



## Climate City Contract

# 2030 Climate Neutrality Action Plan of the City of Lahti

2030 Climate Neutrality Action Plan of the City  
of Lahti

15 September 2023

# Lahti





## Disclaimer

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## Summary

An abstract **summarizes the content** of the 2030 Climate Neutrality Action Plan (Action Plan) that is developed jointly by local authorities, local businesses and other stakeholders.

Textual element
<p>The action plan of Lahti is based on the Climate Programme of Lahti, which was updated in 2023. Lahti aims to be climate- neutral for scope 1 emissions already by 2025 as intermediate step towards the Mission goal in 2030. Our approach covers sectors of climate governance, energy, transport, circular economy and sustainable consumption, carbon sinks and compensation as well as climate adaptation.</p>
<p>The Action Plan is developed jointly with wide group of experts in the city organisation and city's daughter companies, local authorities, local businesses and other stakeholders. Many of the stakeholders have signed the commitment and are responsible for actions in the portfolio.</p>
<p>Based on the emission inventories we have identified that the national policies and already secured local actions have significant impact but an emission gap of 82,9 kt CO<sub>2</sub> ekv remains to be filled by 2030. The biggest emission gap is in buildings but most challenging to cut are the emissions from road traffic. Hence, key priorities that we will focus on in the coming years are cutting the emissions of transport and further decarbonising the energy system. Challenges in these sectors require a systemic change not only from the city and other levels of governance but also behavioural change from citizens and strong participation of the private sector towards more sustainable consumption.</p>
<p>General systemic barriers for climate-neutrality were identified in climate governance, financing and behavioural change. Especially for transport the list of barriers to overcome is long and requires wide collaboration across levels of governance and participation of citizens. In buildings sector some actions in district heating, such as electrification and carbon capture can have huge impact in emissions. In road transport the emissions are scattered for vehicle and road types and a portfolio of actions is needed utilising different levers to enable a modal shift towards sustainable mobility and to accelerate the shift to electrification and low-emission fuels.</p>
<p>In Lahti emission inventories and monitoring of progress in climate actions is embedded in the city's annual reporting cycle. Similarly, the updating of the Climate Programme will be tied to financial planning to secure financing of all actions. The Action Plan will be updated in two years cycles.</p>

## List of figures

The list of figures **identifies the titles and locations** (page numbers) of **all visual elements**: figures, drawings, photos, maps, etc. used in the Action Plan.

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## Abbreviations and acronyms

The list of abbreviations and acronyms **identifies the abbreviations** (a shortened form of a word used in place of the full word) **and acronyms** (a word formed from the first letters of each of the words in a phrase or name) used in the Action Plan.

Abbreviations and acronyms	Definition
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilisation
DH	District heating
EV	Electric vehicles
LSL	Lahden Seudun Liikennän (Regional Public Transport Operator)
SUMP	Sustainable Urban Mobility Plan



# 1 Introduction

The introduction should outline the local policy context in which the Action Plan is being developed and describe the gap it is addressing in broad terms.

## Introduction

Lahti is a mid-size city with ca. 120 000 inhabitants located in inland Southern Finland, making it the 9<sup>th</sup> biggest city in Finland. The city area covers 135 km<sup>2</sup> with most inhabitants living within 5 km from the city center. Eastern parts of the municipality are mostly forest and farming land with large water bodies around the city area (see Annex 1 - Map of the city of Lahti). Since the 1950s the city grew significantly around increasing industry. The fast industrialisation did not happen without costs to local environment and since the 1970s the city has worked hard to take care of its environment with all stakeholders involved. As proof of Lahti's significant efforts in climate and environmental work, we were appointed as the European Green Capital for 2021.

Lahti has for long been the frontrunner in climate work among European cities, and climate-neutrality became a goal in the city strategy of Lahti in 2009 when the first emission reduction targets were placed. To highlight the importance of carbon-neutrality and ensure its realization in best possible way, it is integrated to other strategic goals of Lahti, such as vitality, public health, and biodiversity conservation through strong cross-sectoral programme work. The European Green Capital Year 2021 left a strong political legacy for the work ahead and has already proven that ambitious climate politics can attract new business, increase the vitality of the city, and improve the quality of life.

In October 2021 the newly elected city council confirmed our goal to be carbon neutral already by 2025 as the first big city in Finland. The target is based on production-based emissions accounted mainly in scope 1 (Greenhouse Gas Protocol). The city of Lahti has three official climate-related main targets, that cover all three scopes defined by the Greenhouse Gas Protocol:

1. City's own target: Carbon neutral by 2025, with 80% decrease in production-based emissions compared to 1990 and binding the remaining 20 % to carbon sinks and compensation. In absolute terms, the target for 2025 is 216 kt CO<sub>2</sub>e (mainly scope 1).
2. As part of the national HINKU network (Towards Carbon Neutral Municipalities) Lahti targets to cut its use-based emissions by 80% by 2030 compared to 2007 levels (scopes 1 and 2).
3. Reducing consumption-based emissions by 50% by 2030, compared to 2005, as defined in the targets of Fisus network (Finnish Sustainable Communities) (scopes 1, 2 and 3).

The timeline for the three targets is shown in Figure 1.

To this date we have already cut our production-based scope 1 emissions by 64% since 1990. The most efficient emission reductions since 1990 have come from Lahti Energy abandoning the use of charcoal in the production of district heating in 2019. The most challenging sector, where emission rates have remained similar for decades is road transport. In 2021 almost half of Lahti's production-based emissions came from this sector. Current scenarios predict that climate-neutrality in scope 1 will not be reached until in 2026 or 2027. Although the original, very ambitious aim of meeting the target by 2025 may not be fulfilled, Lahti will still be the first big Finnish city to reach its own climate-neutrality target.

The scope 1 climate-neutrality target 2025 of Lahti does not exactly meet the Mission guidelines, but we can see it as an important milestone towards more ambitious targets. The target also includes a goal and plan for offsetting the residual emissions. We are also on a good way towards the Mission target 2030 and by 2021 have cut scope 1 and 2 emissions by 52%. In the CCC documents we use 1990 as the baseline and the latest emission data from 2021 as an intermediate check point towards climate neutrality. For our third target around consumption based emissions we have started regular emission inventories to better understand the material flows to and from the city to identify actions with most impacts. The ambition of Lahti goes beyond our current targets and year 2030 and we are in the middle of a process to define more ambitious climate and nature targets for the city. We will be ready to update our ambition in the updating cycles of the CCC.



Given our long journey as a climate pioneer, the lowest hanging fruits have already been picked and we are moving towards a more holistic approach and systemic change. Joining the EU mission “100 climate-neutral and smart cities by 2030” and developing this Climate City Contract gives Lahti a remarkable push towards these aims. It gives us more tools for tackling the most challenging remaining emission that still need to be reduced to reach climate-neutrality, while simultaneously creating new collaboration possibilities with local businesses, academia, and citizens. The key priorities that we will focus on in the coming years are cutting the emissions of traffic and further decarbonising the energy system. Challenges in these sectors require a systemic change not only from the city and other levels of governance but also behavioural change from citizens and strong participation of the private sector towards more sustainable consumption.

Lahti Climate Program sets 96 actions holistically across all three emissions scopes and six thematic topics towards climate neutrality. Each of the six thematic topics: climate governance, energy, transport, circular economy and sustainable consumption, carbon sinks and compensation as well as climate adaptation have more specific sub-targets that lead to sectors specific emission reductions and support systemic change inside and across the thematic topics. The Climate Program was approved by the City Board in June 2023, and the progress is being monitored and actions updated annually. Lahti’s Circular Economy Roadmap and Sustainable Urban Mobility Plan, which is prepared and updated along the city master plan, compliment the Climate Program. Our climate work has confluences and common targets with the regional programme “Nature Step to Health” and the new project “Lahti Living Lab - Nature Positive Life”, which both see climate work as a lever to promote human health and biodiversity.

To reach the climate targets, it is necessary to make considerable investments by the city itself, its daughter companies as well as by other stakeholders such as inhabitants and the private sector. In addition to the city’s own typical financial sources, a significant amount of national and EU funding is needed in the path towards net zero. The city of Lahti commits itself to deliver bold climate action that will enable it to achieve the indicated goal on time. This will be done in a fair and just way doing no significant harm and leaving no one behind.

The holistic approach ties the climate work to other strategic goals of the city, such as economic vitality, nature positivity and climate adaptation. Following the guidelines and actions to reach our climate-neutrality goal will bring us also multiple co-benefits, such as well-being and health of citizens. Reducing emissions in traffic will, for instance, lead to enhanced air quality. Similarly, changes in food systems or increased biking and walking can have positive impacts on both health and climate. The city of Lahti is involved in research and development projects regarding planetary lifestyle, which in turn can both have a positive impact on nature, citizens plus reduce greenhouse gas emissions. The city and the strategic partners have identified several co-benefits of climate work that can support the economic vitality of the region such as new possibilities for multistakeholder collaboration, new investments, financing opportunities, support for RDI-sector, new innovations and business opportunities leading to economic sustainability, improved economic competitiveness and employment. This all builds a common trust that Lahti region will succeed and flourish also in the future.

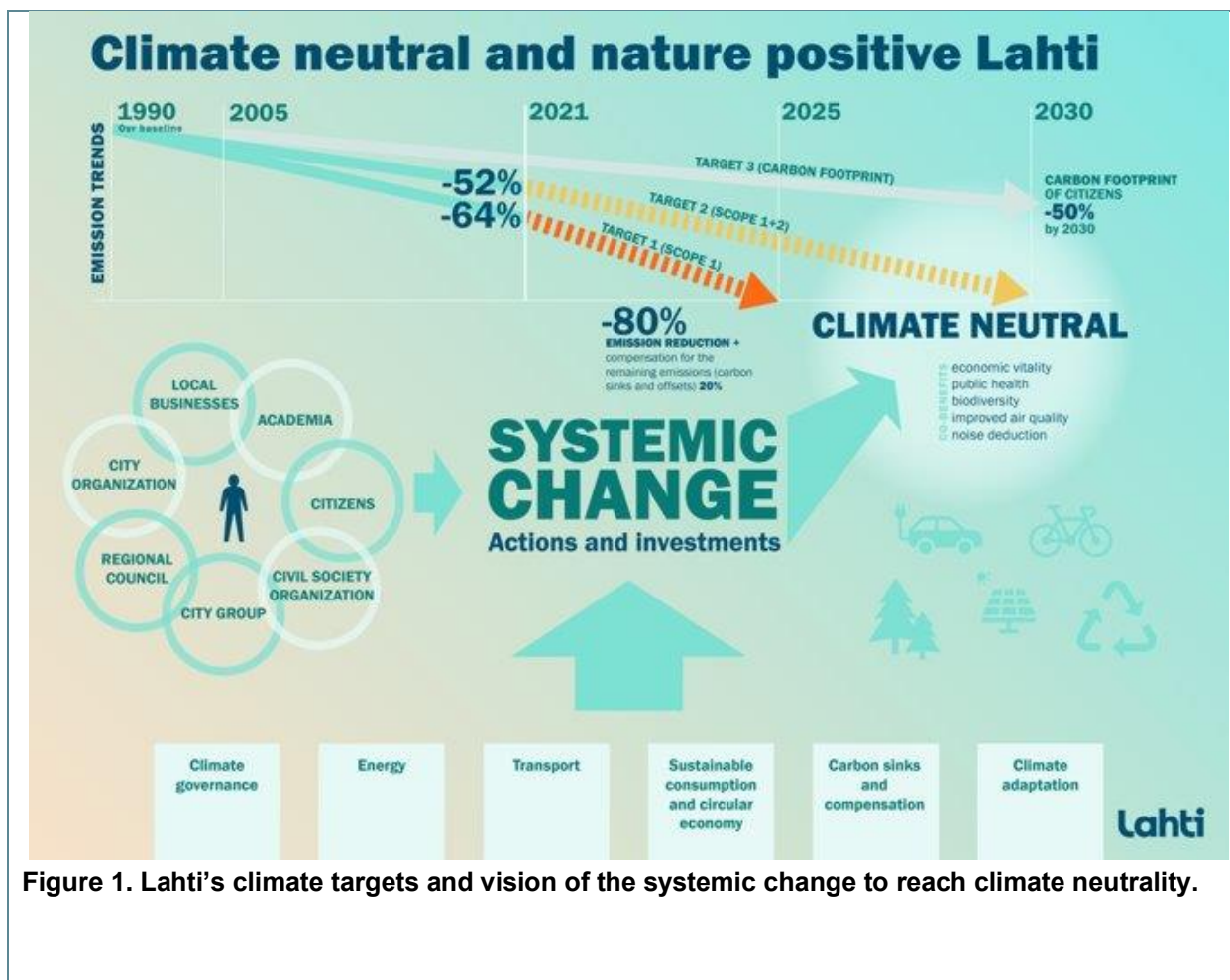


Figure 1. Lahti’s climate targets and vision of the systemic change to reach climate neutrality.

## 2 Work Process

This section should list the working steps carried out, for example along the NZC Climate Transition Map, or related steps planned as well as outline timeline and milestones for future iterations for the continuous development of the Action Plan.

### Work Process - combination of textual and visual elements

The Mission work and preparation of the CCC including the Action Plan was done jointly with the update of the city’s Climate Programme. The work was carried out in May between 2022 and August 2023. The update was coordinated by the Environmental Development Unit which is part of city’s Economic Development Services. The update process included background analyses and benchmarking of climate programs of reference cities, theme-specific workshops and ideation of measures, evaluation of the effects of measures and preparation of emission scenarios and with the parties responsible for specifying the measures. A total of approx. participated in the update 70 people from the city organization, group companies and local stakeholders. In addition, there were climate experts from Sitowise Oy supporting the process.

Below a process description is given following the climate transition map of NZC.

#### Build a Strong Mandate

The city council and city board have given their mandate to climate work in Lahti by accepting the city strategy where climate neutrality was set as a goal, and by accepting the Climate Program that acts as a basis for the Action Plan. During the European Green Capital Year 2021, citizens of Lahti took



surveys regarding climate and environment work. The results showed that our city also has a mandate of our citizens when it comes to climate work.

Our transition team works on two levels as we have a steering group along with a working group of experts. The experts in the working group come from the key city departments of the city of Lahti, and involve people working on environmental policy, urban planning, housing and environment, transport and infrastructure planning. Other experts are invited to join the working group meetings based on the discussed topics. The steering group has members from the management level of the city of Lahti. In addition the largest city-owned companies are represented. We work closely with research institutes, technology sector, and welfare services in terms of low-carbon innovations and enhancing planetary lifestyle in Lahti, and thus have representatives from the universities, Wellbeing services of county Päijät-Häme and Technology Industries of Finland in the steering group.

Also the steering group of the city as well as the City board were regularly updated with the process and provided feedback to the process and substance. In addition the personnel of the unit of Environmental Development were involved in the process to provide feedback and ensure connections to other ongoing projects in sustainability sector such as Climate budgeting, Nature-Step to Health, Circular Economy Roadmap and Master Plan.

### **Understand the system**

To understand the system, where emissions stem from and where we can act to reduce them, emission inventory for 2021 was done by Sitowise with the CO2 report model. Inventory was done with the same methodology also for years 1990, 2010 and 2015. In addition to the regular inventories background information such as activity data and energy consumption data as well as reports from past and ongoing projects were collected to gain a more detailed understanding especially of the transport sector.

We utilized scenario work to understand how the global and national trends will affect the local emissions in coming years and assessed the emission reduction potential of the already set and secured actions. We also estimate the emission reduction potential and of suggested actions. Cost estimates were provided for most significant suggested actions.

Based on the information available, emission gap was calculated.

### **Co-design a Portfolio**

For the design of the Action portfolio was the knowledge of internal experts, stakeholders, academics and knowledge from pilot projects was utilized. The process began with thematic workshops where system information was discussed and ideas for actions collected from experts from city departments and daughter companies. Second round of meetings was organized with departments, teams and stakeholders, as they were able to design actions that they could take responsibility for. A second round of thematic workshops was organized with a larger representation from external experts and stakeholders to finalise the impact pathways and list of actions.

Two stakeholder workshops were organized for companies and organisations that could have larger impact emissions in the area. The participants provided feedback for the structure and content of the Commitment and many agreed to sign the contract as a partner of the city.

### **Take Action**

Our Climate Program lists actions to meet our climate neutrality target, along with a schedule for the realisation of actions. All actions will be taken into the online platform Lahti Environmental Watch (Lahden ympäristövahti). The persons responsible for actions will get notifications from the platform for regular updates on the progress of the actions.

Many of the actions scheduled for 2023-2025 are already ongoing, at least in planning/preparation phase. A big improvement for the preparation will be the introduction of climate budgeting in the





financial planning in 2024. Climate budgeting ensures that the expected investments and other costs will be brought to city budget timely to ensure the implementation in schedule.

The city is actively involved in research and development projects both internationally and with local academic partners LAB and LUT Universities. We collaborate and share ideas with other cities, mainly the other five Finnish EU mission cities and those that are also located in Päijät-Häme region.

Closing the emission gap will require actions, effort, and investments from all the partners involved in the contract. Collaboration between the city of Lahti and its stakeholders covers various aspects from ensuring sufficient labour force and knowledge, sufficient infrastructure, research collaboration. Holistic work of the whole ecosystem built around the actors involved in the cities mission is required for reaching the climate neutrality target. At the same time the holistic approach brings new opportunities for stakeholders and makes Lahti even more attractive for new investments and companies.

### **Learn & Reflect**

The city of Lahti updates its Climate Program annually, and repeats the inventories for production-based and use-based emissions annually. We continuously monitor the realisation of actions listed in our climate programme and action portfolio via our online Lahti Environmental Watch (Lahden ympäristövahti) system. Our following steps are developing indicators for our actions so that their effects can be followed in an easier and more consistent manner.

Our plan is that the city's climate actions and the required financing are updated annually as part of the city budgeting process.

The transition teams will continue meeting regularly to follow the process and develop new ideas. We are part of many city networks allowing peer-learning from others. Many of the intervention identified in this plan, will enhance the communication and climate governance inside the city but also between stakeholders and different levels of governance. We continue to lead the decision making with knowledge gained from the scientific community and from our own monitoring and are ready to change course accordingly.

### **Make it the New Normal**

The climate work in Lahti, and the expertise of the local business sector and universities meet in the sectors of carbon neutral construction, circular economy, and low emission traffic. Clusters of local experts are built around these topics. The city provides platforms such as Pippo-Kujala smart-indra industrial estate and the carbon-neutral Ranta-Kartano district and neighboring sport arena where new technologies can be developed and piloted. Smart technologies, digitalisation, innovative and sustainable procurements and promotion of circular economy are among the key methods. Thus, we have a good and solid base for accelerating the change and making it a new normal. Nevertheless, trying to affect people's behaviour is a task with several challenges. The city of Lahti will be working on an interaction plan related to how its own climate work considers the stakeholders of the city, the residents, and the various departments inside the city to reduce the silo-structure in decision-making. The city of Lahti is also planning a project, together with LAB University of Applied Sciences, focusing on how to communicate the challenging actions that are needed for instance in transport sector in a way that they are more acceptable among local politicians and citizens. Communication plays a strong role in making it a new normal and is one channel of collaboration between the parties of this Climate City Contract. It is important to communicate the concrete actions that the parties of the contract make in their own part to show example to those who are not that far along yet with their climate work.

### **Further action plan development and iterations**

The Action Plan will be updated in two years cycles. In 2025 we hope to have made significant progress in energy and transport sectors. For years 2025-2030 our focus will therefore shift to the



topics of are agriculture forestry and land- use and waste management. We already have a list of action that are prepared and implemented around these topics. Especially AFOLU sector offers possibilities for climate adaptation, biodiversity work and offsetting of residual emissions.

We also continue to follow the progress of the climate work. In Lahti the emission inventories and monitoring of progress in climate actions are embedded in the city's annual reporting cycle. We continue to lead the decision making with knowledge gained from the scientific community and from our own monitoring and are ready to change course accordingly.

**Important milestones of climate work in Lahti 2023-2030:**

- Introducing Climate budget as part of the city budget 2024
- investment decision on CCU 2024
- Year of Sustainable Mobility 2025
- New city council elected; new city strategy 2025
- Lahti Climate Programme and CCC update 2025
- Local compensation marketoperating in 2025
- CCU operating in 2026
- Lahti Climate Programme 2027
- Lahti's own climate neutrality target of 2025 (most likely emission reduction target is achieved in 2027 or 2028)
- New city council elected; new city strategy 2029
- CCC update 2029
- 2030 Mission climate-neutrality target
- Lahti's Consumption based target 2030
- 

**Annual cycle of climate work in Lahti**

- Environmental balance sheet: January-March
- New emission inventory from Sitowise (CO2 report): February
- Reporting on climate activities internally (City sustainability report): March
- Reporting to CDP: June
- Preparation of new actions and climate budget: April-August
- New actions and climate budget approved by City Council: October/November

## 3 Part A – Current State of Climate Action

Part A “Current State of Climate Action” describes the point of departure of the city towards climate neutrality, including commitments and strategies of key local businesses, and informs the subsequent modules and the outlined pathways to accelerated climate action.

### 3.1 Module A-1 Greenhouse Gas Emissions Baseline Inventory

Module A-1 “Greenhouse Gas Emissions Baseline Inventory” should detail and describe the city's latest GHG inventory to establish the emission baseline and to establish the emissions gap to 2030 climate neutrality according to the inventory specifications defined in the Cities Mission's *Info Kit for Cities* and the process outlined in the Action Plan Guidance.



For the City of Lahti 1990 is the baseline used for calculating climate neutrality. This is the reference year stated in the city strategy and climate programme. However, in the tables below, mainly 2021 data is presented since this is the latest data available and more detailed than the 1990 data. For now, we handle 2021 data as intermediate datapoint towards climate neutrality. Emissions are calculated with Sitowise's CO2-report model. The model is based on the method used in the Finnish greenhouse gas inventory and therefore in accordance with the IPCC. For the best possible data we use local data sources where possible but for many sectors we rely on national statistics. The system boundary for this inventory is the geographical boundary of the city as presented in in Annex 1 – Map of the city of Lahti, following administrative borders of the municipality.

<b>A-1.1: Final energy use by source sectors<sup>a</sup></b>				
Base year	2021			
Unit	GWh/year			
	Scope 1	Scope 2	Scope 3	Total
<b>Buildings</b>				
District heating (DH)	na <sup>b</sup>	1107,6	na	<b>1107,6</b>
DH: Natural Gas <sup>g</sup>	206			
DH: Biomass <sup>g</sup>	1168			
DH: Waste <sup>g</sup>	883			
DH: Oil <sup>g</sup>	19			
DH: Biogas <sup>g</sup>	3			
Separate heating (oil, gas, biomass)	405,7	na	na	<b>405,7</b>
Geothermal heating	na	12,5	na	<b>12,5</b>
Electricity for heating	na	184,0	na	<b>184,0</b>
Electricity for industry <sup>c</sup>	na	274	na	<b>274</b>
Other electricity consumption	na	581,5	na	<b>581,5</b>
<b>Transport</b>				
Road transport Combustion	730,6	na	na	<b>730,6</b>
Road transport – EV cahrnging	na	(included in numbers for buildings above)	na	
Rail transport	na	dna <sup>d</sup>	na	
<b>Waste</b>	dna <sup>d</sup>	na	nr <sup>e</sup>	
<b>Industrial Process and Product Use (IPPU)<sup>f</sup></b>	107	na	na	107
<b>Agricultural, Forestry and Land Use (AFOLU)</b>	na	na	na	
<b>TOTAL</b>	<b>1243,3</b>	<b>2159,6</b>	<b>0</b>	<b>3402,9</b>

<sup>a</sup> Source for all data is CO2 report Lahti 2023 (Sitowise Oy)  
<sup>b</sup> Not applicple  
<sup>c</sup> Number includes heating of industrial buildings and electricity use for the industrial processes  
<sup>d</sup> Data not available in GWh format  
<sup>e</sup> Not relevant. Emissions do not exist or are minor in the area



<sup>f</sup> The number includes the fuels used in industrial production, fuels for gasoline-powered machines and other consumption light and heavy fuel oil (including in agriculture and forestry).  
<sup>g</sup> Energy use by fuel from district heating production (direct emissions). Data received from the operator. Numbers are marked in grey since they do not directly match with the Total of district heating (DH) in Scope 2 which is calculated on use base methodology. Numbers also not counted in the TOTAL.

A-1.2: Emission factors applied	
Year	2021
Unit	t CO2e/GWh
Method	Emissions are calculated with Sitowise's CO2-report model. The model is based on the method used in the Finnish greenhouse gas inventory and therefore in accordance with the IPCC. Model includes CO2, CH4 and N2O from combustion, but in the table, an implied emission factor in t CO2e/GWh is presented.
Primary energy/ energy source	CO2equivalent <sup>a</sup>
<b>Buildings</b>	
District heating	60,5
Separate heating (oil)	258,6 <sup>b</sup>
Geothermal heating	81,8 <sup>c</sup>
Electricity for heating	81,8
Electricity for industry	68,1
Other electricity consumption <sup>d</sup>	69,8
<b>Transport</b>	
Road transport	208,9 <sup>e</sup>
<b>Industry</b>	
Machinery (gasoline)	247,1
Oil and natural gas	207,3
<sup>a</sup> Emissions are calculated with Sitowise's CO2-report model. Model includes CO2, CH4 and N2O from combustion, but in the table, an implied emission factor in t CO2e/GWh is presented. <sup>b</sup> Includes also CH4 and N2O emissions from biomass combustion, but the emissions are small and therefore the emission factor is not presented here. <sup>c</sup> Represents emissions of the electricity used by heat pumps. <sup>d</sup> Finland's average electricity consumption emission factor is used in the calculation <sup>e</sup> Implied emission factor for transportation is presented for road transport. It includes gasoline, diesel, gas and biofuels.	

A-1.3: Activity by source sectors			
Activity presented with best available data related to emission sources. Figures do not always directly relate to emission factor presented in Table A1.2. Complementary data on road emissions available in Figure X in A-1.5 and A-1.6.			
Year: 2021			
	Scope 1	Scope 2	Scope 3
<b>Buildings</b>			
Area of oil heated buildings, m2	1 090 641	na <sup>a</sup>	na
Area of gas heated buildings, m2	252 393	na	na



Area of electricity heated buildings, m <sup>2</sup>	na	1 315 616	na
Natural Gas in district heating			
<b>Transport</b>			
Fuel consumption of road transportation, kg/100 km	8,2	na	na
<b>Waste</b>			
Amount of compostable waste, t	29 520	na	na
<b>Other</b>			
Industrial Process and Product Use (IPPU)	dna <sup>b</sup>	dna	na
Agricultural, Forestry and Land Use (AFOLU) <sup>c</sup>	dna	dna	na
<sup>a</sup> Not applicable <sup>b</sup> Data Not Available <sup>c</sup> Some of the data are confidential. Data available upon request. Only emissions from agriculture are included. Key activity data include animal numbers (several categories) and cultivated soil area for several crops.			

#### A-1.4: GHG emissions by source sectors

For the baseline emission inventory we report both 1990 which is the baseline and reference year used and named in the city strategy and 2021 which is the most recent data available.

Emissions are calculated with Sitowise's CO<sub>2</sub>-report model. The model is based on the method used in the Finnish greenhouse gas inventory and therefore in accordance with the IPCC.

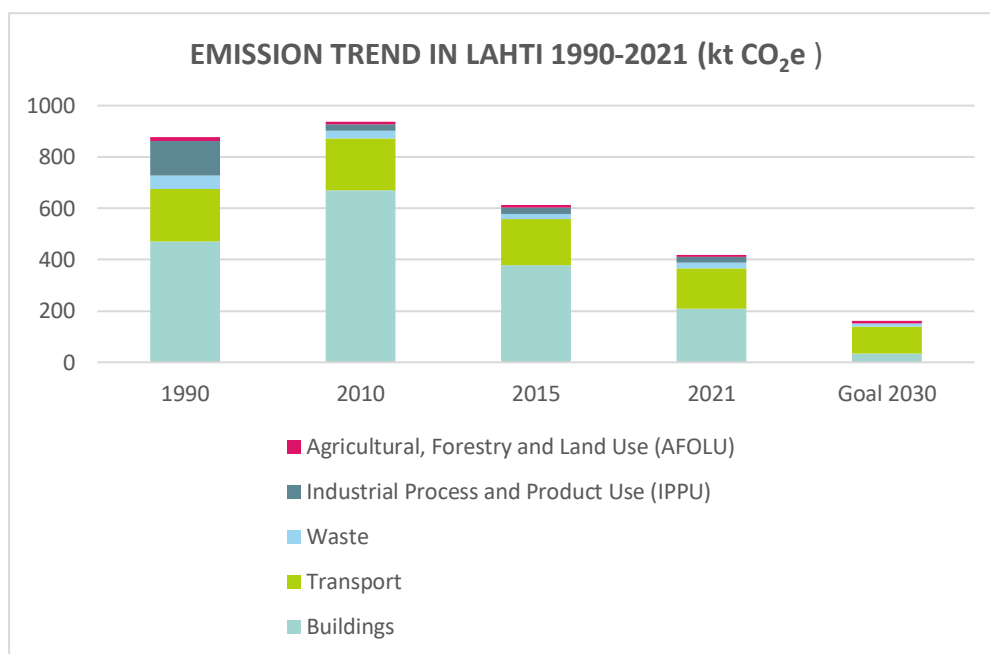
Base year	1990				2021			
Unit	kt CO <sub>2</sub> equivalent/year				kt CO <sub>2</sub> equivalent/year			
	Scope 1	Scope 2	Scope 3	Total	Scope 1	Scope 2	Scope 3	Total
<b>Buildings</b>	<b>286,6</b>	<b>183,7</b>		<b>470,3</b>	<b>133,6</b>	<b>74,3</b>		<b>207,9</b>
Electricity (excl. industry and heating)		99,1		99,1		40,6		40,6
Electricity in industry		65,3		65,3		18,7		18,7
Electric heating		19,3		19,3		15,0		15,0
Geothermal heat	ns				1,0			1,0
District heating	227,3			227,3	67,0			67,0
Separate heating	59,3			59,3	65,6			65,6
<b>Transport</b>	<b>204,5</b>			<b>204,5</b>	<b>157,8</b>			<b>157,8</b>
Road transport	196,1			196,1	152,6			152,6
Rail and waterborne	8,4			8,4	5,2			5,2
<b>Waste<sup>a</sup></b>	<b>53,1</b>			<b>53,1</b>	<b>22,0</b>			<b>22,0</b>



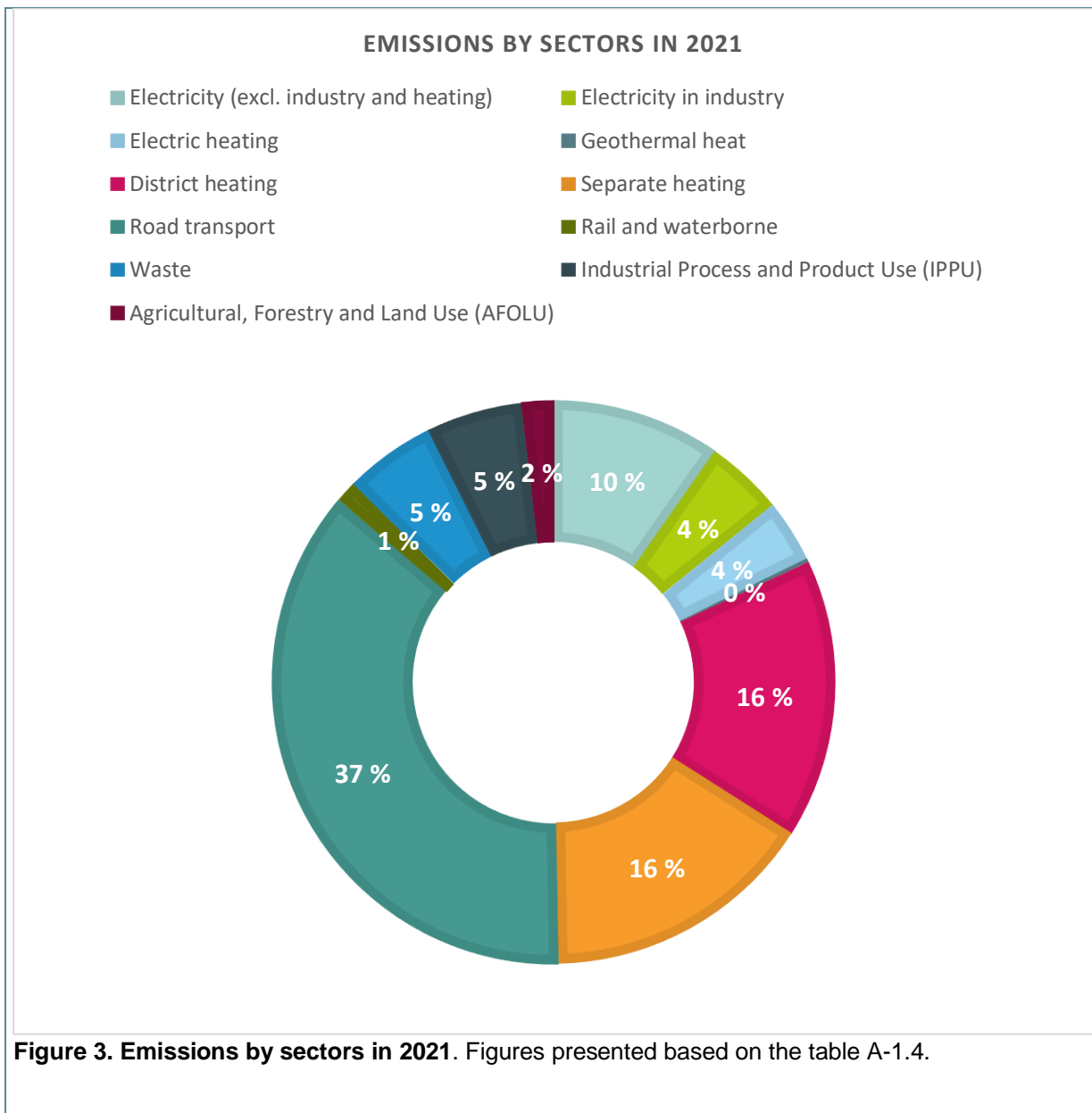
Industrial Process and Product Use (IPPU)	135,2			135,2	ns			22,9
Agricultural, Forestry and Land Use (AFOLU)	13,2			13,2	7,6			7,6
<b>Total</b>	<b>692,6</b>	<b>183,7</b>		<b>876,3</b>	<b>343,9</b>	<b>74,3</b>		<b>418,2</b>

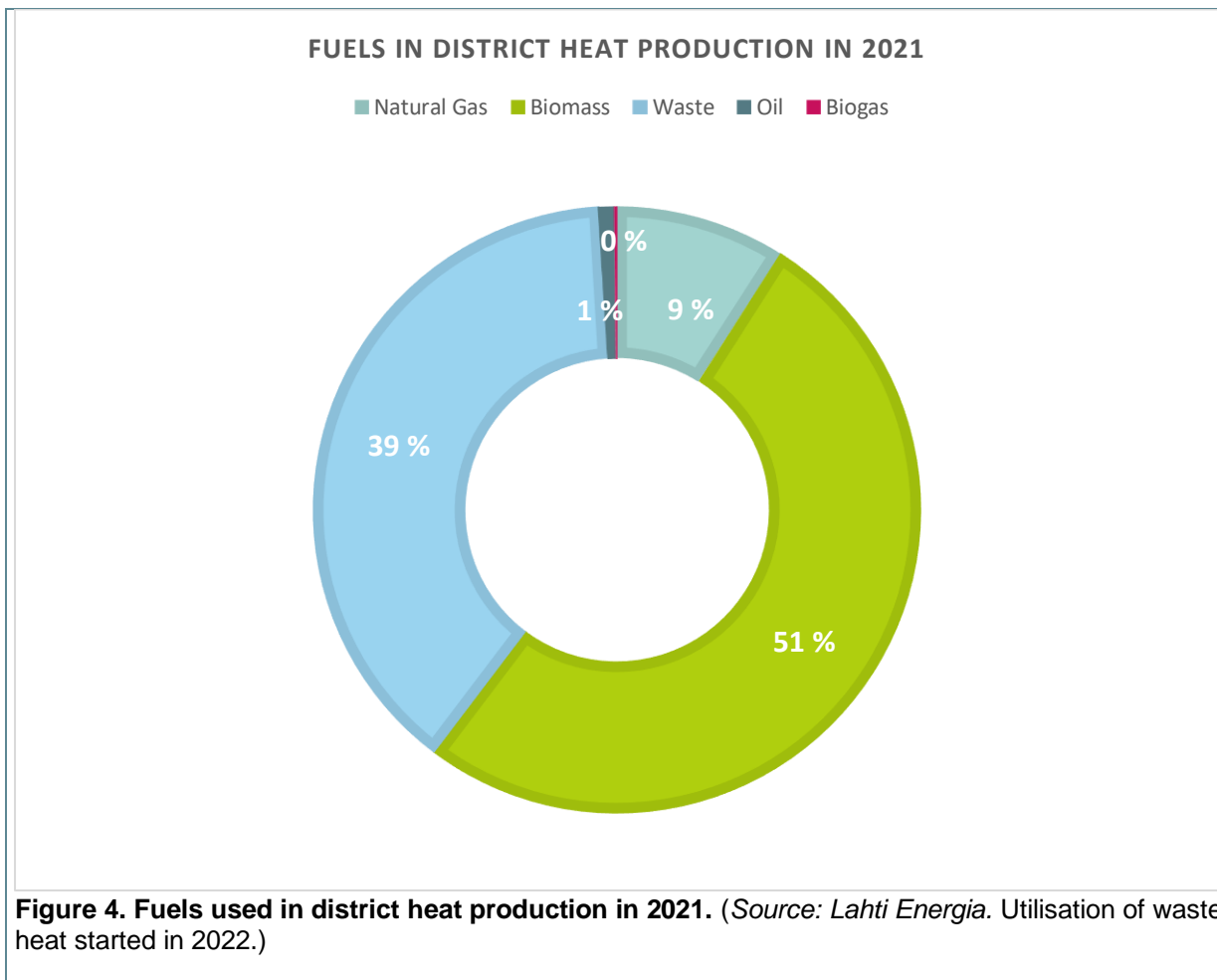
<sup>a</sup>Waste data is reported for Scope 1 based on the information from regional waste management company. Scope 3 emissions from waste produced in the area but transported and managed outside of the area is not available.

**A-1.5: Graphics and charts**

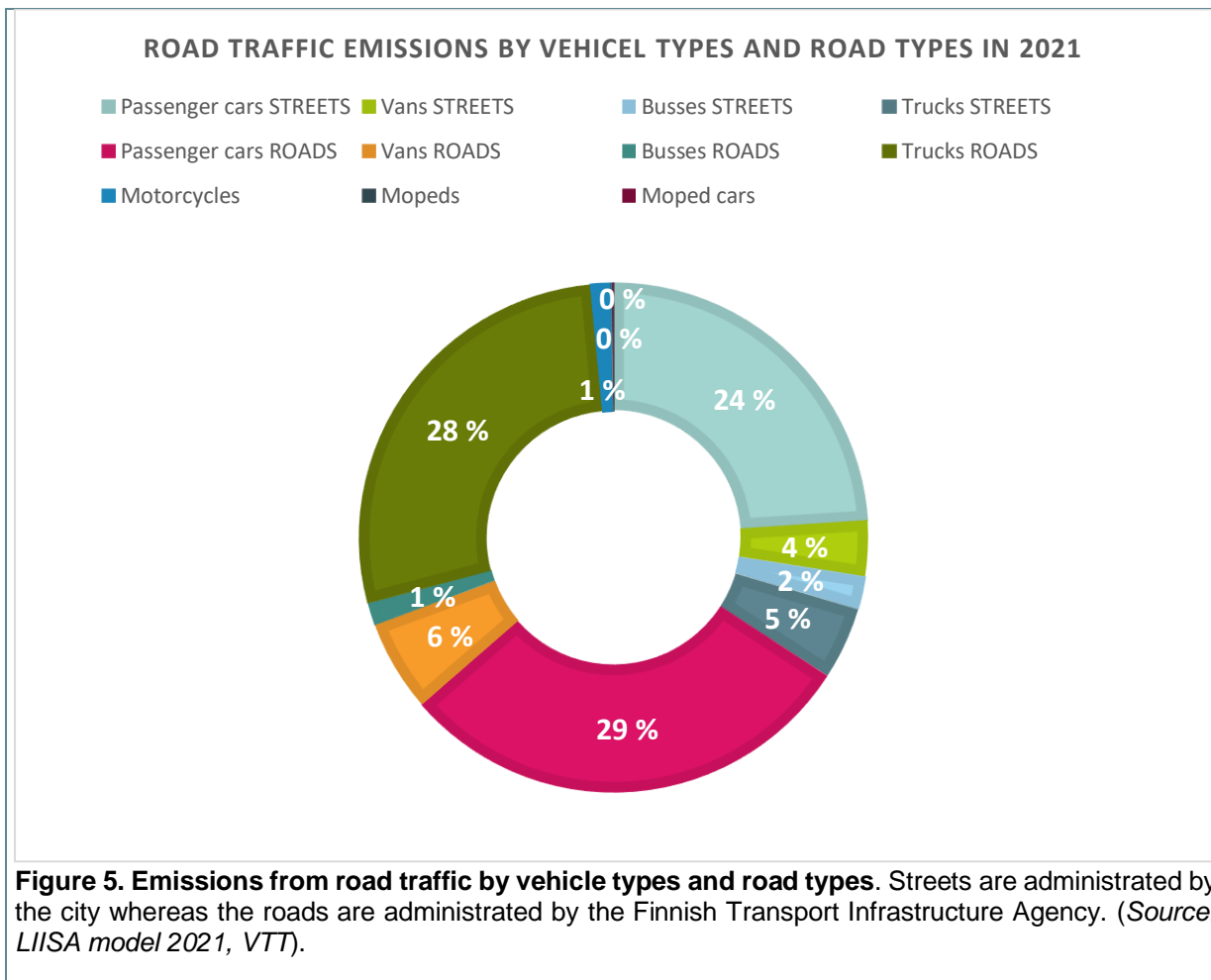


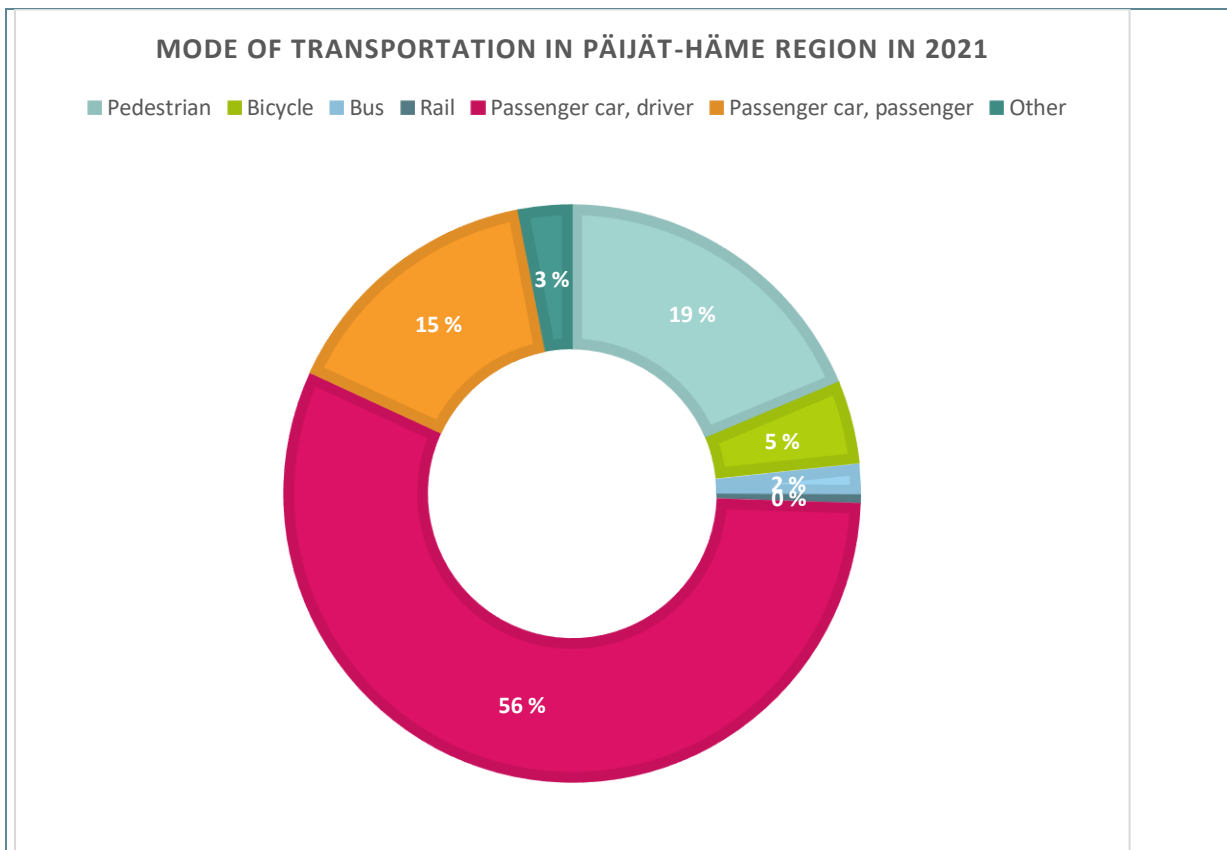
**Figure 2. Emission trend in Lahti 1990 – 2021 and emission goal in 2030.** The goal for 2030 is calculated as -80% from the 1990 baseline. Figures presented base on the table A-1.4.



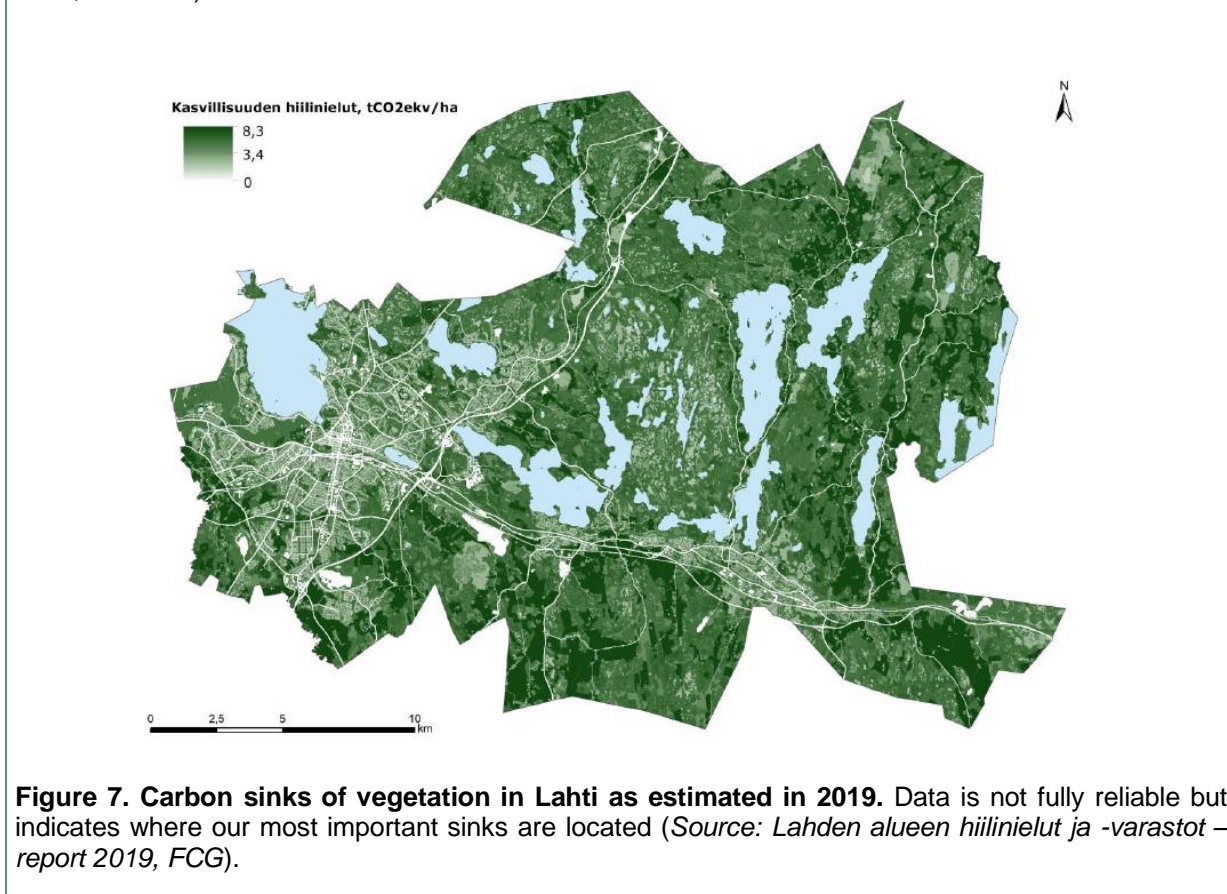








**Figure 6. Mode of transportation in Päijät-Häme region in 2021** (Source: *Henkilöliikennetutkimus 2021, Traficom*).



**Figure 7. Carbon sinks of vegetation in Lahti as estimated in 2019.** Data is not fully reliable but indicates where our most important sinks are located (Source: *Lahden alueen hiilinielut ja -varastot – report 2019, FCG*).



## A-1.6: Description and assessment of GHG baseline inventory

### BACKGROUND

For the City of Lahti 1990 is the baseline used for calculating climate neutrality. This is the reference year stated in the city strategy and climate programme. Given that the Mission guidelines indicate the need to use latest available data as the baseline, we present here also the latest data from 2021. Information from year 2021 is also more detailed than the 1990 data. For now, we handle 2021 data as intermediate datapoint towards climate neutrality. For the best possible data we use local data sources where possible but for many sectors we rely on national statistics. The system boundary for this inventory is the geographical boundary of the city as presented in Annex 1 – Map of the City of Lahti, following administrative borders of the municipality.

### EMISSIONS TREND 1990 - 2021

In 1990 the total emission of Lahti were 876,3 kt CO<sub>2e</sub> and in the latest calculations of year 2021 the total emissions were 418,2 CO<sub>2e</sub> (figure 2). This means that between 1990 and 2021 we have been able to cut the emissions already by 52%. The emissions in Lahti reached their peak in 2010. The number of inhabitants has increased from 16272 in 1990 to 120 027 and the emission per capita have decreased from 6,1 to 3,1 t CO<sub>2e</sub> (excluding industry and IPPU).

The change has mainly been due to changes in district heating (-70%) as the city owned energy company Lahti Energia Ltd quit combustion of charcoal in 2019 and has been able to decrease the emissions from combustion of waste and biomass with technical improvements. Also the emissions from separate heating, especially from oil heating have decreased in the past years as the city has been active to motivate industrial and domestic buildings to take energy renovations.

Also the emissions from electricity use have decreased significantly (ca. -60%), which is mostly due to changes in national electricity production.

The strong decrease in the industry emissions between 1990-2021 (-83%) is partly due to the decrease in industrial activities over long term but also due to changes in energy sources and energy efficiency. There are great examples of greening of industry in Lahti area, as companies have developed custom based low emission solutions based on energy efficiency and circular economy. The city owned energy company Lahti Energia Ltd has been an active collaborator and developer for the needs of industry as well.

On the other hand the emissions from transport, especially from road transport have decreased only moderately (-25%) between 1990 and 2021 despite of the ongoing processes to increase the share of sustainable mobility.

### CURRENT EMISSIONS

#### Buildings

In 2021 buildings still make up the largest part of the emissions (figure 3). In Finland, a significant part of energy consumption and greenhouse gas emissions caused by the heating of buildings. In the emission calculations, the sector is divided for electric heating, geothermal heating, district heating and separate heating. Separate heating includes oil, wood and natural gas heating. The heating of buildings is affected by the annually changing heating demand. The heating demand in different years can be compared with the heating demand figure, which is calculated as the difference between daily outdoor and indoor temperatures.

District heating makes up 16% of the total emissions (figure 3). District heating is organised by the city owned company Lahti Energia Ltd. Lahti Energia has two combined heat and power plants (CHPs) using biomass and waste as energy source in combustion and gasification. The calculated



emissions come from the gasification of waste in Kymijärvi II plant, whereas the combustion of biomass in Kymijärvi III plant is at the moment considered emission free. Lahti Energia has smaller plants producing district heating from gas and oil, which act as a reserve for extreme cold temperature conditions and operate only occasionally. In addition to combustion part of the district heat (16,9 GWh) stems from utilisation of wasteheat in industrial processes and waste waters. The shares of different fuels for 2021 are shown in figure 4.

Emissions from separate heating (16% of total emissions) include public, domestic and industrial buildings that are heated with oil, natural gas or biomass. In separate heating oil is still the most significant emission source in domestic and industrial buildings. It seems possible to significantly reduce the emission from separate heating since the energy crisis of 2022-2023 with high energy prices and problems with availability of fuels.

### **Electricity**

Electricity use makes another 16% of the total emissions (figure 3). The emissions are calculated based on the average emission factor of the national grid supplied electricity. Emission factor of electricity consumption varies every year depending on, among other things the proportions of fuels used in the country, the availability of hydropower, the situation of the emissions trading market, imports and exports. From 2014 the emission factors has decreased from 131 to 74 t CO<sub>2</sub>e/GWh in 2021. In terms of electricity production climate neutrality means more focus on renewable forms of energy, such as wind, water and solar power.

Lahti Energia produces electricity as a side product of district heating in its CHP plants but the company also owns significant portions of electricity production outside of Lahti area which is sold to the national grid. 93% of all electricity production owned by the company is fossil free (hydro, wind and nuclear power).

### **Transport**

The single largest emission sector is the road transport, which alone covers 37% of total emissions (figure 3). The emissions from waterborne traffic and railways are minor and the city has little impact on them, given that the rail traffic is operated by a state owned company and is electrified.

The detailed data and driving performance shows that 65% of the road traffic emissions stem from the roads that are not directly administered or maintained by the city itself but instead by the national road infrastructure agency. 60% of these emissions stem from the vehicles passing through the city area (CO<sub>2</sub>-report 2023).

53% of the road traffic emissions are from passenger cars (roads and streets, figure 5). In the region of Päijät-Häme the electrification rate is still relatively low as only 16% of new vehicles are fully electric (compared to capital region where the ratio is 19%, Source: Traficom). Also the share of sustainable mobility in the region has remained low, and 71% of all journeys are made with passenger cars (figure 6). Truck traffic on the roads is another important emission source (28% of road transport emissions, figure 5) since one of the main highways of the country passes through Lahti.

### **IPPU**

Industry and machinery covers direct scope 1 emissions from industry and machinery. This sector covers 5 % of total emissions. The industrial emissions come from instance from industrial processes which require energy sources such as oil or natural gas. The machinery part includes also off-road vehicles and machines used for instance in agriculture, forestry and construction, mainly running on oil.

### **Waste**

The emissions from waste sector make up 2% of the total emissions. Waste management emissions consist of solid waste landfill disposal, plant composting and wastewater treatment. The emissions stem from waste management from the regional waste management center Salpakierto which is located in Lahti. The emissions from Salpakierto are calculated in only for the proportion of Lahti's



inhabitants (51 % of the region). Currently 99% of all waste in Lahti are sorted and only 1% of ends up in landfill. The methane emissions can be further reduced by promoting organic waste.

#### **AFOLU**

Agricultural emissions are caused by animal digestion, animal manure and arable farming. The most significant emission sources from agriculture are into the soil caused by the nitrogen added as fertilizer and the digestion of farm animals effluent. However, agriculture causes only minor part of the Scope 1 emissions in Lahti and the city has very little power to influence the production and emissions caused.

Land use in larger picture is important for the carbon balance of the city area through the LULUCF sector. Forestry is an important source of livelihood for the land owners of the region. The city owns only small part of the forest and its forests are already sustainably maintained and there are no financial profit expectations for the forests of the city organisation.

We have spatial inventories of the carbon sinks of the vegetation, carbon stocks of vegetation and soil, as well as emissions from soil of the city area from 2019 and 2021, but the results vary significantly from each others making them an unreliable data source. We have initiated a national support project (Kuntanielu 2022-2024) where the aim is to find a standardised way to measure the LULUCF emissions and sinks for all Finnish municipalities. We also collaborate with academic partners and consultancies to understand the importance of urban green in general and the impact of the land-use decisions of the spatial planning department of the city. We have plenty of actions devoted to the topic in our Climate programme under the topic *Carbon sinks and compensation and aim* and our goal is to have reliable inventory data by 2025.

#### **GHG DATA**

Data presented in tables A-1.1 – A-1.4. originates from CO2 report 2023, an emission report that the consultant company Sitowise produces specifically for municipalities need annually. The methodology for CO2 report follows that of the national greenhouse gas inventory and IPCC. The calculations match quite nicely with the requirements indicated in the Mission Info KIT guidelines. Details on the data, calculations and exceptions are listed below. More specific background data is presented in figures 4-7 and data sources are marked in figure captions.

#### **GENERAL :**

- The emission inventory is more detailed on buildings and transport sectors since we have identified these as our main challenges and focus of climate work in the coming years. Sectors of waste, IPPU and AFOLU are at the moment not in the core of the climate work, since they make up only marginal part of the total emissions. Since their portion and importance will increase as emissions decrease on other sectors, these sectors will be in focus in years closer to 2030.
- Energy use: We do not have energy usage data available at the detailed level that the guidelines suggest. For instance we are not yet able to disaggregate electricity use for EVs and other uses. We will work on improving the data especially for the most relevant sectors, such as the EVs.
- Activity data and emission factors: Detailed data for all emission sources not presented, as partly not available, partly confidential and partly difficult to track. We will improve the level of background data for the first update cycle of the CCC.
- Scope 3 emissions: Information on Scope 3 emissions is rarely included. We have preliminary information on consumption based emissions from 2020 and 2022 (*Kulma-calculations, Sitowise*), which includes also Scope 3 emissions but these are not yet at the state to separate the data between scopes and match the Mission guidelines.

#### **BUILDINGS:**

- Electricity: national emission ratios have been used since it is not possible to calculate a local one since data is not available



- Activity data on separate heating is based on national building registers. We are aware that the register is not fully updated for the past energy renovations where the source has been changed to low emission production (especially oil or electric heating to heat pumps). The register also does not account well if several modes of heating are used in one building.
- 

#### AFOLU:

- This is the direct emissions from agricultural production only, excluding forestry and land use change.
- Emissions from machinery used in agriculture and forestry are included in the IPPU sector.
- Activity and energy source data not available for this inventory, since the data is partly confidential. We will be able to provide more detailed data upon request.
- Rough estimates for the carbon sinks and stock of the region exist but are not yet at the state to be included in the inventory

#### IPPU

- The number includes the fuels used in industrial production, fuels for gasoline-powered machines and light and heavy fuel oil consumption. More detailed data especially for the part of construction sector will be needed in the future to plan better targeted actions.

#### TRANSPORT

- For road transport the data presented is collected by the national statistical institute and emissions are shown based on performance on roads in the area (and not on vehicles registered in the area)
- Charging of EVs (scope 2) is included in electricity consumption



## 3.2 Module A-2 Current Policies and Strategies Assessment

Module A-2 “Current Policies and Strategies” should list relevant policies, strategies, initiatives, or regulation from local, regional and national level, relevant to the city’s climate neutrality transition.

A-2.1: List of relevant policies, strategies & regulations					
Type	Level	Name & Title	Description	Relevance	Need for action
(regulation/ policy/ strategy/ action plan)	(local, regional, national, EU)	(Name of policy/ strategy/ plans)	(Description of policy/ strategy/ plans)	(Describe relevance/ impact on climate neutrality ambition)	(list any suggested action in relation – to be further picked in Module C-1)
Strategy	Local	Strategy of the City of Lahti	Carbon neutrality by 2025 is an aim set in the city strategy. The strategy guides all activities of the city and outlines the ways in which Lahti will succeed in the future.	Very relevant. The strategy is implemented through five key projects, of which one is called Carbon neutral 2025.	-Ensure climate and sustainability targets are kept in the strategy when it is updated.
Policy/Action Plan	Local	Climate programme of the City of Lahti	Contains 96 climate actions in six sectors: Climate governance, Energy, Transportation, Circular economy and sustainable consumption, Carbon sinks and compensation, and Adaptation.	Very relevant	-Implementation - Updated annually (in 2025 to match the CCC work)
Action Plan	Local	Sustainable Urban Mobility Plan (SUMP)	Based on city strategy and EU commission guidelines. Is used for guiding citizens towards more	Very relevant	-Implementation -Updated along the Master Plan cycle



			sustainable mobility.		
Plan	Local	City Master Plan	Guides urban development, and implements city strategy and environment targets.	Very relevant	-implementation -updated in four-year-cycles -is connected with SUMP
Policy/Action Plan	Local	City Roadmap for Circular Economy	Guides the city from linear to circular economy and waste-free future.	Relevant especially for construction, procurement, food, stakeholder engagement, education, research	-Implementation
Policy/Plan	Local	Vision for the city center (Keskustavisio)	A vision for what the city center of Lahti will look like in 2040. The aim is to create viable, cozy and attractive city center.	Mobility planning in city center. Relevant citizen engagement.	-Planning phase
Action Plan	Local	Urban Greening Plan	Includes actions for increasing diverse and accessible urban green areas.	Relevant, as includes enhancement of carbon sequestration in urban green areas	-Planning phase - Is related to 2030 EU Biodiversity Strategy -Will be included in the Green Area Plan, which is under update and will be accepted in early 2024.
Action Plan	Local (only at city organisation)	Circular economy action plan for departments of urban planning and urban infrastructure	Guides the circular economy and climate actions at the departments	Very relevant, with practical actions.	-Under update
Policy/Plan	Local	Environmental programme of the city	Guides the environment work of the entire city corporation on a strategic level.	Relevant	-Will be updated in 2023





Policy/Action Plan	Regional	Nature Step to health	The program connects the health and environment targets of Päijät-Häme region.	Very relevant. The program has five detailed targets of which one is about climate change mitigation and adaptation.	-implementation -lasts 10 years and includes several projects
Action Plan	Regional	Carbon Neutral Päijät-Häme 2030: Climate Action Roadmap	The Climate Action Roadmap presents actions towards carbon neutrality.	Relevant. The city of Lahti and Lahti Energy are important stakeholders.	-implementation - The Roadmap is updated annually, and the first follow-up of actions was done in March 2022
Policy	Regional	Land Use, Housing and Transport Agreement (MAL-sopimus)	An agreement between State and municipality, with the key aim to improve the functioning and competitiveness of urban regions and ensure a balanced development of municipalities.	Relevant, The agreement involves also the neighbouring municipalities of Lahti, as well as the Päijät-Häme Regional Council	-implementation -Updated every four years
Policy	Regional	Innovation Ecosystem Agreement	A long-term agreement between State and university cities, with the aim to speed up innovations in carbon reduction, digitalisation and wellbeing.	Relevant, with the key strategic content Carbon-neutral circular economy and sports business	-implementation -Development Center for Carbon Neutral Construction Industry
Policy/Action Plan	Regional	Regional Energy vision	A shared vision for fossil-free energy production.	Very relevant	To be created in autumn 2023
Regulation/policy	National	Finnish Climate Act	National legislation	Relevant	-Poses obligations on



			concerning climate change policy.		the authorities (e.g. municipalities) -Entered into force in 2022 but might be withdrawn in 2023
Strategy	National	Climate neutral Finland 2035 – National Climate and Energy Strategy	Outlines measures by which Finland will meet the EU's climate commitments for 2030 and achieve the targets set in the Climate Change Act.	Relevant	
Policy	National	Medium-term Climate Change Policy Plan (KAISU)	Finland's second Climate Change Policy Plan.	Relevant	
Policy	National	Climate plan for the Land Use Sector	Covers measures targeted at carbon dioxide emissions from agricultural land, forests, land use changes and climate wetlands.	Relevant	-implementation -measures

### A-2.2: Description & assessment of policies

The city strategy is implemented through the programmes and action plans listed above. They cover several sectors and together help Lahti in its climate neutrality targets. The Climate Programme, SUMP and Roadmap for Circular Economy complete each other, so that the most relevant actions set in SUMP and Roadmap for Circular Economy will be followed annually together with the actions set in the Climate Programme. SUMP is also connected with the City Master Plan and is updated along the Master Plan cycle. Despite of all the actions identified in the programmes and accepted by the decision makers, many critical actions included in these existing strategies of the city are still in the planning phase and their funding is not secured. Hence, active work is needed from the responsible actors to ensure that the actions proceed from ideas to implementation and operation. This means for instance that the investment needs are brought timely into the city budgeting process and their importance is highlighted if they seem to fall out of the budget.

National level policies, such as the Climate Act and the National Climate and Energy Strategy form the basis and background for regional and local climate work. The regional work, especially via the Regional Council of Päijät-Häme is also very relevant, as it connects the municipalities and helps with coordinate climate work. The recently updated Climate Programme has several actions that deal with



regional collaboration and development work. The Climate Programme has sub-targets and actions set for six different sectors: Climate governance, Energy, Transportation, Circular Economy and sustainable consumption, Carbon sinks and compensation, and Adaptation. All sectors are necessary for reaching the climate-neutrality target, but the most effective actions take place under the sectors Transportation and Energy. Even under those sectors, the emission reductions come from a combination of several different actions, rather than a single very efficient solution. As the emission reductions of transportation sector are the most challenging ones for practically all Finnish cities, national level policies are in the key role for making more progress. As for Carbon Sinks and Compensation sector, the national policies, similarly than the markets, are still rather new and constantly developing. We are following and participating in the development, but it is rather hard to predict how the national guidelines for instance for carbon offsets will turn out to be. It remains to be seen whether the offsets will be completely based on voluntary markets, or whether the State will regulate them somehow. Locally, we lack knowledge of who gets the benefit for carbon offsets and what counts as offset or emission reduction. If a private company plans to capture emissions from district heating so that the CO<sub>2</sub> produced in combustion of biomass and waste is used for producing synthetic methane and hydrogen for traffic, it is uncertain whether this can be counted as emission reduction or offset.

Some actions and policies in the table above are still in the planning phase, such as the regional energy vision that would also support our local actions for energy efficiency and energy renovations. Collaboration and commitments from private sector are also needed for instance for creating fossil free construction sites, using fossil-free forestry machinery, and shifting to fossil-free production in industry. Other local implementation gaps exist in agriculture, which has limited possibilities to be regulated at local level, and in waste, where we need improved sorting and recycling, as well as capture of land fill gases.

### A-2.3: Emissions gap

All numbers are kt CO <sub>2</sub> ekv												
	Baseline emissions (percentage) 1990 data		Latest emissions (percentage) 2021 data		Residual emissions offsetting <sup>1</sup> / (from 20% 1990*)		Emissions reduction target <sup>2</sup> (2021-residual em.)		Emissions reductions in existing strategies <sup>3**</sup>		Emissions gap (to be addressed by action plan) <sup>4</sup>	
	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)
Buildings	470,3	54	207,9	50	35	20	172,9	71	108,9	68	64	77
Transport	204,5	23	157,8	38	103,36	59	54,4	22	40,7	25	13,7	17
Waste	53,1	6	22	5	14,3	8	7,7	3	7,7	5	0	0
Industrial Process and Product Use (IPPU)	135,2	15	22,9	5	15	9	7,9	3	2,7	2	5,2	6
Agricultural, Forestry and Land Use (AFOLU)	13,2	2	7,6	2	7,6	4	0	0	0	0	0	0
<b>Total</b>	<b>876,3</b>		<b>418,2</b>		<b>175,26</b>		<b>242,9</b>		<b>160</b>		<b>82,9</b>	

<sup>1</sup> Residual emissions consist of those emissions which can't be reduced through climate action and are being offset. Residual emission may amount to a maximum of 20 % as stated by the Mission Info Kit.  
<sup>2</sup> Emissions reduction target = Latest emissions (2021) – residual emissions.  
<sup>3</sup> Emission reductions planned for in existing action planning and strategies should be quantified per sector.  
<sup>4</sup> Emissions gap = Emission reduction target – Emissions reduction in existing strategies.  
\* The residual emissions in 2030 are 20% of the baseline emissions in 1990 (A-1.4.).  
\*\* The estimation is based on scenario work combining national emission trends until 2030 and local actions in Lahti.

### A-2.4: Description of the emissions gap

#### CALCULATING RESIDUAL EMISSION AND EMISSION REDUCTION TARGET

For Lahti the residual emissions are calculated as 20% of the 1990 emissions since this is how it is currently stated in the city strategy (175,26 kt CO<sub>2</sub>e in total emissions and 1,46 t CO<sub>2</sub>e per capita). Since we have long history in climate work, we are still somewhat tied to the already established



practices in climate work at the local and national level and in city networks we belong to. 1990 is indeed an established emission baseline year for many forerunner cities in Europe.

Changing the baseline year, would significantly change the emission reduction target. If residual emissions were calculated as 20% of the latest emission inventory in 2021, they would be 83,64 kt CO<sub>2</sub>e (0,69 t CO<sub>2</sub>e per capita). We have already made many critical climate actions, especially in district heating, and managed to reduce our emission significantly more than many other Mission Cities. The target of 83,64 kt CO<sub>2</sub>e residual emission would be extremely challenging since the lowest hanging fruits with most impact have already been picked. We will be able to discuss need for changing the target and methodology when new city strategy is prepared in 2025, but for the moment and with the means available it would not be socially or financially sustainable to set such a target.

The sector level emission reduction targets are estimations of where we think we might have possibilities to get based on impact assessments of actions and emission scenarios.

### **EMISSIONS REDUCTIONS IN EXISTING STRATEGIES**

The emissions reductions in existing strategies are estimated to total 160 kt CO<sub>2</sub>e by 2030 (figure 9). The estimations base on impact assessments and scenario calculations produced by Sitowise (figure 8). The emission reductions from existing strategies include national emission trend for included emission sectors and impact of local actions in Lahti that are in the strategies and their implementation is secured. These are often climate actions that have turned into established practices in Lahti, such as energy efficiency work in public and private buildings and part of the SUMP actions that are in the city budget.

On the other hand, impacts of actions listed in the city's strategies are not included in the "Emissions reductions in existing strategies" in case their implementation is not secured and they are not yet in the city budget or their external funding is still pending. These unsecured actions are therefore included in the Action portfolio.

The impact of national level emission scenarios in Lahti is estimated based on the climate law and national climate strategies. These were prepared by the previous national government. Scenarios need to be revised based on the plans of the recently elected new national government. For the moment the new government is committed to the national climate-neutrality targets, but for instance in road transport sector the national level emission reductions may not turn out as high and as fast as stated by the previous government.

#### **Buildings**

Buildings sector is expected to see fast reduction in emissions in coming years especially as households and industry shift from separate oil and electric heating to sustainable heating alternatives. Recent problems in fuel availability and high electricity costs have accelerated this shift. The financial support from national government to energy renovations of private households and private sector is a strong driver for the change as well and we rely on this support from national level to meet our local climate goals.

In district heating utilising waste heat from wastewater management started in 2022 and its impact is included in the scenario along with other smaller changes in district heat production.

Also, the emissions from energy consumption are expected to decrease fast since the emission factor of consumed electricity in national grid decreases from 71 to 42 Co<sub>2</sub>e/GWh by 2030. Since 2022 Finland no longer imports electricity from Russia and is forced to rely more on national production. The production of wind power is expected to increase from 8 TWh in 2021 to 30 TWh by 2030 and the nuclear power capacity has also increased since new reactor started to operate in 2023.

#### **Transport**



The emissions from road transport are expected to decrease significantly by 2030 following the national level transport policy including national actions such as tightening of the distribution obligation of fossil free fuels, but also market based trends such as accelerating electrifications of passenger vehicles.

Also, local actions included in the Lahti's SUMP, including gradual shift to low emission vehicles in public transport and improvement of cycling and walking infrastructure and city bike system are partly included in the estimations.

No big changes in emissions of rail and waterborne transport expected by 2030.

#### **Waste**

In waste sector the emissions are expected to lower slightly by 2030 due to enhanced collection of domestic biowaste and textile waste. Targets for these are set in the national law.

#### **IPPU**

In IPPU sector emissions are expected to decrease moderately by 2030 especially through electrification of machinery.

#### **AFOLU**

In AFOLU sector we do not estimate any changes in emissions by 2030, at least in the direct emissions of agriculture. Since 2021 the city offers farmers free education in climate friendly agriculture. Farms are also welcome to join the city as climate partners if they prove to operate in climate friendly manners. The land use change, which is not assessed in our emission inventory, the national goal is to increase the net carbon sinks of land use to meet the residual emissions at national level by 2035.

### **EMISSION GAP**

After accounting for the impacts from ongoing and secured future actions the estimated emission gap of 82,9 kt CO<sub>2</sub>e still remains. This emission gap we will need to fill with local actions (figure 9).

#### **Buildings**

For buildings an emission gap of 64 kt CO<sub>2</sub>e remains. The highest additional potential is in district heating, which is organized by Lahti Energia. The company is fully owned by the city and have important role in our Climate Programme and Mission actions. With large investments in combustion plants in the near past, the company does not plan to quit combustion in the near future but there are possibilities to decrease the emissions for instance with additional electric boilers, season storages, waste heat utilisation and carbon capture techniques.

In separate heating the city has possibilities to accelerate the shift to low-emission heating by increased local advising. Even local incentives might be considered in case the national trend in energy renovations starts to slow down.

#### **Transport**

The emission gap of 13,7 kt CO<sub>2</sub>e in transport sector is the most challenging one to cover. Especially road transport is a huge challenge, since actions that are fast and easy are not foreseen.

Until now we have mainly used carrots to promote and facilitate a modal shift to sustainable mobility, but the results show only modest changes since the SUMP was introduced. Therefore, also actions that make private driving less attempting and less easy need to be considered. The city can also take a more active role in accelerating the electrification and the shift to alternative fuels (hydrogen and biogas) for instance by ensuring a sufficient network for distribution of alternative fuels and charging stations. Electrification of public transport is only a small step, since only 3% of the current road emissions stem from busses.



One of the most powerful actions would be to reduce speed limits on highways. Ca 65% of the remaining road traffic emissions are produced on the highways which the city does not administrate. Hence wide collaboration and support is needed also from the national and regional level.

**Waste**

The waste management center of Salpakierto is an important actor in development of the waste management globally and its daughter company Labio, is one an important produced or biogas that is distributed to the national gas grid. However, given that the emissions from waste sector are already low, the city does not plan actions that would go beyond the obligation from national level in scopes 1 and 2. Therefore no emission gap is set for the waste sector.

**IPPU**

For IPPU sector an emission gap of 5,2 kt CO<sub>2</sub>e remains. As low-emission technical solutions come available in the market, the city can facilitate the change by demanding low-emission machinery from its contractors. Joining the national Green Deal of low emission construction sites would also accelerate the change in Lahti area.

**AFOLU**

Since the past local action for low emission agriculture have not provided significant emission reductions, the city does not plan additional actions for the agricultural production, but the carbon sinks of the local land use are involved in our plans for the offsetting of the residual emissions. This has been described in more detail in section B-2.3.

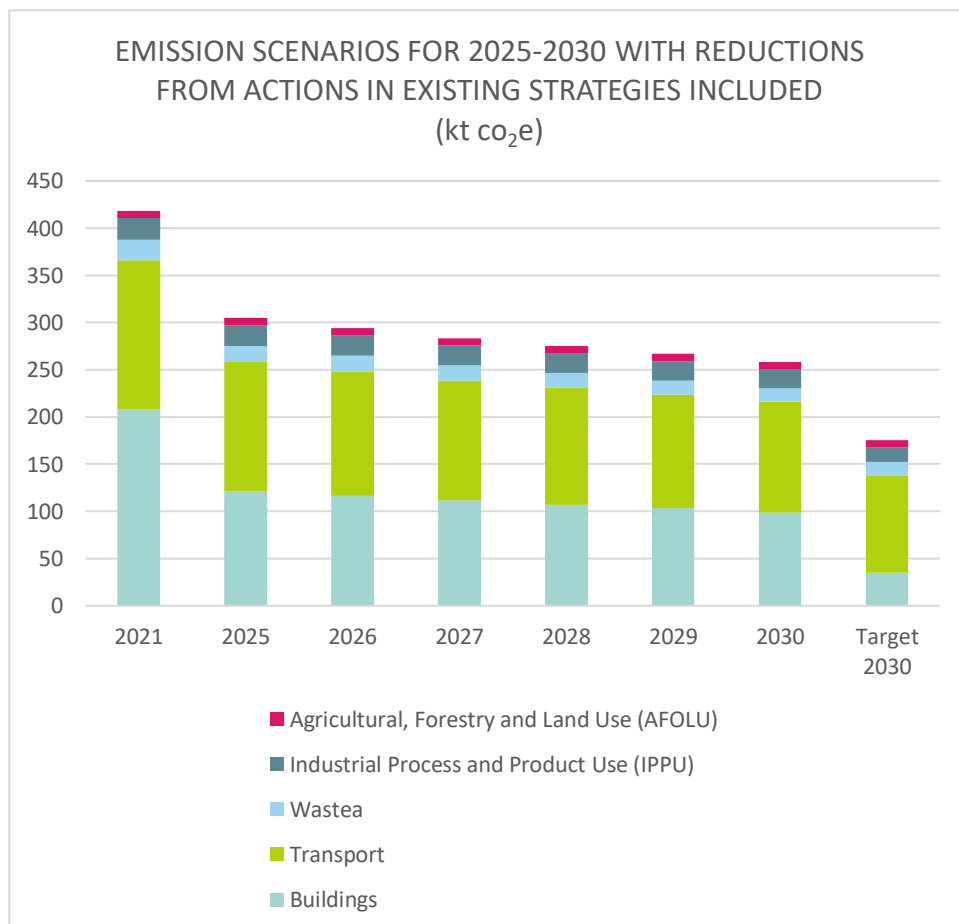
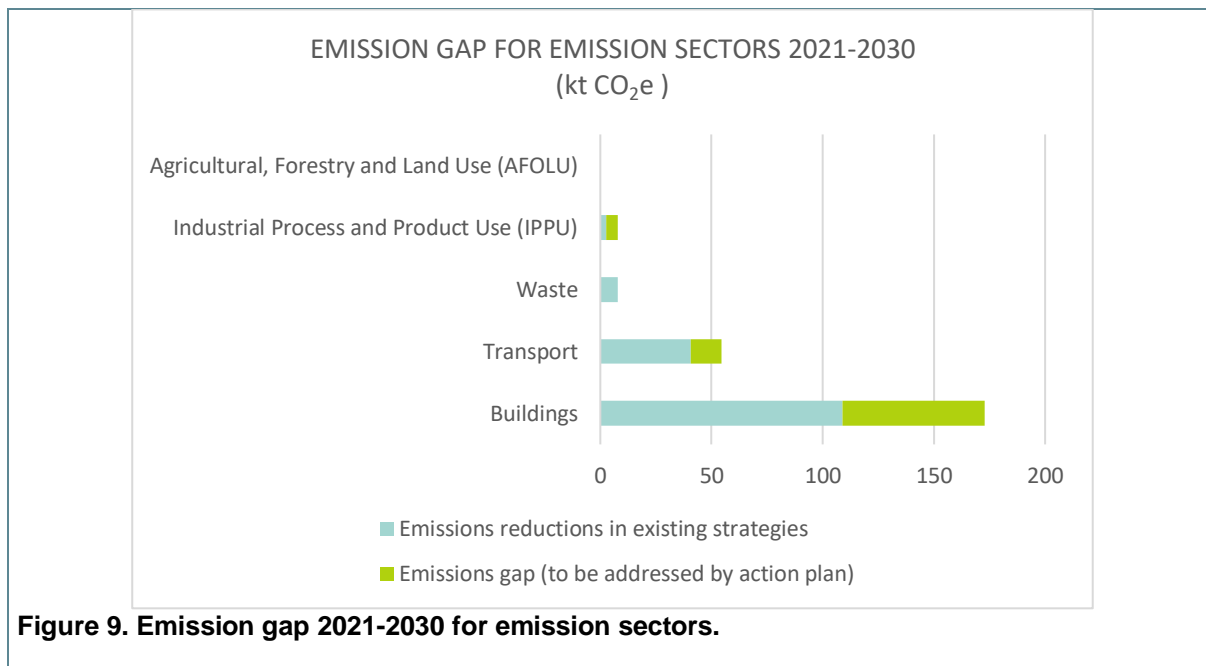


Figure 8. Emission scenarios for 2025-2030 with reductions from actions in existing strategies included.



### 3.3 Module A-3 Systemic Barriers and Opportunities to 2030 Climate Neutrality

Module A-3 “Systemic Barriers to 2030 Climate Neutrality” should document the results of the stakeholder, systems and ecosystem mapping and identification of systemic barriers and opportunities.

A-3.1: Systems & stakeholder mapping				
System description	Stakeholders involved	Network	Influence	Interest
Mobility in inner city	City organisation (urban planning, mobility planning, public transport company, city infrastructure, parking), parking companies, EV charging companies, mobility service providers, residents, local entrepreneur (shops/services), Chamber of commerce, employers, national and regional authorities,	Vision for the city center working group, Green electrification of mobility (GEM) cluster, SUMP working group	Facilitation or restriction of sustainable mobility	-Attracting more visitors and clients in the city center (shops and services) -Creating an inviting atmosphere in the city center (clean, green, fresh, urban) -Emission reduction through sustainable mobility -Efficient public transport network -Improved conditions for biking and walking



Freight and logistics	Labio, Ren-Gas, Ladec, Ministry of Transport and Communication, Finnish Transport Infrastructure Agency, distributors of fuel, producers of electric chargers, largest freight companies	GEM, Regional Council of Päijät-Häme	Planning of transport infrastructure, fueling, speed limits, commissioning of low-emission vehicles in the region	-The city has very little possibilities to reduce emissions of road transport passing through Lahti -National targets related to road transport -Electrification of freight and logistics vehicles - Gas and hydrogen fuels and their distribution
Local energy production	Planning authorities (city and regional), authorities for environmental protection, district heating company, wind energy companies, solar panel companies, grid company, electricity companies, service providers for energy renovations, residents, research institutes, Ladec	Regional Council of Päijät-Häme, GEM	Estimation of environmental effects of energy production, planning of suitable places for solar panels and wind power, conducting energy renovation	-Exploring the possibilities of wind and solar energy -Carbon-neutral district heating
Construction	City's building department, urban planning departments, construction companies, private builders, research institutes	Development Center for Carbon Neutral Construction Industry	Use of wood or other materials with low carbon emissions, circular economy at construction sites	-Emission reductions from the use of low-emission materials -low emission construction sites
Land use	City planning, construction companies, private builders, land owners, forestry companies	City master plan working group, Urban greening plan working group,	Smart land use, carbon sinks and storages	-Avoiding the loss of carbon sinks in the city -Urban greening -Possibilities to develop and use local carbon compensation model

**A-3.2: Description of systemic barriers – textual elements**

**GENERAL BARRIERS**





### Climate governance

Many departments in the city organization deal with climate aspects, but to ensure sufficient resources across departments, and to mainstream it as a normal part of work tasks is a challenge of its own. Climate work should be tightly connected with financial planning. Although we are working on a climate budget in Lahti, the work is slow, as it has not been done before and requires extra work and development.

A general challenge still lies in committing to climate targets that are more ambitious, more expensive or more time consuming than the established procedures and national level requirements. A good example comes from construction sector. The expensive price of climate-friendly construction restricts the use sustainable options in city-owned facilities, as financial interests are often seen more important. It is also difficult to get options and candidates that are both sustainable and affordable in open construction and planning competitions. There seems to be a lack of ambition when it comes to tightening the regulation of local planning e.g., with land transfer agreement since the economic development is seen more important.

Another challenge lies in the coordination of climate work in the city. The climate experts are strategically well-placed in the city organization, their work is well-coordinated among experts, and it is discussed in steering groups. However, the flow of information does not always reach the middle stage managers, who often are not that aware of the scope and magnitude of climate work. There is also a need for a joint database and data management for supporting leading with data and data-based decision making. Different departments have plenty of relevant data, and a joint database would help in following and showing what kind of effects certain actions have on greenhouse gas emissions, and it could also provide info about the co-benefits of actions on, for instance people's health, air quality. Thus, it could help in getting political support for restrictive climate actions.

Deeper collaboration is also needed between different levels of governance. The cities can directly impact only part of the emissions in their area, and a lot of impact lies in the national level climate policies in national ministries. Until recently the cities were less involved in the national level planning and the climate work implemented in municipal level was poorly resourced by the government. The Mission work has started more intense collaboration between cities and ministries which we hope will make the national governance acknowledge that a large part of the national climate actions will be implemented at the municipal level, and we need to coordinate between the levels of governance to make the most out of it.

Also regional council has strong impact in the spatial planning and economic development of the region including the city and the collaboration on projects and joint visions and targets help municipalities to reach their climate targets. Lahti region currently lacks a shared vision for fossil free energy production, but the city has acknowledged the need for composing one. Together with local partners (Ladec, Regional council of Päijät-Häme) we aim to align an energy vision, and work for this will start in late 2023. The energy vision can help and act as a base for reports, research and development, as it will align what kind of renewable energy production we envision to have in our region in the long run.

### Financing

Barriers related to financing are presented in detail in Investment Plan A-3.1. In general, the city aims at decreasing its debt and cuts in the city budget are expected in the coming years. Therefore, alternative financial sources need to be identified. It becomes increasingly important that the needed actions are prepared well in advance and are ready to be included in the 3-5 planning cycle of the city budget. The climate budget will hopefully improve this process.

In general, too many actions and improvements are financed with project funding and long-term funding for scaling or maintenance is missing. Writing proposals and running projects on top of the daily work is considered exhausting by many experts.



Barriers in financing are not only matter of the city as investments to climate friendly solutions are needed also by households and private sector. Here the capacity of national government to offer incentives comes important. The city can take an active role in ensuring that private sector and households have sufficient knowledge and capacity to deploy new technologies and apply for incentives available.

### **Behavioral change**

Making a behavioral change happen takes time, effort, and several forms of action. The city has been using carrots for long time to promote climate-friendly options for its residents but has seen the need to use stick as well. This has created a challenge also for the decision makers who generally are committed to climate work but may hesitate to make decision that cause any restrictions of their potential voters. We need to be able to show the co-benefits of sustainable lifestyle, and promote the aspects of health, economic savings, and the smooth and functioning daily life that an individual can also obtain. For more holistic work and co-creation of solutions, we need to engage local organizations, employers, and other actors as well as new types of experts in social sciences and service design.

## **BARRIERS IN EMISSION SECTORS**

### **Buildings**

In district heating the biggest barrier is the commitment to combustion with past investments. For the past decades combustion of waste has been a popular way to utilize the waste but given that this creates emissions in the energy sector there are national targets to increase the part of waste that utilized as material instead of combustion. This means that in the future the district heat production might rely even more on combustion of biomass, which although emission free at the moment, creates emissions in the LULUCF sector and is in conflict with the national climate targets. In Finland the price of the biomass has increased strongly since the imports from Russia stopped.

These conditions force energy sector to create pathways out of combustion or consider carbon capture and utilization or storage. In Lahti the energy producer is planning a collaboration with a private company to start CCU process where the emissions from combustion would be captured and utilized for production of synthetic methane for trucks. Although the process decreases emissions indirectly it seems that the Mission guidelines do not accept CCU as an emission reduction or offsetting action. This condition creates an unfair solution since the CCU is an expensive long-term investment with a huge climate impact but in paper the emission gap remains. If CCU is not accepted as emission reduction we may not meet the climate-neutrality target by 2030 since the emissions are already low and emission reductions of similar size would not be possible in any other sectors.

A barrier related to built environment lies in oil heating. It currently looks like oil heating is not replaced with other forms of heating in the speed that was assumed in our scenario. The scenario estimated that the current national actions and support would lead to abandoning oil heating by early 2030, but this seems to have been too optimistic. In principle, abandoning oil heating requires private households investing in new forms of heating. This is expensive, and in the current world situation not often a priority or an appealing opportunity for private households. We have experience from local projects and pilots trying to facilitate the energy renovation, but they did not provide any extra impact. The sector is developing in a fast pace due to its market-driven nature, and it is difficult to see where the city could act and how.

### **Transport**



To reduce emissions from transport, we need increased ambition to support the use of public transportation, biking, and walking, as well as a quick renewal of the fleet of vehicles and their motive power.

Electrification and shifting to other alternative fuels would require quick renewal of the fleet. Renewal of fleet has generally been rather slow in Finland, partly as the taxation makes vehicles generally more expensive compared to other European countries. National incentives for this should be secured. To accelerate electrification of vehicles we need to understand the levers and the role the city can take in, for instance coordination of charging infrastructure. Similar challenges occur with biofuels, for which also the national distribution obligation plays a big role.

The current government of Finland has decided to withdraw the earlier plan to raise the distribution obligation. This has direct impact on the greenhouse gas emissions of road transport, which will not decrease according to earlier scenarios where the distribution obligation was estimated to be raised.

Reducing road transport within the city or lowering speed limits in the Päijät-Häme region would be efficient ways to reduce emissions from road transport. They are also more desirable options, than relying solely on the change of motive power. Majority of the road transport emissions come from drive-through transport, which the city cannot control much, but we can work on the transport within Lahti.

However, there seems to be lack of political will for any restrictions, which implies that a significant change is required in residents' behavior for making the change happen. Communicating about sustainable mobility starts with schoolkids who hopefully get used to active lifestyle, walking and biking. Such as change is slow and challenging and will not give instant results. Improving the services of public transportation could help in the change, but it is not cost-efficient. Experiences from other cities show that the budget for public transport would need to be multiplied to improve the level of service enough to attract new passengers. In the future smart mobility options might help, and for instance trial runs for robot buses are already taking place.

Investments required to build infrastructure supporting walking and biking are high. Financial limits in the city budget slow down also the long-term plans scheduled in SUMP (e.g. cycling target network not progressing as planned).

Improving the train connection to neighboring cities (e.g. Helsinki) could be a way to reduce road emissions. However, the rail transport is owned and coordinated at the national level. It is hoped that in the future the regions and cities would be allowed to purchase regional train connection from the national operator to improve the services. However, for instance doubling the train connections between Lahti and Helsinki during peak hours would require increased rail capacity also in Helsinki.

## **IPPU**

The possibilities of the city to influence the emissions from product use and machinery are limited. As low-emission technical solutions come available in the market, the city can facilitate the change by demanding low-emission machinery from its contractors, but until now, there are not always enough contractors whose machinery meets the requirements, and the development is slow. Joining the national Green Deal of low emission construction sites would also accelerate the change in Lahti area but there is fear of increasing costs.

## **AFOLU**

The possibilities of the city to have an impact on local production methods are limited. We can act on our own agricultural land, but as most of the agricultural land is owned by private farmers, the effect is small. We can also encourage people to acquire carbon farming methods, but their actual effect is difficult to estimate too. The emissions from agriculture are expected to follow the national trend in the future.



### Negative emissions, carbon sinks and offsetting

Cities need to develop and expand to attract new businesses and operators. Most of the times this leads to changes in land use, mainly logging of forests. Following this, carbon sinks and storages are lost. This loss could be partially compensated by supporting carbon sinks and storages elsewhere in the city area. However, markets, national level guidelines and regulation for such offsetting are developing slowly in Finland. It is unclear what kind of role municipalities could have in the offsetting market. Questions also arise of who should pay for compensation projects, and how to make sure that their benefits are real. Biodiversity aspect also needs to be considered when planning for compensation projects. Municipalities have little power to influence forestry business, local operators, and forest owners, although local, municipality-run compensation models with monetary incentives might become available within the next couple of years. We see carbon capture (CCS and CCU) as a possibility in the future, and are eagerly following how investments, national and EU-wide policies regarding the topic develop.

### A-3.3: Description or visualisation of participatory model for the city climate neutrality – textual and visual elements

Participation of stakeholders and citizens is greatly important for the planning of the action portfolio as well as implementation of the action. A great part of the impact of the planned actions rely on the activity of the citizens and companies. This is especially crucial for the actions in road transport where the city can provide infrastructure for sustainable mobility but in the end it is the citizen who decides whether they will bike, walk, or take bus, or take their own car. A strong participation in the planning of mobility actions could help us to get also difficult actions accepted by the citizens and politicians.

Creating a participatory model for the climate work is a crucial action in the updated climate programme of the city. The city has several well working instruments for participation developed in urban planning and strategy departments that could be better utilised in climate work. Strong participation is required by law in master plan and zoning processes. The participation processes developed in the Department of Urban planning create basis for all participatory work at the city. Since these already exist it makes sense to build upon them rather than creating our own processes. One of the first steps to do could be to establish a joint database for the data resulting from all the participatory work conducted in the city.

We have done a stakeholder analysis for the sustainability work of the city and identified >100 important stakeholders or stakeholder groups for climate work. Below we list some of the key stakeholders and the existing instruments that could be utilised for the climate participatory model.

#### Residents and civil society organisations

- Partnership table
- Campaigners app and project
- Participatory budgeting
- Time out -discussions
- Sustainable participation in Lahti -project
- Urban planning processes (questionnaires, mapionare feedback, discussions, workshops, co-creation)
- Skidialogi (time out discussion for school children)
- Building control
- Environmental education
- Biannual survey for residents

#### Private sector

- Lahti's climate partnerships



- Mission partners
- Green capital year partnerships
- Climate Leadership Coalition (CLC) - network
- LADEC – regional knowledge clusters (e.g. Green Electrification of Mobility Cluster GEM) (in transition team) (in transition team)
- Development Center for Carbon-neutral Construction
- Päijät-Häme Chamber of Commerce
- Local society for industry (in transition team)

**Other levels of governance**

- National ministries of environment, employment and transport (national support project, financing for projects)
- Regional council of Päijät-Häme (in transition team)
- Wellbeing services county of Päijät-Häme (in transition team)

**Academia**

- LAB, LUT (in transition team)
- University of Helsinki, Finnish Environmental institute (SYKE), Natural Resources Institute Finland (Luke)
- Development Center for Carbon-neutral Construction
- Regional knowledge clusters (e.g. Green Electrification of Mobility Cluster GEM)
- Climate partnership (students involved in supporting private sector in climate work)
- Joint regional projects (e.g. NZC Pilot City Project on sustainable commuting, CiticAP - project)
- Joint National projects (e.g. Kuntanielu, BOOST)
- Joint international projects (e.g. StopWA, Campaigners, GoGreen Routes)

**Other cities**

- Peerlearning, activities and joint projects available through the following groups
- Climate Working Group of Päijät-Häme
- Hinku network - peerlearning
- FISU network - projects
- Finnish Mission cities – national support project, joint projects
- Green City Accord
- European Green Capital Network
- Eurocities
- Covenant of Mayors
- ICLEI



## 4 Part B – Pathways towards Climate Neutrality by 2030

Part B represents the core of the Action Plan, shaped by local authorities, local businesses and stakeholders, comprising of the most essential elements: scenarios, strategic objectives, impacts, action portfolios and indicators for monitoring, evaluation and learning.

### 4.1 Module B-1 Climate Neutrality Scenarios and Impact Pathways

Module B-1 “Climate Neutrality Scenarios and Impact Pathways” should list impact pathways, early and late outcomes and direct and indirect impacts (co-benefits) according to and adapted from the NZC Theory of Change and the AP Guidance – clustered by fields of action.

B-1.1: Impact Pathways					
Energy systems					
Fields of action	Systemic levers	Early changes (1-2 years)	Late outcomes (3-4 years)	Direct impacts (Emission reductions)	Indirect impacts (co-benefits)
Energy systems	Technology/ infrastructure	Electric boilers for district heating	1 <sup>st</sup> boiler operating Phasing out natural gas in district heating	Full expected impacts of fossil free district heating -67 kt CO <sub>2</sub> e	Increased energy security  Improved air quality  Circular economy and business potential
		CCU linked to district heating	Scaling up		
		Developing storing possibilities for district heat	Implementation		
		Increase of solar energy (private/domestic and industrial scale)	Scaling up to 8 MW p	Decrease in consumption of grid-electricity  Decreasing the national emission factor -0,3 kt CO <sub>2</sub> e	Financial impacts for city organisations and other stakeholders (investment needs and savings)
New technical solutions for energy needs of industry based on energy efficiency and circular economy	New solutions available and tested	Decrease in emissions from industry – 15 kt CO <sub>2</sub> e (partly through decrease in national emission factor)			



Governance & policy	A joint regional energy vision	Increased investments in fossil free energy production in the area. Increased circular economy.	Decreasing the national emission factor Amx potentia by 2030 70 MW → -8,9 kt CO <sub>2</sub> e
	clarifying permit processes for renewable energy production	Plans for wind energy in the area	Decreasing the national emission factor Amx potentia by 2030 70 MW □ -8,9 kt CO <sub>2</sub> e
	Investigating possibilities and impacts of local incentives for energy renovations		Close to fossil free separate heating by 2030 → -60 kt CO <sub>2</sub> e
	Stricter regulation of energy for new building	Increased energy efficiency in new buildings	not assessed
Social innovation	Pilot for joint procurement of solar panels or separate heating systems for SMEs or housing	Pilot conducted and scaling possible	Decrease in electricity consumption and emissions from heating
	Innovation competition to solve problems in clean energy production	Pilot conducted and scaling possible	
Finance and funding	Investigating potential for possibilities and cost efficiency of increasing biogas production. Securing investments.	Increasing biogas production	Increase of production to 25 GWh → -2,5 ktCO <sub>2</sub> e
	Securing funding for CCU process	CCU operating	Full expected impacts of fossil free district heating -67 kt CO <sub>2</sub> e
Learning and capacity building	Mapping and analysing the potential of waste heat recovery in new sites (industry)	Implementation in best available sites	not estimated



		Communication on the benefits of district heating (low emission and cost beneficial, carefree option)	Increased number of buildings has joined district heating network	Close to fossil free separate heating by 2030 □ -60 kt CO2e	
		Updating the building registers for separate heating sources.	Increased ability to support energy renovations	Close to fossil free separate heating by 2030 □ -60 kt CO2e	

### Mobility & transport

Fields of action	Systemic levers	Early changes (1-2 years)	Late outcomes (3-4 years)	Direct impacts (Emission reductions)	Indirect impacts (co-benefits)
Mobility & transport	Technology/ infrastructure	Implementation plan for charging infrastructure of (EVs) in public buildings and areas	Number of public charging stations increased and network covers the whole city	Estimated additional impact of SUMP actions: 1.3 ktCO2e / year in 2023-2030	Improving air quality and its effect on health  Health benefits of walking and cycling  Reduction of noise
		Improved walking and cycling environment	Increase in share journeys made by walking and cycling		
	Governance & policy	Collaboration with cities and other levels of governance on national governments role in decreasing transport emissions	Increased obligation for low-emission fuel distribution	Not assessed	Improvement of traffic safety  Financial benefits for consumers and the city  Smooth everyday life and a pleasant street environment  Equality of movement  Image benefits
		Enabling and promoting alternative fuel distribution	Increased numbers of hydrogen and biogas stations	Not assessed	
		Collaboration with cities and other levels of governance on enabling congestion charge in Finnish cities	Piloting in some Finnish city	Not assessed	
		Improved cooperation between service network planning and traffic planning	Common understanding of most efficient and low emission service network for	Not assessed	





			emission reductions	
		Investigating possibilities for piloting speed limit reductions in Lahti area together with national authorities	Speed limit reductions piloted and scaling started	Full potential is – 5,8 kt CO <sub>2</sub> e
Social innovation		Utilising social innovations if pilot project for Sustainable commuting	Social innovations created and tested in Lahti	Not assessed
Finance and funding		Identifying cost effective ways and funding opportunities to improve public transport service level	improved public transport service level	Not assessed
		Securing funding for Cycling routes prioritization program.	Increased length of high quality bike lanes	
		Securing funding for year of sustainable mobility 2025	Year organized including list of pilots to test and collect information on best practices to reduce emissions	61.8 ktCO <sub>2</sub> e by 2030 (requires several successful emission reduction experiments during the year 2025 and scaling up best solutions 2026-2030). This number is, in other words, not the direct reduction in emissions during 2025, but the goal for 2030.
Learning and capacity building		Database for traffic data	A joint database available for all traffic related data in the city	Not assessed
		Estimating impacts of potential actions in advance (emissions, financial, health, social)	Informed planning and decision making	emission reduction through implementation of high impact actions
Democracy and participation		Communication and participation through discussion	Informed planning and	emission reduction through



		about the values related to the needed actions and personal choices	decision making  Increased willingness of stakeholders and citizens to make sustainable mobility choices	implementation of high impact actions and increased willingness for sustainable mobility	
		Low-emission transport strategy for city center	Mobility solutions that allow emission reductions have been identified for the city center	Not assessed	

**B-1.2: Description of impact pathways– textual and visual elements**

We selected to build impact pathways for the most critical sectors of energy systems and transport. Since this is where there are most emission reduction needs, barriers and gaps in our understanding of the system and required needs. Action portfolios parts 1-5 stem directly from the Impact Pathway. Our action portfolio presented later includes actions also from other fields of actions and we will continue building impact pathways also for those fields to check whether we have a full picture of the needs and are utilising all needed levers.

The Direct impacts as emission reduction are estimated based on impact assessments for most important actions (Sitewise, spring 2023). We were not able to provide emission reductions for all actions and for some they are difficult to estimate.

Many (but not all) of the actions are listed in the Climate Programme which was approved by the city board in June 2023. Hence, the actions have general political acceptance, but their implementation and funding is not secured until the single action are in the city budget or when alternative funding is secured. In the Action portfolio descriptions, we have marked what the current status of the action is (options: under preparation, political decision (included in existing strategy), funding secured (project funding secured or costs included in the City Budget), implementation, ongoing action).

## 4.2 Module B-2 Climate Neutrality Portfolio Design

Module B-2 “Climate Neutrality Portfolio Design” should contain a project description for **each intervention planned**, including interventions by local businesses and industry, according to the template B-2.1, including actions those interventions targeted at enhancing carbon sinks to address residual emissions. Narrative analysis and comments can be provided in B-2.2. A summary of how residual emissions are addressed, should be provided in B-2.3.

**B-2.1: Description of action portfolios - textual or visual**

Fields of action	Portfolio description	
	List of actions	Descriptions
<b>Energy systems</b>	<b>District heating</b> # Electric boilers and district heat storage # CCU # waste heat recovery	<b>Goals:</b> <ul style="list-style-type: none"> <li>- Climate-neutral district heating by 2030</li> <li>- Promotion of renewable energy production and storage</li> </ul>



	<p><b>Decentralised production of renewable energy</b>                  # energy vision for the region                  # enabling/requiring fossil free energy in urban planning                  # clarifying permit processes for renewable energy production                  # solar energy production                  # expand biogas production</p>	
<b>Mobility &amp; transport</b>	<p><b>Electrification and low-emission fuels</b>                  # implementation plan for charging infrastructure of (EVs) in public buildings and areas                  # enabling and promoting alternative fuel distribution                  # City logistics</p> <p><b>Modal shift from private driving to sustainable mobility</b>                  # Sustainable commuting                  # Improving walking and cycling environment                  # Improved cooperation between service network planning and traffic planning                  # improving public transport service level                  # Cycle lane prioritization program                  # A comfortable and barrier-free environment for walking and cycling</p> <p><b>Other</b>                  # Low-emission transport strategy for city center                  # Speed limit reduction                  # 2025 - Year of Sustainable mobility</p>	<p><b>Goals:</b></p> <ul style="list-style-type: none"> <li>- By 2030, more than half of all trips will be made using sustainable means of transportation.</li> <li>- We create the conditions for electrification and shift to low-emission fuels in traffic</li> <li>- The year 2025 of sustainable mobility enables the emission reductions required by climate neutrality in road traffic</li> </ul>
<b>Waste &amp; circular economy</b>	<p><b>Waste management</b>                  # enhancing collection of management of bio-, packaging and textile waste</p> <p><b>Circular economy</b>                  #Circular economy Road map</p>	<p><b>Goals:</b></p> <ul style="list-style-type: none"> <li>- The amount of household waste will decrease and the recycling rate will increase, reaching a level of 65% by 2030</li> <li>- The circular economy will enable zero waste by 2050</li> </ul>
<b>Green infrastructure &amp; nature based solutions</b>	<p><b>Carbon sinks</b>                  # Development and deployment of net-carbon sink calculation models                  # Development and deployment of local/regional carbon offsetting model</p> <p><b>Forests</b>                  # Reforestation of wastelands                  # Forests and forest land</p>	<p><b>Goals:</b></p> <ul style="list-style-type: none"> <li>- The carbon sink effect of the Lahti area's forests and the green structure of the urban environment covers a significant part of the need to offset emissions</li> <li>- Changes in land use do not cause net carbon emissions</li> </ul>



	<p>importance as a carbon store is taken into account in the planning of forest management measures</p> <p><b>Agriculture</b> # utilisation of city's rental agricultural land in climate work</p> <p><b>Green infra</b> # Carbon sinks and storages taking into account in the management of green areas</p> <p><b>Climate adaptation</b> # Storm water management # Securing ecosystem services for the city of Lahti in city-owned forests, open areas and built areas in green areas # The proportion of pacified areas in the total area of the area is increased to 5%. Together with LUMO sites, the protected area will be increased to 8% by 2030 # The microclimate effect of built-up green areas (street trees, parks) is improved # Forests and other green areas are diverse in age # Diversity of tree species in parks and forests # Ground water protection</p>	<ul style="list-style-type: none"> <li>- Identify the effects of climate threats in various industries</li> <li>- Plan and implement the required preparedness and adaptation measures</li> <li>- Develop the city of Lahti's capacity to adapt to climate change</li> </ul>
<p><b>Built environment</b></p>	<p><b>Construction</b> # zero emission construction sites # low-emission machinery for urban green maintenance # carbon-neutral building construction # promoting wooden construction and use of carbonised concrete (buildings as carbon stocks)</p> <p><b>Land use and planning</b> # Land use and construction control so, that the effects on carbon sinks is minimized # If the forest and carbon sinks are destroyed, they are compensated # Eco-calculation tools use of land use in planning</p> <p><b>Separate heating &amp; energy efficiency</b> # Strict regulation for energy efficiency of new buildings</p>	<p><b>Goals</b></p> <ul style="list-style-type: none"> <li>- Energy savings in the city's own properties -7.5% between 2017-25 (KETS)</li> <li>- Identify the effects of climate threats in different industries</li> <li>- The required preparedness and adaptation measures are planned and implemented</li> <li>- The city of Lahti's capacity to adapt to climate change will be developed</li> <li>- Land use changes do not cause net carbon emissions</li> </ul>



	<p># Promoting energy renovations in old buildings</p> <p># Improving energy efficiency in rental housing</p>	
<p><b>IPPU</b></p>	<p># Ensuring a just transition from natural gas to sustainable energy (electricity, heat pumps, biogas) in industrial sector (collaboration with Lahti Energia)</p> <p># Decreasing emissions from machinery: distribution obligation, procurement contracts, market guidance</p>	<p><b>Goals</b></p> <ul style="list-style-type: none"> <li>- no official goals in Climate programme yet</li> </ul>
<p><b>Cross sectoral actions</b></p>	<p><b>Climate governance</b></p> <p># Development of more detailed and informative emission data and improved estimates of actions climate impacts</p> <p># Development of climate budget</p> <p># City Group will start reporting its own emissions and all subsidiaries have roadmaps towards climate neutrality</p> <p># Climate partnership with local companies and other stakeholders is developed</p> <p># Development of regional carbon handprint calculations</p> <p># Innovation competitions</p> <p># Enabling the work of efficient local knowledge clusters, e.g. Green electrification of Mobility Cluster</p> <p><b>Sustainable consumption</b></p> <p># Communication plan for climate communication</p> <p># Challenge campaign for residents</p> <p># Challenge campaign for other actors (companies)</p> <p># The conditions for climate-neutral events are improved</p> <p># Residents' well-being and health are promoted in a nature-oriented way</p> <p># Assessment of the carbon footprint of procurement and guidance towards sustainable procurement</p>	<p><b>Goals :</b></p> <ul style="list-style-type: none"> <li>- The entire city group as well as residents, companies and other actors participate in the climate work</li> <li>- The city's climate work is effective and based on knowledge</li> <li>- Residents and operators in the area know what climate neutrality means, why it is being pursued and how they can reduce their personal emissions themselves</li> <li>- Consumption emissions will be halved by 2030</li> </ul>



<b>B-2.2: Individual action outlines - 1</b>		
(fill out one sheet per intervention/project)		
Action outline	Action name	<p><b>District heating</b></p> <ul style="list-style-type: none"> <li># Electric boilers and district heat storage</li> <li># CCU</li> <li># waste heat recovery</li> <li># New technical solutions for energy needs of industry based on energy efficiency and circular economy</li> <li># Communication on the benefits of district heating (low emission and cost beneficial, carefree option)</li> </ul>
	Action type	<p>Technical interventions Regulation and support Top-down and bottom-up systemic initiatives/projects</p>
	Action description	<p>Electric boilers are used to produce profitable district heating to replace fossil fuel-based peak heat production. The need and profitability of seasonal storage is monitored.</p> <p>Ren-Gas is planning a P2X hydrogen economy center in connection with the Kymijärvi power plants, which would take capture CO2 emissions from the production of district heat. According to preliminary plans the hydrogen economy center will start in 2026.</p> <p>Enhancing the recovery of waste heat at the Ali-Juhakkala wastewater treatment plant. Examination of possibilities at other wastewater treatment plants. Utilization of waste heat in connection with the operation of Ren-Gas' hydrogen economy center.</p>
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Technology & infrastructure
	Outcome (according to module B-1.1)	<ul style="list-style-type: none"> <li># 1<sup>st</sup> boiler operating Phasing out natural gas in district heating by 2025</li> <li># CCU in operation and scaled by 2026</li> <li># Possibilities for DH seasonal store explored and potential construction started by 2027</li> <li>Increase in solar energy to 8 MWp by 2030</li> <li># Mapping and analysing the potential of waste heat recovery in new sites (industry) by 2025</li> <li># Increased number of buildings has joined district heating network</li> </ul>
Implementation	Responsible bodies/person for implementation	Lahti Energy, Ren-Gas, Lahti Aqua, departments of urban planning and economic development
	Action scale & addressed entities	Actions are significant in terms of emission reductions. The introduction of new technologies causes employment effects.



	Involved stakeholders	City's subsidiaries, local businesses, citizens, national and regional authorities, grid company, electricity company, research institutes
	Comments on implementation	Investment decision pending
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	Biomass, recycled fuels, natural gas, peat
	GHG emissions reduction estimate (total) per emission source sector	Buildings: -67 kt CO2e
	Total costs and costs by CO2e unit	Classified. Information available for assesment process upon requests

**B-2.2: Individual action outlines - 2**

(fill out one sheet per intervention/project)

Action outline	Action name	<p><b>Decentralised production of renewable energy</b></p> <ul style="list-style-type: none"> <li># energy vision for the region</li> <li># enabling/requiring fossil free energy in urban planning</li> <li># clarifying permit processes for renewable energy production</li> <li># solar energy production</li> <li># expand biogas production</li> <li># Innovation competition to solve problems in clean energy production</li> <li># Stricter regulation of energy for new building</li> <li># Pilot for joint procurement of solar panels or separate heating systems for SMEs or housing</li> <li># New technical solutions for energy needs of industry based on energy efficiency and circular economy</li> </ul>
	Action type	Regulation and support, Top-down and bottom-up systemic initiatives/projects, Skills and capacity building
	Action description	<p>A joint energy vision will be planned together with the actors in the region. The vision describes renewable energy production to start in the area in the long term, to ensure emission-free and reliable local energy. The vision serves as a basis for investigation, research and development work.</p> <p>Enabling renewable forms of energy in land use planning. Identifying and marking areas suitable for wind power and solar energy production in zoning. The development of wind power technology is followed and new investment opportunities are identified.</p>



		<p>Clarifying and simplifying the permit processes required by renewable energy production facilities.</p> <p>The possibilities for industrial-scale solar energy production in the Lahti region are being investigated.</p> <p>A solar panel system will be built in all construction projects where it is economically and technically feasible.</p> <p>In the CANEMURE project, an investigation of increasing solar energy in the real estates of Lahden Talot.</p> <p>The technical feasibility of building a solar power plant on top of the closed Kujala landfill is being explored.</p> <p>Maintaining and developing biogas production through efficient operation and improvement of raw materials availability. The potential to increase production volumes are being explored.</p>
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Technology & infrastructure, governance & policy
	Outcome (according to module B-1.1)	<p># Increase of solar energy (private/domestic and industrial scale), Scaling up to 8 MW p by 2030</p> <p># New technical solutions for energy needs of industry based on energy efficiency and circular economy</p> <p># Increased investments in fossile free nergy production in the area. Increased circular economy.</p> <p># investments in wind energy in the area</p> <p># Increased energy efficiency in new buildings</p> <p># Pilot for joint procurement of solar panels or separate heating systems for SMEs or housing</p> <p># Innovation competition to solve problems in clean energy production</p> <p># Increasing biogas production</p> <p>#</p>
Implementation	Responsible bodies/person for implementation	Department of urban planning, Building Control of Lahti, Lahti Energy, Tilakeskus, Lahden Talot, Salpakierto, Labio
	Action scale & addressed entities	Significant emission reductions are made in the energy sector. Several city stakeholders and actors are involved in the measures.
	Involved stakeholders	City organization, city's subsidiaries, local businesses, citizens, national and regional authorities, solar panel companies, grid company, electricity company, research institutes





	Comments on implementation	Ongoing
Impact & cost	Generated renewable energy (if applicable)	Solar energy, wind power, biogas
	Removed/substituted energy, volume or fuel type	Fossil fuels
	GHG emissions reduction estimate (total) per emission source sector	Buildings: 34,6 t CO <sub>2</sub> e
	Total costs and costs by CO <sub>2</sub> e unit	1.7 M€ (total sum in 2023-2030) Cost estimate, assuming that solar panels on the roofs of new city-owned buildings would cover 2% of total electricity need in 2030 of city-owned buildings

### B-2.2: Individual action outlines - 3

(fill out one sheet per intervention/project)

Action outline	Action name	<b>Electrification and low-emission fuels</b> # implementation plan for charging infrastructure of (EVs) in public buildings and areas # enabling and promoting alternative fuel distribution # City logistics # Collaboration with cities and other levels of governance on national governments role in decreasing transport emissions
	Action type	Top-down and bottom-up systemic initiatives/projects
	Action description	The scope of electric charging infrastructure model regarding public buildings and areas will be reviewed, including: implementation plan for public charging points and increasing the electric charging infrastructure in the areas managed by the city. Cars, bikes, heavy traffic.  Enabling and promoting alternative fuel distribution in cooperation with stakeholders: hydrogen; biogas, electric charging of heavy vehicles.  Development of intra-city delivery traffic to promote sustainable forms of movement (e.g. reducing heavy traffic in the city centre). The Lahti Last Mile project.
Reference to impact pathway	Field of action	Mobility & transport
	Systemic lever	Technology&infrastructure
	Outcome (according to module B-1.1)	# Number of public charging stations increased and network covers the whole city # Increased obligation for low-emission fuel distribution # Increased numbers of hydrogen and biogas stations
Implementation	Responsible bodies/person for implementation	Department of urban planning, Tilakeskus, Lahden pysäköinti, Spatium (Päijät-Sote);



		Ympäristökehitys, Ladec, LAB University of Applied Sciences
	Action scale & addressed entities	Actions can be seen in the city's land use and urban structure, efforts for drive power change affect the city's residents as well as passers-by.
	Involved stakeholders	City organization, city's subsidiaries, local businesses, citizens, national and regional authorities, energy companies, grid company, electricity company, research institutes
	Comments on implementation	Ongoing
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	Fossil fuels and fuels derived from fossil fuels (gasoline, diesel, natural gas)
	GHG emissions reduction estimate (total) per emission source sector	Difficult to assess
	Total costs and costs by CO2e unit	No major investment required from the city.

B-2.2: Individual action outlines - 4		
(fill out one sheet per intervention/project)		
Action outline	Action name	<p><b>Modal shift from private driving to sustainable mobility</b></p> <ul style="list-style-type: none"> <li># Sustainable commuting</li> <li># Improved walking and cycling environment</li> <li># Improved cooperation between service network planning and traffic planning</li> <li># improved public transport service level</li> <li># Cycling routes prioritization program.</li> <li># Safe, comfortable and barrier-free walking and cycling environment</li> <li># Improved walking and cycling environment</li> <li># Securing funding for Cycling routes prioritization program.</li> </ul>
	Action type	<p>Skills and capacity building</p> <p>Change in social behaviour</p> <p>Empowerment and inclusion</p> <p>Regulation and support</p> <p>Top-down and bottom-up systemic initiatives/ project</p> <p>Physical/ spatial interventions</p>
	Action description	<p>Systemic change to sustainable commuting is promoted in the Lahti area through projects and programs in cooperation with employers and stakeholders including monitoring and promoting sustainable commuting of the city personnel.</p> <p>Service network planning and traffic planning developing cooperation to enable sustainable and safe mobility connections. Cross-administrative cooperation development. For example, the school network in relation to safe</p>



		<p>walking and cycling connections. Promoting bicycle parking in city premises. Accessibility of the premises. Networks of (outdoor) sports venues.</p> <p>Safe, comfortable and barrier-free walking and cycling environment. Quality walking routes. Green and cozy street space. Improving accessibility. Accessibility survey of the city center. Accessibility of natural sites. Luontoaskel terveyteen -program. Cycling routes prioritization program.</p> <p>Increasing the competitiveness and attractiveness of public transport. Development of the trunk routes. During the year 2023, a service level plan that updates the target service level of public transport for future years, e.g. based on changes in land use. Guides the development of the routes based on researched information on the coming years. At the same time, material is also created for the general plan of land use, and in which areas land use can be developed sustainably by relying on public transport.</p>
Reference to impact pathway	Field of action	Mobility & transport
	Systemic lever	Technology & infrastructure, governance & policy, learning & capabilities, finance & funding
	Outcome (according to module B-1.1)	# Increase in share journeys made by walking and cycling # Increased length of high quality bike lanes
Implementation	Responsible bodies/person for implementation	Department of urban planning, kaupunkitekniikka, Ympäristökehitys, LAB, LUT, Päijät-Sote, Tilakeskus, Sivistyksen palvelualue, Lahden Seudun Liikenne (LSL)
	Action scale & addressed entities	The measures have a wide impact on the mobility possibilities of the citizens, with a significant opportunity to reduce emissions.
	Involved stakeholders	City organization, city's subsidiaries, local businesses, citizens, national and regional authorities, construction industry
	Comments on implementation	Ongoing, Political decision made, but financing not secured
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	Replacing private driving with more sustainable means of transport with the aim of reducing consumption of fossil fuels and fuels derived from fossil fuels (gasoline, diesel, natural gas).
	GHG emissions reduction estimate (total) per emission source sector	64.1 M€ (total sum in 2023-2030, related to all SUMP measures)
	Total costs and costs by CO2e unit	



**B-2.2: Individual action outlines - 5**

(fill out one sheet per intervention/project)

Action outline	Action name	<p><b>Other</b></p> <ul style="list-style-type: none"> <li># Low-emission transport strategy for city center</li> <li># Speed limit reduction</li> <li># 2025 - Year of Sustainable mobility</li> <li># Collaboration with cities and other levels of governance on restrictions in the law, such as enabling congestion charge in Finnish cities</li> <li># Improved cooperation between service network planning and traffic planning</li> <li># Utilising social innovations if pilot project for Sustainable commuting</li> <li># Identifying cost effective ways and funding opportunities to improve public transport service level</li> <li># Database for traffic data</li> <li># Estimating impacts of potential actions in advance (emissions, financial, health, social)</li> <li># Communication and participation through discussion about the values related to the needed actions and personal choices</li> <li># Low-emission transport strategy for city center</li> </ul>
	Action type	<ul style="list-style-type: none"> <li>Physical/ spatial interventions</li> <li>Nature-based solutions</li> <li>Technical interventions</li> <li>Empowerment and inclusion</li> <li>Regulation and support</li> <li>Top-down and bottom-up systemic initiatives/ projects</li> <li>Skills and capacity building</li> <li>Change in social behaviour</li> </ul>
	Action description	<p>The mobility strategy is based on the vision of the city center. Traffic in the center is planned in favor of pedestrians, cycling and public transport.</p> <p>Lowering speed limits reduces road traffic emissions. Additionally, lowering speed limits significantly increases traffic safety and reduces noise nuisance. The opportunities of lowering speed limits in the city area are being studied.</p> <p>In 2025, various measures aimed at reducing transport emissions will be extensively tested in Lahti. Experiments can concern, for example, parking policy, public transport, logistics, city bicycle system, promotion of cycling and walking, commuting, transporting children or speed limits. Increasing the understanding of all stakeholders including decision makers on the required changes and their climate and financial impacts as well as co-benefits. Goal is to gain acceptance and</p>



		increase will for ambitious traffic emission actions.
Reference to impact pathway	Field of action	Mobility & transport
	Systemic lever	Governance & policy, Learning & capabilities
	Outcome (according to module B-1.1)	# Common understanding of most efficient and low emission service network for emission reductions # Speed limit reductions piloted and scaling started # Social innovations created and tested in Lahti # improved public transport service level # A joint database available for all traffic related data in the city # Informed planning and decision making # Informed planning and decision making # Increased willingness of stakeholders and citizens to make sustainable mobility choices # Mobility solutions that allow emission reductions have been identified for the city center
Implementation	Responsible bodies/person for implementation	Department of urban planning, Team of Environmental Development, ELY-keskus
	Action scale & addressed entities	The development of the city center area indirectly affects all operators in the city center area and, for example, the accessibility of services.
	Involved stakeholders	City organisation, LSL, schools, all operators in the area
	Comments on implementation	Political decision, funding not secured
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	Replacing private driving with more sustainable means of transport with the aim of reducing consumption of fossil fuels and fuels derived from fossil fuels (gasoline, diesel, natural gas).
	GHG emissions reduction estimate (total) per emission source sector	Transport: 61.8 ktCO <sub>2</sub> e by 2030 (requires several successful emission reduction experiments during the year 2025 and scaling up best solutions 2026-2030). This number is, in other words, not the direct reduction in emissions during 2025, but the goal for 2030.
	Total costs and costs by CO <sub>2</sub> e unit	<i>Not estimated yet</i>

<b>B-2.2: Individual action outlines - 6</b>		
(fill out one sheet per intervention/project)		
Action outline	Action name	<b>Construction</b> # zero emission construction sites # low-emission machinery for urban green maintenance # carbon-neutral building construction



		# promoting wooden construction and use of carbonised concrete (buildings as carbon stocks)
	Action type	Top-down and bottom-up systemic initiatives/projects Regulation and support Skills and capacity building Physical/ spatial interventions Nature-based solutions
	Action description	Ecosystem agreement for innovation activities between the Lahti urban region and the government. The strategic focus area of the agreement, the carbon-neutral circular economy of cities, promotes the city climate work, especially through carbon-neutral construction and material cycles.  All vehicles purchased for the service area of the urban environment are electrically powered. The vehicles can be reserved for both official and leisure use. Low emissions are taken into account also in the vehicle leasing competition.  Wooden buildings are a significant long-term carbon storage. The current state of wood construction is assessed and the calculation and monitoring methods are being developed. Wood construction is promoted especially in public buildings and apartment building construction. The development and introduction of carbon dioxide sequestration in concrete is also followed.  Through communication and advice, property owners are encouraged to renovate instead of demolish, as well as energy efficiency measures, the use of renewable energy and wood construction.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Technology & infrastructure, democracy & participation, governance & policy
	Outcome (according to module B-1.1)	# zero emission construction sites # low-emission machinery for urban green maintenance # carbon-neutral building construction # promoting wooden construction and use of carbonised concrete (buildings as carbon stocks)
Implementation	Responsible bodies/person for implementation	Department of Economic Development, Departments of procurement, City Environment, Youth Services, Tilakeskus, Lahden Talot, Ympäristökehitys, Development Center for Carbon-Neutral Construction, Department of urban planning, Building Control



	Action scale & addressed entities	The city can act as a forerunner in urban construction, exploring new solutions and technologies which can significantly reduce emissions. Residents are also involved in reducing construction-based emissions.
	Involved stakeholders	Residents, city personnel, research institutes, construction and wood industry
	Comments on implementation	Ongoing, financing of investments not secured
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	Fossil fuels and fuels derived from fossil fuels (gasoline, diesel and natural gas in transport, oil and and gas in heating), carbon-intensive building materials and methods
	GHG emissions reduction estimate (total) per emission source sector	Buildings, offsetting through increase in carbon stocks of buildings (not assessed)
	Total costs and costs by CO2e unit	No major increase in running costs. Increase in construction costs need to be evaluated.

B-2.2: Individual action outlines - 7		
(fill out one sheet per intervention/project)		
Action outline	Action name	<p><b>Land use and planning:</b></p> <ul style="list-style-type: none"> <li># Land use and construction control so, that the effects on carbon sinks is minimized</li> <li># If the forest and carbon sinks are destroyed, they are compensated</li> <li># Eco-calculation tools use of land use in planning</li> </ul>
	Action type	<ul style="list-style-type: none"> <li>Regulation and support</li> <li>Physical/ spatial interventions</li> <li>Nature-based solutions</li> <li>Top-down and bottom-up systemic initiatives/ projects</li> <li>Skills and capacity building</li> </ul>
	Action description	<p>Land use and construction control so that trees and other vegetation are preserved as far as possible and unnecessary earth excavation is avoided.</p> <p>A local compensation model is prepared and and future carbon sink losses are compensated with it.</p> <p>The KEKO calculator is used to evaluate for land use planning alternatives in cities, as indicated in the planning instructions of the general land use plan. The KEKO calculator is especially applicable for reviews of significant land use alternatives and in evaluating competitions regarding land use planning. The green factor metric can be used in the zoning of compact areas and in the detailed planning</p>



		<p>of sites, fundamentally important in the planning of groundwater areas. The KEKO calculator green factor is a critical evaluation criteria in carbon footprint evaluations. A new calculation tool, with multiple improvements to KEKO is being developed.</p> <p>Promoting carbon-neutral construction with zoning and land transfer conditions. Certain conditions/limits in the zoning and land transfer condition that guarantee the realization of carbon neutrality.</p>
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Governance & policy
	Outcome (according to module B-1.1)	<p># Land use and construction control so, that the effects on carbon sinks is minimized</p> <p># If the forest and carbon sinks are destroyed, they are compensated</p> <p># Eco-calculation tools use of land use in planning</p>
Implementation	Responsible bodies/person for implementation	Department of urban planning, Rakennusvalvonta, Ympäristöpalvelut,
	Action scale & addressed entities	The connection between land use and carbon sinks is taken into account in all areas of the city. Compensation is taken into account in the city's budget.
	Involved stakeholders	City organisation and personnel, national and regional authorities, research institutes
	Comments on implementation	Ongoing, funding for compensation not secured
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	Being assessed at the moment
	Total costs and costs by CO2e unit	Being assessed at the moment

**B-2.2: Individual action outlines - 8**

(fill out one sheet per intervention/project)

Action outline	Action name	<p><b>Separate heating &amp; energy efficiency</b></p> <p># Strict regulation for energy efficiency of new buildings</p> <p># Improving energy efficiency in rental housing</p> <p># Promoting energy renovations in old buildings</p>
	Action type	<p>Top-down and bottom-up systemic initiatives/projects</p> <p>Technical interventions</p> <p>Regulation and support</p>





		Skills and capacity building Empowerment and inclusion
	Action description	Energy saving measures in the properties of Lahden Talot  The goal of the Carbon Neutral Building Development Centre is to promote carbon-neutral construction, renewable energy solutions and increase energy efficiency in the existing building stock.  Energy efficiency measures in the rental housing stock: repairing and renovating the old building stock. Various measures have been implemented as part of the Canemure project, and their emission-reducing effect is being evaluated. In the future, the measures will be implemented in connection with renovation measures suitable for the properties. Development of real estate analytics.  Residents and housing associations are advised and supported in energy renovations (replacing oil and gas heating, connecting to the district heating network, utilizing geothermal energy, small-scale production of solar energy, enabling joint procurement and energy sharing communities).
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Technology & infrastructure, democracy & participation, governance & policy
	Outcome (according to module B-1.1)	# Strict regulation for energy efficiency of new buildings # Improving energy efficiency in rental housing # Promoting energy renovations in old buildings
Implementation	Responsible bodies/person for implementation	Lahden Talot, Rakennusvalvonta, Hiilineutraalin rakentamisen kehittämiskeskus, Ympäristökehitys, Elinvoima- ja työllisyyspalvelut
	Action scale & addressed entities	Professionalism in the construction industry and municipal engineering is needed in many different ways. Residents are encouraged to undertake energy-based renovations.
	Involved stakeholders	The City organization, residents, Lahti Energy, service providers for energy renovations, solar panel companies, grid company, national and regional authorities, research institutes
	Comments on implementation	Ongoing
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	Oil and gas heating



	GHG emissions reduction estimate (total) per emission source sector	Not assessed
	Total costs and costs by CO2e unit	Investments of Lahden talot classified. No major investment required from the city.

<b>B-2.2: Individual action outlines - 9</b>		
(fill out one sheet per intervention/project)		
Action outline	Action name	<b>Waste management</b> # enhancing collection of management of bio-, packaging and textile waste
	Action type	Empowerment and inclusion, change in social behaviour, skills and capacity building
	Action description	<p>Improving the collection of biowaste and packaging waste from properties. Planning, tendering and starting transportation of biowaste and packaging waste. Service concepts for different service segments; review for a voluntary collection model such as multi-bin collection.</p> <p>Streamlining waste transport : transition to centralized waste transportation organized by the city and tendered by Salpakierto Oy. When the waste transport contracts organized by the city are tendered, the environmental friendliness and energy efficiency of the vehicles to be purchased are taken into account.</p> <p>Comprehensive sorting is ensured in kindergartens, schools and high schools and the content of sanitation contracts is defined to support sorting.</p> <p>A communication campaign about the collection of disposable textiles, the collection is monitored, developed and expanded.</p>
Reference to impact pathway	Field of action	Waste & circular economy
	Systemic lever	Governance & policy
	Outcome (according to module B-1.1)	# enhancing collection of management of bio-, packaging and textile waste
Implementation	Responsible bodies/person for implementation	Salpakierto, Waste management authority, Tilakeskus, Sivistyspalvelut: education sector
	Action scale & addressed entities	Waste management emission reduction measures require the actions of the city organization as well as the actions of the citizens.
	Involved stakeholders	The city organization, national and regional authorities, citizens, local businesses
	Comments on implementation	Ongoing, political decision, financing secured
Impact & cost	Generated renewable energy (if applicable)	



	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	Not Assessed
	Total costs and costs by CO2e unit	Not Assessed

B-2.2: Individual action outlines - 10		
(fill out one sheet per intervention/project)		
Action outline	Action name	<b>Circular economy</b>
	Action type	Top-down and bottom-up systemic initiatives/projects, skills and capacity building, change in social behaviour
	Action description	<p>The measures below are from Lahti's Circular Economy Roadmap:</p> <p>Education and competence, for example:</p> <p>Circular economy advice, education and help for business development is offered to companies.</p> <p>Everyday practices follow the principles of the circular economy, and the circular economy is taught at all levels of education: early childhood education, elementary school, upper secondary and vocational education, and university of applied sciences and university education.</p> <p>Internal lending system for youth services, where all loanable items are listed and loanable</p> <p>Public procurements promoting the circular economy, for example:</p> <p>Circular economy criteria according to the procurement guidelines of the city's procurement program are used in all public procurements. In the city group's budget, provision has been made for the possible additional costs of purchases that promote the circular economy.</p> <p>The movable assets available in the city's units are mapped and they are primarily used before purchasing new ones. The possibility of acquiring movable property as a used, rented or leasing service is also investigated and recorded. These guidelines are also included in the procurement program and instructions.</p> <p>In the construction and demolition projects of the city group, the circular economy is at the center both in the selection and use of</p>



		<p>materials for new construction and in the recycling and reuse of construction and demolition waste.</p> <p>Promoting the circular economy as a key starting point for land use and urban planning, including the promotion of circular economy business activities, e.g. mass economy management of zoning and regional construction. The use of recycled materials and recycled aggregates in the planning and procurement of urban infrastructure is promoted.</p> <p>The utilization rate of the buildings and premises of the city group is high and the service life is long. In the planning, construction and renovation of public spaces, the essential principle is multi-use and the adaptability of the purpose of use of the spaces.</p> <p>The sustainable food system, for example:</p> <p>Sustainable food production, biogas utilization and nutrient cycle, reducing food waste and sorting and utilizing biowaste.</p> <p>Materials and sharing economy, for example:</p> <p>Shared use services are supported through the regional planning of residential areas (e.g. in beach areas, shared spaces, saunas, playgrounds, docks, shared cars, boat berths).</p> <p>Borrowing services for library items and facilities are developed and actively communicated to residents.</p> <p>The internal circulation of the items owned by the city will be enhanced by appointing a coordinating responsible party to maintain warehouses, refurbish and transport such assets, manage the electronic information system, monitor the amount of assets in circulation and financial savings, and take care of the further utilization of unnecessary assets.</p>
Reference to impact pathway	Field of action	Waste & circular economy
	Systemic lever	Social innovation, governance & policy
	Outcome (according to module B-1.1)	
Implementation	Responsible bodies/person for implementation	Elinvoima- ja työllisyyspalvelut (ETP), Sivistyspalvelut, Youth services, Tilakeskus, Salpakierto, Environmental Development Team, Department of procurement
	Action scale & addressed entities	Lahti's Circular Economy Roadmap with its actions applies to the entire city group.



	Involved stakeholders	LADEC, Salpaus, LAB, LUT
	Comments on implementation	Ongoing, political decision for roadmap, financing of actions not secured
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	Being assessed
	Total costs and costs by CO2e unit	Not assessed

**B-2.2: Individual action outlines - 11**

(fill out one sheet per intervention/project)

Action outline	Action name	<p><b>Carbon sinks</b></p> <p># development and deployment of net-carbon sink calculation models</p> <p>#development and deployment of local/regional carbon offsetting model</p>
	Action type	<p>Top-down and bottom-up systemic initiatives/projects</p> <p>Physical/ spatial interventions</p> <p>Nature-based solutions</p> <p>Technical interventions</p> <p>Regulation and support</p>
	Action description	<p>Calculations of net carbon sinks at different levels (detailed vs. wider area) are being developed, for example, in the Kuntanielu project.</p> <p>The compensation model is being designed, for example, in the Kuntanielu project together with researchers, stakeholders and other municipalities. The goal of the model is to connect compensation producers in the Lahti area, as well as the city and other compensation buyers.</p> <p>In the case of unrealized land use reservations, the impact of non-construction on forest carbon sinks and stores is calculated. The carbon map is utilized in this measure.</p>
Reference to impact pathway	Field of action	Green infrastructure & nature-based solutions
	Systemic lever	Learning & capabilities
	Outcome (according to module B-1.1)	<p># development and deployment of net-carbon sink calculation models</p> <p>#development and deployment of local/regional carbon offsetting model</p>
Implementation	Responsible bodies/person for implementation	Environmental Department, Department of urban planning, Department of urban infrastructure



	Action scale & addressed entities	Calculations of net carbon sinks and developing a compensation model requires extensive cooperation and involves several stakeholders.
	Involved stakeholders	The city organization, landowners, research institutes, national and regional authorities, other municipalities
	Comments on implementation	Ongoing
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	Plan to be able to compensate for 216 kt CO <sub>2</sub> e by 2025 or as soon as the city's own scope 1 emission reduction target is reached
	Total costs and costs by CO <sub>2</sub> e unit	30e/t CO <sub>2</sub> e, 16,86 Me for 2025-2030

<b>B-2.2: Individual action outlines - 12</b>		
(fill out one sheet per intervention/project)		
Action outline	Action name	<b>Forests</b> # reforestation of wastelands # Forests and forest land importance as a carbon store is taken into account in the planning of forest management measures
	Action type	Top-down and bottom-up systemic initiatives/projects Physical/ spatial interventions Nature-based solutions Skills and capacity building
	Action description	Increasing carbon sinks by reforesting underutilized areas. The situation of old gravel extraction sites will be reviewed, and landowners will be encouraged to reforest.  The most important means of influencing the carbon balance are especially the maintenance of carbon reserves in forests. In terms of carbon sequestration, it would be important to preserve existing forests, especially in lush growing areas.
Reference to impact pathway	Field of action	Green infrastructure & nature-based solutions
	Systemic lever	Governance & policy
	Outcome (according to module B-1.1)	# reforestation of wastelands # Forests and forest land importance as a carbon store is taken into account in the planning of forest management measures
Implementation	Responsible bodies/person for implementation	Departments of Forest management, Urban infrastructure, Environmental services, Land politics



	Action scale & addressed entities	Decisions regarding the use of forests are made by landowners and the city organization and affect the city's carbon sinks.
	Involved stakeholders	The city organization, landowners, research institutes, national and regional authorities
	Comments on implementation	Ongoing, political decision
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	Being assessed
	Total costs and costs by CO2e unit	No major investment required from the city.

**B-2.2: Individual action outlines - 13**

(fill out one sheet per intervention/project)

Action outline	Action name	<b>Agriculture</b> # utilisation of city's rental agricultural land in climate work
	Action type	Top-down and bottom-up systemic initiatives/projects
	Action description	Restoration of peat fields owned by the city. The surface area of the potential areas and the landscape values are determined.
Reference to impact pathway	Field of action	Green infrastructure & nature-based solutions
	Systemic lever	Political decision
	Outcome (according to module B-1.1)	# utilisation of city's rental agricultural land in climate work
Implementation	Responsible bodies/person for implementation	Department of land politics
	Action scale & addressed entities	Decisions are made in the city organization and affect the city's land use and employ workers implementing restoration measures. Evaluations require expertise and cooperation with stakeholders.
	Involved stakeholders	The city organization, research institutes, national and regional authorities
	Comments on implementation	Political decision
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	Being assessed
	Total costs and costs by CO2e unit	Being assessed



<b>B-2.2: Individual action outlines - 14</b>		
(fill out one sheet per intervention/project)		
Action outline	Action name	<b>Green infra</b> # Carbon sinks and storages are taking into account in the management of green areas
	Action type	
	Action description	In particular, trees and the preservation of soil carbon stocks are taken into account in the management of city green areas.
Reference to impact pathway	Field of action	Green infrastructure & nature-based solutions
	Systemic lever	Governance & policy
	Outcome (according to module B-1.1)	<ul style="list-style-type: none"> <li>- A possible increase in carbon sinks and storages</li> <li>- A more comfortable and healthier urban area</li> </ul>
Implementation	Responsible bodies/person for implementation	Department of urban infrastructure
	Action scale & addressed entities	Decisions regarding the management of green areas can have long-term effects and require expertise and cooperation with stakeholders.
	Involved stakeholders	The city organization, employers, national and regional authorities, research institutes
	Comments on implementation	Ongoing, financing not secured
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	Being assessed
	Total costs and costs by CO2e unit	Not assessed

<b>B-2.2: Individual action outlines - 15</b>		
(fill out one sheet per intervention/project)		
Action outline	Action name	<b>Climate adaptation</b> # Storm water management
	Action type	Top-down and bottom-up systemic initiatives/projects Physical/ spatial interventions Nature-based solutions Skills and capacity building
	Action description	The local treatment of stormwater is increased, and new information is collected about different treatment solutions. In street planning, when dimensioning green areas, snow conditions and stormwater absorption are taken into account.





Reference to impact pathway	Field of action	Green infrastructure & nature-based solutions
	Systemic lever	Technology & infrastructure, learning & capabilities
	Outcome (according to module B-1.1)	# Storm water management
Implementation	Responsible bodies/person for implementation	Ympäristöpalvelut, rakennusvalvonta ja Department of urban planning; kunnallistekniikka
	Action scale & addressed entities	Storm water management and related necessary measures are implemented throughout the city.
	Involved stakeholders	The city organization, employers, landowners, national and regional authorities, research institutes
	Comments on implementation	Ongoing, funding secured
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	
	Total costs and costs by CO2e unit	Being assessed

<b>B-2.2: Individual action outlines - 16</b>		
(fill out one sheet per intervention/project)		
Action outline	Action name	<p><b>Securing ecosystem services for the city of Lahti in owned forests, open areas and built-up areas in green areas</b></p> <p>#The proportion of protected areas in the total area of the area is increased so that it rises to 5%. Together with LUMO sites, the protected area will be increased to 8% by 2030</p> <p>#The microclimate effect of built-up green areas (street trees, parks) is improved</p> <p># Forests and other green areas that are diverse in age</p> <p># Diversity of tree species in parks and forests</p> <p># Ground water protection</p>
	Action type	Top-down and bottom-up systemic initiatives/projects
	Action description	<p>The most valuable natural environments are protected from construction. Restoration efforts and care of protected areas is intensified and special attention is paid to the habitats of the most endangered organisms. Follow-up annually in the Environmental Review with protection indicators.</p> <p>In the long term, forests are grown in such a way that they vary in the ratio of tree species, species and age structure and enable versatile recreation. At the same time, they withstand</p>



		<p>deforestation and changes in weather conditions better than forests where only one tree species of the same age grows.</p> <p>The effect of urban vegetation that balances the temperature and winds, binds air pollutants and reduces the generation of harmful stormwater, is increased.</p> <p>The groundwater model of the city of Lahti will be updated in terms of material. The information of that material is exported to the city's spatial information system for use by various units.</p>
Reference to impact pathway	Field of action	Green infrastructure & nature-based solutions
	Systemic lever	Governance & policy
	Outcome (according to module B-1.1)	<p>#The proportion of protected areas in the total area of the area is increased so that it rises to 5%. Together with LUMO sites, the protected area will be increased to 8% by 2030</p> <p>#The microclimate effect of built-up green areas (street trees, parks) is improved</p> <p># Forests and other green areas that are diverse in age</p> <p># Diversity of tree species in parks and forests</p> <p># Ground water protection</p>
Implementation	Responsible bodies/person for implementation	Metsätoimi, Department of urban planning, Ympäristöpalvelut, Vihertoimi, Kadunpito, Ympäristökehitys
	Action scale & addressed entities	The management and actions concerning natural environments and groundwater extend to the entire city area and employ several operators in the city.
	Involved stakeholders	The city organization, employers, landowners, national and regional authorities, research institutes
	Comments on implementation	Ongoing
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	
	Total costs and costs by CO2e unit	Being assessed

**B-2.2: Individual action outlines - 17**

(fill out one sheet per intervention/project)

Action outline	Action name	<p><b>Climate governance</b></p> <p># Development of more detailed and informative emission data and improved estimates of actions climate impacts</p>
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		<ul style="list-style-type: none"> <li># Development of climate budget, assessments costs of actions</li> <li># City Group will start reporting its own emissions and all subsidiaries have roadmaps towards climate neutrality</li> <li># Climate partnership with local companies and other stakeholders is developed</li> <li># Development of regional carbon handprint calculations</li> <li># Innovation competitions</li> <li>#Enabling the work of efficient local knowledge clusters, e.g. Green electrification of Mobility Cluster</li> </ul>
	Action type	Empowerment and inclusion, regulation and support
	Action description	<p>Regional emissions, consumption-based emissions and regional carbon sinks and compensations are monitored on an annual basis. Emissions are reported to the city government and the European Commission. The city monitors the development of emission calculations.</p> <p>Assessment of the effects of climate measures is being developed so that resources can target effective and cost-effective actions.</p> <p>The city develops climate budgeting, including an assessment of the economic effects of measures, the connection between the economy and climate work in financial planning and the communication about economic effects of climate work.</p> <p>Subsidiaries report their emissions and prepare company-specific road maps towards carbon neutrality. The actions of the subsidiaries are linked to the goals of the city's strategy.</p> <p>The city invites companies and other organizations to become climate partners of the city of Lahti. Climate partners commit to climate action and form an active network.</p> <p>The city is developing a carbon handprint calculation, which will be used to show the effectiveness of city and region operators climate work outside the region.</p> <p>Through an open challenge competition, effective emission reduction measures are sought in key areas in themes such as energy and transport.</p> <p>Green electrification of Mobility (GEM) brings together companies operating in the sector in</p>



		Lahti and experts, promoting the industry's business in the region and supporting the development of electronic transport in the region.
Reference to impact pathway	Field of action	Cross sectoral actions
	Systemic lever	Governance & policy
	Outcome (according to module B-1.1)	# Development of more detailed and informative emission data and improved estimates of actions climate impacts # Development of climate budget, assessments costs of actions # City Group will start reporting its own emissions and all subsidiaries have roadmaps towards climate neutrality # Climate partnership with local companies and other stakeholders is developed # Development of regional carbon handprint calculations # Innovation competitions #Enabling the work of efficient local knowledge clusters, e.g. Green electrification of Mobility Cluster
Implementation	Responsible bodies/person for implementation	Departments of Environmental development, finances, owner control, Economic development, Communications
	Action scale & addressed entities	Actions guide the operation of the entire city and its development.
	Involved stakeholders	All operators in the city
	Comments on implementation	Ongoing, political decision
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	
	Total costs and costs by CO2e unit	No major investment required from the city.

**B-2.2: Individual action outlines - 18**

(fill out one sheet per intervention/project)

Action outline	Action name	<b>Sustainable consumption</b> # Communication plan for climate communication # Challenge campaign for residents # Challenge campaign for other actors (companies) # The conditions for climate-neutral events are improved # Residents' well-being and health are promoted in a nature-oriented way # Assessment of the carbon footprint of procurement and guidance towards sustainable procurement
	Action type	Skills and capacity building



		<p>Change in social behaviour Empowerment and inclusion Technical interventions Regulation and support</p>
	Action description	<p>Communication plan for climate communication : Plan for the years 2023-2027. Communication to different target groups (residents, companies, other operators)</p> <p>Challenge campaign for residents: The campaign inspires and urges residents, companies and associations to make sustainable choices (especially transport and energy).</p> <p>Climate Campaigners -app</p> <p>The conditions for climate-neutral events are improved: the carbon footprint calculation of events will be introduced. We will improve the responsibility of events by developing advice and guidance.</p> <p>Through the Nature Step to Health program, climate work is combined with nature work and health promotion. The goal is that the diversity of nature is strengthened; Lahti residents are healthier and more active more; opportunities for recreational use of nearby nature are increasing. Emphasis from a climate perspective in exercise and nutrition.</p> <p>As part of the effectiveness evaluation of the circular economy roadmap. Let's identify which procurement categories it would belong to to be focused primarily on account of their volume or environmental impact and an implementation plan</p>
Reference to impact pathway	Field of action	Cross sectoral actions
	Systemic lever	technology, social innovation, democracy participation
	Outcome (according to module B-1.1)	<p>Sustainable consumption</p> <ul style="list-style-type: none"> <li># Communication plan for climate communication</li> <li># Challenge campaign for residents</li> <li># Challenge campaign for other actors (companies)</li> <li># The conditions for climate-neutral events are improved</li> <li># Residents' well-being and health are promoted in a nature-oriented way</li> <li># Assessment of the carbon footprint of procurement and guidance towards sustainable procurement</li> </ul>



Implementation	Responsible bodies/person for implementation	Departments of Communication; Environmental Development, Event services
	Action scale & addressed entities	
	Involved stakeholders	Citizens, companies, civil society organisations
	Comments on implementation	On going, political decision
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	Difficult to assess
	Total costs and costs by CO2e unit	Being assessed

**B-2.3: Summary strategy for residual emissions**

In the recently updated Climate Programme of the City, we have devoted one sector for carbon sinks and offsetting with 19 actions for 2023-2030 to cover the residual emissions (20% from 1990 level). However, the plan does not exactly match with the guidelines of the Cities mission. According to our own target the 20% should be bound into sinks and, as the last option, compensated. We count also the already existing sinks into the 20% and not only the additional ones as instructed in the Mission Infokit for Cities. This is a common way of counting sinks in Finland, as about 75 % of the land area of Finland is covered with forests, and we have less possibilities to afforestation than many other countries in Europe. We consider the net sink, aka the difference between the sinks and sources instead of plain biological sink of vegetation and soil. Thus, the sources caused by logging or land use change are subtracted from the biological sink to get the net sink value.

As mentioned in section A-2.2., the national guidelines and policies regarding carbon sinks and offsets are still under development. There are yet no clear rules for how municipalities should proceed with carbon offsets. Lahti is a forerunner also in this topic as we are currently involved in a project where carbon offset guidelines for municipalities are developed. Developing the guidelines, as well as a local carbon compensation model, where the producers, buyers, and benefits of carbon offsets would remain in the Lahti region, are stated as acts in the Climate Programme. With the local carbon compensation model, we would have carbon credits produced and bought locally or regionally instead of having to buy them from outside of Finland. This way we could better control and follow the effects of the offset projects and keep the financial benefits in the region. We also want to tie biodiversity aspects into the model so that the chosen offset project would not endanger biodiversity, but support or even enhance it. The Climate Programme includes acts related to the target, that land use in the city should not cause net carbon emissions. The local offset model would help with this target too because the city needs to grow and land use change is inevitable. We also want to raise the share of construction that stores and binds carbon, as by increasing the use of wood and other suitable materials. One of such materials is concrete that functions as a carbon sink, which was recently developed by VTT Technical Research Centre of Finland. A pilot plant for manufacturing this carbon-negative concrete is in Hollola, a neighbouring municipality of Lahti.



### 4.3 Module B-3 Indicators for Monitoring, Evaluation and Learning

Module B-3 “Indicators for Monitoring, Evaluation and Learning” should contain a selection of indicators taken from the Comprehensive Indicator Sets developed by NZC. The following should be provided: An overview table listing the indicators selected per outcome and impact including targets and evaluation points (B-3.1); and a metadata table for each indicator selected, as specified in the Comprehensive Indicator Sets (B-3.2).

<b>B-3.1: Impact Pathways</b>						
Outcomes/ impacts addressed	Portfolio	Indicator No. (unique identified)	Indicator name	Target values		
				2025	2027	2030
Actions for decreasing GHG emissions in the atmosphere due to stationary energy production and grid supplied electricity and heating	District heating  Decentralised production of renewable energy	1	GHG emission from stationary energy	150 kt CO <sub>2</sub> equivalent	100 kt CO <sub>2</sub> equivalent	35 kt CO <sub>2</sub> equivalent
Actions for decreasing GHG emissions in the atmosphere due to transportation	Electrification and low-emission fuels  Modal shift from private driving to sustainable mobility  Other strategic interventions	2	GHG emission from transport	150 kt CO <sub>2</sub> equivalent	125 kt CO <sub>2</sub> equivalent	103 kt CO <sub>2</sub> equivalent
Actions for decreasing GHG emissions in the atmosphere due to waste treatment	Waste management  Circular economy	3	GHG emission from waste	17,3 kt CO <sub>2</sub> equivalent	16,1 kt CO <sub>2</sub> equivalent	14,3 kt CO <sub>2</sub> equivalent
Actions for decreasing GHG emissions in	Ensuring a just transition from natural gas to	4	GHG emission from IPPU	20 kt CO <sub>2</sub> equivalent	18 kt CO <sub>2</sub> equivalent	15 kt CO <sub>2</sub> equivalent



the atmosphere due to industrial processes and product use	sustainable energy (electricity, heat pumps, biogas) in industrial sector  Decreasing emissions from machinery: distribution obligation, procurement contracts, market guidance					
Actions for decreasing GHG emissions in the atmosphere due to agriculture, forestry and other land uses		5	GHG emission from AFOLU (Currently only agriculture included in the emission calculation)	7,6 kt CO <sub>2</sub> equivalent	7,6 kt CO <sub>2</sub> equivalent	7,6 kt CO <sub>2</sub> equivalent
Emission gap		7	Residual emissions			0 %

<b>B-3.2: Indicator Metadata</b>	
(for each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	GHG emission from stationary energy
Indicator Unit	kt CO <sub>2</sub> equivalent
Definition	Greenhouse gas emissions (mainly CO <sub>2</sub> emissions) from the operations of buildings.
Calculation	According to CO <sub>2</sub> report Lahti 2023 (Sitowise Oy): <a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
<b>Indicator Context</b>	
Does the indicator measure direct impacts (i.e. reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it impact?	Indicator covers the following sectors in CO <sub>2</sub> -report: Industry and machinery, Separate heating
Does the indicator measure indirect impacts (i.e. co-benefits)?	no
If yes, which co-benefit does it measure?	n/a
Can the indicator be used for monitoring impact pathways?	yes
If yes, which NZC impact pathway is it relevant for?	<b>Energy systems</b>





Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	CDP
<b>Data requirements</b>	
Expected data source	CO2 report Lahti (Sitowise Oy) and Lahti Energy
Expected availability	yes, updated annually
Suggested collection interval	annually
<b>References</b>	
Deliverables describing the indicator	<a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
Other indicator systems using this indicator	

<b>B-3.2: Indicator Metadata</b>	
(for each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	GHG emission from transport
Indicator Unit	kt CO <sub>2</sub> equivalent
Definition	Greenhouse gas emissions from the operations of vehicles
Calculation	According to CO2 report Lahti 2023 (Sitowise Oy): <a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
<b>Indicator Context</b>	
Does the indicator measure direct impacts (i.e. reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it impact?	Indicator covers the following sectors in CO2-report: Road transport, Other transport modes
Does the indicator measure indirect impacts (i.e. co-benefits)?	no
If yes, which co-benefit does it measure?	n/a
Can the indicator be used for monitoring impact pathways?	yes
If yes, which NZC impact pathway is it relevant for?	Transport
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	CDP
<b>Data requirements</b>	
Expected data source	CO2 report Lahti (Sitowise Oy)
Expected availability	yes, updated annually
Suggested collection interval	annually
<b>References</b>	
Deliverables describing the indicator	<a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
Other indicator systems using this indicator	

**B-3.2: Indicator Metadata**



(for each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	GHG emission from waste
Indicator Unit	kt CO <sub>2</sub> equivalent
Definition	Greenhouse gas emissions from waste treatment, waste incineration and landfills
Calculation	According to CO2 report Lahti 2023 (Sitowise Oy): <a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
Indicator Context	
Does the indicator measure direct impacts (i.e. reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it impact?	Indicator covers the following sectors in CO2-report: Waste
Does the indicator measure indirect impacts (i.e. co-benefits)?	no
If yes, which co-benefit does it measure?	n/a
Can the indicator be used for monitoring impact pathways?	yes
If yes, which NZC impact pathway is it relevant for?	
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	CDP
Data requirements	
Expected data source	CO2 report Lahti (Sitowise Oy)
Expected availability	yes, updated annually
Suggested collection interval	annually
References	
Deliverables describing the indicator	<a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
Other indicator systems using this indicator	

<b>B-3.2: Indicator Metadata</b>	
(for each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	GHG emission from IPPU
Indicator Unit	kt CO <sub>2</sub> equivalent
Definition	Greenhouse gas emissions from industrial processes and product use within city boundary.  Not relevant. Emissions do not exist or are minor in the area.
Calculation	
Indicator Context	
Does the indicator measure direct impacts (i.e. reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it impact?	Industrial Process and Product Use (IPPU)
Does the indicator measure indirect impacts (i.e. co-benefits)?	no
If yes, which co-benefit does it measure?	n/a
Can the indicator be used for monitoring impact pathways?	n/a
If yes, which NZC impact pathway is it relevant for?	



Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	n/a
<b>Data requirements</b>	
Expected data source	n/a
Expected availability	n/a
Suggested collection interval	n/a
<b>References</b>	
Deliverables describing the indicator	n/a
Other indicator systems using this indicator	n/a

<b>B-3.2: Indicator Metadata</b>	
(for each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	GHG emission from AFOLU
Indicator Unit	kt CO <sub>2</sub> equivalent
Definition	Greenhouse gas emissions from agriculture within city boundary.
Calculation	According to CO2 report Lahti 2023 (Sitowise Oy): <a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
<b>Indicator Context</b>	
Does the indicator measure direct impacts (i.e. reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it impact?	Indicator covers the following sectors in CO2-report: Agriculture
Does the indicator measure indirect impacts (i.e. co-benefits)?	no
If yes, which co-benefit does it measure?	n/a
Can the indicator be used for monitoring impact pathways?	yes
If yes, which NZC impact pathway is it relevant for?	
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	
<b>Data requirements</b>	
Expected data source	CO2 report Lahti (Sitowise Oy)
Expected availability	yes, updated annually
Suggested collection interval	annually
<b>References</b>	
Deliverables describing the indicator	<a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
Other indicator systems using this indicator	

<b>B-3.2: Indicator Metadata</b>	
(for each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	GHG emission from grid supplied energy
Indicator Unit	kt CO <sub>2</sub> equivalent
Definition	GHG emissions occurring as a consequence of the use of grid supplied electricity, heat, steam and/or cooling within the city boundary



Calculation	According to CO2 report Lahti 2023 (Sitowise Oy): <a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
<b>Indicator Context</b>	
Does the indicator measure direct impacts (i.e. reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it impact?	Indicator covers the following sectors in CO2-report: Electric heating, Geothermal heat, Other electricity consumption (Consumers' electricity consumption), Electricity in industry, District heating
Does the indicator measure indirect impacts (i.e. co-benefits)?	no
If yes, which co-benefit does it measure?	n/a
Can the indicator be used for monitoring impact pathways?	yes
If yes, which NZC impact pathway is it relevant for?	
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	CDP
<b>Data requirements</b>	
Expected data source	CO2 report Lahti (Sitowise Oy)
Expected availability	yes, updated annually
Suggested collection interval	annually
<b>References</b>	
Deliverables describing the indicator	<a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
Other indicator systems using this indicator	

<b>B-3.2: Indicator Metadata</b>	
(for each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	Residual emissions
Indicator Unit	%
Definition	The difference between the city's GHG emissions inventory and its 2030 climate neutrality target.
Calculation	Emission gap = (Emission reduction target - Emissions reduction in existing strategies) / Emission reduction target
<b>Indicator Context</b>	
Does the indicator measure direct impacts (i.e. reduction in greenhouse gas emissions?)	no
If yes, which emission source sectors does it impact?	n/a
Does the indicator measure indirect impacts (i.e. co-benefits)?	no
If yes, which co-benefit does it measure?	n/a
Can the indicator be used for monitoring impact pathways?	yes
If yes, which NZC impact pathway is it relevant for?	
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	



<b>Data requirements</b>	
Expected data source	CO2 report Lahti (Sitowise Oy)
Expected availability	yes, updated annually
Suggested collection interval	annually
<b>References</b>	
Deliverables describing the indicator	<a href="https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf">https://co2.sitowise.com/CO2tilastot/CO2-raportti_Menetelm%C3%A4kuvaus_2023.pdf</a>
Other indicator systems using this indicator	



## 5 Part C – Enabling Climate Neutrality by 2030

Part C “Enabling Climate Neutrality by 2030” aims to outline any enabling interventions, i.e. with regard to organizational setting or collaborative governance models, or related to social innovations – designed to support and enable the climate action portfolios described in Module B-2 as well as aiming to achieve co-benefits outlined in the impact pathway (Module B-1).

### 5.1 Module C-1 Organisational and Governance Innovation Interventions

Module C-1 “Organisational and Governance Innovation Interventions” consists of a summary table, listing organizational and governance interventions and describing their impact (C-1.1) and a section for more detailed descriptions and comments (C-1.2).

C.1.1: Enabling organisational and governance interventions					
Intervention name	Description	Responsible entity/ dept./ person	Involved stakeholder	Enabling impact	Co-benefits
(indicate name of intervention)	(describe the substance of the intervention)	(indicate responsible)	(list all stakeholder involved and affected)	(describe how intervention enables climate neutrality)	(indicate how intervention helps achieve impact listed in Module B-1)
Joint regional energy vision	Joint view on how energy emissions produced in the region in the future. What sources are available, where could we attract investors	City of Lahti, Regional Council of Päijät-Häme	Other municipalities, academia, business sector, energy sector	Increased investments in fossil free energy production in the area. Increased circular economy.	Increased energy security  Improved air quality  Circular economy and business potential  Financial impacts for city organisations and other stakeholders
Clarifying permit processes for renewable energy production	Permit processes are long and officers might have conflict views. Clarification is needed for what permits are needed and when and from who	Departments of City Environment	ELY and other regional and national authorities	Enabling and accelerating Plans for wind energy in the area	



Investigate possibilities for local incentives for energy renovations		Departments of City Environment and economic development			
Stricter regulation and energy policy for new building		Departments of City Environment		Increased energy efficiency in new buildings	
Collaboration with cities and other levels of governance on national governments role in decreasing transport emissions		Departments of Environmental development, and City Environment	National governant, regional council, ELY, Väylävirasto, Traficom	Increased obligation for low-emission fuel distribution	Improving air quality and its effect on health  Health benefits of walking and cycling
Enabling and promoting alternative fuel distribution		Departments of Environmental development, and City Environment		Increased numbers of hydrogen and biogas stations	Reduction of noise  Improvement of traffic safety
Collaboration with cities and other levels of governance on enabling congestion charge in Finnish cities Improved cooperation between service network planning and traffic planning		Unit of Environmental development,	Other Mission Cities,	Piloting in some Finnish city	Financial benefits for consumers and the city  Smooth everyday life and a pleasant street environment
Investigating possibilities for piloting speed limit reductions in Lahti area together with national authorities		Departments of Environmental development, and City Environment	ELY, Väylävirasto	Speed limit reductions piloted and scaling started	Equality of movement  Image benefits

**C-1.2: Description of organisation and governance interventions – textual and visual elements**

(Please provide here any further detail on listed interventions)

Table above lists interventions identified in impact pathways. In addition we have identified following needs and opportunities in organisational and governance interventions

- Joint procurements ((with Mission Cities)
- Green deals for instance for green mobility and construction (National Green deals)
- Academic partnerships for understanding and facilitating behavioural change
- Mobility and infra planning: need for increasing the common vision on the requirements and values guiding the planning and implementation in the city



## 5.2 Module C-2 Social and Other Innovation Interventions

Module C-2 “Social and Other Innovation Interventions” consists of a summary table, listing organizational and collaborative governance interventions and describing their impact (C-2.1) and a section for more detailed descriptions and comments (C-2.2).

C.2.1: Enabling social innovation interventions					
Intervention name	Description	Responsible entity/ dept./ person	Involved stakeholder	Enabling impact	Co-benefits
(indicate name of intervention)	(describe the substance of the intervention)	(indicate responsible)	(list all stakeholder involved and affected)	(describe how intervention enables climate neutrality)	(indicate how intervention helps achieve impact listed in Module B-1)
Pilot for joint procurement of solar panels or separate heating systems for SMEs or housing		Unit of Environmental development,	Service providers, SME sector		
Innovation competition to solve problems in clean energy production		Unit of Environmental development, Department of communication	RDI sector, business sector, citizens		
Utilising social innovations if pilot project for Sustainable commuting	In Lahti’s Pilot City Project there are plans to utilise social innovations for promoting sustainable commuting	Unit of Environmental development,	Academic partners, cae organisations, service providers, employees in case organisations		

C-2.2: Description of social innovation interventions – textual and visual elements
<p>Table above lists interventions identified in impact pathways. In addition we have identified following needs and opportunities in social innovation interventions</p> <ul style="list-style-type: none"> <li>- Co-design of local carbon sink actions and offsetting market. Regional collaboration with advocacy organisations in agriculture and forestry</li> <li>- Climate partnership for new types of actors : e.g. for agricultural entrepreneurs or organisations</li> <li>- Pubic-private or private-private partnerships for facilitating electrification of mobility Ladec, Green electrification of mobility cluster</li> <li>- Pubic-private or private-private partnerships for facilitating change in construction sectors. Center for carbon-neutral construction</li> <li>- Communication plan/strategy for climate work</li> </ul>





- Solving barriers in mobility sector : how to stop bike thefts, how to increase road security for all, can we find new ways to collect mobility data

### 5.3 Module C-3 Financing of Action Portfolio

Module C-3 “Financing of Action Portfolio” should contain the list of action portfolios and interventions outlined in Modules B-2, and those from C-1 and C-2 with cost implication to provide a summary list of interventions that need to be unpacked in the Investment Plan.

<b>C-3.1: Summary of interventions with cost implication (to be unpacked in Investment Plan)</b>					
Action/ intervention name	Responsible entity and person	Start/end date	Field of action	Impact	Total cost estimated
(list action portfolios and interventions from Modules B-2, C-1 and C-2, which have a cost implication)	(indicate responsible entity and person)	(indicate start and end date of the activity)	(indicate the field of action the interventions belongs to)	(indicate impact - i.e. the GHG reduction/ co-benefit)	(indicate the total costs in €, estimated for the intervention)
SUMP - all measures	LSL, Departments of Urban Planning, Urban infrastructure, Environmental Development	2023 - 2030	Transport	0.4-1.3 ktCO <sub>2</sub> e / year in 2023- 2030	64.1 M€ (total sum in 2023-2030, related to all SUMP measures)
Campaign year for sustainable mobility 2025		2023-2030	Transport	61.8 ktCO <sub>2</sub> e by 2030 (requires several successful emission reduction experiments during the year 2025 and scaling up best solutions 2026-2030). This number is, in other words, not the direct reduction in emissions during 2025, but the goal for 2030.	Will be assessed in 2023-2024
Electric cars	Investment mainly by inhabitants	2023-2030	Transport	9.3 ktCO <sub>2</sub> e in 2030 when comparing emissions	284.7 M€ (total sum in 2023-2030, assuming that



	and the private sector			from gasoline and diesel cars to electric cars	there will be 8500 electric cars in the city in 2030, while there were 860 electric cars in 2022)
Electric boiler	Lahti Energia	2023-2024	Energy systems	2 ktCO <sub>2</sub> e / year in 2024-2030	10 M€ investments related to electric boiler in operation in 2024
Electric boiler and heat storages	Lahti Energia	2026-2030	Energy systems	8 ktCO <sub>2</sub> e / year in 2026-2030	classified estimates, investment decisions pending
CCU	Lahti Energia and Ren-Gas	2026-2030	Energy systems	43-85 ktCO <sub>2</sub> e / year in 2026-2030	Classified for Lahti Energia's part of the project. The value of the investment in total is, when considering also the private investment, approx. 250 M€. Cost estimate, investment decision pending
Solar energy production in city-owned real estates	Tilakeskus	2023-2030	Energy systems	35 tCO <sub>2</sub> e / year in 2025-2030 and	1.7 M€ (total sum in 2023-2030) -1.2 M€ (total sum in 2023-2030)  Cost estimate, assuming that solar panels on the roofs of new city-owned buildings would cover 2% of total electricity need in 2030 of city-owned



					buildings. Partly in the city budget.
Implementation of energy renovations	Households and private sector	2023-2030	Built environment	2 ktCO <sub>2</sub> e / year when energy renovations have been implemented	84.0 M€ (if energy renovations are implemented in 10% of the buildings in the city). Investments mainly those of inhabitants and companies.
Lighting in public areas		2023-2030	Built environment	0.01-0.04 ktCO <sub>2</sub> e / year in 2023-2030	investments: 0.7 M€ (total sum in 2023-2030)
Carbon sinks and offsetting	Environmental development	2025-2030	Green Infrastructure & Nature Based Solutions	22-129 ktCO <sub>2</sub> e / year in 2025-2030	11.3 M€ (total sum in 2025-2030)
Cross Cutting Costs	Experts across city departments	2023-2030	All	n/a	Approx. 600 000 € / year

## 6 Outlook and next steps

This section should draw any necessary conclusions on the Action Plan above and highlight next steps and plans for further refining the Action Plan as part of the Climate City Contract.

### Plans for next CCC and Action Plan iteration – textual elements

The climate neutrality for scopes 1 and 2 by 2030 is an ambitious challenge for all Mission cities but in Lahti we are on a good way towards the goal since we started early. The Mission work has already brought additional value to our climate work, especially through improved collaboration with a wide variety of stakeholders - which is also a requirement for getting to the goal.

In 2023-2025 our focus will be in energy systems, road transport and sustainable consumption. Improving climate governance, financing and stakeholder engagement are important levers to be utilized.

An important step considering all actions in the portfolio is climate budgeting, which we will introduce in the financial planning of the city in 2024. The preparation of the Investment Plan showed us that the connection of climate governance and financial planning, nor the reporting of investments to climate work is not as systematic as it could be and should be. For many actions the investment or operational costs have not yet been estimated. We also have critical knowledge gaps in climate impacts of planned actions. We have been well prepared for the big investments but given that the municipalities are expected to face financially tough years, climate budgeting can provide us a way to secure and schedule funding for all required actions in the portfolio.

Another important general step will be to improve the climate governance especially between the local, regional, and national level. Work with other Finnish Mission cities and the supporting national



ministries will be a good platform to improve the collaboration and understanding what is needed from each level of governance.

In buildings sector important investment decisions will be made especially in the district heating system, where electric boilers and utilization of CCU could provide massive reduction of emissions. In transport, high expectations are placed for the year of Sustainable Mobility in 2025 which will allow us to pilot several actions that could lead to significant emission reduction if scaled. The participation of citizens and other actors in the area is crucial for success especially in sustainable mobility. Therefore, communication and nudging towards sustainable consumption and lifestyles are necessary actions.

The Action Plan will be updated in two years cycles. In 2025 we hope to have made significant progress in energy and transport sectors. For years 2025-2030 our focus will therefore shift to the topics of agriculture forestry and land- use and waste management. We already have a list of action that are prepared and implemented around these topics. Especially AFOLU sector offers possibilities for climate adaptation, biodiversity work and offsetting of residual emissions.

We also continue to follow the progress of the climate work. In Lahti the emission inventories and monitoring of progress in climate actions are embedded in the city's annual reporting cycle. We continue to lead the decision making with knowledge gained from the scientific community and from our own monitoring and are ready to change course accordingly.

## 7 Annexes

**Add any textual or visual material** to the 2030 Climate Neutrality Action Plan in the ANNEX as necessary.



### ANNEX 1 - Map of the city of Lahti

#### LAHTI

Area: 135 km<sup>2</sup>  
Population: 120 223

Average daily traffic in 2022 (vehicles/day)

- 34 - 600
- 601 - 2500
- 2501 - 32700
- Not known

- Nature reserve
- Forest
- Agricultural land

