Environmental Report 2021

City of Helsinki

Environmental Report 2021

City of Helsinki

City of Helsinki Environmental Report 2021
City of Helsinki, publications of the Central Administration 2022:29
ISBN 978-952-386-123-7 (html)
ISBN 978-952-386-124-4 (pdf)
ISSN-L 2242-4504
ISSN 2323-8135 (online publication)

Cover photo: Julia Kivelä
Publisher: City of Helsinki, Urban Environment Division

Table of Contents

Address by the Deputy Mayor

The year 2021 was meaningful for both the climate and the environment in Helsinki. We decided on the new City Strategy, which will set the bar higher for our carbon neutrality objectives, set ambitious policies for ensuring biodiversity and requires us to pay more attention to reconciling housing construction and natural values. Helsinki brought its carbon neutrality target forward to 2030. The new City Strategy also specifies that the City will have a zero-carbon target for 2040. The practical decisions that we make during this council period of office will be crucial for achieving the objectives set.

Moving forward, the Carbon-neutral Helsinki Action Plan will be updated annually with new actions. This is key for us to find the best and most effective ways to reach our targets. Last year, our total emissions neither increased nor decreased, since the emissions of Helen increased as much as the emissions of other sectors decreased. Even though this development is partially explained by Russia's preparation for war and its repercussions, we still need to get back on a downward trend with our emissions. The development of emissions highlights that sustainable solutions must be adopted quickly, even in heating production.

In 2021, we also approved the City of Helsinki Biodiversity Action Plan (LUMO), which has also since been included in the new City Strategy. The plan is a powerful statement for paying attention to biodiversity in all City operations. The new strategy focuses on nature more intensively than before. One of its aims is to have five new nature reserves in Helsinki on an annual basis. The central objectives are the natural ageing of forests and the systematic increase of diversity in forests and forested areas within recreational and natural areas.

Pleasant and diverse local nature is important to Helsinki residents. This is evident in the results of the participatory budgeting voting in which people have selected many projects that aim to make the local environment greener. For example, a total of ten parks were selected in the OmaStadi project to have more meadow-like lawns through changes to the maintenance methods.

One of the milestones towards an even more pleasant and functional city was the completion of the Hämeentie renovation project. Hämeentie street is now safer for pedestrians and cyclists, faster for public transport and quieter for everyone, in addition to having cleaner air. We will face challenges in promoting sustainable modes of transport in the coming years. As the population grows and land use becomes denser, it will be increasingly important to get people back onto public transport after the pandemic to avoid congestions and reduce emissions.

In 2021, Helen made the decision to close the Hanasaari Coal Power Plant and end production there by spring 2023. It was also decided that the burning of coal would stop at Salmisaari Power Plant in spring 2024. These decisions will mark the end of burning coal in our city – over five years earlier than planned. A year from writing this address, we will have closed down one of our coal power plants. It will be a significant step on our journey towards a carbon-neutral capital city.

Anni Sinnemäki
Deputy Mayor for Urban Environment

Helsinki in a Nutshell

Helsinki is the centre of a rapidly growing large metropolitan city area. Helsinki, together with the municipalities of the Helsinki Metropolitan Area (Espoo, Vantaa, and Kauniainen) and eight neighbouring municipalities, forms an area with a population of over 1.5 million residents, which is referred to as the Helsinki Region. As of 31 December 2021 Helsinki had a population of 658,457. As of the end of 2021 the population density was 3,072.7 residents per land area square kilometre. The city of Helsinki's surface area is 715.48 km2, of which 214.29 km2 (29.95%) is land, 0.9 km2 is inland waters, and 500.29 km2 sea waters. The majority of the city's green areas are forest (45.7 km2), parks (9.3 km2) and landscape fields or meadows (10.9 km2). There were a total of 453,600 jobs in Helsinki in 2021. Helsinki accounts for 18 per cent of Finland's jobs.

From an environmental impact's perspective, the City of Helsinki is one of the most significant actors at the Finnish scale. Helsinki's total greenhouse gas emissions are approximately five percent of Finland's total greenhouse gas emissions. The Viikinmäki wastewater treatment plant cleans the wastewater produced by approximately 890,000 people. Additionally, as Finland's largest employer, the City's operations have significant environmental impacts due to the volume of office work, for example.

The Helsinki Group comprises the following entities:

- The City as a parent entity (4 divisions, City Executive Office, Audit Department and 5 municipal enterprises).
- Subsidiary entities, i.e. organisation which are owned directly by the City (90 subsidiary organisations and 12 foundations).
- Associated entities, i.e. companies, foundations and joint municipal authorities in which the City has a 20–50 per cent ownership stake (35 associated companies and 6 joint municipal authorities).

At the end of 2021, the City employed 39,255 people.

Environmental management and partnerships

The City of Helsinki is committed to ambitious goals related to the environment and climate. The new City Strategy 2021–2025, 'A Place of Growth,' states that the City's growth must be sustainable and in harmony with ecological boundaries. The City's environmental policy complements the current City Strategy in terms of environmental protection. By monitoring the environmental policy indicators set out in the Environmental Report, we are also partially monitoring the implementation of the City Strategy. In addition to the environmental report, Helsinki Environmental Statistics also offer multifaceted information about the City's environmental status. The Environmental Report and environmental statistics are open data.

Environmental management systems and sustainable development plans help develop operations

The objective of the City's environmental policy is for City organisations to develop their environmental management by adopting environmental management systems or, at least, following their principles. The EcoCompass environmental management system certificate was granted to the Urban Environment Division, Youth Services, Pakila Work Centre and Helsinki Biennial in 2021. The building of the environmental management system was underway in the Social Services and Health Care Division, Sports Services, Helsinki Art Museum and Helsinki City Museum. Stara, Service Centre Helsinki, the City Library network and Kinapori Senior Centre continued in the EcoCompass system.

Of the City's subsidiary communities, the EcoCompass certificate was granted to Helsingin Asumisoikeus Oy, Helsingin Seniorisäätiö foundation and Helsinki City Theatre in 2021. The EcoCompass certificate was renewed for Jääkenttäsäätiö ice field foundation, Oulunkylä Rehabilitation Centre, MetropoliLab Oy and Helsingin kaupungin asunnot Oy. The Green Office certificate was awarded to Forum Virium Helsinki Oy and the Port of Helsinki Ltd.

The Urban Environment Division grants a 30 per cent discount on the rent charged for the use of its areas against an audited EcoCompass environmental management system in order to encourage events to use the system. Due to the pandemic, not many events could be organised in 2021, and the City only granted the discount to the Great Beers – Small Breweries event.

The Eco-Schools programme involved 36 daycare centres, schools and educational institutions of the City of Helsinki, and three Helsinki educational institutions possessed the OKKA certificate for sustainable development. In spring 2021, Helsinki Vocational College and Adult Institute started a process that aims for it to be certified by the OKKA Foundation regarding sustainable development.

Environmental matters included in supervisors' training

In 2020, the Urban Environment Division launched cooperation with Helsinki Vocational College and Adult Institute regarding the development of supervisors' environmental competencies. In 2021, environmental matters were included in two one-day training sessions on strategy and the operating environment and a one-time webinar on future leadership.

For the first time, environmental matters were also included in the City Executive Office's updated 'Starting in a Supervisory Position' online training module that was piloted in spring 2021. In the online training module, the section on the City's environmental management is aimed at all supervisors. In addition to that, the participants also select, at least, one optional theme related to sustainable development, climate change mitigation and adaptation, biodiversity and circular economy. The online training module was completed by 34 supervisors in 2021.

Eco-support activity network grew

By the end of 2021, the number of eco-supporters working in the Helsinki Group was 1,325. Four eco-support training sessions were held in 2021 with a total of 93 new eco-supporters across all divisions and public enterprises participating. In addition to these, 14 further training sessions were organised on varying themes. As in previous years, some of the training was implemented in cooperation with the eco-support activity network of the Helsinki Metropolitan Area. The eco-support activities were showcased at several of the City's internal and external events, such as the webinar for the Baltic Sea Day, orientation events for new City employees and training sessions for supervisors. Eco-support aid was granted to 18 work communities in total for the promotion of circular economy, sustainable commuting and environmental education.

Three new municipalities joined the nationwide network for eco-support activity. In 2021, there were a total of 34 municipalities, joint municipal authorities and other organisations operating in the national eco-support activity network coordinated by the City of Helsinki.

Cooperation with companies to promote responsibility

The Mission Zero Foodprint project coordinated by Forum Virium Helsinki developed the Climate Meal concept for restaurants. The Climate Meal label, included in the concept, helps customers in restaurants identify the dishes with a lower-than-average carbon footprint. The label is granted to dishes where the ingredients have a combined carbon footprint of at most 1.0 kg CO2e The Climate Meal campaign ran in October 2021, during which over 50 restaurants in the Helsinki Metropolitan Area started using the label. The label will also be available to restaurants even after the campaign. They can start using the label by registering at ilmastoannos.fi and committing to using the carbon footprint calculator to determine the carbon footprint of the climate meals.

The Think Sustainably service of the MyHelsinki.fi website was developed by updating the service's entire criteria to better meet today's standards and to spur companies on. The Think Sustainably service has attracted plenty of international attention, and it even

received the Place Marketing Award in the Tourism category in France in September 2021.

The revision of the Climate Partners network's operating model started at the end of the year. The intention is to develop cooperation between the City and companies to be increasingly concrete and take responsibility into account as extensively as possible. Two new organisations joined the network during the year: Rototec Oy and A-Insinöörit.

Environmental management model of the City of Helsinki

The City Council approved the City Strategy 2021–2025 to direct the City's operations. In 2012, the City Council also approved the City's environmental policy, which supplements the current City Strategy with regard to environmental protection. The environmental policy sets out the medium-term (2020) and long-term (2050) objectives for environmental protection. The environmental policy is currently being updated. The objectives of the City's environmental policy are implemented in the programmes for the subareas of environmental protection, which include (the body that decided on the programme is shown in parentheses):

- Carbon-neutral Helsinki Action Plan (City Board)
- Climate change adaptation policies for 2019–2025 (City Board)
- Noise Abatement Action Plan 2018–2022 (Environment and Permits Sub-committee)
- Air Quality Plan 2017–2024 (Environment and Permits Sub-committee)
- Baltic Sea Action Plan 2019–2023 (City Board)
- Helsinki's Nature Conservation Programme 2015–2024 (Environment Committee)
- City of Helsinki Biodiversity Action Plan 2021–2028 (Urban Environment Committee)

The City Board and the government have signed the Municipal Energy Efficiency Agreement 2017–2025 and the Action Plan of Rental Housing Communities in the Housing Property Sector 2017–2025, which is related to the Energy Efficiency Agreement of the Property and Building Sector. These set out the energy conservation target for the agreement period. The progress of the target is reported on an annual basis.

The City Board approves the instructions for drafting and following the budget, which include instructions on recording and taking environmental matters into account.

The City's divisions, enterprises and subsidiary communities implement the City Strategy and the City's environmental protection sub-programmes in their operations. Several of the City's divisions, enterprises and subsidiary communities have also adopted environmental management systems. Below is a list of the systems in use:

- ISO 14001 environmental management system: Helsinki City Transport, Finlandia Hall Ltd, HELEN Ltd, Palmia Oy, Port of Helsinki Ltd
- EcoCompass environmental management system: Urban Environment Division, Youth Services, Pakila Work Centre, Helsinki Biennial, Stara, Service Centre, Helsinki City Library network, Kinapori Senior Centre, Sports Services (certified in 2022) and 14 subsidiary communities

- EcoCompass environmental management system being built: Social Services And Health Care Division, Helsinki Art Museum, Helsinki City Museum and one subsidiary community.
- Green Office system: Education Division administration and four subsidiary communities.
- Green Flag or OKKA certificate: 39 City schools, daycare centres and upper secondary schools.

There are eco-supporters working in the City's divisions, enterprises and subsidiary communities who promote environmentally sustainable operating methods and increase environmental awareness on top of their own work.

The City's divisions and enterprises have the option of setting binding environmental objectives in the budget. In 2021, such objectives were set by the Urban Environment Division, Helsinki City Transport (HKL) and City of Helsinki construction services Stara.

The City's environmental work is reported on annually in the Environmental Report, which also monitors the environmental policy indicators. The Environmental Report is reviewed by the City Board and City Council.

Second sustainable development report was handed to the UN

Helsinki is committed to promoting the global Sustainable Development Goals under the 2030 Agenda. The City submitted its second report on sustainable development to the UN in July 2021. The reporting process involved an extensive City-level working group who identified themes that require development and brought up concrete actions that would support the goals. The report is available at https://sustainable.helsinki/

Eyes on the future

The City's environmental policy will be updated in 2022 to complement the current City Strategy in terms of environmental protection. The City's internal environment and climate network founded in 2021 will continue to operate in the coming years. The network will support Helsinki Group's divisions, enterprises and subsidiary communities in environmental management and facilitate functional cooperation and peer support between the organisation's various sections. Developing the staff's competencies has been identified as a key factor in promoting environmental work and sustainable development. The well-received environmental management training for supervisors will continue, and the online training module on sustainable development for the entire staff will be prepared in 2022. The development processes started in 2021 for the City's environmental statistics and environmental reporting will continue in 2022.

Climate protection

In the City Strategy for the 2021–2025 council period of office, Helsinki brought its carbon neutrality target forward to 2030. The Carbon-neutral Helsinki Action Plan was updated to meet the new target year and will focus on the most effective actions in construction, transport and energy solutions, in accordance with the City Strategy and the emissions reduction target. The Strategy also states that the City will have an ambitious zero-carbon objective for 2040.

The implementation of the first period of the Carbon-neutral Helsinki Action Plan progressed well, and many of the actions have been completed. Some of the actions have been integrated into normal public service. Those actions that are still underway and would benefit from the programming, the actions have been transferred to other plans and programmes, such as the roadmap for circular and sharing economy.

Total greenhouse gas emissions remained at the level of the previous year

Globally, 2021 was the sixth-warmest year on record. The past six years have been the warmest, while 2011–2020 was the warmest decade. In Finland, 2021 ended up being at an ordinary temperature range, even though June was the hottest on record in Southern and Central Europe and July was also very warm.

The total greenhouse gas emissions generated by residents, services and industry in Helsinki in 2021 amounted to 2,345 kt CO_2e, remaining at the same level as in the previous year. This is due to the emissions from district heating increasing, even as emissions from other sectors decreased. The increase in emissions from district heating is mainly explained by Helen Ltd's fuel distribution: the relative proportion of natural gas decreased, while the proportion of coal and oil increased. Compared to 1990, the total emissions of Helsinki were 33% lower. Emission per capita also remained at the previous year's level. Emissions per capita were 3.6 t CO_2e, which is 50% lower than in 1990.

Renewable energy accounted for 16% of the energy produced by Helen in 2021. Energy was produced with hydropower, wood pellets, wind power and solar power, as wellas with heat pumps by using various surplus energy flows.

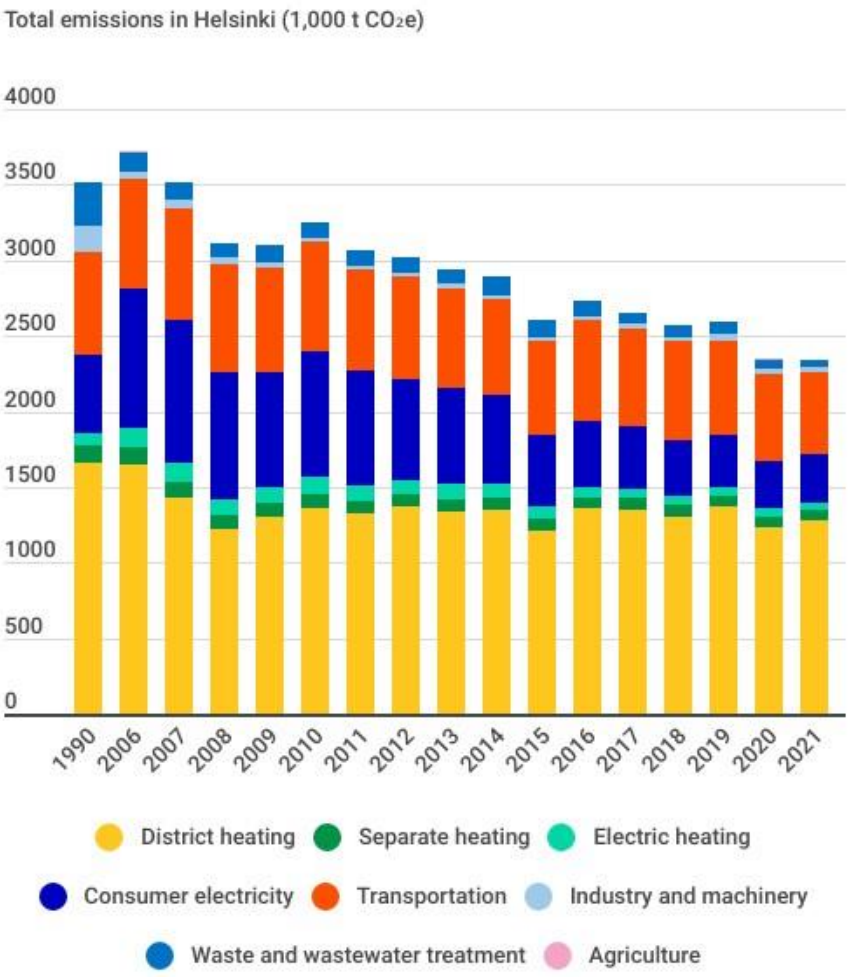

Image 1. Total greenhouse gas emissions in Helsinki in 2021 amounted to 2,345 kt CO2e.

Towards carbon-neutral energy production

Helen aims to reach carbon neutrality in energy production in 2030. In 2022, Helen will prepare a new carbon neutrality plan in accordance with this objective of having entirely carbon-neutral energy production in 2030. In 2021, Helen made the decision to close the Hanasaari Coal Power Plant and end production there by spring 2023. It was also decided that the burning of coal would stop at Salmisaari Power Plant in spring 2024. With these decisions, Helen will stop using coal over five years earlier than planned. The closing of Hanasaari Power Plant will reduce carbon dioxide emissions in 2023 by almost 50% from the 1990 level. The production will be replaced with heat recovery, bi-oheat, solar and wind power and energy storage. Similarly, the closing of Salmisaari Power Plant will reduce emissions by a minimum of 60% in 2024 and accelerate the move towards a decentralised heating production and energy system. By 2030, the carbon dioxide emissions from energy production will decrease by 85% from the 1990 level. The remaining emissions will be compensated for.

Many development projects underway in building construction

The Re-thinking Urban Housing programme is in charge of the development needs of designing and constructing blocks of flats. In the past few years, the programme has seen several projects that pay special attention to climate change. In 2021, Re-thinking Urban Housing included two new projects, the 0-CO2 and Urban Wooden Block projects. In the 0-CO2 Block project in Kalasatama aims to create an operating model that will help achieve a fully carbon-neutral residential block. The Urban Wooden Block project in Pohjois-Pasila is based on a plan that won the Asuntoreformi ('Housing Reform') architectural competition in 2018. The project aims to develop a type of a wooden block of flats in an urban enclosed block, study a feeling of communality at various scales and highlight new solutions for housing design. Of the projects in the programme, the ones that were completed were the Lifecycle Block in Koskela, the SunZEB block in Kalasatama, the Energy-efficient and Bright Residential Building in Jätkäsaari and the Group Rental project in Kruunuvuorenranta.

The development of a national emissions database for infrastructure construction continued in 2021, led by the Finnish Transport Infrastructure Agency. In the first stage, the database will focus on road construction but also pay attention to other characteristics of urban infrastructure construction as extensively as possible. The interviews and data collection carried out in 2021 resulted in an initial database that will be tested in spring 2022. At the same time, reviews and development work on the harmonisation of the methods started.

The work to update the lifecycle management model, which directs the City's own housing construction and compiles the objectives and instructions related to eco-sustainable construction, continued in 2021. The latest version was published at the turn of 2021 and 2022, at which point the management model was renamed the 'objectives of eco-sustainable construction' regarding the service building projects. In housing production, the lifecycle management model was develop to suit housing construction and piloted in various projects. After having piloted it early in the year, it was decided that the lifecycle management model would be adopted for all projects to be launched.

In 2021, the City's projects for both service buildings and housing production adopted the environmental documentation for worksites, the goal of which is to direct the implementation of construction so that the environmental impact of construction can be prevented, reduced and mitigated. The document includes, for example, the Green Deal on zero-emission worksites and the first-stage requirements for contractors.

The lifecycle carbon footprint for a building will be calculated for all new construction projects of the City and, subject to discretion, also for renovation projects. The calculations are used to steer operations towards a lower-emission direction, and information about them is compiled to set a threshold value for the carbon footprint. The carbon footprint has also been used as the minimum requirement and quality criterion in the City's lifecycle, rental and design–build projects.

In addition to this, the Canemure project piloted carbon footprint calculations as a part of the renovation planning for the Hämeentie street space. Through climate-smart and resource-smart design, technical solutions and material choices, almost a third of a project's emissions can be reduced. More details about the Canemure project are in the Procurements chapter.

Climate taken into account in planning

The planning of wooden construction areas progressed in 2021 as the Karhunkaataja detailed plan (50,000 floor m2 of wooden residential buildings) and the Koivusaari detailed plan (27,100 floor m2 of wooden residential buildings) were completed and moved to decision-making. The detailed plans for Hermanninranta and Länsi-Haaga were also prepared. In addition to this, minor detailed plans on wooden construction were at varying stages in Malmi, Tapanila, Pihlajamäki, Patola and Kumpula.

The possibilities and preparation of regional geothermal heating were studied in connection with the plan for Karhunkaataja and the planning of Hermanninranta and Länsi-Haaga. In Koivusaari, the utilisation of seawater heat was also studied. The circular economy perspective was implemented by the plan regulations and conversions regarding the mass balance of the Koivusaari detailed plan and promotion of solutions that preserve old elements, such as the educational building on Onnentie and the Kätilöopisto Hospital. The perspective of the carbon footprint was present in the planning principles for central Malmi, which were approved by the Urban Environment Committee in 2021.

Through the assessment method for the low-carbon qualities of Helsinki detailed plans (the HAVA method), the lifecycle carbon footprint and handprint of Helsinki detailed plans can be reviewed. The purpose of HAVA is to become a clear, easy-to-use and updateable method that will visualise climate impact. It can be used to direct operators to low-carbon and even carbon-positive solutions. The results yielded by HAVA can be used as a part of assessing a plan's impact, for example in the comparisons within a planning project (wooden construction vs concrete construction, demolitions vs preservation, underground parking vs carpark). Through HAVA, the factors that are significant for carbon emissions can be identified from the plans and also influenced.

Winner selected in the Verkkosaari Low-carbon Green Block plot conveyance competition

In the Verkkosaari Low-carbon Green Block plot conveyance competition, launched to promote low-carbon construction in Helsinki, a 50-% emphasis was placed on the carbon footprint, E-value and green factor. Through a plot conveyance competition with a good location, it can be assessed how high the criteria-based targets can be set, and how these essential criteria on carbon neutrality can be achieved at the same time. The competition had 12 ambitious entries, of which 'Grün in der Mitte' by the construction company Hartela was selected as the winner. The architecture in the entry was by Arkkitehtitoimisto Anttinen Oiva arkkitehdit Oy. Much like all the best proposals, the innovative and low-carbon proposal managed to integrate climate-friendly solutions into an architecturally sound solution. Based on the best entries, a market dialogue event was also held in spring 2022 between companies and City expert, as a part of the Embodied Carbon project of the CNCA network.

Traffic emissions reduced by many means

The City Strategy aims for the City of Helsinki's work on carbon neutrality to focus on the electrification of the transport system and the promotion of sustainable and smart transport solutions. In accordance with the Carbon-neutral Helsinki 2030 Action Plan, the transport sector is pursuing a 69% reduction in greenhouse gas emissions (2005–2030).

The emission reductions of traffic are being realised by means such as increasing the popularity of cycling and walking and by increasing the percentage of electric cars, electric buses and rail-based public transport. For more information on the promotion of sustainable transport and mobility, see the chapter ‘Transport’ in this report.

Projects speed up development work

The City of Helsinki coordinated the 6Aika Carbon-neutral And Resource-wise Industrial Areas (CRIA) project that promoted work towards carbon neutrality in industrial areas and ended in 2021. The project sought means of reducing the emissions from machinery and making the use of materials more efficient. In addition to this, it coached companies on carbon neutrality. The CRIA project was active in the cities of Helsinki, Espoo, Vantaa and Turku. In the infrastructure worksite pilot in Helsinki, procurement criteria and practices that promote the zero-emission operations of a worksite were tested. The Vuosaari Harbour piloted joint collection of plastic waste and the potential of the plastic value chain in its industrial area, while also preparing a review and roadmap for 2021–2035 to reduce the emissions from harbour machinery. The emissions calculation model for harbour machinery, along with its tutorial videos, is also suitable for the calculations for other types of machinery. These and other results of the project can be seen on the hnry.fi.

The mySMARTLife project, included in the EU’s Horizon 2020 programme, tested innovative and smart urban energy solutions and aimed to improve their entry to the market. In addition to the sub-project in Helsinki, pilots that largely focused on smart technology were carried out in Hamburg and Nantes, and lessons learned have been shared with several European cities. The project, which started in 2016, was extended from late 2021 to September 2022. The project that focused on reducing the emissions from traffic and energy, in particular, is now at the monitoring and reporting stage, and a shared European publication on the results, lessons and development of the actions is being planned.

Eyes on the future

The Carbon-neutral Helsinki Action Plan focuses on increasingly impactful actions, as specified in the City Strategy. In order to rapidly handling factors that influence technological development, political and other types of guidance and other emissions, the actions will be updated annually, moving forward. The City will also continue other work related to climate change mitigation which will be monitored as a part of the operation of the climate and environment network. The role of subsidiary communities in climate work will be expanded as a part of the process where all subsidiary communities prepare their own carbon neutrality plans.

Emissions situation in Helsinki, kt CO2e

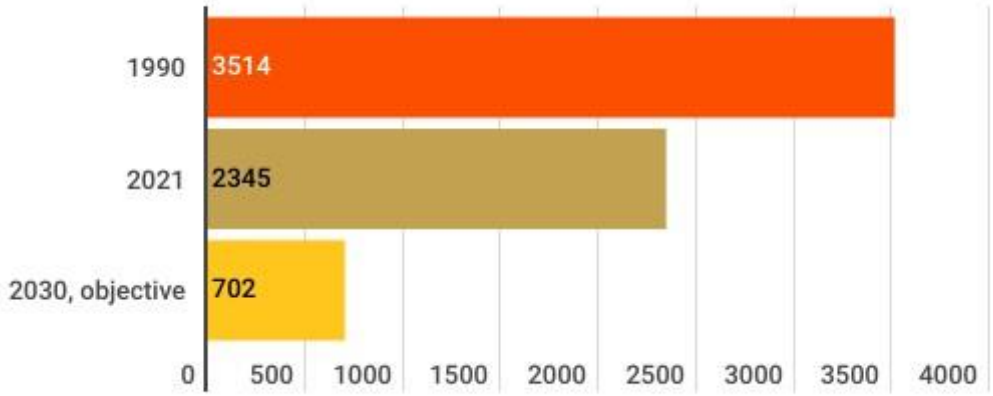

Image 2. Helsinki must reduce its emissions by 1,643 kilotonnes of CO_2 equivalent from 2021 to 2030 in order to achieve carbon neutrality, an 80% reduction compared to the year 1990.

Adapting to climate change

Adapting to climate change, or climate change adaptation, refers to the means of preparing for extreme weather phenomena and reducing the detrimental effects of climate change. According to the City Strategy “we will all have to adapt to the consequences of our planet’s climate crisis. The health, property and way of life of Helsinki’s inhabitants must be protected. The goal is to prepare Helsinki well for extreme weather phenomena and their indirect effects.” Helsinki will take the actions required for adaptation. Preparation must be integrated into city planning, new construction and reconstruction projects. Helsinki has assessed the weather and climate risks concerning the city. The City’s key climate risks are stormwater floods caused by heavy rain, a sudden raise in sea level caused by storms, slipperiness, extreme and abnormal winter conditions, heatwaves, drought and the eutrophication of the Baltic Sea.

Image 3. Töölönlahti wetlands, which will retain and clean stormwaters flowing from the direction of Pasila. Photograph by Elisa Lähde.

Climate change adaptation policies – a key climate risk management programme

Helsinki’s climate change adaptation policies 2019–2025 is a programme through which the City of Helsinki aims to adapt to climate change and prepare for extreme weather phenomena. The vision of the policies is ‘Climate-proof Helsinki in 2050’. The adaptation measures are included in the City’s planning and guidance, for example, in land

use planning, preparation and preparedness planning, stormwater management, the development of green areas and structures, and nature conservation and management.

Progress of Helsinki's climate change adaptation policies 2019–2025 in 2021

A City-level expert group for adaptation, appointed by the Head of the City Executive Office, started operating in autumn 2021. The group is tasked with prioritising and concretising the actions presented in the adaptation policies. The group's work is underway, with the first adaptation priorities being natural stormwater management, climate-proof construction and renovation projects, reinforcement of green structures, and climate risk management as a part of the City's management system.

Stormwater management is key in climate change adaptation. The quantitative and qualitative stormwater management are directed through the stormwater programme. To enhance the stormwater quality control, the HuLaKaS project was initiated, through which Helsinki aims to define qualitative risk areas for stormwater. The quality of the stormwater flowing from the Mechelininkatu street and the functionality of the filtering solution in Taivallahti will also be monitored separately. The functionality and filtering performance of the stormwater filtering structure in Kuninkaantammi will also be monitored for 1.5 years, approximately.

The green factor method is used to create green, comfortable and climate-proof plots in the increasingly dense urban structure, which also promotes the climate change adaptation of urban areas. A plot-specific green factor will be used for all land use plans if there are no special reasons for deviating from it. A survey was carried out (by WSP) on the use and impact of the green factor, also including suggestions on how to develop the tool. The development work on the regional green structure tool to be used in city planning is underway.

Helsinki's Sustainable Energy and Climate Action Plan (SECAP) was prepared. SECAP compiled the City's climate programmes and plans and the assessments regarding climate risks and vulnerability.

Nature-based solutions support adaptation

According to the City Strategy "part of preparing for climate change will include planting more trees and adding more green spaces to the city. Drought-resistant greenery will be added to Helsinki parks and green walls and roofs will assist with drainage. Effective green solutions can help manage storm water, minimise flood risks and limit the heat island effect of hotter temperatures in urban areas." Helsinki has adopted natural solutions for stormwater management and increasing greenery in the urban structure. Natural solutions promote adaptation to climate change while also producing several other benefits, such as health benefits, recreation opportunities and greener residential environments.

The City of Helsinki, in collaboration with Ramboll, has compiled information and instructions on making the existing yards of blocks of flats greener in the form of an information package. The information package showcases the history of residential yards, illustrates nature-based solutions and their impact and benefits, and provides examples

of yard renovations. The package also includes separate information cards for designers and residents on using the yards and for housing managers and housing companies for maintenance.

The B.Green project creates new green infrastructure solutions and the associated digital tools to support city planning. The project will create a participatory city planning model that will help green infrastructure solutions to be applied widely.

In autumn 2021, a communication campaign on adapting to climate change, directed towards residents, with the theme ‘green solutions – superheroes of climate change.’ The campaign was implemented through Facebook, Instagram, Twitter posts and theAd Shel digital screens on the streets of the city centre.

Eyes on the future

Helsinki is preparing for extreme weather phenomena and the continuously changing climate and its consequences. Helsinki is strengthening its climate resilience through impactful adaptation measures. Climate change affects groups of people, businesses and areas in various ways. When assessing the impact of climate change, Helsinki will emphasise fairness in its preparation and decision-making and aiming measures with consideration to social vulnerability.

Energy

The production and consumption of energy play significant roles in achieving the carbon neutrality target. The consumption of district heating accounts for 54% of the CO2 emissions of the entire city (urban area), while the electricity consumption of buildings accounts for 16%. The CO2 emissions of the Helsinki Group account for 14% of the emissions of the entire urban area. Of this percentage, 95% is caused by the energy consumption of buildings.

Helsinki's energy conservation work is based on the Carbon-neutral Helsinki Action Plan, which aims for the City to become carbon-neutral by 2030. Helsinki has been involved in the energy efficiency agreements made between municipalities and the Finnish government. These agreements are used to implement the measures required by the national energy and climate strategy at the municipal level.

National requirements for construction exceeded, local renewable energy produced

For several years, it has been required for the City's own new buildings to be made more energy-efficient than what is demanded by the national requirements. Since the beginning of 2021, the requirements for service buildings were made stricter by ten percentage points. I.e., new construction projects that start from 1 January 2021 onwards must have an E-value that is 30% lower than the national requirement, and the E-value of renovations must improve by 20 percentage points from the national requirement. The target for new housing construction in 2021 was that residential buildings should be at energy class A. In housing production renovation projects, the E-value must be 32% lower from the year of construction, and 25% lower from the current status.

In the binding operational goals for the 2021 budget, a target was set for service building projects: a heat pump system would be selected as the main heating system whenever this is technically feasible and when the investment's repayment period is less than 15 years. The goal in both new construction and building improvement projects was still for an amount of electricity equivalent to approximately 10% of purchased electricity to be produced with solar power if the system is financially viable.

In 2021, the primary form of heat production for new housing production sites was geothermal heating, and the feasibility and financial viability of other heat pump systems were also studied in relation to district heating. In renovation sites, the feasibility and financial viability of geothermal heating and other heat pump systems in relation to district heating were surveyed. For new construction and renovation sites, the requirement was that solar panels be implemented for all sites with potential for it. Solar power will cover the consumption of property electricity on a summer day, at the minimum.

Energy consumption causes considerable carbon dioxide emissions

The City accounted for 13% of the consumption of electricity, 18% of the consumption of heat and 4% of the consumption of district cooling in the entire Helsinki urban area. The properties owned by the City rarely use separate heating; they are mainly heated by using district heating, meaning that the emissions from energy production are generated by centralised energy production.

The energy consumption and CO2 emissions of the Helsinki Group in 2020 and 2021 are presented in the table below. The CO2 emissions of Helsinki Group grew only by 1%, while energy consumption grew by 7% from 2020. The explanation for the moderate growth in CO2 emissions is that some of the electricity in 2021 was purchased as green electricity. The emission factor of Helen's basic district heating product increased by 1.6%, whereas the emission factor of the basic electricity product decreased by 6% from the previous year.

Tables 4–9. Energy consumption and CO2 emissions of the Helsinki Group in 2020 and 2021.

PREMISES, owned by the city*	**GWh, 2020**	**GWh, 2021**	**GWh change %, 2020-2021**	**CO2 kilotonnes, 2020**	**CO2 kilotonnes, 2021**	**CO2 change %, 2020-2021**
Electricity	190	191	0,3 %	47,0	44,3	-6 %
District cooling	2,67	4,79	79 %	0,00	0,00	0 %
District heating	329	391	19 %	61	74	21 %
Total	**521**	**587**	**13 %**	**108**	**119**	**9 %**

PREMISES, other (incl. subsidiary communities)	**GWh, 2020**	**GWh, 2021**	**GWh change %, 2020-2021**	**CO2 kilotonnes, 2020**	**CO2 kilotonnes, 2021**	**CO2 change %, 2020-2021**
Sähkö**	205	238	16 %	50,6	38,5	-24 %
Kaukojäähdytys	2,32	3,34	44 %	0,00	0,00	0 %
Kaukolämpö***	782	804	3 %	146	152	4 %
Yhteensä	**989**	**1045**	**6 %**	**197**	**190**	**-3 %**

OUTDOOR LIGHTING, TRAFFIC LIGHTS	**GWh, 2020**	**GWh, 2021**	**GWh change %, 2020-2021**	**CO2 kilotonnes, 2020**	**CO2 kilotonnes, 2021**	**CO2 change %, 2020-2021**
Outdoor lighting, electricity	42,8	38,4	-10 %	10,6	8,90	-16 %
Traffic lights, electricity	1,18	1,21	2 %	0,29	0,28	-4 %
Total	**44,0**	**39,6**	**-10 %**	**10,9**	**9,18**	**-15 %**

PUBLIC AREAS	**GWh, 2020**	**GWh, 2021**	**GWh muutos-%, 2020-2021**	**CO_2 kilotonnia, 2020**	**CO_2 kilotonnia, 2021**	**CO_2 muutos-%, 2020-2021**
Electricity	3,25	3,88	19 %	0,80	0,90	12 %
District heating	3,36	3,87	15 %	0,63	0,74	17 %
Total	**6,61**	**7,75**	**17 %**	**1,43**	**1,64**	**14 %**

TRAFFIC	GWh, 2020	GWh, 2021	GWh muutos-%, 2020-2021	CO_2 kilotonnia, 2020	CO_2 kilotonnia, 2021	CO_2 muutos-%, 2020-2021
Metro traffic, electricity (green)	49,9	49,9	0 %	0,0	0,0	0 %
Tramline traffic, electricity (green)	25,1	27,8	11 %	0,0	0,0	0 %
Ferry traffic, fuel	6,64	7,00	5 %	1,71	1,81	5 %
Total	**81,7**	**85,0**	**4 %**	**1,71**	**1,81**	**5 %**

VEHICLES AND MACHINERY	GWh, 2020	GWh, 2021	GWh muutos-%, 2020-2021	CO_2 kilotonnia, 2020	CO_2 kilotonnia, 2021	CO_2 muutos-%, 2020-2021
Vehicles and machinery	17,6	24,3	38 %	4,1	3,7	-11 %

	GWh, 2020	GWh, 2021	GWh muutos-%, 2020-2021	CO_2 kilotonnia, 2020	CO_2 kilotonnia, 2021	CO_2 muutos-%, 2020-2021
TOTAL	**1660**	**1788**	**7 %**	**323**	**325**	**1 %**

* Service buildings directly owned by the City where consumption is monitored by the hour (in the Nuuka system with about 600 properties).

** Including 30% of green electricity in 2021 (in 2020, this was not included in the calculations).

*** The district heating for Korkeasaari is zero-emission circulated heating (about 4 GWh).

The CO2 emissions for 2020 have been calculated by using the product-specific emission factors of Helen Ltd, which are the following:

- 187 g/kWh for district heating
- 247 g/kWh for electricity (data for 2019; the factor for 2020 is not available)
- 0 g/kWh for cooling

The CO2 emissions for 2021 have been calculated by using the product-specific emission factors of Helen Ltd, which are the following:

- 190 g/kWh for district heating
- 232 g/kWh for electricity (data for 2020; the factor for 2021 is not available)
- 0 g/kWh for cooling

In 2021, a majority of CO2 emissions (95%) came from the energy consumption of properties. Since 2019, the CO2 emissions calculations have used the emission factors specific for each energy product. The calculations for 2021 also include green electricity and district heating contracts as new elements, as far as the information has been available. Consumption in accordance with the green electricity contracts amounts to 72 GWh in the calculations. This involves subsidiary communities whose purchased electricity is fully green, such as Heka Oy, Korkeasaari, Kiinteistö oy Kaapelitalo and Jätkäsaaren Putkikeräys Oy. As for green district heating, the calculations for 2021 only take the zero-emission circulate heat bought by Korkeasaari into account.

The district heating consumption of both properties and public areas increased by 8% from 2020 after the relatively warm winter in 2020.

The electricity consumption of service buildings remained almost at the same level as last year. During the pandemic, the ventilation in service buildings was intensified, which increased the consumption of both electricity and district heating in 2021.

The district cooling consumption of properties increased due to the increased number of cooled sites. The electricity consumption of outdoor lighting has continued to decrease thanks to systematic energy efficiency measures.

The electricity consumption of metro traffic remained at the same level as last year, but the energy consumption of tramline traffic increased by 11% because of the cold storage of trams when the Koskela depot was out of order. Due to the cold storage, the trams need to be kept running more extensively to warm them up before starting operations.

The fuel consumption of the Suomenlinna ferries increased by 5% from 2020 due to resuming a normal schedule after the reduced schedule of 2020.

District heating accounted for 67% of the City's total consumption (1,199 GWh), while electricity accounted for 31% (550 GWh), cooling accounted for 0.5% (8.13 GWh) and fuels accounted for 1.8% (31.4 GWh).

Energy consumption per capita at last years' level

The energy consumption per capita of the City's own operations varies each year. In 2021, there was an increase of 7% from 2020. This is also influenced by the relatively warm winter of 2020, which decreased the consumption of district heating that year. The City's population growth has slowed down in the past few years. The graph below shows the trends in the per capita energy consumption of the City's own operations for the last 16 years. During the period in question, per capita energy consumption has decreased by 20%. The energy consumption data for 2019–2021 is more comprehensive than in the reporting system used from 2006 to 2018, which is why, in reality, the reduction achieved in per capita energy consumption during the period examined is greater than presented here.

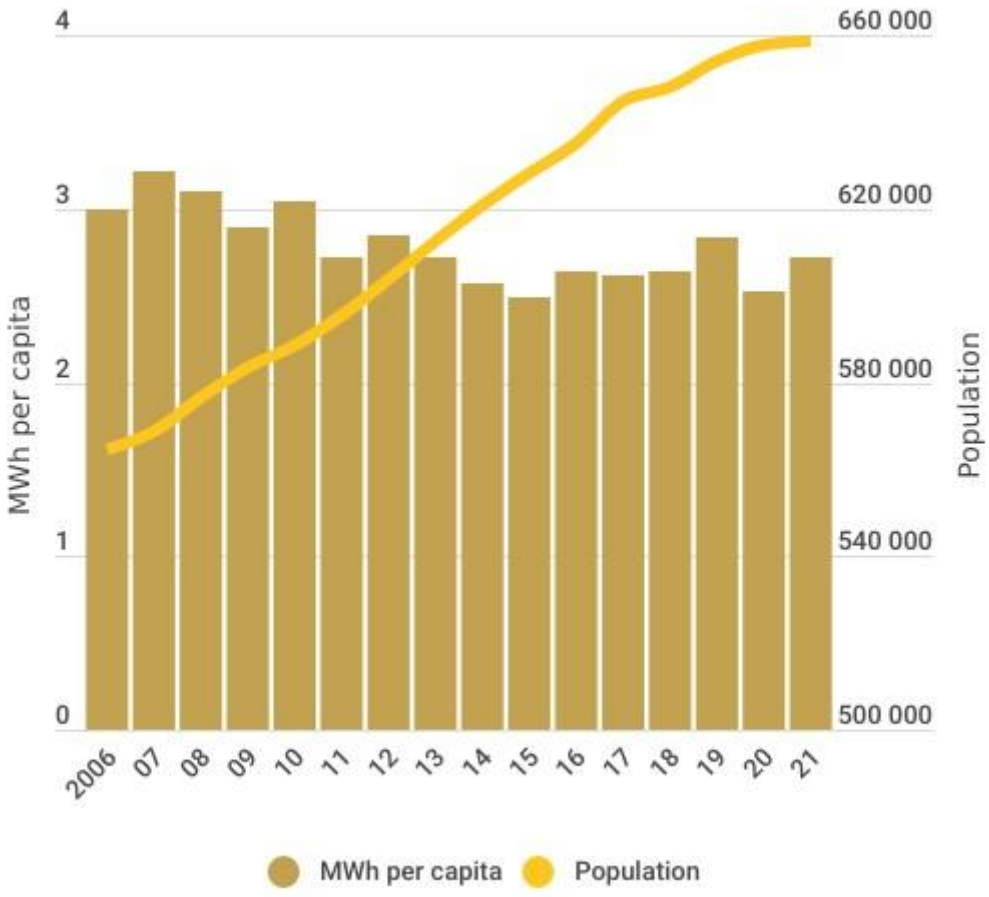

Image 4. The development of the per capita energy consumption in the City of Helsinki's own operations and the population of the city in 2006–2021.

Monitoring of energy consumption

The properties under the direct ownership of the City have been connected to the Nuuka system, and their energy consumption is monitored on an hourly basis. The Nuuka system covers approximately one third of the energy consumption of the Helsinki Group's properties. The energy consumption of the housing company Helsingin kaupungin asunnot Oy (Heka) accounts for approximately 56% of the consumption of the Helsinki Group's properties. The energy consumption of the buildings owned by Heka is monitored on a monthly basis.

The consumption data for the entire Helsinki Group is obtained from Helen Ltd's information system, from which it is retrieved based on a property's connections. Consumption is reported as the total consumption of the locations of use. The list of properties is based on Facta, the building register of Helsinki, from which the properties belonging to the Helsinki Group were picked.

Approximately 30% of the energy conservation targets achieved

Helsinki is committed to an energy conservation target of 61 GWh in the municipal energy efficiency agreement (KETS), while subsidiary companies of the City that own rental apartments are committed to an energy conservation target of 55.7 GWh in the energy efficiency agreement for rental apartments (VAETS) during the contract period 2017–2025. The contractual obligations are implemented with energy conservation measures, the energy conservation effects of which are reported to Motiva annually.

By the end of 2025, the total energy savings achieved by the known energy efficiency actions (KETS + VAETS) of the City will have amounted to approximately 34 GWh, which is a little over 30% of the total conservation target for the entire contract period. The assessment of the effects of more energy-efficient construction than the national requirement in new and renovation construction is partly still in progress, so the energy conservation effects of all projects have not been taken into account in the reported measures.

Measures for improving energy efficiency

The City will install solar power stations in connection with new and renovation construction projects, and as separate investments on existing properties. Surveys related to the financial viability of solar power systems were continued in 2021, and tenders were invited for the solar power systems of six service buildings, the installation of which started in 2021. On the roof of the City's subsidiary community Postipuiston pysäköinti Oy, 210 solar panels with a total power rating of 92.4 kWp were built.

In the new ice arena in Pirkkola, a new recovery system for condensate heat and a recycling system with heat pumps were installed. The condensate heat pump will produce about 2,525 MWh/a of thermal energy, which can be used to heat the ice arena.

The piloting of the energy efficiency partnership model that started in 2020 continued in four service buildings. In the ESCO model, a partner company provides a savings guarantee for the investment, the realisation of which will be monitored for the contract period. The ESCO projects of Liikuntamylly and Pohjois-Kontula civil defence shelter progressed to the monitoring phase. The actions within the projects included the replacement of ventilation systems and a geothermal system for Liikuntamylly. The realised actions can help reach energy savings of 2 GWh per year.

The energy survey operations started off after the delays caused by the pandemic. Energy surveys were ordered for about 30 service buildings. Some of the fieldwork and the implementation of the actions took place in 2021, and others later.

In 2021, the diagnostics features of the smart property data platform, the Nuuka system, which is used in service buildings, were developed to ensure the functionality of building engineering systems. In 2021, the building engineering automation of about 70 sites was integrated into the Nuuka system, which allows various control processes to be used to optimise indoor conditions and energy efficiency. The goal is to integrate the building automation systems of a few hundred locations into Nuuka in the coming years.

The computational reference value for energy efficiency, the E-value, for Heka's extensive modernisation projects launched in 2021 (eight sites in total) improved by at least 32% in all but one site, compared to the year of construction, which is in line with the objective set. Solar power plants were completed for seven new housing sites and one modernised site had with the total combined power of 118 kWp. In addition to this, two

exhaust air pump systems were installed, and the launch of three geothermal heating projects was decided on. As renewable energy procurements, tenders were called for a solar power plant for five existing sites.

The HELENA project of Heka, launched in October 2020, multi-target optimisation was prepared for 24 extensive modernisation sites, which aim for an energy efficiency improvement of 40%. In October 2021, the HELENA project also launched Heka's innovation programme which sought innovative solutions for improving buildings' energy efficiency. A total of 39 applications were received from Finland and other countries. Discussions for potential pilots continued with nine participants. More information about Heka Oy's sustainability operations is on Heka's website.

The start of 2021 saw the launch of the Energy Renaissance operating model, which improves the energy efficiency of privately owned apartment buildings and increases the consumption and generation of renewable energy in housing companies. As a part of the project, energy specialists will offer practical aid to housing companies and strengthen residents' agency through free counselling. You can read more about the project on the Helsinki's Climate Actions website.

In 2021, the Energiaviisas kaupunkikonserni (Energy-wise Helsinki Group) project was also launched, funded by the Ministry of the Environment. In this project, the City will offer support for the identification and implementation of energy conservation measures by its subsidiary communities. In the project, energy surveys were made and proposed measures were prepared to improve energy efficiency in the target properties. The project has provided assistance to operators such as Urheiluhallit Oy, Kalasataman jätteen Putkikeräys, Kaisaniemen Metrohalli and Korkeasaari Zoo. More information about the project results is available on the Helsinki's Climate Actions website.

Electricity supplier Helen's goal is to improve energy efficiency by 5.4% from the 2015 level by 2025. Significant measures taken by Helen in 2021 for the energy efficiency of its production included the sixth heat pump at Katri Vala, increasing the power of the fifth heat pump, and raising the connection power for district and internal cooling. On the energy distribution side, the district heating network was renovated, and the network optimisation programme was adopted. The energy conservation objectives based on the energy efficiency agreement were exceeded. More information on Helen Ltd's sustainability actions is in Helen's sustainability report.

Eyes on the future

The investment in energy efficiency and renewable energy production will be prepared and implemented as continuous operations. The energy survey operations on service buildings will continue to raise the energy efficiency of the existing buildings to a better level. In the coming years, special attention will be paid to the timely implementation of the actions presented in the energy survey. The aim is to develop monitoring of the implementation and the verification of the energy conservation achieved in cooperation with the building owner, user and maintenance operator.

The smart capabilities of the City's buildings will be improved in the coming years to meet the needs of the future. For this purpose, demand response in electricity and district heating and various AI applications for the optimisation of buildings' conditions and energy consumption have been implemented and will be tested further.

Transport

The City Strategy aims for the City of Helsinki's work on carbon neutrality to focus on the electrification of the transport system and the promotion of sustainable and smart transport solutions. When the strategy is implemented, the detrimental emissions will also be reduced significantly. The motor traffic volume increased from the previous year, but remained lower than the pre-pandemic levels of autumn 2019. Passenger numbers in public transport also remained low.

New carbon neutrality goal accelerates the development of cycling

The objective of the Bicycle Action Plan 2020–2025 is for Helsinki to be a year-round cycling city for all ages. The City's carbon neutrality target being moved forward directly affects the objectives of the action plan. The programme as a whole, and the planning of its target network, in particular, will be specified further to meet the new objectives.

As for the cycling network, the most significant project in 2021 was the completion of the roadworks on Hämeentie. Hämeentie was upgraded as a street mainly intended for pedestrians, cyclists and public transport. The upgrade will improve the safety of pedestrians and cyclists, in particular.

Another significant development was the launch of the Kaisantunneli project. In the two-year project, a tunnel for pedestrians and cyclists will be built below the railway yard and the tracks at the Central Station. The tunnel will facilitate cycling traffic to the east and west, and it will be connected to the bike centre and bike parking facilities owned by Metropolitan Area Transport Ltd.

Of the 130-kilometre target network in the city centre, 50 kilometres were completed or under construction in 2021. Of the 130-kilometre target for the Baana cycling network, 20 kilometres were completed or under construction. The number of bike parking spaces built came close to the target of 1,000 spaces set for 2021.

The Walking Promotion Programme was approved by the Urban Environment Committee. In June–August 2021, the summer terrace and summer streets in Kasarmintori square were implemented.

The impact of COVID-19 continued in public transport

Helsinki Region Transport (HSL) aims to cut local emissions and carbon dioxide emissions from public transport by more than 90% (2010–2025). The goal is also for at least 30% of HSL's buses (approximately 400 units) to run on electricity by 2025. At the end of 2021, 176 of HSL's buses ran on electricity, 80 of which operated in the Helsinki area.

Passenger levels in public transport remained low due to the COVID-19 pandemic, compared to the pre-pandemic times. The number of passengers decreased by 7.3% on the metro, 3.6% on buses and 10.0% on local trains in the HSL area from 2020 to 2021. The passenger numbers of trams also decreased by 9.6% from the previous year. Compared to 2019, the impact of the pandemic was the clearest: the number of

passengers decreased by 39.5% on the metro, 40.3% on buses, 40.0% on local trains and 44.5% on trams.

The city bike season started on 1 April and continued until the end of October. In 2021, the were 457 operational city bike stations in the Metropolitan Area. In Helsinki, the service expanded by 105 new stations and 1,050 bikes. The city bikes were used for approximately 2.4 million journeys in Helsinki. The usage rate of the bikes did not yet resume the pre-pandemic level.

The Helsinki region placed fourth in the international BEST comparison. In the BEST survey, customer satisfaction ratings of the public transport of 11 European cities were compared. In the HSL area, 74% of customers were satisfied with public transport in 2021.

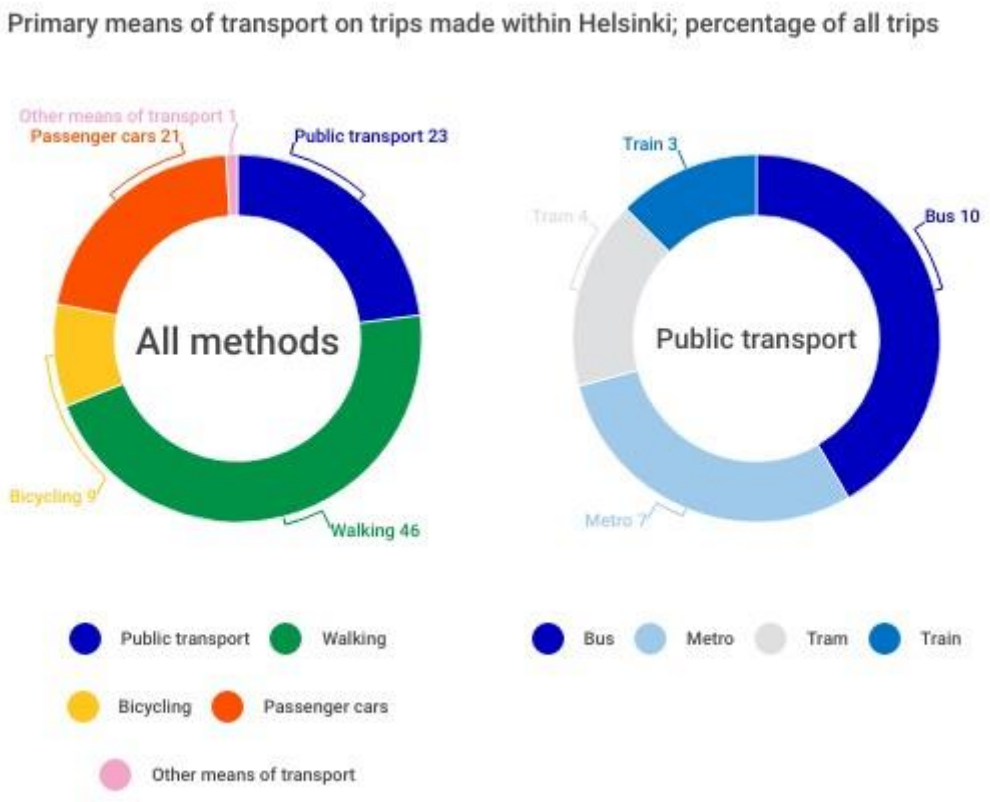

Image 5. The distribution of modes of transport used for journeys within Helsinki in 2021. Walking was the most popular form of transport, accounting for 46%, while the bus was the most popular form of public transport, accounting for 10%.

Number of electric cars on the rise

Helsinki's goal is for electric cars to account for 30% of the vehicle population of Helsinki in 2030. In 2021, the number of electric cars grew significantly from the previous year. By the end of the year, there were 14,125 plug-in hybrids and 4,401 electric cars

in operation: 18,526 rechargeable passengers cars in total. Rechargeable cars accounted for approximately 8.4% of all cars in operation, whereas in 2020 this proportion was at 3.4%.

The public areas in Helsinki have about 100 public charging points for electric cars. In 2021, a new tendering competition for public charging stations was prepared, which will lead to Helsinki having 50 public charging stations in 2022. Additionally, there are semi-public and private charging points in Helsinki.

The implementation of the charging points will also be promoted in connection to new construction and urban infill. Furthermore, the City's conditions for plot conveyance will support the increase of charging points in existing buildings.

In 2021, within the mySMARTLife project, the City and VTT worked together to set up a shared charger for electric buses and heavy vehicles in Hakaniemi. The pilot will accelerate the electrification of heavy vehicles.

Helsinki advanced the incentives for low-emission vehicles. City experts started to offer free guidance on building charging stations for housing companies of blocks of flats. The Helsinki Region Environmental Services Authority (HSY) is implementing a similar measure for detached housing companies. The City of Helsinki Environmental Services and the ITS-Finland registered association organised a webinar series on low-emission transport for companies in the Metropolitan Area. An update to the parking discount for low-emission vehicles was also prepared.

The Act on Environmental and Energy Efficiency Requirements for Vehicle and Transport Service Procurements, and implementation of the EU Clean Vehicles Directive, entered into force on 2 August 2021. The Act will largely affect the increase of clean vehicles among Helsinki's own vehicle fleet and transport service procurements. Low-emission worksite machinery and maintenance vehicles will also be promoted.

Smart transport solutions make routines smoother

The new City Strategy highlights the importance of smart transport solutions for ensuring smooth everyday life. Smart transport and the collection of up-to-date traffic data have been promoted in Helsinki until now through the Intelligent Transport System Development Programme.

In 2021, the LIDO-TIKU project was launched with the goal of implementing a real-time service for traffic overview, statistics and monitoring images. The service allows data to be used in traffic planning, research and control.

The draft of Helsinki's new parking policy was made available for residents' comments in 2021. The objective is to price parking according to the desired service level and use real-time data of the parking situations. The preparation of the conditions for delivery traffic and parking IDs and the discount for low-emission vehicles also progressed in 2021. The IDs will be used via a mobile application.

In connection with the Jätkäsaari Mobility Lab project, 12 new pilots and research, development and innovation projects related to smooth, safe and sustainable transport

and mobility were implemented. Automatic bus pilots also continued in 2021, including the Sohjoa Last Mile project.

Transport projects progressed

The construction of the Crown Bridges tramway and the tramway between Kalasatama and Pasila started in late 2021. Of the target of 25 kilometres for the Jokeri Light Rail, as many as 21.5 kilometres were completed by the end of 2021.

The master plan for light rail lines in West Helsinki and the implementation thereof were approved by the City Council in January 2021. The tramway network in the city centre expanded in spring 2021 to Eiranranta and Atlantinkatu in Jätkäsaari .

Helsinki City Council approved the project plan for the Sörnäinen car tunnel that will connect the coastal paths in Sörnäinen and Hermanni.

A collection of vision objectives and indicators were prepared for the land use, housing and transport plan for the Helsinki region (the MAL plan), which was approved in the co-operative meeting for the Helsinki region in early 2022. The draft of the MAL 2023 plan will be circulated for commenting in autumn 2022.

Image 6. Passenger numbers in car and public transport increased on Helsinki calculation lines in 2021.

The level of motor traffic on calculation lines remains lower than before the pandemic

In 2021, the amount of motor vehicle traffic (i.e. passenger cars, vans, lorries, trucks, buses and trams) in Helsinki increased by 2% both at the peninsula border and at the inner city border in comparison to the previous year. On the crosstown calculation line, the amount of motor vehicle traffic increased by 3% in 2021 compared to 2020. Despite the growth of traffic volumes, the results for all three calculation lines were still lower than in the pre-pandemic times in autumn 2019.

On an average weekday, the border of the Helsinki peninsula was crossed by 31,400 cyclists, which is 8.7% less than in 2020.

The ownership of passenger cars in Helsinki increased by 1.62% from the previous year (428 cars per 1,000 residents), and the number of passenger cars in traffic use increased by 0.68% (336 cars per 1,000 residents). The number of cars per 1,000 residents has increased by 4.53% in the last five years, while the same number for cars in traffic use has increased by 1.87% in the same period.

Eyes on the future

The population of Helsinki is growing and land use is becoming denser, which is why it is particularly important to control the harmful impacts of traffic. Transport is becoming increasingly electric, especially in terms of light vehicles, thanks to the direction of the EU and the development of the market. In addition to electric transport, Helsinki's carbon neutrality goal for 2030 can be achieved by affecting the vehicle traffic performance. Key factors include land use planning, promoting sustainable modes of transport, pricing and increased services related to transport. The increase in remote work will reduce the need for commuting on a more permanent basis.

Air quality

The air quality in Helsinki has improved over the last few decades, and it is fairly good at an international level. However, exhaust emissions from traffic, street dust and emissions from burning wood in domestic fireplaces continue to be harmful to people's health and comfort. In autumn 2021, the World Health Organization (WHO) published new threshold values for air pollution based on the latest health research. These threshold values are significantly lower than before, and they are largely exceeded even in Helsinki, especially in terms of nitrogen oxide, inhalable particles and small particles.

Helsinki City Strategy aims to improve the quality of the city environment and promote safety and comfort within it. Focusing on the electrification and further sustainability of transport will advance the City's climate goals, as well as air quality. The purpose of the City's Air Quality Plan is to reduce nitrogen dioxide emissions from traffic so that the emissions will not exceed the threshold values. In addition to decreasing exhaust gas emissions, the plan's other focus areas are street dust and the small-scale burning of wood. The plan contains 48 measures to be implemented in 2017–2024.

Nitrogen dioxide concentrations on the decrease

In the past years, the annual EU limits for nitrogen oxide have not been exceeded in Helsinki. The exhaust gas emissions from traffic have decreased thanks to advanced vehicle technology and electrification. Replacing buses with lower-emission ones has played a key role. However, the nitrogen dioxide concentrations may rise at times on busy and chasm-like streets. Last year, the concentrations across the board were higher than in 2020, during which the air quality was improved by the decrease in traffic volumes due to the COVID-19 pandemic and a very mild winter.

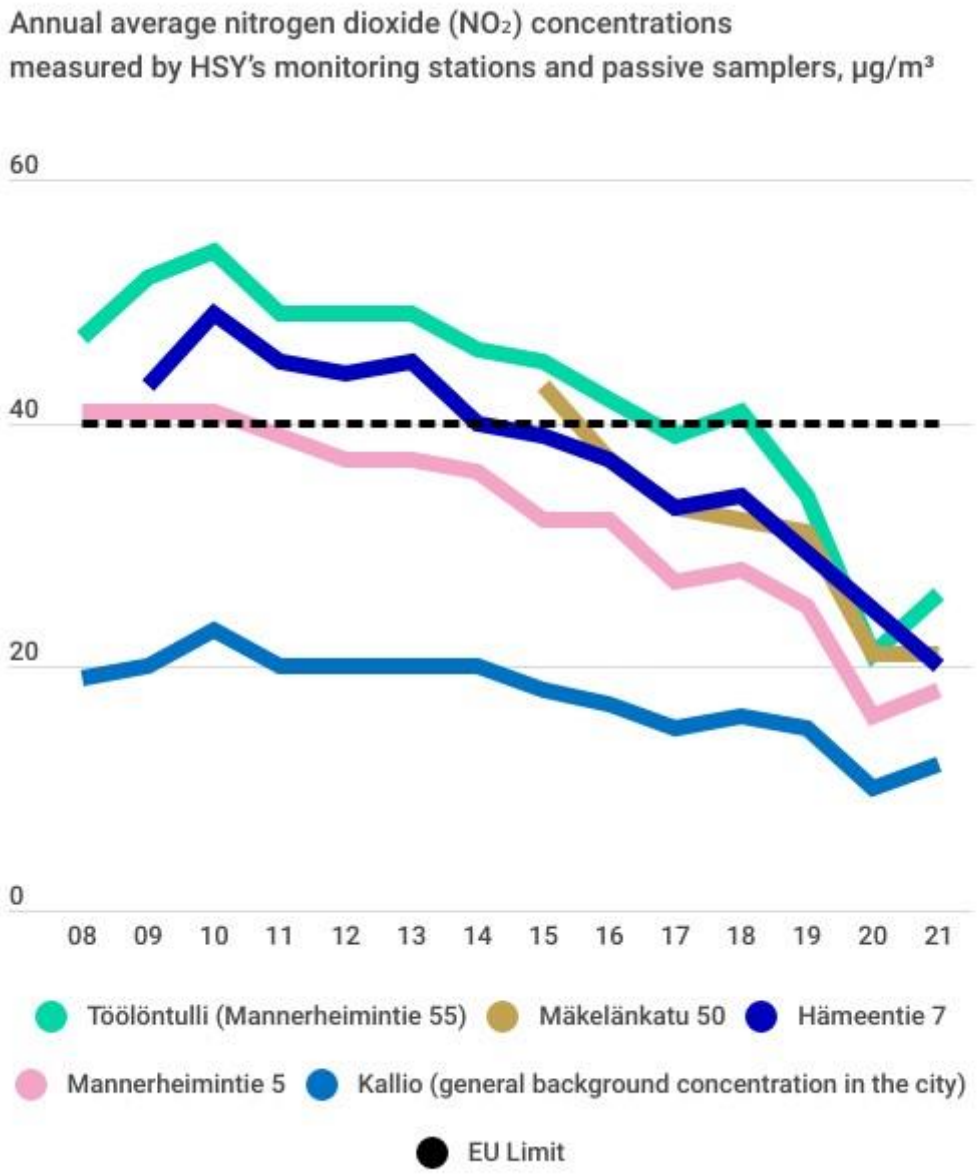

Image 7. The nitrogen dioxide concentrations were slightly higher than last year.

Street dust can be controlled by promoting studless tyres

In addition to direct exhaust emissions, traffic also produces street dust. The limit values for street dust, i.e. inhalable particles, have not been exceeded in Helsinki in recent years, but the risk of exceeding them still remains. The dust volumes in the spring are also significantly affected by the weather conditions and snow volumes in the spring and winter. In 2021, the situation with street dust was more difficult than in the previous year.

For several years now, Helsinki has participated in research collaboration projects on the formation of street dust and measures to reduce it. The measures that have proven to be the most effective have been adopted in practical street maintenance. In addition to these, the City aims to promote the use of studless friction tyres through communication, as these tyres wear out the street surfaces much less than studded tyres. The City

will purchase only studless tyres for its own passengers cars and vans. In autumn 2021, the City prepared a pilot on banning studded tyres that will begin on the Lönnrotinkatu street in autumn 2022.

The impact of large construction sites on local particle concentrations has been identified as a challenge. In 2021, measurements were carried out in Jätkäsaari like in previous years. Efforts are being made to prevent dust emissions in cooperation with contractors, and new methods were developed in the HOPE project coordinated by Helsinki, among others.

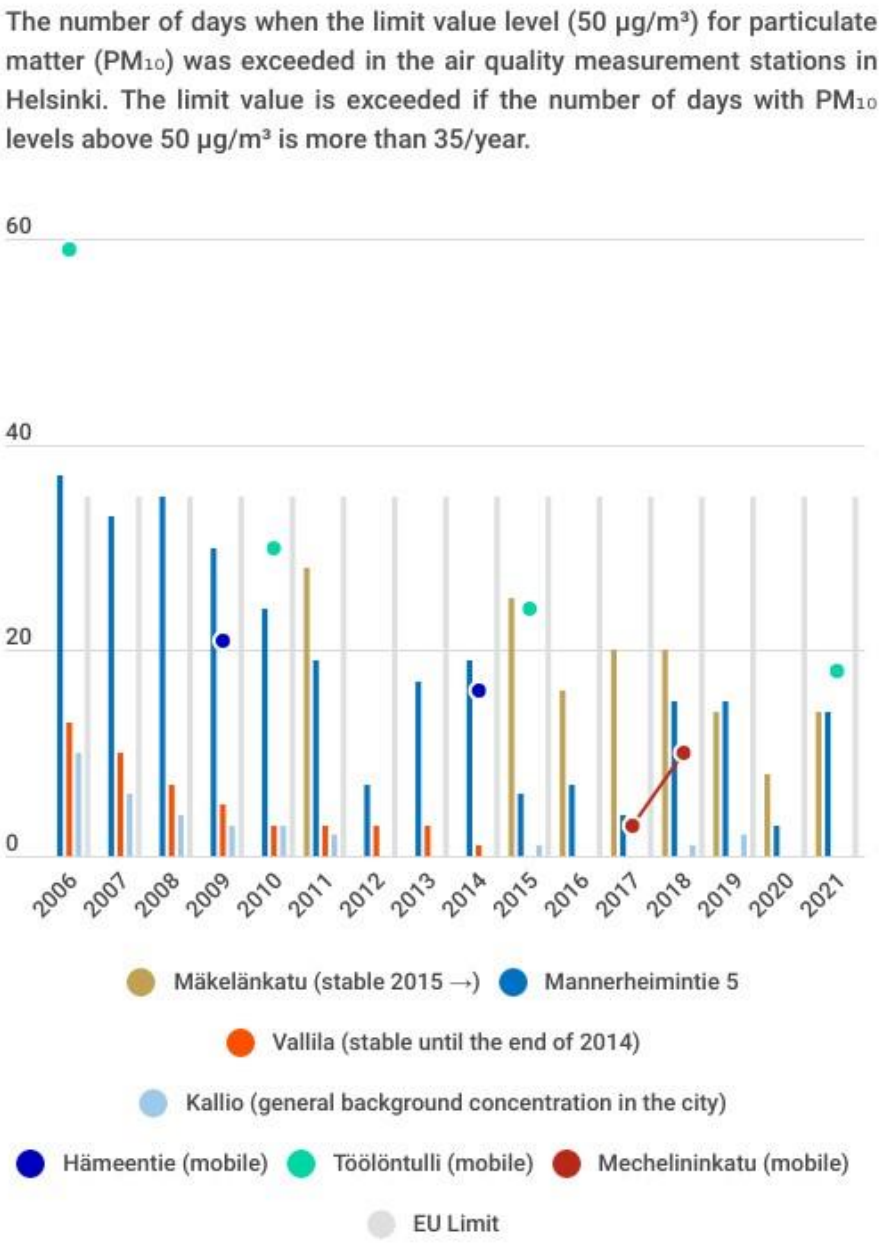

Image 8. Street dust concentrations increased somewhat from the previous year.

Using communication to reduce emissions from burning wood

In dense detached house areas, the air quality is decreased by the small-scale burning of wood in fireplaces and sauna stoves. In the Helsinki Metropolitan Area, small particle emissions from fireplaces are even greater than those from traffic. Efforts are being made to find ways to decrease emissions from the small-scale burning of wood by means such as research projects in which the City is involved. Residents have also been extensively provided with information on ways to significantly influence how cleanly wood burns.

Eyes on the future

Thanks to advancements in vehicle traffic technology and the electrification of vehicles, direct exhaust emissions have decreased. However, street dust will remain a challenge, which is why the use of studless tyres and dust control require investments. It has even been estimated that electric cars may produce more dust emissions because they are heavier. In addition to this, air pollution is diluted less as the city structure grows denser. Large construction sites have been identified as major sources of street dust, and controlling their dust emissions requires further development. Burning wood in the fireplaces of detached houses will not decrease in the near future, which is why we must make an effort to control its emissions.

Noise abatement

Noise remains a notable environmental issue, even in Helsinki. Environmental noise decreases the quality and comfort of the living environment, and continuous loud noise may also cause health hazards. Road traffic is the primary source of harmful noise in Helsinki. 37% of the residents of Helsinki live in areas where the noise level caused by road traffic exceeds the limit value of 55 dB during the day. Noise is locally also caused by construction and repair work, public events and restaurants, for example.

The City's traffic noise situation is being monitored according to the Environmental Noise Directive through a noise survey carried out every five years. The preparation for a new noise survey started in 2021 and will be completed in summer 2022. Based on the noise survey, a new noise abatement action plan will be prepared to steer the City's noise abatement work. The current action plan for 2018–2022 contains measures related to city planning, affecting the noise source, and structural noise abatement, among other things.

Image 9. Road traffic is the primary source of harmful noise in Helsinki. Photograph by Vesa Laitinen.

Several actions to improve the soundscape

Harmful noise is also prevented through land use and transport planning. Transport investments and land use are always planned together in Helsinki, which also makes it possible to pay attention to noise abatement. New residential areas or other noise-sensitive functions will not be placed in areas exposed to noise without sufficient noise abatement. The noise hazards from various facilities and temporary functions are regulated by the Environmental Protection Act and the environmental protection regulations of the City of Helsinki.

By improving the prerequisites of public transport, pedestrian traffic and cycling, the aim has been to steer traffic towards more sustainable forms of transport. For example, the redevelopment of Hämeentie that was completed in 2021 will improve the safety of pedestrians and cyclists and make public transport smoother. The construction of Kaisantunneli that started in 2021 will also improve pedestrian and cycling traffic to the east and west, for its part. The promotion of sustainable and also lower-noise transport is covered in more detail in the section titled Transport.

Vehicles becoming increasingly electric will also affect the soundscape in the city somewhat. Helsinki's goal is for electric cars to account for 30% of the vehicle population of Helsinki in 2030. In 2021, the number of electric cars grew significantly from the previous year. The goal of Helsinki Region Transport (HSL) is for at least 30% of HSL's buses (approximately 400 units) to run on electricity by 2025. By the end of 2021, there were 176 electric buses, 80 of which operated in the Helsinki area.

The City of Helsinki annually allocates funds for noise barriers on streets. In 2021, about 0.3 million euros were allocated to the planning of a noise barrier on Vanha Porvoontie. Highway noise abatement is primarily the responsibility of the Uusimaa Centre for Economic Development, Transport and the Environment and the Finnish Transport Infrastructure Agency. On Konalantie and Topeliuksenkatu, streets were repaved with noise-reducing materials. The City also started a campaign to promote the use of studless winter tyres.

Only a few events

In terms of noise from events, 2021 was quieter than normally since large outdoor concerts were cancelled for the second year in a row. However, construction projects continued in the city as usual. Intensive residential construction continued in Jätkäsaari, Pasila, Kruunuvuorenranta and Kuninkaantammi, among other districts.

The Route Eight Roadworks, that is, the redevelopment of Caloniuksenkatu, Runeberginkatu and Helsinginkatu streets, began in January 2021 and will continue until 2023. The construction of Kaisantunneli, which involves some noise abatement challenges, began and will continue until autumn 2023. The work on the Crown Bridges tramway started in Hakaniemi, Sompasaari, Korkeasaari and Kruunuvuorenranta in the autumn. The construction of the new tramway will continue until 2027. The special challenge related to noise abatement in this worksite involves protecting the zoo from noise.

It was possible to reduce temporary noise hazards through efficient communication and by agreeing on noise abatement with especially sensitive sites in advance.

Eyes on the future

As the city becomes denser, it is also important for attention to be paid to the soundscape and noise abatement in the future.

Even though 2021 was quiet in terms of events and outdoor concerts, in autumn 2021, the Environmental Services still prepared for events to be held in 2022 by preparing a new timing policy for outdoor concerts. After the pandemic, more concerts can be organised at the key event venues in 2022 when compared to past years. Compared to previous levels, the number of outdoor concerts increased in the Olympic Station and the former Malmi Airport, in addition to which the third day of an event must end by 23.00.

Water protection

The water areas in Helsinki include extensive marine areas as well as the freshwater areas of the Vantaa River, various creeks, ditches, ponds and springs. In accordance with the City Strategy, the state of the small water bodies and coastal waters of Helsinki will be improved, and attention will be paid to the revival of the migratory fish stock. The significance of the sea will be strengthened and opening the nearby archipelago to public use will be continued. In addition to the environmental policy, water protection in Helsinki is regulated by the Small Water Bodies Programme, the Stormwater Management Programme, the Instructions on Prevention and Control of Floods, the Baltic Sea Action Plan, and the Water Resources Management and Sea Management Plans.

Sea water temperatures in Helsinki coastal waters break records

The temperature of sea water rose to a record-breaking level on the second week of July: the temperature of the surface waters in Kruunuvuorenselkä was as high as 25.2 degrees Celsius, and in the shallow waters close to the shore, the temperatures reached over 27 degrees in several spots. The record-breaking values were preceded by a marine heatwave of about a month. During a marine heatwave, sea water temperature exceeds the threshold value, calculated from the long-term seasonal monitoring data, for at least five consecutive days. The impact of marine heatwaves on the coastal marine ecosystem may be destructive as they may reduce the chances of survival for key species, such as the bladder wrack, in the coastal waters that are already under heavy stress.

Seawater temperatures were measured for a second consecutive year through a sensor network based on the IoT. An autonomous sensor network for observing the status of the environment will be developed further in the coming years.

No major changes occurred regarding the eutrophication of the sea area. Total nitrogen concentrations were slightly lower than the long-term average, while the total phosphorus concentrations were slightly higher than the long-term average. However, the situation was somewhat better than the previous year as the nutrient concentrations at individual monitoring stations were slightly lower than the measurements from 2020. The amount of algae in seawater was higher than the long-term average, similarly to the past few years. However, compared to 2020, the situation had improved somewhat, as the amount of algae was lower in Töölönlahti, Seurasaarenselkä and the western outer archipelago, in particular.

The A-chlorophyll concentrations, which indicate the total levels of phosphorus and algae, have continued to grow, and the total nitrogen concentrations fluctuate around the long-term average. The increase in the turbidity of surface waters has stopped at the 2010 level, and the turbidity of the waters near the seabed has decreased. The oxygen level of water near the seabed is continuing to decrease in Helsinki coastal waters, partially due to the rising average temperature of the coastal waters.

Image 10. The seawater temperature rose to a record-breaking level on the second week of July. Photograph by Julia Kivelä.

The Baltic Sea Challenge as support for marine conservation

Together with Turku, Helsinki is committed to implementing a third Baltic Sea Action Plan in 2019–2023. The action plan contains 117 water protection measures that take factors such as the EU Strategy for the Baltic Sea Region and the UN's Sustainable Development Goals into account. The measures are divided between five objectives: clear coastal waters, a healthy marine habitat, clean and safe water transport, systematic use of water areas and active participation by the residents in the Baltic Sea region. The measures are divided extensively among the City divisions, in addition to which City of Helsinki construction services Stara, HSY and the Port of Helsinki are also involved. The progress on the measures is being monitored on a regular basis, and 93 measures had been started, were underway or had been completed in Helsinki by the end of 2021.

The measures that have progressed include many measures related to nutrient removal, the management of harmful substances, port operations and private boating, charting valuable sea areas, and international cooperation, in addition to the development of the activities of the local-level Baltic Sea panel, among other things.The cooperation with the University of Helsinki grew closer with the launch of a seminar series of urban environment and the extension of the professorship in the economics of Baltic Sea protection for 2021–2026.

In the Baltic Sea Challenge, Helsinki and Turku also support other operators in implementing new water protection and Baltic Sea activities. In 2021, two new members joined the international partnership network of the Baltic Sea Challenge, and four partners updated their commitments.In February, a seminar titled 'A clean, productive and

shared Baltic Sea – regional and local actions for sustainable future' was organised for the network members, and in November, an annual national seminar was held with the theme of littering and environmental education. Cooperation between cities around the Baltic Sea region to protect the Baltic Sea was developed together with the Swedish organisation Race for the Baltic.

In the summer, a communication campaign aimed at leisure boaters regarding toxic paint and underwater noise was implemented, and we also participated in the 'Mahanpuruja muovista' ('tummy ache from plastic') campaign of the Keep the Archipelago Tidy Association and the Helsinki Region Environmental Services Authority (HSY). The Baltic Sea Challenge participated in the Baltic Sea Day on 26 August 2021 by organising a webinar where City employees learned about different perspectives related to their work in terms of sea protection.

The projects in the water protection enhancement programme improve the state of Helsinki's small water bodies

Helsinki is involved in two projects launched by the Ministry of the Environment and included in the Water Protection Enhancement Programme. The shared goal of the projects is to improve the state of small water bodies and sensitive bays in Helsinki.

In the HuLaKaS project on stormwater quality and inlet-specific filtering is charting the risk areas and functions that will reduce the quality of stormwater in Helsinki and the location of such risk areas regarding sensitive bodies of water. The project will result in a map of risk areas to be used for the City's planning and environmental protection efforts. To improve the stormwater quality in the risk areas, the project will pilot the functionality, usability and cost-efficiency of a filter to be placed into stormwater inlets. To summarise the project, an assessment of the filtering method's functionality at the level of each catchment area and its replicability and scalability for different risk areas in cities will be produced through modelling.

The 'Tools for Improving Construction Site Water Quality' project aims to reduce the amount of solids and harmful substances from construction and demolition sites ending up in waters. The project will collect information about the environmental load caused by construction sites and assess its significance for the creeks in the city and the Baltic Sea. Through pilot worksites, information on the level and quality of environmental load and best practices for controlling the load in worksite conditions will be collected. The project aims to update Helsinki's instructions on worksite water and study which threshold values could be reasonably included in various instructions on the topic. The intention is to study the process of worksite water management from planning to implementation and control and, based on the results achieved, develop an operating model that can be scaled for cities of various sizes. With the model, the quality control of worksite water can be integrated into the normal construction process in cities.

Occurrence of PFAS studied in Vantaa River

Over a million people live in the impact area of the Vantaa River, and the river meanders for over 100 kilometres from Riihimäki to the bay in Vanhakaupunki, Helsinki.The Vantaa River is the auxiliary raw water source for the Helsinki Metropolitan Area. The load on the Vantaa River has decreased, and the ecological condition of the river is classified as satisfactory overall. The Kytäjoki river area and the upper reaches of the Kerava River are in ecologically good condition. A good ecological condition would also

be achievable in the lower reaches if the annual median of the overall phosphorus concentration were to reach a level of 60 µg/l. Phosphorus and nitrogen enter the Vantaa River from wastewater and agriculture.

In 2020–2021, the catchment area of Vantaa River was involved in the PFAS project that monitored the occurrence of harmful perfluorooctanesulphonic (PFOS) and per- and polyfluoroalkyl (PFAS) compounds. PFAS are used in various consumer products, electronics and fire retardants. PFAS were detected in all samples studied during the project. It was concluded that wastewater treatment plants and runoff waters were the greatest sources of PFAS to Vantaa River. Of the PFAS compounds, the accumulation of PFOS into fish exceeded the environmental quality norm or was close to exceeding it in Vantaa River and downstream of Kerava River. Downstream of Vantaa River, the norm was exceeded multifold. Further research into the concentrations in the fish from the water area are required to determine if the use of the fish for food should be restricted. More in-depth research on the stormwater volume and quality is also required.

The survey on the blue network complements the overview of ecological networks

The Urban Nature themed map on Helsinki's city plan illustrates the City's ecological networks, forest network, meadow network and blue network. In the survey on the blue network, the information on water ecology will be elaborated on and offered in a more accessible format. The information on the blue network survey on the natural state of small waters, shores and the sea area make it easier to take natural values into account when planning land use, monitoring waters and otherwise developing the areas.

In the preliminary survey carried out in 2021, a method was defined classifying the quality and structure of a network based on location data. The accuracy of the location data analysis was improved through land surveys. The survey will be completed in 2022.

Wastewater was treated efficiently

The amount of water pumped into the water supply network in 2021 was 94 million cubic metres in the Helsinki Region Environmental Services Authority's (HSY) water supply area, while 52 million cubic metres were pumped into the Helsinki network.

The Viikinmäki Wastewater Treatment Plant in Helsinki is the largest water treatment plant in all of Finland and the Nordic region. The Viikinmäki plant, built within the bedrock, processes the wastewater of about 890,000 residents, not only from Helsinki, but also Central and Eastern Vantaa, Kerava, Tuusula, Järvenpää, and Sipoo.

The plant treated a total of 140 million cubic metres of wastewater, 73 million cubic metres of which came from Helsinki. The total volume of wastewater was slightly higher than in the previous year, while the volume of wastewater from Helsinki decreased somewhat from the previous year. The Viikinmäki Wastewater Treatment Plant met all the environmental permit regulations. Combined sewer network overflows amounted to 0.15% of the overall amount of wastewater.

The 2021 treatment efficiency for phosphorus in Viikinmäki was 97%. For biological oxygen demand, the removal efficiency was 98%, and for nitrogen, 91%. The wastewater treated at the Viikinmäki treatment plant is conducted through 16-kilometre-long tunnels to the open sea.

The phosphorus load from the Viikinmäki Wastewater Treatment Plant on the sea areas in front of Helsinki was 18 tonnes (-14% from the 2020 level), and the nitrogen load was 470 tonnes (-2% from the 2020 level). For eutrophication, the nitrogen load is more significant because nitrogen is a minimum nutrient in the waterways in the Helsinki region.

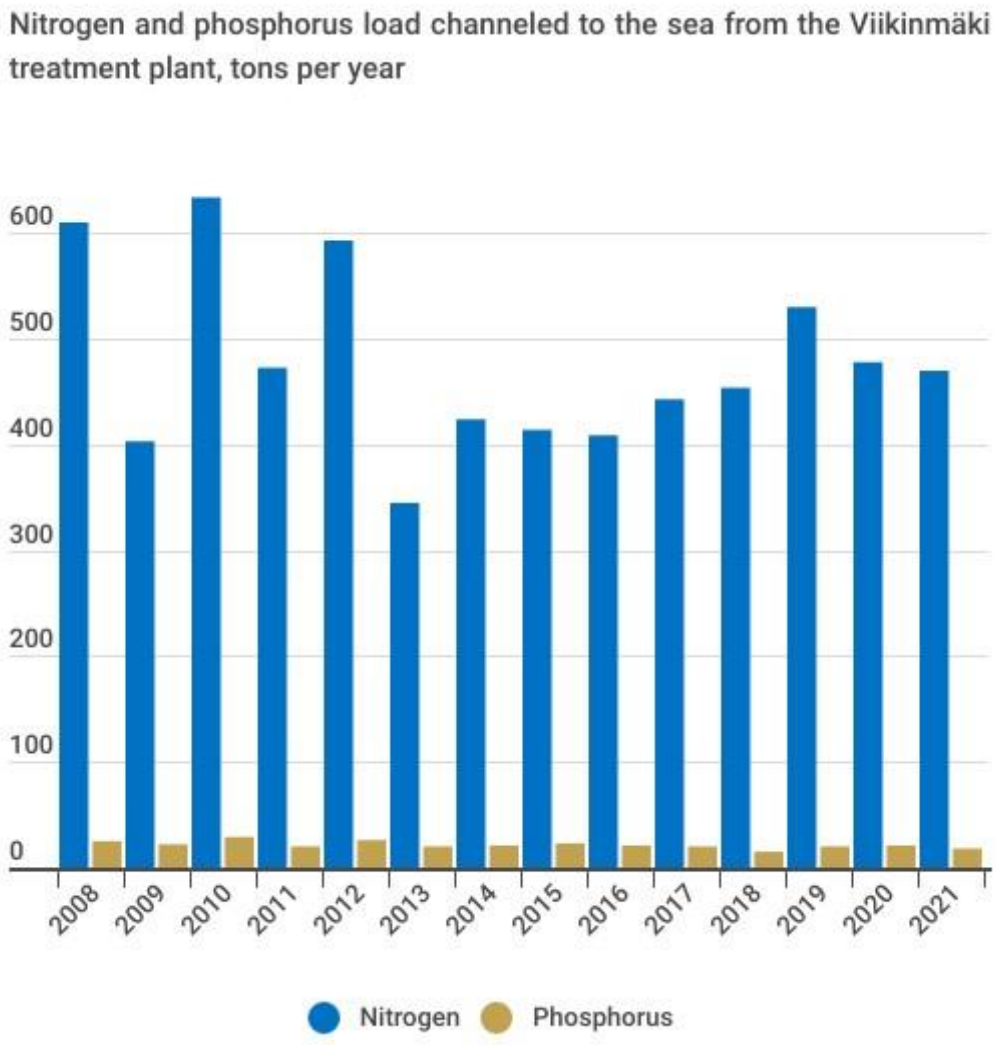

Image 11. The nitrogen and phosphorus load caused by the Viikinmäki Wastewater Treatment Plant on the Baltic Sea in 2008–2021.

Water protection control focused on the tasks defined in the Water Services Act

During the year, different courts issued several decisions regarding the application of the Water Services Act on applications for an exemption from the connecting obligation. Supervision resources also had to be focused on the tasks defined in the Water Services Act when the stormwater pipeline renovations made by the HSY brought on an influx of applications from persons who wished to be exempted from the connecting obligation. This workload reduced other work done on water protection control. Due to the busy year, it was not possible to carry out all inspections detailed in the control plan.

Because of task prioritisation, the number of inspections related to hazard reports was much lower than previously.

The environmental hazards caused to creeks from the drilling of geothermal wells have kept the environmental supervision authorities busy for several of the last few years. The challenge was met by preparing joint instructions for the treatment of water generated from geothermal drilling with HSY and the municipalities in the Helsinki Metropolitan Area. Drilling entrepreneurs were also heard during the preparation of the instructions.The instructions were published in February 2021. The deployment of the instructions will take time and will need to focus on in the future since geothermal systems are increasingly popular.

Eyes on the future

The close proximity of the sea is a very important success factor for Helsinki and a part of local identity. Most of the city area is sea, and there are 300 islands in this area. The state of the marine environment must be taken into account in our operations as a source of competitiveness and well-being for the city, its residents and organisations.

Helsinki will do its part to protect the Baltic Sea. The sea is being threatened by eutrophication, hazardous substances and littering, which have severe consequences for marine nature and biodiversity.

The eutrophication of the sea areas in Helsinki is caused by the nutrient load from the catchment area and the special characteristics of coastal waters and bays. Despite the decreased nutrient load, the phosphorus concentration in the middle and outer archipelagos has grown since the start of the 21st century. To control eutrophication, it remains important to reduce the nutrient load and opt for alternative methods of retaining nutrients in soil and recycling them.

Hazardous substances and littering are a threat to the ecosystem and habitats in the Baltic Sea. Hazardous substances and litter are carried from land to sea in wastewater and stormwater, wind and currents. When these materials end up in the environment, they pose a danger and cause harm to both humans and biota and reduce the recreational value of coastal and maritime areas. We can intervene in the problem and develop new solutions by raising awareness of the sources and routes of hazardous substances and litter. The environmental supervision authorities' focus on the instructions and supervision on processing worksite water will help to improve the condition of waterways.

To reduce the load on the sea area, the Metropolitan Area must implement targeted actions in the local catchment areas. Monitoring the impact of the measures is especially important in urbanised areas with fragmented land use. Helsinki will make the monitoring of currents and coastal waters more effective in the coming years by using IoT technology. Current channels and coastal waters will have several continuously running monitoring stations that will serve to verify and enhance the investments made in improving the condition of the environment.

Securing biodiversity

In autumn 2021, a new City Strategy for 2021–2025, A Place of Growth, was decided on. The Strategy aims at sustainable growth in harmony with ecological boundaries. Essential elements regarding biodiversity are green areas and the Baltic Sea. The City of Helsinki Biodiversity Action Plan 2021–2028 (LUMO) was finally completed after a long preparation period, and subsequentially approved by the Environment Committee. A key objective of the LUMO plan is to take biodiversity into consideration in all operations of the City. In 2021, as many as 63 LUMO actions, equalling 66%, were launched, some of which involve continuous development.

The Nature Monitoring Plan and new information about biodiversity

The Environmental Services prepared a Nature Monitoring Plan in 2021. The plan mainly includes the monitoring of species and biotopes. Some of the monitoring processes are based on location data, but many of them require an inventory on-site. Some of the new monitoring processes will begin in 2022.

Of the longer-term monitoring processes, the bird monitoring in Vanhankaupunginlahti Bay and the archipelago continued in 2021. The monitoring of bumblebees continued for the third year in a row. The number of tree bumblebee and gypsy cuckoo bumblebee specimens was significantly higher than in past years. However, there were much fewer large red-tailed bumblebees. The honeybee was also having another weak year.

In 2021, extensive information about the biodiversity of underwater nature was collected from the sea area off the coast Helsinki. The survey was carried out as a part of the national programme on surveying underwater biodiversity (VELMU). The preliminary results of the survey were published as a map layer on the City's internal map service which shows the most valuable areas for underwater biodiversity. The results will be elaborated on and refined during 2022.

Information from the endangered and near-threatened biotopes in Helsinki surveyed in 2017–2020 has been compiled in the Helsinki Nature Information System (LTJ). The survey was carried out on the mainland and on 45 islands. Occurrences of endangered biotopes covered 450 hectares, while near-threatened ones covered 100 hectares. They exist fairly evenly around the Helsinki, apart from the most densely-built areas. The most endangered biotopes are semi-natural biotopes and swamps and many groves. The sites identified in the survey were divided into three value classes based on their conservation status and the diversity of the location. The most valuable class includes sites with endangered biotopes with an excellent or good level of diversity. There were a total of 390 such sites in the materials collected.

In summer 2021, decaying wood in Helsinki forests was inventoried. The results of the inventory will be used to assess the amount of decaying wood in various urban forests. Changes caused by storms and insects in forests are being constantly monitored in connection with other maintenance work. A separate monitoring project is also underway, involving the Urban Environment Division, the Natural Resources Institute Finland (LUKE) and the University of Helsinki.

Image 12. The monitoring of bumblebees continued for the third year in a row. Photograph by Raisa Ranta.

Biodiversity to be increased in green area planning and maintenance

In 2021, the survey of meadow networks was completed, the work on blue networks began, and the flying squirrel network was updated to improve critical points.

During the year, 42 detailed plans were prepared, in 21 of which the green factor was used and nature-related provisions were set based on the factor. Ecological networks were taken into consideration in the detailed plans, with the exception of three plans. Conflicts between the green network and other land use remained in these plans. A total of 23 detailed plans included provisions on the implementation of green roofs. Furthermore, the 'Fifth Dimension' project of the University of Helsinki in Kurkimoisio studies green roofs as habitats for endangered species. Provisions on green roofs were included in two detailed plans. In updates to the detailed plans, the spots for small water bodies, open swamps and spring mires were marked as green areas or local green areas and areas to be preserved. The restoration plan for the eastern fork of the Vanhankaupunginkoski Rapids were completed.

Decaying wood was left in the forests subject to maintenance, trees of varying ages were favoured, and forest areas were excluded from maintenance work. In 2021, the area plan for Oulunkylä and Maunula and the public area plans for Herttoniemi and Vuosaari, as well as Malmi and Pukinmäki, were completed. All of these plans promote biodiversity in both forests and meadows. The recently completed meadow network survey was taken into consideration in the plans.

The updated species planning guidelines included in the urban flora guide paid attention to insects' and birds' requirements on habitats and nutrition. The section on plants in the urban space instructions was also updated. It now includes e.g. new instructions on layered greenery on streets. The maintenance of lawns was changed so that they

were only mowed once in summer 2021. In addition to this, a total of ten parks were selected in the OmaStadi project to have more meadow-like lawns through changes to the maintenance methods.

The Maintenance Department updated the product cards on work instructions to direct the City of Helsinki construction services (Stara) and subcontractors. The instructions also include guidelines on biodiversity. Product cards for recycled substrates were also prepared regarding the recycling of soil and handling soil that includes invasive alien species.

Invasive alien species were combatted in green areas in connection with other management measures, through voluntary work events and in cooperation with residents, educational institutions, organisations and open prisons. The City received funding from the Ministry of Agriculture and Forestry to combat the rugosa rose on the bird islets in the archipelago and the shores in Mustikkamaa and Lauttasaari. The project will last three years. The monitoring of Himalayan balsam in the Mätäjoki River catchment area, carried out together with the City of Vantaa, also received government funding. The area has plenty of Himalayan balsam. Hogweed populations are monitored and combatted, as necessary. The aim is to exterminate hogweed from Helsinki entirely. All invasive alien plant species were also combatted in worksites in conjunction with the construction of Jokeri Light Rail.

State funding for nature conservation

The proportion of nature reserves from the all land area increased by 0.6% in a year. At the moment, the proportion is at 3.8%. The proportion of nature reserve of all water area also increased by 0.5%, currently being at 0.98%. When including protected biotopes, species protection areas, and Natura areas not protected by the Nature Conservation Act, the total protected area amounts to 4.4% of Helsinki's land area and 1.5% of water areas. The new proposed nature reserves will increase the percentage of protected land area to 5.8%.

The Centre for Economic Development, Transport and the Environment (ELY Centre) founded three new nature reserves in Helsinki, all of which are bird islets: Pitkäouri, Tiirakari and Ulko-Hattu. The latter was founded at the suggestion of the Lauttasaari Society. The Finnish Government founded two nature reserves in its land located in the Helsinki area: Vallisaari and Kapellviken. Founding applications and maintenance and usage plans were completed for five sites included in the nature conservation programme. These sites include Kruunuvuorenlampi, which is the only protected pond in Helsinki, the diverse Uutela forest area, the Rudträsk wetlands and the impressive Skatanniemi scenic cliff with its antiquities.

Extensive grazing of cattle started in Bruksviken by the Östersundom bird waters. A pasture was built and a restoration action plan was prepared for it in cooperation with the Lumovoimaa project of Metsähallitus. Through the project, grazing animals were also found for the area. As soon as the first summer, the number of birds in Bruksviken increased significantly, and birdwatchers consider it to be one of the best bird bay in Helsinki, along with Vanhankaupunginlahti. An extension to the pasture was introduced to the bird waters in Vanhankaupunginlahti, which will expand the area where the cattle graze by a third from the previous pasture. In the bird waters of both Östersundom and Vanhankaupunginlahti, reed fields were mowed by using the funding from the Ministry of the Environment's Helmi project.

Investments in nature were made in the Mustavuori and Östersundom area regarding the sites included in the nature conservation programme and their vicinity. Three new

Class I and two new Class II polypore and Corticium sites were delineated for the area. The inventories revealed several endangered or near-threatened species and species that were new to science. In the survey on the cap-and-stem mushrooms that mainly grow on the ground in lime-heavy areas, two endangered species were discovered, and the insect survey resulted in several specimens of the Siberian winterdamsel, which is strictly protected under Appendix IV of the nature directive. Biotopes were defined and endangered plant species were discovered in the areas. The results of the nature surveys will be used when planning the maintenance and use.

In 2021, the Ministry of the Environment granted funding from the Helmi programme to the restoration of the Haltialanmetsä swamp groves and the Bengtsår oak groves and semi-natural biotopes. These are endangered biotopes. In Haltiala, the previously launched restoration of the swamp grove will be expanded and enhanced. Invasive alien species were removed from Haltiala, dams were built for drains, and the monitoring of the restoration progress was started. In Bengtsår, the vegetation of the oak grove, including tree saplings, have suffered from roe deer grazing in the area and maples shading the oaks. Because of this, fences were set up for the grove and roe repellents were spread to protect the saplings of the valuable broad-leaved trees. Additionally, maples were removed from around old oaks. In the nature reserve, the pines planted into the grove were thinned out for the vegetation to revert to the original grove.

In the ‘Stay on the Trail’ campaign and the ‘Responsible Forest Adventure’ materials directed at young people instructed people on sustainable outdoor recreation in nature reserves and green areas.

The preparation of the City’s nature service policy started. The policy will direct and develop the recreational use of nature and secure the health benefits provided by nature.

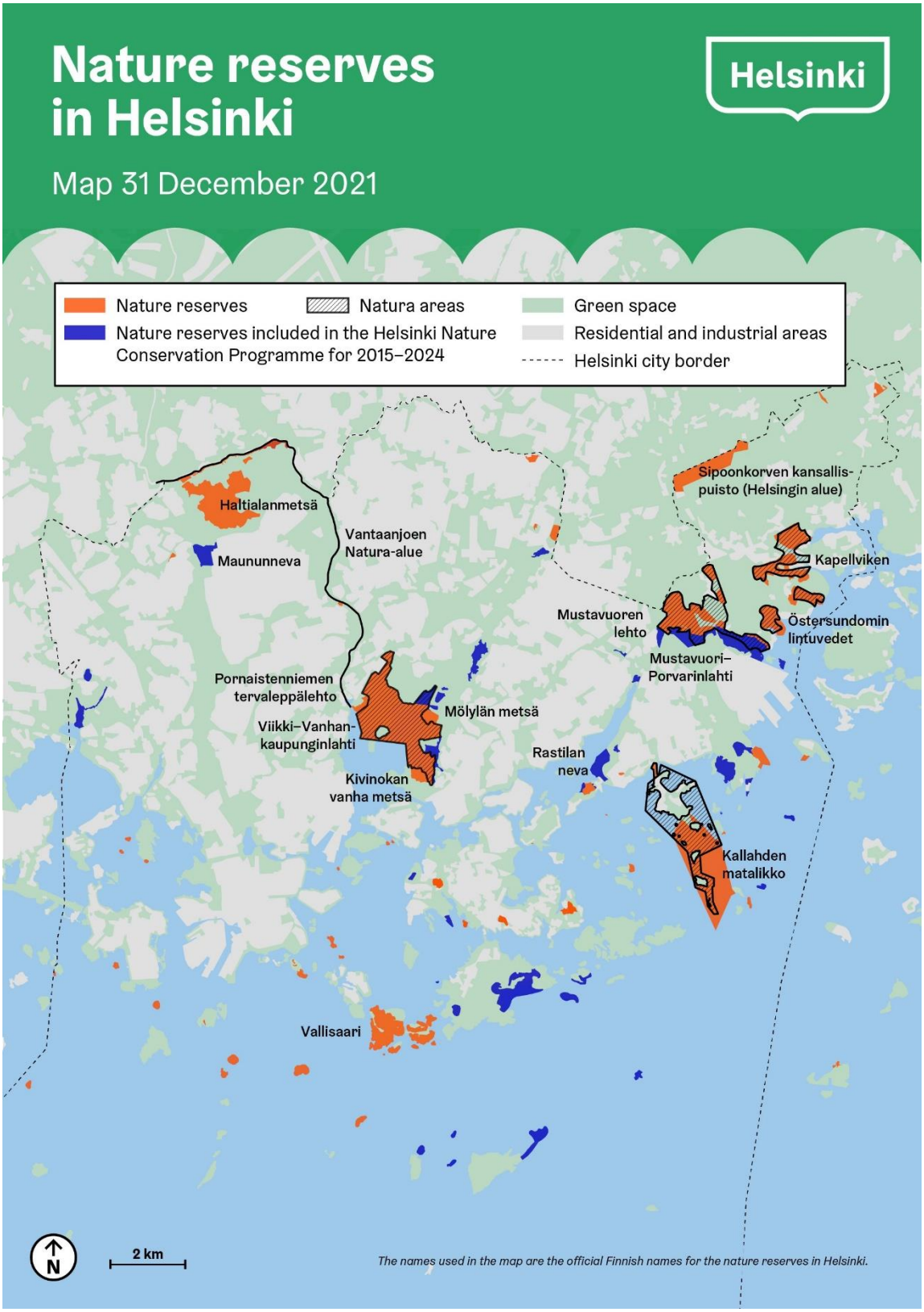

Image 13. Currently, 3.8% of all land area is nature reserves, as compared to 0.98% of water areas.

Korkeasaari Zoo Wildlife Hospital is Finland's largest institution for caring for wild animals

The Wildlife Hospital of Korkeasaari Zoo received 1,290 animals for treatment and care in 2021. The number of patients was lower than in the previous year, during which 1,700 animals were brought into care. The number of patients was affected by a northern goshawk that was brought into care in February 2021 and was diagnosed to be carrying avian influenza. Because of this, veterinary authorities ordered the hospital facilities to be closed down for two months and disinfected. Even after the hospital reopened, the practical care work involved many precautions. Due to the risk of avian influenza, certain bird species were not accepted for care, or accepted only limitedly. Of birds delivered to care, the swift was the most common, and the most common mammal was the squirrel. Rarer animals brought into care included a kingfisher, a common murre, a ruff, a white-backed woodpecker, a greater white-fronted goose, a Brandt's bat, a brown long-eared bat and a common toad. An exceptional number of northern bats, 17 specimens, were looked after. Three grey seal pups were in care. Of animals brought into care, about 40% survived and could be returned to the wild.

Eyes on the future

The excellent progress towards securing biodiversity will continue, and nature will be better included in all of the City's operations. For this purpose, information and instructions regarding species and biotopes will be added to so that the rarest species and habitats can be secured. This also involves the determined development of green and blue networks. The recreational opportunities in nature will be promoted, but the wear on nature will be prevented, at the same time.

Restoration of contaminated soil and landfill sites

The most significant restoration sites with contaminated soil that are tended by the City are the Verkkosaari and Hakaniemenranta areas and the plot for the We Land construction project in Ruoholahti.In addition to the large projects, several individual small sites were inspected and restored in 2021. Soil was restored at, approximately, 40 different locations.

The soil restoration was usually carried out during the other construction work in the areas. The soil condition database created by the Ministry of the Environment features the details of 900 areas in Helsinki where research has shown the soil to be contaminated, where the soil has been assessed as being potentially contaminated or where the soil has been restored.

Former landfill sites in Helsinki are restored pursuant to environmental protection legislation. The restoration of the Vuosaari landfill continued. The City is also preparing to restore the Iso-Huopalahti landfill site in the coming years. Reservations have also been made for the follow-up care of landfills.

The soil was cleaned in the same way as in previous years, to the extent required to achieve the objectives set for construction and restoration, and, primarily, by excavating the soil containing harmful substances and transporting it elsewhere for appropriate processing. Soil was also restored by isolating the contaminated soil on site. Below is an overview of how the contaminated soil matter was transported for treatment or final disposal in Helsinki in 2018–2021.

In 2021, a total of 100,100 tonnes of contaminated soil was transferred from the City's restoration sites to be processed or disposed of, which is approximately 67% less than in the previous year. The costs generated by the restoration of contaminated areas and landfill sites decreased from the previous year.

In 2021, 1,500,000 tonnes of unspoiled excavated earth were used at public construction sites. 81,728 tonnes of unspoiled excavated earth were delivered to external recipients.

Table 10. The contaminated soil transported for treatment or final disposal from the City's restoration sites, as well as the costs incurred by the City from the restoration of contaminated soil and landfills in 2018–2021.

	2018	2019	2020	2021
Soil, tonnes	109 100	111 000	298 800	100 100
Costs in EUR	17 878 000	25 004 000	24 221 000	15 785 000

Procurements

Helsinki is the largest public procurer in Finland, and the annual volume of the City's procurements is about four billion euros. In accordance with its procurement strategy, Helsinki is committed to promoting environmental, social and financial responsibility in its procurements. Procurements are one of the key ways of implementing the Helsinki's new City Strategy prepared in 2021, according to which the City of Helsinki will be managed according to the UN Sustainable Development Goals and climate change mitigation and adaptation and the protection of biodiversity will be prioritised.

In 2021, the execution of the updated procurement strategy started. A working group was appointed to promote responsibility and effectiveness and to assume responsibility for promoting the measures in the procurement strategy theme. In procurement development, the focus was on reducing climate emissions and harmful substances and the development of monitoring.

On average, the environmental criteria were used in around 51% of the procurements of the City's divisions and enterprises in 2021 when examined as individual procurements. However, there are differences in how the City divisions and public enterprises use environmental criteria: for example, up to 100% of the Service Centre's and Culture and Leisure Division's procurements included environmental criteria in 2021, while 80% of Stara's procurements include such ceiteria. Some of the City divisions still faced major challenges in monitoring the environmental criteria.

The criteria used most frequently last year were the criteria in the environmental management system. In addition to this, the environmental criteria, energy efficiency, reduction of harmful substances and recyclability were emphasised regarding vehicles and machinery. The selection of the criteria applied shows the impact of the Green Deals that entered into force last year.

City of Helsinki's efforts towards sustainable procurements were recognised

At the end of the year, the City Of Helsinki received the Procura+ Award from the ICLEI – Local Governments for Sustainability in the 'Procurement Initiative Of The Year' category. The award focused especially on the work done for responsible procurements in the Towards Carbon Neutral Municipalities and Regions (CANEMURE) project.

The Procura+ Award highlights sustainable and innovative procurements and offers visibility for public buyers and initiatives that aim for the future.

Emissions from worksite operations and harmful chemicals were reduced with a Green Deal agreement

The realisation of the Green Deals on procurements started in earnest in 2021. Regarding both deals, several market dialogue events and education sessions were organised.

The first requirements agreed on in the Green Deal for zero-emission worksites entered into force on 1 July 2021. This means that procurement criteria that control exhaust

emissions will be set for all worksites of the City of Helsinki. In 2021, zero-emission worksites, in accordance with the Green Deal, were implemented in 11 infrastructure projects, for example. Several projects are already going beyond these requirements, and worksites are being implemented as low-emission ones by using renewable diesel fuels, for example. The aim of the Green Deal agreement for emission-free worksites is to reduce the emissions generated by worksites and promote the electrification of machinery.

The Green Deal on reducing harmful substances in the procurements of the early childhood education sector finalised the procurement criteria for cleaning agents and sanitation services. Within the deal, criteria for the procurement categories of indoor and outdoor playing equipment and furniture were prepared in 2021. The aim of the procurement criteria and market dialogue events is to minimise the amount of harmful substances in daycare environments through procurement processes, and, therefore, reduce the total chemical exposure of children.

Green Deal is a voluntary agreement between the government and the public sector or businesses. Besides Helsinki, the agreements involve a large number of Finnish cities and other public procurers, which is why the agreement has the potential to have a great impact on the market.

New initiatives on a national procurement strategy and metropolitan cooperation

In 2021, Helsinki was especially active in networking regarding responsible procurements. In Finland, the execution of the national procurement strategy started, and Helsinki assumed an active role in it. In the ecological sustainability theme group of Hankinta-Suomi, ecologically sustainable food procurements were promoted, and discussion was initiated on promoting biodiversity through procurements. The municipalities in the Metropolitan Area started closer cooperation in the Metropolitan Policy Procurements working group, which prepares funding applications to promote low-emission procurements, in particular.

At the international level, Helsinki continued working in the European Commission's Big Buyers cooperation groups, which developed zero-emission worksites and electric worksite machinery and. Helsinki also actively participated in peer learning events and cooperation groups organised by ICLEI, such as the group for responsible ICT procurements and the group for circular economy procurements.

Legislation on clean vehicles introduced changes to vehicle and transport service procurements

The Act on Environmental and Energy Efficiency Requirements for Vehicle and Transport Service Procurements, and implementation of the EU Clean Vehicles Directive, entered into force on 2 August 2021. The Act will accelerate the increase in the proportion of low-emission and zero-emission vehicles of the City of Helsinki's vehicle and transport service procurements in the coming years. The objectives of the law are in line with Helsinki's carbon neutrality objective, in addition to which Helsinki has also prepared minimum environmental criteria even for vehicle and transport service procurements that remain outside the law.

Of other procurement categories, the development work was directed especially at ICT devices, property maintenance procurements and food and restaurant services.

Climate impacts are taken better into account in various procurements

The development of the City's low-emission procurements continued under the six-year Towards Carbon Neutral Municipalities and Regions (Canemure) project. Helsinki's subproject examines nine different procurements that have a significant climate impact. The possibility of taking the carbon footprint into account was assessed during their preparation. In 2021, tenders were invited for the last pilot procurement within the Canemure project: food services for senior homes and the Service Centre. Additionally, the project compiled a report on the application of carbon footprint data to public construction and food procurements. The report was published in early 2022.

In June 2021, the project organised the 'Sustainable school meals – environmentally responsible meal services in municipalities' webinar in cooperation with the cities of Espoo and Vantaa.

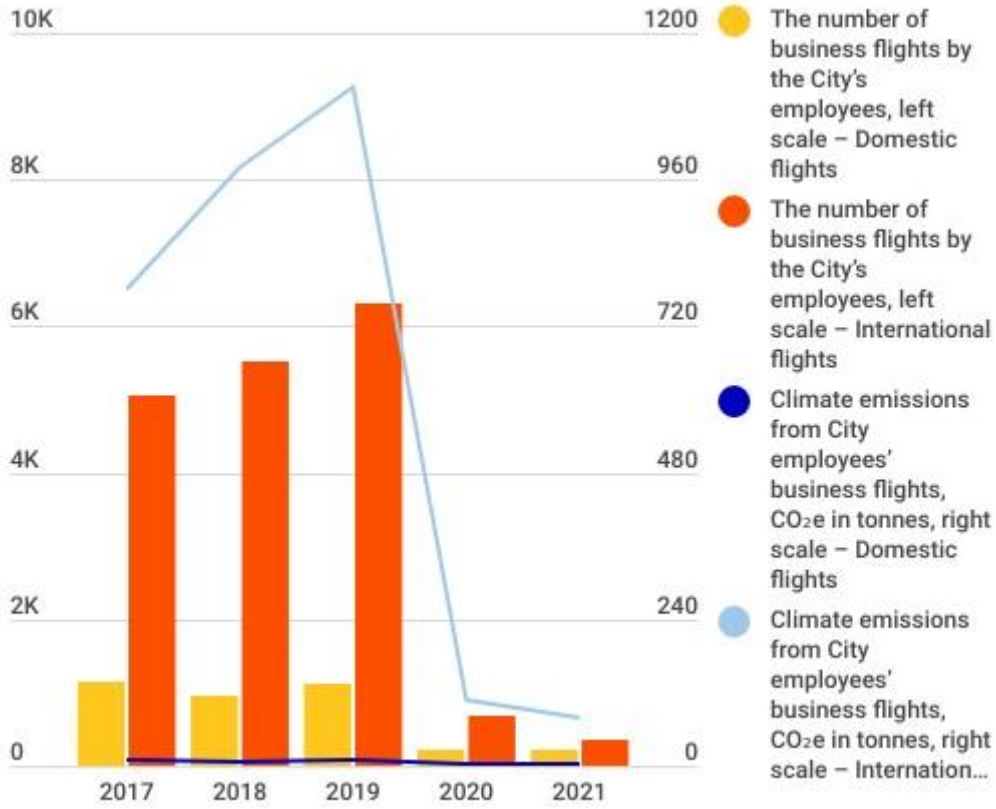

Image 14. One of the forms of procurement followed in the Environmental Report is business trips by air by City employees. The COVID-19 pandemic further decreased their number in 2021. The City's travel instructions state that the carbon neutrality and low-emission perspectives need to be taken into account in all business and business trips.

Eyes on the future

Management of responsible procurements, training and operating models will be made more systematic with the implementation of the procurement strategy. The areas to be developed next include the responsibility of ICT device procurements, better consideration of social and financial responsibility and the protection of biodiversity through procurements. The procurement work will focus increasingly on producing impact and developing monitoring.

Circular economy

In the City Strategy 2021–2025, the carbon neutrality objective of Helsinki was moved to 2030, and the ambitious implementation of the circular economy roadmap is seen as a way of reducing emissions. The deployment of the Helsinki Roadmap for Circular and Sharing Economy, approved in 2020, is mainly progressing well.

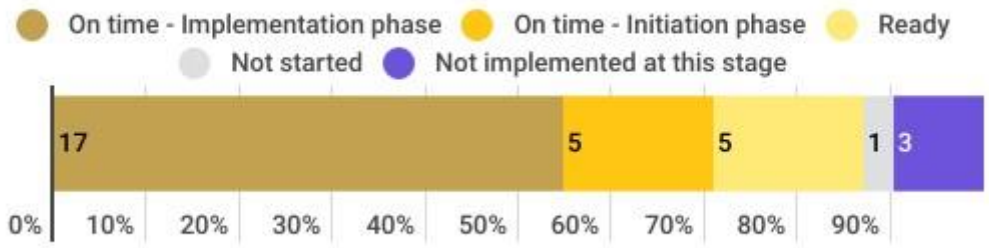

Image 15. Status of the actions included in Helsinki's Roadmap for Circular and Sharing Economy on 8 April 2022. Most of the measures have progressed on schedule..

Education and communication as key commitment factors in an organisation

The realisation of the circular economy objectives requires a shared understanding and commitment from the organisation as a whole. This will require communication and education. In 2021, a total of four training sessions on circular economy were organised for the building and infrastructure developers under the Urban Environment Division. About 300 persons attended the sessions. The theme of circular economy was also included in the City's three training sessions for eco-supporters, which were attended by 168 eco-supporters in total. The Environmental Services also offer the management and business students of Helsinki Vocational College and Adult Institute education and circular economy and sustainable development. In 2021, three training sessions were organised. The total number of attendees was about 100. Circular economy was also included in the pedagogical activities of the City' Education Division: for example, in 2021, learning modules were designed to reinforce circular economy competencies in basic education.

In 2021, the City's internal circular economy network was founded. The network consists of representatives of various divisions and public enterprises. Its tasks include e.g. deploying and coordinating measures related to circular economy included in city-level programmes, supporting annual environmental reporting, coordinating the updates to Helsinki's map of circular and sharing economy, and sharing information and best practices about circular economy. The circular economy network convened twice in 2021.

Construction sites enhanced material recycling

In autumn 2021, the City started a three-year circular economy cluster programme. The goal of the programme is to promote circular economy in the construction sector by developing solutions and new innovations for concrete planning and construction sites. The City has invited construction companies, research institutes, universities and other operators related to the field to join the cluster.

The circular and sharing economy roadmap also presents objectives and actions regarding demolition projects. In 2020, demolition instructions that take the circular economy into account were completed for the demolition of the City's service buildings. A separate collection of demolition waste, according to the instructions, was required at eight sites in total in 2021. A demolition survey in the planning phase was implemented at nine sites in total, and the reuse of demolition materials was required of five sites. The demolition instructions and demolition survey mentioned above have also been piloted at demolition sites related to housing production.

In 2021, a total of 1,500,000 tonnes of excavated earth and rock material was used in the construction of public areas. Thanks to reuse, approximately EUR 8.5 million and 1,100,000 litres of fuel were saved, in addition to which CO2 emissions were reduced by 2,600 tonnes. The location data-based 'mass tool' intended for managing land masses was adopted for Helsinki's infrastructure design projects, and in 2021, mass data from over 70 projects was entered into the tool.

Helsinki will also enhance other material flows from infrastructure construction. These include organic surface soil dug during construction, green waste produced during the maintenance of public areas, and surplus paving stones from construction sites. Recycled substrate products are produced in the Kivikko processing field and the Tali soil farm, using topsoil originating from the City's worksites and composted green waste. In 2021, the substrate production in Kivikko and Tali was established and the recycled fields were used efficiently. A total of 12,300 cubic metres of recycled substrates were used. In 2021, the City also prepared an operating model for the reuse of recycled rocks and started the systematic recycling of rocks.

Examples of realised projects

- The restoration of the Vuosaarenhuippu area was completed in autumn 2021. In the restoration of the landfill, a total of 800,000 cubic metres of recycled materials were used. Through recycling, 2,400,000 litres of fuel and 6,000 tonnes of CO2 emissions were saved, compared to a situation where the masses would have been transported to reception points outside the city.
- Recycled materials, especially crushed concrete, have been used in the construction of Jokeri Light Rail. Furthermore, the topsoil peeled off during construction has been utilised in recycled substrate. The aim is to utilise restored soil, and the kerbstones and paving stones to be removed will be reused.
- In the 'From Kalasatama to Pasila' project, circular economy was defined as one of its key goals. The project area's excavated masses and structure will be used systematically. Recycled substrates, recycled rocks and recycled asphalt reduce the need for virgin materials. When mass economy is balance through the use of recycled materials, the project's carbon footprint will also be reduced as worksite traffic decreases.

Visibility for services in circular and sharing economy

Helsinki City Strategy 2021–2025 has set the goal of facilitating residents' opportunities of making eco-friendly choices in their everyday lives.

A circular economy service selection was added to the service map of the Metropolitan Area in spring 2021. This section includes services offered by both the City and companies that focus e.g. on selling recycled and surplus products, loaning out, renting and repairing products, and shared spaces and vehicles. When the new service selection was published, a communication campaign was implemented along with it, with the service map being advertised on the outdoor screens around the city and news articles being written about it.

The Stara Reuse Centre sells movable property removed from worksites and renovation sites. The materials and equipment to be removed will be sold at the shop of the Stara reuse centre in Oulunkylä, which is open to all residents. Vehicles and machinery are sold via an bidding competition held twice a year. In 2021, the Stara Reuse Centre sold e.g. 197 pieces of small-scale machinery and worksite equipment, 103 passenger cars or vans, 53 pieces of machinery, 33 carpenter's benches, and 27 worksite cabins and sea containers.

Pakila Work Centre renovates the furniture from City premises. Some of them are returned to the City, and the rest are sold to private customers in the furniture shop in Pakila. Wood remains and wood dust from furniture production are compressed into burnable briquettes that can be used among firewood. In 2021, about 18,000 kilograms of briquettes were sold.

The Uusix workshops make products out of recycled and surplus materials and repair and maintain devices such as computers no longer used by the City, which are then sold at the Uusix PC-shop in Kyläsaari. In 2021, 1,556 workstations, 508 laptops, 1,098 monitors and 568 printers were sold.

The City of Helsinki libraries actively realise circular economy in their operations. Libraries loan items such as tools, musical instruments, cargo bikes and sports season cards. Various devices can also be tested and reserved in the libraries, including sewing machines, VR glasses or 3D printers. Some libraries also offer a studio or music room with instruments and equipment.

Table 11. Items borrowed from libraries in 2021.

Items borrowed:	**Pieces**	**Times borrowed**
Sleds	37	58
Snowshoes	32	62
Mölkky games	34	266
Energy meters	51	161
Decibel meters	3	58

Structure detectors	7	188
Sewing machines	5	41
Hand-held drills	2	72
Total	**171**	**906**

‘Eco-shelves’ showcasing books on recycling, climate change and energy-efficient construction were established in 14 libraries, and 540 books were borrowed from them. The Helsinki City Library network communicated about its sharing services e.g. via the ‘Dear Library’ campaign, in addition to which the information screens in the libraries showed environmental information monthly.

Image 16. Libraries loan tablets, among other items. Photograph by Aleksi Poutanen.

Pilots and established operating models for using surplus food

In autumn 2021, the Head of the City Executive Office approved the policy on catering in events organised by the City. The purpose of the policy will be to reduce food waste from catering, reduce the environmental impact of the food served, and reduce the use of disposable plates and cutlery. The policy is based on the City’s Roadmap for Circular and Sharing Economy and entered into force at the start of 2022.

Service Centre Helsinki is constantly working to reduce food waste. In 2020, schools adopted a software-based solution for monitoring food waste. In 2021, the use of the monitoring system was extended to all schools and daycare centres. The lines with cafeterias in the care sector started using the Hävikkivalvoja app for monitoring food waste in May. The objective for the coming years is to harmonise the food waste monitoring

system so that all premises of the Service Centre will have the same monitoring system. General instructions on reducing surplus food were prepared for the staff of the sites. In 2021, daycare centres piloted a new payment system for selling surplus food.

Stadin Safka launched and established its operations. During the first year of operations, the focuses were on the formation of the processes, the relationship with donors and the expansion of the food aid network. At the end of 2021, the network of Stadin Safka included 55 donors and 57 food aid operators. The surplus food delivered by Stadin Safka is offered to Helsinki residents in need of support in various ways, including food bags, meals and snacks. During the year, about 660,000 kilograms of surplus food was delivered from the Stadin Safka terminal. In spring 2021, a calculation model was prepared to assess the climate impact of the operations.

Eyes on the future

The Roadmap for Circular and Sharing Economy will be updated in 2022 so that it will cover the various themes of circular economy more extensively in the future. Of the current focuses, construction involves the most challenges. The aim is to accelerate measures within construction through the circular economy cluster programme that was launched in autumn 2021. The objective for 2022 is also to develop an operating model that promotes the internal reuse of furniture throughout the City organisation. We are also considering potential ways of promoting the visibility and popularity of various circular and sharing economy services.

Environmental awareness and responsibility

The City of Helsinki's ambitious climate and environment objectives are also heavily featured in early childhood education, schools, and services aimed at young people and adults. Helsinki wants to be a pioneer in environmental education and support a sustainable lifestyle for its residents. According to the City Strategy, Helsinki will also commit to facilitate residents' personal opportunities to make environmentally friendly choices in their everyday lives.

Sustainable future as a key theme in education

The Education Division of the City of Helsinki implemented a study path on sustainable development, which means that learners of all ages can learn about climate change and sustainable development in early childhood education, basic education, upper secondary education and non-formal education. The study path became reality in 2021 through various models and measures that combine climate and environmental education, futures literacy and design-based learning.

Through the 'KETTU – Sustainable future in early childhood education and basic education' model, 350 professionals in the early childhood education sector were trained to become experts in climate responsibility and sustainable development. A 'KETTU' ('fox') book was also published to support the sustainability topics in early childhood education. In 2021, it was decided that the KETTU model would be selected as a binding objective across Helsinki's early childhood education. This means that, in 2022, over 30,000 children will learn about climate change mitigation, circular economy and environmental skills with the help of fox characters.

For basic education, study modules related to dealing with climate change were developed. In addition to this, a pilot course was implemented with the University of Helsinki with the theme of 'circular economy competencies through invention pedagogics.' A cross-curricular course called Carbon-neutral Helsinki became a mandatory course for all first year students of general upper secondary schools starting from August 2021. Helsinki Vocational College and Adult Institute decided to apply for the OKKA certificate for sustainable development in educational institutions.

Young people moved about in nature actively

The Youth Services' work with the EcoCompass environmental management system achieved a milestone last year when the services received the EcoCompass certificate as acknowledgement of their determined efforts for the environment. The environmental programme and EcoCompass process of the Youth Services was a significant and ambitious endeavour to take eco-friendly choices and methods into account in youth work. They aim to continue this work.

Despite the prolonged COVID-19 pandemic, it was possible to organise several activities around the city, including nature excursions, camps, shore cleaning campaigns, vegetarian cooking sessions, recycling and crafts activities, flea markets and cultivation activities.

In the Ruutibudjetti data collection project implemented at all youth work units, young people were asked how the pandemic had affected their leisure time. The young people were also asked about their environmental concerns and desire to take action for the environment. Many of the respondents said their leisure activities had decreased or stopped altogether. Young people expressed thoughts about sustainable fashion and food waste, but also their own health and friendships. The responses highlighted their desire to move about in local nature, do good to others by donating clothes and other items, change their own consumption habits and discuss them with friends, and volunteer for activities related to the environment and animal protection. Based on the responses, the local youth work units will develop their activities, together with young people.

In 2021, the Environmental Youth Work Unit participated in the virtual World Village Festival together with the Youth Services' partnership unit and theSatakolkyt project. In the summer, the stables on the Vartiosaari island hosted the Youth Island Gallery for the second time. The unit was also connected to the Edible Park, a community garden in Mustikkamaa. With the support of the Herttoniemi unit, the park was used for open workshops on environmental art, the garden and chickens were taken care of, volunteer work was organised, and participants joined the Satakolkyt coastal trips. The urban environment of the park provided a setting for creative work and nature-themed workshops. Like in previous years, events related to the Baltic Sea Day were organised in the autumn in cooperation with the Satakolkyt project. This time, the venue for this was set up in Mustikkamaa.

On the Bengtsår camping island in Hanko, a 'Climate Menu' video was filmed in cooperation with the City's seasonal media workers and the Ilmastomenu association. Ilmastomenu is an organisation that promotes a sustainable diet in terms of climate. In addition to the above, a record-breaking number of camping supplies for young people's independent trips were borrowed from the camping gear centre Wempaimisto.

Lessons and materials to support environmental education

Helsinki Region Environmental Services Authority (HSY) and its partner Metropolitan Area Reuse Centre offered environmental education services free of charge to daycare centres and educational institutions. Because of the pandemic, the aim was to extend the outdoor season to last the whole year by making changes to the programme. The order volumes and demand for distance lessons also grew steadily and became an established part of the guidance services. For students in lower and general upper secondary school, in particular, distance lessons seemed to work even better that conventional school visits.

In 2021, a total of 6,418 children and young people in Helsinki attended the environmental education lessons offered by HSY. A total of 410.5 hours of lessons were offered. However, due to the pandemic, the total number of lessons did not resume the normal level after the collapse in 2020. Among children aged 5–6, the most popular lessons were the 'Running tap water' outdoor adventure, the 'Let's conserve nature!' outdoor play session on circular economy, and the 'Rojupöhö' puppet theatre show. In addition to these, children in pre-primary school attended remotely guided digital gaming sessions on circular economy and everyday water management. Educational institu-

tions were offered outdoor lessons, distance lessons and remotely guided digital gaming sessions. The most popular lessons for educational institutions took place outdoors: 'Let's study local water,' 'Circular Economy ABC,' and the 'Running tap water' outdoor adventure. In addition to these, several distance lessons and remotely guided gaming sessions were held on the themes of sustainable consumption, circular economy and vital water.

In 2021, HSY's Twin School Programme involved three twin schools from Helsinki: Karviaistie School, Siltamäki Primary School and Poikkilaakso Primary School. The free-of-charge Twin School Programme includes lessons, learning materials and training for teachers that support environmental education. The schools selected to the programme have access to an environmental educator assigned to them and a twin school programme that is adapted to their needs.

Environmental awareness and sustainable movement in nature were promoted

Harakka Nature Centre was not opened to the public until the start of June due to the COVID-19 restrictions. During its operating period, the ferry to Harakka Island carried about 6,000 visitors. A total of 37 nature study days were organised, and 41 environment study days. For daycare centres, 44 island adventure days were organised, some of which were implemented as forest adventure trips in the daycare centres' surroundings since some groups were unable to use public transport. In total, 2612 children and young people with their teachers participated in the nature school and island adventures.

A total of 23 persons attended the Baltic Sea Camp for young people and the archipelago nature camp. Five environmental education courses were organised, with a total of 51 participants. The public events and guided weekend tours of Harakka Nature Centre were attended by 412 persons. 9 themed trips open to all and island adventure trips for children were organised, with 244 visitors attending. 35 private excursions were held, and they were attended by 384 visitors.

Harakka Nature Centre and Annantalo joined forces to organise the Kalliolla exhibition inspired by Helsinki Biennial and the richness of archipelago nature. The exhibition included various activities for visitors, and it was available from Helsinki Day to late August, reaching a total pf 7,162 visitors. In connection with the exhibition, Annantalo organised themed workshops and open activities which were attended by 143 children and adults in total

The nature excursions intended for city residents did not start until the beginning of June because of the pandemic. The total number of excursions held was 19, and they had 527 participants. Participants had to sign up in advance for all of these excursions. City residents were encouraged to observe the nature and engage in citizen science as a part of the nature excursions, courses, the nature school and the observation challenge implemented via the iNaturalist application. The 'Wanted: the comma and Camberwell beauty butterflies' gained the interest of 146 persons, but due to rainy weather, only 20 photographic observations of these species were made.

Responsible movement in nature was promoted through new materials and with signs set up in nature. Instructions on responsible movement on the water were shared via the Luontoviisas website and boat rental companies, canoeing clubs and yacht clubs. The 'Stay on the Trail' communication campaign instructed people on how to behave responsibly in nature and in nature reserves through a website, a video on nature excursions with a focus on responsibility, and invitation cards to nature trips distributed in

libraries. To reduce wear, signs that encouraged visitors to stay on the trail and reminded them of the sensitive wildlife were set up in the nature reserves. The new signs were well received. The final seminar of the Urban Eco Islands project, the ‘Nature boom – sustainable movement in urban nature’ event was attended by 510 persons via remote connections.

Image 17. Forest adventure trips were organised in the surroundings of daycare centres. Photograph by Raisa Ranta.

Korkeasaari Zoo inspired children and young people to learn about animals and nature conservation

In 2021, the operations of Korkeasaari Zoo were adapted to the pandemic and partially organised online. The selection of online learning games was expanded. The nature school activities were carried out in both the spring term and autumn term. The distance nature school was attended by 24 classes in total, while the contact teaching in the nature school in the autumn term was attended by 28 classes. The conference for students in lower and general upper secondary schools was organised in spring, for the first time as an online event, which allowed schools from all over Finland to be invited. The Baltic Sea Day was celebrated in August together with the Baltic Sea Action Group and Keep the Archipelago Tidy Association. The Baltic Sea Day was attended by 737 pupils in total. The summer camps for children of primary school age were attended by 59 children. A total of 9,800 schoolchildren and about 1,400 children attending early childhood education visited Korkeasaari, either on-site or through guided distance learning programmes.

Residents took part in taking care of their own environment

The Park Pal activities include important actions such as volunteers picking up litter from their own local environment, and the activities received several new volunteers.

The total number of Park Palas grew by almost 500 new pals. Some of the registered pals were groups, such as school classes or daycare groups. By the end of 2021, about 2,000 Park Pals had registered.

The number of environmental volunteer projects, such as cleaning campaigns and projects on combatting invasive alien species, resumed to the pre-pandemic levels. Residents, residents' associations and schools organised 166 environmental cleaning sessions in total, in which over 22,400 volunteers participated. Due to the pandemic, the volunteer cleaning campaign with the City as the main organiser was not organised, similarly to 2020.

The City of Helsinki, WWF Finland and Helsingin luonnonsuojeluyhdistys nature conservation association organised 12 volunteer work sessions to remove invasive alien plant species from Pornaistenniemi, Lammasaari, Uutela, Fastholma, Kallahdenniemi, Mustikkamaa and Lauttasaari in June–October. A total of 161 volunteers participated, along with companies. The species that were combatted were the Himalayan balsam and the rugosa rose. The residents also organised their own projects for combatting invasive alien species, and many residents stated that they remove invasive alien species independently during their leisure time.

Ilmastoinfo communicated and provided training actively

During the second year of the pandemic, the Ilmastoinfo campaign of HSY reached residents through webinars and the Koutsi online courses. The Koutsi.hsy.fi online training platform offers courses free of charge to all residents who are interested in the aspects of a sustainable lifestyle. The popular 'energy expert' course for housing companies was organised twice during the year, in addition to which an energy efficiency course designated for housing managers was organised for the first time. In 2021, 504 new users registered on the online education platform.

Over 600 Helsinki residents attended the webinars by Ilmastoinfo in 2021. The webinars focused on topics such as the charging of electric cars, using solar power in housing companies, moving from oil heating to renewable energy sources and energy conservation actions in detached houses. Ilmastoinfo communicated actively via various channels throughout the year and participated in various themed days and weeks. The #lähdinkäveleen social media campaign organised in spring 2021 highlighted the climate impact of movement and the benefits of walking. Furthermore, Ilmastoinfo also communicated about the effect of consuming excessive protein on wastewater treatment plants and the eutrophication of the Baltic Sea. The theme of sustainable consumption was highlighted in the Tap Water Bar, which was accessible to visitors at Helsinki Biennial throughout the summer.

Environmental risks

From the City's perspective, the most significant environmental risks are fires, oil and chemical spills, soil and water contamination, deterioration of air quality, diminishing biodiversity, disruptions in the railway network and the challenges posed by extreme weather phenomena to healthcare, in particular. Invasive alien species also cause harm. Preparing for these risks is done through systematic actions.

Due to climate change, extreme weather conditions will increase and forecasting will become more difficult. In Helsinki, the Rescue Department is in charge of the response to accidents caused by exceptional weather conditions, the preparation for which was actively developed in 2021. The situations caused by exceptional weather conditions are often wide-scale and long-term in nature and require cooperation and external resources.

There is a great risk of an oil spill in the Baltic Sea. In 2021, the Rescue Committee approved Helsinki Rescue Department's oil spill prevention and response plan for 2021–2025. The plan aims to introduce stability into oil spill preparation and uphold conditions where the Rescue Department remains prepared for all situations where oil spill prevention and response is necessary. In 2021, stakeholders from inside and outside the City organisation attended the oil spill response training and exercise sessions offered by the Rescue Department. The Rescue Department also participated in the international Balex Delta 2021 oil spill response exercise held off the coast of Pyhtää and Kotka. The exercise was more extensive and involved more countries than any other exercise on environmental damage prevention held in Finland. It is also a part of the cooperation included in the Convention on the Protection of the Marine Environment of the Baltic Sea Area (by HELCOM). The veterinarian of Korkeasaari Zoo acted as the head veterinarian for the Balex exercise. The information and experience accumulated in the work of the zoo's wildlife hospital are also being used in the training of oil spill response volunteers.

In the Central Park of Helsinki, the spruce bark beetle has destroyed several hundred spruces in the past years. In summer 2021 and winter 2022, the City cut down dried-up trees in the area. Removing trees overtaken by the spruce bark beetle is essential to secure the old spruce stands in the Central Park that have significant natural and landscape value. The spruce bark beetle is a species that belongs to Finnish nature and benefits from the hot and dry summers that are increasingly frequent due to climate change.

Table 12. Oil spills in Helsinki in 2018–2021.

Oil spills in Helsinki	2018	2019	2020	2021
In waterways	13	52	25	38
In essential groundwater basins	11	2	11	11
In other areas	366	329	325	316
TOTAL	**390**	**383**	**361**	**365**

Smart & Clean

The Helsinki Metropolitan Area's Smart & Clean Foundation was a joint five-year change project between cities, companies, universities and research institutes in the Helsinki region as well as the Finnish Government. The project involved 29 partners from the public and private sectors. The Foundation operated from 1 July 2016 to 30 June 2021. It orchestrated effective climate solutions for the systemic challenges of cities related to transport, energy, construction and the waste and water supply sector. Solutions that reduce emissions also produced a new kind of business and yielded export references for companies.

The Foundation was an innovative and long-term finance and administration model. Its operations were funded by donations and grants from partners. The Foundation's Board consisted of the CEOs, mayors and other managers of the partners. Smart & Clean aimed to create an operating model that would promote a systemic shift towards a '1.5°C society' through cooperation.

The Circulating All Plastics project, which started as the Foundation's spearhead project, aimed to have all recyclable plastic in the Helsinki Metropolitan Area and the City of Lahti recycled more efficiently. This ecosystem, which consists of private and public operators, is developing effective actions to meet the common goal, covering the plastic production chain from manufacturing to reuse. In the Circulating All Plastics initiative, a diverse group of local operators is committed to the goal of maximally increasing the volume of plastic being recycled. The operations focus on scalable solutions that mitigate climate change and promote circular economy while also creating new business and jobs. At the moment, significantly less than 10% of all recyclable plastic in the Metropolitan Area is being recycled. It would be possible to increase this proportion to 70%, at the maximum.

Another example of the Foundation's work is that it worked with ITS Finland in 2020 as part of the National Growth Programme for the Transport Sector on developing a model for affecting the sustainability of the transport system and promoting the achievement of the 1.5ºC climate target in particular.

During its existence, the Foundation actively facilitated cooperation between companies and the public sector and accelerated a shift towards cleaner and more sustainable business. These operations that aimed to strengthen ecosystems and promote new solutions also drew notable international attention. Furthermore, the Foundation's operational support also extended to coaching related to Helsinki's services and network operations more widely.

When the Foundation's fixed-term operations ended, the projects that would continue were integrated into the other operations of the project partners. The groundwork laid by the operations was also one of the incentives to strengthen Helsinki's work on developing business for clean and sustainable urban solutions. The development of ecosystems and competencies will continue e.g. through various accelerator and incubator operations and closer cooperation with universities.

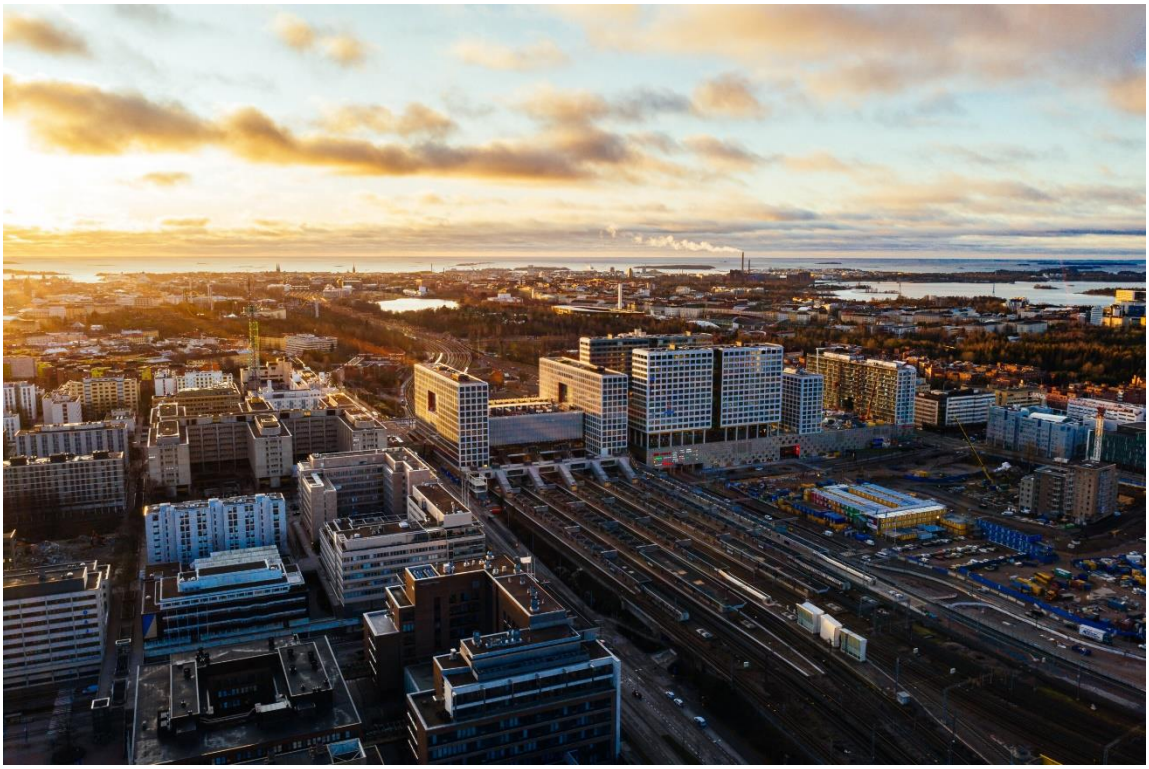

Image 18. The Smart & Clean Foundation was a joint five-year change project between cities, companies, universities and research institutes in the Helsinki region, along with the Finnish Government. Photograph by Jussi Hellsten.

Environmental economy

Environmental economy includes the income, costs and investments primarily arising from environmental reasons. The information is presented for the parent organisation, meaning the City's divisions, enterprises and departments.

The environmental costs, including amortisations, totalled EUR 77.7 million (+2.4% from 2020). The environmental costs accounted for 1.5% of the City's total operating costs, equalling EUR 118 per capita. The City's largest expense items were the costs of the promotion of climate and environmentally friendly transport (26.6%) and sanitation and waste management (26%).

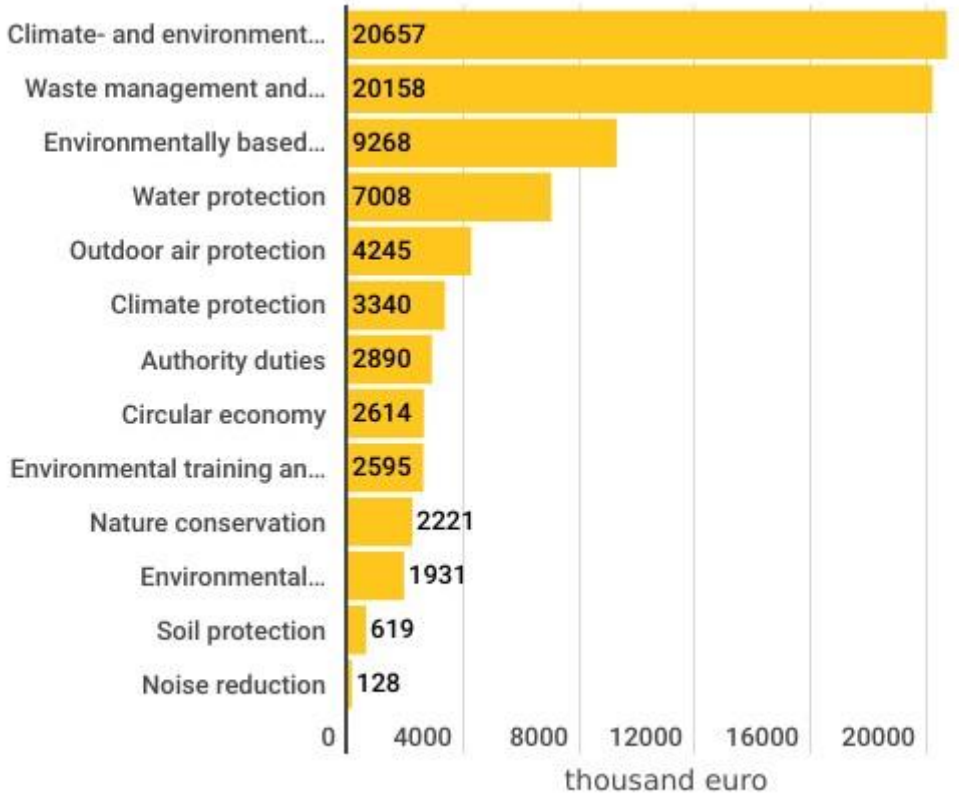

Image 19. The City's environmental costs were EUR 77,674,053 in 2021.

The environmental investments added up to EUR 210.4 million, which was 27.8% of the total capital expenditure of the City and EUR 319 per capita. The City's environmental investments increased by 29.6% from the previous year, and the largest investments were related to the promotion of climate and environmentally friendly transport – including HKL's investments in public transport (85.5%) – and the restoration of contaminated soil (7.3%).

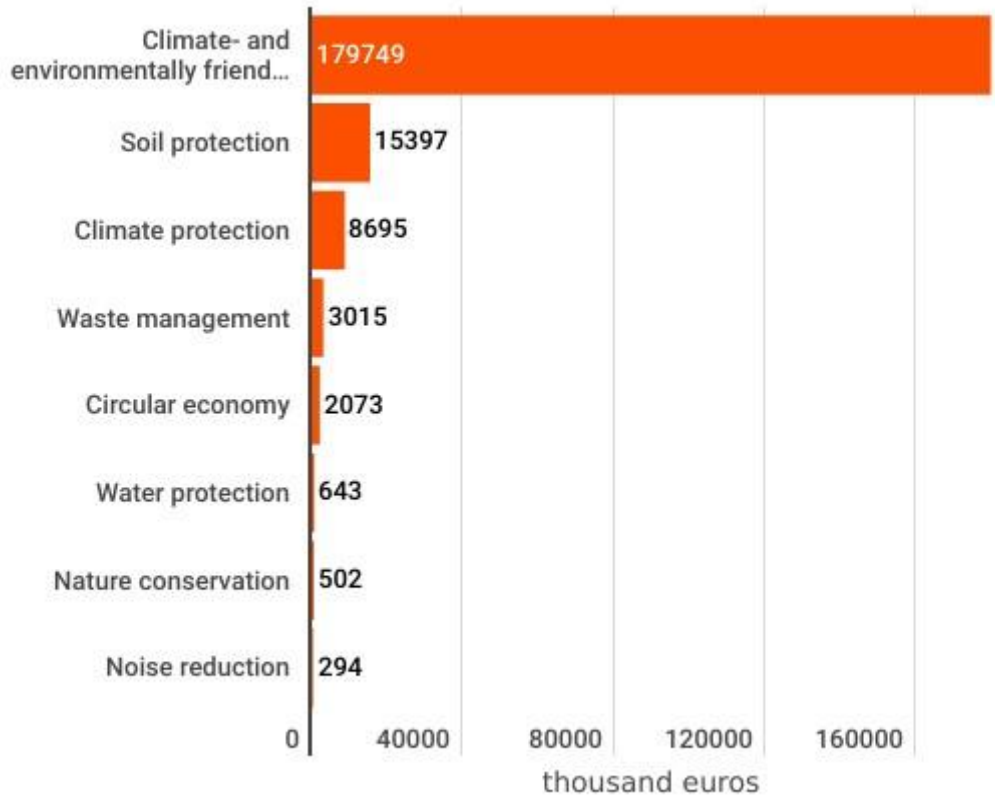

Image 20. The City's environmental investments were EUR 210,368,239 in 2021.

The internal environmental income added up to some EUR 5.4 million (-5.8% from 2020.) The internal environmental income accounted for 0.4% of the total operating income of the City and was EUR 8 per capita. The most significant income was generated from city bikes (27.4%) and vehicle transfer fees in connection with street cleaning (23.3%).

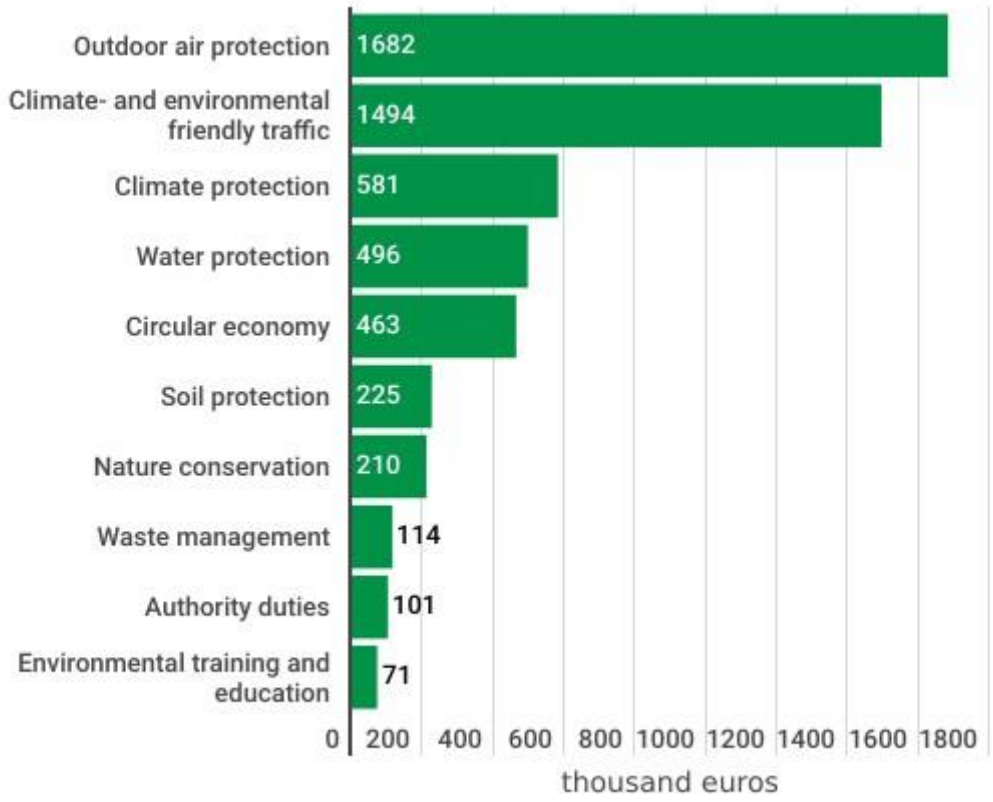

Image 21. The City's environmental income was EUR 5,436,796 in 2021.

The value of environmental liabilities in the financial statements on 31 December 2021 was EUR 18.7 million. The liabilities concerned preparing for the restoration of old landfills and decontaminating soil.

Environmental indicators

The tables below show the environmental indicators for monitoring various areas.

Table 13. Indicators for environmental management and partnerships

Indicator	2021	Definition
Proportion of divisions, public enterprises and subsidiary communities where environmental management is at least at the level of the lighter environmental management systems (proportion of all)	51%	(new indicator)
Proportion of divisions, public enterprises and subsidiary communities where environmental management is part of a bonus system or another incentive (proportion of all)	23%	(new indicator)

Table 14. Indicators for climate change mitigation

Indicator	2021	Definition
Greenhouse gas emissions in Helsinki area (kt CO_2e and change compared to 1990)	2,345 kt CO_2e, -33%	No changes in the indicator's development
Greenhouse gas emissions per capita in Helsinki area (t CO_2e and change compared to 1990)	3.6 t CO_2e, -50 %	No changes in the indicator's development
Energy consumption per capita in the Helsinki area	21,101 kWh	The indicator has deteriorated
Proportion of renewable energy of energy consumed in Helsinki	32%	The indicator has improved
Energy savings in the City's own operations (public buildings, vehicles, street lights), GWh and savings in proportion to target (KETS 2017–2025)	22.4 GWh, 36% of the target	The indicator has improved
Energy savings of City-owned residential buildings, GWh and savings in proportion to target (VAETS 2017–2025)	-	(calculation in progress)

Table 15. Indicators for traffic

Indicator	2021	Definition
Proportion of sustainable modes of transport (walking, cycling, public transport, others)	80 %	No changes in the indicator's development
Greenhouse gas emissions in Helsinki traffic (kt CO_2e and change compared to 1990)	541 kt CO_2e, -21%	The indicator has improved
Proportion of electric and gas cars of the passenger car population	7.5 %	(new indicator)

Table 16. Indicators for air protection

Indicator	2021	Definition
The annual average nitrogen dioxide concentration at the Mannerheimintie measurement station (limit value of 40 µg/m3, as specified in the EU directive)	17.9 µg/m3	The indicator has deteriorated
The annual average nitrogen dioxide concentration at the Mäkelänkatu measurement station (limit value of 40 µg/m3, as specified in the EU directive)	20.5 µg/m3	The indicator has improved
Number of days when the limit value level of particulate matter was exceeded at the Mannerheimintie measurement station in Helsinki (EU directive: max. 35 days per year)	14 pcs/a	The indicator has deteriorated
Number of days when the limit value level of particulate matter was exceeded at the Mäkelänkatu measurement station in Helsinki (EU directive: max. 35 days per year)	14 pcs/a	The indicator has deteriorated
Annual average amount of inhalable particles (PM10) at the Kallio measurement station	10 µg/m3	The indicator has deteriorated
Annual average of fine particles (PM2.5) at the Kallio measurement station	5.8 µg/m3	The indicator has deteriorated

Table 17. Indicators for noise abatement

Indicator	2021	Definition
Number of residents exposed to road traffic noise (over 55 dB LAeq7-22) based on the noise survey made every five years	233,020 (2017)	-
Proportion of completed actions in the noise abatement action plan	37/53	(new indicator)

Table 18. Indicators for water protection

Indicator	2021	Definition
Nitrogen emissions to the sea from Viikinmäki Wastewater Treatment Plant (t/a)	470 t/a	The indicator has improved
Phosphorus emissions to the sea from Viikinmäki Wastewater Treatment Plant (t/a)	18 t/a	The indicator has improved
Proportion of Helsinki's coastal waters in good condition	0%	(new indicator)
Proportion of Helsinki's groundwater basins in good condition	80%	(new indicator)

Table 19. Indicators for nature protection and soil

Indicator	2021	Definition
Share of nature reserves of total land area	3.8%	The indicator has improved
Change in the number and area of nature reserves (from previous year)	+5 pcs and +154.3 ha	The indicator has improved
Total land area of water-permeable areas in Helsinki (available every second year)	61% (2020)	-
The area of forests and wooded areas or their relative proportion of all land areas (available every second year)	43% (2020)	-
Change in the number of natural areas (compared to previous year)	(not available)	-
Change in the number of bumblebee specimens (since 2019)	+70%	The indicator has improved (it should be noted that annual fluctuations in insect populations are normal, and a distinct trend can only be observed in the long term).

Change in the number of European honeybee specimens (since 2019)	-56%	The indicator has deteriorated

Table 20. Indicators for procurement

Indicator	2021	Definition
Proportion of environmental criteria of the City of Helsinki acquisitions	51%	The indicator has improved

Table 21. Indicators for environmental awareness

Indicator	2021	Definition
Number of new eco-supporter who completed basic training (persons/a)	93 persons	(new indicator)
Proportion of environmentally certified Helsinki educational institutions, schools and daycare centres of all	9%	(new indicator)

Table 22. Indicators for circular economy

Indicator	2021	Definition
Amount of soil masses utilised (t/a)	1,500,000 t	(new indicator)
Number of employees who participated in circular economy training (persons/a)	568 persons	(new indicator)