NET ZERO CITIES

EU MISSION PLATFORM | CLIMATE NEUTRAL AND SMART CITIES

Climate City Contract

2030 Climate Neutrality Action Plan

2030 Climate Neutrality Action Plan of the Municipality of Thessaloniki

CITY OF THESSALONIKI

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Table of Contents

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.

The Municipality of Thessaloniki recognises the global challenges and the role of cities to act proactively to mitigate the impacts of the climate crisis and implement strong approaches to address current and future challenges.

The city's main challenge is to rapidly adapt sustainable systemic changes including redesigning and delivering urban infrastructures and services that enhance citizen's participation, connectivity and community, shape a thriving and sustainable city, build a dynamic urban economy, become responsive and support climate resilience and disaster management. Tremendous opportunities for the city to be improved, advanced, and maintain its contribution to the goals of sustainable development lie also in the utilization of big data computing and the underpinning technologies, and in the implementation of their novel applications.

The Municipality of Thessaloniki was selected to join the European Commission's Mission for 100 climate neutral and smart cities by 2030, after an intensive process led by independent experts from the European Commission and among 377 European cities that expressed interest. Thessaloniki in 2030 aims to have become a climate neutral, smart, sustainable, resilient and attractive city with positive benefits for public health, accessibility and well-being of citizens. This requires, on the one hand, robust policies and investing in ambitious actions, concerning public space, processes and resources that are within its sphere of competence and go beyond existing plans and strategies and, on the other hand, mobilizing and involving relevant stakeholders, institutions and businesses to achieve targets in various sectors that are higher than the corresponding national targets.

Thessaloniki's pathways towards climate neutrality cross various sectors for which the Municipality of Thessaloniki has a specific vision with specific measurable targets been set. The sectors chosen for Thessaloniki are Electricity, Buildings and Heating, Transport & Logistics, Water & Waste management, Land Use and Green Infrastructure, as well as the one related to Smart Cities and Governance, which contribute reaching climate neutrality horizontally.

The objective of the Action Plan is the overall reduction of emissions from all the aforementioned sectors in 2030 at a level of 80% (taking into account 20% of residual emissions). Regarding residual emissions, the Municipality of Thessaloniki includes in the plan an integrated strategy in cooperation with stakeholders and plans/ implements mitigation actions, such as small-scale biogas energy production, carbon capture agriculture, as well as nature-based actions, such as the densification of urban green areas and the development of new urban areas.

Reaching the goal of climate neutrality requires, apart from finding financial programmes and tools, the creation of a Transition team to orchestrate the process of collaboration and coordination actions of multiple actors across sectors. Besides, the goal of transition to climate neutrality by 2030does not consist only the vision of the Municipality but is the output of co-creation and cooperation between all stakeholders of the quadruple helix model (Public, Private, Research Community and Citizens) in planning and decision-making. Particular attention must be paid to interacting with civil society and consulting with them, so that the actions implemented have the maximum possible acceptance, thus multiplying their impact and making society itself the agent of this transition. It is also proposed that an open forum for dialogue be set up to involve citizens in the decision-making process and monitor progress in implementing the actions.

At the same time, the Municipality of Thessaloniki plans to approach the Central Government in a targeted manner and together with the other five Greek cities participating in the above mentioned mission of the European Commission (Athens, Kozani, Trikala, Ioannina, Kalamata).

Finally, the Municipality of Thessaloniki is expected to work with large private organizations that will

act as “Climate Neutrality Ambassadors”, in order to commit to implementing climate neutrality actions. These actions will involve both de-carbonisation of their operations and “green” donations for the wider benefit of the local community.

According to calculations and estimations derived from the "economic model" (methodology proposed by the EIT Climate KIC and adopted for the calculations carried out in the framework of Action Plan &Investment Plan establishment for the Municipality of Thessaloniki), in the year 2030, under "business as usual" conditions, i.e. without the implementation of targeted projects and actions for the climate neutrality transition, i.e. without the implementation of the 2030 Climate Neutrality Action Plan, the emissions within the Municipality of Thessaloniki borders are estimated at 2.84 tons of CO2 equivalent per capita. More specifically, emissions from the electricity and heating sectors of the building stock will be at high levels, with rates of 47% and 26% respectively, which ranks them as the two most important sectors that can be improved in terms of energy savings and emissions reduction, by planning and addressing appropriate efficient actions. The transport and logistics sector contributes about a quarter of total emissions (23%), while the waste management sector also contributes 4%.

The recognition of the contribution of the sectors to energy consumption and environmental burden also shapes the Municipality's strategy, which prioritises a series of actions to address pollutant emissions and consequently climate change, aiming at climate neutrality by 2030. Emblematic Interventions for the creation of climate-neutral areas focusing on sustainable mobility, electro-mobility, addressing climate change impacts and energy efficiency in buildings are listed within the Action Plan.

The electrification of the energy system (and, in this regard, the implementation of actions related to e.g., electric cars, installation of heat pumps, etc.) requires the de-carbonisation of the electricity grid. To achieve this, the following are required: a) a significant increase in the share of RES for electricity generation (>80% of electricity will come from RES, in line with national energy targets) and b) enhancing the flexibility of the grid. In this direction, it is foreseen to increase local/distributed RES electricity generation with parallel technical interventions to upgrade the electricity grid, in cooperation with local, regional and national relevant actors, in particular electricity providers and distributors. These measures contribute to upgrade the municipality energy security, by reducing its exposure to external energy inputs. In addition, it is necessary to develop actions aiming at significant increase of distributed photovoltaic systems in common/public spaces. These actions aim to increase the self-consumption from RES within the municipality, to further enhance the sustainability of the energy mix and act as complementary means of raising awareness and mobilising citizens (e.g., dissemination and adoption of good practices), particularly if the benefits of installing such systems are sufficiently communicated to citizens and civil society.

The Municipality of Thessaloniki understands and recognises the need to address energy poverty, so that the energy transition is implemented in a socially just and acceptable way. Priority will be given to serving energy vulnerable households, with the ultimate aim of reducing energy poverty within the Municipality.

As far as buildings and heating are concerned, extensive technical interventions development for buildings’ energy upgrade (passive and active systems), is a basic prerequisite for the reduction of the energy needs of the building stock and the increase of RES to cover these needs, results which will lead to the de-carbonisation of the energy needs of the Municipality's building stock. The Municipality of Thessaloniki adopts the principle “energy efficiency comes first” whenever possible and tries to prioritise the order of interventions in view to achieve the best result with the available resources (e.g., having sufficient thermal insulation before replacing the heating system). In addition, new technologies, Information Technology and telecommunications solutions are offering new opportunities to manage and control buildings. According to the latest European directives (e.g., new EPBD), intelligent buildings are equally important in achieving a better quality of life and

as a supporting means to increase buildings' energy efficiency.

In order to achieve the Municipality of Thessaloniki climate neutrality targets, a renovation rate of 3.5% (percentage of buildings renovated annually) is required, of which 60% are extensive renovations (energy savings of 30-60%). This percentage increases (5.5%) if interventions only consist lamps and appliances replacement with more energy-efficient ones, as these initiatives are considered more likely to be implemented, given the lower capital investment required. The specific targets, although optimistic, are achievable as: a) there is a very high potential for renovation due to the age of the buildings within the Municipality of Thessaloniki and b) there is a strong construction activity (buildings and infrastructure).

In addition to existing buildings, it is also important to ensure high energy efficiency in new buildings. More specifically, the aim is to construct new buildings that will meet the highest energy standards (A+/A) by a percentage of 35%, in line with the estimates of other cities participating in the Mission that have similar characteristics to the Municipality of Thessaloniki. Finally and further to the building stock upgrade, the Municipality of Thessaloniki aims to increase other installations' energy efficiency (e.g., lighting, water supply installations, etc.), thus aiming to further reduce emissions from anthropogenic activities within the Municipality.

In the Transport and Logistics sector, the Municipality of Thessaloniki announces its intention to achieve the climate neutrality transition by 2030, by initially aiming to modernise mobility services and infrastructure management, through the implementation of infrastructure projects (such as redevelopments, cycle paths, etc.) and projects included in the Thessaloniki Sustainable Urban Mobility Plan (SUMP), planned for 2025 horizon. These projects are either ongoing or are in tendering phase. The above-mentioned projects aim to reshape the public space and its functions, resulting in a reduction of private passenger cars use and increase of public transport use, in order to also upgrade road safety. In addition, in order to modernise mobility services and infrastructure management and in parallel with the metro operation, public transport network restructure is planned, to enhance multimodal stations and park & ride facilities (people usually park their cars in the suburbs and take the bus or metro to avoid congestion in the city center). These actions aim to promote public transport and multimodality, resulting in reduction of car use, increase of public transport and active mobility, leading, also, in the long term, to the improvement in citizens' health.

In order to ensure a sustainable city with improved living conditions, the Municipality of Thessaloniki aims to create new and combined mobility services based on public transport and micro-mobility, as well as to promote services such as car sharing, ridesharing and carpooling.

This has resulted in the creation of a set of new mobility services that act as a counterbalance to car ownership, emphasising multimodality and, thus, reducing car use, while increasing both the use of public transport and the average number of passengers per car. In order to ensure the sustainability of the city through the modernisation of mobility services and infrastructure management, the Municipality of Thessaloniki sets as an additional objective; the promotion of electro-mobility infrastructure in public spaces, an action that will attract users of all categories. In addition, among the actions included in the promotion of electro-mobility is the gradual conversion of the urban bus fleet to electric buses.

Finally, the Municipality of Thessaloniki has set within its medium-term objectives the transition towards the full digitalization of mobility and transport by utilizing existing structures and tools, such as the Mobility Living Lab, developed by HIT/ CERTH (Hellenic Institute of Transport/ National Center for Research and Technological Development). This will enhance multimodal transport management, the adoption of the "Mobility as a Service" concept (a concept that aims to shift from the pattern of trips by private car to a new model of trips by shared means and public transport) and, finally, data-driven decision and policy making to improve transport and mobility conditions, as well as to inform commuters in order to make decisions that ultimately serve climate neutrality. These

objectives are being promoted through the implementation of specific actions and projects and the digitisation of mobility, which have either already been implemented or are ongoing or at the process towards tender.

In the Water and Waste management sector, the introduction of separate collection of bio-waste, which accounts for the largest share of the waste stream composition, is the most important factor in achieving the landfill diversion target. In order to achieve the Municipality of Thessaloniki climate neutrality targets, the composting rate needs to reach 70%, while the treatment of bio-waste through the development of the necessary infrastructure is also a key factor. The ultimate aim of the above is to reduce the environmental footprint and thus improve the quality of the environment. At the same time, the Municipality of Thessaloniki aims to upgrade the existing electronic recording and monitoring systems for waste management. The aim is to speed up the resolution of waste management issues and identify areas for improvement, in order to make them more transparent. An additional objective of the Municipality of Thessaloniki is to reduce the volume of waste for landfill (recycling of paper to 85%, plastic to 55%, metals to 60% and glass to 75%), thus reducing the environmental footprint of waste management and enhancing the city cleanliness. This will be achieved by modernising and renewing the cleaning and recycling equipment.

The strategic interventions of the Land Use and greening infrastructure sector aim to create a low-emission urban form. In the Municipality of Thessaloniki this transition is required to be achieved through extensive tree planting and increase of the area of the city covered by tree foliage. This can be achieved without changing the total area of green space, beyond what is foreseen in the Municipality Urban land uses Plan, but by densifying trees and replacing low green (grass, ornamental plants) with high green (trees). In addition to the removal of CO2 from the atmosphere by trees, the replacement of low greenery with high greenery will have other benefits, such as reduction in surface and atmospheric temperatures and heat islands found throughout the surface of Thessaloniki, noise absorption as trees act as natural noise barriers, protection of biodiversity as trees provide shelter and food for various species of birds, insects and other animals, helping to promote biodiversity in the urban environment.

Finally, interventions in the area of Smart City and governance are foreseen, which will contribute horizontally to the achievement of the Climate Neutrality objective. They concern the creation of digital infrastructure and digital citizen services and social participation, environmental sustainability support and Climate Footprint monitoring.

The 2030 Climate Neutrality Action Plan describes all interventions, including those to reach our priorities, as well as all further actions, and describes how the city plans to implement them, including both actions related to strengthening cooperation with stakeholders (Governance Enhancement Actions) and social innovation actions to ensure the active participation of citizens.

The progress of the implementation of the plan as well as its results will be monitored on a permanent basis, in order to propose, at regular intervals, any necessary modifications and improvements to the action plan. In order to reach this goal, the establishment of a **Carbon Progress Indicator Monitoring System and a Climate Transition Observatory** are foreseen, including the methodology and tool development aiming at supporting the Municipality of Thessaloniki in monitoring progress towards the climate transition and providing information on progress reports to the EU Mission Agency, as well as in taking decisions on the review of the Action Plan. The methodology and tool will be based on the way the baseline inventory of the Action Plan was created as well as on the multi-source Carbon Footprint monitoring platform developed/ operated by HIT/ CERTH.

The priorities that the Municipality of Thessaloniki has set for the implementation of the Action Plan consist, on the one hand, to the prioritization of actions within the municipality boundaries, and, on the other hand, to the synergies with the other Greek cities participating in the European Commission's Mission initiative for the mobilization of the National Government and relevant

stakeholders, in order to reach and overcome the national targets.

1 Introduction

Local policy context in which the Action Plan is being developed and description of the gap to be addressed

The Municipality of Thessaloniki was selected to join the European Commission's Mission for 100 climate neutral and smart cities by 2030, after an intensive process led by independent experts from the European Commission and among 377 European cities that expressed interest. Thessaloniki in 2030 aims to have become a climate neutral, smart, sustainable, resilient and attractive city with positive benefits for public health, accessibility and well-being of citizens. This requires, on the one hand, robust policies and investing in ambitious actions, concerning public space, processes and resources that are within its sphere of competence and go beyond existing plans and strategies and, on the other hand, mobilizing and involving relevant stakeholders, institutions and businesses to achieve targets in various sectors that are higher than the corresponding national targets.

Municipality of Thessaloniki acknowledges the global challenges and the role of the cities to act proactively to mitigate the effects of climate crisis and implement robust, approaches to address current and future challenges.

The city's main challenge is to rapidly adapt sustainable systemic changes including redesigning and delivering urban infrastructures and services that enhance citizen's participation, connectivity and community, shape a thriving and sustainable city, build a dynamic urban economy, become responsive and support climate resilience and disaster management. Tremendous opportunities for the city to be improved, advanced, and maintain its contribution to the goals of sustainable development lie also in the utilization of big data computing and the underpinning technologies, and in the implementation of their novel applications.

Thessaloniki aims to become a climate-neutral and smart city by 2030, reducing the expected CO2 emissions within its municipal boundaries by 80%. Achieving the target will transform Thessaloniki into a sustainable, resilient and attractive city with positive benefits for public health, accessibility and well-being of citizens. This requires, on the one hand, robust policies and investing in ambitious actions, concerning public space, processes and resources that are within its sphere of competence and go beyond existing plans and strategies and, on the other hand, mobilizing and involving relevant stakeholders, institutions and businesses to achieve targets in various sectors that are higher than the corresponding national targets.

Thessaloniki's pathways towards climate neutrality crosses various sectors for which the Municipality of Thessaloniki has a specific vision with specific measurable targets been set. More specifically:

Electricity: widespread installation of Renewable energy sources (RES) in public space and buildings. Thessaloniki will become a pioneer in promoting the replacement of fossil fuels by RES at national level.

Buildings & Heating: Renovation and upgrading of the building stock will be at a high level for all types of buildings, private (residential and commercial), municipal and other public. New buildings will largely follow the highest energy efficiency standards. Heating will largely use high efficiency electrical systems. Public facilities will be upgraded as a whole.

Transport & Logistics: the vast majority of trips by polluting private cars will be replaced in 2030 by tripsusing sustainable/ “green” means of transport (private or shared bicycles and micro-mobility vehicles, private or shared electric cars, public transport) within a sustainable multimodal transport system. The urban logistics system will be transformed and optimized, within a regulated operating environment and will use sustainable means of transport.

Water & Waste management: Packaging recycling will increase rapidly to reach the corresponding European targets. Bio-waste management will be modernised through composting infrastructure and food waste will be dramatically reduced.

Land Use & Green Infrastructure: Extensive tree planting programme and increasing the area of the city covered by tree foliage. Nature-based solutions and reduction of surface and atmospheric temperatures, heat islands, noise absorption. Protection of biodiversity.

Reaching the goal of climate neutrality requires, apart from finding financial programmes and tools, the creation of a Transition team to orchestrate the process of collaboration and coordination actions of multiple actors across sectors. Besides, the goal of transition to climate neutrality by 2030does not consist only the vision of the Municipality but is the output of co-creation and cooperation between all stakeholders of the quadruplehelix model in planning and decision-making: 1. the business sector, 2. the public sector, 3. research/academic centres, 4. civil society organisations. At the same time, the Municipality of Thessaloniki plans to approach the Central Government as a joint effort with the other five Greek cities participating in the EU Mission “100 climate-neutral and smart cities by 2030” (Athens, Kozani, Trikala, Ioannina, Kalamata).

Figure 1: Ecosystem for climate neutrality

In addition, the Municipality of Thessaloniki is expected to work with large private organizations that will act as “Climate Neutrality Ambassadors”, in order to commit to implementing climate neutrality actions. These actions will involve both de-carbonisation of their operations and “green” donations for the wider benefit of the local community.

Over the last decade, the European Union has stepped up its efforts to mitigate climate change by setting high targets for Member States to achieve. In this context, Greece is working systematically to align national legislation with the relevant European energy and climate guidelines and is promoting financial programmes in this direction, both in the public and private sectors. In parallel with the national policy documents, the Municipality of Thessaloniki, recognising the need to achieve climate neutrality, has formulated local/regional action plans to address specific issues within the targeted sectors.

According to calculations and estimations derived from the "economic model" (methodology proposed by the EIT Climate KIC and adopted for the calculations carried out in the framework of Action Plan &Investment Plan establishment for the Municipality of Thessaloniki), in the year 2030, under "business as usual" conditions, i.e. without the implementation of targeted projects and actions for the climate neutrality transition, i.e. without the implementation of the 2030 Climate Neutrality Action Plan, the emissions within the Municipality of Thessaloniki borders are estimated at 2.84 tons of CO2 equivalent per capita. More specifically, emissions from the electricity and heating sectors of the building stock will be at high levels, with rates of 47% and 26% respectively, which ranks them as the two most important sectors that can be improved in terms of energy savings and emissions reduction, by planning and addressing appropriate efficient actions. The transport and logistics sector contributes about a quarter of total emissions (23%), while the waste management sector also contributes 4%.

The recognition of the contribution of the sectors to energy consumption and environmental burden also shapes the Municipality's strategy, which prioritises a series of actions to address pollutant emissions and consequently climate change, aiming at climate neutrality by 2030.

2 Work Process

Work Stream - Methodology for the formulation of the Action Plan

The development of the Action Plan was based on the methodology proposed by the European Commission and in particular the Net Zero Cities initiative. In particular, the standard texts for the "Climate City Contract", the "Action Plan" and the "Investment Plan" were used, as well as all the proposed texts and guidelines from the initiative. Key elements for the drafting of the Action Plan were both the proposal submitted by the Municipality of Thessaloniki to join the network of 100 Climate Neutral and Smart Cities for 2030, and the participation and views of citizens and stakeholders in the wider area of the Municipality of Thessaloniki.

For the development of the baseline emissions inventory, the year 2020 (later than 2018, as required by the relevant directives) was chosen as the base year. Although 2020 was the year Covid-19, the sectors "Electricity", "Buildings & Heating", "Water & Waste management" and the "Land Use & Greening Infrastructure" sectors are not affected. On the contrary, for the sector "Transport & Logistics", given the unquestioned influence of Covid-19 on this sector, a typical travel year (2019) was chosen. The data came from the Traffic Model maintained by HIT/ CERTH and was also used for the compilation of the Sustainable Urban Mobility Plan of the Municipality of Thessaloniki.

For the required data to be included in the emissions inventory, the proposed "Economic Model" tool from Net Zero Cities was used, and they were collected according to their availability for the Municipality of Thessaloniki. More specifically, for those data for which no values were available, assumptions were made based on national and regional data, as well as international literature, according to availability in each case. It is worth mentioning that for the calculation of emissions per sector in the year BAU2030 (Business as Usual), the "Economic Model" tool required the forecast of the annual change in the population of the Municipality of Thessaloniki for the year 2030, so it was chosen to keep the population of 2030 similar to that of the 2021 census.

The objective of the Action Plan is the overall reduction of emissions from all the above mentioned sectors from BAU2030 to 2030 at a level of 80% (taking into account 20% of residual emissions). For the year 2030, specific targets for KPIs were set which were requested by the "Economic Model" in order to achieve climate neutrality for the city of Thessaloniki. And in the case of target setting for the year 2030, for those data where no values were available, assumptions were made based on national or European targets as well as international literature, depending on availability in each case.

The goals set by sector are expected to be achieved by the proposed actions of the Action Plan, always in conjunction with the achievement of national targets by national institutions and central government. As mentioned above, an important factor in the formulation of the Action Plan was the holding of participatory workshops with citizens and stakeholders from the wider area of the Municipality of Thessaloniki in order to identify problems, barriers and opportunities for achieving climate neutrality for the Municipality of Thessaloniki.

In addition, in order to record actions and activities planned by the various services of the Municipality of Thessaloniki, as well as by the stakeholders, an electronic questionnaire was designed and distributed, where the required information on the planned actions and activities was filled in. In addition, further communication with some of these stakeholders was deemed necessary, which was carried out either by telephone or face-to-face meetings in order to complete the Action Plan more correctly and completely.

Figure 2: Visual identity

Finally, in order to better promote and communicate the Action Plan to citizens and stakeholders in the city, a visual identity was designed, which emphasizes the objective of the Municipality of Thessaloniki towards climate neutrality. The logo was designed with the Net Zero Cities colour palette.

3 Part A – Current State of Climate Action

Part A "Existing situation" describes the starting point of the Municipality of Thessaloniki towards climate neutrality, including the existing commitments and strategies of key local actors and businesses, setting the background for fast and effective climate action.

3.1 Module A-1 Greenhouse Gas Emissions Baseline Inventory

Module A-1 "Greenhouse Gas Emissions Baseline Inventory" describes in detail the procedure and results of the last emissions inventory of the Municipality of Thessaloniki, for the reference year 2020, based on which the targets and residual emissions for 2030 will be derived. The methodology was based on the "Economic Model", which supports the calculations required for the Climate City Contract, as well as the requirements of the Mission's *Info Kit for Cities* and the Action Plan Guidance.

More specifically, for the calculation of greenhouse gas emissions from the building sector and electricity consumption, scope 1 and scope 2 emissions were taken into account. Scope 1 emissions included emissions resulting from the consumption of fuel to meet the heating and DHW Sanitary Hot Water) demand of all buildings within the boundaries of the Municipality of Thessaloniki. More specifically, the consumption of natural gas and heating oil was taken into account. Tier 2 emissions include emissions from the use of energy produced outside the boundaries of the municipality through the grid. In this case, the total electricity consumption (for all uses) was taken into account, as it was assumed that the majority of electricity consumed within the municipality is centrally generated and distributed through the electricity grid, in line with the indications of the Net Zero Cities model. Within the boundaries of the system for the Municipality of Thessaloniki, municipal buildings and installations, tertiary and residential sectors were included. The industrial and agricultural sectors were excluded from the analysis due to the very low relevance for the Municipality of Thessaloniki (minimal relevant activity) and due to the inability of the Municipality to intervene and influence actions in these sectors.

Similarly, for the calculation of GHG emissions from the transport & logistics sector, scope 1 emissions were taken into account. These emissions include emissions from motorised traffic and more specifically from passenger vehicles, buses, municipal vehicles, as well as urban delivery vehicles and trucks operating in the area of the Municipality of Thessaloniki.

Finally, for the calculation of GHG emissions from the waste sector, in line with the relevant guidance from City Advisor, scope 3 emissions were taken into account. These emissions refer to the total volume of waste collected within the boundaries of the Municipality of Thessaloniki.

The following summarizes and describes the main data and calculations related to greenhouse gas emissions in the Municipality of Thessaloniki, as they were obtained from the Net Zero Cities "Economic Model" tool.

A-1.1: Final energy use by source sectors				
Base year	2020			
	Scope 1	**Scope 2**	**Scope 3**	**Total**
Electricity (GWh/ year)	**-**	**989**	**-**	**989**
Buildings & Heating (GWh/ year)				**1,332**
Gas	937	-	-	937
Oil	395	-	-	395

Transport				**1,131**
Passenger transport	781			
Road freight transport	350			
Waste management	**-**	**-**	**142,839**	**142,839**
Land Use & Green Infrastructure				**1,880**
Agricultural (acres)	1,880			1,880

A-1.2: Emission factors applied (from economic model data inputs)							
Base year	2020						
For calculation in t or MWh of primary energy							
Methodology of the Intergovernmental Panel on Climate Change (IPCC) and the Covenant of Mayors for Climate and Energy							
Sector	**Primary energy/ energy source**	**Carbon Dioxide (CO_2)**	**Methane (CH_4)**	**Nitrous Oxide (N_2O)**	**Hydrofluorocarbons and perfluorocarbons**	**Sulphur hexafluoride (SF_6)**	**Nitrogen trifluoride (NF3)**
Transport	Passenger cars + motorcycles (g/km)	155					
	Buses (g/km)	1455					
	Light duty trucks (<3.5 t) (g/km)	220					
	Heavy duty trucks (>3.5 t) (g/km)	360					
Buildings & Heating	Heat production (district heating) (g/kWh)	0					
	Heat production (local heating) (g/kWh)	215					
Electricity	Electricity generation (g/kWh)	405					

A-1.3: Activity by source sector (from economic model data inputs)			
Base year	2020		
	Scope 1	**Scope 2**	**Scope 3**
Transport			
Transport need - passenger cars + motorcycles (M km/year)	767		
Transport need - buses (M km/year)	14		
Transport need - trains/metro (M km/year)	0		
Transport need - light duty trucks (<3.5 t) (M km/year)	90		
Transport need - heavy duty trucks (>3.5 t) (M km/year)	260		
Buildings & Heating			
Heating demand (space heating + domestic hot water)(GWh/year)	1332		
Electricity			
Electricity demand within city boundaries (GWh/year)		989	
Waste			
Collected waste within city boundaries (tonnes)			142839
Other			

A-1.3: Activity by source sector (from economic model data inputs)			
Base year	2020		
	Scope 1	**Scope 2**	**Scope 3**
Transport			
Transport need - passenger cars + motorcycles (M km/year)	767		
Transport need - buses (M km/year)	14		

Transport need - trains/metro (M km/year)	0		
Transport need - light duty trucks (<3.5 t) (M km/year)	90		
Transport need - heavy duty trucks (>3.5 t) (M km/year)	260		
Buildings & Heating			
Heating demand (space heating + domestic hot water)(GWh/year)	1332		
Electricity			
Electricity demand within city boundaries (GWh/year)		989	
Waste			
Collected waste within city boundaries (tonnes)			142839
Other			

A-1.4b: GHG emissions by source sector (from economic model inputs)					
Base year	2020				
Unit	t CO_2 equivalent/ year				
	Scope 1	**Scope 2**	**Scope 3**	**Total**	**% of Total**
Transport	225737			225737	25%
Buildings & Heating	250416			250416	27%
Electricity		399507		399507	44%
Waste*			39876	39876	4%
Other	1880			1880	0%
Total	478033	399507	39876	917416	100%

** Includes Scope 1 Waste emissions (produced and processed in the city) and Scope 3 (produced by the city but processed outside the city border)*

A-1.4b: GHG emissions by source sector (from economic case)	
Base year	BAU 2030 (Business as Usual 2030)
Unit	t CO_2 equivalent/ year

	Scope 1	Scope 2	Scope 3	Total	% of Total
Transport	208592			208592	23%
Buildings & Heating	238207			238207	26%
Electricity		423001		423001	47%
Waste*			33011	33011	4%
Other					0%
Total	446800	423001	33011	902811	100%

** Includes Scope 1 Waste emissions (produced and processed in the city) and Scope 3 (produced by the city but processed outside the city border)*

A-1.5: Graphics and charts

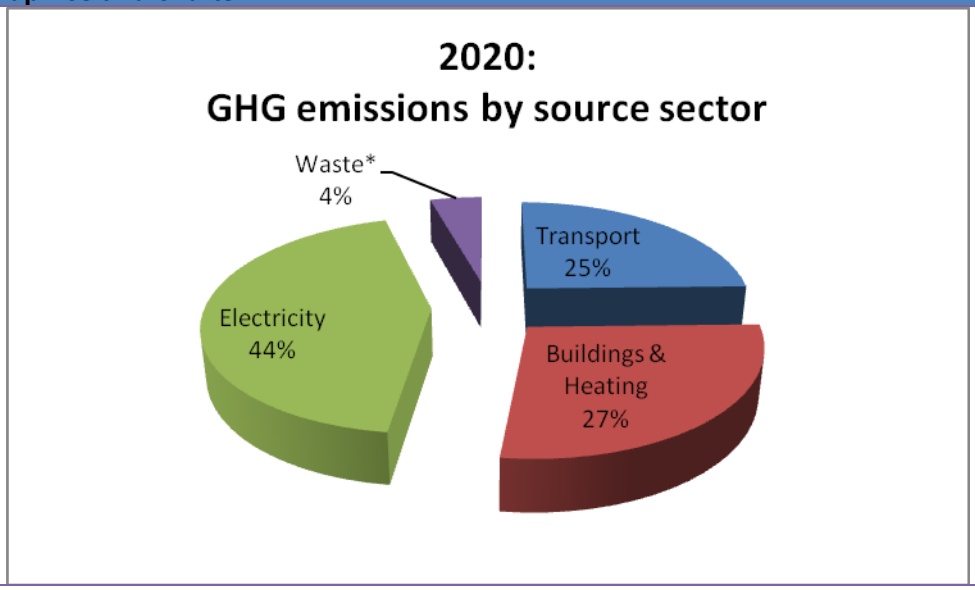


Figure 3: GHG emissions by sector (2020)

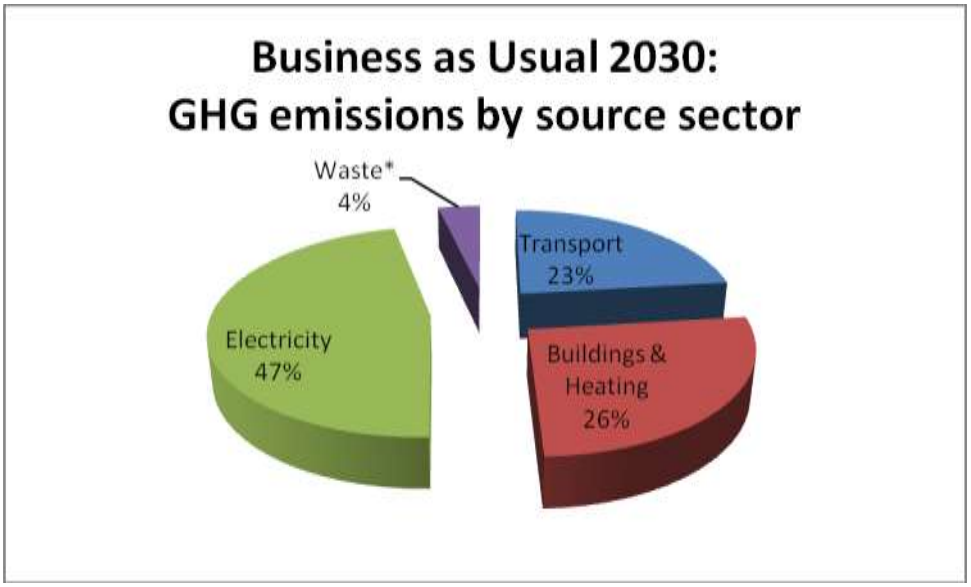


Figure 4: GHG emissions by sector (BaU2030)

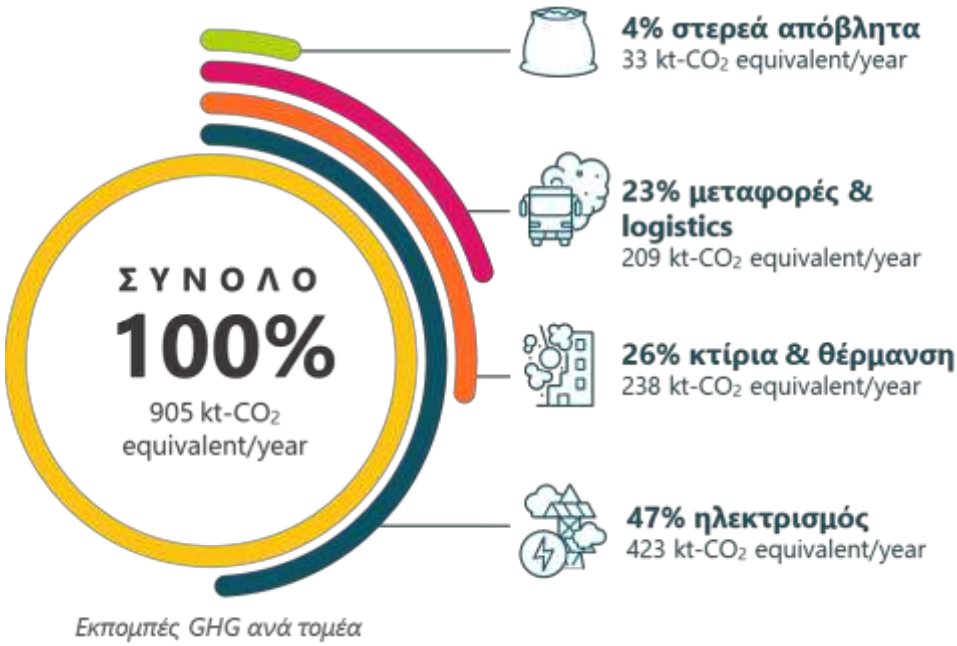


Figure 5: GHG emissions by sector (BAU2030)

A-1.6: Description and assessment of GHG baseline inventory

The methodology followed to formulate the baseline GHG emissions inventory was developed above and was based on the completion of the indicators and quantities requested by the proposed "Economic model" tool.

In the base year (2020), the electricity sector is the one with the highest GHG emissions at 44% (399,507 equivalent tonnes of CO_2 per year), followed by the building stock heating sector at 27% (250,416 equivalent tonnes of CO_2 per year). The transport and logistics sector is also very close at 25% (225,737 CO_2 equivalent tonnes per year), while emissions from waste management account for only 4% (39,876 CO_2 equivalent tonnes per year) of total emissions (Table A-1.4b).

In more detail, the Municipality of Thessaloniki has significant energy needs for heating its building stock, both for space heating and water heating, amounting to 1,332 GWh per year, while the electricity needs within the boundaries of the Municipality, including lighting and other infrastructure loads, are estimated at 989 GWh per year (Table A-1.3). With regard to the most energy demanding category, that of heating for the building sector, it is observed (Table A-1.1) that the main source of heating fuel is natural gas and therefore it appears that the Municipality of Thessaloniki is highly dependent on the availability and supply of natural gas.

In the transport and logistics sector it is clear that both passenger and freight transport contribute to the increase in greenhouse gas emissions. In particular, passenger car journeys are 767 million kilometres per year, while bus journeys are around 14 million kilometres per year. Similarly, the freight transport sector makes a significant contribution of 350 million kilometres per year, which demonstrates the importance of having measures and actions in place. As regards waste management, 142,839 tonnes of waste are collected annually for the Municipality of Thessaloniki (Tables A-1.1 and A-1.3).

It is worth mentioning that although the energy consumed in GWh in the electricity sector is lower than that for heating the building sector, the emissions in tonnes of CO2 equivalent are higher. This

variation is due to the emission factors adopted for this Plan, as shown in Table A-1.2, which were formulated taking into account relevant factors from international literature based on relevant standards (for gas and oil) and the emission factors for electricity taking into account the energy mix for 2020.

Moreover, although the kilometres travelled by buses are significantly lower than those of passenger cars, the emissions released in the former case are much higher (Table A-1.2) which is mainly due to the age of the urban bus fleet. At the same time, emissions from freight transport are significantly higher than those from passenger transport by car, which demonstrates the need to strengthen this sector with actions towards climate neutrality.

In order to achieve the climate neutrality target for the Municipality of Thessaloniki, the reduction of emissions from all sectors is required to reach 80%. This reduction is required to be made by BAU 2030 (Business as Usual 2030), where keeping the city's population constant until 2030, as commented above, the final contribution of each sector to GHG emissions is derived.

According to the calculations resulting from the “Economic Model” in the year BAU 2030 the emissions per inhabitant of the Municipality of Thessaloniki are 2.84 tonnes of CO_2 equivalent/ inhabitant.

In more detail, emissions from the electricity and heating sectors of the building stock will be at equally high levels with rates of 47% and 26% respectively, which places them in two important sectors that can be improved in terms of energy savings and emissions reduction with appropriate efficient actions. At the same time, the transport and logistics sector is responsible for about a quarter of total emissions at 23%, while the waste management sector also appears in this case at 4%.

In the field of land use and green infrastructure, the estimation of greenhouse emissions is based on Hellenic Statistical Authority data on economic activities in the Municipality of Thessaloniki, on data derived from the GIS of the Municipality of Thessaloniki and on data provided by the AUTH, UoM, and TIF - Helexpo. Three topics were considered (a) activities and greenhouse emissions, (b) tree plantations and CO2 absorption capacity, and (c) existing renewable energy production facilities in public and common areas. The sector's GHG emissions result from agricultural activities not related to buildings, energy, and waste, which are recorded in other sectors of this report. Hellenic Statistical Authority data show that GHG emissions from forestry activities in the Municipality of Thessaloniki are zero.

The activity that produces greenhouse gas emissions in the Municipality of Thessaloniki is related to the crops in the area of the vegetable gardens, which according to the Municipality Urban land uses Plan is of 1,880 hectares. The estimate of greenhouse gas emissions from the cultivation of vegetables and fruit ranges from 0,5 to 2 tonnes of CO2 per hectare per year. We chose an average of 1 ton per acre per year, and the total annual GHG production is estimated at 1,880 tons. In the forthcoming Municipality Urban land uses Plan, the area with vegetable crops is limited to 25 acres.

The recognition of the contribution of the sectors to energy consumption and environmental burden also shapes the Municipality's strategy, which prioritises a series of actions to address pollutant emissions and consequently climate change, aiming for climate neutrality by 2030. What is worth mentioning is that reducing emissions from the two most energy-intensive sectors, electricity and heating of the building stock, mainly requires actions that are not the responsibility of the Municipality of Thessaloniki, but relate to decisions and actions of the Central Government. On the other hand, in the transport and logistics sector, actions to reduce emissions are mainly the

responsibility of the Municipality of Thessaloniki and are more immediately feasible.

3.2 Module A-2 Current Policies and Strategies Assessment

Module A-2 “Current Policies and Strategies” lists the current relevant policies, strategies, initiatives, or regulation from local, regional, and national level, relevant to the city’s climate neutrality transition. The relevant Action Plans and strategies developed by the Municipality to reach its environment and energy goas are included. This chapter also presents the current national funding programmes that contribute to energy saving, pollutants reducing and, thus, its pathway towards climate neutrality.

A-2.1: List of relevant policies, strategies &regulations					
	Type (regulation/ policy/ strategy/ action plan	Level (Local, regional, national, EU)	Name & Title (Name of policy/ strategy/ plans)	Description (Description of policy/ strategy/ plans)	Relevance (Describe relevance/ impact on climate neutrality ambition)
1	Legislation	National	Law 4936/ 2022: National Climate Law - Transition to climate neutrality and adaptation to climate change	Measures and policies are put in place to ensure the country's gradual transition to climate neutrality by 2050.	The measures and policies relate to the penetration of renewables, the reduction of greenhouse gas emissions from various sectors, such as buildings and transport, with the ultimate goal of climate neutrality.
2	Legislation	National	Law 4784/ 2021: Greece on the move: Sustainable Urban Mobility Micro-mobility Arrangements for the modernization, simplification and digitalization of procedures of the Ministry of Infrastructure and Transport and other provisions.	It establishes a framework for the preparation of the SUMPs and sets out procedures for the preparation, examination, characterisation, monitoring and supervision of the SUMPs in order to promote sustainable mobility. In addition, arrangements for micromobility, in particular for Light Personal Electric Vehicles, are outlined.	The contents of the Law are inextricably linked to the promotion of sustainable mobility and the strengthening of mild environmentally friendly means of transport. The drafting of a SUMP with specific priorities and interventions aimed at promoting alternative means of transport and the drafting of a relevant legislative framework to regulate the circulation of light mobility vehicles in cities will help Thessaloniki's transition to a zero-emission era.
3	Legislation	National	Law 4710/ 2020: Promotion of electromobility and other provisions.	This includes actions to expand the use of low- and zero-emission vehicles, the development of recharging	This Law is directly linked to achieving climate neutrality as it promotes electromobility and the use of low emission vehicles.

				infrastructure, especially publicly accessible ones, and a regulatory framework for the electric mobility market.	
4	Legislation	National	Law 4819/ 2021: An integrated framework for waste management.	Recycling and the circular economy are further promoted as key policy tools for the rational management of waste, and new targets are set for 2035.	This Law sets national requirements for the reuse and recycling of Municipal Waste management, the requirements for the recycling of packaging, while promoting the separate collection of paper, glass, plastics, metals and biowaste towards a "zero waste" society and related greenhouse gas emissions.
5	Strategy	National	National Strategy for Smart Specialisation	It is a national strategy for growth based on Research and Innovation.	Describes policies and interventions at national and regional level for development using new ICTs and their integration into all sectors of the economy, which can work positively to address the causes of climate change.
6	Strategy	National	National Waste Management Plan (NWMP)	The 2020-2030 NWMP reflects a set of EU policies, such as the First and Second Action Plans for the Circular Economy, the European Green Deal and the Plastics Strategy.	The NWMP aims to prevent and reduce waste production, limit the use of natural resources while improving their efficiency, with the ultimate goal of moving towards a circular and sustainable economy.
7	Action Plan	National	National Energy and Climate Plan (NECP)	A National Strategic Plan with a detailed roadmap for achieving comparable energy and climate targets by 2030.	The National Strategic Reference Framework (NSRF) develops the Long Term Strategy 2050 for a successful and sustainable transition to climate neutrality by 2050. The roadmap foresees

					actions to save energy, reduce pollutants, penetrate renewable energy sources, green investments, digitise energy networks and use new ICTs to achieve its objectives.
8	Action Plan	National	National Plan for the promotion of electromobility	Consultation on an Action Plan for the development of charging infrastructure, the electrification of transport and the development of an electromobility ecosystem.	The Plan facilitates the integration of electromobility into the transport system in order to achieve the country's climate neutrality target by 2050.
9	Strategy	Regional	Regional Spatial Planning and Sustainable Development Plan	The Regional Spatial Planning and Sustainable Development Plan aims, amongst others, at the protection, utilisation and sustainable management of the natural and human resources of the Region, the integration of the protection of the natural environment and the landscape in all individual policies.	The plan clearly states the intention to reinforce international best practices for increasing energy efficiency and reducing energy requirements.
10	Strategy	Regional	Regional Plan for Adaptation to Climate Change	The aim of the Plan is to identify and prioritize the necessary measures and actions for the adaptation of the Region of Central Macedonia to the upcoming climate changes.	The plan refers to projects and actions that use new information and communication technologies to address climate change.
11	Strategy	Regional	Integrated Sustainable Urban Development Strategy of Thessaloniki	An integrated plan of actions/ interventions to improve the mobility and quality of life of the residents of the Metropolitan area	The actions aim to promote sustainable mobility, improve the urban environment for the benefit of residents and tourists and ultimately reduce

				of Thessaloniki.	environmental impacts.
12	Strategy	Regional	Regional Waste Management Plan (RWMP)	The Waste Management Plan is an integrated plan for the management of waste produced in the Region. It shall determine the general guidelines for their management, in accordance with the guidelines of the National Waste Management Plan and the National Plan for the Waste prevention and indicates the appropriate measures that promote hierarchically and in combination: a) prevention, b) reuse, c) recycling, d) other types of recovery, such as energy recovery; and (e) safe disposal at the level of the Region.	The objectives of the RWMP are the implementation and application of measures and actions that promote hierarchically a) prevention, b) reuse, (c) recycling; and (d) other types of recovery, such as energy recovery, and contribute to the implementation of the circular economy which is a necessary and indispensable condition for achieving climate neutrality.
13	Action Plan	Regional	Operational Plan of the Region of Central Macedonia 2021-2027	It is the main financial tool of the Region of Central Macedonia in which actions, policies and strategies are proposed in 5 axes.	The Regional Operational Plan includes proposals and actions at the level of municipalities to increase energy efficiency and digitise municipal services.
14	Strategy	Local	Sustainable Urban Mobility Plan of Thessaloniki (SUMP)	The SUMP is the strategically designed plan to meet the mobility needs of people and businesses in the Municipality of Thessaloniki while ensuring quality of life.	During the implementation of the SUMP and in accordance with the views of citizens and stakeholders, realistic expectations for the city of Thessaloniki were formed. More specifically, the SUMP is expected to promote environmental protection and air quality improvement through interventions included in its implementation scenarios.

15	Strategy	Local	Electric Vehicle Charging Plan	Locating charging stations and organising the corresponding electromobility infrastructure, in order to increase the demand for electric vehicles and cater for the requirements of existing ones.	The promotion and enhancement of electrification through the installation of chargers is in line with the City's climate neutrality goals.
16	Strategy	Local	Thessaloniki 2030, Strategy for Urban Resilience	In 2014 Thessaloniki became a member of the network of "100 Resilient Cities" and formulated in 2017 the Urban Resilience Strategy for 2030. The aim of the Strategy is to ensure prosperity its citizens and invest in its human resources, strengthening the local economy and with respect to the natural resources.	The Strategy aims to reduce water, air and soil pollution, which is an EU target. One of the four pillars of the strategy is the creation of a sustainable city with actions aimed at improving air quality, amongst others.
17	Strategy	Local	Digital Transformation Strategy for the city of Thessaloniki (2017-2030)	It is the roadmap and the reference framework for the Digital Transformation of the Municipality with a 2030 horizon. The Strategy is expected to further contribute to the efficiency of public administration, the removal of geographical and social exclusions, the strengthening of the integration of all citizens in the economic and social life of the Municipality, as well as the creation of new jobs.	The main pillars/ areas of the Digital Transformation Strategy are the exploitation of city data and the strengthening of digital innovation. Digital solutions are a key factor in transforming the city into a smart, resilient and zero-emission city, which is also highlighted in the Green Deal.
18	Action Plan	Local	Sustainable Energy and Climate Action Plan (SECAP)	The Municipality's Action Plan for the definition and achievement of its	SECAP is the key document that sets out the energy objectives of the Municipality and

				energy targets.	explains what specific actions by sector will achieve these objectives.
19	Action Plan	Local	Energy Efficiency Plan for Buildings	Action plan for improving the energy efficiency of the Municipality's buildings.	Energy saving in the public building sector, which aims to upgrade the energy efficiency of buildings, reducing greenhouse gas emissions.
20	Action Plan	Local	Local Waste Management Plan (LWMP)	The Local Waste Management Plan for the optimisation of waste management at municipal level, referring to wate generated within the boundaries of the Municipality of Thessaloniki.	The LWMP includes actions related to the rational management of waste (prevention, reuse, recycling, etc.) in order to create a "zero waste" society in the Municipality of Thessaloniki.
21	Initiative	Local	Covenant of Mayors on Climate and Energy	Voluntary commitment of the Municipality to achieve the European climate and energy targets.	The Covenant of Mayors was launched in 2008 to help municipalities achieve the European 20-20-20 targets by 2020, including a CO2 reduction of at least 20% and since 2016 it refers to the 40% greenhouse gas reduction target by 2030.
22	Initiative	Local	Memorandum of Understanding between the Municipality of Thessaloniki and THESSM@LL	Development of joint actions for the collection and processing of mobility data and the creation of tools and infrastructure to support the decision-making process and the provision of real-time information services on mobility to the residents of Thessaloniki.	The transformation of the entire city of Thessaloniki into a study case of the innovative mobility services developed in the Laboratory allows the evaluation of the solutions in real conditions by the stakeholders, aiming to maximize the benefits of the services provided to citizens, while reducing the negative impacts of the transport system on atmosphere and environment.
23	Initiative	Local/	Declaration of Intention to	The Municipality of Thessaloniki signed	The Regional Innovation Hub seeks to support

		Regional	cooperate and participate in the ecosystem of the EIT Urban Mobility Regional Innovation Hub for Urban Mobility in Greece	the declaration of intent to participate in Ris Hub Greece in order to participate in the innovation ecosystem for Sustainable Mobility in the Region of Central Macedonia, to highlight and implement innovative solutions in urban environments that promote sustainable, smart and interconnected mobility and climate neutrality.	municipalities in the transition to innovative mobility according to the priorities of each municipality and their cooperation in order to raise financial resources.
24	Feasibility study	Local	Expansion and Optimization of Waste Collection Services in the Integrated Urban Waste Management System of the Municipality of Thessaloniki (TA2018067 GR HUB	Investment Plan, for the period 2020-2030, through the gradual introduction of new elements of the waste collection system, initially with pilot projects and then with their expansion, with a focus on bio-waste collection and source separation.	Proposals and investment plan for the improvement and expansion of the separate waste sorting system of the Municipality of Thessaloniki aiming at the creation of a "zero waste society" in the Municipality of Thessaloniki.
25	Funding programme	National	Kinoume ilektrika I and II	Subsidy for the purchase/ supply of electric vehicles by private individuals.	Accelerating the transition of transport from oil to electricity that can be generated from renewable sources, reducing greenhouse gas emissions.
26	Funding programme	National	Green Taxi	Subsidy scheme for Public Passenger vehicles (TAXI)	Aid for the purchase or leasing of one (1) pure electric car with zero CO2 emissions to improve urban air quality.
27	Funding programme	National	Research-Innovate 2021-2027	The main objective of the Action is to link research and innovation with entrepreneurship and to enhance the competitiveness, productivity and extroversion of	Through the Action is foreseen the development of products to enhance business innovation and help achieve the goal of climate neutrality for cities by 2030.

				enterprises towards international markets, in the direction of the transition to quality innovative entrepreneurship and increase domestic value added.	
28	Funding Programme	National	Greek Smart Cities investment initiative - Investmnents in Smart Sustainable Cities (SSC) [Recovery Fund]	Implementing projects to facilitate the transformation of 11 Greek cities into smart cities through investments in smart sustainable cities, as well as in infrastructure and systems for a sustainable and green urban future.	The project includes a total of twelve actions for the development of intelligent systems and infrastructure.
29	Funding programme	National	HLEKTRA	Energy upgrading of public sector buildings.	Energy savings in the public building sector, aiming at upgrading buildings to at least energy class B, with a reduction of greenhouse gas emissions of at least 30% for each building.
30	Funding programme	National	Antonis Tritsis	Improvement and modernization of the Municipality's infrastructure with the aim of sustainable development and the safety and quality of life of citizens.	Upgrading of the Municipality's school buildings to save energy and reduce pollutants.
31	Funding programme	National	"Save 2021" and "Save-Renovate for young people"	Improving the energy class of households.	The total investment of the programme will contribute to the energy renovation of at least 105,000 homes by 2025, facilitating the transition to climate neutrality.
32	Funding programme	National	Recycle - replace my appliance	Grants to households to replace old appliances with new, environmentally friendly and more energy efficient ones.	In addition, the project's investment is expected to contribute to energy savings and pollutant reduction, targeting the untapped energy potential of households, facilitating the transition

					to climate neutrality.
33	Funding programme	National	Photovoltaics system on roof program grant	Subsidies to households and farmers to cover their energy needs with green energy produced by themselves.	Accelerating the transition of electricity generation from fossil fuels to renewable sources, reducing greenhouse gas emissions.
34	Operational Programme	Local	Operational Programme (OP) of the Municipality of Thessaloniki	The Operational Programmes of the first-tier local authorities are local policy tools	The OP includes all the actions that the Municipality of Thessaloniki plans to implement for the period of validity of the OP (e.g. 2020-2023 etc.)
35	Action Plan	Local	Urban Heat Island (UHI) Adaptation Strategies Evaluation Report	The Plan includes an assessment of the future climate impacts of urban heat island effects and an evaluation of adaptation plans	It focuses on examining the impact of green interventions in the urban area of Thessaloniki.
36	Action Plan	Local	Development of UHI adaptation action plans, good practice guides & economic tools	It is addressed to relevant local/ regional authorities, stakeholders and professionals from different sectors	The relevant adjustment measures include: (i) Short-term adaptation measures to reduce heat exposure. (ii) Long-term adaptation measures based on the assessment of future climate change on the UHI effect.
37	Action Plan	Local	2050 CliMobCity Action Plan for the Municipality of Thessaloniki-	Developed packages of measures for the reduction of CO2 emissions with the reinforcement and further elaboration of actions proposed in the Municipality of Thessaloniki's SUMP	The measures in the Action Plan aim to reduce CO2 emissions from urban transport in cities and to create environmentally and climate-friendly urban mobility across the EU.
38	Operational Programme	Regional	Regional Association of Solid Waste Management Agencies of Central Macedonia (FODSAKM) Operational Plan	The FODSAKM operational plan includes actions related to the achievement of environmental and energy objectives	The actions of the Plan encourage and enhance the achievement of the Municipality of Thessaloniki's climate neutrality objectives.

39	Action Plan	Local	ROOF Thessaloniki Integrated Action Plan. Social and Affordable Housing and Combating Housing Exclusion and Homelessness in Thessaloniki	Action Plan for social and affordable housing and combating housing exclusion and homelessness in Thessaloniki	The aim of the Plan is to create conditions and facilitate relevant interventions and policies in order to ensure the right to housing for all citizens of the Municipality. The appropriate energy configuration and use of these buildings can lead to the reduction of emissions emitted from these buildings and the achievement of the climate neutrality objective.
40	Plan	Local	Municipality Urban land uses Plan	It concerns the general urban planning organization of the spatial units within the administrative boundaries of the Municipality of Thessaloniki	It includes policies and strategies for the spatial organisation of the Municipality of Thessaloniki, with interventions in building, services, energy, local economy, circular economy, waste, transport, housing, green spaces, renewable energy and nature-based solutions.
41	Plan	Local	Thessaloniki International Fair Special Urban Plan	It concerns the redevelopment of the Thessaloniki International Fair	It provides for the creation of a single block maximum permitted building area in the entire building block is 96,000 sq.m., and the remaining 176 acres of the building block area is for open spaces, common areas, and green spaces.
42	Action Plan	Local	Urban Accessibility Plan	According to the provisions of par. 10 of article 121 of Law 4819/ 2021 (A΄129), there is a need to draw up a programme for the definition of necessary interventions to ensure accessibility of public open spaces,	The plan will identify interventions that will enhance accessibility within the Municipality of Thessaloniki, promoting walking.

				including pedestrian networks, escape routes, relief areas, temporary care points and shelters for citizens within the administrative boundaries of local authorities.	
43	Business Plan	Local	Operational Plan for ensuring Public and Communal spaces	The Operational Plan for ensuring Public and Communal spaces intends to contribute to the completion of the implementation of the City Plan through the acquisition of designated public and communal spaces and is geared towards documenting the existing situation for the above areas for which eminent domain has not been granted.	Conists a tool for the City to plan for the completion of City plan implementation and the acquisition of designated public and common areas on a priority basis. Through open public data on the geoportal of the Ministry of Environment and Energy mapsportal.ypen.gr, actions related to the densification of urban greenery, and nature-based solutions to reduce the heat island and improve the microclimate in urban neighbourhoods can be monitored
44	Action Plan	Local	Smart City Strategy: Intelligent Thessaloniki	The plan aims to make Thessaloniki a pole of growth and extroversion, taking into account parallel emblematic investments. At the same time, it will create the conditions for the development of new and outward-looking business activities, attract investment and create new employment, as well as provide multiple alternative options for recreation and experiential activities.	Climate neutrality is intertwined with the concepts of smart city and digitalisation. In this framework, the Municipality, by adopting smart solutions and intelligent applications, aims to highlight and strengthen Thessaloniki as a strong and internationally recognised business, tourist and cultural destination.
45	Plan	Local	Special Spatial Plan for the	The purpose of the Special Spatial Plan is	The relationship of the city, in its metropolitan

			Coastal Front of the Thessaloniki Urban Complex	to highlight the big picture of the coastal front of the Thessaloniki Urban Complex (Kalochori to Angelochori area). The Plan includes at mobility enhancement, upgrade of the natural and built environment along the maritime zone, giving a new, urban regulated, public space to the residents and visitors of the Thessaloniki Urban Complex.	dimension, with the sea and its extensive coastal front is crucial for resilience and adaptation to climate change. The continuous zone of a public upgraded urban space between the city and the sea can receive important green infrastructure projects and nature-based solutions that will be instrumental in mitigating the effects of climate change on the metropolitan scale of the city.

A-2.2: Description & assessment of policies

Over the last decade, the European Union has stepped up its efforts to mitigate climate change by setting high targets for Member States to achieve. In this context, Greece is working systematically to align national legislation with the relevant European energy and climate guidelines and is promoting financial programmes in this direction, both in the public and private sectors.

Indicative examples of funding programmes for energy and climate at national level, in which the Municipality of Thessaloniki has participated in the past: EKSOIKONOMO-OTA, Bioclimatic urban renewals, while the following funding programmes are currently ongoing: Save 2021/ exoikonomo2021, Save-Renovate for young people, Photovoltaics system on roof program grant, Recycle - replace my appliance, kinoume ilektrika and Green Taxi, which address individuals, , as well as ELEKTRA and "Antonis Tritsis", which aim to upgrade the energy efficiency of public sector buildings. At the same time, the Municipality is eligible for financing the implementation of projects that serve national objectives through the NSRF, the Green Fund and Public Investment Program. Finally, the Municipality's participation in the Greek Smart Cities Programme funded by the Recovery Fund and the launch of the new Research-Innovate 2021-2027 is expected to strengthen the city with actions and projects that will facilitate its digital transformation and accelerate its transition to a smart, sustainable and interconnected city. The Municipality of Thessaloniki Operational Programme can integrate several of the proposed actions within the 2030 Climate Neutrality Action Plan, focusing on those within its direct responsibility.

Law 4936/ 2022: National Climate Law - Transition to climate neutrality and adaptation to climate change, urgent provisions to address the energy crisis and protect the environment" is the most recent relevant law, which emphasizes the goal of climate neutrality by 2050. Law 4936/ 2022 establishes measures and policies to ensure the country's gradual transition to climate neutrality by the year 2050 and sets interim climate targets for the years 2030 and 2040 towards the reduction of net anthropogenic greenhouse gas emissions. The law provides, amongst others, for the preparation of Regional Plans for Climate Change Adaptation, as well as Municipal Emission Reduction Plans. Specifically, the Municipal Emission Reduction Plan includes an inventory and emission reduction targets for energy-consuming buildings, equipment and infrastructure used by first-tier local authorities and legal entities supervised by them. The Law as a whole promotes the penetration of Renewable Energy Sources (RES) while eliminating the production of electricity from fossil fuels. It also introduces specific measures to reduce emissions from buildings, for example

from 1/1/2025 the sale and installation of heating oil burners will be prohibited.

Also, at the end of 2019, the National Energy Efficiency Action Plan was integrated into the National Energy and Climate Plan (NECP), emphasizing quantitative targets per sector of action to mitigate climate change. A revision of NECP is expected within 2023, which mainly further promotes the Photovoltaics installation for electricity generation and the energy efficiency of the country's building stock through energy saving programmes and the installation of heat pumps. For building stock upgrading, investments of 642 million euros per year are foreseen for the period 2021-2025 and 935 million euros per year for the period 2026-2030.

At regional level and in accordance with the requirements of Law 4414/ 2016, the Region of Central Macedonia has developed the Regional Plan for Climate Change Adaptation, which is a policy document for the implementation of the region's strategy to address the consequences of climate change and to shield the region against them. In terms of addressing climate change directly through the use of 'smart solutions', the plan proposes the creation of smart grids and demand management to mitigate the effects of increased electricity demand due to warming. In addition, the Regional Spatial Planning and Sustainable Development Plan was also established, which is an update of the Regional Spatial Planning Framework of Central Macedonia based on the National Strategy for Climate Change Adaptation and the National Energy and Climate Plan (NECP) as well as the requirements of the de-carbonisation. Within the plan there is a clear reference to the intention to strengthen international best practices for increasing energy efficiency as well as reducing energy demands by focusing on reducing losses through the development of smart energy grids at regional and local level. Finally, the Integrated Sustainable Urban Development Strategy for Thessaloniki includes projects and actions aiming at sustainable mobility promoting, improving the urban environment for the benefit of residents and tourists and ultimately reducing environmental impacts.

At local level, the Thessaloniki 2030 Urban Resilience Strategy has four pillars/ objectives that include proposals and actions to make Thessaloniki a jointly open sustainable city with a dynamic local economy and an urban governance system. At the same time, a key objective of the Strategy is to redefine the city's relationship with the sea with benefits for its resilience and its population. Since the Strategy was formulated in 2017, two evaluation reports have been carried out, in 2020 and 2022, which strongly emphasise the weakness of data collection and the lack of services interconnection to systematically make information available for evaluation. An important conclusion of the two evaluations of the Strategy is the difficulty in collecting data and the lack of systematic communication between the relevant Services and stakeholders. For this reason, relevant action on the development of an appropriate governance and communication model between partners will be analysed in Module C-1.

The Covenant of Mayors is a European initiative launched in 2008 in which local and regional authorities can participate and make a voluntary commitment to achieve European climate and energy targets. Since 2016, the Covenant of Mayors has been addressed at international level, with the main objective of reducing greenhouse gases by 40% by 2030, promoting the updating of Sustainable Energy Action Plans (SEAPs) into Sustainable Energy and Climate Action Plans (SECAPs) towards the climate change mitigation. The Municipality of Thessaloniki joined the Covenant of Mayors in 2011 and in this framework it developed a SEAP in 2014, creating a series of proposed actions in different sectors for energy saving, use of renewable energy sources and reduction of pollutants, with emphasis on the building and transport sectors. In addition, the city of Thessaloniki has developed its 2030 Strategy for Resilience and prosperity, which includes actions to reduce pollutants, improve air quality and provide environmental education for citizens.

The National Smart Specialisation Strategy 2021-2027 is a strategy document for the promotion of innovation, research and technology, aiming to enhance sustainable growth in 8 sub-sectors of economy. The National Smart Specialisation Strategy is further specified by region. The Region of

Central Macedonia adopted its strategy in 2016. Within the National Smart Specialisation Strategy, extensive reference is made to measures and actions that can be implemented at national and regional and local level regarding Sustainable Energy.

At local level, the Digital Transformation Strategy for the city of Thessaloniki 2017-2030 is inextricably linked to the long-term planning of the Municipality and specifically to the strategy "Thessaloniki 2030". In terms of its structure, the strategy is based on the following five axes: a connected city, a city for all, a city that shares its data, a participatory city and a city that supports digital innovation. Each axis takes into account the benefits for the city and its citizens, the priorities, objectives, actions and the vision of the municipality. The formulation of the Digital Transformation Strategy of the Municipality of Thessaloniki was a prerequisite for the continued transformation of the city into a Smart City, while aligning ICT projects and actions with strategic objectives to increase added value. The implementation of the Digital Transformation Strategy is being developed over three time periods, with an evaluation at the end of each period, in order to achieve optimal targeting of the relevant actions.

In the transport sector at national level, in recent years, legislation has been adopted to support the acceleration of the transition of the transport and urban mobility system to the era of climate neutrality and innovative interconnected mobility. Law 4784/ 2021: Greece on the move: Sustainable Urban Mobility Micromobility Regulations for the modernization, simplification and digitization of procedures of the Ministry of Infrastructure and Transport and other provisions (Government Gazette Vol. A' 40/16.3.2021) establishes the framework for the preparation of Sustainable Urban Mobility Plans for the first and second tier local authorities in Greece. The process of preparing the Thessaloniki Sustainable Urban Mobility Plan is in accordance with this legislation and in June 2022 with the Government Gazette Vol. B' 2775/03.06.2022 it was officially characterized as the Urban Mobility Plan of the Municipality of Thessaloniki. In addition, the framework for micro-mobility vehicles is initially established in Greek cities, providing a solution to various issues that had arisen from their entry into the transport systems of cities. Problems related to the speed limit, traffic lanes, parking space, training, etc. By establishing a framework for their operation, cities are given the opportunity to introduce these vehicles safely into the lives of their inhabitants, thereby reducing car use and promoting sustainable mobility.

In addition, Law 4710/ 2020: Promotion of electromobility and other provisions, launched a national effort to transition the transport system to more environmentally friendly forms of energy, providing fiscal and non-fiscal incentives for the development of electromobility. At the same time, the law organises the electromobility market in the country and defines urban planning regulations for the installation of charging infrastructure for electric vehicles. The National Electromobility Plan is currently under public consultation, with targeted policy measures for the electrification of vehicle fleets, the development of charging infrastructure and the development of ecosystems electrification.

At local level, the Sustainable Urban Mobility Plan of Thessaloniki was formulated in accordance with the current legislation for the preparation of such plans (4599/ 2019), while it also took into account the updated European directives Eltis. It was adopted in 2021 and is the main strategic document, on behalf of the Municipality of Thessaloniki, related to transport and sustainable mobility, aiming to upgrade the urban fabric and the quality of life of its residents and visitors. The main purpose of the SUMP is to facilitate the movement of residents, visitors and goods in order to ensure maximum ease and upgrade accessibility to all daily activities. To this end, the SUMP promotes alternative means of transport (public transport, walking and cycling), which will lead to an increase in the level of safety for all travellers, a reduction in environmental pollution and a total improvement of the quality of the urban fabric. With the implementation of the SUMP interventions by 2030, redefining the role and functioning of areas of the Municipality of Thessaloniki in the new era of the multimodal public transport system and supporting polycentricity and the creation of local

centres, significant improvements in the daily life and quality of life of the Municipality of Thessaloniki residents are expected. The Thessaloniki SUMP refers to the development of an action plan for the participation of citizens and stakeholders, as well as the signing a Memorandum of Cooperation. Both of the above actions were carried out during the SUMP implementation. Module C-1 includes actions related to the cooperation model of the actors involved in the SUMP implementation.

In 2022, the Electric Vehicle Charging Plan was completed, which proposes 225 locations where Electric Vehicle Charging Stations will be installed with a total of 444 charging slots. Through the EVCP, areas of potential interest for the installation of electric vehicle chargers have been identified, taking into account their social and functional characteristics (population density, proximity to points of interest, etc.).

The Municipality of Thessaloniki, recognizing the need to integrate innovation in mobility management to achieve the transition to the goals of climate neutral cities, but also the need for a human-centered approach to the use of technological solutions in mobility to facilitate the daily life of citizens and to support urban freight transport with the sustainable development of cities, signed in 2022, a declaration of intent to cooperate and participate in the ecosystem of the EIT Urban Mobility Regional Innovation Hub.

In addition, the Municipality of Thessaloniki will sign a Memorandum of Cooperation with the Thessaloniki Smart Mobility Living Lab (THESSM@LL), where HIT/ CERTH, as the coordinator of THESSM@LL, will provide the Municipality of Thessaloniki, amongst others, support in planning and decision-making for solving mobility problems and in achieving its climate neutrality goals, monitoring of KPIs related to mobility and transport of persons and goods, as well as air quality and climate neutrality related metrics, as well as the ability to evaluate the performance of an innovative service/ solution and support the Municipality in the innovative transition through its eventual adoption by users.

Law 4819/ 2021, which is the integrated framework for waste management - Incorporation of Directives 2018/ 851 and 2018/ 852 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste and Directive 94/62/EC on packaging waste, framework for the organisation of the Hellenic Recycling Organisation, provisions on plastic products, sets as targets the priority of circular economy over recycling, the recycling of municipal waste of at least 55% by 2025 and at least 65% by 2035 and the recycling of packaging waste of at least 65% by 2025 and 70% by 2030. In addition, it introduces the compulsory implementation of the Pay-as-you-throw (PAYT) scheme in local authorities with more than 100,000 inhabitants from 2023 and in local authorities with more than 20,000 inhabitants from 2028. Sets separate waste collection: in at least 11 waste streams, including new products such as textiles, household hazardous waste, pharmaceuticals and finally setting a quantitative target of 30% reduction of food waste by 2030 at retail and consumer level.

At national level, the new National Waste Management Plan (NWMP) was published in September 2020, which incorporates the European Directives on the Circular Economy into national legislation, with the aim of implementing it in the period 2020-2030, while it will be evaluated every five (5) years and if necessary revised. The NWMP 2020-2030 reflects a set of EU policies, such as the First and Second Action Plans for the Circular Economy, the European Green Deal and the Plastics Strategy. Indicative targets of the NWMP at national level are to minimise landfill to 10% by 2030 and to introduce mandatory separate collection at least for metals, paper, glass, glass, plastic, textiles (from 2023). At the same time, the organisation of new Alternative Management Systems (AMS), the strengthening of Source Separation and the transition from the linear production model to the circular economy by strengthening and incentivising circular entrepreneurship are among the most important changes that the NWMP is expected to raise. In order to implement the policies of the Regional Waste Management Plans (RWMPs) are established in each region, which specify the

management of all waste generated in the relevant geographical unit, in compliance with the objectives and provisions of the NWMP.

At local level, the Municipality of Thessaloniki has established the Local Waste Management Plan (LWMP) with targeted actions for the optimal management of municipal waste generated within the boundaries of the Municipality of Thessaloniki with specific targets and actions for the next 5 years (2021-2025), which is based on a new, more decentralized management model that emphasizes combined actions of the Municipality and the Region. The main objective of the Municipality is to promote an integrated plan for the rational management of municipal waste through prevention, reuse and recycling actions towards a "zero waste" city. In a similar context, the proposals of the feasibility study Expansion and Optimization of Waste Collection Services in the Integrated Urban Waste Management System of the Municipality of Thessaloniki, where an investment plan 2020-2030 is proposed for the improvement and expansion of the separate waste sorting system of the Municipality of Thessaloniki.

The Municipality Urban land uses Plan defines the framework for climate change strategies in the Municipality of Thessaloniki. It was approved by the Municipal Council in April 2019 and is awaiting approval by the Ministry of Environment and Energy. It sets out policies and strategies for the spatial organisation of Thessaloniki, energy, local economy, circular economy, waste, transport, housing, green spaces, renewable energy and nature-based solutions.

The Municipality Urban land uses Plan includes climate neutrality regulations and actions that affect greenhouse emissions in the Land Use & Green Infrastructure, such as limiting agricultural land for crops in the vegetable garden area of 25 acres, protecting and developing forests and woodlands in the Municipality of Thessaloniki, expanding green spaces in extensions on the perimeter of the Municipality of Thessaloniki, increasing open space and green space and curbing heat island conditions, interventions in 7 ex-military camps by creating new green spaces and tree canopy. Also the creation of three large metropolitan parks. In the city centre, a significant area of the Thessaloniki International Fair (TIF) is being shifted to common use as green space, and combined with open spaces of the Museums, the ex-military cam (Trito Soma Stratou), the Aristotle University of Thessaloniki, the Teloglio, the Pasha Gardens and the eastern walls. To the east, a park of approximately 185 hectares is being created in the area of Nea Elvetia and to the west a metropolitan park of 195 hectares is planned on the site of the old commercial railway station and the Holocaust Museum currently under construction. It also includes interventions in the port, with piers 1-3 receiving civic uses and port uses limited to piers 4-6. Redevelopment of the TIF with half of its area allocated to the metropolitan park. Expansion of six categories of parking (I-VI), pedestrian walkways, and bicycle lanes. Increase the use of renewable energy sources. The Municipality Urban land uses Plan foreseens the limitation of the agricultural area for growing vegetables in the Vegetable Gardens to 25 acres, rather than 1,880 acres, so in 2030 these emissions will not exist and no mitigation actions are required.

The approved (2020) Thessaloniki International Fair (TIF) Special Urban Plan provides for the creation of a single building block with a maximum building coefficient of 0.6, a coverage of 45%, and a maximum permissible building area of 96,000 sq.m. The remaining 176 hectares of the area of the TIF concern open spaces, public spaces and green areas. The draft Presidential Decree for the redesign of the Thessaloniki International Fair, covering a total area of 176 hectares, was approved by the Council of State as constitutional and legal (2021). In order to create green spaces and expand the tree cover in the redevelopment of the TIF, TIF-Helexpo S.A. has submitted a proposal to the Growth fund (National Fund of greece) to finance the project through a PPP shceme that provides for private participation with funds of 100 million euros. The budget of the project is estimated at 280-300 million euros and seems to be adopted by the Growth fund.

The Special Spatial Plan for the Coastal Front of the Thessaloniki Urban Complex study, which concerns the entire length of the Thessaloniki urban complex, describes and analyses the

development character and prospects of the maritime zone, as shown by demographic characteristics, economic activities and employment, and any comparative advantages of the area in relation to the wider environment. The guidelines and arrangements for spatial development and the organisation of overarching planning levels for the wider area are defined, giving a brief profile of the spatial framework and analysing the specific relationship and role of the coastal zone with the hinterland of the Urban Agglomeration of Thessaloniki. The key elements of the proposal for the spatial development and organisation of the coastal zone are then set out, and the pattern of development, spatial and urban organisation of its reference area in relation to the wider built environment. The permitted land uses and building conditions (building coefficient, maximum permitted coverage, maximum permitted height) are also specified, reference is made to the network of open public spaces and public facilities and the network of footpaths (status - structure - flows), as well as to the proposed infrastructure networks.

The inventory and analysis of current policies and strategies show that there are various frameworks available, either mandatory through legislation or voluntary through initiatives, at national, regional and local level, in order to take supporting actions appropriately designed for the gradual achievement of climate neutrality. It is clear that all the above-mentioned frameworks have been set up with a central focus on reducing greenhouse gas emissions, which will directly serve the long-term goal of climate neutrality. It should be noted, however, that the National Law and the National Energy and Climate Plan (NECP) set the target of climate neutrality by 2050, while the renewed Covenant of Mayors sets the target of 40% GHG reduction by 2030. Consequently, the Municipality of Thessaloniki will need to update its action plans and climate strategies, based on an accelerated plan for more immediate and ambitious measures to achieve climate neutrality by 2030. Finally, as ICTs become even more prominent and digitalisation even more necessary, policy frameworks on Smart Cities and Governance as a lever to halt climate change are expected to be further specified.

A-2.3: Emissions gap (kt CO2e)

	Baseline emissions (BAU 2030)	**Residual emissions offsetting[1]**		**Emissions reduction target[2]**		**Emissions gap (amount necessary to achieve net-zero)**	
	(Absolute value)	(Absolute value)	(% of BAU 2030)	(Absolute value)	(% of BAU 2030)	(Absolute value)	(% of BAU 2030)
Transport	209	53	25%	155	75%	0	0%
Buildings & Heating	238	30	12%	209	88%	0	0%
Electricity	423	93	22%	330	78%	0	0%
Waste	33	8	25%	25	75%	0	0%
Other	2	0	20%	2	80%	0	0%
Total	905	184	20%	720	80%	0	0%

[1] 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.
[2] Emissions reduction target percentage for "Other" sector is assumed to be the same as for the other 4 main sectors.

As presented in the previous sections, BAU2030 emissions for the year 2030 emitted by the electricity sector uses are the highest with the buildings & heating and transport & logistics sectors following. Emissions from the waste management sector are significantly lower, however it is a sector with great potential for improvement. Based on the calculations from the “economic model”, residual emissions from each sector were derived which are the emissions that cannot be reduced but can be mitigated by actions by stakeholders.

According to the Municipality of Thessaloniki's target for its climate neutrality transition, each sector contributes to the achievement of the final target. As shown in the table, to reach the overall target of 80%, the buildings & heating sector should mitigate emissions by 88% and the electricity sector by 78%. The transport & logistics and waste management sectors mitigate their emissions by 75%, which shows that there is space for improvement for these sectors with additional actions and projects mainly under the responsibility of the Municipality of Thessaloniki and local stakeholders. The other sector concerns emissions from vegetable gardens within the Municipality of Thessaloniki, with the new Municipality Urban land uses Plan reducing the area of vegetable gardens from 1,880 to 25 hectares, so in 2030 these emissions will not exist and no mitigation actions are required.

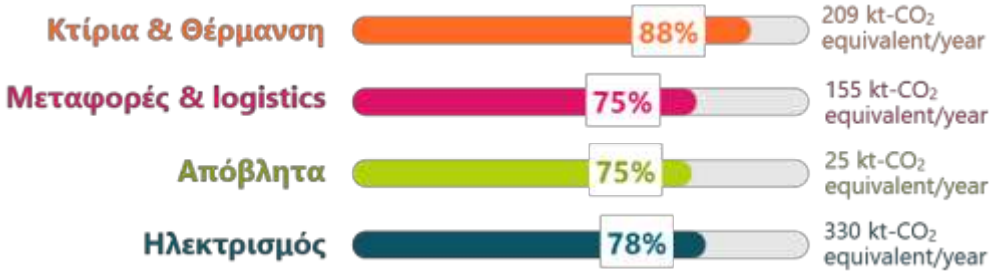


Figure 6: Emission reduction needs of each sector to reach the target (2030

A different illustration of each sector's contribution to the 2030 target shows the percentage that each sector contributes to achieving the overall 80% emissions reduction. In more detail, the electricity sector contributes 46% and the buildings & heating sector 29%. The transport & logistics sector follows with a contribution of 22% and the waste management sector with 3%.

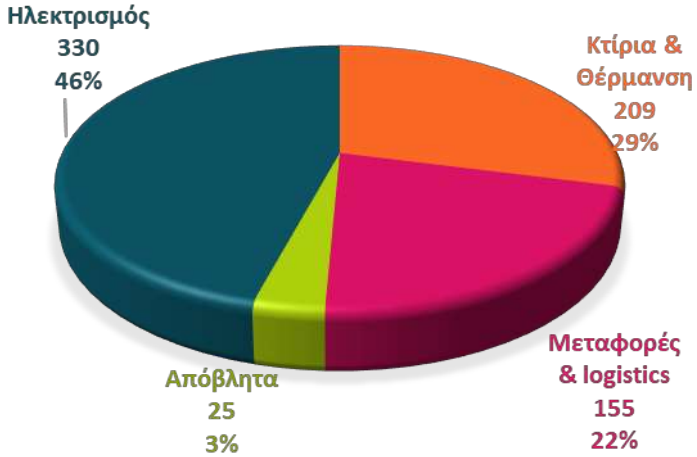


Figure 7: Emission reduction needs of each sector to reach the target (2030

Overall, by reaching the 2030 target, emissions per capita are 0.57 t CO2 equivalent/ capita.

The existing planning of the Municipality of Thessaloniki includes a number of projects and interventions that will contribute to partially meeting the above objective for the transition to climate neutrality (and are included in Module B of this document). However, in order to achieve the final target of reducing GHG emissions by 80% in the whole BAU 2030, additional actions and activities are required, as well as synergies at the level of stakeholders in the local Ecosystem as well as at the national level. Finally, a significant parameter for achieving the target is the active involvement of citizens and businesses in the municipality and the use of social innovation tools.

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

In Module A-3 " Systemic Barriers and Opportunities to 2030 Climate Neutrality", the Municipality of Thessaloniki lists the systems (fields of action) that present barriers and opportunities for its transition to climate neutrality by 2030. It also maps in regard to these systems the stakeholders and potential stakeholders that can contribute removing barriers and support energy and environmental actions towards the transition to climate neutrality.

A-3.1: Systems & stakeholder mapping				
System description	Stakeholders involved	Network	Influence	Interest
Electricity	▪ Ministries (e.g. Ministry of Environment and Energy, Ministry of Digital Governance, Ministry of Infrastructure and Transport) ▪ Region of Central Macedonia ▪ Other municipalities ▪ Public Power Corporation S.A./ Hellenic Electricity Distribution Network Operator S.A. ▪ Energy providers ▪ Citizens ▪ CERTH ▪ Autonomous districts within	▪ Covenant of Mayors for Energy and Climate ▪ Energy communities ▪ European Green Cities Network ▪ Eurocities ▪ ICLEI ▪ Resilient Cities Network ▪ Climanet ▪ Network of Greek Cities for Development (DEPAN)	▪ Experience and good practices exchange ▪ Actions financing within the Regional Operational Programme (ROP) ▪ Approvals/ Licences for RES connection to the electricity grid ▪ Synergies/ Subsidies/ Green Financing Models/ Electricity Price ▪ Citizens' approval of actions/ engagement in decision making/ Consumers and potential energy	▪ Synergies/ knowhow improvement ▪ Investing on climate neutrality and National Energy and Climate goals ▪ Network upgrade towards environment safety ▪ Change in electricity market prices ▪ Potential energy producers, market prices ▪ Contributing to climate neutrality transition ▪ Contributing to climate neutrality/

	the municipality boundaries (AUTH, UoM, TIF-HELEXPO, Thessaloniki Water Supply & Sewerage Co S.A. (EYATH S.A.), Thessaloniki Wastewater Treatment Plant (WWTF))		producers ▪ Technical Support for actions implementation ▪ Implementation of actions at large-scale Autonomous districts/ Pilots	Innovation/ Energy and cost savings
Buildings & Heating	▪ Ministries (e.g. Ministry of Environment and Energy, Ministry of Digital Governance, Ministry of Infrastructure and Transport) ▪ Region of Central Macedonia ▪ Other municipalities ▪ Autonomous districts within the municipality boundaries (AUTH, UoM, TIF-HELEXPO ▪ Technical Chamber of Greece/ Section of Central Macedonia ▪ Property/ Building Owners ▪ Civil Society ▪ Thessaloniki Hotels Association ▪ CERTH ▪ MDAT SA	▪ Covenant of Mayors for Energy and Climate ▪ Eurocities ▪ ICLEI ▪ Resilient Cities Network ▪ Climanet ▪ Network of Greek Cities for Development (DEPAN)	▪ Experience and good practices exchange ▪ Actions financing within the ROP ▪ Implementation of actions at large-scale Autonomous districts/ Pilots ▪ Technical Support for actions implementation ▪ Citizens' approval of actions/ engagement in decision making ▪ Synergies/ Upgrade housing building stock ▪ Synergies/ Upgrade hotels building stock	▪ Synergies/ knowhow improvement ▪ Investing on climate neutrality and National Energy and Climate goals ▪ Contributing to climate neutrality transition ▪ Contributing to climate neutrality/ Innovation/ Energy and cost savings ▪ Energy and cost savings, competitive tourism services ▪ Energy and cost savings, property value enhancement ▪ Property owners, landlord and tenant
Transport & Logistics	▪ Ministries (e.g. Ministry of Environment and Energy, Ministry of Digital Governance, Ministry of Infrastructure and Transport) ▪ Region of	▪ EIT Urban Mobility ▪ EIT Ris Hub ▪ THESS@MALL Living Lab ▪ Intelligent Cities Challenge (ICC) ▪ Urbact programmme ▪ Eurocities ▪ ICLEI	▪ Actions financing within the ROP ▪ Experience and good practices exchange ▪ Technical Support for actions planning & implementation	▪ Investing on climate neutrality and National Energy and Climate goals, as well as research innovation ▪ Synergies/ knowhow improvement

	Central Macedonia ▪ Other municipalities ▪ Transport Authority of Thessaloniki (TheTA) S.A. ▪ HIT/ CERTH ▪ Autonomous districts within the municipality boundaries (AUTH, UoM, TIF-HELEXPO ▪ Civil Society (walking, cyclists associations) ▪ Transport operators (including shared bicycles & micro-mobility, taxi) ▪ City logistics operators	▪ ERTICO - ITS ▪ Resilient Cities Network ▪ Climanet ▪ Network of Greek Cities for Development (DEPAN)	▪ Organisation responsible for development, coordination, supervision and control of public urban passenger transport ▪ Transport operators, tactical and on-demand ▪ Citizens' approval of actions/ engagement in co-planning & decision making ▪ Implementation of actions at large-scale Autonomous districts/ Pilots ▪ Urban logistics & last mile deliveries	▪ Level & quality of service upgrade for commuters and visitors ▪ Road safety & comfort upgrade for commuters and visitors ▪ Upgrade of monitoring system, public transport and as a whole ▪ Pilot implementation of new innovative services/ solutions and technological objects both through innovative simulation environments such as the Thessaloniki Digital Twin, and through pilot tests in real-world conditions ▪ Fleet upgrade with electric vehicles ▪ Reducing emissions while reducing transport costs ▪ Mentality change and shift to sustainable means of transport
Water waste management	▪ Ministries (e.g. Ministry of Environment, Energy and Climate Change, Ministry of Digital Policy, Ministry of Infrastructure and Transport) ▪ Region of	▪ Climanet ▪ Network of Greek Cities for Development (DEPAN)	▪ Actions financing within the ROP, focusing at National Waste Management Plan (NWMP) ▪ Experience and good practices exchange ▪ Alternative Waste	▪ Investing on climate neutrality and National Waste Management Plan (NWMP) ▪ Synergies to reduce, recycle and reuse waste ▪ Creating a zero-waste society,

	Central Macedonia ▪ Other municipalities ▪ Waste Management Agency (FODSA) of Central Macedonia ▪ Hellenic Recovery Recycling Corporation (HERRCO) ▪ ANAKEM S.A. Collective System for Alternative Management (CSAM) EYATH ▪ Civil society ▪ Waste Transfer Station of the NW Urban Complex of Thessaloniki ▪ Material Recovery Facilities		Management Systems ▪ Wastewater Treatment ▪ Waste producers/ packaging recycling	participating in climate neutrality ▪ Increase recycling rate, participate in climate neutrality ▪ Increasing the percentage of Waste Management Systems ▪ Wastewater treatment to meet climate neutrality objectives ▪ Engagement in co-designing actions, reduce waste and increase recycling rates ▪ Contributing to climate neutrality ▪ Rational waste and recycling management
Land Use & Green Infrastructure	▪ Ministries (e.g. Ministry of Environment and Energy, Ministry of Digital Governance, Ministry of Infrastructure and Transport) ▪ Region of Central Macedonia ▪ Other municipalities ▪ Autonomous districts within the municipality boundaries (AUTH, UoM, TIF-HELEXPO	▪ Eurocities ▪ Council of European Municipalities and Regions (CEMR) ▪ URBACT ▪ MedCities ▪ Eurotowns network ▪ Intercultural cities programme (ICC) ▪ Climate Alliance ▪ CitiesWithNature ▪ METREX (The Network of European Metropolitan Regions and Areas) ▪ OLIS is the network of European cities and regions ▪ Metropolis, global network of major cities and metropolitan	▪ Cooperation on a wide range of issues, from culture and environment to social issues and transport ▪ Cooperation between local and regional governments ▪ Exchange and learning for sustainable urban development ▪ Local governments working together for sustainability ▪ Common challenges of cities in the Mediterranean region ▪ Climate protection, forest	▪ Planning and organisation of land use in cities ▪ Design and organisation of sustainable urban districts ▪ Urban plans and climate neutrality interventions ▪ Nature-based urban interventions ▪ Urban district redevelopment for energy and environmental excellence (LEED)

		areas ▪ Climanet ▪ Network of Greek Cities for Development (DEPAN) ▪ Central Union of Municipalities of Greece (KEDE)	conservation	

A-3.2: Description of systemic barriers and opportunities – textual elements

The Municipality of Thessaloniki is at an early stage in its transition to climate neutrality. It consists of 6 Municipal Units, while together with 10 other neighbouring Municipalities form the Metropolitan Unit of Thessaloniki and is characterised by dense construction with high buildings, narrow streets and virtually no public open space. Only 4% of the city consists of green and open spaces, with 2.73 m2 of green space per inhabitant, while the internationally accepted minimum is 10 m2 per inhabitant.

Municipality-wide electricity demand, including lighting and other infrastructure loads, is estimated to exceed 900 GWh per year, leading to annual emissions of 399 kt CO2 eq. This value of electricity consumption, together with the resulting emissions of pollutants, refers to the total electricity consumption (low and medium voltage) of the Municipality, excluding the agricultural and industrial sectors. Especially for the year 2022, the consumption of electricity for street and square lighting, as well as to cover the needs of municipal buildings, resulted in a monthly cost of about 800,000 euros. Based on DAPEEP (Renewable Energy Sources Operator & Guarantees of Origin) data for the year 2020, the electricity needs are mainly covered by the use of fossil fuels with an estimated 62%, while the contribution of renewable energy is around 31%, with the contribution of hydroelectricity at 7%. Regarding the utilization of RES, according to the available open data of the HEDNO, as of November 2021, 500 kW of municipal photovoltaic systems had been installed, while additional 526.77 kW of private photovoltaic systems had been installed within the boundaries of the Municipality of Thessaloniki and connected to the local electricity grid. Nevertheless, the total photovoltaic capacity of about 1 MW represents a very small percentage of local RES utilization, indicating that there is significant space for improvement and available RES potential.

The Municipality of Thessaloniki has a very large building stock, with a total surface area of more than 22,000,000 m², with an energy saving potential of more than 60%. In particular, based on the 2011 census, more than 80% of the buildings of the Municipality of Thessaloniki were constructed before 1990, so they need radical energy upgrading due to their age and lack of design/ materials for thermal protection. However, it is estimated that only 0.9% of the existing building stock is renovated on an annual basis. It is therefore important to immediately increase the renovation rate of energy inefficient buildings, as indicated by the relevant European and national targets. Specifically for the heating of the building stock of the Municipality of Thessaloniki, the energy needs, both for space heating and water for use heating, are estimated to exceed 1,300 GWh per year, leading to annual emissions of 250 kt CO2 eq. These needs are mainly covered, about 79%, by the use of fossil fuels, with an emphasis on the use of natural gas.

The Municipality of Thessaloniki understands and recognises the need to address energy poverty, so that the energy transition is implemented in a socially just and acceptable way. Energy poverty results from a combination of low income and high costs to meet energy needs, especially with regard to the energy efficiency of the building stock. People living in inefficient buildings are more exposed to illness (e.g. colds), heat waves and other impacts of climate change. A related study concluded that in 2020, 8% of the population within the EU would not be able to keep their homes sufficiently warm. Therefore, energy poverty remains a major challenge and helping vulnerable

citizens is a key task for the EU and its member states. In this context, the Municipality of Thessaloniki seeks and proposes actions that will create value and generate benefits for all its residents, without discrimination. Further financial tools with an emphasis on supporting low-income social strata (e.g. more favourable loan conditions for energy interventions), targeted information actions, reduction of bureaucracy (faster processing of relevant permits) and social benefits (e.g. distribution of low consumption light bulbs, consideration of further income-based reduction of municipal parking spaces, development of green spaces in different neighbourhoods within the municipality, etc.) are indicative ways to mitigate energy poverty. The Municipality of Thessaloniki intends to proceed with the quantification and monitoring of selected indicators related to energy poverty, taking the first key step to address it within its boundaries.

The size and morphology of the city favours travel by bicycle and walking, while the tourist development of the city has brought a high demand for travel within the central area in order to visit places of interest, which favours the use of soft modes of transport. The distribution of travel by means demonstrates the predominance of motorised private cars over sustainable means of transport (public transport, walking, cycling), which is supported by the high percentage of households (44%) that have a private car as their main means of transport (2018). A significant percentage of households have no vehicle (19%) due to the large student population living in the city. The public transport network consists of the OASTH (Organisation of Urban Transportation of Thessaloniki) buses, with the metro under construction, and the percentage of daily trips made by bus with at least one end within the Municipality of Thessaloniki is 32%. Annually, 920 million passenger-kilometres are travelled by passenger cars, while the figure for buses is 326 million passenger-kilometres per year. On the contrary, only 63 million passenger-kilometres per year are covered by bicycle and/ or walking. At the same time, due to the age of the bus fleet, 1,455 grams of CO2/ km are emitted, which suggests the need to modernise the fleet, and indeed to electrify it.

Moreover, as the Municipality of Thessaloniki serves a high volume of through transport (due to trips that have both ends outside the Municipality), the main roads axes of the centre (Nikis Avenue, Egnatia, Agiou Dimitriou, Tsimiski) are significantly overloaded and the phenomenon of illegal parking is particularly critical, as the percentage of illegal parking in the central area of the Municipality of Thessaloniki reaches 50%. Therefore, the need to mitigate motorised trips and shift to more sustainable modes of transport using appropriate and safe infrastructure becomes evident.

In the freight transport sector, a large number of light (<3.5 tons) and heavy (>3.5 tons) trucks travel significant distances within the Municipality of Thessaloniki on a daily basis, with the problems of unloading and increased greenhouse gas emissions being evident in most parts of the historic centre. The lack of a Sustainable Urban Freight Transport plan makes it difficult to address the issue of freight transport in an integrated way and to create the right ecosystem of stakeholders to rationalise freight transport and reduce greenhouse gas emissions.

At the same time, the Thessaloniki Smart Mobility Living Laboratory (THESSM@LL), coordinated by HIT/ CERTH, supports the Municipality of Thessaloniki in planning and decision-making for adressing mobility problems as well as in achieving its climate neutrality goals,

The Municipality of Thessaloniki produced 29.5% of the total production of Urban Solid Waste (USW) of the Regional Unit of Thessaloniki. Currently, about 80% of the total USW production is sent to landfill. In cooperation with the Regional Association of Solid Waste Management Agencies of Central Macedonia (FODSAKM), it is planned to include in financing the supply of equipment for the separate collection of biowaste (bins, garbage trucks, branch shredders) and an integrated information and awareness campaign for citizens and businesses. FODSA KM has also proceeded with the inclusion for funding of projects that include the treatment of pre-sorted bio-waste and until their construction, FODSA foresees to cooperate with private bio-waste treatment companies in order to serve the municipalities of the region of Central Macedonia. With the supply of separate bio-waste collection equipment, the Municipality will be able to develop a road map. The

Municipality is implementing separate glass collection, having installed 437 glass collection bins. Recyclable packaging is collected in bins and transported by the Municipality for processing at the Sorting Centres of recyclable materials located at Thermi (6 583,99 tn/year), Ionia (9 938,04 tn/year) and Sindos (3 244,19 tn/year) for a total of 19 766,22 tn/year. The residue from the sorting of packaging waste is transported to the Mavrorachi landfill site for disposal.

Considering the existing situation of the Municipality as outlined above, the built environment, energy systems, transport and waste are the four main "systems" of the Municipality to be exploited in order to move towards climate neutrality by 2030. Of course, the horizontal digital governance system will also play an important role in this whole process.

At the level of synergies, the Municipality of Thessaloniki is a founding member of the Green Cities Network since 2012 and has already collaborated with a number of institutions, such as the Chamber of Commerce and Industry, the Federation of Industries of Northern Greece, the Exporters' Association, the Commercial Association of Thessaloniki, the Thessaloniki Hotels Association, the Aristotle University of Thessaloniki, the University of Macedonia, the Consumers Protection Center, the Ecological Movement of Thessaloniki, the Association of Cycling Associations of Macedonia-Thrace, the Pedestrians Association, the Museums of the city, etc. Furthermore, the Municipality of Thessaloniki, recognizing the need to integrate innovation in mobility management to achieve the transition to the goals of climate neutral cities, but also the need for a human-centered approach in the use of technological solutions in mobility to facilitate the daily life of citizens and support urban freight transport with the sustainable development of cities, joined the EIT Urban Mobility Regional Innovation Hub, an initiative of the European Institute of Innovation and Technology in the field of urban mobility, and the European Commission's initiative to promote the use of mobility technologies. It also participates in European funding projects for actions related to the environmental and energy upgrading of the municipality. In addition, there are relevant funding projects underway for both public and private sectors, as mentioned above in Module A-2.1.

While there is the capacity, as presented above, the Municipality, in order to accelerate its climate action transition, will need to overcome the existing systematic barriers, as considered, identified and listed below.

Despite the operation of specific departments for the necessary studies and the drafting of technical specifications in the structure of the Municipality of Thessaloniki, the main obstacle to the implementation of actions is the fragmentation and/ or overlapping of relevant responsibilities, and even the lack of interaction between the various administrative and technical services of the Municipality. Significant delays are noted in the process of tendering for projects (objections, disputes between bidders, etc.), but also in the procedures for calling for funding programmes and obtaining grants. There is also a lack of expertise at the level of municipal officials in terms of design and implementation of climate practices and the use of smart energy systems, and a lack of energy data, particularly on energy consumption in the building sector.

Another main obstacle is the inadequacy of the municipality's financial resources to implement the climate action pipeline foreseen to achieve the climate targets, but also the limited access to financial mechanisms, as well as the lack of experience, expertise and human resources in terms of climate finance and investment. The absence of a Metropolitan Governance System leads to a lack of financial independence for municipalities and the creation of complex legislative barriers between municipalities, regional authorities and central government. The municipality is heavily dependent on European/ national funding for new projects, so it needs to diversify its funding sources and leverage new partnerships to access private investment. As a result of these obstacles, the Municipality is turning to external support from specialist consultants.

The barriers to climate neutrality can therefore be divided into 3 main areas: Governance and

Policy, Finance, Learning and Education. At this point it should be noted that for the development of climate actions and the climate neutrality transition, it is important to involve the local community in decision making and to have their consent to energy and climate actions. Therefore, an additional area to be managed by the municipality is that of seamless citizens climate awareness. Furthermore, the exchange of experience and know-how between municipalities on governance, good practices, financing models, etc., can enhance the knowledge and capacities of the municipality to accelerate its way to climate neutrality. The Municipality should also establish an open dialogue with the private sector in the region to exchange views and identify needs and opportunities for upgrading.

Concerning the movement of people and goods, problems related to infrastructure, organisation of systems, communication between actors and fragmentation of responsibilities are identified. At the same time, the inability to adopt innovative solutions to facilitate travel choices (e.g. access restriction systems in areas, non-extensive use of electric/ hybrid vehicles, traffic management systems) is recognised. Insufficient coordination and cooperation between these actors can hinder the development and implementation of effective strategies. Adequate financial resources are essential for the implementation of infrastructure projects and therefore limited funding may hinder the transition towards climate neutrality.

In the area of land use and green infrastructure, systemic barriers are limited, as nature-based solutions are well accepted by all stakeholders and the urban community. The sector's contribution to Thessaloniki's climate neutrality is positive and is done in several ways: by the absence of greenhouse gas emissions from agriculture and forestry activities due to the highly urban character of the city, by removing CO2 from the atmosphere through tree foliage, and by contributing to the development of renewable energy sources that have zero greenhouse gas emissions where they are used. The dynamics of these pathways, with the full replacement of traditional forms of food production by new forms of urban agriculture (vertical farms), the mobilisation of all stakeholders and the city's population in increasing tree foliage, and the development of RES with installations in the public space of the city, can maximise the contribution of the Land Use and green infrastructure sector to the climate neutrality of Thessaloniki. The key elements therefore of the Land Use and green infrastructure sector's neutrality scheme are two: on the one hand, maximising CO2 absorption with nature-based solutions, and on the other hand, increasing the production of RES with installations in the public space of the city and using the renewable energy produced in all types of urban activities and infrastructure.

Trees absorb CO2 through the process of photosynthesis. During photosynthesis, tree leaves absorb CO2 from the atmosphere and, using sunlight, convert CO2 into glucose and oxygen. The glucose is used by the tree for growth, while the oxygen produced is released back into the atmosphere. Barriers and risks to increasing the area of urban tree cover include deforestation and loss of peri-urban forest; lack of forest management; changes in climate conditions such as high temperatures, drought and flooding that can affect tree health and growth; harmful effects such as disease, pests or weed attacks; and densification of urbanization that limits the potential for tree planting in private residential areas. Opportunities concern reforestation and planting of new trees in deforested areas or on unused land, adoption of sustainable forestry practices such as selective logging, reforestation with deciduous trees, expansion of hydroponics, public education and awareness of the importance of forests and natural CO2 absorption that can lead to increased social support and participation in forestry and reforestation initiatives.

The public space of the city can contribute to the production of renewable energy in various ways. Some opportunities include the deployment of photovoltaic systems in parks or other public spaces, the installation of wind turbines in areas with sufficient winds and limited disturbance, the automation of public lighting and reduction of lighting intensity in the absence of users, or the use of public lighting systems with integrated photovoltaic panels. Despite the opportunities that public

space provides for renewable energy generation, potential barriers that may affect the implementation of these initiatives include lack of funding, limited available space and availability of open space to install such systems, which may compete with other public space needs and requirements, legal and bureaucratic barriers, permitting procedures, safety requirements and environmental regulations, lack of awareness and understanding by the public and community.

On issues related to digital governance in Greece, there are often significant delays in the development of a basic digital policy in areas such as the legislative framework, financial support, appropriate infrastructure and education. However, over the last decades efforts have been made, at least at the legislative level, to gradually modernise e-services. The city of Thessaloniki has made significant efforts in recent years to digitally modernise the operation of the municipality and provide modern digital services to its citizens. Thessaloniki is also an important technological hub, as it hosts universities, research centres and business associations, and therefore benefits from many projects that have been implemented or are in progress by the city's stakeholders. However, the low level of civic participation and the lack of digital skills of a large proportion of citizens are frequent and significant problems.

The Municipality intends to intensify its efforts to collect and record data related to climate change (climate, energy, greenhouse gas emissions, etc.), through upgrading the Air Pollution and Meteorological Parameters Measurement Network stations, and through the installation of a network of Internet of Things (IoT) sensors for measuring air quality, in order to use them to monitor the transition to climate neutrality and to take targeted environmental and energy actions. This data will be available to all stakeholders on a full, open and free basis. It should be noted that data protection is important for the Municipality of Thessaloniki, which has a specific policy on information collection practices, including the categories of data it may collect, maintain, process, the purpose of collection, the categories of persons to whom the data are disclosed and the rights deriving from them. The Municipality of Thessaloniki has in recent years had (permanent) cooperation with a Data Protection

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

The Municipality of Thessaloniki, taking into account the systems it will use to move to climate neutrality, the available synergies, existing barriers and opportunities, presents a participatory operating model, further utilizing the available relevant departments and the Resilience Office, which is staffed by the relevant staff of the Department of Operational Planning and Monitoring of Development Programmes, as well as from temporary staff, when available, through funded proposals. The Resilience Office in collaboration with other relevant departments of the Municipality of Thessaloniki will be responsible for the management of data (environmental, energy, etc.), for the continuous circulation of information resulting from the participatory model, and for monitoring and effectiveness of the participatory model, proposing corrective actions for improvement.

The relevant departments and the Office will cooperate on a regular basis to exchange information and take decisions. The Office will designate officers to form the Transition team. The Transition team will be divided into 4 sub-groups, each of which will be responsible for addressing existing barriers in the sectors: Governance and Policy, Financing, Learning and Education, Citizen Awareness. Each sub-group will be composed of the on board partners and stakeholders directly concerned, who will discuss on a regular basis and define actions to remove the barriers identified per sector. The long-term cooperation between the Municipality and the stakeholders will be ensured through the Climate City Contract. Finally, the sub-groups will inform the Transition team on the progress of the actions and the Coordination Group will in turn inform the Departments and Directorates so that any corrective actions and adjustments can be made where necessary. It

should be noted that an interdepartmental working group has already been set up which includes representatives from all the Services of the Municipality of Thessaloniki. The coordination of the group is carried out by the staff of Department of Operational Planning and Monitoring of Development Programmes (ATESPAP) - Resilience Office.

Particular attention must be paid to interacting with civil society and consulting with them, so that the actions implemented have the maximum possible acceptance, thus multiplying their impact and making society itself the agent of this transition. It is also proposed that an open forum for dialogue be set up to involve citizens in the decision-making process and monitor progress in implementing the actions.

A participatory governance model is also necessary both to maximise CO2 absorption through nature-based solutions and to maximise the installation of renewable energy systems in the public space of the city. This model should promote cooperation between public bodies, the private sector, civil society and academia. These actors can work together in the design, implementation and management of CO2 absorption projects and renewable energy systems. Participatory processes in decision-making, consultations, hearings and meetings with the community and stakeholders, transparency and democratic processes, training and information to develop common understanding and enhance participation. In addition, use of funding mechanisms such as the Recovery and Resilience Fund, the Fair Transition Fund, the Green Fund and other investment mechanisms can provide the necessary resources for the implementation of actions. Furthermore, a participatory governance model can include mechanisms to monitor and evaluate CO2 absorption projects and renewable energy systems, by collecting data, measuring performance, publishing results to build trust and continuous improvement initiatives. A participatory governance model encourages collaboration, transparency and stakeholder accountability, making them active players in the design and implementation of initiatives to address systemic barriers and seize related opportunities.

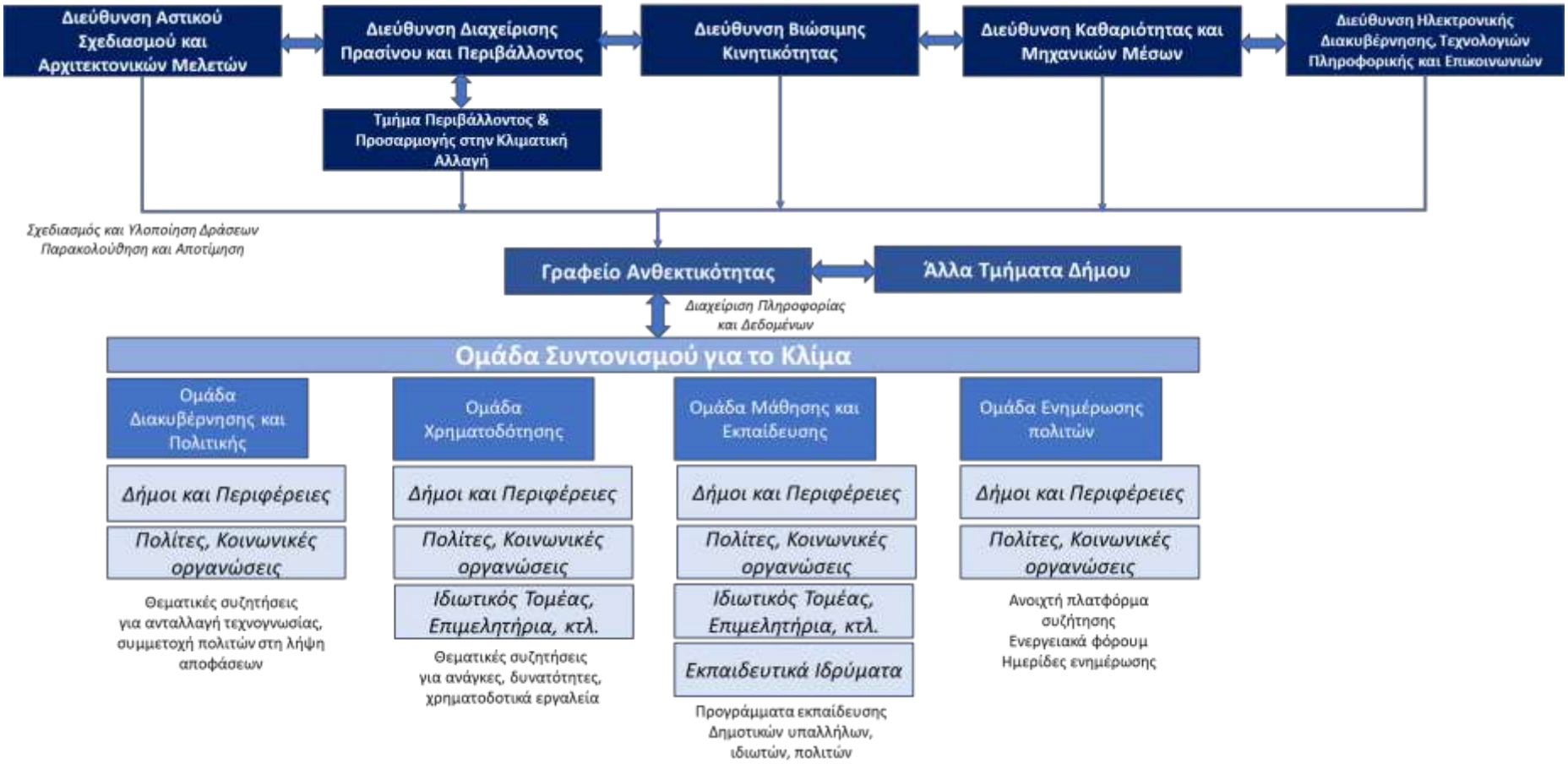


Figure 8: Climate Transition team and cooperations structure

4 Part B – Pathways towards Climate Neutrality by 2030

Part B constitutes the core of the Action Plan of the Municipality of Thessaloniki as formulated by the local authority, local businesses, research bodies and stakeholders (as defined in Part A), and includes a) the key strategic objectives, short and medium term outcomes and long term impacts that are expected to be achieved, b) the full and detailed portfolio of actions that the Municipality of Thessaloniki intends to implement until 2030 in order to achieve its objectives and c) appropriate indicators from monitoring and evaluating its implementation progress.

4.1 Module B-1 Climate Neutrality Scenarios and Impact Pathways

The development of the Impact Pathways was based on the Net Zero Cities (NZC Theory of Change) which takes a structured approach to describing how the defined actions will lead to short (1-2 years) and medium (3-4 years) term outcomes and ultimately to direct (climate neutrality) and indirect impacts by 2030. Systemic barriers and opportunities, as presented in Module A-3, have also been taken into account, with the ultimate aim of proposing actions aiming at improving the sectors that mostly contribute to the carbon balance of the Municipality of Thessaloniki (see Module A-1). The Municipality of Thessaloniki, in full compliance with the guidelines, has developed different pathways for each of the action areas and for different systemic levers including **A**: **Technology and infrastructure**, **B**: **Governance and policies**, **C**: **Social innovation**, **D**: **Democratic participation**, **E**: **Financing** and **F**: **Learning and competences**. The different impact pathways for each of the considered action areas are summarized in table B-1.1. The short and medium term outcomes were selected to serve the basic needs of the municipality and the strategic objectives of the EU.

B-1.1: Impact Pathways

Fields of action	Systemic levers	Early changes (1-2 years)	Late outcomes (3-4 years)	Direct impacts (Emission reductions	Indirect impacts (co-benefits)
1. Electricity (energy systems)	**A:Technology and infrastructure**	Local/ distributed electricity generation from RES	Increasing the share of renewables in electricity generation	Demilitarisation of the electricity network	Energy security Energy system electrification
		Technical interventions to upgrade the electricity network	Increased network flexibility		Stability of the electricity network
	C: Social innovation	Social awareness and information actions for citizens	Increase in own energy production	Changing the role of Citizens from passive to active consumers (prosumers)	Economic benefits Creating green jobs
	D: Democratic participation	Establishment of working groups, memoranda of understanding and a	Involvement of citizens and stakeholders in decision-making		▪ Fair energy transition

		cooperation platform			
2. Buildings & Heating (Built Environment)	**A: Technology and infrastructure**	Technical interventions for energy upgrading of buildings (passive systems)	Reduction of the thermal needs of the building stock	Refragmentation of the thermal needs of the building stock of the Municipality	Climate change adaptation and mitigation
		Technical interventions for energy upgrading of buildings (active systems)	Increasing RES to meet the thermal needs of buildings		
		Technical interventions for energy upgrading of buildings (passive systems)	Reduction of the electrical needs of the building stock	Unblocking the electrical needs of the Municipality's building stock	
		Technical interventions for energy upgrading of buildings (active systems)	Increasing the use of RES to meet the electricity needs of buildings		
		Intelligent monitoring and control solutions (automation, sensors, control systems, smart devices, etc.) for buildings	Automated operation of buildings - increased efficiency	Increased "intelligence" of the Municipality's building stock	Better quality of life inside buildings
		Technical interventions for energy upgrading of facilities (e.g. street lighting, water pumps, etc.)	Increasing the energy efficiency of installations	Further reduction of emissions from anthropogenic activities within the Municipality	Climate change adaptation and mitigation
	B: Governance and policies	Development of new structures and partnerships with bodies relevant to this field of action	More efficient decision-making processes - attracting new ideas-players	Strategic advantage by creating an environment that supports innovation	Full alignment with relevant national and international policies
	E. Financing	Development of new business models	Easier access to financial instruments for	Cost savings	▪ Increasing the rate of renovations - economies of

			energy upgrading - energy saving in buildings		scale ▪ Reducing energy poverty
	F. Learning and competences	Information/ education of municipalities/ businesses on the energy benefits of energy efficiency in buildings and the availability of related solutions	Better knowledge of municipalities- businesses on issues related to the energy and environmental performance of their buildings	Significant increase in private initiatives related to the energy upgrade of buildings	Attracting new investments - businesses
3. **Transport & Logistics**	**A: Technology and infrastructure**	Technical infrastructure projects (redevelopments , cycle infrastructure, pedestrian paths, etc.) and implementation of the SUMP projects of the 2025 horizon, which are being implemented or are in the tendering phase	Reducing the need for motorised passenger transport	▪ Reducing greenhouse gas emissions from transport & logistics ▪ Reduction in the use of private vehicles ▪ Increasing the use of low-carbon technology vehicles ▪ Increased acceptance of strategies-actions related to de-carbonisation of transport ▪ Easier transition to the use of alternative means of transport and services	▪ Participatory planning for sustainable transport ▪ Collaborative mobility management models ▪ Liveable city ▪ Improving living conditions ▪ Road safety
			Shift to Public Transport & active mobility		
			Lever to change the mindset of the citizen		
		Metro in operation - Restructuring of the public transport network - Opening of transfer stations and park &ride areas	Shift to Public Transport & active mobility		
			Buses fleet electrification		
		New mobility services based on public transport and micromobility, as well as car sharing, ridesharing, carpooling are launched	Shift to Public Transport & active mobility		
			Reducing the need for motorised passenger transport		
			Increasing car pooling		
			Transition to full digitalisation of transport & logistics		
		Technical projects for the	Optimisation of urban freight		

		optimisation of supply chain processes	transport		
		Electrification infrastructure in public space	Electrification of cars		
			Electrification of heavy vehicles		
			Contribute to change the mindset of the citizen		
		Gradual conversion of the bus fleet to electric buses	Electrification of cars		
			Electrification of heavy vehicles		
			Electrification of buses		
		Technology and digitisation projects for mobility and logistics	Transition to full digitalisation of transport & logistics		
	B: Governance and policies	Organisation of a cooperation scheme for stakeholders in mobility management	Involving citizens and stakeholders in creation innovation and decision-making	▪ Reducing greenhouse gas emissions from transport & logistics ▪ Increased acceptance of strategies-actions related to de-carbonisation of transport	▪ Participatory planning for sustainable transport ▪ Collaborative mobility management models ▪ Liveable city ▪ Improving living conditions ▪ Road safety ▪ Early adaptation to new conditions
			Shift to Public Transport & active mobility		
		Mobility as a Service ecosystem	Involving citizens and stakeholders in creation innovation and decision-making		
			Transition to full digitalisation of transport & logistics		
		SUMP Observatory	Shift to Public Transport & active mobility		
		Development of a Sustainable Urban Freight Transport plan	Optimisation of urban freight transport		
	C: Social innovation	**Social awareness and information actions for citizens**	Shift to Public Transport & active mobility	Facilitate shift to the use of alternative means of transport and services	▪ Participatory planning for sustainable transport ▪ Collaborative mobility

			Increasing car pooling	Reducing greenhouse gas emissions from transport & logistics Reduction in the use of private vehicles	management models ▪ Liveable city ▪ Improving living conditions ▪ Road safety ▪ Early adaptation to new conditions
	D: Democratic participation	Establishment of working groups, memorandums of understanding and a cooperation platform	Involving citizens and stakeholders in creation innovation and decision-making Optimisation of urban freight transport	▪ Reducing greenhouse gas emissions from transport & logistics ▪ Increased acceptance of strategies-actions related to de-carbonisation of transport	▪ Participatory planning for sustainable transport ▪ Collaborative mobility management models ▪ Liveable city ▪ Improving living conditions ▪ Road safety
		Widespread use of mobility Living Lab and citizen integration as 4^{ou} helix	Shift to Public Transport & active mobility Reducing the need for motorised passenger transport	▪ Reducing greenhouse gas emissions from transport & logistics ▪ Increased acceptance of strategies-actions related to de-carbonisation of transport ▪ Facilitate shift to the use of alternative means of transport and services ▪ Reduction in the use of private vehicles	
	Q: Funding	Development of new business models	Facilitate access to financial instruments for the implementation of actions by individuals Optimisation of urban freight transport Transition to full digitalisation of transport & logistics	Reducing greenhouse gas emissions from transport &logistics	▪ New investments ▪ Improved operation of urban freight transport
		Incentives for adopting active mobility and switching to electric vehicles	Contribute to change the mindset of the citizen	▪ Increasing the use of low-carbon technology vehicles	

			Electrification of cars	▪ Reducing greenhouse gas emissions from transport & logistics	
			Electrification of heavy vehicles		
			Electrification of buses		
			Shift to Public Transport & active mobility	Facilitate shift to alternative means of transport and services	
	F: Learning and competences	Seminars on the safe use of mobility vehicles and bicycles	Shift to Public Transport & active mobility	Facilitate shift to the use of alternative means of transport and services	▪ Improving citizens' health ▪ Road safety
4. Water & Waste Management	**A: Technology and infrastructure**	Introduction of separate collection of bio-waste	Increasing the composting rate of bio-waste	Reducing the environmental footprint by improving bio-waste management	Improving the quality of the environment
		Development of the necessary bio-waste treatment infrastructure	Reduction of the volume of waste to be landfilled		Strengthening the circular economy
		Interconnection of the Municipality of Thessaloniki with the FODSA Integrated Monitoring Information System for Waste Management for the real-time monitoring of the quantities delivered to the FODSA waste treatment facilities	More efficient waste management and identifying areas for improvement	Faster resolution of management issues	Transparency in waste generation and management
			Increase the recycling rate of 4 streams (paper, metal, glass and plastic)		
		Modernisation and renewal of cleaning and	Reduction of the volume of waste to be landfilled	Increasing the proportion of recyclable	Cleanliness of the city

		recycling equipment		materials and reducing the environmental footprint of waste	
		Adoption of modern and efficient methods of monitoring the maintenance of rolling stock and mechanical equipment	Increase in active fleet of refuse collection vehicles	Greater waste collection capacity and increased fleet resilience	
	B: Governance and policies	Optimising the organisation and monitoring of the waste collection fleet and separate collection bins	More efficient waste management	Increasing the proportion of recyclable materials and reducing the environmental footprint of waste	Improving the quality of the environment
		Organisation of new Alternative Management Systems (AMS) with the inclusion of new streams in the extended producer responsibility scheme	Reduction of the volume of waste to be landfilled	Reduction of co-mingled materials and reduction of the environmental footprint of waste	
	C: Social innovation	Activating and raising citizens awareness on waste prevention and management issues	Increase the recycling rate of 4 streams (paper, metal, glass and plastic)	Increasing the proportion of recyclable materials and reducing the environmental footprint of waste	Raising environmental awareness among citizens
		Minimising the final disposal of waste, through its reuse	Reducing the volume of waste to landfill and reducing food waste	Reduction of co-mingled materials and reduction of the environmental footprint of waste	
	Q: Funding	Use of new financial instruments for the maintenance/ replacement of equipment	Ability to replace old equipment with more modern and environmentally friendly equipment	Improved vehicle functionality and efficiency	Increasing the efficiency of waste collection and management; and reduction of gas emissions
		Encourage the co-financing of	Gradually introduce new	Developing and implementing	Reducing waste and promoting

		projects and programmes by various stakeholders to develop new technologies and innovative practices in waste management	elements of the waste collection system, initially through pilot schemes and then by expanding them,	more sustainable and efficient technologies for waste management	sustainable development
5. and Use & Green infrastructure	**A: Technology and infrastructure**	Extensive tree planting and increasing the area of the city covered by tree foliage	Doubling the number of trees along the streets and roads axes of Thessaloniki	Increase in CO2 uptake by tree foliage	Better air and environmental quality, healthier city, reduction of heat islands
		Planning of interventions for urban greenery as foreseen in the Municipality Urban land uses Plan	Creating new metropolitan and urban parks		
		Integrated peri-urban forest protection plan	Infrastructure to protect peri-urban green areas from fires	Conservation and protection of the peri-urban forest	
	B: Governance and policies	Participatory processes to improve urban green space and the ratio of m2 of green space per inhabitant	Greater citizen participation and social acceptance of nature-based solutions	Engaging citizens in nature-based interventions. Expanding the implementation of related solutions	Improving the quality of the environment
		Creation of a Living Lab for nature-based interventions suitable for Thessaloniki	New solutions for nature-based interventions with greater interdisciplinarity and greater effectiveness	New interventions in the natural ecosystems of Thessaloniki	
	C: Social innovation	Social networks and digital applications to enhance the natural environment of Thessaloniki and nature-based interventions	Increasing the number of citizens and bottom-up actions for the environment and green	Extending actions for the environment and greenery	Integrating natural solutions into social processes to improve the quality of life of Thessaloniki residents
		Social entrepreneurship for nature-based interventions	Enganging the private sector on environmental protection issues	New areas of non-profit entrepreneurship and development	
	D:	Open	Open	Greater	Better public

	Democratic participation	governance in the decisions of the Municipality of Thessaloniki in the field of environment and urban and peri-urban greenery	governance in the decisions of the Municipality of Thessaloniki in the field of environment and urban and peri-urban greenery	acceptance and social legitimacy of environmental and green decisions and policies	administration decisions due to the activation of social intelligence mechanisms
	E: Financing	Mobilising private and non-profit resources for environmental improvement actions	Increased investment for actions, infrastructure, and projects in the environment and green sector	Private non-profit initiatives	Development of the city's economy and job creation through actions for the environment, greenery, the natural ecosystems of the city
		Greater share of public investment in environmental issues		Public interventions in the environment	
		Private investment and new business models in the environmental sector		Developing green entrepreneurship	
	F. Learning and competences	Mimicking natural ecosystems to address environmental & anthropogenic challenges	Capacity building for nature-based interventions with greater interdisciplinarity and greater effectiveness	Innovation, new models for environmental interventions and nature-based solutions	Better understanding of climate change and natural methods of coping with its risks
		Training in the redevelopment/ rehabilitation of urban areas according to the LEED standard			
		Development of methods and capacities for nature-based interventions for all ecosystems of Thessaloniki, natural and man-made			
6. **Smart City - Governance**	**A: Technology and infrastructure**	Upgrading digital infrastructure	▪ Improved digital connectivity ▪ Improved service delivery ▪ Increased data accessibility	Improved access to information, awareness and behaviour change	Improved process/application of natural resource management

		Equipment upgrade	▪ Improved response of equipment systems ▪ Improved service delivery ▪ Increased data accessibility		
	B: Governance and policies	Modernisation of data management and analysis	▪ Increased transparency ▪ Involvement of citizens and stakeholders in decision-making ▪ Improved Urban Green Management ▪ Improved Management of Natural Strategic benefit of promoting an environment that encourages innovation Resources	Strategic benefit of promoting an environment that encourages innovation	Promote full compliance with relevant national and international laws
		Modernisation of e-government services	▪ Improved service delivery ▪ Increased data accessibility ▪ Improved decision-making ▪ Increased transparency ▪ Involvement of citizens and stakeholders in decision making		
	C: Social innovation	Integration of social awareness and information actions for citizens	▪ Increased transparency ▪ Involvement of citizens and stakeholders in decision-making	Increased acceptance of strategies - actions related to the de-carbonisation of the energy network	Fair energy transition
	D: Democratic participation	Design of collaboration platforms (collaboration platform)	Involvement of citizens and stakeholders in decision-making		
	F. Learning and competences	Informing citizens about environmental sustainability and	▪ Increased transparency ▪ Involvement of citizens and	▪ Increasing private initiatives for environmental	Attracting new investments - businesses

		climate footprint monitoring	stakeholders in decision-making ▪ Improved Urban Green Management ▪ Improved Management of Natural Resources	sustainability and climate footprint monitoring	
		Strengthening citizens' entrepreneurship and training them in new technologies	▪ Involvement of citizens and stakeholders in decision-making ▪ Promoting the economy	Job growth	

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

The Impact Pathway for the **Electricity (Energy Systems)** sector is developed in 3 systemic levers:

A. Technology and infrastructure: The electrification of the energy system (and by extension the implementation of actions related to e.g. electric cars, installation of heat pumps, etc.) requires the de-carbonisation of the electricity grid. To achieve this requires: a) a significant increase in the share of RES for electricity generation (>80% of electricity will come from RES, in line with national energy targets) and b) enhancing the flexibility of the grid. An anarchic and sudden increase in RES electricity generation (and especially variable RES i.e. PV and Wind Turbines) would have negative effects on grid stability and lead to significant energy losses. For this reason, it is envisaged to increase local/ distributed RES electricity generation with parallel technical interventions to upgrade the electricity grid, in cooperation with local stakeholders, especially electricity providers and distributors. These measures contribute to the energy security of the municipality by reducing its exposure to external energy inputs. In addition, it is necessary to develop actions aimed at significantly increasing the number of distributed PV systems in common/public spaces. These actions aim to increase the self-consumption from RES within the municipality, to further enhance the sustainability of the energy mix, and act as a complementary means of raising awareness and mobilising citizens (e.g. imitation of good practices), especially if the benefits of installing such systems are sufficiently known to the general public. It should be stressed that as there is no district heating system within the Municipality of Thessaloniki, no corresponding actions and objectives relating to wider heating/cooling networks/systems are included.

C. Social innovation: The Municipality of Thessaloniki intends to organise/support social awareness and information actions for citizens (e.g. on the benefits of implementation, the availability of financial instruments, etc.), which are expected to lead to an increase in energy self-production (e.g. through the installation of active/hybrid energy systems). The ultimate objective is to change the role of the citizens from passive to active consumers (i.e. prosumers), which may also bring economic benefits (e.g. through the sale of excess energy). By implementing relevant actions, a change in the mindset of the citizens of the municipality is also sought, so that they are fully aware of both the benefits and the obligations arising from this action plan - as it is impossible to achieve the climate neutrality objectives without their direct contribution. This change will also enable the achievement of individual targets (e.g. electrification of heating, installation of PV on roofs, etc.) which are higher than the national average.

D. Democratic participation: The involvement of citizens and stakeholders in decision making related to how to achieve the energy transition of the municipality is expected to lead to increased acceptance of strategies-actions related to the de-carbonization of the energy grid and is a prerequisite for a just energy transition. This involvement can be achieved through the creation of working groups, memoranda of understanding, a specific information and exchange platform, etc. Such actions are ancillary to the effort to change the mindset of citizens and mobilise them.

The Figure below illustrates the logical continuity and the interactions of the various outcomes and impacts with regard to the "Electricity - Energy Systems" Impact Pathway.

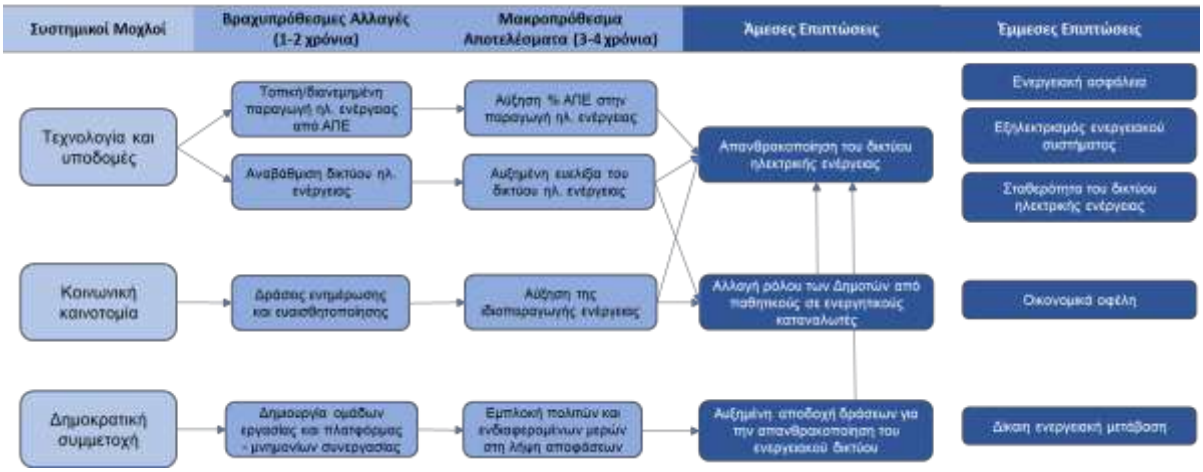


Figure 9: Impact Pathway "Electricity - Energy Systems"

The Impact Route for the **Buildings & Infrastructure sector Heating - Built Environment** is developed in 4 systemic levers:

A. Technology and infrastructure: The elaboration of extensive technical interventions for the energy upgrading of buildings (passive and active systems) is a key prerequisite for reducing the energy needs of the building stock and increasing the use of renewable energy to meet these needs, results which will lead to the de-carbonisation of the energy needs of the Municipality's building stock. Although thermal and electrical needs are mentioned as separate pathways for practical reasons, this does not mean that actions to couple different sectors will not be considered and implemented.

The Municipality of Thessaloniki adopts the principle "energy efficiency comes first" whenever possible, and tries to prioritize the order of interventions in order to achieve the best result with the available resources (e.g. having sufficient thermal insulation before replacing the heating system). In addition, new technologies and IT and telecommunications solutions are unlocking new possibilities in how we manage and control a building. According to the latest European directives (e.g. new EPBD), intelligent buildings are equally important in achieving a better quality of life and as a supporting means to increase the energy efficiency of buildings.

In order to achieve the climate neutrality targets of the Municipality of Thessaloniki, a renovation rate of 3.5% (percentage of buildings renovated annually) is required, of which 60% are extensive renovations (energy savings of 30-60%). This percentage increases (5.5%) if only interventions involving the replacement of lamps and appliances with more energy-efficient ones are taken into account, as these initiatives are considered more likely to be implemented due to the lower capital required. The specific targets, although optimistic, are achievable as: a) there is a very high potential for renovation due to the age of buildings within the Municipality of Thessaloniki as reflected in Module A-3, b) there is a strong construction activity (buildings and infrastructure), which even for the year 2022 showed the highest growth in European Commission at national level - this trend is reinforced by

relevant policies and financial tools as presented in Module A-2 (e.g. better loan conditions for interventions leading to buildings of higher energy class renovations, subsidy for new appliances, etc.). It should also be noted that the corresponding target of the renovation rate at European level is 3% (but with a longer-term horizon).

In addition to existing buildings, it is also important to ensure high energy efficiency in new buildings. More specifically, the aim is to construct new buildings that will meet the highest energy standards (A+/A) by a percentage of 35%, in line with the estimates of other Mission cities that have similar characteristics to the Municipality of Thessaloniki. Finally, as regards this systemic driver, the Municipality of Thessaloniki aims to increase the energy efficiency of installations other than buildings (e.g. lighting, water supply, etc.), thus aiming at further reducing emissions from humen activities within the municipality.

B. Governance and policies: The Municipality of Thessaloniki recognizes that in order to achieve its vision of climate neutrality by 2030, the development of new structures (see also Module A-3) and partnerships with stakeholders related to energy efficiency in buildings and facilities are required. This will lead to more efficient (both in terms of time and content) decisions. The implementation of innovative actions (e.g. installation of innovative energy systems, large-scale infrastructure, participation in international European research projects, etc.) is expected to attract new players (e.g. companies, skilled personnel, start-ups, etc.) to the region. The Municipality of Thessaloniki sets as a key objective the development of entrepreneurship within its boundaries, and the creation of an environment of cooperation and innovation enhances the achievement of this objective.

E. Funding: In a sustainable development framework, in addition to environmental and social aspects, it is necessary to ensure the cost-effectiveness of the proposed solutions. The Municipality of Thessaloniki, with the synergy of local institutions, businesses and stakeholders, aims to develop business models in order to create and deliver value to residents, taking advantage of the knowledge, experience, data, etc. that will be acquired during the implementation of the Action Plan. These models are expected to facilitate access to financial instruments for energy upgrading - energy saving buildings. The ultimate aim is to achieve cost savings (e.g. by reducing energy bills, providing better loan conditions, etc.) which in turn will indirectly lead to an increase in the rate of renovation (and/ or construction of new buildings with high energy standards) and a reduction of energy poverty.

F. Learning and competences: The Municipality of Thessaloniki understands the importance of properly informing citizens and businesses operating within its boundaries about the energy benefits of energy efficiency in buildings and the availability of energy efficiency solutions. The majority of citizens are not aware of the available solutions and tools (especially the latest technology) that are available, and the relevant information is fragmented and requires either a considerable amount of time or the outsourcing of work to specialists, which entails much higher costs and/or solutions that are not fully in line with needs. Relevant information and education (where possible) will lead to a stronger knowledge base of citizens and businesses on issues related to the energy and environmental performance of their buildings, which in turn will help to significantly increase private initiatives related to energy efficiency upgrading of buildings - which is essential for achieving climate neutrality targets.

The figure below illustrates the logical continuity and the interactions of the various outcomes and impacts with regard to the Impact Pathway "Buildings & Heating - Built Environment".

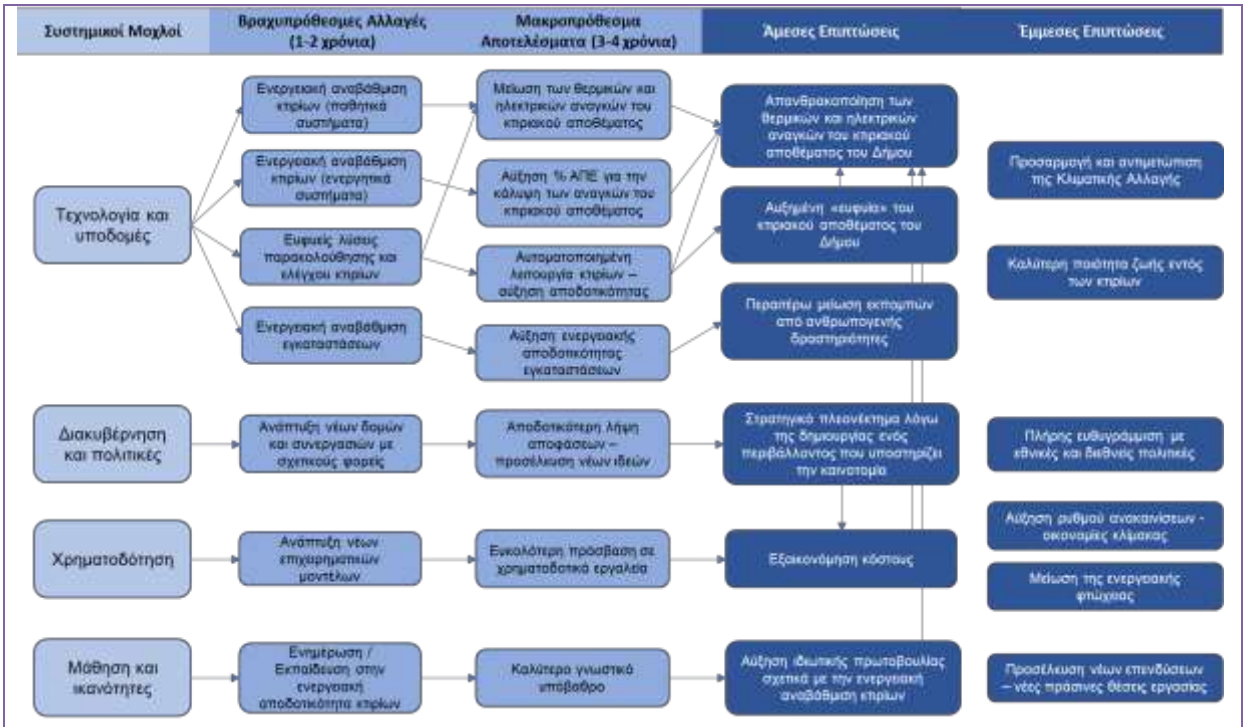


Figure 10: Impact Pathway "Buildings & Heating - Built Environment"

The **Transport & Logistics Impact Pathway** is developed in 6 systemic levers:

A. Technology and infrastructure: The Municipality of Thessaloniki announces its intention to achieve its vision of climate neutrality by 2030, by initially aiming to modernise mobility services and infrastructure management through the implementation of infrastructure projects (such as redevelopments, cycle paths, etc.) and projects included in the SUMP to be elaborated with horizon 2025 programme of the SUMP. These projects are either in progress or in the tendering phase. The aforementioned aime at reshaping the public space and its functions, resulting in a reduction in the use of private passenger cars while increasing the use of public transport to ensure road safety. In addition, in order to modernise mobility services and infrastructure management, it is proposed that further to the metro operation, the public transport network shall be restructured, with the operation of transfer stations and park & ride areas (people usually park their cars in the suburbs and take the bus to avoid congestion in the city centre). These actions aim to promote public transport and multimodality resulting at reduction of car use and increase of public transport use and active mobility, ensuring in the long term improvement in citizens' health.

In order to ensure a sustainable city with improved living conditions, the Municipality of Thessaloniki aims to create new mobility services based on public transport and micro-mobility, as well as to promote services such as carsharing, ridesharing and carpooling. This results in the creation of a set of new mobility services that act as a counterbalance to car ownership by emphasizing multimodality and thus reducing the car use rate while increasing both the use of public transport and the increase in the passengers car occupancy. In order to ensure the sustainability of the city through the modernization of mobility services and infrastructure management, the Municipality of Thessaloniki sets as an additional objective the creation of infrastructure and facilities for elector mobility at public space, an action that will attract users of all categories. In addition, among the actions included in the promotion of electro mobility is the gradual conversion of the urban bus fleet to electric buses.

Finally, the Municipality of Thessaloniki has set within its medium-term objectives the transition

towards the full digitalisation of Mobility and Transport. This will enable multimodal traffic management, the adoption of the concept of Mobility as a Service and the use of data to improve travel conditions. These objectives are being promoted through the creation of technological projects and the digitisation of mobility, which have either already been implemented or are currently being tendered.

B. Governance and policies: According to this systemic lever, the main objective of the Municipality is to promote coordinated actions to promote policies, strategies for multimodal mobility management. This can be achieved by organising a cooperation scheme between different stakeholders related to mobility management. This will have the effect of strengthening the effort to decarbonise transport while promoting cooperative models of mobility management. An additional action that will contribute to the climate neutrality of the city by 2030 is the creation of a Mobility as a Service ecosystem that aims to create the appropriate digital infrastructure and organisational framework for the development of multiple collaborative mobility services. This action promotes the smooth functioning of coordinated models for the development of innovation in the field of mobility. In order to adapt in a timely manner to the ever-changing new conditions, it is proposed to promote a SUMP observatory (a map of all the SUMPs in Greece) with the aim of creating a mechanism for monitoring actions in order to contribute to the effort to decarbonise transport.

C. Social Innovation: The Municipality of Thessaloniki is taking important initiatives by organizing actions to promote environmental awareness and activate citizens. Through social awareness and information actions, the Municipality aims to change the mindset of citizens regarding their mobility habits. The transition from the use of private cars to more sustainable and environmentally friendly means of transport is a central pillar of this effort. The creation of alternatives for transport and services makes it easier for citizens to switch to more environmentally friendly means of transport, thus contributing to the sustainable development of the city. However, these impacts go beyond the obvious change in mobility habits. Finally, the impact of these efforts is highlighted beyond the benefits in terms of travel mode. The preference for sustainable modes of travel has a direct positive impact on the health of citizens, ensuring a cleaner and healthier environment for the community.

D. Democratic participation: through the creation of working groups, the conclusion of memoranda of understanding and the development of specific platforms, the Municipality aims to activate the community by giving citizens and stakeholders the opportunity to actively participate in the decision-making process. In addition, citizens will have the opportunity to use the Smart Mobility Living Lab of HIT/ CERTH. Their involvement is expected to add more value to strategic actions aimed at de-carbonizing the city's transport system. Further direct impacts of the above-mentioned initiatives are the strengthening of the public spirit and the acceptance of the necessary changes needed to promote sustainable mobility. Finally, citizen involvement is the driving force for innovation. In particular, through their participation in working groups and cooperation platforms, citizens actively contribute to the development of new ideas and approaches that respond to their real needs.

E. Funding: The Municipality of Thessaloniki aims to develop new business models and provide incentives to both enhance active mobility and gradually change the vehicle fleet to more environmentally friendly electric vehicles. This approach is intended to facilitate access to financial instruments for the implementation of actions by private entrepreneurs, while at the same time strengthening actions that promote a change in the mindset of citizens. The ultimate aim is to speed up the implementation of the proposed de-carbonisation actions. Through pilot projects and the gradual introduction of new elements in the transport system, the Municipality is promoting the development and implementation of more sustainable and efficient technologies. Future new investments will help to promote sustainable development and improve the quality of life of the citizens of the Municipality of Thessaloniki.

F. Learning and competences: The Municipality of Thessaloniki aims to inform citizens through actions focusing on the safe use of micro-mobility vehicles and bicycles, as well as the promotion of active

mobility. Through seminars on the safe use of these vehicles, the Municipality offers citizens the opportunity to be trained and informed about best practices and safe traffic rules. In the medium term, an increase in the use of micro-mobility vehicles and bicycles is expected to be observed, thus reducing the impact resulting from the use of private motor vehicles. The immediate impact of these efforts is reflected in a faster implementation of actions aimed at de-carbonising transport. By strengthening the information base and education of citizens, the City promotes environmental sustainability and the overall reduction of greenhouse gas emissions.

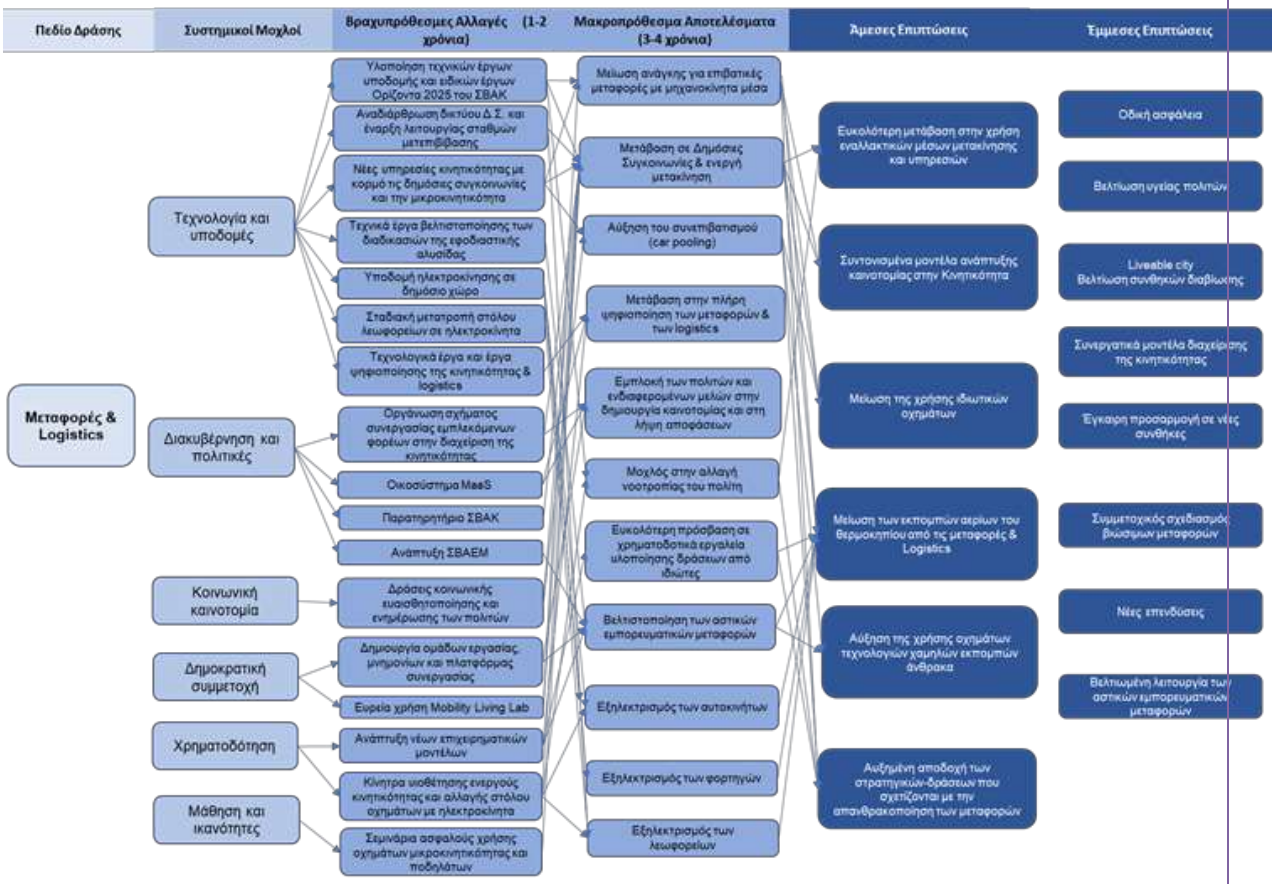


Figure 11: Impact Pathway " Transport & Logistics"

Municipality Urban land uses Plan

The **Impact Pathway for the Water & Waste management sector** is developed in 4 systemic levers:

A. Technology and infrastructure: The introduction of separate collection of bio-waste, which accounts for the largest share of the waste stream composition, is the most important factor in achieving the landfill diversion target. In order to achieve the climate neutrality targets of the Municipality of Thessaloniki, the composting rate needs to reach 70%, while the treatment of bio-waste through the development of the necessary infrastructure is also a key factor. The ultimate aim of the above is to reduce the environmental footprint and thus improve the quality of the environment. At the same time, the Municipality of Thessaloniki aims to upgrade the existing electronic recording and monitoring systems for waste management. The aim is to speed up the resolution of waste management issues and to identify areas for improvement in order to make them more transparent. An additional objective of the Municipality of Thessaloniki is to reduce the volume of waste for landfill (recycling of paper to 85%, plastic to 55%, metals to 60% and glass to 75%), thus reducing the environmental footprint of

solid waste and enhancing the cleanliness of the city. This will be achieved by modernising and renewing the cleaning and recycling equipment.

B. Governance and policies: Understanding the importance of improving the quality of the environment, the Municipality of Thessaloniki aims to manage municipal waste more efficiently. Therefore, it aims to increase the percentage of recyclable materials and to reduce the environmental footprint of waste, achieving this through the optimisation of the existing waste management system (mixed and recyclable). Fully in line with the objectives of improving environmental quality is also the reduction of the volume of waste to be landfilled by organising new Alternative Management Systems (AMS) with the inclusion of new streams in the extended producer responsibility regime.

C. Social innovation: The Municipality of Thessaloniki intends to organize/ support social awareness and activation actions for citizens on prevention and management of waste generated, enhancing their environmental awareness in order to reduce co-mingled materials and reduce the environmental footprint of waste. Raising citizens' environmental awareness with a view to reducing co-mingled materials and thus reducing the environmental footprint of waste can be achieved by minimising the final disposal of waste through its reuse.

E. Funding: The Municipality of Thessaloniki's use of new financial tools for the maintenance/ replacement of equipment with more modern and environmentally friendly equipment aims to improve the functionality and efficiency of the vehicles, while the ultimate goal is to increase the efficiency of waste collection and management. At the same time, the Municipality of Thessaloniki aims to encourage the co-financing of projects and programmes by various bodies in order to develop new technologies and innovative practices related to waste management. This is achieved by gradually introducing new elements of the waste collection system, with pilot projects in the first phase and then expanding them. The result of this is the development and implementation of more sustainable and efficient technologies for the management and reduction of solid waste.

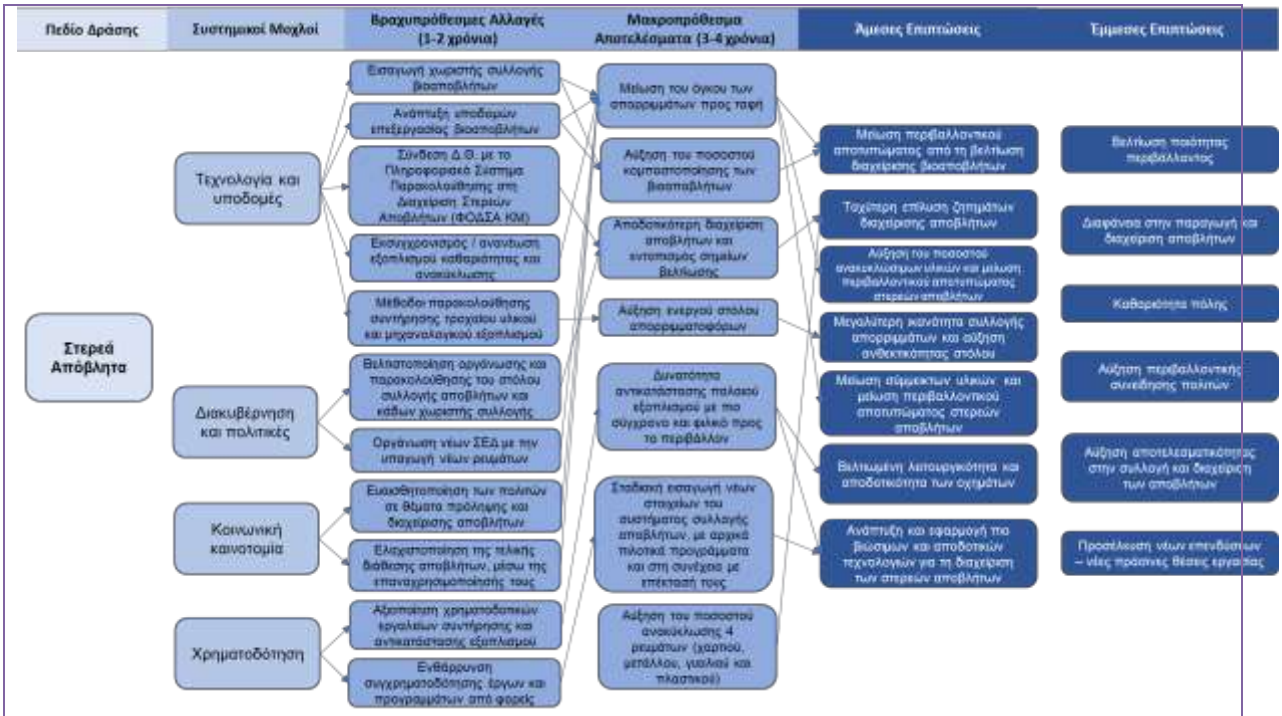


Figure 12: Impact Pathway "Water & Waste management Sector"

The Impact Pathway for the **Land Use and Green Infrastructure sector** is developed in 6 systemic levers:

A. Technology and infrastructure: Aim to create a low-emission urban form. In the Municipality of Thessaloniki, especially in the Land Use and Environment sector, this pathway can be implemented through extensive tree planting and increasing the area of the city covered by tree foliage. This is possible without changing the total area of green spaces, beyond what is foreseen in the Municipality Urban land uses Plan of Thessaloniki, by densifying trees and replacing low green (grass, ornamental plants) with high green (trees). In addition to the removal of CO2 from the atmosphere by trees, the replacement of low greenery with high greenery will have other benefits, such as a reduction in surface and atmospheric temperatures and heat islands found throughout the surface of Thessaloniki, noise absorption, as trees act as natural noise barriers; protection of biodiversity, as trees provide shelter and food for various species of birds, insects and other animals, helping to promote biodiversity in the urban environment.

B. Governance and policies: Includes participatory processes to improve urban greening and the ratio of m2 of green space per inhabitant and the creation of a Living Lab for nature-based interventions suitable for Thessaloniki. The expected medium-term results are increased citizen participation and social acceptance of nature-based solutions, as well as the emergence of new solutions for nature-based interventions with greater interdisciplinarity and effectiveness. Immediate impacts are the activation of citizens in nature-based interventions, the expansion of the implementation of related solutions, as well as new interventions in the natural ecosystems of Thessaloniki. Indirect impacts relate to the improvement of the quality of the environment in the city.

C. Social innovation: Includes social networks and digital applications for enhancing Thessaloniki's natural environment and social entrepreneurship for nature-based interventions. The medium-term results are based on increasing the number of citizens and bottom-up actions for the environment and greenery and activating the private sector in environmental protection issues. Direct impacts are on the expansion of environment and green actions and the creation of new non-profit entrepreneurship

activities, while indirect impacts include the integration of nature-based solutions into social processes to improve the quality of life of Thessaloniki's residents.

D. Democratic participation: It focuses on open governance in the decisions of the Municipality of Thessaloniki in the field of environment and urban and peri-urban green, which is expected to provide greater acceptance and social legitimacy to the decisions and policies of the municipality. The direct impact will be on the decisions of the public administration due to the activation of social intelligence mechanisms, while the indirect impact will be on the implementation of policies that correspond to the problems and objectives of the city's society.

E. Funding: Includes (a) mobilization of private and non-profit resources for environmental improvement actions, (b) a greater share of public investment in environmental issues, and (c) private investment and new business models in the environmental sector. The expected medium-term results are an increase in investment in environmental and green actions, infrastructure, and projects.

The direct impacts include private non-profit initiatives, increased public funding for the environment, and the development of green entrepreneurship, while the indirect impacts include the development of the city's economy and job creation through actions for the environment, greenery, the city's natural ecosystems

F. Learning and competences: Focus on mimicking natural ecosystems to address environmental & anthropogenic challenges, training for LEED-ND compliant urban regeneration, and developing methods and competences for nature-based interventions for all ecosystems of Thessaloniki, natural and anthropogenic. It is expected to develop capacities for nature-based interventions with broader interdisciplinarity and greater effectiveness, with direct impacts on innovation, new models for environmental interventions and nature-based solutions, and direct impacts on a better understanding of climate change and natural methods of coping with its risks.

The Figure below illustrates the logical continuity and the interactions of individual Impact Pathways in the sector "Land Use and Environment".

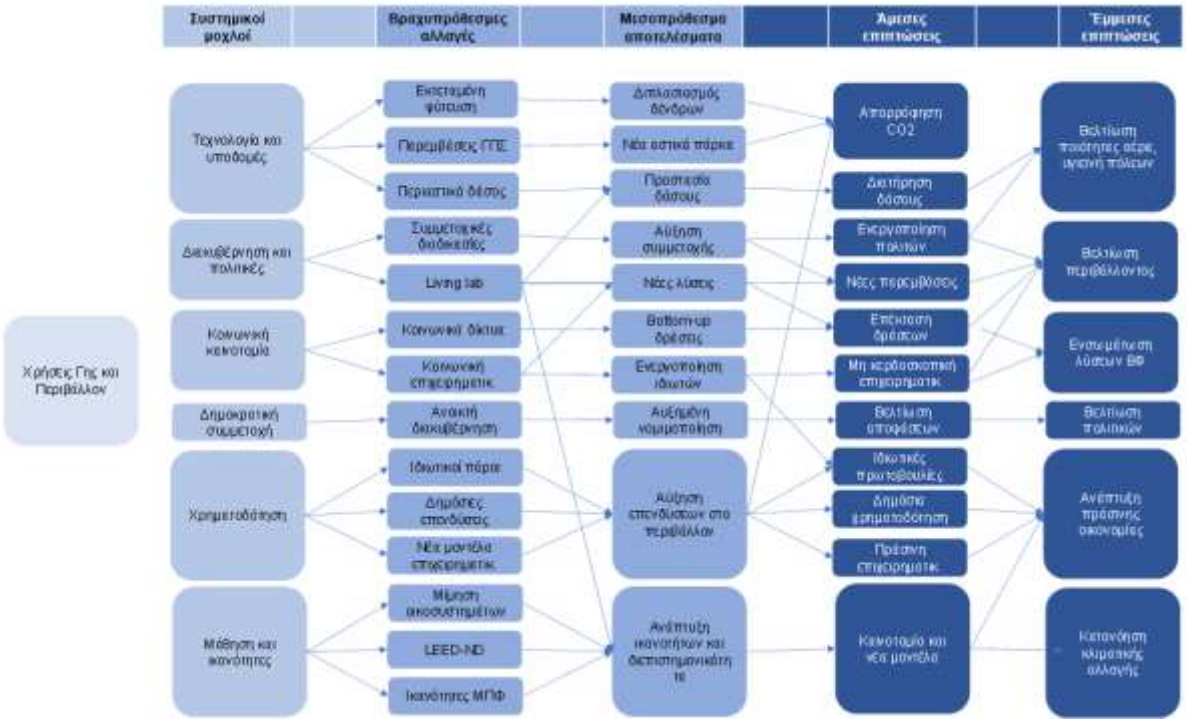


Figure 13: Impact pathway of the "Land Use and Green Infrastructure" sector

The systemic levers on which the Impact Pathway is developed in the **Smart City - Governance** sector are:

A. Technology and infrastructure: The Municipality of Thessaloniki recognizes that in order to achieve its vision of climate neutrality by 2030 as part of the EU initiative, changes related to the systemic driver Technology and Infrastructure are crucial. Upgrading the digital infrastructure entails strengthening the technological framework and connectivity within the municipality. Improving the broadband network, expanding Wi-Fi coverage and building advanced communication systems are a few of the actions that will directly improve service delivery and informed decision-making in climate action in the future. At the same time, the Municipality aims to modernize and optimize various devices and systems used on a daily basis by both citizens and employees. These actions under the systemic Technology and Infrastructure lever signal the City's commitment to leverage technological advances and upgrade its physical assets to accelerate the transition to climate neutrality.

B. Governance and policies: According to this systemic, the City's key objective is to make changes to modernize data management and analysis, as well as modernize e-government services within the City. The modernization of data management and analysis implies the adoption of advanced technologies and tools to collect, organize and analyze data related not only to day-to-day governance (e.g. e-citizen services) but also data related to climate change and GHG emissions (e.g. use of sensors or IoT devices to collect real-time environmental data). By modernizing data management and analysis, the municipality can better understand its carbon footprint, identify key areas for reducing emissions, and track progress towards climate neutrality targets. At the same time, the modernisation of e-government services ensures that the municipality can effectively communicate and engage with stakeholders, encouraging their active participation in climate initiatives and facilitating a more inclusive decision-making process.

C. Social innovation: The Municipality of Thessaloniki recognizes that in order to achieve its vision of climate neutrality by 2030, it is necessary to organize social awareness and information actions for citizens. The Municipality's main focus is to integrate social awareness campaigns, educational material and relevant information on climate change and sustainability into digital platforms accessible to the community. These platforms may include municipal websites, mobile apps, social media channels or community forums. By providing easy access to information and resources, the municipality aims to raise awareness about climate issues, inspire behavioural change and empower citizens to actively engage in sustainable practices.

D. Democratic Participation: in full alignment with the climate neutrality targets for 2030, and in conjunction with the objectives of the Social Innovation systemic lever, the Municipality aims to directly enhance the democratic participation of citizens. The aim is to provide platforms that enable inclusive collaboration. The design of collaboration platforms includes the creation of digital spaces or tools that allow various stakeholders, including citizens, community organizations, businesses and government officials, to meet, exchange ideas and co-create solutions to address climate challenges. These platforms facilitate open dialogue, information sharing and collective problem solving, fostering a participatory approach to decision-making.

F. Learning and skills: the Municipality of Thessaloniki aims at specific actions focusing on informing citizens about environmental sustainability and climate footprint monitoring, as well as strengthening citizens' entrepreneurship and training them in new technologies. Informing citizens about environmental sustainability and climate footprint monitoring includes the provision of educational resources, workshops and campaigns that raise awareness about the importance of sustainable practices. Empowering citizens and training them in new technologies involves equipping individuals with the skills and knowledge needed to use new technologies and innovative solutions to address climate challenges. These combined changes underscore the City's commitment to building a

knowledgeable and skilled community that is actively engaged in climate action.

The figure below illustrates the logical continuity and the interactions of the various outcomes and impacts of the Impact Pathway with regard to the Smart City - Governance action area.

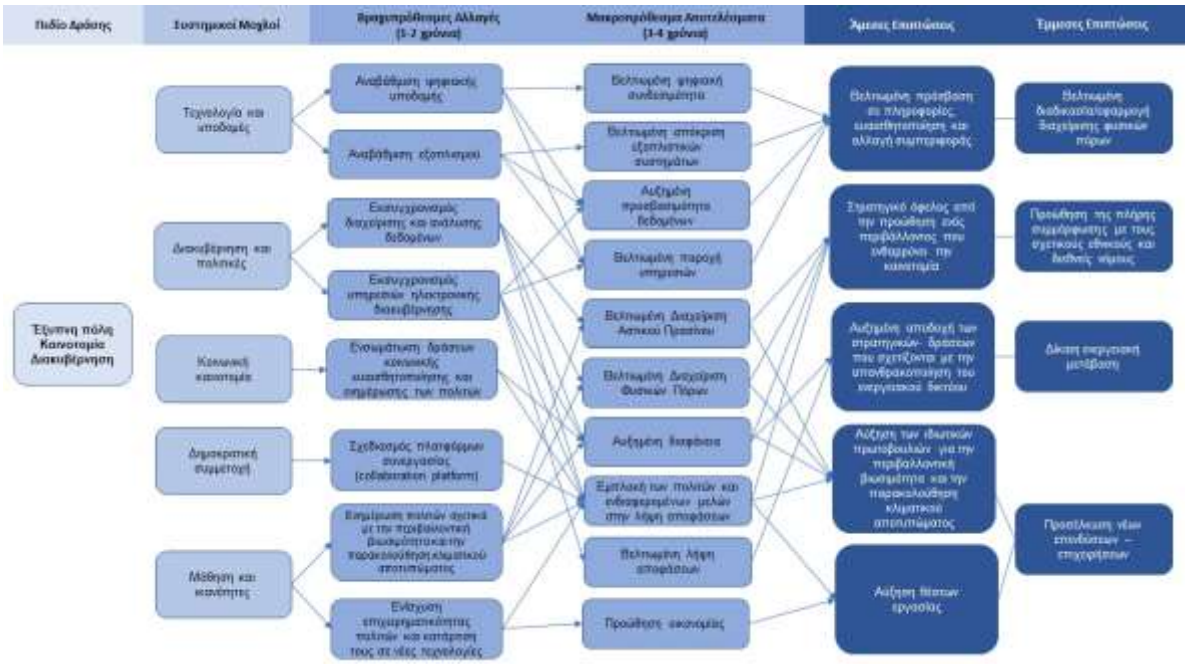


Figure14: Impact pathway "Smart City - Governance"

4.2 Module B-2 Climate Neutrality Portfolio Design

Module B-2 includes all the actions - interventions that will be implemented in order for the Municipality of Thessaloniki to achieve the Climate Neutrality target by 2030, including actions of local businesses, institutions and research institutes. The planned actions are summarised in the table below (B-2.1) and their detailed description is given below (B-2.2). At the end of Part B (B-2.3) a summary of how the Municipality of Thessaloniki intends to manage residual emissions is provided.

B-2.1: Description of action portfolios - textual or visual		
Fields of action	Portfolio description	
	List of actions	Descriptions
1. Electricity (Energy systems)	**1.1** Installation of RES in public/ commune spaces (outside buildings and built environment)	It concerns the installation of distributed PV systems in common/ public areas (outside the built environment) with net metering and/ or feed-in-tariff) and/ or the installation of PV parks outside the boundaries of the Municipality with virtualnet metering.
	1.2 Wind farm for electricity generation	Creation of a Wind Farm with production capacity, with a total production capacity of 17.25 GWh/ year, in areas of the port of Thessaloniki, in the area of the 6ou pier located 3 km from the front of the Thessaloniki waterfront.
	1.3 Upgrading/ Strengthening of the electricity network within the Municipality of Thessaloniki boundaries	It concerns the upgrading of the electricity network through targeted technical solutions (e.g. transformer upgrades) in order to increase the flexibility and stability of the network. In addition, it includes the pilot installation of batteries

		(centralized) in selected areas - streets.
	1.4 Certified green electricity	It is about obtaining certificates (official record) proving that a certain amount of electricity has been produced from RES. Green certificates can be traded separately from the energy produced.
2. Buildings & Heating - Built Environment	**2.1** Energy upgrading of municipal buildings - interventions in the building envelope	It concerns the implementation of technical interventions in the building envelope (e.g. better thermal insulation, replacement of frames, etc.) in existing buildings, with the aim of reducing energy needs. Particular emphasis is given by the Municipality of Thessaloniki to the energy upgrade of schools within its boundaries
	2.2 Energy upgrading of municipal buildings - more efficient lighting and appliances/ systems	It concerns the implementation of infrastructure interventions in existing buildings that involve the installation/ replacement of devices-systems with new ones of higher efficiency and intelligence (e.g. LED lighting, smart devices).
	2.3 Energy upgrading of municipal buildings - more efficient heat generation from electricity	It concerns the installation of heat pumps and/ or energy efficient air conditioning systems to meet the thermal needs of municipal buildings.
	2.4 New municipal buildings with high energy efficiency standards	It concerns the construction of new municipal buildings that meet top energy efficiency standards. The Municipality of Thessaloniki has undertaken the preparation of studies and, where appropriate, the construction of the corresponding projects for new school buildings or public utility facilities that will have a near-zero carbon footprint through excellent insulation, minimisation of thermal bridges, bioclimatic design, shading systems, thermal break windows and special double glazing, use of special low energy consumption lamps, and installation of a BEMS energy management system.
	2.5 Installation of renewable energy systems in municipal buildings	It concerns the installation of PV systems in buildings (roof, façade and/ or surrounding area of the building). These interventions will be defined on a case-by-case basis and according to the needs and possibilities (available surface area, orientation) of the building in question.
	2.6 Upgrading the energy efficiency of the water supply and sewerage network	It concerns the implementation of energy saving measures in central pumping - water supply - wastewater treatment plants. The exact definition and sizing of the relevant sub-actions will be defined during the implementation of the Action Plan, by the competent management bodies (EYATH) and according to the needs of each case.
	2.7 Upgrading the energy efficiency of public lighting	It concerns the gradual replacement (where necessary) of public lighting with new smart lamps/ luminaires with low emission and LED technology. It is also proposed to pilot the installation of autonomous photovoltaic lighting poles.
	2.8 Energy upgrading of tertiary sector buildings - interventions in the building envelope	It concerns the implementation of technical interventions in the building envelope (e.g. better thermal insulation, replacement of frames, etc.) in existing buildings, with the aim of reducing energy needs. These interventions will be defined on a case-by-case basis and according to the needs of the building and its owners (e.g. differentiation of

		needs and possibilities according to the type of use such as offices, hospitals, etc.).
	2.9 Energy upgrading of tertiary sector buildings - more efficient lighting and appliances/ systems	It concerns the implementation of technical interventions in existing buildings that involve the installation/ replacement of devices-systems with new ones of higher efficiency and intelligence (e.g. LED lighting, smart devices).
	2.10 Energy upgrading of tertiary sector buildings - more efficient heat generation from electricity	It concerns the installation of heat pumps and/ or energy efficient air conditioning systems to meet the thermal needs of buildings in the tertiary sector.
	2.11 New buildings with high energy efficiency standards	It concerns the construction of new buildings that meet top energy efficiency standards (at least B+ energy class, of which 35% are A or A+ energy class).
	2.12 Installation of renewable energy systems in buildings in the tertiary sector	It concerns the installation of PV systems in buildings (roof, façade and/or surrounding area of the building). These interventions will be defined on a case-by-case basis and according to the needs and possibilities (available surface area, orientation) of the building in question.
	2.13 Creating a pilot energy community	It concerns the creation of a pilot energy community (REC - Renewable Energy Community), which will be defined for a specific area within the Municipality, and will include small and large consumers/ producers, with the aim of promoting collective self-production and self-consumption.
	2.14 Energy upgrading of residential buildings - interventions in the building envelope	It concerns the implementation of technical interventions in the building envelope (e.g. better thermal insulation, replacement of frames, etc.) in existing buildings, with the aim of reducing energy needs. These interventions will be defined on a case-by-case basis and according to the needs of the building and its owners. Priority will be given to serving energy vulnerable households, through the necessary state aid, with the ultimate aim of reducing energy poverty within the IZ.
	2.15 Energy upgrading of domestic buildings - more efficient lighting and appliances/ systems	It concerns the implementation of technical interventions in existing buildings that involve the installation/ replacement of devices-systems with new ones of higher efficiency and intelligence (e.g. LED lighting, smart devices). As in the case of Action 2.14, financial incentives and subsidies from central government programmes should be secured to achieve a fair energy transition through the support and participation of energy vulnerable households in this action.
	2.16 Energy upgrading of residential buildings - more efficient heat generation from electricity	It concerns the installation of heat pumps and/ or energy-efficient air conditioning systems to meet the thermal needs of dwellings. This action is of high importance for the Municipality of Thessaloniki as it is one of the main ways of decoupling from natural gas, which is currently the main means of heating homes. As in the case of Actions 2.14 and 2.15, priority will be given to serving energy vulnerable households through the necessary state aid, with the ultimate aim of reducing energy poverty within the municipal boundaries.

	2.17 New buildings with high energy efficiency standards	It concerns the construction of new buildings that meet top energy efficiency standards. (energy class B+ as a minimum, of which 35% energy class A or A+).
	2.18 Installation of renewable energy systems in residential buildings	It concerns the installation of PV systems in buildings (roof, façade and/or surrounding area of the building). These interventions will be defined on a case-by-case basis and according to the needs and possibilities (available surface area, orientation) of the building in question.
	2.19 Green Light Initiative	Pilot distribution of LED lamps to citizens by the Municipality of Thessaloniki. This action acts in a complementary manner to Action 2.15, with the ultimate aim of raising public awareness, making the Action Plan known to the general public and providing practical assistance to low-income households. The number of distributed lamps should be sufficient (e.g. >10,000) to disperse and cover a large number of beneficiaries.
3. Transport & Logistics	**3.1** Reducing road capacity & preventing car access in the central area of the Municipality	It includes all the Actions that aim to reduce the use of cars in the central area of the Municipality of Thessaloniki and to redistribute the use of roads in favour of cleaner means of transport. 1. Reduction of lanes on the hierarchical road network, in order to reduce car use and give space to other means of transport 2. Creation of low emission zones, climate neutral districts and restricted access by conventional vehicles 3. Interventions and promotion to citizens and businesses, intervention of the Aristotle University of Thessaloniki (study - campaign - governance) 4. Construction and operation of a bypass road to divert through traffic through the central area of the Municipality (Fly over road infrastructure). 5. Integrated interventions, studies and projects to reduce traffic, improve traffic flow and avoid congestion in the area of the Flyover construction projects. 6. Parking management by electronic and other means: expansion and upgrade of the electronic controlled parking system, and dynamic parking pricing Important relevant projects are: a) Emblematic intervention of Egnatia Street, b) Conversion of Tsimiski Street into a light traffic road, c) Conversion of the Rotunda area into a low emission zone
	3.2 Demand management	It includes supporting actions aiming at managing the demand for car use. 1. Use of a single information system for mobile workers 2. Creating a framework and incentives for teleworking in the public and private sectors (with a focus on climate neutrality ambassadors)
	3.3 Foster active mobility	It includes all Actions supporting the reduction of car use and a corresponding increase in the relative use rate for walking and cycling.

		1. Extension of the cycle path network 2. Redevelopment and pedestrianisation. Interconnecting sidewalks. Creating pedestrian corridors and implementing safe smart crossings. Design and creation of tourist routes 3. Shared Micromobility services 4. Campaigning and informing commuters about sustainable transport options through digital applications
	3.4 Restructuring of bus lines, interconnection with the new metro lines and promotion of multimodality	It includes all the Actions aiming at promoting public transport and multimodality resulting in a reduction of car use and a corresponding increase in the relative use rate for metro and bus as well as combined transport. 1. Restructuring of bus lines and launch of express lines 2. Construction of transfer stations / Park &Ride stations 3. Unified pricing for combined means of transport and electronic ticketing 4. Operation of the Mobility as a Service system and creation of a neutral platform to support the system 5. Fleet change and fleet growth for public transport on demand services An important related work is: Transfer station and park and ride in Nea Elvetia
	3.5 District oriented developments	It includes all actions based on urban planning that aim to maximise the use of pedestrian or green transport within an area to bring different land uses together. 1. Urban planning measures to link land uses with Metro stations through green mobility (Transit oriented development zones), with emphasis on the areas: Delphon, Voulgari New Railway Station, City Hall 2. Creation of climate-neutral local centres and neighbourhoods & interconnection of different land uses (residential, work, commercial) through green mobility corridors (Mixed used development zones) An important related work is: Redevelopment of the areas of influence around the Metro stations (new pedestrian walkways or soft streets - connection to cycle paths - transfer etc.) - ensuring an increased level of road safety and passenger service level.
	3.6 Moving together	It includes all actions based on urban planning that aim to maximise the use of pedestrian or green transport within an area to bring different land uses together. 1. Implementation and operation of a car pooling service 2. Operation of an on demand ridesharing service 3. Campaign and measures to promote co-passage in organised ecosystems (for example students of AUTH/ UoM)
	3.7 Electrification of public transport	Includes action to replace existing public transport buses with electric buses.

	3.8 Electrification	It includes all Actions aiming at the widespread replacement of existing vehicles with electric vehicles and the creation of the necessary charging infrastructure. 1. Incentives for the widespread adoption of electromobility by individuals and businesses 2. Implementation of all Electric Vehicle Charging Plan actions & Expansion of the necessary charger infrastructure 3. Promoting electric car sharing mobility 4. Electrification of the fleets of the Municipality and other bodies (the electrification of the fleet of the Cleaning Department is included in the electrification of heavy vehicles).
	3.9 Intelligent transport systems & Optimal traffic and emergency management	It includes all the Transport Digitalisation Actions and the widespread introduction of digital Intelligent Transport Systems (ITS) tools for traffic and emergency management. 1. Monitoring systems and environmentally friendly management of traffic lights 2. Creation of Mobility & climate data space and digital services to the Ecosystem 3. Digital twin for impact assessment of alternative scenarios for climate neutrality policies and actions 4. Multi-source Carbon Footprint Assessment and Monitoring Platform 5. Application to influence commuter behaviour in favour of climate neutrality
	3.10 Development of public and private urban distribution centres and micro fulfillment centres (e.g. lockers) in order to increase the load factor of vehicles entering the central area of the Municipality and reduce the distances travelled in urban distribution	It includes all Actions relating to the development of public and private urban distribution centres and micro fulfillment centres. The aim of the actions is to reduce the distances travelled within the Municipality of Thessaloniki and to ensure that only vehicles with increased load capacity enter the central area of the Municipality. 1. Development of urban freight consolidation centres, freight hotels and micro fulfillment centres 2. Creating an ecosystem of cooperation 3. Development of lockers (regulatory framework, selection of institutions and cooperation model) in public spaces of the Municipality of Thessaloniki 4. Incentives for the conversion of ground floor shops into loading/ unloading bays or areas to increase storage
	3.11 Incentives for the acquisition and use of green and electric vehicles in urban distribution with a focus on low emission zones	It includes all Actions related to increasing the use of green and electric urban delivery vehicles. 1. Creation of parking spaces for cargo bikes 2. Incentives for the acquisition of green and electric urban delivery vehicles
	3.12 Actions to reduce the impact of urban deliveries on congestion and increase the load factor	1. Night-time distribution in the central area, application of service windows for specific sectors (e.g. Supermarkets), restrictions on the load factor for vehicles approaching the centre 2. Shared lanes for urban delivery vehicles and urban buses to be used by delivery vehicles with

		a high load factor in off-peak time windows 3. Installation of intelligent infrastructure to monitor unloading points and provide a booking tool with preferential status for vehicles with a high load factor
	3.13 Planning, monitoring and supporting the transition to climate neutrality of the urban distribution system	It includes the package of actions that is considered necessary initially for planning and then monitoring the transition of the urban distribution system to climate neutrality. It concerns regulatory, policy and governance actions between the urban distribution ecosystem in the Municipality of Thessaloniki. 1. Development of a Sustainable Urban Freight Transport Plan for the entire Municipality of Thessaloniki 2. Regulatory framework and incentives for the collection and provision of digital urban freight transport data by private parties to the Municipality of Thessaloniki 3. Observatory to monitor urban freight transport and its impact on the environment and the local economy 4. Incentives and installation of a telematics system for monitoring freight flows
	3.14 Actions to optimize the waste collection procedures of the Municipality of Thessaloniki	It includes all the actions for the optimisation of waste collection in the Municipality of Thessaloniki. This is achieved through the supply and installation of a GPS system in the refuse collection vehicles as well as the supply and operation of a fuel level monitoring system and a system for measuring the weight of bins in the refuse collection vehicles. Finally, the automation of the weighing of the refuse collection vehicles at the Waste Transfer Station will further reduce greenhouse gas emissions.
	3.15 Supply of electric vehicles and vehicles with anti-pollution technology to upgrade the cleaning services of the Municipality of Thessaloniki and reduce the carbon footprint of its vehicle fleet	The action concerns the supply of clean vehicles for the cleaning services of the Municipality. It concerns both waste collection vehicles and other types of vehicles of the Municipality of Thessaloniki used in the cleaning services.
4. Water Waste management	**4.1** Design and operation of Green Point, Recycling Corners	Locating green points and organising and operating them with trained staff and necessary supplies. A Green Spot is a designated and landscaped area with appropriate infrastructure and equipment for citizens to deposit separately collected recyclable municipal waste or used items so that they can be sent for recycling or reuse.
	4.2 Supply of recycling bins and extension of the glass bins network	Discrete glass collection (blue bin) and development of a network of "yellow" bins for paper collection in selected areas of the Municipality (squares, parks, schools, etc.).
	4.3 Organisation of new Alternative Management Systems (AMS)	Strengthening Source Separation (SR) to minimise waste sent to landfills by: 1. Implementation of a separate collection programme for used clothing, footwear and other textile materials.

		2. Establishment of a collection point for frying oil and collection at Green Spots. 3. Implementation of the existing separate collection system for waste electrical and electronic equipment in cooperation with the EMS and at the Green Spot. 4. Implementation of the existing bulky waste collection system through special vehicles of the Municipality.
	4.4 Implementation and operation of Creative Reuse Centres (CRCs)	The Municipality of Thessaloniki, in cooperation with the relevant FODSA., in order to achieve the quantitative targets for the preparation for reuse and recycling, in accordance with the provisions of the relevant RWMP and LWMP, will proceed with the implementation and operation of Centres for Creative Reuse of Materials, which is an institutional obligation under Article 18 of Law No. 4819/2021, in municipalities with a population of more than twenty thousand (20,000) inhabitants. At the moment, the preparation of a relevant maturity study is foreseen.
	4.5 Upgrading and extension of underground temporary storage systems for the creation of 4-stream arrays and supply of a chain store	Supply and installation of underground temporary storage bins for the creation of four-stream arrays of urban waste, redesign of the temporary storage system and replacement of a chain link for the transport of bins
	4.6 Supply and replacement of refuse collection vehicles	End-of-life replacement of refuse collection vehicles, supply of refuse collection vehicles for the collection of recyclable packaging, supply of refuse collection vehicles for the collection of organic waste, replacement of tractors, water carriers, bulky vehicles, tricycles, sweepers Replacement of FODSA waste transport vehicles at the end of their life cycle.
	4.7 Implementation of separate collection and recovery of bio-waste	Supply of brown bins (240 and 660L) and branch shredders for the implementation of a separate collection programme of bio-waste from targeted producers and households. In addition, it includes the implementation of the household composting programme through the supply and distribution of household composting bins to Children's Centres, School Units and private communal areas The processing of the separately collected bio-waste will be carried out at FODSA biowaste treatment facilities.
5. Land Use & Green infrastructure	**5.1** Densification of urban greenery - Planting trees in public and common areas of the Municipality of Thessaloniki - removing CO2 from the atmosphere	Planting trees and increasing the area of the Municipality of Thessaloniki covered by trees is the most established nature-based solution for absorbing CO2 from the atmosphere.
	5.2 Nature-based solutions to curb the heat island effect	The aim of the action is to mitigate the heat island in a specific urban area of the city centre (the urban district of Diikitirio) with nature-based solutions that will increase the green cover and water permeable surfaces of the district to 40% of its total surface area.
	5.3 Thessaloniki ConfEx	The redevelopment of the central urban island of TIF

	Park: redevelopment of TIF - HELEXPO	- HELEXPO constitutes a process of redefining central land use, while at the same time it is an important opportunity for the city to experiment with the creation of a zero urban island as a whole, in terms of public space management, the design and construction of planned structures, as well as in terms of space management, waste management and circularity. The master plan envisages the realisation of the above objective through key sustainability factors such as dismantling and circularity, site design and building, choice of materials, operation and management, communication and participation.
	5.4 Metropolitan Park of Memory - Holocaust Museum	Creation of a metropolitan memorial park near the Holocaust Museum, on an area of about 70 ha resulting from the contribution of the land of the old/commercial railway station.
6. **Smart City - Governance**	**6.1** Infrastructure of telecommunications, computing and peripheral equipment of the Municipality of Thessaloniki. Upgrading of internet infrastructure - broadband network in all parts of the city	Supply and installation of telecommunication, computing and peripheral equipment for the Municipality of Thessaloniki for the reconstruction of the data and voice network and the development of DR (Disaster Recovery) and BC (Business Continuity) infrastructures. Broadband internet access at every point in the city and access, among other things, to services and content provided by the municipality and local businesses.
	6.2 Use of cloud computing for the services of the Municipality	Modern technological infrastructures that enable the provision of innovative services and data at low cost.
	6.3 Citizens' e-Services and e-Government services	An integrated online platform where citizens can access various services and information (online payment of taxes and bills, issuing certificates and permits, scheduling appointments and reporting issues). Digitization of government services, allowing citizens to access and submit various documents and applications electronically (permits, licenses, registrations and property-related issues).
	6.4 Operation of the new EYATH portal	Development of a new customer service portal and a corresponding mobile application that allows the consumer to have access to an upgraded electronic payment system, the full "archive" of his transactions, his history and consumption statistics, informative material, personalized information (e.g. water supply interruption, appointment reminders or overdue debts) and, above all, the possibility of authenticating the user through taxisnet, so that transactions are secure and bureaucratic requirements are reduced to a minimum, the people movement.
	6.5 Implementation of Energy Optimization Software for Municipal Buildings	Development of energy optimisation software that allows central monitoring and control of energy consumption in municipal buildings. The software can provide real-time data on energy use, identify areas of inefficiency, suggest energy saving measures or even give set points to controlled loads in municipal buildings. It can also facilitate the integration of renewable energy sources, such as

		solar panels, into the building's energy infrastructure.
	6.6 Digital infrastructure for a sustainable & green urban future	Greek Smart Cities: Investing in infrastructure and Smart Sustainable Cities (SSC) systems for a sustainable & green urban future 1. Urban regeneration interventions for the economic reconstruction of local shopping streets in all the Municipal Communities of the Municipality of Thessaloniki 2. Upgrading the operation of the urban green management system and its interconnection with the Municipality's website for information and use by institutions and citizens
	6.7 Upgrading sensors and devices for data collection for air quality measurement	Upgrade of the IoT sensor network (Municipal IoT Sensor Network, AIRTHINGS), measuring air pollution and meteorological parameters, which will be operated from 2020 by the relevant Department of the Municipality of Thessaloniki. 1. Upgrading the network can help to highlight air pollution mitigation strategies in the IOT region. Link to the carbon footprint platform 2. At the same time, the action includes the replacement of the 6 stations of the network with energy autonomous, powered by photovoltaic panels and equipped with new generation pollution measurement analyzers. 3. The upgrade of the stations can help to highlight air pollution mitigation strategies in the IOT area.
	6.8 Establishment of a Multi-Source Carbon Footprint Assessment and Monitoring Platform	Development of a CO emissions monitoring platform2 with interfaces for data input from the competent services of the Municipality of Thessaloniki, utilizing the existing mobility and urban transport monitoring platform developed and operated within the framework of the Living Smart Mobility Lab by HIT/ CERTH.
	6.9 Carbonation Progress Indicator Monitoring System and Climate Transition Observatory	Development of a methodology and tool aimed at supporting the Municipality of Thessaloniki in monitoring progress towards the climate transition and providing information on progress reports to the EU Mission Agency, as well as in decision-making for the review of the Action Plan.

For Sectors **1. Electricity (Energy Systems)** and **2. Buildings & Heating (Built Environment)**, Module B-2.2 presents some further information on these actions, grouped according to the categorization of actions as defined in the Net Zero Cities “Economic Model”, which supports the calculations required to prepare the Climate City Contract, and in conjunction with the Climate Neutrality Scenarios and Impacts Pathways as defined in Module B-1.

More specifically, information is provided on the following actions: a) Renovation of the building stock, b) New buildings with high energy efficiency standards, c) More efficient lighting and appliances/ systems, d) More efficient heat generation from electricity, e) Generation of electricity from A. For each of the above actions, the key target assumptions for 2030 are also presented, based on which the relative impacts and costs of their implementation have been calculated, according to the Net Zero Cities model.

B-2.2: Individual action outlines - 1.1: Photovoltaic systems in public and common areas of the Municipality of Thessaloniki		
Action outline	Action name	**1.1: Photovoltaic systems in public and common areas of the Municipality of Thessaloniki**
	Action type	Construction Interventios
	Action description	Installation of photovoltaic panels in public areas of the Municipality of Thessaloniki for the production of renewable energy and the reduction of GHG emissions
Reference to impact pathway	Field of action	**1. Electricity (Energy Systems)**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Increasing locally produced RES in electricity generation
Implementation	Responsible bodies/person for implementation	Consortium of the Municipality of Thessaloniki, Aristotle University of Thessaloniki, TIF-HELEXPO, private investors
	Action scale & addressed entities	The project will be implemented in various public spaces, such as parks, squares, outdoor parking lots and other public areas, as well as in school facilities throughout the city of Thessaloniki.
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, Institutions with autonomous areas within the Municipality (AUTH, UoM, HELEXPO), School units of the Municipality of Thessaloniki
	Comments on implementation	The project requires continuous maintenance and monitoring to ensure the efficient operation of the photovoltaic panels. Potential barriers may include inadequate funding, resistance from the community due to the appearance of the panels, and technical difficulties during installation. These can be addressed through adequate preparation and planning, community outreach and dialogue, and the selection of qualified and experienced technical teams to install the systems.
Impact & cost	Generated renewable energy (if applicable)	It is calculated based on the production capacity of the PV system. Each 1 m2 of PV panel in Thessaloniki produces 298 kWh per year. The total renewable energy produced per year is = 16,241,000 kWh (54,500 * 298).
	Removed/substituted energy, volume, or fuel type	1,396.47 Tonne of Oil Equivalent/ year
	GHG emissions reduction estimate (total) per emission source sector	In 2021, emissions from the energy sector in Greece were estimated at 452 grams of carbon dioxide per kilowatt hour (gCO_2/KWh) of electricity produced. On this basis, the reduction of GHG/CO2 from the project is estimated at 7,341 tonnes (16,241,000 kWh of energy produced * 0.452 kg/kWh)
	Total costs and costs by	The total cost of the project is calculated by

	CO2e unit	distinguishing PV panels into three categories (a) standard PV panels with simple support structures, (b) PV on roofs with more complex support structures, and (c) PV panels on tiles (e.g. Platio). The estimated cost of installing PV systems is estimated separately for each category, (a) 300 €/sq m, which includes standard PV panels and simple support structures, (b) 500 €/sq m, which includes standard PV panels and roofing structures, and (c) 900 €/sq m of installed tiled PV panels. The total cost of the project amounts to €22 650 000. To this should be added the cost of maintenance and replacement of PV panels due to wear and tear or vandalism. With a carbon intensity for Greece of 0.452 kg CO2/kWh, the amount of CO2 avoided is 7.341 tn, and the cost per tonne of CO2 avoided is 3.085 euro/tonne.

B-2.2: Individual action outlines - 1.2: Wind farm for electricity generation at the port of Thessaloniki		
Action outline	Action name	**1.2: Wind farm for electricity generation at the port of Thessaloniki**
	Action type	Construction Interventions
	Action description	Installation and operation of a 10MW wind farm for the production of renewable electricity with 6 to 10 wind turbines in selected locations at the 6th pier of the port of Thessaloniki
Reference to impact pathway	Field of action	**1. Electricity (Energy Systems)**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Increasing locally produced RES in electricity generation
Implementation	Responsible bodies/person for implementation	Consortium with the participation of the Municipality of Thessaloniki, the Thessaloniki Port Authority, and a private investor with experience in the construction and management of wind farms
	Action scale & addressed entities	Local scale, the project is a pilot for coastal renewable energy production, all residents of Thessaloniki will be positively affected through the reduction of CO2 emissions
	Involved stakeholders	Thessaloniki Port Authority, the competent departments of the Municipality of Thessaloniki, private investors from the Hellenic Association of Renewable Energy Producers
	Comments on implementation	Investigation is required into the locations of the AGs and possible malfunctions in the activities of the Port of Thessaloniki. Potential obstacles and measures to address them include possible community reaction, environmental impacts, technical issues, as well as permitting procedures for the installation of AGs.
Impact & cost	Generated renewable energy (if applicable)	A wind farm with 10 1 MW wind turbines, operating at 20% efficiency due to wind

		variability, produces 17,250 MWh per year (10MW * 24 * 365 * 0.20)
	Removed/substituted energy, volume, or fuel type	1,483.23 Tonne of Oil Equivalent/ year
	GHG emissions reduction estimate (total) per emission source sector	With emissions of 452 gCO_2/KWh) of electricity produced the reduction of GHG/CO2 from the project is estimated at 7,919 tonnes per year (17,250,000 kWh * 0.452 kg/kWh / 1,000kg/tn)
	Total costs and costs by CO2e unit	Wind farm cost estimates available online estimate the cost of installation at $1.3 million per megawatt (MW) of electrical power generation. In addition are maintenance costs estimated at 1-2 cents (USD) per kWh generated or 1.2 to 1.5 euro cents (c€) per kWh of wind energy produced. With these data, a 10MW wind farm requires an investment of 12 million euros. With a carbon intensity for Greece of 0.452 kg CO2/kWh, the amount of CO2 avoided is 17,520,000 kWh * 0.452 kg CO2/kWh = 7,919,040 kg CO2. The investment cost per tonne of CO2 avoided, based on the total cost of the wind farm, is EUR 1,515/tonne.

B-2.2: Individual action outlines - Production of electricity from RES		
Action outline	Action name	**Production of electricity from RES**
	Action type	Construction Interventios
	Action description	It concerns the implementation of actions 1.1, 1.2, 1.3, 1.4, 2.5, 2.12, 2.13, 2.18 as presented in Module B-2.1 and aims at significantly increasing the share of RES in the energy mix of electricity, while supporting the reliability and flexibility of the energy system. Due to the size and specificity of Actions 1.1 and 1.2, these actions are discussed in more detail below.
Reference to impact pathway	Field of action	**1. Electricity (Energy Systems), 4. Buildings & Heating (Built Environment)**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Increased share of RES for electricity generation, Increased grid flexibility, Increased RES to meet the electricity needs of buildings
Implementation	Responsible bodies/person for implementation	PV in municipal buildings: Directorate of Urban Planning and Architectural Studies / PV in private buildings: Property Owners, TEI, PV in a wider context: Investors, RAE Network upgrade: PPC, HEDNO
	Action scale & addressed entities	It is addressed to all owners (existing and new) of public, residential and tertiary buildings within the boundaries of the Municipality of Thessaloniki. Addressed to entities at a wider level (e.g. PPC, HEDNO)
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, Region of Central Macedonia, PPC/HEDNO, Energy Providers, Citizens,

		CERTH, Other Entities with autonomous areas within the Municipality (AUTH, UoM, HELEXPO, EYATH FODSA K.M))
	Comments on implementation	This action is characterized as an action of high importance as it directly affects the environmental impact and the effectiveness of the electrification actions. Achieving the climate neutrality objectives requires the replacement of the use of fossil fuels with renewable energy for electricity generation by 78% by 2030, a reduction that leads to an ultimate share of electricity generated from fossil fuels of 14%. This value is in line with national targets to reduce fossil fuels in the national energy (electricity) mix to below 20% by 2030. It becomes evident that the successful implementation of this action is only possible if the national targets for the penetration of renewables (>80%) in the country's energy mix by 2030 are met. Local initiatives - municipal pilot projects for the production of RES (e.g. see Action 1.1.), although they seemingly satisfy a very small share of the total energy needs (<1%), act mainly as a means of raising awareness and mobilising citizens and the business world.
Impact & cost	Generated renewable energy (if applicable)	>790 GWh (according to the projected 2030 electricity mix, which includes ≈80% RES (86% including hydropower), and assuming that the EE needs remain constant (balancing consumption reduction from saving measures and consumption increase due to heat pumps, in fact an increase in electricity consumption within the Municipality is expected).
	Removed/substituted energy, volume, or fuel type	≈475 GWh (in line with the projected reduction of the contribution of fossil fuels to electricity generation from 62% to 14%).
	GHG emissions reduction estimate (total) per emission source sector	330 kt CO_{2eq} /year
	Total costs and costs by CO2e unit	170 million € 0.5 million €/kt CO_{2eq}

B-2.2: Individual action outlines - Renovation of building stock		
Action outline	Action name	**Renovation of building stock**
	Action type	Construction Interventios
	Action description	It concerns the implementation of actions 2.1, 2.8 and 2.14 as presented in Module B-2.1 and aims at renovating the building stock of the Municipality of Thessaloniki, with emphasis on upgrading the building envelope.
Reference to impact pathway	Field of action	2. Buildings & Heating (built environment)
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Reduction of the thermal needs of the building stock, Reduction of the electrical needs of the building stock, Automated operation of buildings

		- increased efficiency
Implementation	Responsible bodies/person for implementation	Municipal buildings: Directorate of Urban Planning and Architectural Studies / Private Buildings: Property Owners, Technical Chamber of Greece
	Action scale & addressed entities	It is addressed to all owners and/ or tenants of long term (existing) buildings of the public, residential and tertiary sector within the boundaries of the Municipality of Thessaloniki, and primarily to the owners of buildings built before 1979 (implementation of the thermal insulation regulation) and then before 2010 (introduction of the Regulation of Energy Performance of Buildings - KENAK).
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, Region of Central Macedonia, Home /building owners, Citizens, CERTH, Technical Chamber of Greece, Thessaloniki Hotels Association, Other entities with autonomous areas within the Municipality (AUTH, UoM, HELEXPO, EYATH)
	Comments on implementation	The success or otherwise of this action is mostly based on the mobilisation of property owners, and its implementation is therefore inextricably linked to the implementation of national initiatives (e.g. subsidies, changes in legislation/regulations). Achieving the climate neutrality targets of the IOT requires achieving an annual renovation rate of the building stock of 3.5%, with the majority (60%) of renovations having to achieve energy savings of at least 30-60% (see Section B-1). The organisational and social innovation interventions as defined in Sections C-1 and C-2 as well as the national financial instruments-programmes (see Section A-2) contribute to the achievement of these objectives.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	>100GWh/year (assuming the annual renovation rate (3.5%), the existing thermal needs (1,332 GWh/year), and an average saving of 35%). The calculations do not take into account the savings from the penetration of heat pumps.
	GHG emissions reduction estimate (total) per emission source sector	35 kt CO_{2eq} /year
	Total costs and costs by CO2e unit	559 million € 16 million €/kt CO_{2eq}

B-2.2: Individual action outlines - New buildings with high energy efficiency standards		
Action outline	Action name	**New buildings with high energy efficiency standards**
	Action type	Construction Interventios
	Action description	It concerns the implementation of actions 2.4,

		2.11 and 2.17 as presented in Module B-2.1 and aims at the high energy efficiency of the entire building stock of the Municipality of Thessaloniki, with the new buildings being examples of good practice.
Reference to impact pathway	Field of action	2. Buildings & Heating (built environment)
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Reduction of the thermal needs of the building stock, Reduction of the electrical needs of the building stock, Automated operation of buildings - increased efficiency
Implementation	Responsible bodies/person for implementation	Municipal buildings: Directorate of Urban Planning and Architectural Studies / Private Buildings: Property Owners, Technical Chamber of Greece
	Action scale & addressed entities	It is addressed to all owners of (new) public, residential and tertiary buildings within the boundaries of the Municipality of Thessaloniki, as well as to design and construction companies operating within the Municipality, which should be aware of the requirements arising from the Action Plan of the Municipality.
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, Region of Central Macedonia, Home /building owners, Citizens, CERTH, Technical Chamber of Greece, Thessaloniki Hotels Association, Other entities with autonomous areas within the Municipality (AUTH, UoM, HELEXPO, EYATH)
	Comments on implementation	In order to achieve the climate neutrality targets, it is planned to increase the share of new buildings built to the highest standards and regulations. More specifically, it is foreseen that around 35% of new buildings built will be of energy class A or A+, with the remaining new buildings being at least class B+. Overall, a 50% improvement in energy efficiency is sought compared to the minimum statutory requirements (see Module B-1). The main driver for the implementation of this action is the national and European legislation on minimum energy efficiency standards for new buildings, but the Municipality of Thessaloniki will try to accelerate their adoption through information actions, development of synergies with relevant bodies, etc.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	≈12 kWh/m^2 of new buildings (for buildings that will become category A+ instead of B+)
	GHG emissions reduction estimate (total) per emission source sector	1 kt CO_{2eq} /year
	Total costs and costs by CO2e unit	15 million € 15 million €/kt CO_{2eq}

B-2.2: Individual action outlines - More efficient lighting and devices/systems		
Action outline	Action name	**More efficient lighting and devices/ systems**
	Action type	Construction Interventios
	Action description	It concerns the implementation of actions 2.2, 2.6, 2.7, 2.9, 2.15, 2.19 as presented in Module B-2.1 and aim at upgrading the energy efficiency of appliances and systems not only at building level but also at a wider level (e.g. installations)
Reference to impact pathway	Field of action	2. Buildings & Heating (built environment)
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Reduction of the thermal needs of the building stock, Reduction of the electrical needs of the building stock, Automated operation of buildings - increased efficiency, Increased energy efficiency of facilities
Implementation	Responsible bodies/person for implementation	Municipal Buildings/Facilities: Department of Urban Planning and Architectural Studies, Department of Electric Lighting and Light Signalling. Private Buildings/ Facilities: Property/ Facility Owners, EYATH
	Action scale & addressed entities	It is addressed to all owners (existing and new) of public, residential and tertiary buildings within the boundaries of the Municipality of Thessaloniki. It is addressed to the main energy consumers within the Municipality (EYATH, Universities, HELEXPO, etc.). It is addressed to the Department of Electric Lighting and Light Signalling
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, Region of Central Macedonia, Home/building owners, Citizens, CERTH, Technical Chamber of Greece, Thessaloniki Hotels Association, Other entities with autonomous areas within the Municipality (AUTH, UoM, HELEXPO, EYATH)
	Comments on implementation	In order to achieve the climate neutrality targets of the Municipality of Thessaloniki, a replacement rate of 5.5% per year of building lamps and appliances with more energy efficient ones is required by 2030, of which 65% is for extensive changes (≈40% energy savings on lighting and appliances) and 35% for small-scale changes (≈15% savings). New EU initiatives such as the Building Smart Index support the purchase of smart appliances, while relevant funding programmes (see Module A-2) significantly enhance the likelihood of achieving the above-mentioned targets. The Municipality of Thessaloniki has already planned a number of interventions regarding the energy upgrade of municipal lighting, while actions such as D2.19 can further highlight the importance of implementing such interventions.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	

	GHG emissions reduction estimate (total) per emission source sector	57 kt CO_{2eq} /year
	Total costs and costs by CO2e unit	183 million € 3.2 million €/kt CO_{2eq}

B-2.2: Individual action outlines - More efficient heat generation from electricity		
Action outline	Action name	**More efficient heat generation from electricity**
	Action type	Construction Interventios
	Action description	It concerns the implementation of actions 2.3, 2.10, 2.16 as presented in Module B-2.1 and aims at replacing traditional fossil fuel based thermal systems with high efficiency electrical systems (e.g. heat pumps)
Reference to impact pathway	Field of action	2. Buildings & Heating (built environment)
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Increased use of RES to meet the thermal needs of buildings, Automated operation of buildings - increased efficiency, Increased energy efficiency of facilities
Implementation	Responsible bodies/person for implementation	Municipal buildings: Directorate of Urban Planning and Architectural Studies / Private Buildings: Property Owners, Technical Chamber of Greece
	Action scale & addressed entities	It is addressed to all owners (existing and new) of public, residential and tertiary buildings within the boundaries of the Municipality of Thessaloniki.
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, Region of Central Macedonia, Home/building owners, Citizens, CERTH, Technical Chamber of Greece, Thessaloniki Hotels Association, Other entities with autonomous areas within the Municipality (AUTH, UoM, HELEXPO, EYATH, FODSA K.M)
	Comments on implementation	As highlighted in the previous sections, the electrification of the energy system and the decoupling from natural gas/oil to meet the thermal needs of the building stock, are key prerequisites for achieving the climate neutrality objectives. Consequently, a significant increase in the percentage-share of thermal needs met by electrical systems (e.g. heat pumps, efficient air conditioning systems, etc.) is required. More specifically, total heating needs by 2030 should be covered by: a) 35% by fossil fuels (current value: 79%), 60% by high efficiency electrical systems (current value: 20%) and 5% by biofuels (current value: 1%). These specific target values were chosen taking into account corresponding projections at European level, market penetration trends of heat pumps, and calculations to meet the 80% carbon dioxide emission reduction target. This transition is a particular challenge as a significant proportion

		of buildings use gas burners for heating. Therefore, as in the case of actions related to building envelope renovation, the success or otherwise of this action is inextricably linked to the implementation of national initiatives (e.g. subsidies, change of legislation/regulations). New EU initiatives such as the 'renovation passports' are supporting the implementation of the action.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	115 kt CO_{2eq} /year
	Total costs and costs by CO2e unit	€80 million 0.7 million €/kt CO_{2eq}

For Sector **2. Transport & Logistics**, as mentioned above, the actions were divided into two major categories: Passenger Transport and Freight Transport and Logistics

Their contribution to the reduction of greenhouse gas emissions was calculated according to the indicators proposed by the “Economic model”.

B-2.2: Individual action outlines - 3.1.1 Reduction of lanes on the hierarchical road network, in order to reduce car use and make space available for other means of transport		
Action outline	Action name	**3.1.1** Reduction of lanes on the hierarchical road network, in order to reduce car use and make space available for other means of transport
	Action type	Spatial interventions
	Action description	Implementation of technical regeneration projects, one-way/ramps and related interventions in the public space aiming at redistributing its functions by shifting the emphasis from car to walking and cycling. The main tool to achieve this objective is the reduction of lanes on the hierarchical road network in order to reallocate them from car travel to other modes of transport. The implementation of the Action is foreseen in the SDS for the whole central area with emphasis on Egnatia and Tsimiski streets. In particular, the flagship intervention of Egnatia Street provides for dedicated bus lanes, and connections to metro stations and other means, while in the project to convert Tsimiski Street into a low-traffic street, a large part of Tsimiski Street is converted into a street for the exclusive use of buses and electric vehicles. In addition,

		the SDC proposes the redevelopment of Dodekanissou Street, Vafopoulou Street, 26th October, and the redevelopment study of Vass. olgas, as well as one-way and two-way streets, reconfiguration of signalised intersections, and widening (Ag. Dimitriou Street) and the undergrounding study of Vass. George. In addition to the SBAK proposals, it is proposed to extend the measure of converting roads into low-traffic, low-speed and pedestrianised roads throughout the central area of the Municipality of Thessaloniki. The result of the implementation of all these projects will have a positive impact on the functioning of the central area and its role in the new era of multimodality envisaged with the operation of the Metro.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Reducing the need for motorised passenger transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	It concerns the main roads of the Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki,
	Comments on implementation	The implementation of the Action is based on the partial exclusion of the central area of the Municipality of Thessaloniki for conventional cars with the simultaneous upgrading of peripheral centres of the Municipality and support to multimodality (shared electric vehicles and public transport) according to the planning that already exists in the SDS of the Municipality of Thessaloniki and with possible extensions to a larger geographical area. The Action is interlinked with Actions D2.2, D2.3, D2.4, D2.5.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.1.1 contributes to the Indicator Reduced motorized passenger transportation need (21% reduction compared to BAU or 26 CO2e reduction according to the Economic Model) (Calculation based on the data estimated from the traffic model of the SDC)*
	Total costs and costs by CO2e unit	55.270.000,00€

B-2.2: Individual action outlines – 3.1.2 &3.1.3

Action outline	Action name	**3.1.2** Low emission zones. Climate neutral districts and restricted access by conventional vehicles **and 3.1.3** Interventions and promotion to citizens and businesses, intervention of the AUTH (study - campaigns - organisation/government)
	Action type	Spatial and other interventions
	Action description	A comprehensive programme of actions to transform the Rotunda area into a low emission zone including interventions to deter the entry of private vehicles, while increasing accessibility by bicycles and electric vehicles (shared micro-mobility vehicles), removing on-street parking through subsidised off-street parking, supporting electrification for residents through and servicing deliveries within the zone exclusively by electric vehicles. Finally, they include interventions for public space regeneration, climate upgrading of buildings and protection against climate change impacts (for example shading and air renewal canopies in electricity generation contributing to the production of solar energy for municipal lighting, etc.). The programme is also interlinked with interventions outside the narrow area of Rotonda in adjacent and neighbouring areas such as interventions in the Egnatia road and in the area of the AUTH (described in the Thessaloniki City Council's SDS). Beyond the technical urban design and road infrastructure projects, there are a number of governance, social innovation and participation interventions related to the active involvement and support of citizens and businesses in the area as well as the cooperation with the University of Thessaloniki.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and infrastructure
	Outcome (according to module B-1.1)	Reducing the need for motorised passenger transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	It concerns the main roads of the Municipality of Thessaloniki.
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki,
	Comments on implementation	In the Municipality's SUMP the following area of

		application has been defined  but which is proposed to grow to the boundary of Iasonidou to the West. The Action Plan for the Rotunda area is a guide for the implementation of similar actions in other areas of the Municipality. As an Action it is interlinked with other actions in the Transport sector concerning electromobility, shared micromobility and Mobility as a Service as well as with Actions in other sectors such as energy, land use and the built environment.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Actions 3.1.2 and 3.1.3 contribute to the Indicator Reduced motorized passenger transportation need (21% reduction compared to BAU or 26 CO2e reduction according to the Economic Model) (Calculation based on the data estimated from the traffic model of the SDC)*
	Total costs and costs by CO2e unit	Total: 8.000.000 € Action 3.1.2: 3.000.000 € Action 3.1.3: 5.000.000 €

B-2.2: Individual action outlines – 3.1.4 &3.1.5		
Action outline	Action name	**3.1.4** Construction and operation of a bypass road to divert through traffic (Fly over road infrastructure) **and 3.1.5** Overall interventions, studies and projects to reduce traffic, improve traffic flow and avoid congestion in the area of the Flyover construction works.
	Action type	Technical Interventions
	Action description	The action concerns the construction and operation of a new road infrastructure "New Eastern Regional Road of Thessaloniki (fly

		over)" which is intended to decongest the main roads of the Municipality of Thessaloniki and in particular the main area of the Municipality of Thessaloniki. The action also includes interventions for the wide implementation of Intelligent Transport Systems in the area of the Regional Road. In addition to the construction of the road infrastructure, a series of interventions such as studies, traffic regulations, traffic management applications and others are also envisaged in order to reduce congestion due to the construction works and the smooth operation of the overall road network.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Reducing the need for motorised passenger transport
Implementation	Responsible bodies/person for implementation	Region of Central Macedonia (RCM)
	Action scale & addressed entities	Urban Complex of Thessaloniki
	Involved stakeholders	Technical Directorate of the RCM
	Comments on implementation	The implementation of the action also concerns the implementation of Intelligent Transport Systems, which should be integrated with the RCM urban traffic management systems and will have a cumulative positive impact on the reduction of CO2
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Actions 3.1.4 and 3.1.5 contribute to the Indicator Reduced motorized passenger transportation need (21% reduction compared to BAU or 26 CO2e reduction according to the Economic Model).*
	Total costs and costs by CO2e unit	Action 3.1.4: 478.000.000 € (Not included in the cost of the Action Plan as funding has been secured) Action 3.1.5: 10.000.000 €

B-2.2: Individual action outlines – 3.1.6		
Action outline	Action name	**3.1.6** Parking management by electronic and other means: expansion and upgrading of the electronic controlled parking system, and dynamic parking pricing
	Action type	Technical interventions Other interventions

	Action description	Expansion of the existing controlled parking system both geographically and technologically, with the installation of forklifts to detect illegal vehicles for the policing of loading bays and disabled ramps. Introduce a regulatory framework for dynamic pricing of on-street parking based on actual parking demand. Implementation of a digital system for dynamic demand-based charging.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure, Governance and Policies
	Outcome (according to module B-1.1)	Reducing the need for motorised passenger transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki,
	Comments on implementation	The implementation of the action also concerns the implementation of Intelligent Transport Systems, which should be integrated with the RCM urban traffic management systems and will have a cumulative positive impact on the reduction of CO2
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.1.6 contributes to the Indicator Reduced motorized passenger transportation need (21% reduction compared to BAU or 26 CO2e reduction according to the Economic Model) (Calculation based on the data estimated from the traffic model of the SDC)*
	Total costs and costs by CO2e unit	3.000.000,00€

B-2.2: Individual action outlines – 3.2.1		
Action outline	Action name	**3.2.1** Exploiting a single system of information for commuters
	Action type	Technical Interventions
	Action description	One of the key digitisation actions in the Transport & Logistics Sector is the creation of a single system for traveller information, which includes methods to influence traveller behaviour and can also be used to implement campaigns to promote sustainable mobility choices. The application will leverage the digital infrastructure mobility data space infrastructure

		to generate information related to travel planning with a focus on green modes and avoidance of private cars. The application will provide the commuter with information on the CO2 emissions burden and the delay caused by alternative travel options based on their needs. It will also give suggestions for the optimal choice of means of transport, with a focus on active travel (walking, cycling and micro-mobility). In many cases, it will also include recommendations to either avoid travel altogether, or to propose less burdensome travel alternatives, or to avoid specific areas based on environmental criteria if the journey is to be made by polluting means of transport. This **Action 3.2.1** includes the implementation of the mobile application and the broad campaign to promote it to citizens.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Reducing the need for motorised passenger transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki, HIT/ CERTH
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki,
	Comments on implementation	Action 3.2.1 is linked to Actions 3.3.4 and 3.9.5 as an integrated intervention. It is also directly related to Actions 3.9.2 and 3.4.4
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.2.1 contributes to the Indicator Reduced motorized passenger transportation need (21% reduction compared to BAU or 26 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	150.000,00€

B-2.2: Individual action outlines – 3.2.2		
Action outline	Action name	**3.2.2** Creating a framework and incentives for teleworking in the public and private sectors (with a focus on climate neutrality ambassadors)
	Action type	Other Interventions (Social Innovation)

	Action description	As the achievement of climate neutrality of the Municipality of Thessaloniki requires a 21% reduction in the number of journeys made by motorised means, the implementation of teleworking is one of the key measures that should be considered/established. Its implementation in the Municipality of Thessaloniki is initially proposed to start from the Municipality's services and then to be extended to other public services. The focus will be mainly on employees who travel long distances to and from work on a daily basis. At the same time, with appropriate incentives (financial support for the purchase of laptops etc.) in private companies, teleworking can be extended to the private sector. Companies that implement the measure to achieve climate neutrality can join the climate neutrality ambassadors of the Municipality of Thessaloniki together with other bodies that will reinforce climate neutrality.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Social Innovation
	Outcome (according to module B-1.1)	Reducing the need for motorised passenger transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, public services within the Municipality of Thessaloniki, private companies
	Comments on implementation	Teleworking in Greece has been regulated by Law 4807/2021 (Government Gazette A´96) for public sector employees and by the provision of Article 67 of Law 4808/2021 (Government Gazette A´101) for private sector employees. In both cases, a presidential decree is provided for the adoption of a presidential decree for the more specific regulation of personal data protection issues, after an opinion of the Personal Data Protection Authority.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.2.2 contributes to the Indicator Reduced motorized passenger transportation need (21% reduction compared to BAU or 26 CO2e reduction according to the Economic Model)*
	Total costs and costs by	220.000 €

	CO2e unit	

B-2.2: Individual action outlines – 3.3.1		
Action outline	Action name	**3.3.1** Extension of the cycle path network
	Action type	Technical Interventions
	Action description	The action includes the implementation of the proposed cycle path networks of the Sustainable Urban Mobility Plan, which will enhance alternative and green transport and the interconnection of the proposed redevelopments. More detailed information is provided in the comments on the description of the action. In order to achieve the climate neutrality objectives of the Municipality of Thessaloniki and to achieve a 40% increase in the use of public transport and environmentally friendly means of transport, additional networks of cycle paths are proposed in the action. The Municipality of Thessaloniki, as a member of the URBACT network "RESILIENT EUROPE - RESILIENT EUROPE", has set the objective of formulating Integrated Action Plans to address specific challenges facing the city. In particular, as regards the upgrading and extension of cycling infrastructure, a network of 75 km of cycling infrastructure was designed in principle, including 31 km of primary network, 32 km of secondary and 12 km of local network. During the planning process, emphasis was placed on the connection with the neighbouring municipalities with a view to creating a metropolitan network of cycling infrastructure and the feasibility of the proposals was examined in terms of the geometric and functional characteristics of the urban road network.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, civil society, HIT/ CERTH, universities, pedestrian associations, cyclists' associations

	Comments on implementation	The SUMP proposes: i. Review and upgrade of the existing network of cycle paths ii. Extension of the existing network on the road sections - Kleanthous from C. Extension of the existing road network to include: - Pappafi from G. Lambraki to Papafi - Papafi from Kleanthous to Kautantzoglou - Them. Sofouli from Vass. Olga to Argonauton - Egnatia from Dodecaneseou to Kaytatzoglou - K. Karamanlis Avenue - Maintenance of a pilot bicycle lane and its harmonization with the specifications for dedicated bicycle lanes - Bottsari from M. Alexandrou to Papanastasiou - P. Syndika from M. Alexandrou to Papanastasiou (until 2025).- 28th October from K. Karamanlis to M. Alexandrou - Ag. Αμύνης - Agia Sophia from Nikis Avenue to Filippou - Al Stavrou from Papanastasiou to Kanari - B. Heraklion - Ag. Theodoras from Dodecanese to Ag. Sofias - Venizelos from Ag. Demetriou to L. Nikis - Kanari from P. Syndikas to Papafi - Papafi from Kanari to Kleanthous - Karooli & Demetriou from Egnatia to Ag. Demetriou - Katsimidis from Papafi to Ag. Demetriou - Krystallis - Philippou from Karaoli & Demetriou to D. Gounari - Konstantinopoulos from Kleanthous to 28th October - M. Alexandrou from 3rd September to 25th March - M. Kalou - Dragomanou from Lagada to Monastiriou - Mackenzie King - Pavlou Mela from Ag. Sofias to L. Nikis - Svolou - Keramopoulou from Angelaki to Ag. Sofias - Vasilissis Olga (until 2030). Implementation of the cycle paths have been proposed for inclusion in the CMP-BIA as part of wider site regeneration projects.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.3.1 contributes to the Indicator Shift to public & non-motorized transport (shift from car to public & active mobility by 40% compared to BAU or 24 CO2e reduction according to the Economic Model) (Calculation based on the data estimated from the traffic model of SUMP).*
	Total costs and costs by CO2e unit	22.500.000,00€

B-2.2: Individual action outlines – 3.3.2		
Action outline	Action name	**3.3.2** Redevelopment and pedestrianisation. Interconnection of pavements. Create

		pedestrian corridors and implement safe smart crossings. Design and creation of tourist routes
	Action type	Technical Interventions
	Action description	The action includes the proposed network of sidewalks and redevelopments of the Sustainable Urban Mobility Plan with emphasis on the functional interconnection of sidewalks and redevelopments to support green travel. Through the action, the Municipality of Thessaloniki wishes to enable pedestrian mobility from the different regeneration areas to the rest of the areas, providing a unified experience of environmentally friendly mobility that supports sustainable mobility. Along the routes, it is proposed to use smart technologies and in particular the creation of smart crossings in order to increase the level of safety provided to travellers. The pedestrian routes are extended in the eastern part of the municipality in order to connect neighbourhoods outside the central area.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki,
	Comments on implementation	More specifically, in the SUMP the creation of five pedestrian routes is proposed (Moni Latomou - N. Kountouriotis, Evangelistria - Beach front, Urban vineyard of the Aristotle University of Thessaloniki - Beach front, Philippou - Tsirogianni and Kautantzoglou - Beach front) which either cross existing pedestrian streets and roads with wide sidewalks or cross road sections of inappropriate infrastructure where the Municipality should intervene to create the appropriate infrastructure and conditions for the use of this infrastructure. In the east of the Municipality, six routes are proposed (Toumba - Nea Paralia, Toumba-Rema, Papanastasiou - Megaro, Solonos - Patrikiou Park, Nea Elvetia Park - Bottsari and Kellarios Ormos - Allatini), which include the installation of smart crossings. Two supporting projects based on technological

		solutions have also been proposed as part of the proposals to the CIF-BIA to actually increase road safety and the sense of safety of pedestrians: 1. Construction of standard crossings at selected points of reduced road safety on the roads of the Municipality of Thessaloniki, with emphasis on school rings 2. Increasing the road safety level of critical junctions in the Municipality of Thessaloniki and implementing smart systems in them
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.3.2 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger-kilometres compared to BAU or 24 CO2e reduction according to the Economic Model) (Calculation based on the data estimated from the traffic model of the SDC)*
	Total costs and costs by CO2e unit	36.300.000,00€

B-2.2: Individual action outlines – 3.3.3		
Action outline	Action name	**3.3.3** Shared Micromobility services (Shared Micromobility services)
	Action type	Technical interventions Other interventions
	Action description	The Action concerns the implementation and operation of competitive shared mobility vehicle services by different private providers of the relevant services. The shared vehicles will be available in different parts of the city (private off-street areas operating as rental and drop-off stations or virtual stations on pavements where the allocation of public space is required). The development of the services will be open to private investors but will need to follow the regulatory framework for the use of public space, and security set by the City. If there is a concession of public space (mainly parking spaces on pavements or other public spaces) there should be a clear framework of reciprocity to the municipality. In the same context, the Municipality will take the initiative to establish and maintain a relevant cooperation network, which is part of the relevant Mobility as a Service (MaaS) network. Beyond the buffer, the City will be responsible

		for the zoning and striping of the shared vehicle parking spaces.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki, Individuals, TheTA
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Cooperation between the competent departments of the Municipality of Thessaloniki and private service providers
	Comments on implementation	The Action does not concern the supply and operation of shared bicycles by the Municipality but the creation of a suitable environment for the development of shared vehicle services by private individuals. However, the supply and operation of shared bicycles by the Municipality is an alternative or parallel intervention that may be selected at a later stage depending on the progress of the project. The implementation of Action 2.3.3 relies heavily on private capital that will come from competing micro-mobility car-sharing services. The Municipality of Thessaloniki will ensure the creation of the relevant regulatory framework, as well as the location and layout of the micromobility stations. Action 3.3.3 is directly related to Action 3.4.4 (Mobility as a Service) and is one of the main interventions for the implementation of an integrated Mobility as a Service for Thessaloniki.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.3.3 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger-kilometres compared to BAU or 24 CO2e reduction according to the Economic Model) (Calculation based on the data estimated from the traffic model of the SUMP)*
	Total costs and costs by CO2e unit	11.000.000,00€

B-2.2: Individual action outlines – 3.3.4		
Action outline	Action name	**3.3.4** Campaign and information system for the

		commuter on sustainable transport options
	Action type	Other interventions
	Action description	The Action includes all actions to promote active travel (walking, cycling and micro-mobility) through campaigns in electronic and conventional media, social networks and finally through the use of the Single Mobility Information System.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Social innovation
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility, Involving citizens and stakeholders in innovation and decision making
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki, Individuals, TheTA
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki,
	Comments on implementation	Action 3.3.4 is linked to Actions 3.2.1 and 3.9.5 as an integrated intervention (at least in relation to the use of the integrated travel information system). It is also directly related to Actions 3.9.2 and 3.4.4
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.3.4 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger kilometres compared to BAU or 24 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	250.000,00€

B-2.2: Individual action outlines – 3.4.1		
Action outline	Action name	**3.4.1** Restructuring of bus lines and launching of express lines
	Action type	Other Interventions (Study)
	Action description	The introduction and operation of the two metro lines in 2025 will create new planning needs for the public transport system, especially with regard to the supply of the new means of transport. The action proposes a restructuring of the Public Transport bus lines based on the overall rationalisation, re-routing, improvement of the characteristics and programming of the existing network, where necessary, as well as

		the creation of new bus lines to complement the Public Transport network. In addition, the action includes the creation of express lines that will cross the Municipality without many intermediate stops, serving residents mainly during peak hours. An indicative example is the creation of a bus line that passes through the Regional Road. These routes will be particularly useful during Flyover construction.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	TheTA
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	TheTA, Municipality of Thessaloniki, Region of Central Macedonia, bus lines operator (OASTH), neighbouring municipalities, shop owners, civil society, HIT/ CERTH
	Comments on implementation	The proposed network involves modifications to route layouts, and/or transfer of starting points/terminals or the abolition of some of the existing lines of OASTH, as well as the creation of new bus lines, with the aim of creating a feeder network to the Thessaloniki Metro and other means of transport that will be implemented in the city. The restructuring of the Public Transport system designed and studied by HIT/ CERTH included: - 4 trunk lines (high frequency lines connecting points of significant demand for Public Transport) - 10 vertical feeder lines (lines connecting areas with the coastal front and with vertical direction, which at some point of their route are connected, directly or in close proximity, with one or more Metro stations) - 21 local feeder lines (local lines which at some point of their route are connected, 8 regional feeder lines (regional feeder lines (regional lines that, on the one hand, provide interconnection between the external areas of the Regional Unit of Thessaloniki and the central municipalities of Greater Thessaloniki) - 6 local lines (local lines (local lines not interconnected with Metro stations)).
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	

	GHG emissions reduction estimate (total) per emission source sector	*Action 3.4.1 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger-kilometres compared to BAU or 24 CO2e reduction according to the Economic Model) (Calculation based on the data estimated from the traffic model of the SUMP)*
	Total costs and costs by CO2e unit	

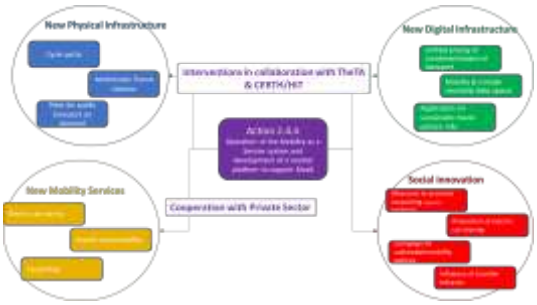
B-2.2: Individual action outlines – 3.4.2		
Action outline	Action name	**3.4.2** Construction of transfer stations / Park & Ride stations
	Action type	Technical interventions
	Action description	It includes the necessary actions for the design and construction of the infrastructure for bus accommodation (as well as charging of electric buses) and to serve the objectives of multimodal mobility and park and ride at Metro stations. The action will take into account the requirements for the supply of bus lines to transfer stations
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	TheTA
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Ministry of Transport and Infrastructure, TheTA
	Comments on implementation	Directly related to Actions 3.3.3 (micro-mobility services), 3.4.4 (mobility as a service) and 3.8.3 (car sharing)
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.4.2 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger-kilometres compared to BAU or 24 CO2e reduction according to the Economic Model) (Calculation based on the data estimated from the traffic model of the SUMP)*
	Total costs and costs by CO2e unit	4.280.000,00€

B-2.2: Individual action outlines – 3.4.3		
Action outline	Action name	**3.4.3** Uniform pricing of combined transport and e-ticketing
	Action type	Technical interventions

		Other interventions
	Action description	The Action concerns the creation of a single electronic ticket for the city's public transport (a technological project that will also include the upgrading of the telematics and passenger information system as well as business intelligence applications). In the same context, it is proposed to extend the system to allow for the integration of other means of transport that will complement public transport, such as micro-mobility and electric car sharing vehicles and park & ride. In order to achieve this objective, the technological extension of the above-mentioned system is needed on the one hand, but above all the creation of a framework for uniform pricing with the possibility of dynamic price adjustments depending on current conditions. Finally, the same action includes the interconnection with the Mobility as a Service applications
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	TheTA
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	TheTA, private individuals, HIT/ CERTH
	Comments on implementation	Action 3.4.3 is by itself key in relation to supporting the use of public transport in view of the opening of the metro in Thessaloniki but with the proposed extensions it becomes directly related to Action 3.4.4 (Mobility as a Service), indeed it is one of the main interventions for the implementation of an integrated Mobility as a Service, and is expected to have multiplier benefits through the reduction of car use.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.4.3 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger kilometres compared to BAU or 24 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	35.000.000,00 €

B-2.2: Individual action outlines – 3.4.4		
Action outline	Action name	**3.4.4** Operating a Mobility as a Service system

		and creating a neutral platform to support the system
	Action type	Technical interventions Other interventions
	Action description	The Action concerns the implementation of the basic requirements for the operation of an integrated Mobility as a Service (MaaS) system for Thessaloniki. The MaaS of Thessaloniki will include competitive carpooling and co-passenger services combined with public transport. The Action foresees firstly the preparation of a plan for the implementation of the integrated Mobiity as a Service system in Thessaloniki.... The integrated system will be based on the implementation of a neutral platform on which the interconnection of all individual mobility services (information, electronic tickets, payment, etc.) will be based and the possibility of their use in multimodal chains by the travellers. The Action includes the development of a digital application, available on mobile and web, through which commuters will be able to plan their journey, make transport reservations and purchase tickets and access to them. The design of the system will be such as to allow simultaneous provision of services by more than one digital application (for example one may be operated by an Operator and another by a private digital application provider). The Action includes a number of supporting interventions for the operation of MaaS, such as the establishment of a governance framework and operating rules for the relevant Ecosystem, and the promotion of MaaS services and implementation.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	Cooperation between TheTA, Municipality of Thessaloniki, Individuals, HIT/ CERTH
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	TheTA, Municipality of Thessaloniki, Individuals, HIT/ CERTH
	Comments on implementation	Action 3.4.4 is crucial for the introduction of the concept of Mobility as a Service in Thessaloniki.

		MaaS is a relatively recent tool that combines new mobility services, digital applications, innovative business models and governance framework in Mobility that aim to change the current pattern based on car ownership and use in favour of car sharing, public transport and walking. Action 3.4.4 is combined with the following Actions to produce an integrated MaaS service in the city: 1. Regarding the necessary new physical infrastructure, with Actions D3.3.1, D3.4.2, D3.4.5 (and the design of D5.1) 2. As regards new digital infrastructure, with Actions D3.2.1, D3.4.3, D3.9.2, D3.9.5 3. As regards the necessary new mobility services, with Actions D3.3.3, D3.6.1-3.6.2, D3.8.3 4. Regarding social innovation with Actions 3.3.4, 3.6.3, 3.9.5 The figure below shows the set of interventions to be implemented under this Action D3.4.4 
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.4.4 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger kilometres compared to BAU or 24 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	1.500.000,00 €

B-2.2: Individual action outlines – 3.4.5		
Action outline	Action name	**3.4.5** Fleet change and fleet growth for public transport on demand services
	Action type	Technical Interventions
	Action description	The action includes the design, management and monitoring of Demand Responsive

		Transport (DRT) services/solutions. This action will connect remote areas inside and outside the municipality with its central area, feeding into the main public transport lines. Given the reduced demand for travel in remote areas and having as a first priority to serve the residents of these areas, the proposed possibility of on demand public transport action will increase the efficiency of public transport while reducing the environmental impact.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	TheTA
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	
	Comments on implementation	The users of the service will be able to plan their journey up to 48 hours in advance through the free application, choosing as origin - destination one of the existing stops located in the areas.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.4.5 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger kilometres compared to BAU or 24 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	7.500.000,00 €

B-2.2: Individual action outlines – 3.5.1		
Action outline	Action name	**3.5.1** Urban planning measures to link land uses to Metro stations through active mobility (Transit oriented development zones), with emphasis on the areas: Delphon, Voulgari, New Railway Station, City Hall
	Action type	Technical Interventions
	Action description	Creating climate-neutral zones developed around major Metro terminals. These zones have been identified in the Municipality's SUMP and primarily concern the areas around the Metro terminals at New Railway Station and Nea Elvetia but also zones around Delphon, Voulgari and the City Hall. It includes interventions for the construction of park & ride stations, redevelopment of the peripheral zones

		around the stations, traffic management and support for multimodality (linking terminals with cycle paths, car-sharing stations), with the ultimate aim of increasing the accessibility of land uses adjacent to the stations through pedestrian mobility. The Action includes a focused intervention based on the proposals of the SUMP and concerns the creation of a climate-neutral zone in the key areas of the City Hall, AUTH and TIF. The development of electric mobility infrastructure, park and ride (in the area of the ex-military camp G' Soma Stratou) and shared mobility is foreseen, while at the same time interventions related to the Egnatia road (Emblematic Egnatia) and the prevention of the entry of private cars into the AUTH are foreseen. The above interventions are described in the Municipality's SUMP. In addition, energy upgrading of public and municipal buildings and subsidies for upgrading private buildings in the Desperé area are proposed. The above interventions will be implemented through the following projects that have been proposed for funding by the Regional Operational Programme (ROP): 1. Study and project for the redevelopment of the areas of influence around the METRO stations (new pedestrian routes or soft measures for transport calming- connection to cycle paths – multimodality etc.) - ensuring an increased level of road safety and passenger service level 2. Redevelopment of the perimeter zone of the Metro transfer station in Nea Elvetia of the Municipality of Thessaloniki
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Municipality of Thessaloniki, TheTA and private individuals
	Comments on implementation	As an Action it is interlinked with other actions in the Transport sector concerning electromobility, the promotion of multimodality, shared micromobility and Mobility as a Service as well

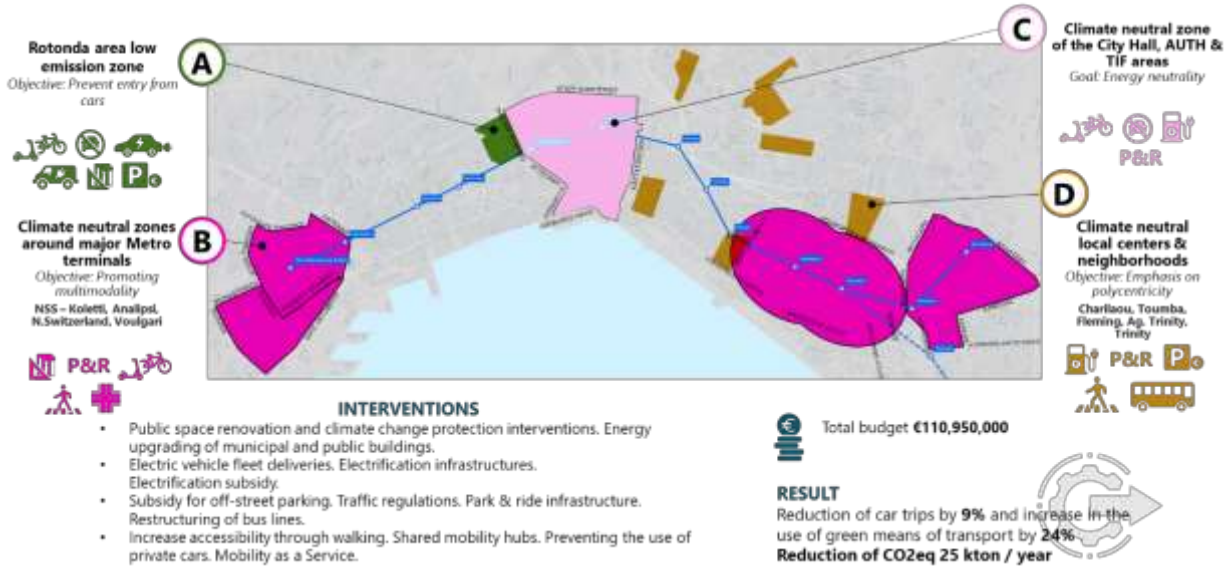
		as with actions in the built environment and energy sectors.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.5.1 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger-kilometres compared to BAU or 24 CO2e reduction according to the Economic Model) (Calculation based on the data estimated from the traffic model of the SUMP)*
	Total costs and costs by CO2e unit	56.686.000,00€

B-2.2: Individual action outlines – 3.5.2		
Action outline	Action name	**3.5.2** Creating climate-neutral local centres and neighbourhoods & interconnecting different land uses (residential, employment, commercial) through green mobility corridors (Mixed used development zones)
	Action type	Technical Interventions
	Action description	According to the Municipality's SUMP, high through traffic flows using private cars via major, horizontal roads/arterial roads contribute to CO2 emissions in the city centre. To address this problem, a polycentric urban structure is proposed. As potential local centres, areas such as: Toumba, Harilaou, Triandria, Fleming and Agia Triada, which attract a large number of trips, and where interventions will be implemented to develop them as urban peripheral centres on the one hand and to operate with a reduced carbon footprint on the other hand. The interventions concern: 1. Urban regeneration by reallocating public space in favour of sustainable forms of transport, converting streets to low-traffic, and creating sustainable transport corridors within each centre, 2. Interconnection between centres by sustainable means of transport (bicycle and bus lines) 3. Energy upgrades of buildings 4. Creation of shared electric vehicle and bicycle stations 5. Securing space for the creation of charging infrastructure for electric shared vehicles 6. Incentives for electrification 7. Interventions to change the parking pattern: subsidies for the use of parking spaces in

		selected areas near metro terminals, incentives for the conversion of buildings into parking spaces, incentives for the development of lightweight structures for parking on vacant lots 8. Changes to the distribution model: night-time distribution of goods and integration of distribution points into the parking management system for better supervision and use (monitoring by THESi system). Provision of space and support for the creation of small consolidation centres and implementation of alternative means of distribution The above interventions are outlined in the Municipality's SDMP and will be implemented through the following projects that have been proposed for funding by the Regional Operational Plan: 1. PAOK stadium area redevelopment projects (Zone B) 2. Regeneration of the Depot 3. Redevelopment of the streets where markets are held
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Shift to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki,
	Comments on implementation	Implementation in the proposed areas will be a good practice for expansion to other areas/neighborhoods in the Municipality. As an Action it is interlinked with other actions in the Transport sector concerning electromobility, the promotion of multimodality, shared micromobility and Mobility as a Service as well as with actions in the built environment and energy sectors.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.5.2 contributes to Indicator Shift to public & non-motorized transport (40% reduction of car passenger-kilometres compared to BAU or 24 CO_2e reduction according to the Economic Model) (Calculation*

		based on the data estimated from the traffic model of the SUMP)
	Total costs and costs by CO2e unit	42.000.000,00€

Actions 3.5.1 and 3.5.2 (in combination with Action 3.1.2 - Low Emission Zone Rotunda) are emblematic Urban Design Interventions aiming at the creation of climate neutral areas within the Municipality of Thessaloniki with emphasis on sustainable mobility, electromobility, addressing climate change impacts and energy upgrading of buildings. The map below shows the proposed interventions (based on the SUMP).



B-2.2: Individual action outlines – 3.6.1, 3.6.2, 3.6.3		
Action outline	Action name	**3.6.1** Implementation and operation of the Car pooling service **3.6.2** Operation of the on demand ridesharing service **3.6.3** Campaign, incentives and measures to promote co-passage in organised ecosystems (for example students of AUTH/UoM)
	Action type	Technical interventions Other interventions
	Action description	This includes all actions relating to the promotion of co-passage. The car pooling application is a digital mobile application to support co-pooling with privately owned cars and will be interconnected with the Mobility as a Service platform. The application will prioritise emission avoidance and prioritise available electric vehicles. In addition to implementation costs, the action includes start-

		up support costs. The on demand ridesharing application is also a digital mobile application to support co-pooling, but the main difference from the previous car pooling application is that in this case co-pooling with shared transport means is supported, be it electric cars car sharing (Action 3.8.3), or taxis or even public transport buses (link to Action 32.4.5). In addition to the implementation costs and study costs, the action includes costs to support the start-up and finally a subsidy of part of the passenger transport costs as an economic incentive. The Action includes promotion of services with a focus on specific categories of users whose trips are attracted by large travel generators, such as students. In addition, measures are proposed to restrict the movement of private cars with fewer than two passengers from specific lanes. In these lanes, vehicles with more than two passengers will be allowed to move (in addition, and for the policing of the measure, systems for the supervision and monitoring of the measure can be provided, which will have to be studied and, if deemed necessary, budgeted for - at this stage, not included in the costing).
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Increase car pooling
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, private individuals
	Comments on implementation	The applications to be developed under Actions 3.6.1-3.6.2 will be integrated into the operation of Mobility as a Service services supported by Action 3.4.4.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Actions 3.6.1-3.6.2-3.6.3 contribute to the Car pooling Indicator (17% increase in passengers per car compared to BAU or 8 CO2e reduction according to the Economic Model)*

	Total costs and costs by CO2e unit	**Action 3.6.1:** 100.000 € **Action 3.6.2:** 1.000.000 € **Action 3.6.3:** 300.000 € 175 € / kgCO2 eq

B-2.2: Individual action outlines – 3.6.1, 3.6.2, 3.6.3		
Action outline	Action name	**3.6.1** Implementation and operation of the Car pooling service **3.6.2** Operation of the on demand ridesharing service **3.6.3** Campaign, incentives and measures to promote co-passage in organised ecosystems (for example students of AUTH/UoM)
	Action type	Technical interventions Other interventions
	Action description	This includes all actions relating to the promotion of co-passage. The car pooling application is a digital mobile application to support co-pooling with privately owned cars and will be interconnected with the Mobility as a Service platform. The application will prioritise emission avoidance and prioritise available electric vehicles. In addition to implementation costs, the action includes start-up support costs. The on demand ridesharing application is also a digital mobile application to support co-pooling, but the main difference from the previous car pooling application is that in this case co-pooling with shared transport means is supported, be it electric cars car sharing (Action 3.8.3), or taxis or even public transport buses (link to Action 32.4.5). In addition to the implementation costs and study costs, the action includes costs to support the start-up and finally a subsidy of part of the passenger transport costs as an economic incentive. The Action includes promotion of services with a focus on specific categories of users whose trips are attracted by large travel generators, such as students. In addition, measures are proposed to restrict the movement of private cars with fewer than two passengers from specific lanes. In these lanes, vehicles with more than two passengers will be allowed to

		move (in addition, and for the policing of the measure, systems for the supervision and monitoring of the measure can be provided, which will have to be studied and, if deemed necessary, budgeted for - at this stage, not included in the costing).
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Increase car pooling
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, private individuals
	Comments on implementation	The applications to be developed under Actions 3.6.1-3.6.2 will be integrated into the operation of Mobility as a Service services supported by Action 3.4.4.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Actions 3.6.1-3.6.2-3.6.3 contribute to the Car pooling Indicator (17% increase in passengers per car compared to BAU or 8 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	**Action 3.6.1:** 100.000 € **Action 3.6.2:** 1.000.000 € **Action 3.6.3:** 300.000 € 175 € / kgCO2 eq

B-2.2: Individual action outlines – 3.7.1		
Action outline	Action name	**3.7.1** Electrification of public transport
	Action type	Other interventions - Supply
	Action description	The action includes the supply of electric city buses that will operate in the Municipality of Thessaloniki. The action includes the supply of approximately 370 clean vehicles (buses), 100% electric or equivalent technology in terms of emissions. In addition to reducing emissions, the action is expected to increase the attractiveness of public transport.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure

	Outcome (according to module B-1.1)	Bus deselectrification, Public Transport Transition & active mobility
Implementation	Responsible bodies/person for implementation	TheTA
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Ministry of Infrastructure and Transport, TheTA, bus lines operator (ΟΑΣΘ), Municipality of Thessaloniki
	Comments on implementation	The supply of the vehicles will be implemented in two phases. The first phase, which is expected to be completed by mid-2024, will involve 130 new vehicles, 12m long, 100% electric vehicles in the fleet of Thessaloniki's public urban transport, of which 110 vehicles with an autonomy of 160km and 20 vehicles with an autonomy of 130km.In Phase B, it is estimated that 240 new zero-emission vehicles will be acquired. For Phase B, the type of vehicles in terms of both size and propulsion technology has not been finalised. Thus, of the total of 515 vehicles currently on the road under the current programme, 370, i.e. 72%, will be zero-emission vehicles. However, the bus electrification target under this action plan is to reach 100% of the City's circulating fleet by 2030. Therefore, all buses operating within the City in 2030 should be electrified (in 2019, baseline year, the number of buses operating within the City was 231 buses).
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.3.1 contributes to the Indicator Electrification of buses (100% increase of the electric fleet compared to BAU or 26 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	227.000.000,00€ 8.730,76 € per kg CO2 eq

B-2.2: Individual action outlines – 3.7.2. 3.7.3		
Action outline	Action name	**3.8.1** Incentives for the widespread adoption of electromobility by individuals and businesses **and 3.8.2** Implementation of all Electric Vehicle Charging Plan actions & Expansion of the necessary charger infrastructure
	Action type	Technical Interventions, Other Interventions

	Action description	The path to climate neutrality goes through electrification with the electrification of the public and private vehicle fleet. Other actions in the Plan include the electrification of the fleet of Public Transport, the Municipality and other bodies, while a special action concerns the electrification of urban delivery vehicles and waste collection vehicles. In order to reach the target of 36% electrification of the private and business fleet by 2035, incentives for the replacement of conventional vehicles for private and business customers are necessary. Currently there are funding schemes available, such as the Buy Electric scheme, which should be strengthened with more emphasis on areas such as the Municipality of Thessaloniki that are required to achieve climate neutrality by 2030. Particular emphasis is also placed on the electrification of the taxi fleet, where funding programmes are also in place, such as green taxis. The entire taxi fleet is expected to be electrified by 2030 through the action. At the same time, given that the Municipality of Thessaloniki has developed the Electric Vehicle Charging Plan, the action proposes the expansion of the network of charging infrastructure and the relevant actions for the implementation of the Electric Vehicle Charging Plan proposed in the SUMP.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Bus electrification
Implementation	Responsible bodies/person for implementation	Ministry of Environment in cooperation with the Municipality of Thessaloniki
	Action scale & addressed entities	The action has a national scope with particular emphasis on the area of the Municipality of Thessaloniki.
	Involved stakeholders	Municipality of Thessaloniki, Region of Central Macedonia, Ministry of Environment, individuals, businesses, taxi owners
	Comments on implementation	The national target for electrification of the car fleet for 2035 is 32% and for light trucks is 39% and for heavy trucks 10%. The targets set for Thessaloniki exceed the national targets, as it is required of cities participating in the EU's 100 Climate Neutral and Green Cities Initiative to be

		climate neutral by 2030. More specifically, 36% for cars (specific reference in the National Plan to incentives for electrification of the taxi fleet in Athens and Thessaloniki), 40% for light trucks and 12% for heavy trucks were selected.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.8.1 contributes to the Indicator Electrification of cars + motorcycles (Increase in electrification 36% compared to BAU or 15 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	**Action 3.8.1:** €63.000.000 **Action 3.8.2:** 1.052.000€

B-2.2: Individual action outlines – 3.8.3		
Action outline	Action name	**2.8.3** Promoting electric car sharing mobility
	Action type	Technical interventions Other interventions
	Action description	The Action concerns the creation of competitive car sharing services by different private providers of electric car mobility services. The shared vehicles will be available at various locations in the city (private off-street areas operating as rental and drop-off stations or virtual roadside stations, in which case the allocation of public space is required) equipped with fast chargers. The development of the services will be open to private investors but will need to follow the regulatory framework for the use of public space, charging and security set by the City. Where there is a public space concession (particularly alongside on-street parking) there should be a clear framework for reciprocity to the City. In the same context, the Municipality will take the initiative to set up and maintain a network of cooperation, which is a sub-network of the relevant Mobility as a Service (MaaS) network. Beyond the buffer, the City will be responsible for the zoning and striping of the shared vehicle parking spaces.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure

	Outcome (according to module B-1.1)	Electrification of cars, Electrification of trucks
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki, private individuals
	Action scale & addressed entities	The action has a national scope with particular emphasis on the area of the Municipality of Thessaloniki.
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki in cooperation with private providers of car sharing services
	Comments on implementation	The app will help the goal of electrifying the private vehicle fleet by replacing the use of conventional cars with shared, electric cars. The target is at 36% (compared to 34% envisaged in the consultation document of the national electrification plan). The implementation of Action 3.8.3 relies heavily on private capital that will come from competing car sharing services. The Municipality of Thessaloniki will ensure the creation of a relevant regulatory framework (the Ministry of Transport and Infrastructure is expected to prepare an institutional framework for the introduction of carsharing, carpooling and caron demand transport), as well as the location and layout of car sharing stations. Action 3.8.3 is directly related to Action 3.4.4 (Mobility as a Service) and is one of the main interventions for the implementation of an integrated Mobility as a Service for Thessaloniki.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.8.3 contributes to the Indicator Electrification of cars + motorcycles (Increase in electrification 36% compared to BAU or 15 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	11.000.000,00€

B-2.2: Individual action outlines – 3.8.4		
Action outline	Action name	**2.8.4** Electrification of the fleet of the Municipality and other bodies
	Action type	Other interventions - Supply
	Action description	Supply of electric vehicles and vehicles with anti-pollution technology. EYATH has 60% of its

		fleet hybrid or electric and is expected to procure 3 new electric vehicles in 2024. The action also includes the environmental upgrading of the waste transport fleet of the FCDA KM.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Electrification of cars
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki, Other Bodies, EYATH, FODSA KM.
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki,
	Comments on implementation	The budget for the electrification of the vehicles of the Municipality's Sanitation Department and/or the replacement of refuse collection vehicles is included in other Actions (D 3.15 and 4.6 respectively)
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*Action 3.8.3 contributes to the Indicator Electrification of cars + motorcycles (Increase in electrification 36% compared to BAU or 15 CO2e reduction according to the Economic Model)*
	Total costs and costs by CO2e unit	4.000.000 €

B-2.2: Individual action outlines – 3.9.1		
Action outline	Action name	**3.9.1** Monitoring systems and environmentally friendly management of traffic lights
	Action type	Technical Interventions
	Action description	The action includes all the technological interventions aimed at creating an integrated traffic management and traffic light control system for the whole city. It is also foreseen to interconnect the traffic light control system with the road infrastructure management systems of the fly over which are the responsibility of the project promoter. The Action will adopt environmentally friendly traffic control methods through traffic lights. This consists of two main interventions: a) modification of traffic light programmes to favour pedestrian, cyclist and vehicle movements to transfer and park and ride stations at Metro

		stations, and b) implementation of a bus priority system at traffic lights (with simultaneous bus lane policing system).
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Transition to full digitalisation of transport & logistics, Reduction of the need for motorised passenger transport, Transition to Public Transport & active mobility
Implementation	Responsible bodies/person for implementation	Region of Central Macedonia
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Region of Central Macedonia
	Comments on implementation	The Action will contribute to the indicator of private car travel avoidance as there is no corresponding indicator in the economic model proposed by the Call for Proposals and finally used, which expresses the reduction of emissions from vehicle traffic management actions. Action 3.9.1 can be combined with Action 3.4.4 (Mobility as a Service) so that the two systems together contribute to multimodal traffic management
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	*5% in total emissions from the transport sector*
	Total costs and costs by CO_2e unit	20.240.000,00€

B-2.2: Individual action outlines – 3.9.2, 3.9.3.		
Action outline	Action name	**3.9.2** Creation of Mobility & climate data space and digital services to the Ecosystem **3.9.3** Digital twin for impact assessment of alternative climate neutrality policy and action scenarios
	Action type	Technical Interventions
	Action description	The collection and integration of different digital data related to mobility, logistics and other related areas (for example energy) will support the successful transition of the sector to digitalisation. The Action supports the creation of a common

		data space for Transport and Logistics, along the lines of the European Community data spaces, which will be interconnected through federation with other existing or under construction data spaces of other sectors/operators. The data collected in the data space will come from the participants in the Transport and Logistics Network, i.e. from existing systems and observatories. This primary data will be processed to produce useful knowledge that will be fed back to the Ecosystem to support the decision making of the entities and enterprises that are part of it (Digital Services to the Ecosystem). In the same framework, a digital twin will be developed for the impact assessment of alternative scenarios of climate neutrality policies and actions, but this is a separate Action due to the complexity of its implementation. The basis for the implementation of Actions 3.9.2-3.9.3 is the existing Mobility Living Lab operated by HIT/ CERTH, which will be expanded to include more data and interfaces with other data spaces. The Living Lab will support a fourfold helix, i.e. interaction with Government/Agencies, Business, Research Institutions and Citizens.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Transition to full digitalisation of transport & logistics
Implementation	Responsible bodies/person for implementation	Cooperation between the Municipality of Thessaloniki and HIT/ CERTH
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Cooperation between the Municipality of Thessaloniki and HIT/ CERTH
	Comments on implementation	Actions 3.9.2 and 3.9.3 are the basic and necessary digital infrastructure for the operation of the applications resulting from Actions 3.1, 3.4.4, 3.9.4
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 CO_2e unit	**Action 3.9.2:** 250.000,00€

		Action 3.9.3: 500.000 €

B-2.2: Individual action outlines – 3.9.4		
Action outline	Action name	**3.9.4** Multi-source Carbon Footprint Assessment and Monitoring Platform
	Action type	Other Interventions - Technological Interventions
	Action description	The platform is a multifunctional tool for monitoring and assessing energy consumption and pollutant production in the city of Thessaloniki. It enables the creation and analysis of scenarios to support decision-making on proposed environmental footprint reduction interventions. It brings together multiple public and private sector data sources (buildings, vehicles, green spaces, etc.) and includes detailed methodologies for estimating energy consumption and pollutant production from these primary data. The flexible spatio-temporal visualisation of indicators, graphs and maps on the platform provides comprehensive information on progress towards achieving climate neutrality targets and assessing the impacts of environmental actions and projects.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Transition to full digitalisation of transport & logistics
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, HIT/ CERTH, Thessaloniki Smart Mobility Living Lab,
	Comments on implementation	The platform developed by the HIT/ CERTH in collaboration with the Municipality of Thessaloniki is a multidisciplinary collaboration of stakeholders to achieve climate neutrality goals. The objectives of the platform's operation can be summarised as follows: 1. Decoding the environmental footprint 2. Informing and raising user awareness about energy consumption and environmental impacts 3. Creating hypothetical scenarios for the most efficient implementation of environmental

		footprint reduction methods 4. Contribution to the objectives of the Municipality of Thessaloniki for the reduction of pollutants and environmental footprint 5. Contributing to the European Commission's goals of achieving climate neutrality by 2030.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The action is related to the digital city - governance sector and therefore has no direct and measurable impact on CO_2 reduction. It contributes to the overall achievement of the objective.
	Total costs and costs by CO2e unit	50.000,00€

B-2.2: Individual action outlines – 3.9.5		
Action outline	Action name	**3.9.5** Application to influence commuter behaviour in favour of climate neutrality
	Action type	Technical Interventions, Other Interventions
	Action description	The Action concerns the implementation of an artificial intelligence system that will calculate the impact of different alternative travel and use of alternative means of transport depending on current conditions. It will also calculate other parameters related to the usage targets of specific means of transport given the current situation and the availability of resources (for example, if there is an increasing demand for shared means of transport that are out of stock, the application will give priority to other means of transport that are under-used at the time). The application will evaluate the degree of penetration of different methods of influencing commuters, for example gamification, loyalty points, other incentives and accordingly suggest the optimal use of one or a combination of the methods of influence by the mobile application.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Transition to full digitalisation of transport & logistics
Implementation	Responsible bodies/person for implementation	Cooperation between the Municipality of Thessaloniki and HIT/ CERTH
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Municipality of Thessaloniki and HIT/ CERTH

	Comments on implementation	Action 3.9.5 is directly linked to actions 3.2.1 and 3.3.4. The Action 3.9.5 application is the backoffice of the single sign-on system but can also feed other relevant applications owned and operated by private operators as well as provide input for the operation of Mobility as a Service applications
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 CO_2e unit	200.000,00€

B-2.2: Individual action outlines – 3.10.1		
Action outline	Action name	**3.10.1** Development of urban freight consolidation centres, freight hotels and micro fulfillment centres
	Action type	Technical Interventions
	Action description	The action includes the development of urban freight consolidation centres in two areas at the edges of the Municipality of Thessaloniki (New Railway Station area and TIF area) in order to increase the load occupancy rate of vehicles entering the central area of the Municipality and reduce the distances travelled in urban distribution. At the urban consolidation centres facilities, goods are collected, orders are consolidated and then dispatched to customers using environmentally friendly means of transport (e.g. cargo bikes). For the consolidated dispatch of goods, a framework of cooperation between the companies will be developed in order to reduce transport costs, as well as the impact on traffic and the environment. The action is also combined with action 3.10.2 for the creation of a freight transport & logistics ecosystem in the Municipality of Thessaloniki.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Optimisation of urban freight transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki in cooperation with courier companies
	Action scale & addressed entities	The action concerns the wider area of the Municipality of Thessaloniki, as with the creation

		of urban consolidation centres at both ends of the Municipality, shipments can be collected to various points both inside and outside the Municipality.
	Involved stakeholders	Municipality of Thessaloniki, courier companies (last mile), chambers of commerce, HORECA companies, 3pl companies, property/space owners, technology suppliers, suppliers of environmentally friendly freight transport systems, HIT/ CERTH
	Comments on implementation	The benefits resulting from the implementation of the action are social, environmental and economic. However, complexity has been identified in terms of organisational and administrative arrangements. The Municipality of Thessaloniki will have the role of coordinator/ manager of these urban consolidation centres, with individuals contributing to their construction and operation.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model . The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	9.500.000 €

B-2.2: Individual action outlines – 3.10.2		
Action outline	Action name	**3.10.2** Creating an ecosystem of cooperation (Freight Quality Partnerships)
	Action type	Other Interventions
	Action description	Planning and organising freight transport is a complex process in which public authorities have less experience of passenger mobility, while private companies implementing urban freight transport have a better knowledge of the technical aspects. Sustainable planning is therefore a complex process as it has to: a) involve many private actors with different and often conflicting needs and objectives, and b)

		strike a balance between the operational requirements for high efficiency and low costs and the social requirements for low CO_2 emissions, high safety and sustainability. The action includes the development of the urban freight transport ecosystem in the city of Thessaloniki involving both public and private actors. The aim of the action is to develop appropriate models of cooperation in order to optimise the urban freight transport processes in Thessaloniki and improve the quality of life of its inhabitants. The Municipality of Thessaloniki will be the coordinator of the ecosystem which will consist of stakeholders of the quadrilateral helix. These actors in the freight transport and logistics sector can be classified into three broad categories, as follows: Urban Logistics Actors: shippers, freight forwarders and freight carriers, last mile deliveries, final consumers/residents, local businesses and retailers. Authorities and Accelerators: the Municipality of Thessaloniki, the Region of Central Macedonia, research and academic institutions (CERTH/ IMET, AUTH), regulatory authorities, the Regional Chamber of Commerce and Industry, civil society, scholars. Urban Logistics Facilitators: property/vacancy owners, real estate agents, technology providers, providers of sustainable and flexible transport solutions especially for last mile deliveries.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Governance and Policies
	Outcome (according to module B-1.1)	Optimisation of urban freight transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	They are mentioned above in the description of the ecosystem.
	Comments on implementation	The implementation of the action is a key part of the transition of the urban freight transport system to climate neutrality, as through the development of the ecosystem the stakeholders, their relationships and potential synergies will be identified.
Impact & cost	Generated renewable energy	

	(if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	200.000 €

B-2.2: Individual action outlines – 3.10.3		
Action outline	Action name	**3.10.3** Development of lockers (regulatory framework, selection of locations and cooperation model) in public spaces of the Municipality of Thessaloniki
	Action type	Technical Interventions
	Action description	The action concerns the design and installation of lockers for last mile deliveries in public spaces in the Municipality of Thessaloniki. In a first stage, a study will be carried out to select the most suitable locations according to the requirements of both consumers and the needs of transport and courier companies. Subsequently, and following the development of an appropriate regulatory framework for the allocation of public space, models of cooperation between the Municipality and courier companies will be examined and defined. The Municipality of Thessaloniki as coordinator will provide the space and the companies will install the equipment, while at the same time the framework for cooperation between the various companies will be established in order to manage and use the Lockers.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure, Finance
	Outcome (according to module B-1.1)	Optimisation of urban freight transport, Easier access to financial instruments for the

		implementation of private actions
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Municipality of Thessaloniki, courier companies (last mile), suppliers, residents, businesses that send their products to customers, HIT/ CERTH
	Comments on implementation	This action differs from 3.10.1, as it proposes to place the Lockers in public spaces, which require different procedures than private spaces.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	1.600.000 €

B-2.2: Individual action outlines – 3.10.4		
Action outline	Action name	**3.10.4** Incentives for the conversion of ground-floor shops into loading/unloading or increased storage areas
	Action type	Other Interventions
	Action description	In the Municipality of Thessaloniki and especially in streets outside the central area there are several unoccupied shops. At the same time, and given that these roads have limited lanes, the stops of lorries for unloading create problems of both traffic congestion and increased environmental pollution. In addition, the limited space in existing shops does not allow traders to maintain a high level of stock, which increases the requirements for more frequent loading and unloading. The action includes the recording of unoccupied stores within the central area of the Municipality

		of Thessaloniki in order to convert them either into places for unloading or into storage areas of the neighbouring stores.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Governance and Policies
	Outcome (according to module B-1.1)	Optimisation of urban freight transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Municipality of Thessaloniki, Region of Central Macedonia, Thessaloniki Chamber of Commerce and Industry, transport companies, shop/vacancy owners, technology suppliers, HIT/ CERTH, businesses, citizens
	Comments on implementation	Following the inventory of unoccupied shops, the action can be implemented in a limited number of about 200 shops by providing incentives to landlords to rent their shops at a lower rent to traders for either storage space or loading and unloading.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	1.000.000 €

B-2.2: Individual action outlines – 3.11.1		
Action outline	Action name	**3.11.1** Creation of parking spaces for cargo bikes
	Action type	Technical Interventions
	Action description	This action concerns the creation of parking spaces for cargo bikes in public areas of the Municipality of Thessaloniki, based on accessibility, space and location criteria. Through this action, the city will achieve various

		benefits such as reducing the number of vehicles in circulation, freeing up space and improving safety, reducing fuel and CO_2 emissions to protect the environment, reducing transport costs and improving access to destinations due to the flexibility of cargo bikes. This action will be implemented on two levels, firstly the identification of the city and the available public spaces that can become parking spaces. Then, once an appropriate legal framework for the use of public space has been established, the ways of cooperation between the municipality and courier companies will be evaluated and defined. The Municipality of Thessaloniki, as the responsible party, will provide the space and the companies will install the equipment, while the framework for cooperation between the various companies will be defined so that they can manage and use the cargo bike parking spaces.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Optimisation of urban freight transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Region of Central Macedonia, Municipality of Thessaloniki, Thessaloniki Chamber of Commerce and Industry, companies providing equipment for urban distribution systems, technology suppliers, HIT/ CERTH, technology suppliers, owners of vacant spaces/ plots
	Comments on implementation	This action is directly linked to action "3.10.3 Development of public and private urban distribution centers and micro fulfillment centers (e.g. lockers) in order to increase the load factor of vehicles entering the central area of the Municipality and reduce the distances travelled in urban distribution" as the creation of urban storage facilities will increase demand at these locations so the creation of full parking spaces will better serve the increased demands.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light

		duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	1.500.000 €

B-2.2: Individual action outlines – 3.11.2		
Action outline	Action name	**3.11.2** Incentives for the acquisition of green and electric urban delivery vehicles
	Action type	Technical Interventions
	Action description	This action aims to provide incentives for the acquisition of green and electric urban delivery vehicles. Through this action, the Municipality of Thessaloniki wants to achieve the conversion of the fleet of companies operating in the city to electric. In this way it will achieve a significant reduction of carbon dioxide emissions in the city. The Municipality of Thessaloniki can in various ways provide incentives for the acquisition of electric vehicles such as the installation of electric vehicle chargers and the creation of public parking spaces for cargo bikes.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Funding and Governance and Policies
	Outcome (according to module B-1.1)	Optimisation of urban freight transport, Facilitate access to financial instruments for the implementation of actions by private individuals, Electrification of trucks
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Ministry of Environment, Region of Central Macedonia, Municipality of Thessaloniki, Thessaloniki Chamber of Commerce and Industry, urban distribution system equipment providers, technology suppliers, HIT/ CERTH
	Comments on implementation	This action is directly linked to action **3.11.1** Creation of parking spaces for cargo bikes as such spaces are an incentive for companies to electrify their fleet. In addition, subsidised programmes such as the Electric mobility scheme or similar schemes that will emerge in the coming years can be used as financial

		incentives for this action.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	35.000.000 €

B-2.2: Individual action outlines – 3.12.1, 3.12.2.		
Action outline	Action name	**3.12.1** Night-time distribution in the central area, application of service windows for specific sectors (e.g. Supermarkets), restrictions on the load factor for vehicles approaching the centre **and 3.12.2** Shared lanes for urban delivery vehicles and urban buses for use by delivery vehicles with high load occupancy during off-peak time windows.
	Action type	Technical Interventions
	Action description	This package of actions includes actions that benefit delivery vehicles with a high occupancy rate by giving them access to the central area as well as the possibility to use the bus lanes. Night-time dispensing with the appropriate buffer will be implemented in the central area and will end at 7:00. This central area will be accessible to delivery vehicles with a high load factor of more than 70%. At the same time, specific time windows will be established for unloading in specific sectors, mainly in the catering sector. In all cases, unloading will take place at specific locations and in accordance with the framework established. In addition, vehicles with increased occupancy will be able to use the bus lanes thereby increasing the speed of delivery vehicles,

		reducing delays and ultimately reducing congestion and greenhouse gas emissions. The bus lanes will be used only during off-peak hours in order to avoid disturbing the traffic of urban buses and to ensure that people can travel smoothly by sustainable means of transport.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Optimisation of urban freight transport, Truck electrification
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki in cooperation with the Region of Central Macedonia and TheTA
	Action scale & addressed entities	The implementation of night-time delivery is a process that will benefit both the Municipality and its residents, as well as the companies, as it will enable them to optimise their operations. However, an appropriate regulatory framework is required
	Involved stakeholders	Region of Central Macedonia, Municipality of Thessaloniki, Thessaloniki Chamber of Commerce, bussiness, 3pl companies, transport companies, technology suppliers, HIT/ CERTH, ΟΣΕΘ, Police, Municipal Police
	Comments on implementation	Initially, the implementation of the action will involve an inventory of the shops and their needs for the loading and unloading of goods and then an appropriate plan will be developed. An important factor for the success of this action is the continuous policing of the measures to be imposed in order to ensure compliance with them and ultimately the achievement of their objectives. This action is also in full correlation with action 3.10.4 which provides incentives for the conversion of ground floor shops into loading/unloading or increased storage areas. These spaces will be used for unloading operations carried out under the conditions described above.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of

		48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	Total: 300.000 € Action 3.12.1: 150.000 € Action 3.12.2: 150.000 €

B-2.2: Individual action outlines – 3.12.3.		
Action outline	Action name	**3.12.3** Installation of intelligent infrastructure to monitor loading bays and provide a booking tool with preferential status for vehicles with a high load factor
	Action type	Technical Interventions
	Action description	This action concerns the installation of a smart infrastructure to monitor the unloading points and provide a booking tool with preferential status to the Municipality of Thessaloniki. It will achieve a reduction in the total number of kilometres covered by vehicles, thus improving traffic congestion in the city and reducing emissions. At the same time, it will achieve a reduction in the incidents of illegal parking which has been identified and is a major problem. For this particular action, the number of parking spaces to be converted into smart parking spaces and the business plan under which the action will operate should be decided. At the next level, the Municipality of Thessaloniki will supervise the installation of the necessary equipment and the electronic service.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Optimisation of urban freight transport, Truck electrification
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Municipality of Thessaloniki, HIT/ CERTH, Thessaloniki Chamber of Commerce, Region of Central Macedonia, transport companies, technology providers, last mile companies, operators of urban distribution systems

	Comments on implementation	This action is differentiated from action "**3.12.1** Night-time delivery in the central area, implementation of service windows for specific sectors (e.g. Supermarkets), restrictions on the load factor for vehicles approaching the centre" as the reservation tool will allow users to choose both the time and the parking space and does not only work for night-time delivery.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	2.000.000 €

B-2.2: Individual action outlines – 3.13.1.		
Action outline	Action name	**3.13.1** Development of a Sustainable Urban Freight Transport Plan (SUVM) for the entire Municipality of Thessaloniki
	Action type	Other Interventions
	Action description	The Action concerns the development of an integrated Sustainable Urban Freight Transport Plan (SUFTP) for the entire Municipality of Thessaloniki. The development of the SDLMP will be carried out according to the specifications of the relevant Eltis "Topic Guide - Sustainable Urban Logistics Planning", which was prepared by EKETA/ IMET. In addition, the action includes relevant studies on specific distribution systems.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Optimisation of urban freight transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	The development of the SBAEM concerns the

		entire Municipality of Thessaloniki. However, since it is a holistic plan to optimise the operation of freight transport in the city of Thessaloniki, the cooperation of all private and public stakeholders is required.
	Involved stakeholders	Municipality of Thessaloniki, HIT/ CERTH, Thessaloniki Chamber of Commerce, transport companies, Region of Central Macedonia, shop owners, Citizens, HORECA companies, chambers of commerce
	Comments on implementation	During the preparation of the SUMP, the identification of mobility problems identified the problematic organisation of freight distributions which makes it difficult to move (insufficient number of parking spaces for freight vehicles, nuisance, poor planning, non-observance of specific loading hours, etc.). Amongst other things, the Sustainable Urban Freight Transport Plan will help to reduce air and noise pollution, energy consumption and greenhouse gas emissions.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	350.000 €

B-2.2: Individual action outlines – 3.13.2, 3.13.3		
Action outline	Action name	**3.13.2** Regulatory framework and incentives for the collection and provision of digital urban freight data by private parties to the Municipality of Thessaloniki **and 3.13.3** Observatory to monitor urban freight transport and its impact on the environment and the local economy
	Action type	Technical Interventions

	Action description	The action includes the development of a regulatory framework and incentives for the collection and provision of digital urban freight data by private parties (action C.10). This will facilitate the monitoring of transport activities and the analysis of data to improve the transport of goods. The mapping of transport companies and stakeholders collecting data will lead to the mapping of the ecosystem in which they will be given appropriate incentives to link up with observatories and living labs. The observatory will then be developed to monitor urban freight transport and its impact on the environment and the local economy. The observatory will collect data through appropriate interfaces, process it and provide support to decision makers through appropriate artificial intelligence tools. The observatory will evaluate the results and through appropriate interfaces feed the monitoring of environmental footprint reduction indicators and their impact on traffic, which will be carried out in the tool to be developed in Action 3.6.9 Carbon Progress Indicator Monitoring System and Climate Transition Observatory.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Governance and Policies
	Outcome (according to module B-1.1)	Optimising urban freight transport, Engaging citizens and stakeholders in innovation and decision-making, Transition to full digitalisation of transport & logistics
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Municipality of Thessaloniki, HIT/ CERTH, Thessaloniki Chamber of Commerce, Region of Central Macedonia, transport companies, technology providers, last mile companies, operators of urban distribution systems
	Comments on implementation	This action will contribute both to increasing freight data and to increasing cooperation between the various stakeholders. This action is linked to action "**3.13.4** Incentives and installation of a telematics system for monitoring freight flows" which will increase the data contained in the freight observatory.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy,	-

	volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	Action 3.13.2: - Action 3.13.3: 150.000 €

B-2.2: Individual action outlines – 3.13.4		
Action outline	Action name	**3.13.4** Incentives and installation of a telematics system for monitoring freight flows
	Action type	Technical Interventions
	Action description	This action aims to install a telematics system to monitor the flows of vehicles carrying out freight transport. Appropriate incentives will be given to the owners of vehicles/ transport companies to acquire the telematics devices and share their data with the Municipality of Thessaloniki. Transport companies will be able to optimise the routing of their vehicles and maximise the transported load per route by recording the routes of vehicles and analysing the data appropriately. Through this action, both traffic congestion and emissions will be reduced in the area of the Municipality of Thessaloniki, as the availability of data can help to adjust the navigation system of courier companies depending on the conditions. In addition, through data analysis, the Municipality of Thessaloniki can identify where the city needs support and where there is a sudden increase in demand, in order to take corrective measures to improve the infrastructure.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure, Finance

	Outcome (according to module B-1.1)	Transition to full digitalisation of transport & logistics, Optimisation of urban freight transport, Easier access to financial instruments for the implementation of actions by individuals
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Ministry of Environment, Region of Central Macedonia, Municipality of Thessaloniki, HIT/ CERTH, Thessaloniki Chamber of Commerce, Region of Central Macedonia, transport companies, technology providers, last mile companies, operators of urban distribution systems
	Comments on implementation	This action is linked to action "**3.13.3** Observatory for monitoring urban freight transport and its impact on the environment and the local economy", as the data collected from the in-vehicle devices will feed into the Urban Freight Observatory. The Municipality of Thessaloniki should initially hold meetings with various courier providers to analyse the benefits they can derive from a telematics system. It should then guide them on the telematics data they should collect and how to link them to the observatory through appropriate incentives.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model. The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	2.400.000 €

B-2.2: Individual action outlines – 3.14		
Action outline	Action name	**3.14** Actions to optimize the waste collection procedures of the Municipality of Thessaloniki
	Action type	Technical Interventions
	Action description	The action includes specific actions that optimise the operation of the Municipality's services related to the collection of solid waste. More specifically, it includes the supply and installation of 208 GPS, 305 fuel metering systems and 118 bin weight recording systems for refuse collection vehicles for the entire fleet. In addition, it includes the installation of automatic recording and weighing of waste trucks as they enter the Waste Transfer Station.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Transition to full digitalisation of transport & logistics, Optimisation of urban freight transport
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki and areas of Transfer Stations
	Involved stakeholders	Municipality of Thessaloniki, FODSA KM, Region of Central Macedonia
	Comments on implementation	Through the implementation of the action, the movements of vehicles will be recorded, in order to automate the routes and the best possible exploitation/use of the capacity of the bins of the waste collection vehicles, achieving the reduction of the distances travelled. In addition, the creation of a relevant database on vehicle consumption and waste collection will be achieved through this action.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "Reduction of total distance travelled through route optimisation" by 25% compared to BAU, to the indicator "% of max load weight of heavy duty trucks" 60%, "% of max load weight of light duty trucks" 45% and to the overall reduction of 48 $CO2_e$ according to the Economic Model.
	Total costs and costs by CO2e unit	200.000 €

B-2.2: Individual action outlines – 3.15

Action outline	Action name	**3.15** Supply of electric vehicles and vehicles with anti-pollution technology to upgrade the cleaning services of the Municipality of Thessaloniki and reduce the carbon footprint of its vehicle fleet
	Action type	Technical Interventions
	Action description	The action includes the supply of tractors & garbage trucks with anti-pollution technology, sweepers, tractor-type washers, two-wheelers, three-wheelers, 5 & 9-seater passenger cars and bicycles. The supply includes charging stations.
Reference to impact pathway	Field of action	**3. Transport & Logistics**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Truck electrification
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Municipality of Thessaloniki
	Involved stakeholders	Municipality of Thessaloniki, FODSA KM, Region of Central Macedonia
	Comments on implementation	Through the action, the replacement of Euro1 - Euro3 technology vehicles will be carried out due to their age, with new anti-pollution technology and lower manufacturing costs. At the same time, operating costs (fuel, road tax), noise pollution and greenhouse gas emissions are expected to be reduced. The action is expected to make a significant contribution to the effort of the Municipality of Thessaloniki to achieve its climate neutrality targets by 2030.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	The Action contributes to the indicator "electrification of light duty trucks" 40% "electrification of heavy duty trucks" 12% and to the overall reduction of 9 CO_2 e according to the Economic Model.
	Total costs and costs by CO2e unit	15.000.000 €

B-2.2: Individual action outlines – 4.1		
Action outline	Action name	**4.1** Design and operation of a Green Point / Recycling Corners
	Action type	Technical Interventions

	Action description	This action includes both the design and operation of Green Spots (GSPs). The Municipality of Thessaloniki has applied for European funding from the EU LIFE-IP Programme for the construction of one of the two planned central Green Spots, which will start operating in 2025, while 25 additional small-scale neighbourhood Green Spots will be developed. The purpose of the Green Spaces is to separately collect different categories of recyclable municipal waste in order to promote reuse and recycling. The Municipality of Thessaloniki, in the context of upgrading the recycling infrastructure and strengthening waste recycling, through the "Antonis Tritsis" programme, will proceed with the development of a network of Recycling Corners. Recycling polycentres will be installed at 48 points in the city, where residents will be able to dispose of four different materials (metal, plastic, glass, paper).
Reference to impact pathway	Field of action	**4. Water & waste management**
	Systemic lever	Technology and infrastructure, Social innovation
	Outcome (according to module B-1.1)	Increasing the proportion of recyclable materials and reducing the environmental footprint of solid waste
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	It concerns selected points in the region of Central Thessaloniki, Citizens
	Involved stakeholders	Recycling and Municipal Waste Management Department of the Municipality of Thessaloniki, Citizens, Environmental organisations and social organisations (NGOs)
	Comments on implementation	One of the two planned central green points has a surface area of ~2,000 m^2 and is expected to have a temporary storage capacity of 200 tn, serving approximately 30,000 inhabitants. In addition, it is foreseen that 48 recycling corners will be developed and put into use by the year 2025.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	It contributes to the overall achievement of the target to increase recycling.

	Total costs and costs by CO2e unit	The total cost for the implementation of the action until 2025 is: 20,285,000 €

B-2.2: Individual action outlines – 4.2		
Action outline	Action name	**4.2** Supply and replacement of recycling bins and expansion of glass bins network
	Action type	Technical Interventions
	Action description	This action concerns a series of actions aimed at strengthening source separation (SRS). In particular, it is planned to strengthen the discrete collection of glass (blue bins) and the development of a network of "yellow" bins for the collection of paper in selected areas of the Municipality (squares, parks, schools, etc.). In addition, it is planned to replace worn bins for the collection of recyclable packaging
Reference to impact pathway	Field of action	**4. Water & waste management**
	Systemic lever	Technology and infrastructure, Social innovation
	Outcome (according to module B-1.1)	Increase the proportion of recyclable materials and reduce the environmental footprint of solid waste. Reduction of co-mingled materials and reduction of the environmental footprint of solid waste.
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	It is addressed to all citizens residing in the municipality of Thessaloniki, the municipal services and their employees.
	Involved stakeholders	Municipality of Thessaloniki, FODSA KM, Citizens
	Comments on implementation	The above will contribute to the 85% paper and 75% glass recycling target.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	It contributes to the overall achievement of the target to increase recycling.
	Total costs and costs by CO2e unit	The total cost for the implementation of the action until 2025 is: 861,500 €

B-2.2: Individual action outlines – 4.4		
Action outline	Action name	**4.4** Organisation of new Alternative

		Management Systems (AMS)
	Action type	Technical Interventions
	Action description	This action includes a series of actions aimed at strengthening source separation (SRS). The way it will be implemented is to agree with the SDSs on the adjustments to be made to existing and new collection systems. The aim is to minimise the amount of waste sent to final disposal sites (landfills). Among the measures being promoted are: 1. Implementation of a separate collection programme for used clothing, footwear and other textile materials. 2. Setting up a collection point for frying oil and collection will take place at the Green Spots 3. Implementation of separate collection of waste electrical and electronic equipment 4. Implementation of the existing bulky waste collection system through special vehicles of the Municipality.
Reference to impact pathway	Field of action	**4. Water & waste management**
	Systemic lever	Technology and infrastructure, Governance and policies
	Outcome (according to module B-1.1)	Increase the proportion of recyclable materials and reduce the environmental footprint of solid waste, Faster resolution of waste management issues
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	It is addressed to all citizens residing in the municipality of Thessaloniki, the municipal services and their employees.
	Involved stakeholders	Municipality of Thessaloniki, FODSA, Citizens, Hellenic Recovery Recycling Corporation
	Comments on implementation	For the proper functioning of these actions, a further agreement with the EWCs is a prerequisite, while Law 4819/2021 has already been passed, which creates a new framework that further promotes recycling and the circular economy as key policy tools for the rational management of waste.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	It contributes to the overall achievement of the target to increase recycling.
	Total costs and costs by CO_2e unit	Total revenues that the Municipality of Thessaloniki will have from the ETS over six

		years (2024-2030) 627,408€

B-2.2: Individual action outlines – 4.5		
Action outline	Action name	**4.5** Upgrading and extension of underground temporary storage systems for the creation of 4-stream arrays and supply of a chain store
	Action type	Technical Interventions
	Action description	This action concerns the supply and installation of underground temporary storage bins for the creation of 4-stream arrays of MSW, the redesign of the temporary storage system and the replacement of a chain linkage for the transport of bins. So far there are 59 underground temporary storage systems in 28 locations in the Municipality of Thessaloniki. In 2024, 35 underground bins with 4-stream arrays will be installed in 2024 and another 35 in 2025.
Reference to impact pathway	Field of action	**4. Water & waste management**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Increasing the proportion of recyclable materials and reducing the environmental footprint of solid waste
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	It concerns the whole city
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, Environmental Services, Citizens
	Comments on implementation	As part of the increase in underground bins of 4-stream arrays, it is planned to convert them from two to four streams by 2024 and through this action to remove the double bin (2 green bin array). Part of the funding for this action will be provided by the Green Fund
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	It contributes to the overall achievement of the target to increase recycling.
	Total costs and costs by CO2e unit	The total cost for the implementation of the action until 2025 is: 3,215,000 €

B-2.2: Individual action outlines – 4.6		
Action outline	Action name	**4.6** Supply and replacement of refuse collection vehicles

	Action type	Technical Interventions
	Action description	The Municipality has 235 vehicles for the collection/management of MSW. 47% (111 vehicles) of the total number of cleaning vehicles will complete 15 years of operation by 2025 and therefore replacement planning is needed for the proper operation of the MSW collection network. This action proposes to replace in 2023 the vehicles that completed 20 years of operation in 2020 and in 2025 the refuse collection vehicles that completed 12 years of operation in 2020. For other vehicles, it is proposed to replace in 2024 the vehicles that will reach fifteen years of operation in 2020. The action therefore includes the procurement and replacement of end-of-life refuse collection vehicles. In particular, it provides for: -Supply through leasing of 5 16m3 press-type garbage trucks (bulky) -Replacement of 3 garbage trucks collecting recyclable packaging -Purchase of 19 waste collection vehicles for the collection of organic waste.
Reference to impact pathway	Field of action	**4. Water & waste management**
	Systemic lever	Technology and Infrastructure, Finance
	Outcome (according to module B-1.1)	Improved vehicle functionality and efficiency, Increased waste collection capacity and increased fleet resilience, Increased recyclable material rate and reduced environmental footprint of solid waste, Reduced environmental footprint from improved bio-waste management.
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	It is addressed to all citizens residing in the municipality of Thessaloniki, the municipal services and their employees.
	Involved stakeholders	Municipality of Thessaloniki, FOSDA, Citizens, Suppliers and manufacturers (of waste collection vehicles and equipment)
	Comments on implementation	Complementary actions that will need to be implemented through this action are the supply of press containers, the replacement of tractors, water carriers, tricycles, sweepers, scrubbers
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	It contributes to the overall achievement of the target to increase recycling.
	Total costs and costs by CO_2e unit	Supply of press-type garbage trucks (bulky):

		1.020.000€ Supply of waste collection vehicles for the collection of recyclable packaging: €600,000 Supply of organic waste collection vehicles: €3.800.000 Total cost: 5,420,000 €

B-2.2: Individual action outlines – 4.7		
Action outline	Action name	**4.7** Implementation of separate collection and recovery of bio-waste
	Action type	Technical Interventions
	Action description	This action includes the implementation of the system of separate collection of bio-waste from targeted producers through the supply/distribution of bio-waste collection bins (660L) and the separate collection of bio-waste from households through the supply/distribution of bio-waste collection bins (240lt). The supply of waste collection vehicles (5 and 14 m^3) and branch shredders In addition, through the household composting programme, the supply and distribution of household composting bins to Children's Centres, School Units and private communal areas is foreseen. Since the full development of the system requires the operation of a composting facility in the Regional Unit of Thessaloniki, which is not planned before 2024-2025, the plan foresees the start of collection from mass production points of bio-waste and schools (2% of the final target in 2022, 2023 and 5% of the final target in 2024). The cooperation of FODSA with private biowaste treatment plants and subsequently with the operation of the MBW, the plan provides for collection through the network of brown bins and household composting, with the aim of diverting from landfill the pre-sorted biowaste and achieving the 47% Source Separation target for household biowaste.
Reference to impact pathway	Field of action	**4. Water & waste management**
	Systemic lever	Technology and infrastructure, social innovation
	Outcome (according to module B-1.1)	Reducing the environmental footprint by improving bio-waste management
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki

	Action scale & addressed entities	It concerns the whole city
	Involved stakeholders	Municipality of Thessaloniki, FODSA, Citizens, Producers
	Comments on implementation	The collection of bio-waste will start from schools and large producers and will be extended in 2024 to all large producers of bio-waste. At the same time, from 2024, it is planned to make household composting equipment available. Completion of the separately collected biowaste treatment will be carried out at the Biowaste Treatment Facilities of the actions requires the cooperation of the CMWF and until the construction and operation of the plants, the CMWF will enter into partnerships with private biowaste treatment plants.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	It contributes to the overall achievement of the target to increase recycling.
	Total costs and costs by CO2e unit	The total cost for the implementation of the action until 2025 is: 3,323,000 €

B-2.2: Individual action outlines – 5.1		
Action outline	Action name	**5.1: Densification of urban greenery - Planting of trees in public and common areas of the Municipality of Thessaloniki - removal of CO_2 from the atmosphere**
	Action type	Technical
	Action description	Planting of trees in public and common areas of the Municipality of Thessaloniki, as described in Annex 3, with a total of 50,000 new tree plantings for the expansion of parks and the densification of roadside tree rows, corresponding to a 79.4% increase in the number of trees within the city
Reference to impact pathway	Field of action	**5. Land use and Green Infrastructure**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Commitment CO_2 with nature-based solutions. Increasing CO uptake$_2$ from tree foliage
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki, AUTH, PAMA, C' SA, ecological organizations, citizens of the Municipality of Thessaloniki
	Action scale & addressed entities	Local scale with a positive impact on all residents of Thessaloniki due to better air quality and environment, a healthier city,

		reduction of heat islands
	Involved stakeholders	Municipality of Thessaloniki, AUTH, PAMA, C' SA, ecological organizations, citizens of the Municipality of Thessaloniki
	Comments on implementation	Informing and raising public awareness of the importance of tree planting, maintenance, protection of the peri-urban forest, care of new plantations. Involve civil society in organizing public information and awareness campaigns, as well as creating partnerships with local organizations, companies and schools to support the initiative.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	As described in the Annex HkP3, in total, the existing and future capacity to remove CO2 from the atmosphere from urban and peri-urban greenery (trees) amounts to 3,531 + 480 = 4,011 tn CO2/year
	Total costs and costs by CO2e unit	The total cost is estimated at 150 € per planting site (100 Euro for the supply of a 10-year old tree and 50 € for planting costs). The total cost of the project is 7,500,000 (50,000 planting places * 150 €/place). The cost per unit of CO2 is 15,000 Euro/tonne (7,500,000 € / 500 tn CO2 reduction from new tree plantations).

B-2.2: Individual action outlines – 5.2		
Action outline	Action name	**5.2. Addressing heat islands in a district of Thessaloniki**
	Action type	Technical
	Action description	An urban area is classified as an "Urban Heat Island (UHI)" when it is significantly warmer than nearby peri-urban or rural areas due to man-made infrastructure and human activities. A key factor in the creation of the urban heat island phenomenon is the covering of the ground with artificial non-water permeable materials that do not allow rainwater to be absorbed. In addition, buildings and narrow streets trap heat by reducing air flow. Human activities such as heating buildings and driving cars also add heat to the environment. Vegetation and other nature-based applications and solutions (rain gardens, grass and

		permeable floors in public spaces, artificial water bodies, water mirrors, etc.) help to cool the air, unlike asphalt and concrete which absorb heat, causing a rise in temperature. The aim of the action is to mitigate the heat island in a specific area of the city centre (the urban district of Diokitirio) with solutions that will increase the green cover and water permeable surfaces of the district to 40% of its total surface area.
Reference to impact pathway	Field of action	**5. Land use and Green Infrastructure**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	The action indirectly affects energy consumption in buildings, as it has been shown that a 25% increase in urban green cover and waterproof floors can save residents 40% of their annual energy needs for cooling.
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Pilot implementation of action in an urban district It is addressed to residents of the pilot area. Results and implementation monitoring in the pilot will be replicable for other districts and the entire municipality
	Involved stakeholders	Municipality of Thessaloniki
	Comments on implementation	The implementation of the action in this pilot district will make use of the know-how acquired through the municipality's participation in the UP2030 project, a Horizon Europe / Mission project on "Urban planning and design for just, sustainable, resilient and climate-neutral cities by 2030", as well as the partnerships developed with relevant institutions and citizens / residents of this urban district.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	The action affects CO_2 emissions reduction directly, through CO2 absorption from the densification of urban greenery/trees (capped in action 5.1.) and indirectly through emission reductions from the reduction of energy use for cooling.
	Total costs and costs by CO2e unit	10.000.000 €

B-2.2: Individual action outlines – 5.3		
Action outline	Action name	**5.3. Thessaloniki ConfExPark: redevelopment of TIF - HELEXPO**
	Action type	Infrastructure
	Action description	The redevelopment of the central urban island of TIF - HELEXPO constitutes a process of redefining central land use, while at the same time it is an important opportunity for the city to experiment with the creation of a zero urban island as a whole, in terms of public space management, design and construction of the planned structures, as well as in terms of space management, waste management and circularity. The master plan envisages the realisation of the above objective through key sustainability factors such as dismantling and circularity, site design and building, choice of materials, operation and management, communication and participation.
Reference to impact pathway	Field of action	**5. Land use and the environment**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Experimentation to create a low-emission urban island, renewable energy production in buildings and public space, use of low-carbon building materials and public space, CO2 capture with nature-based solutions in the public space of the park
Implementation	Responsible bodies/person for implementation	TIF - HELEXPO
	Action scale & addressed entities	Local scale. However, the creation of the Thessaloniki ConfExPark is a project of significant supra-local scope, both in terms of the nature of an exhibition park and in terms of the needs of its physical design due to the accessibility needs of a large number of users during exhibition periods.
	Involved stakeholders	Ministry of the Environment, EESYP - Hellenic Company of Holdings & Property S.A., Region of Central Macedonia, Municipality of Thessaloniki, Professional Chambers, city authorities
	Comments on implementation	The redevelopment project of the urban island "ConFEx Park" will be implemented through a partnership of public and private funds (PPP). The private funds are expected to be raised from private investments which will be able to participate in the exploitation of individual infrastructures such as the business - commercial centre, the hotel unit, the underground parking, etc.

		The master plan provides for the implementation of the sustainability, mitigation and climate change adaptation objectives of the urban island through continuous monitoring and proper management of the project at all stages of development. The operational strategy provided includes key performance indicators to continuously monitor and manage the sustainability performance of the project and all infrastructure to identify opportunities for improvement and adaptation.
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	It has been calculated in the context of other actions
	Total costs and costs by CO2e unit	Total project cost: 300.000.000 €

B-2.2: Individual action outlines – 5.4		
Action outline	Action name	**5.4. Metropolitan Park of Memory - Holocaust Museum**
	Action type	Technical
	Action description	Creation of a metropolitan memorial park near the Holocaust Museum, on an area of approximately 70 ha resulting from the contribution of the land of the old/commercial railway station.
Reference to impact pathway	Field of action	**5. Land use and the environment**
	Systemic lever	Technology and infrastructure
	Outcome (according to module B-1.1)	CO2 sequestration with nature-based solutions. Increasing CO2 absorption by densifying urban greenery, especially trees
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	Local and metropolitan city scale
	Involved stakeholders	Region of Central Macedonia, Municipality of Thessaloniki, city agencies, civil society
	Comments on implementation	The creation of the metropolitan park is planned to be included in the Integrated Spatial Investments of Thessaloniki, 2021-27
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy, volume, or fuel type	-
	GHG emissions reduction estimate (total) per emission source sector	The contribution to CO2 absorption has been calculated in the context of other actions, such as Action 5.1 - Urban greening

	Total costs and costs by CO2e unit	Total cost: 16.700.000 €

B-2.2: Individual action outlines – 6.3, 6.4		
Action outline	Action name	**Citizen Services and Social Participation (Relates to Actions 6.3- 6.4).**
	Action type	Technical Interventions Other interventions (social participation and awareness raising)
	Action description	It includes all digital infrastructure interventions aimed at environmental sustainability: Action 6.5. Development of Energy Optimisation Software for Municipal Buildings. The software can provide real-time information on energy consumption, identify inefficiencies, or make recommendations for energy saving practices. The goal of the action is to identify energy saving opportunities to reduce energy waste and ultimately save costs for the municipality. Action 6.6. Includes first of all two ongoing projects of the Municipality of Thessaloniki: MUNICIPALITY OF THESSALONIKI - Subproject 1 - Greek Smart Cities: Investments in infrastructure and SSC systems for a sustainable & green urban future. Funded by TAA. Includes actions: • Smart pedestrian crossing & Sensor-based vehicle counting and categorisation system (correlation with Action 3.3.2) • Intelligent supervision of public spaces • Smart Lighting and Smart Lighting Control Platform (remote management and fault detection) and energy consumption monitoring (link to Action 2.7) • Early warning systems for natural disasters • Wireless internet access points (link to Action 6.1) • Personalised Education Services • Interconnection of Municipal Authority Buildings to support Smart City (link to Action 6.1) • Development of a Data Center at the Town Hall (correlation with Action 6.1) • School energy management (link to Action 6.5) • Upgrading of Electronic Citizen Services and development of a platform for Participatory Democracy Innovation solutions for urban regeneration interventions for the Economic Reconstruction of Local Commercial Streets in all the Municipal Communities of the Municipality of Thessaloniki (also funded by TAA), and includes: • Parking prevention system on ramps for disabled persons (interface with Actions

		3.1.6, 3.3.2) • Centrally controlled irrigation water management system • Smart Pedestrian Crossing System (3.3.2) • Smart Tree Builders Finally, the Action includes a new intervention to upgrade the operation of the urban green management system and its interface with the municipality's website, creating a platform for strategic planning of green infrastructure. The platform of the urban green management system will offer flexible data collection, visualisation of results through new templates and forms and an improved user interface. In addition, a citizen participation element will be integrated into the system, allowing citizens to contribute to decision-making on green spaces by automatically submitting requests or comments to the system.
Reference to impact pathway	Field of action	**6.Smart City - Governance**
	Systemic lever	Technology and infrastructure Democratic participation
	Outcome (according to module B-1.1)	Increased transparency, Involvement of citizens and stakeholders in decision making, Improved Urban Green Management
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	It is addressed to all citizens residing in the municipality of Thessaloniki, the municipal services and their employees.
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, the Region of Central Macedonia, Citizens, CERTH, other institutions with autonomous areas within the Municipality (AUTH, UoM, HELEXPO, EYATH)
	Comments on implementation	
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The actions of the sector do not have a direct and measurable impact on CO_2 reduction. They contribute to the overall achievement of the target.
	Total costs and costs by CO2e unit	Total cost: 12.400.000 € of which 10.000.000 € (secured funding) for the Hellenic Smart Cities project: Investments in infrastructure and SSC systems for a sustainable & green urban future 2.300.000 € (secured funding) for the project

		"Urban Revitalization Interventions for the Economic Reconstruction of Local Commercial Streets in all the Municipal Communities of the Municipality of Thessaloniki".

B-2.2: Individual action outlines – 6.7, 6.8		
Action outline	Action name	**Climate Footprint Monitoring (Relates to Actions 6.7 - 6.8).**
	Action type	Technical Interventions Other interventions (social participation and awareness raising)
	Action description	This action involves upgrading sensors to collect data on air quality, specifically targeting air pollution and meteorological parameters. The existing sensor network, Municipal IoT Sensor Network (AIRTHINGS), will be upgraded with IoT technology to enhance its capabilities. This network was initially created under the AIRTHINGS project and is now operated with the municipality's own resources. The upgraded network will help identify air pollution mitigation strategies in the region, helping to improve air quality. Replacement of the 6 Network Stations with energy autonomous, powered by photovoltaic panels and equipped with new generation pollution measurement analyzers, which do not require continuous use of air conditioning for their operation. In addition, the network for measuring air pollution and meteorological parameters will be upgraded by replacing six stations with energy-autonomous stations powered by photovoltaic panels. These upgraded stations will be equipped with new generation pollution measurement analysers that operate without continuous air conditioning, reducing energy consumption. In addition, a multi-source carbon footprint assessment and monitoring platform is being developed. This platform will integrate data from various sources and interfaces to develop an integrated CO2 emissions monitoring system. The platform is being developed by HIT/ CERTH in cooperation with the Municipality of Thessaloniki (Detailed description Action 3.9.4).
Reference to impact pathway	Field of action	**6.Smart City - Governance**
	Systemic lever	Technology and infrastructure

		Governance and policies Democratic participation
	Outcome (according to module B-1.1)	Improved response of equipment systems, Improved service delivery, Improved data accessibility, Increased transparency, Involvement of citizens and stakeholders in decision making, Improved management of natural resources, Improved service delivery
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	It is addressed to all citizens residing in the municipality of Thessaloniki, the municipal services and their employees.
	Involved stakeholders	Competent departments of the Municipality of Thessaloniki, the Region of Central Macedonia, Citizens, CERTH, other institutions with autonomous areas within the Municipality (AUTH, UoM, HELEXPO, EYATH)
	Comments on implementation	The replacement of the infrastructure (housing houses and analysers) with new technology energy autonomous, contributes significantly to the reduction of the CO_2 footprint, since: 1) photovoltaics are used for energy supply and 2) no air conditioning is required, since the new generation analysers operate seamlessly at temperatures up to 50^o C. It is noted that for the existing infrastructure, the continuous operation (24/7) of air conditioning inside the houses is absolutely necessary.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The actions of the sector do not have a direct and measurable impact on CO_2 reduction. They contribute to the overall achievement of the target.
	Total costs and costs by CO2e unit	Maximum Estimated total cost: 2,350,000 €

B-2.2: Individual action outlines – 6.9		
Action outline	Action name	**6.9 Carbonation Progress Indicator Monitoring System and Climate Transition Observatory**
	Action type	Technical Interventions
	Action description	The action concerns the development of a methodology and tool that aims to support the Municipality of Thessaloniki in monitoring progress towards the climate transition and providing information on progress reports to the EU Mission Agency, as well as in taking

		decisions on the review of the Action Plan. The methodology and the tool will be based on the way the baseline inventory was created as well as on the multi-source Carbon Footprint monitoring platform (Action 6.8) developed/operated by the HIT/ CERTH. Essentially in this action, cross-sectoral monitoring of the transition towards climate neutrality will be achieved through the development of appropriate interfaces and interfaces with the tools of other actors.
Reference to impact pathway	Field of action	**6.Smart City - Governance**
	Systemic lever	Technology and Infrastructure
	Outcome (according to module B-1.1)	Improved service delivery, Increased data accessibility, Increased transparency, Involvement of citizens and stakeholders in decision making, Improved management of natural resources, Improved service delivery
Implementation	Responsible bodies/person for implementation	Municipality of Thessaloniki
	Action scale & addressed entities	The action concerns the Municipality of Thessaloniki and the neighbouring municipalities.
	Involved stakeholders	Municipality of Thessaloniki, HIT/ CERTH, Living Labs and observatories managers, Region of Central Macedonia, Data Collection Agencies
	Comments on implementation	Monitoring the implementation of the Action Plan for the transition to climate neutrality is one of the key issues raised by the EU, having included in the Plan a specific section with monitoring indicators. In the Municipality of Thessaloniki, several observatories and data collection platforms have been developed in different sectors. The role of the Municipality in order to achieve its goal towards climate neutrality is to register the existing observatories and coordinate these institutions and collect the provided data.
Impact & cost	Generated renewable energy (if applicable)	
	Removed/substituted energy, volume, or fuel type	
	GHG emissions reduction estimate (total) per emission source sector	The actions of the sector do not have a direct and measurable impact on CO_2 reduction. They contribute to the overall achievement of the target.
	Total costs and costs by CO2e unit	200.000 €

B-2.3: Summary strategy for residual emissions

Mitigation actions for the remaining 20%.

1. Installation of PV at the Efkarpia Waste Transfer Station and at the rehabilitated Tagarades landfill to meet the energy needs of FODSA through RES

The FODSA has taken actions for the installation of PV stations as follows:

1. Installation of PV in Tagarades with non-injection of energy into the grid (Zero Feed-in scheme) with an installed capacity of 182,03kW (Local Community of Agia Paraskevi, District of Thermi, P.E. Thessaloniki). A contract has already been signed to commission a study for the installation of PV
2. Installation of PV in the SMA Evkarpia with Virtual Net Metering (Virtual Net Metering) with an installed capacity of 999,53 kW (Evkarpia area of Pavlou Mela, P.E. Thessaloniki). A primary request has been posted on KIMDES and the procurement procedure for the award of a contract for the study for the installation of PV

From the installation of the PV plants, the energy produced will primarily cover the needs of the FADSA's facilities, while it will contribute to the saving of primary energy, the reduction of pollutants and a very significant reduction in energy costs.

2. Energy production from biogas

A. The Power Plant (HPP) from the biogas of the Tagarades landfill

The E/I station at the Tagarades landfill was constructed in the period 2005-2006, while it became operational in November 2006. The plant is a companion project of the landfill and pumps the biogas produced in order to be used for electricity production, which is injected into the distribution network of the PPP. The biogas is combusted in internal combustion engines (gas engines) in the most appropriate way in order to limit emissions to the atmosphere. The plant operates 24/7/365 and is the second largest landfill biogas energy recovery facility in Greece. The facility includes all the necessary electrical and mechanical equipment for the uninterrupted and efficient operation of the plant. In particular, it includes four gas engines (1.26 MWel each), as well as peripheral equipment.

B. The power plant (E/P) from the biogas of the Mavrorachi landfill

The E/I station at Mavrorachi Landfill was licensed and constructed between September 2017 and July 2020, and was put into trial operation in August 2020. The regular operation of the facility started at the end of February 2021. The plant is a companion project to the Mavrorachi Landfill and pumps the biogas produced through vertical wells and horizontal collection networks. The electricity produced is injected into the medium voltage grid of the HEDNO. The biogas is burned in state-of-the-art internal combustion engines (gas engines) in the most appropriate way in order to limit emissions to the atmosphere. The plant operates 24/7/365 and is the most modern facility for the energy recovery of biogas from landfills in Greece. The installation includes all the necessary electrical and mechanical equipment for the uninterrupted and efficient operation of the plant. In particular, it includes three gas engines (1.17 MWel each), as well as peripheral equipment.

The plant produces electricity from the biogas of the waste that arrives at the landfill. According to a representative of the contractor, the electricity produced amounts to 26,500 MVH per year, and can power around 7,000 households, while capturing 140,000 tonnes of carbon dioxide. In particular, the plant exploits biogas produced from organic matter accumulated in the landfill after anaerobic treatment. The biogas is mainly methane and is one of the most greenhouse gas contributors. The plant has three 1.15 megawatt dynamics engines separately. The availability of the plant is close to 95%, i.e. the installed capacity is almost the same as that produced. At the same time, about

140,000 tonnes of carbon dioxide are saved.

3. Coal Binding Agriculture

Pilot application of carbon sequestration agriculture in the Environmental Parks of the FODSA KM for soil remediation in contaminated soils, with emphasis on remediated landfills in the Region of Central Macedonia.

Under the European Green Deal and the new Common Agricultural Policy 2023-2027 (CAP) , the European Union has set a target to reduce greenhouse gas emissions by 55% by 2030, compared to 1990 levels, in order to achieve climate neutrality at EU level by 2050. In particular, one of the environmental objectives of the CAP 2023-27 is to contribute to climate change mitigation and adaptation, including through reducing greenhouse gas emissions and enhancing carbon capture and sequestration, and to promote sustainable energy . The proposal aims at piloting carbon capture techniques in agriculture on rehabilitated former landfills of the FODSA KM (Environmental Parks of Thermi and Derveni).By exploiting former uncontrolled waste disposal sites for the use of carbon capture and storage (CCS) methods with specific crops, an environmentally degraded area, which cannot support other types of crops, is transformed into a site that will contribute to achieving climate neutrality in the future.

4. Nature-based solutions (nature-based solutions)

Three actions with nature-based solutions contribute to removing CO2 from the atmosphere and reducing residual CO2 emissions.

(1) Densification of urban greenery in the Municipality of Thessaloniki. Tree planting is one of the most effective methods for CO capture2 . In the Municipality of Thessaloniki, the estimated CO2 sequestration capacity is 4,007 tn per year, through the existing cover and planting of 50,000 new trees. This is an excellent step in the right direction to increase the density of urban greening, especially in public and common areas.

(2) Similar is the action for the creation of a Metropolitan Park of Memory - Holocaust Museum that combines historical and social memory with environmental sustainability. On a site of about 70 hectares, the park could accommodate various species of trees and plants that would contribute to CO2 sequestration while raising awareness about the consequences of war and totalitarian regimes.

(3) The pilot action to curb the heat island effect in a district of Thessaloniki, by increasing the green cover and the water permeable surfaces, can be an effective measure to reduce the energy used for cooling and therefore the CO2 emissions.

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

In Module B-3 the Municipality of Thessaloniki presents the monitoring, evaluation and learning indicators related to the implementation of the Climate Neutrality Action Plan 2030. A set of measurable and verifiable key performance indicators (KPIs) is an important prerequisite for monitoring, evaluation and continuous analysis of the Municipality's achievements. The indicators were selected from the NetZeroCities comprehensive indicator sets and are related to the action areas and impact pathways listed in Section B-1. The selected indicators are presented in Table B-3.1 along with their associated outcomes and impacts, targets, and evaluation points, and Table B-3.2 presents each indicator with its metadata.

For the action area "Smart City - Innovation - Governance" there is no clear reference to specific action indicators, so their selection is approximate. The selected indicators are presented in Table B-

3.1 together with their associated outcomes and impacts, objectives and benchmarks, while Table B-3.2 presents each indicator with its metadata.

B-3.1: Impact Pathways						
Outcomes/ impacts addressed	Action/ project	**Indicator No.** (unique identified)	Indicator name		Target values	
				2025	2027	2030
Demilitarisation of the electricity network	Production of electricity from RES	D1	Greenhouse gas emissions from grid-sourced energy (reduction of CO_2 e (kton))	90	180	330
	Production of electricity from RES	D2	Local RES production (MWh/year)	0	34,59	34,59
Fragmentation of the Transport & Logistics sector	All the actions of the Transport & Logistics sector	D3	Greenhouse gas emissions from transport and logistics (reduction of CO_2 e (kton))	30	100	155
	Transport & Logistics actions 3.1.1 - 3.9.5	D4	Reducing the need for motorised passenger transport	5%	10%	21%
		D5	Shift to Public Transport & active mobility	14%	24%	40%
		D6	Increase in co-passenger traffic	1.2	1.2	1.4
		D7	Electrification of cars	5%	15%	36% (2035)
		D8	Electrification of buses	28%	28%	100%
Fragmentation of the Transport & Logistics sector Optimisation of urban freight transport	Transport & Logistics actions 3.10.1 - 3.15	D9	Average use of maximum load weight for light trucks (< 3.5t)	23%	35%	45%
		D10	Average use of maximum load weight for heavy trucks (> 3.5t)	45%	50%	60%
		D11	Reduction of the total distance travelled	5%	10%	25%
		D12	Light trucks (< 3.5t)	10%	20%	40%
		D13	Heavy trucks	0%	3%	12%

			(> 3.5t)				
Unfragmentation of the solid waste sector	Water & waste management sector actions 4.1 - 4.6	D14	Greenhouse gas emissions from solid waste ((reduction of CO_2 e (kton)))		5	10	25
		D15	Increase in paper recycling rate (%)		17	50	85
		D16	Increase in metal recycling rate (%)		17	40	60
		D17	Increase in glass recycling rate (%)		17	50	75
		D18	Increase in plastic recycling rate (%)		17	30	55
	4.7 Implementation of separate collection and recovery of bio-waste	D19	Increase in composting rate (%)		1	50	70
Refragmentation of the thermal / electrical needs of the building stock of the Municipality Further reduction of emissions from anthropogenic activities within the Municipality	Renovation of building stock (building shell)	D20	Greenhouse gas emissions from stationary energy ((CO reduction$_2$ e (kton)))		60	120	209
	New buildings with high energy efficiency standards						
	More efficient lighting and appliances/systems						
	More efficient heat generation from electricity						
Land use and Green Infrastructure	Action on planting new trees and creating new urban green islands	D21	Planting of new trees (thousands of trees)		10	30	50
		D22	Total foliage area of trees (% change)		20	60	100
		D23	Total carbon removed or stored in vegetation and soil per unit area per year (tn)		3,5	3,75	4,0

	Action on the containment of heat islands in a district of Thessaloniki	D24	Urban Heat Island (UHI) incidence (number of incidences compared to 2020)		-0%	-25%	-50%
Improved access to information, awareness and behaviour change	Digital Infrastructure	D25	Covering residents with wireless and broadband coverage		50%	60%	80%
Improving the municipality's capacity to collect, analyse and interpret data (including CO2 emissions data)	Data Management and Analysis	D26	Improving the management of the Municipality's infrastructure through monitoring and prevention of issues related to the maintenance of the infrastructure		20%	30%	40%
Improving citizens' access to e-services, increasing transparency and participation	Citizen Services	D27	Increase in the number of citizens using the digital services of the Municipality for their convenience		25%	40%	60%
Raising awareness and changing citizens' behaviour	Social awareness and information for citizens	D28	Improving the level of citizens' awareness of their environmental footprint		40%	60%	80%

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D1: Greenhouse gas emissions from grid-sourced energy**
Indicator Unit	kt CO_2 equivalent
Definition	Greenhouse gas emissions resulting from the use of the electricity network within the boundaries of the Municipality
Calculation	The calculation methodology is described in detail on pages 56 - 75 of the GHG Protocol for Cities (GPC). Other useful sources.
Indicator Context	
Does the indicator measure direct impacts	Yes

(i.e., reduction in greenhouse gas emissions?)	
If yes, which emission source sectors does it impact?	Action areas according to the GHG inventory - Module A-1 (Buildings and Heating, Electricity)
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	-
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	Impact pathways according to Module B-1 1. Energy systems A. Technology and infrastructure
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	Yes
Data requirements	
Expected data source	Energy Providers, RAE, Hellenic Statistical Service, Municipality of Thessaloniki, European Directives (for extraction of emission factors)
Expected availability	Upon request to energy providers regarding energy consumption
Suggested collection interval	Every two years (in line with the required progress reports)
References	
Deliverables describing the indicator	IPCC, GPC, GCom CRF
Other indicator systems using this indicator	Direct link to the CDP questionnaire (2.1c) and MyCovenant

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D2: Renewable energy produced locally**
Indicator Unit	MWh/y
Definition	Electricity produced from renewable sources within the administrative boundaries of the Municipality of Thessaloniki
Calculation	Annual electricity production
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?	Areas for action according to the GHG inventory - 1. Electricity (Energy systems)
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	-
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	**1.** Electricity (energy systems)
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	Yes Convent of Mayors-Local electricity production [MWh/y]

Data requirements	
Expected data source	Consortia projects for (a) photovoltaic panels in public spaces and (b) wind farms
Expected availability	Online
Suggested collection interval	Annual
References	
Deliverables describing the indicator	JRC Infokit for Cities, JRC Techical report (2016) Covenant of Mayors: Monitoring Indicators
Other indicator systems using this indicator	Reduction of GHG emissions

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D3: Greenhouse gas emissions from transport and logistics**
Indicator Unit	t CO_2 equivalent
Definition	Greenhouse gas emissions resulting from the use of motor vehicles within the boundaries of the Municipality
Calculation	The calculation methodology is based on the SUMI indicators and is described in SUMI Indicator 7. The calculation of the indicator will be carried out in Action 6.9 Carbon Progress Indicator Monitoring System and Climate Transition Observatory
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?	Action areas according to the GHG inventory - Module A-1 (Transport & logistics)
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	-
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	3. Transport & Logistics
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	Yes
Data requirements	
Expected data source	Public transport providers, urban distribution companies, Hellenic Statistical Service, Municipality of Thessaloniki, European Directives (for the extraction of emission factors), HIT/ CERT, Municipality of Thessaloniki
Expected availability	With appropriate memoranda of understanding with all stakeholders of the relevant ecosystem, data will be sent in an automated way, at the agreed intervals.
Suggested collection interval	Every 6 months
References	
Deliverables describing the indicator	Sustainable Urban Mobility Indicators (SUMI)
Other indicator systems using this indicator	Direct connection to MyCovenant

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D4 - D8: Indicators relating to passenger transport**
Indicator Unit	Percentage %
Definition	Indicator D4 captures the percentage reduction in the need for motorised passenger transport, Indicator D5 captures the rate of transition from private cars to public transport and active modes of transport Indicator D6 reflects the increase in co-passenger traffic Indicators D7 and D8 show the percentage of cars and buses that will be electrified in the Municipality of Thessaloniki.
Calculation	The methodology for calculating the indicators will be developed in Action 6.9 Carbon Progress Indicator Monitoring System and Climate Transition Observatory
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it impact?	-
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Reduction of km by car - Reduction of car use and switching to other means - Increase co-passenger traffic→ Reduce congestion, Reduce delays
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	3. Transport & Logistics
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	-
Data requirements	
Expected data source	Thessaloniki Smart Mobility Living Lab (HIT/ DERTH), Multi-source Carbon Footprint Assessment and Monitoring Platform (HIT/ CERTH), Transport Project Providers, Hellenic Statistical Service, Municipality of Thessaloniki, European Directives (for the extraction of emission factors), Ministry of Environment, Energy and Climate Change, Transport and Communications Directorate of the Region of Central Macedonia, Monitoring of the approved SUMP of the Municipality of Thessaloniki, Commuter questionnaires
Expected availability	With appropriate memoranda of understanding with all stakeholders of the relevant ecosystem, data will be

	sent in an automated way, at the agreed intervals.
Suggested collection interval	Real time data - Real time for certain types of data Every 12 months for the rest
References	
Deliverables describing the indicator	Thessaloniki Smart Mobility Living Lab Sustainable Urban Mobility Indicators (SUMI)
Other indicator systems using this indicator	-

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D9 - D13: Indicators related to logistics and freight transport**
Indicator Unit	Percentage %
Definition	Indicators D9 and D10 refer to the percentage of average use of the maximum load weight for light trucks (< 3.5t) and heavy trucks (> 3.5t) respectively. Indicator D11 refers to the percentage reduction in the total distance travelled by urban freight vehicles. Indicators D12 and D13 refer to the electrification of light trucks (< 3.5t) and heavy trucks (> 3.5t) respectively.
Calculation	The methodology for calculating the indicators will be developed in Action 6.9 Carbon Progress Indicator Monitoring System and Climate Transition Observatory.
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it impact?	-
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Reduction of traffic congestion Economic efficiency of freight transport
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	3. Transport & Logistics
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	-
Data requirements	
Expected data source	Thessaloniki Smart Mobility Living Lab (HIT/ DERTH), Multi-source Carbon Footprint Assessment and Monitoring Platform (HIT/ CERTH), Transport Project Providers, Hellenic Statistical Service, Municipality of Thessaloniki, European Directives (for the extraction of emission factors), Ministry of Environment, Energy and Climate Change, Transport and Communications

	Directorate of the Region of Central Macedonia, Monitoring of the approved SUMP of the Municipality of Thessaloniki, Commuter questionnaires
Expected availability	With appropriate memoranda of understanding with all stakeholders of the relevant ecosystem, data will be sent in an automated way, at the agreed intervals.
Suggested collection interval	Real time data - Real time for certain types of data Every 12 months for the rest
References	
Deliverables describing the indicator	Thessaloniki Smart Mobility Living Lab Sustainable Urban Mobility Indicators (SUMI)
Other indicator systems using this indicator	-

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D14: Greenhouse gas emissions from solid waste**
Indicator Unit	CO_2 e (kton)
Definition	The indicator measures greenhouse gas emissions from solid waste
Calculation	The calculation methodology is described in detail on pages 56 - 75 of the GHG Protocol for Cities (GPC). Other useful sources.
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?	Action areas according to the GHG inventory - Modulo A-1 (Solid Waste)
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	-
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	Water & Waste management
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	Yes
Data requirements	
Expected data source	Electronic Waste Register, FODSA KM, Municipality of Thessaloniki
Expected availability	Online and upon request to the above mentioned bodies.
Suggested collection interval	Semester
References	
Deliverables describing the indicator	GHG Protocol for Cities (GPC), JRC Infokit for Cities
Other indicator systems using this indicator	-

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**A15 - A18: Increase the recycling rate of paper, metal, glass, plastic**
Indicator Unit	%
Definition	The indicators measure the share of recycled municipal waste in total municipal waste generation. Based on the requirements of the EU, 4 indicators have been developed for each of the 4 streams of recyclable packaging materials
Calculation	Share of recycled municipal waste in total municipal waste generation per stream of recyclable packaging materials
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it impact?	-
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Increasing recycling, reducing the amount of waste going to landfill, promoting the circular economy
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	Water & Waste management
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	Yes
Data requirements	
Expected data source	Electronic Waste Register - https://admin-wrm.ypeka.gr/ota-statistics-search-form
Expected availability	Online
Suggested collection interval	Semester
References	
Deliverables describing the indicator	Green City Accord
Other indicator systems using this indicator	Reference to the 'Local Waste Management Plan'

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**A19: Increase in composting rate**
Indicator Unit	%
Definition	The indicator measures the share of bio-waste composted in the total municipal waste generation
Calculation	Share of composted bio-waste in total municipal waste production
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it	-

impact?	
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	reducing the amount of waste going to landfill, promoting the circular economy, reducing food waste
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	Water & Waste management
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	Yes
Data requirements	
Expected data source	Electronic Waste Register - https://admin-wrm.ypeka.gr/ota-statistics-search-form
Expected availability	Online
Suggested collection interval	Semester
References	
Deliverables describing the indicator	Green City Accord
Other indicator systems using this indicator	Reference to the 'Local Waste Management Plan'

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D20: Greenhouse gas emissions from stationary energy**
Indicator Unit	t CO_2 equivalent
Definition	Greenhouse gas emissions from the operation of buildings
Calculation	The indicator can be calculated as "Amount of fuel consumption per fuel type x GHG emissions per fuel type". The calculation methodology is described in detail on pages 60 - 73 of the GHG Protocol for Cities (GPC). Other useful sources: IPCC, JRC Infokit for cities
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?	Action areas according to the GHG inventory - Section A-1 (Buildings and Heating, Electricity)
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	-
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	Impact pathways according to Modulo B-1 2. Built environment A. Technology and infrastructure
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	Yes
Data requirements	
Expected data source	Energy Providers, Hellenic Statistical Service, Municipality of Thessaloniki, European Directives (for extraction of emission factors)

Expected availability	Upon request to energy providers regarding energy consumption
Suggested collection interval	Every two years (in line with the required progress reports)
References	
Deliverables describing the indicator	IPCC, GPC, JRC Infokit for cities
Other indicator systems using this indicator	Direct link to the CDP questionnaire (2.1c) and MyCovenant

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D21: Planting of new trees**
Indicator Unit	Number of trees
Definition	Number of new trees in parks and urban green islands of the Municipality of Thessaloniki planted each year
Calculation	Export from the updated database of the application https://app.greentree.gr/el/map/3
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?	All emission fields and sectors
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Air quality, reducing heat islands, reducing pollution, improving natural ecosystems
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	5. Land Use and Environment and Residual Emissions
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	Yes, as reforestation or afforestation
Data requirements	
Expected data source	Municipality of Thessaloniki - Directorate of Greenery and Environment Management - Tree database application https://app.greentree.gr/el/map/3
Expected availability	Online
Suggested collection interval	Annual
References	
Deliverables describing the indicator	European Commission (2021) Evaluating the Impact of Nature-based Solutions: Appendix of Methods.
Other indicator systems using this indicator	Reduction of GHG emissions

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D22: Total Leaf Area of trees (Total Leaf Area)**
Indicator Unit	Hectares / square metres
Definition	The LA (Leaf Area) describes the total amount of leaf area of all NBS in a geographical area

Calculation	Surface area calculation from analysis of satellite photos of the municipality or the use of applications such as GREENPASS® system and tools
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	Yes, it can be used to estimate CO2 sequestration from tree foliage
If yes, which emission source sectors does it impact?	All emission fields and sectors
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Air quality, reducing heat islands, reducing pollution, improving natural ecosystems
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	5. Land Use and Environment and Residual Emissions
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	No
Data requirements	
Expected data source	Satellite Data Analysis / Photogrammetry Laboratories AUTH
Expected availability	Online
Suggested collection interval	Annual
References	
Deliverables describing the indicator	European Commission (2021) Evaluating the Impact of Nature-based Solutions: Appendix of Methods.
Other indicator systems using this indicator	Reduction of GHG emissions

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**Δ23: Total carbon removed or stored in vegetation and soil per unit area per year**
Indicator Unit	Total carbon removed or stored (tonnes/ha/y or similar units)
Definition	Kg CO2 removed from the atmosphere and stored per hectare of soil per year
Calculation	Calculation of the Normalized Difference Vegetation Index (NDVI) and estimation of the CO2 stored in the biomass of trees from satellite images of the municipality of Thessaloniki
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?	From all fields and emission sectors
Does the indicator measure indirect impacts (i.e., co- benefits)?	No

If yes, which co-benefit does it measure?	-
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	5. Land Use and Environment and Residual Emissions
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	No
Data requirements	
Expected data source	Aristotle University of Thessaloniki's Satellite Data Analysis Laboratories
Expected availability	Online
Suggested collection interval	Annual
References	
Deliverables describing the indicator	European Commission (2021) Evaluating the Impact of Nature-based Solutions: Appendix of Methods.
Other indicator systems using this indicator	Reduction of GHG emissions

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**Δ24: Urban Heat Island (UHI) incidence**
Indicator Unit	
Definition	Urban Heat Island (UHI) effect denotes an urban area that is significantly warmer than its rural or undeveloped surrounding areas. Expressed and evaluated as temperature (°C).
Calculation	Requires a rather large amount of temperature measurement stations to holistically identify the effect within the urban area
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it impact?	-
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Because of the UHI effect, citizens living in urban areas experience more heat stress than those living in the countryside.
Can the indicator be used for monitoring impact pathways?	No
If yes, which NZC impact pathway is it relevant for?	5. Land use and the environment
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	No
Data requirements	
Expected data source	Meteorological measuring stations (temperature). Alternatively through a crowdsourcing application in which residents of Thessaloniki give temperature measurements
Expected availability	Directly
Suggested collection interval	Temperature data at individual locations at regular intervals

References	
Deliverables describing the indicator	European Commission (2021) Evaluating the Impact of Nature-based Solutions: Appendix of Methods.
Other indicator systems using this indicator	

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D25: Coverage of residents with wireless and broadband**
Indicator Unit	%
Definition	The indicator indicates the percentage of the municipality's residents who have access to a reliable high-speed wireless network
Calculation	The indicator is calculated by dividing the number of residents with access to broadband by the total number of residents
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it impact?	-
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Improved access to information, awareness and behaviour change
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	Impact corridors in accordance with Section B-1, 6. Smart City - Innovation - Governance A. Technology and infrastructure
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	
Data requirements	
Expected data source	Telephony-Internet providers, Hellenic Statistical Service, Municipality of Thessaloniki
Expected availability	Following a request to the Telephony-Internet providers
Suggested collection interval	Every two years
References	
Deliverables describing the indicator	The indicator refers to the Digital Strategy of the Municipality of Thessaloniki 2017-2030, and more specifically to the section "The Connected City"
Other indicator systems using this indicator	

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**D26: Increase the number of citizens using the digital services of the Municipality for their convenience**
Indicator Unit	%
Definition	The indicator indicates the percentage increase in the number of citizens using digital services to communicate with the municipality, for their

	convenience, and to carry out various procedures.
Calculation	The indicator is calculated by subtracting the initial number of citizens using digital services from the current number and dividing the result by the initial
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it impact?	-
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Improving the municipality's capacity to collect, analyse and interpret data (including CO2 emissions data)
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	Impact pathways according to Section B-1 6. Smart City - Innovation - Governance B . Governance and policies
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	
Data requirements	
Expected data source	Inspectors or technicians of the Municipality, Municipality of Thessaloniki
Expected availability	The municipality may establish procedures for the regular collection and updating of data
Suggested collection interval	Every two years
References	
Deliverables describing the indicator	The indicator refers to the digital strategy of the Municipality of Thessaloniki 2017-2030, and more specifically to the section "A city that harnesses its data"
Other indicator systems using this indicator	

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**A27: Coverage of residents with wireless and broadband**
Indicator Unit	%
Definition	The indicator indicates the percentage of the municipality's residents who have access to a reliable high-speed wireless network
Calculation	The indicator is calculated by dividing the number of residents with access to broadband by the total number of residents
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it impact?	-
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Improving citizens' access to e-services, increasing transparency and participation

Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	Impact pathways according to Section B-1 6. Smart City - Innovation - Governance B . Governance and policies
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	[yes/no]
Data requirements	
Expected data source	Municipality of Thessaloniki, Questionnaires for citizens
Expected availability	The availability of traffic on the various platforms of the municipality can be in real time. Questionnaires are made occasionally
Suggested collection interval	Every two years
References	
Deliverables describing the indicator	The indicator refers to the digital strategy of the Municipality of Thessaloniki 2017-2030, and more specifically to the section "The Participatory City"
Other indicator systems using this indicator	

B-3.2: Indicator Metadata	
(For each indicator selected – take from Comprehensive Indicator Sets)	
Indicator Name	**A28: Improving the level of awareness of citizens about their environmental footprint**
Indicator Unit	%
Definition	The indicator indicates the percentage of citizens who have acquired knowledge about their environmental footprint and that of their city.
Calculation	The indicator is calculated as the percentage of citizens who have been informed in relation to the total population of the city
Indicator Context	
Does the indicator measure direct impacts (i.e., reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it impact?	-
Does the indicator measure indirect impacts (i.e., co- benefits)?	Yes
If yes, which co-benefit does it measure?	Awareness raising and behaviour change
Can the indicator be used for monitoring impact pathways?	Yes
If yes, which NZC impact pathway is it relevant for?	Impact pathways according to Section B-1 6. Smart City - Innovation - Governance C . Social Innovation & F. Learning and skills
Is the indicator captured by the existing CDP/ SCIS/Covenant of Mayors platforms?	[yes/no]
Data requirements	
Expected data source	Municipality of Thessaloniki, Questionnaires for citizens
Expected availability	Regular distribution of questionnaires to citizens of all ages
Suggested collection interval	Every two years

References	
Deliverables describing the indicator	
Other indicator systems using this indicator	

5 Part C – Enabling Climate Neutrality by 2030

Part C " Enabling Climate Neutrality by 2023" is a building block for the implementation of climate neutrality actions, creating favourable systemic conditions for the activation of Part B. In Part C, the Municipality of Thessaloniki lists the supporting interventions (e.g. on the organisational framework, collaborative governance models or social innovations) that the Municipality of Thessaloniki has designed to support and activate the set of climate actions as listed in Section B-2, as well as to contribute to additional benefits, directly or indirectly, as defined in the impact pathways in Section B-1.

5.1 Module C-1 Organisational and Governance Innovation Interventions

Module C-1 consists of a summary table presenting the interventions for organization and governance, with stakeholders, the link to climate neutrality and co-benefits (C-1.1), and a sub-section providing detailed information on these interventions (C-1.2).

C.1.1: Enabling organisational and governance interventions					
Intervention name	Description	Responsible entity/ dept./ person	Involved stakeholder	Enabling impact	Co-benefits
Climate City Contract (CCC).	The Municipality of Thessaloniki, together with other stakeholders, plans to proceed with the signing of the CCC.	Municipality of Thessaloniki, Dept. of Operational Planning and Development Programmes Monitoring (Resilience Office)	• General Secretary of Spatial Planning and Urban Environment, Ministry of Environment and Energy • Region of Central Macedonia (RCM) • Aristotle University of Thessaloniki (AUTh) • University of Macedonia (UoM) • National Center for Research andTechnologicalDevelopment (CERTH) • International Hellenic University (IHU) • Hellenic Electricity Distribution Network Operator (HEDNO) S.A. • Centre for Renewable Energy Sources and Saving (CRES) • Thessaloniki Water Supply&Sewerage Co S.A. (EYATH S.A.) • Regional Association of Solid Waste Management Agencies of Central Macedonia	The CCC has recently been developed as a useful governance tool with the main objective of accelerating the transition to climate-neutral and sustainable cities.	Strategic advantage

			(FODSAKM) • Transport Authority of Thessaloniki (TheTA) S.A. • Thessaloniki International Fair(TIF)-HELEXPO SA • Major Development Agency Thessaloniki (MDAT) S.A. • Technical Chamber of Greece • Section of Central Macedonia • Thessaloniki Chamber of Commerce and Industry (TCCI) • Professional Chamber of Thessaloniki • Federation of Industries of Greece (SBE) • Commercial Association of Thessaloniki • Thessaloniki Hotels Association (THA)		
Resilience Office	Modernization of the structure of the Municipality to improve its organizational structure on climate neutrality.	• Municipality of Thessaloniki: • Operational Planning & Operations Planning Department Monitoring of Development Programmes (ATESSPAP) / Resilience Office • Department of Urban Planning & Architectural Studies • Directorate for Sustainable Mobility & Networks • D/ Directorate of Greenery Management & Environment / Department of Environment and Climate Change Adaptation etc.	Municipality of Thessaloniki:	The Office of Resilience will coordinate City departments and climate actions, helping to address fragmentation and/or overlapping responsibilities, as well as any delays (key systemic barriers, Section A-3).	Strategic advantage and alignment with relevant national and international policies.
Organisation of a cooperation	Establishment of a Metropolitan cooperation	The scheme should be organised by	Municipality of Thessaloniki Other municipalities	In line with the systemic problems	• Normal traffic operation

scheme in relation to Multimodal Traffic Management and Mobility issues	scheme between stakeholders for the multimodal management of mobility and the solution of problems related to traffic, parking, micro-mobility, public transport and the allocation of public space	the body that has a metropolitan role, but the participation of the Municipality and its active role is considered essential.	WFP ΟΣΕΘ Metro and bus operators ΕΚΕΤΑ/ ΙΜΕΤ	identified in A.3, the creation of such a scheme seems necessary. Multimodal mobility management will favour the use of public transport and other means over car use.	Rational management of public space for the benefit of citizens
Ecosystem Governance related to digitisation in Mobility: mobility data space and collaboration with other data spaces, collaboration between Living Labs and MaaS	Creating an ecosystem that includes stakeholders in all actions related to the digitalisation of transport. The Ecosystem will be governed by a framework based on fair and balanced participation.	Municipality of Thessaloniki with the contribution of all stakeholders in the relevant proposed actions of Section B.	• Municipality of Thessaloniki • CSETA • WFP • Other municipalities • ΟΣΕΘ • Other Public Sector Stakeholders • Private sector mobility service providers • Digital service providers Technology providers	Widespread digitisation will lead to a plethora of applications that will in turn encourage the use of public transport and other sustainable and environmentally friendly means of transport.	Transition to the era of digitalisation and accelerating the introduction of innovative applications in the transport system of the city of Thessaloniki
Participatory governance model for energy and climate (Section A-3)	Development of a new participatory governance model to improve the organisational structure of the Municipality and strengthen partnerships with governmental and non-governmental bodies on energy-related issues.	• Municipality of Thessaloniki: • ATESSPAP / Resilience Office • Department of Urban Planning & Architectural Studies Directorate for Sustainable Mobility & Networks etc.	• Municipalities • Regions • Ministries • TEN-TEPA • Energy providers • Association of Hoteliers of Thessaloniki • Owners of houses/buildings • Citizens • CSETA • University of Macedonia • Other entities with autonomous areas within the Municipality (AUTH, PAMAK, HELEXPO, EL, ELTH, EVATH) • Local businesses	Establish an Energy and Climate Coordination Group, divided into sub-groups, to address barriers in the sectors: Governance and Policy, Financing, Learning & Governance and Policy, Financing, Learning and Education, Citizen Awareness (key systemic barriers, Section A-3). Each sub-group is	Increased uptake of climate actions and a just energy transition.

				composed of relevant stakeholders and citizens.	
Urban governance model with emphasis on transparency & cybersecurity	Privacy and information management mechanisms available	• Municipality of Thessaloniki: • ATESSPAP / Resilience Office • Electronic Governance Directorate Internal Audit Department etc.		Targeted interventions and effective resource management, leading to reduced emissions, but also improving the efficiency of the resources involved.	Citizens' active involvement in climate policies and initiatives.
Monitoring mechanism for the SDS	Establishment and operation of a mechanism to monitor the proper and scheduled implementation of the Plan, and also to set indicators of achievement of objectives in order to propose changes/modifications where conditions have changed or objectives are not being met	Municipality of Thessaloniki	• Municipality of Thessaloniki EKETA/ IMET	The SDS is the backbone of the Transport & Logistics Action Plan. Therefore, the correct and timely implementation of the proposed projects and actions of the SDS is a prerequisite for the Action Plan.	Proper operation of the transport system in the city of Thessaloniki.
Developing new business models to finance the installation and maintenance of roadside chargers and the operation of electromobility services	Developing business models in cooperation with investment institutions, which will facilitate access to financial instruments with the participation of private investors.	• Municipality of Thessaloniki: • Department of Entrepreneurship Support Employment and Entrepreneurship Support Office	• Municipalities • Regions • TEN-TEPA • ADMIE • Energy service companies • Energy providers • Private investors Space providers for the deployment of chargers	Through new business models, the Municipality will be able to unlock funds that will be made available for the creation of charger infrastructure and new electrification services.	Solving problems related to the driving range of electric vehicles.
Developing new business models for cooperation with the private sector for car sharing, Mobility as a Service, etc.	Developing business models in partnership with individuals for the development of new physical mobility services	• Municipality of Thessaloniki: • Department of Entrepreneurship Support Employment and Entrepreneurship Support Office	• Municipality of Thessaloniki • Other municipalities • ΟΣΕΘ • Metro and bus operators • Private providers of physical mobility services • Private digital application providers • ECCTA/IMET	Through new business models, the Municipality will be able to unlock funds to create new and combined environmentally friendly mobility services.	New services for citizens and visitors

Development of new business models to optimise urban distribution	Development of business models in cooperation with private individuals for the optimization of freight transport (logistics) processes in the Municipality of Thessaloniki with private capital	• Municipality of Thessaloniki: • Department of Entrepreneurship Support Employment and Entrepreneurship Support Office	• Municipality of Thessaloniki • Other Lemmas • Private companies active in logistics/ urban distribution • Private companies with commercial activity HORECA etc, EKETA/ IMET	Through new business models, the Municipality will be able to unlock funds to create new urban delivery services with a positive impact on the reduction of vehicle kilometres travelled by light and heavy urban delivery vehicles within the Municipality of Thessaloniki.	Smooth circulation of both persons and goods within the Municipality of Thessaloniki.
Developing new business models for energy upgrading	Developing business models in cooperation with investment institutions, which will facilitate access to financial instruments for energy infrastructure upgrades and energy saving.	• Municipality of Thessaloniki: • Department of Entrepreneurship Support Employment and Entrepreneurship Support Office	• Municipalities • Regions BEDDIE • ADMIE • Energy service companies • Energy providers • Business • Association of Hoteliers of Thessaloniki Other bodies with autonomous areas within the municipality	Through new business models the Municipality will be able to unlock funds to be allocated to energy upgrading and energy saving projects towards climate neutrality.	Increasing the rate of energy upgrades leads to a reduction in electricity bills, addressing energy poverty.
Green Public Procurement (GPP)	Implementation/ evolution of the Green Public Procurement policy in the Municipality of Thessaloniki	• Municipality of Thessaloniki, Procurement Department Financial & Economic Directorate Cash Management	• Municipality of Thessaloniki Suppliers and contractors of the Municipality	With EPCs, the Municipality can contract for goods, services and projects with a lower environmental impact throughout their life cycle.	Immediate emission reduction and energy/money savings.
Voluntary agreements with large consumers	Conclusion of voluntary energy saving agreements between the Municipality and large energy consumers	• Municipality of Thessaloniki: • Department of Entrepreneurship Support Employment	• Municipalities • Regions • Hospitals • Hotels • Business • Exhibition spaces • Educational institutions • Association of Hoteliers	Energy saving actions by large consumers with compensatory benefits	Increasing private initiatives, attracting new investments - businesses,

		and Entrepreneurship Support Office	Thessaloniki • Other bodies with autonomous areas within the municipality	offered by the Municipality.	creating green jobs.
Digitisation of documents and processes	Upgrading of the Electronic Document Circulation System (EDCS)	• Municipality of Thessaloniki • Electronic Governance Directorate • Internal Audit Department	• Competent Ministries • KEP	• Reducing carbon emissions from paper production. • Energy and resource savings due to the reduced need for physical storage and printing. Reduction of carbon emissions due to the reduced need to travel.	Efficient information management as well as the convenience and satisfaction of citizens due to the possibility to access information from anywhere.
Tele-working and commuting	Initiatives to promote distance working within the Municipality of Thessaloniki, both in the private and public sector.	Municipality of Thessaloniki	• Services of the Municipality of Thessaloniki • Private businesses within and outside the Municipality of Thessaloniki	• Reduction of greenhouse gas emissions and traffic congestion Reducing carbon emissions from energy production in commercial buildings.	• Improved air quality. • Reduction of traffic congestion Improved work-life balance for residents.
Cooperative scheme for waste data collection and analysis	Creation of aggregated databases of Municipal Solid Waste Management of the MSW and preparation of annual waste management reports	FODSA K.M.	• Municipality of Thessaloniki • Other municipalities • Recycling Recovery Companies • FODSA Region of Central Macedonia Operators of Treatment and Disposal Facilities	Data collection and analysis can help to understand the nature and quantity of waste generated. This can lead to improved waste management.	Effectively addressing challenges and developing appropriate strategies to improve waste management by decision-makers.
Creating an ecosystem to promote and enhance recycling (separate collection, bio-waste, etc.)	Creating a collaborative ecosystem involving all stakeholders to develop common recycling strategies and objectives. Particular emphasis will be placed on the	Municipality of Thessaloniki	• Municipality of Thessaloniki • FODSA KM • Alternative Management Systems (AMS) • Recycling Recovery Companies • EEAA	• Increasing the recycling rate with a direct reduction in associated greenhouse gas emissions Promoting sustainable	Optimisation of waste collection procedures. Reduction of nuisance and traffic problems from solid waste

	separate collection of recyclable materials as well as on the collection of bio-waste with appropriate infrastructure (collection and treatment).			bio-waste management	collection.
Detailed planning of sector interventions Land use and environment	It includes (a) the preparation of a strategic plan for each intervention, (b) the preparation of a Municipal Emission Reduction Plan. According to Law 4936, (c) contributing to the National Strategy for Adaptation to Climate Change	Municipality of Thessaloniki	Municipality of Thessaloniki, Ministry of Environment, Organizations participating in the actions of the sector Land Use and Environment	Increasing locally produced renewable energy. Increase the capture of carbon dioxide directly from the atmosphere. Redevelopment of districts of Thessaloniki	Improving quality of life and reducing pollution
Organisational interventions	Organisational interventions include developing synergies and partnerships, working with local organisations, citizens' groups, educational institutions and businesses, developing partnerships between public administration, the private sector and the private sector.	Municipality of Thessaloniki	Municipality of Thessaloniki, Ministry of Environment, Organizations participating in the actions of the sector Land Use and Environment	Contribute to the implementation of the actions of the sector	As above
Awareness and acceptance of actions by civil society	Public awareness interventions include consultation with the local community of Thessaloniki, encouraging the participation of the local community in the interventions through various actions, information on the benefits of local RES systems	Municipality of Thessaloniki	Municipality of Thessaloniki, ecological associations of the city, NGOs	Contribute to social acceptance and participation in actions	As above

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

In order to remove existing barriers to climate neutrality (see Section A-3.2), the Municipality of Thessaloniki has defined specific interventions to improve its organisation and governance, with the ultimate goal of achieving its climate targets by 2030. First, it wishes to build on the **Climate City Contract (CCC)**, which has recently been developed as a useful governance tool, with the main objective of accelerating the transition to climate neutral and sustainable cities. The Municipality together with other stakeholders (municipalities, educational institutions, public interest companies, NERC, etc.) is going to sign the CMP, through which it will ensure the long-term commitment and cooperation of a large number of stakeholders. It is important to ensure the participation of the Region of Central Macedonia, other Municipalities and Regions of the country, as well as relevant Ministries, in order to achieve climate cooperation between different levels of government (local, regional, national). With the CSP, the Municipality will be led to more efficient and inclusive decision-making processes and to attract new ideas and stakeholders, gaining a strategic advantage in the efficiency of climate actions.

Also, as discussed in Section A-3.3, the City has and is developing the **Office of Resilience** to improve its organizational structure related to the implementation of climate actions. The Office of Resilience will be responsible for coordinating the relevant City departments, as well as organizing, prioritizing, and monitoring the City's climate neutrality-related actions. In addition, the Office will ensure data collection, the smooth circulation of information and the acceleration of bureaucratic procedures, helping to address fragmentation and/or overlapping responsibilities, as well as any delays in the context of tenders, project awards, etc. (key systemic barriers, Section A-3.2). By upgrading the Office dedicated to resilience and climate change, the Municipality gains a strategic advantage in terms of efficiency of actions, participation in synergies, etc. and achieve alignment with relevant national and international policies.

In addition, the Municipality has designed a **participatory governance model** under the Office of Resilience to further improve its organisational structure, strengthen its partnerships with stakeholders, both governmental and non-governmental, and promote citizen participation in climate neutrality decision-making. The participatory model is based on the Climate Coordination Group, which is divided into 4 sub-groups, each of which is tasked with addressing existing barriers in the sectors: Governance and Policy, Financing, Learning and Education, Citizen Awareness (key systemic barriers, Section A-3.2). Each sub-group is composed of relevant stakeholders (municipalities, regions, chambers, businesses, etc.) and citizens, and will function as a Local Climate Team (LCT). The participatory model of the municipality promotes multi-level governance, collaboration and exchange of know-how and good practices with other stakeholders and democratic participation, leading to increased uptake of climate actions and a just energy transition.

The Municipality of Thessaloniki, as part of its governance, intends to adopt the policy of **Green Public Procurement (GPP)**. GPP allows public authorities to contract for goods, services and projects with a lower environmental impact throughout their life cycle, compared to other available goods, services and projects that perform the same primary function. In this way, the municipality contributes to direct emission reductions and energy and money savings, especially when the full life-cycle cost of a contract is taken into account and not just the purchase price.

Regarding access to investment capital, the Municipality intends to work on the **development of new business models**, in cooperation with investment institutions (such as energy service companies, banking institutions, businesses, etc.) and electricity providers and operators, which will facilitate access to financial instruments and capital for energy infrastructure upgrades. In this way, the City will unlock significant funds to be allocated to energy saving projects towards climate neutrality. Increasing the rate of energy upgrades will lead to an immediate reduction in the cost of electricity bills, addressing energy poverty. We note that TIF has already received a loan from the European Investment Bank (EIB) and under certain circumstances, this is something it is willing to do again. In addition, the EIB loan was complemented by funds from the Public Investment

Programme, thus increasing the available investment funds (a total of €25 million).

In addition, the Municipality has a strategic priority to save energy from large consumers. In order to identify the largest energy consumers (electrical/thermal) within the Municipality, a specific study will be carried out with the ultimate goal of planning the installation of CHP/RES and solar systems. In the same strategic priority, the Municipality will try to enter into **voluntary agreements/memoranda of cooperation with large consumers** (hospitals, universities, hotels, etc.) who wish to save energy, while the Municipality will provide them with compensatory benefits (e.g. reduction of fees, free parking spaces, etc.).

The Municipality of Thessaloniki, in order to further increase its strategic advantage in forthcoming partnerships and funding towards climate neutrality, will carry out **energy audits and certifications of selected municipal buildings**, the development of digital representations (BIM) and assessment of the intelligence of these buildings (based on the SRI - Smart readiness iindicator method). In this way, thorough solutions will be developed for the conversion of municipal buildings to near-zero emissions.

With regard to Transport & Logistics, it is proposed to create **two sub-networks of stakeholders** that will help to support the climate neutrality objectives and will also serve the broader objectives of well-managed mobility as well as the transition to a digitised mobility situation. The proposed cooperation networks can operate autonomously or within the overall participatory governance proposal of this paper, but in any case the Municipality of Thessaloniki should take the initiative for their creation, mainly because it does not have the competence in some traffic and mobility related subjects, such as Public Transport, which are however, crucial for the success of the actions described.

The first network concerns the cooperation of different bodies with responsibilities for managing individual parts of infrastructure and mobility services. The institutionalization of **a cooperation scheme for multimodal Traffic and Mobility Management issues** between entities such as the Region of Central Macedonia, OSEΘ, the Municipality of Thessaloniki, the transport project executing agencies, the other Municipalities of the Metropolitan area with the assistance of EKETA/IMET, can effectively contribute both to the planning and execution of actions that have to do with the overall management of all transport means and infrastructure and with the integration of different management systems for the direct and integrated management of the transport infrastructure.

The Action Plan includes a series of technological actions that have as a direct or indirect result the digitalisation of transport and the acceleration of the introduction of innovation in the transport system of the Municipality of Thessaloniki:

- Creating a data space for mobility
- Creating a common infrastructure to support Mobility as a Service schemes
- Physical mobility services based on the use of digital applications
- Strengthening the role of the smart mobility living lab operated by CERTH/IMET.

The second network concerns the cooperation of stakeholders to coordinate the development of the entire digital infrastructure proposed in relation to transport, and the multiplier effect of this infrastructure. The network has the ultimate goal of **creating an Ecosystem**, and adopting a governance framework that ensures the fair and equitable participation of all parties, from both the public and private sectors.

In order to monitor the implementation and results of the SEAP, it is proposed to establish a **mechanism for monitoring the SEAP**. The mechanism will include an observatory for the implementation of the SEAP, as well as the definition of critical indicators of the effectiveness of the

implementation of the SEAP interventions. Depending on the results of the implementation or the emergence of new circumstances, there may be a redefinition of the objectives and actions, with a corresponding study, as well as a new participatory consultation of the stakeholders involved.

Finally, it is proposed to examine and adopt **new business models** that aim to raise funds from alternative sources to finance investments related to the Action Plan, as well as to create a new framework of cooperation between the Municipality of Thessaloniki and private parties, through the concession and exploitation of public space for the development of actions that serve the objectives of the Mobility Action Plan, e.g. incentives for the widespread use of electromobility, leasing of public space for the installation and operation of electric vehicles, etc. The new business models address three main areas: Electromobility, Mobility as a Service and Urban Distribution & Logistics.

In the area of digital governance and innovation, through the action on **making public data and public information available**, citizens will have access to public data available through platforms in machine-readable form through open standards and easy access for all. The Municipality of Thessaloniki already has a number of open data platforms, such as the Municipality of Thessaloniki Open Data Portal and the Municipality of Thessaloniki Risk Data Portal. The upgrade of the e-services offered by the Municipality to citizens aims to improve their functionality immediately. Through the upgrade of these platforms, urban centres can become more efficient and interconnected while facilitating the management and monitoring of big data and providing new services for citizens and relevant stakeholders.

Privacy and information management mechanisms available either from smart sensors, logging devices or spatially enabled data discovery/disposal mechanisms. The action on the **urban governance model with a focus on transparency and cybersecurity** will emphasise the interoperability of the different information systems with each other and cybersecurity. It includes the upgrading of the Electronic Document Circulation System to cover new services mainly concerning documents with a financial scope (e.g. invoices, multiannual commitment decisions, etc.) and the creation of a repository of the Municipality of Thessaloniki for the digitised archives of the Historical Archive of the Municipal Council.

The **digitisation of documents and procedures** includes actions to streamline administrative procedures and reduce paper consumption in order to satisfy citizens by enabling them to access information from anywhere. Already before 2020, the Municipality of Thessaloniki operates an Electronic Document Circulation System (EDCS). As part of these actions, the existing web portals will be upgraded, as well as mobile applications will be developed for easy access to public services for citizens. In this way, citizens will be able to more easily submit documents and follow procedures they have requested, from wherever they are. Finally, digital signature and authentication systems will be implemented to ensure the security and legitimacy of online transactions with public bodies.

The action on **teleworking and commuting** refers to the promotion of initiatives related to teleworking. Teleworking was successfully implemented during the pandemic in the Municipality of Thessaloniki, but due to the cyber-attack on the Municipality of Thessaloniki in 2020 it was not implemented again. By upgrading the municipality's cybersecurity systems, it is now possible to re-promote it, which can significantly contribute to reducing greenhouse gas emissions, as it significantly reduces the daily commuting of employees. Administrations can encourage employees in both the public and private sectors to adopt flexible working policies that allow them to work remotely, either full or part-time, by providing them with infrastructure and support for remote working (e.g. laptops).

Organisational and intergovernmental innovation interventions on **land use and environment** face systemic barriers to activating the pathways mentioned and implementing sectoral actions. They are located in issues of planning, organisation, and social acceptance. The proposed interventions address systemic barriers and opportunities through improved organisational structures and

governance models. This includes creating a framework for cooperation between municipal authorities, local stakeholders and residents, and strengthening participation in decision-making processes and project implementation.

Design interventions include

- The preparation of a strategic plan for each intervention with the typical strategic planning modules (analysis, objectives, action plan, implementation, measurement and evaluation). The plan should also include the governance of the interventions, the development of infrastructure, the facilitation of licensing procedures and the securing of support from the local community.
- The preparation of a Municipal Emission Reduction Plan. According to Law 4936 "National Climate Law - Transition to climate neutrality and adaptation to climate change", and Article 16. "By 31 March 2023, each first-tier local government (LGU) shall prepare a Municipal Emission Reduction Plan (Municipal Emission Reduction Plan). The Municipal Emission Reduction Plan shall calculate the carbon footprint in accordance with para. 2, investigates, identifies and prioritises in an evidence-based manner the necessary measures and actions for reducing emissions of the local authority concerned, is compatible with the objectives and policies of the National Energy and Climate Plan (NECP), and is reviewed at least every five years. In particular, it shall include an inventory and emission reduction targets for energy-consuming buildings, equipment and infrastructure used by the first-tier local authorities and the legal entities supervised by them, and may also include removals."
- Contributing to the National Strategy for Adaptation to Climate Change (YPE, 2016), which provides, among other things, for the need to maintain a Special Register of Planted Surfaces and the creation of a data bank that will be continuously updated with the notifications of the construction of planted surfaces submitted to the local building services. In Section 4.12 Built Environment, Measure 4, the ESIF supports the increase of urban greening. "The relationship between built space and greenery will need to change to balance the coming climate changes. This will include making use of underutilised sites, redistributing and restoring green space in the built environment. Finally, the integration of greenery into existing structures (roofs, vertical surfaces, etc.) should be a priority."

The organisational interventions include

- Develop synergies and partnerships with stakeholders or programmes at regional, national or international level that share the same climate commitment.
- Working with local organisations, citizens' groups, educational institutions and businesses to achieve synergies and strengthen interventions. This may include training programmes, voluntary activities and financial support.
- The development of strategic partnerships between public administration, the private sector and local stakeholders can help to strengthen interventions. Through these relationships, common strategies can be achieved, knowledge and resources can be exchanged, and the smooth management and operation of the infrastructure that will be created can be achieved.

Public awareness interventions include

- Educate stakeholders and the public on the need for action for sustainable development and environmental protection. This can be done through educational programmes, seminars, talks and events.
- Consultation with the local community of Thessaloniki for decisions regarding proposed

interventions, crowdsourcing of design and improvement ideas.

- Encourage local community participation in the interventions through various actions, such as information campaigns, meetings and consultations with residents, participatory planting schemes, protection of RES infrastructure in common areas.
- Educate and inform the public about the benefits of photovoltaic systems and wind farms and their contribution to reducing greenhouse gas emissions. This may include information campaigns, events and visits to installations of renewable energy systems.

With regard to **Solid Waste,** it is proposed to create a network of initiatives and partnerships between the parties involved in the management and recycling of MSW, aiming at the development of common strategies and targets for the recycling of packaging and biowaste in Thessaloniki. The network has the ultimate goal of **creating an ecosystem** with the active participation of stakeholders and citizens, and the adoption of a governance framework that will ensure the fair and equitable participation of all

5.2 Module C-2 Social and Other Innovation Interventions

Module C-2 consists of a summary table presenting the social innovation interventions of the Municipality of Thessaloniki, with the stakeholders involved, the correlation with climate neutrality and the additional benefits (C-2.1), and a sub-section that provides detailed information on these interventions (C-2.2).

C.2.1: Enabling social innovation interventions					
Intervention name	Description	Responsible entity/ dept./ person	Involved stakeholder	Enabling impact	Co-benefits
Evaluation of key parameters related to the energy poverty phenomenon	It concerns the measurement and monitoring of selected indicators related to energy poverty - indicatively: heating/cooling rating days, share of buildings renovated annually, percentage of households that cannot be adequately heated, percentage of households living more than 1km from the nearest public transport station, percentage of municipalities	•	Municipality of Thessaloniki	Evaluation of key parameters related to the energy poverty phenomenon	It concerns the measurement and monitoring of selected indicators related to energy poverty - indicatively: heating/cooling rating days, share of buildings renovated annually, percentage of households that cannot be adequately heated, percentage of households living more than 1km from the nearest public transport station, percentage of municipalities

	in settlement with energy suppliers, etc.				in settlement with energy suppliers, etc.
Local Climate Teams (TOK, let's talk)	Establish local climate groups with relevant stakeholders and citizens for open dialogue, thematic debates, education activities, etc.	•	Municipality of Thessaloniki	Local Climate Teams (TOK, let's talk)	Establish local climate groups with relevant stakeholders and citizens for open dialogue, thematic debates, education activities, etc.

C-2.2: Description of social innovation interventions – textual and visual elements

In order to remove existing barriers to climate neutrality (see Section A-3.2), the Municipality of Thessaloniki, in addition to the interventions for improving organisation and governance mentioned in Section C-1, has also identified interventions for social innovation, with the ultimate aim of further contributing to the achievement of its climate goals by 2030. Initially, the Municipality will establish **Local Climate Teams (LCTs)** as part of the new participatory governance model, as described above. Through the Local Climate Action Teams, the involvement of citizens and stakeholders in decision making leads to the implementation of actions that have secured the acceptance of society, and thus to a just and democratic energy transition.

The Climate Neutrality Action Plan will be updated taking into account key indicators for a **just energy transition and social cohesion**, in line with relevant strategies and initiatives (e.g. Covenant of Mayors). The assessment of key parameters related to the energy poverty phenomenon involves measuring and monitoring selected indicators related to energy poverty - including: heating/cooling rating days, share of buildings renovated annually, percentage of households that cannot be adequately heated, percentage of households living more than 1km from the nearest public transport station, percentage of municipalities in an arrangement with energy supply companies, etc.

In addition, the Municipality intends to develop **an Energy Transition Office with a public service platform**. This new structure will function as a support office for citizens and businesses interested in renovating their buildings, in the sense of a "one-stop-shop" for the provision of relevant services (e.g. technical specifications, available funding programmes, engineering advice, etc.). Useful information material on the possibilities and requirements for energy upgrading of buildings will also be available on the public service platform, through which individuals will be able to submit and resolve any questions. The Office aims to increase private initiatives related to energy upgrading of buildings in order to promote climate neutrality through the private building sector, but also to attract new investments - businesses locally and create green jobs.

To implement a broad publicity action on climate change, the Municipality chooses to organise an annual **Energy Forum** - Conference, with the participation of many stakeholders from different levels of government, as well as non-governmental organisations, such as NGOs and citizens. In this way, open dialogue, exchange of experiences, good practices and know-how, attraction and promotion of new ideas for the climate neutrality of the Municipality, creation of new synergies are promoted. The aim is to improve the level of knowledge of all stakeholders on climate, to promote new ideas and collaborative initiatives, to attract new investments - businesses, with the ultimate goal of a just and democratic energy transition.

For the transport sector and the active participation of civil society in climate neutrality issues, the Municipality of Thessaloniki will **synergize with organized groups of cyclists, pedestrians and**

people with disabilities, with the organization of a sustainable urban mobility forum playing an important role in the relevant ecosystem. All of the above will be supported by various **cooperation networks** that the Municipality plans to develop either with businesses and start-ups active in digital mobility &MaaS, or with commercial companies and logistics and urban distribution companies. Finally, the widespread use of the mobility Living Lab and the integration of citizens in it as a 4ο helix following the EU proposals for **citizens' engagement** in Living Labs is one of the actions that the Municipality of Thessaloniki is expected to promote in cooperation with EKETA/ IMET as coordinator of THESSM@LL.

The transition to climate neutrality and the acceleration of innovation in the transport systems of modern cities should be combined with the possibility of unrestricted accessibility for all social groups, such as people with reduced mobility, low-income, vulnerable groups, etc. Research shows that public transport users belonging to low-income families, women, the elderly and people with reduced mobility identify transport systems without comfort and safety and with limited access. **Inclusive and accessible** public **transport systems** are one of the main priorities of the Municipality of Thessaloniki in the process of reorganising its bus system, as well as in the planning of the multimodal transport system with the introduction of the metro and innovative micro-mobility and shared vehicle systems.

In addition, the Municipality, recognizing the importance of the participation of the younger generation in climate actions, proposes targeted **information and education actions**, in cooperation with educational institutions, especially **in primary schools** (e.g. storytelling, puzzles, treasure hunts, visits to demonstration facilities, digital media, games, etc.). The actions will be implemented by involving students and teachers in actions related to the goal of climate neutrality (e.g. protection and maintenance of green spaces (pocket parks, planted rooms, etc.) of the Municipality of Thessaloniki. This approach improves the knowledge background on climate from childhood, gets the younger generation involved in climate action and promotes new ideas/initiatives.

Finally, the Municipality pays special attention to the **Thematic Training Actions**, which concern both the employees of the Municipality and the citizens. The training actions for municipal employees will concern procurement through Green Public Procurement (GPP), drafting of technical specifications, tendering and award procedures, in order to promote the reduction of environmental pollutants and accelerate the implementation of climate actions. Training actions for citizens will be related to private initiative towards climate neutrality (e.g. energy efficient household appliances (ecolabel, Ecodesign), possibilities of self-production through RES, etc.). It is expected that these actions will strengthen the knowledge base on climate and private initiatives that will help to attract new business investments, create green jobs and accelerate towards climate neutrality.

In addition, in the transport sector in particular, the various **information and awareness-raising actions for the general public** on issues related to electromobility, active mobility (cycling, walking) and the promotion of public transport and multimodal transport are of great importance. In addition, specific awareness-raising campaigns for tourists and cruise visitors, as well as campaigns promoting car pooling/ ridesharing are also expected to be of benefit.

The use of augmented/virtual reality (AR/VR) techniques combined with digital representations allows citizens to be informed and participate in the actions of the Municipality that promote climate neutrality as the proposed interventions are visualized and the expected benefits are understood. This achieves an **interactive experiential presentation of** the design of the municipality's regeneration/interventions through virtual environments for both planners and citizens, leading to greater awareness and adoption. The creation of Digital Innovation hubs and incubators of high-tech companies based in the city and the use of the city's open data for business opportunities and value creation is an immediate priority for the municipality. At the same time, the provision of an

online platform for human capital utilization and job placement is envisaged.

The action on the **education and training of citizens in new technologies by sector and employment category** concerns the creation of training seminars aimed at further training the citizens of the Municipality of Thessaloniki in new technologies and the simultaneous provision of a construction and collective space suitably equipped with modern electronic and mechanical equipment. This action aims to reduce the digital inequality between the different population groups of the city and provide equal opportunities for all and promote an entrepreneurial ecosystem of circular economy and synergy.

Finally, through the **enhancement of citizen participation in municipal actions with Gamification techniques / Voting**, citizens will have direct and full information and the possibility of active participation in the decision-making of the municipality and the participation of citizens in municipal actions related to the energy transition is enhanced. Utilising new technologies and solutions (e.g. digital participation platforms, gamification with avatars, hackathons, ideathons, etc.) a network of partnerships and initiatives is promoted putting citizens at the heart of the smart cities ecosystem with co-creation strategies, while meeting their requirements.

A series of social innovation interventions for the development of smart city applications can contribute to the activation and social acceptance of the Land Use and AFOLU actions. They complement and reinforce the organisation and governance interventions mentioned above. They include:

- Application for adoption and digital management of planted trees, monitoring the health and growth of trees. This can be done using sensors and wireless networks to detect soil moisture, temperature and air quality, offering remote monitoring and management. The platform can also include functions for citizen participation, suggestion of planting sites, tree adoption, and other social participation activities to increase tree planting in Thessaloniki.
- Digital monitoring of photovoltaic systems in public space: Development of a management platform for the monitoring of photovoltaic systems in public and common areas. The platform can provide information on energy production, panel performance, carbon dioxide emissions reduced by the use of solar energy. It can also include solutions to reduce vandalism of equipment or removal of equipment installed in public spaces.
- Smart wind farm management systems with an application that will provide information on the wind farm's energy production, the performance of the wind turbines and the status of the equipment. It can provide alerts of any problems or potential failures and allow remote monitoring and audits.

Regarding the Solid Waste sector, the Municipality aims to fully **inform and raise awareness on recycling.** This intervention is aimed at informing citizens about the environmental and economic importance of recycling, with the ultimate aim of adopting the principles of the Circular Economy. In addition, it aims to design and produce communication material to promote recycling in social media and mass media. Particular emphasis is also placed on the organisation of the annual recycling festival to raise awareness among citizens, businesses and students. Also included are educational programmes and awareness-raising events for citizens and students such as a second-hand bazaar, a recycling festival and the operation of a citizens' information hotline for all waste streams. Implementation of a comprehensive information and awareness programme for citizens on the implementation of the **separate collection of bio-waste**. Special awareness-raising activities for schools, which will take place in the Environmental Parks under the responsibility of the FEDSA, as well as the construction of an Environmental Education Recycling Park. Particular emphasis will be placed on special campaigns aimed at young people, such as schools.

The **waste prevention plan** refers to the design and implementation of measures and practices

aimed at reducing the volume and burden of waste generated. The implementation of the plan will focus on promoting circular consumption, information, awareness raising and providing tools for citizens (such as guides, studies, technical standards) to move from a linear to a circular model of behaviour and consumption. In addition, awareness-raising and information campaigns will be carried out targeting the general public or specific consumer groups and presenting success stories of prevention programmes already in place.

At the same time, voluntary agreements with social networks and companies are promoted to reduce waste at source through systematic repair and reconstruction, promoting the design of products for easy disassembly. In addition, programmatic agreements with social networks are planned to develop collection of specific streams, **reuse** actions and promotion in secondary materials.

In addition, the implementation of **pay-as-you-throw (POP)** systems is foreseen. A "pay-as-you-throw" system is a system whereby waste producers are charged based on the actual amount of waste they produce. In application of this system, the calculation of the uniform fee for cleaning and lighting may also be based on the production of waste per household or building complex, professional activity, urban or municipal unit, provided that the first-tier local authority concerned has a system for measuring the waste produced or for one of the waste streams produced.

With the aim of **reducing food waste**, it is proposed to support free food distribution through voluntary agreements by the catering, tourism and retail sectors. In particular, actions are proposed to save and provide food and food at every level of the food chain, as well as awareness-raising programmes on food waste and strengthening the prevention of food waste. In addition, appropriate guides will be produced which will include techniques for food waste management in places of sanitary interest.

5.3 Module C-3 Financing of Action Portfolio

Section C-3 "Financing of Actions" summarizes all the actions of the Municipality of Thessaloniki with the resulting impacts and costs, as calculated by applying the Economic Model of the Net Zero Cities program.

C-3.1: Summary of actions with cost implications

Relevant sector	A/N	Action	Implementation Manager	Start/ end date	Impact (reduction kt CO2e)	Total costs (€ million)	Total sector costs (€ million)
Buildings & Heating	2.1,2.8,2.14	Renovation of building stock (building shell)	All parties involved	2020-2030	35	657.0	**983**
	2.4,2.11,2.17	New buildings with high energy efficiency standards	All parties involved	2020-2030	1	17.0	
	2.2,2.6,2.7,2.9,2.15,2.19	More efficient lighting and devices/systems	All parties involved	2020-2030	57	216.0	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
	2.3,2.10,2.16	More efficient heat generation from electricity	All parties involved	2020-2030	115	93.0	
Electricity	1.1,1.2,1.3,1.4,4.5,4.12,4.13,4.18	Production of electricity from RES	All parties involved	2020-2030	330	206.0	**240.65**
	1.1	Photovoltaic systems in public and common areas of the Municipality of Thessaloniki	Municipality of Thessaloniki	2024-2030	7,321	22.7	
	1.2	Wind farm for electricity generation at the port of Thessaloniki	Municipality of Thessaloniki	2024-2030	7,919	12.0	
Transport & Logistics	3.1.1	Reduction of lanes on the hierarchical road network, in order to reduce car use and give space to other means of transport	Municipality of Thessaloniki	2020-2030	16	55.3	**691.262**
	3.1.2	Low emission zones. Climate neutral districts and restricted access by conventional vehicles (Rotunda region)	Municipality of Thessaloniki	2020-2030		3.0	
	3.1.3	Interventions and promotion to citizens and shopkeepers,	Municipality of Thessaloniki	2024-2030		5.0	

C-3.1: Summary of actions with cost implications

Relevant sector	A/N	Action	Implementation Manager	Start/ end date	Impact (reduction kt CO2e)	Total costs (€ million)	Total sector costs (€ million)
		intervention of the Aristotle University of Thessaloniki (study - project)					
	3.1.4	Construction and operation of a bypass road to divert through traffic (Fly over road infrastructure)	Periphery. Central Macedonia	2024 - 2030			
	3.1.5	A series of interventions, studies and projects to reduce traffic, improve traffic flow and avoid congestion in the area of the Flyover construction works.	Periphery. Central Macedonia	2024-2030		10.0	
	3.1.6	Parking management by electronic and other means: expansion and upgrade of the electronic controlled parking system, and dynamic parking pricing	Municipality of Thessaloniki	2024-2030		3.0	
	3.2.1	Single information system for	Municipality of Thessaloniki	2024-2030		0.2	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
		mobile workers					
	3.2.2	Creating a framework and incentives for teleworking in the public and private sectors (with a focus on climate neutrality ambassadors)	Municipality of Thessaloniki	2025-2030		0.2	
	3.3.1	Extension of the cycle path network	Municipality of Thessaloniki	2020-2030	24	22.5	
	3.3.2	Redevelopment and pedestrianisation. Interconnecting sidewalks. Creating pedestrian corridors and implementing safe smart crossings. Design and creation of tourist routes	Municipality of Thessaloniki	2020-2030		36.3	
	3.3.3	SharedMicromobility services (Shared Micromobility services)	Municipality of Thessaloniki - Individuals	2024-2030		11.0	
	3.3.4	Campaign and information system for the commuter on sustainable transport options	Municipality of Thessaloniki	2024-2030		0.3	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
	3.4.1	Restructuring of bus lines and launch of express lines	OSEF/Transport Minister	2024-2030			
	3.4.2	Construction of transfer stations / Park and Ride	OSEF/Transport Minister	2020-2030		4.3	
	3.4.3	Unified pricing for combined means of transport and electronic ticketing	OSEF/Transport Minister	2024-2030		35.0	
	3.4.4	Operation of the Mobility as a Service system and creation of a neutral platform to support the system	Municipality of Thessaloniki - OSEΘ - Individuals - EKETA/IMET	2024-2030		1.5	
	3.4.5	Fleet change and fleet growth for public transport on demand services	OSEΘ/OASΘ/Transport Ministry	2025-2030		7.5	
	3.5.1	Urban planning measures to link land uses to Metro stations through pedestrian mobility (Transit oriented development zones), with emphasis on the areas: Delphi, Voulgari	Municipality of Thessaloniki	2020-2030		56.7	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
		NSO, City Hall					
	3.5.2	Creation of climate-neutral local centres and neighbourhoods & interconnection of different land uses (residential, work, commercial) through sustainable mobility corridors (Mixed used development zones): Toumba, Harilaou, Triandria, Fleming and Agia Triada	Municipality of Thessaloniki	2020-2030		42.0	
	3.6.1	Implementation and operation of a car pooling service	Municipality of Thessaloniki	2024-2030	8	0.1	
	3.6.2	Operation of an on demand ridesharing service	Municipality of Thessaloniki	2024-2030		1.0	
	3.6.3	Campaign and measures to promote co-passage in	Municipality of Thessaloniki	2024-2030		0.3	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
		organised ecosystems (for example students of AUTH/PAMAK)					
	3.7.1	Electrification of public transport	OSEF/Transport Minister	2023-2030	26	227.0	
	3.8.1	Incentives for the widespread adoption of electromobility by individuals and businesses	Municipality of Thessaloniki - Ministry of Environment and Natural Resources	2020-2030	15	63.0	
	3.8.2	Implementation of all SFIO actions & Expansion of the necessary charger infrastructure	Municipality of Thessaloniki	2020-2030		1.1	
	3.8.3	Promoting electric car sharing mobility	Municipality of Thessaloniki - Individuals	2025-2030		11.0	
	3.8.4	Electrification of the fleets of the Municipality and other bodies	Municipality of Thessaloniki - Other Bodies	2020-2030		4.0	
	3.9.1	Monitoring systems and environmentally friendly management	Periphery. Central Macedonia	2020-2030	5	20.2	

C-3.1: Summary of actions with cost implications

Relevant sector	A/N	Action	Implementation Manager	Start/ end date	Impact (reduction kt CO2e)	Total costs (€ million)	Total sector costs (€ million)
		of traffic lights					
	3.9.2	Creation of Mobility &climate data space and digital services to the Ecosystem	ECCTA/IMET	2020-2030		0.3	
	3.9.3	Digital twin for impact assessment of alternative scenarios for climate neutrality policies and actions	Municipality of Thessaloniki	2024-2030		0.3	
	3.9.4	Multi-source Carbon Footprint Assessment and Monitoring Platform	Municipality of Thessaloniki	2023-2030			
	3.9.5	Application to influence commuter behaviour in favour of climate neutrality	Municipality of Thessaloniki - EKETA/IMET	2024-2030		0.2	
	3.10.1	Development of urban freight consolidation centres, freight hotels	Municipality of Thessaloniki - Individuals	2024-2030	57	9.5	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
		and micro fulfillment centres					
	3.10.2	Creating an ecosystem of cooperation	Municipality of Thessaloniki - Individuals	2024-2030		0.2	
	3.10.3	Development of lockers (regulatory framework, selection of institutions and cooperation model) in public spaces of the Municipality of Thessaloniki	Municipality of Thessaloniki - Individuals	2024-2030		1.6	
	3.10.4	Incentives for the conversion of ground floor shops into loading/unloading bays or areas to increase storage	Municipality of Thessaloniki	2024-2030		1.0	
	3.11.1	Creation of parking spaces for cargo bikes	Municipality of Thessaloniki	2024-2030		1.5	
	3.11.2	Incentives for the acquisition of green and electric urban	Municipality of Thessaloniki - Ministry of Environment and Natural Resources	2024-2030		35.0	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
		delivery vehicles					
	3.12.1	Night-time distribution in the central area, application of service windows for specific sectors (e.g. Supermarkets), restrictions on the load factor for vehicles approaching the centre	Municipality of Thessaloniki	2024-2030		0.2	
	3.12.2	Shared lanes for urban delivery vehicles and urban buses to be used by delivery vehicles with high load occupancy during off-peak time windows.	Municipality of Thessaloniki	2024-2030		0.2	
	3.12.3	Installation of intelligent infrastructure to monitor unloading locations and provide a booking tool with	Municipality of Thessaloniki	2024-2030		2.0	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
		preferential status for vehicles with a high load factor					
	3.13.1	Development of a Sustainable Urban Freight Transport Plan (SBAEM) for the entire Municipality of Thessaloniki	Municipality of Thessaloniki	2024-2030		0.4	
	3.13.2	Regulatory framework and incentives for the collection and provision of digital urban freight transport data by private parties to the Municipality of Thessaloniki	Municipality of Thessaloniki - EKETA/IMET - Individuals	2024-2030			

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
	3.13.3	Observatory to monitor urban freight transport and its impact on the environment and the local economy	Municipality of Thessaloniki	2024-2030		0.2	
	3.13.4	Incentives and installation of a telematics system for monitoring freight flows	Municipality of Thessaloniki - Individuals - Ministry of Transport	2024-2030		2.4	
	3.14	Actions to optimize the waste collection procedures of the Municipality of Thessaloniki	Municipality of Thessaloniki	2020-2030		0.2	
	3.15	Supply of electric vehicles and vehicles with anti-pollution technology for the upgrading of the cleaning services of the Municipality of Thessaloniki and the	Municipality of Thessaloniki	2020-2030		15.0	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
		reduction of the carbon footprint of its vehicle fleet					
Water Waste management	4.1	Design and operation of a Green Point/Recycling Corners	Municipality of Thessaloniki	2020-2030	25	20.3	**34.305**
	4.2	Supply and replacement of recycling bins and extension of glass bins network	Municipality of Thessaloniki	2020-2030		0.9	
	4.3	Organisation of new Alternative Management Systems (AMS)	FODSA	2020-2030			
	4.4	Implementation and operation of Creative Material Reuse Centres (CMRCs)	FODSA	2020-2030		0.2	
	4.5	Upgrading and extension of underground temporary storage systems for	Municipality of Thessaloniki	2020-2030		3.2	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
		the creation of 4-current arrays and supply of a chain store					
	4.6	Supply and replacement of refuse collection vehicles	Municipality of Thessaloniki - FODSA	2020-2030		5.4	
	4.7	Implementation of separate collection and recovery of bio-waste	Municipality of Thessaloniki - FODSA	2020-2030		3.3	
		Prevention and reuse	Municipality of Thessaloniki	2020-2030		0.1	
		Information and awareness raising for the recycling of packaging and biowaste	Municipality of Thessaloniki - FODSA	2020-2030		1.0	
Land use and Green infrastructure	5.1	Densification of urban greenery - Planting trees in public and common areas of the Municipality of Thessaloniki - removing CO_2 from the atmosphere	Municipality of Thessaloniki	2024-2030		7.5	**34.2**
	5.2	Addressing heat islands in a district of Thessaloniki	Municipality of Thessaloniki	2024-2030		10.0	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
	5.3	Thessaloniki ConfExPark - TIF - HELEXPO redevelopment	HELEXPO	2024-2030			
	5.4	Metropolitan Park of Memory	Municipality of Thessaloniki	2024-2030		16.7	
Smart City - Governance	6.1	Infrastructure of telecommunications, computing and peripheral equipment of the Municipality of Thessaloniki (TTH). Upgrading of internet infrastructure - broadband network in all parts of the city	Municipality of Thessaloniki	2020-2030		15.70	**32.05**
	6.2	Use of cloud computing for the services of the Municipality	Municipality of Thessaloniki	2020-2030		0.3	
	6.3	e-Citizen Services and e-Government Services		2020-2030		1.4	
	6.4	Operation of the new EYATH portal		In the course of 2023		0.1	
	6.5	Implementation of Energy Optimization Software for Municipal Buildings	Municipality of Thessaloniki	2020-2030		0.1	

C-3.1: Summary of actions with cost implications							
Relevant sector	**A/N**	**Action**	**Implementation Manager**	**Start/ end date**	**Impact (reduction kt CO2e)**	**Total costs (€ million)**	**Total sector costs (€ million)**
	6.6	Digital infrastructure for a sustainable & green urban future	Municipality of Thessaloniki	2020-2030		12.4	
	6.7	Upgrading of sensors and devices for data collection to measure air quality	Municipality of Thessaloniki	2020-2030		1.6	
	6.8	Creation of a Platform for Estimating and Monitoring the Carbon Footprint from multiple sources	Municipality of Thessaloniki	2022-2023		0.4	
	6.9	Carbonation Progress Indicator Monitoring System and Climate Transition Observatory	Municipality of Thessaloniki	2024-2023		0.2	

6 Outlook and next steps

Plans for next CCC and Action Plan iteration – textual elements

The Climate Contract of the City of Thessaloniki was signed on 8 September 2023 with a multitude of stakeholders involved in climate neutrality in all sectors participating in its signing. The actors involved in the signing of the Climate Contract represent all stakeholders in the triple helix, private sector/business, public authorities and the academic research community. Citizens will also play a

key role in the implementation of the action plan, both through social innovation actions and participation in the co-creation of interventions.

The priorities that the Municipality of Thessaloniki has set for the implementation of the Action Plan relate on the one hand to the prioritization of actions on its part and on the other hand to synergies with the other Greek cities participating in the EU initiative for the mobilization of the National Government and relevant stakeholders in order to achieve the national targets.

More generally, the energy and building and heating sectors are the most energy-intensive sectors with the highest GHG emissions. However, the majority of actions related to these sectors are outside the competence of the Municipality of Thessaloniki. The priority actions that fall within the competence of the Municipality of Thessaloniki are: Implementation of the relevant renovation and energy upgrades of municipal buildings, Conversion of the entire municipal fleet (municipal vehicles and refuse collection vehicles) to electric.

The transport &logistics and waste sectors include the majority of the actions under the responsibility of the Municipality and their implementation can start immediately.

For transport & logistics: implementation of the entire SUMP and the strengthening of the traffic management system of the Municipality of Thessaloniki, development of the Sustainable Urban Freight Transport Plan (SUVM) for the more detailed description of the relevant interventions in order to optimize urban distribution in the Municipality of Thessaloniki and the creation of an ecosystem for the development of Mobility as a Service (MaaS) and the promotion of multimodality.

For waste: Implement the whole of the PRSP in order to achieve the ambitious targets set to reach the European packaging and bio-waste recycling rates.

Important for achieving climate neutrality is the adoption of digital actions through the creation of a cross-sectoral Living Lab and the corresponding digital data infrastructures. The existing Thessaloniki Smart Mobility Living Lab is the model for the creation of the relevant Roadmap.

It is necessary to establish a mechanism to monitor indicators of carbonisation progress and a climate transition observatory. Its implementation requires monitoring of relevant indicators (KPIs) at regular intervals (2025, 2027, 2030). The Municipality of Thessaloniki has a Platform for Assessment and Monitoring of its Footprint.

In addition, the Municipality of Thessaloniki together with the other Greek cities of the network will claim specific resources from the Central Government for the achievement of the actions that mainly concern the exceeding of the national targets:

- Incentives to achieve the increased electrification rate of the car fleet compared to the national target.
- Incentives for the electrification of private car fleets, especially those involved in urban deliveries.
- Increased percentage of RES use compared to the national target.
- Creation of funding programmes mainly for actions that are implemented by private individuals (households and businesses), such as replacement of heating systems, building renovations, as well as upgrading of lighting systems and electrical appliances.

Finally, it plans to seek partnerships with large private organisations that will act as "Climate Neutrality Ambassadors" to engage them in climate neutrality actions. These actions will involve both carbonization of their operations and "green" donations for the broader benefit of the local community.

NET ZERO CITIES

EU MISSION PLATFORM | CLIMATE NEUTRAL AND SMART CITIES

Climate City Contract

2030 Climate Neutrality Commitments

Climate Neutrality Commitments of the Municipality of Thessaloniki

CITY OF THESSALONIKI

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Table of contents

1 Introduction

Thessaloniki's motivation to join the EU Mission "100 climate-neutral and smart cities by 2030" and the city's commitments to climate action. Aims of the document.

Municipality of Thessaloniki acknowledges the global challenges and the role of the cities to act proactively to mitigate the effects of climate crisis and implement robust, approaches to address current and future challenges.

The city's main challenge is to rapidly adapt sustainable systemic changes including redesigning and delivering urban infrastructures and services that enhance citizen's participation, connectivity and community, shape a thriving and sustainable city, build a dynamic urban economy, become responsive and support climate resilience and disaster management. Tremendous opportunities for the city to be improved, advanced, and maintain its contribution to the goals of sustainable development lie also in the utilization of big data computing and the underpinning technologies, and in the implementation of their novel applications.

Thessaloniki aims to become a climate-neutral and smart city by 2030, reducing the expected CO_2 emissions within its municipal boundaries by 80%. Achieving the target will transform Thessaloniki into a sustainable, resilient and attractive city with positive benefits for public health, accessibility and well-being of citizens. This requires, on the one hand, robust policies and investing in ambitious actions, concerning public space, processes and resources that are within its sphere of competence and go beyond existing plans and strategies and, on the other hand, mobilising and involving relevant stakeholders, institutions and businesses to achieve targets in various sectors that are higher than the corresponding national targets.

Thessaloniki's pathways towards climate neutrality crosses various sectors for which the Municipality of Thessaloniki has a specific vision with specific measurable targets been set. More specifically:

- **Electricity**: widespread installation of Renewable energy sources (**RES**) in public space and buildings. Thessaloniki will become a pioneer in promoting the replacement of fossil fuels by RES at national level.
- **Buildings & Heating**: Renovation and upgrading of the building stock will be at a high level for all types of buildings, private (residential and commercial), municipal and other public. New buildings will largely follow the highest energy efficiency standards. Heating will largely use high efficiency electrical systems. Public facilities will be upgraded as a whole.
- **Transport & Logistics**: the vast majority of trips by polluting private cars will be replaced in 2030 by trips using sustainable/ "green" means of transport (private or shared bicycles and micro-mobility vehicles, private or shared electric cars, public transport) within a sustainable multimodal transport system. The urban logistics system will be transformed and optimized, within a regulated operating environment and will use sustainable means of transport.
- **Water & waste management**: Packaging recycling will increase rapidly to reach the corresponding European targets. Bio-waste management will be modernised through composting infrastructure and food waste will be dramatically reduced.
- **Land Use &Green Infrastructure**. Extensive tree planting programme and increasing the area of the city covered by tree foliage. Nature-based solutions and reduction of surface and atmospheric temperatures, heat islands, noise absorption. Protection of biodiversity.

2 Goal: Climate neutrality by 2030

Whole city's ambition as a unique and common commitment for 2030. A summary of how these areas will be addressed towards 2030. The 2030 ambition is supported by a City Council Decision [No. 25/26-01-2022 (6JULOR5-TCL)] and by the relevant city's stakeholders ecosystem approve, involvement, support and transition team commitments. Other indirect benefits are included - objectives alongside the transition to the climate neutrality goal, such as well-being, health, equity, justice, economic prosperity.

Over the last decade, the European Union has stepped up its efforts to mitigate climate change by setting high targets for Member States to achieve. In this context, Greece is working systematically to align national legislation with the relevant European energy and climate guidelines and is promoting financial programmes in this direction, both in the public and private sectors. In parallel with the national policy documents, the Municipality of Thessaloniki, recognising the need to achieve climate neutrality, has formulated local/ regional action plans to address specific issues within the targeted sectors.

In order to achieve climate neutrality transition, the Municipality of Thessaloniki aims the reduction of at least the 80% of emissions from all sectors. According to calculations and estimations derived from the "economic model" (methodology proposed by the EIT Climate KIC and adopted for the calculations carried out in the framework of Action Plan & Investment Plan establishment for the Municipality of Thessaloniki), in the year 2030, under "business as usual" conditions, i.e. without the implementation of targeted projects and actions for the climate neutrality transition, i.e. without the implementation of the 2030 Climate Neutrality Action Plan, the emissions within the Municipality of Thessaloniki borders are estimated at 2.84 tons of CO_2 equivalent per capita. More specifically, emissions from the electricity and heating sectors of the building stock will be at high levels, with rates of 47% and 26% respectively, which ranks them as the two most important sectors that can be improved in terms of energy savings and emissions reduction, by planning and addressing appropriate efficient actions. The transport and logistics sector contributes about a quarter of total emissions (23%), while the waste management sector also contributes 4%.

The recognition of the contribution of the sectors to energy consumption and environmental burden also shapes the Municipality's strategy, which prioritizes a series of actions to address pollutant emissions and consequently climate change, aiming at climate neutrality by 2030.

The **electrification of the energy system** (and, in this regard, the implementation of actions related to e.g., electric cars, installation of heat pumps, etc.) requires the de-carbonization of the electricity grid. To achieve this, the following are required: a) a significant increase in the share of RES for electricity generation (>80% of electricity will come from RES, in line with national energy targets) and b) enhancing the flexibility of the grid. In this direction, it is foreseen to increase local/ distributed RES electricity generation with parallel technical interventions to upgrade the electricity grid, in cooperation with local, regional and national relevant actors, in particular electricity providers and distributors. These measures contribute to upgrade the municipality energy security, by reducing its exposure to external energy inputs. In addition, it is necessary to develop actions aiming at significant increase of distributed photovoltaic systems in common/ public spaces. These actions aim to increase the self-consumption from RES within the municipality, to further enhance the sustainability of the energy mix and act as complementary means of raising awareness and mobilizing citizens (e.g., dissemination and adoption of good practices), particularly if the benefits of installing such systems are sufficiently communicated to citizens and civil society.

As far as **buildings** and **heating** are concerned, extensive technical interventions development for buildings' energy upgrade (passive and active systems), is a basic prerequisite for the reduction of the energy needs of the building stock and the increase of RES to cover these needs, results which will lead to the de-carbonization of the energy needs of the Municipality's building stock. The Municipality of Thessaloniki adopts the principle "energy efficiency comes first" whenever possible and tries to prioritize the order of interventions in view to achieve the best result with the available resources (e.g., having sufficient thermal insulation before replacing the heating system). In addition, new technologies, Information Technology and telecommunications solutions are offering

new opportunities to manage and control buildings. According to the latest European directives (e.g., new EPBD), intelligent buildings are equally important in achieving a better quality of life and as a supporting means to increase buildings' energy efficiency.

In order to achieve the Municipality of Thessaloniki climate neutrality targets, a renovation rate of 3.5% (percentage of buildings renovated annually) is required, of which 60% are extensive renovations (energy savings of 30-60%). This percentage increases (5.5%) if interventions only consist lamps and appliances replacement with more energy-efficient ones, as these initiatives are considered more likely to be implemented, given the lower capital investment required. The specific targets, although optimistic, are achievable as: a) there is a very high potential for renovation due to the age of the buildings within the Municipality of Thessaloniki and b) there is a strong construction activity (buildings and infrastructure).

In addition to existing buildings, it is also important to ensure high energy efficiency in new buildings. More specifically, the aim is to construct new buildings that will meet the highest energy standards (A+/A) by a percentage of 35%, in line with the estimates of other cities participating in the Mission that have similar characteristics to the Municipality of Thessaloniki. Finally and further to the building stock upgrade, the Municipality of Thessaloniki aims to increase other installations' energy efficiency (e.g., lighting, water supply installations, etc.), thus aiming to further reduce emissions from anthropogenic activities within the Municipality.

In the **Transport** and **Logistics** sector, the Municipality of Thessaloniki announces its intention to achieve the climate neutrality transition by 2030, by initially aiming to modernize mobility services and infrastructure management, through the implementation of infrastructure projects (such as redevelopments, cycle paths, etc.) and projects included in the Thessaloniki Sustainable Urban Mobility Plan (SUMP), planned for 2025 horizon. These projects are either ongoing or are in tendering phase. The above-mentioned projects aim to reshape the public space and its functions, resulting in a reduction of private passenger cars use and increase of public transport use, in order to also upgrade road safety. In addition, in order to modernize mobility services and infrastructure management and in parallel with the metro operation, public transport network restructure is planned, to enhance multimodal stations and park & ride facilities (people usually park their cars in the suburbs and take the bus or metro to avoid congestion in the city center). These actions aim to promote public transport and multimodality, resulting in reduction of car use, increase of public transport and active mobility, leading, also, in the long term, to the improvement in citizens' health.

In order to ensure a sustainable city with improved living conditions, the Municipality of Thessaloniki aims to create new and combined mobility services based on public transport and micro-mobility, as well as to promote services such as carsharing, ridesharing and carpooling.

This has resulted in the creation of a set of new mobility services that act as a counterbalance to car ownership, emphasizing multimodality and, thus, reducing car use, while increasing both the use of public transport and the average number of passengers per car. In order to ensure the sustainability of the city through the modernization of mobility services and infrastructure management, the Municipality of Thessaloniki sets as an additional objective; the promotion of electro-mobility infrastructure in public spaces, an action that will attract users of all categories. In addition, among the actions included in the promotion of electro-mobility is the gradual conversion of the urban bus fleet to electric buses.

Finally, the Municipality of Thessaloniki has set within its medium-term objectives the transition towards the full digitalization of mobility and transport by utilizing existing structures and tools, such as the Mobility Living Lab, developed by HIT/CERTH (Hellenic Institute of Transport/ National Center for Research and Technological Development). This will enhance multimodal transport management, the adoption of the "Mobility as a Service" concept (a *concept that aims to shift from the pattern of trips by private car to a new model of trips by shared means and public transport*) and, finally, data-driven decision and policy making to improve transport and mobility conditions, as

well as to inform commuters in order to make decisions that ultimately serve climate neutrality. These objectives are being promoted through the implementation of specific actions and projects and the digitization of mobility, which have either already been implemented or are ongoing or at the process towards tender.

In the **Water** and **Waste management** sector, the introduction of separate collection of bio-waste, which accounts for the largest share of the waste stream composition, is the most important factor in achieving the landfill diversion target. In order to achieve the Municipality of Thessaloniki climate neutrality targets, the composting rate needs to reach 70%, while the treatment of bio-waste through the development of the necessary infrastructure is also a key factor. The ultimate aim of the above is to reduce the environmental footprint and thus improve the quality of the environment. At the same time, the Municipality of Thessaloniki aims to upgrade the existing electronic recording and monitoring systems for waste management. The aim is to speed up the resolution of waste management issues and identify areas for improvement, in order to make them more transparent. An additional objective of the Municipality of Thessaloniki is to reduce the volume of waste for landfill (recycling of paper to 85%, plastic to 55%, metals to 60% and glass to 75%), thus reducing the environmental footprint of waste management and enhancing the city cleanliness. This will be achieved by modernizing and renewing the cleaning and recycling equipment.

The strategic interventions of the **Land Use** and **greening infrastructure** sector aim to create a low-emission urban form. In the Municipality of Thessaloniki this transition is required to be achieved through extensive tree planting and increase of the area of the city covered by tree foliage. This can be achieved without changing the total area of green space, beyond what is foreseen in the Municipality Urban land uses Plan, but by densifying trees and replacing low green (grass, ornamental plants) with high green (trees). In addition to the removal of CO_2 from the atmosphere by trees, the replacement of low greenery with high greenery will have other benefits, such as reduction in surface and atmospheric temperatures and heat islands found throughout the surface of Thessaloniki, noise absorption as trees act as natural noise barriers, protection of biodiversity as trees provide shelter and food for various species of birds, insects and other animals, helping to promote biodiversity in the urban environment.

Finally, interventions in the area of **Smart City** and **governance** are foreseen, which will contribute horizontally to the achievement of the Climate Neutrality objective. They concern the creation of digital infrastructure and digital citizen services and social participation, environmental sustainability support and Climate Footprint monitoring.

3 Key priorities and strategic interventions

Summary of selected systemic strategic priorities to be implemented for the Thessaloniki transition to climate neutrality by 2030. These changes are essential and have a profound impact on reducing greenhouse gas emissions in the city, such as de-carbonising the city's heating system or energy generating from renewable sources. Commitments between the city and other local stakeholders' ecosystem address these key priorities and contribute to their achievement.
The annexed 2030 Climate Neutrality Action Plan describes all interventions, including those to reach our priorities, as well as all further actions, and describes how the city plans to implement them.

Electricity (Energy system)

- **Installation of RES in public spaces (outside buildings and the built environment)**: refers to the installation of distributed photovoltaic systems in public spaces (outside the built environment) with net metering and/ or feed-in-tariff) and/ or the installation of photovoltaic parksoutside the boundaries of the Municipality with virtual net metering, with a total production capacity of >16.24 GWh/ year.

- **Wind farm for electricity generation**: Creation of a Wind Farm, with a total production capacity of 17.25 GWh/ year, in areas of the port of Thessaloniki, in the area of the 6th pier, 3 km from the front Thessaloniki waterfront.
- **Electricity network upgrading/ strengthening within the Municipality of Thessaloniki**: It concerns the upgrading of the electricity network through targeted technical solutions (e.g. transformers upgrade), aiming at increasing the flexibility and stability of the network. In addition, it includes the pilot installation of centralized batteries in selected areas - streets of the Municipality of Thessaloniki. The exact definition and sizing of the relevant sub-actions will be determined during the implementation of the Action Plan, by the competent management bodies (Hellenic Electricity Distribution Network Operator- HEDNO) and according to the current needs.
- **Certified green electricity**: Refers to obtaining certificates (official record) proving that a certain amount of electricity has been produced from renewable energy sources. Green certificates can be traded separately from the energy produced. The Municipality of Thessaloniki and the relevant stakeholders will consider during the implementation of the Action Plan the possibility of obtaining such certificates.
  An indicative example is the securing of an electricity supply contract through bilateral power purchase and sale contracts with money settlement (Financial/ Virtual Corporate PPA Pay-as-Produced) to cover the energy needs of E.Y.A.TH. S.A. for a period of eight years, with a four-year option right and a total volume of one hundred (100) gigawatt hours (GWh) per year, in order to ensure the energy security of the contracting entity. The requirementis for all of the company' s water supply and waste water treatment facilities (200 facilities). The total annual volume will be covered 50% by Photovoltaic Power Plants and 50% by Wind Power Plants.

Transport & Logistics

- Emblematic Interventions for the creation of climate-neutral areas focusing on sustainable mobility, electro-mobility, addressing climate change impacts and energy efficiency in buildings. These include:
  A) Designation of the Rotonda area as a low emission zone and as a climate neutral district. Interventions to discourage the entry of private vehicles, while increasing bicycles and electric vehicles (shared micro-mobility vehicles) accessibility, removing on-street parking by subsidizing off-street parking, supporting electrification for residents through and serving deliveries within the zone exclusively by electric vehicles. Also public space redevelopments are included, as well as interventions for climate upgrading of buildings and protection from climate change impacts (for example shading and air renewal canopies in electricity generation with contribution to electricity generation for municipal lighting, etc.). The programme is also interconnected with interventions on the Egnatia road and in the area of the AUTH (in line with the Municipality of Thessaloniki's SUMP). Beyond the urbanisation and road infrastructure projects, there are a number of governance, social innovation and participation interventions related to the active involvement and support of citizens and businesses in the area, as well as cooperation with AUTH.
  B) Urban planning measures for the interconnection of land use with Metro stations through green mobility (Transit oriented development zones), with emphasis on the areas: Delphon, Voulgari, New Railway Station, City Hall. Creation of climate neutral zones developed around major Metro stations. This includes interventions to build park& ride facilities, redevelopment of the peripheral zones around the stations, traffic management and multimodality facilities (connecting stations with bicycle infrastructure, car-sharing stations). The action includes a focused project concerning the creation of a climate-neutral zone including the hub areas of City Hall, the AUTh and TIF - HELEXPO. The development of electro-mobility, park and ride (in the area of an ex-military camp - G' Soma Stratou) and shared mobility infrastructure is foreseen, while interventions related to the Egnatia Street (Emblematic Egnatia project) and the prevention of the entry of private cars to AUTH (in accordance with the Municipality of Thessaloniki' s SUMP) are foreseen.
  C) Creating climate neutral local centres and neighbourhoods & interconnecting different land uses (residential, employment, commercial) through "green" mobility

corridors (Mixed used development zones). According to the Municipality's SUMP, there have been recorded high volumes of through traffic flows (private cars) passing through major, urban axes, aggravating CO2 emissions in the city center. To address this problem, the creation of a polycentric urban structure is proposed. Potential local centers should be the following areas: Toumba, Harilaou, Triandria, Fleming and AgiaTriada. Interventions include urban renewal, interconnection between centres by sustainable means of transport (bicycle and bus lines), buildings energy upgrades, creation of shared electric vehicle and bicycle stations, electromobility, parking model change (subsidies for use of parking spaces in selected areas near metro stations, incentives for conversion of buildings into parking spaces, etc.), and changes in the urban distribution/ logistics model.

- **Development of urban freight consolidation centers, freight hotels and micro fulfillment centers.**
  The action includes the development of urban freight consolidation centers in two areas at the edges of the Thessaloniki city center (New Railway Station area and TIF - HELEXPO area) in order to increase the load occupancy rate of vehicles entering the central area of the Municipality and reduce the trips distances in urban distribution. At the urban consolidation centers facilities, goods are collected, orders are consolidated and then dispatched to customers using environmentally friendly means of transport (e.g., cargo bikes). For the consolidated dispatch of goods, a framework of cooperation between the companies will be developed in order to reduce transport costs, as well as the impact on traffic and the environment.
- **Development of a SUSTAINABLE URBAN LOGISTICS PLAN/ Urban freight transportation (UFT) plan for the entire Municipality of Thessaloniki**
  The Action concerns the development of an integrated Sustainable Urban Freight Transport Plan (SUFTP) for the entire Municipality of Thessaloniki. The development of the SUFTP will be carried out according to the specifications of the relevant Eltis "Topic Guide - Sustainable Urban Logistics Planning", which was prepared by HIT/CERTH. In addition, the action includes relevant studies on specific distribution systems.

Water & Waste management

- **Implementation of separate collection and recovery of bio-waste**
  This action includes the implementation of the system of separate collection of bio-waste from targeted producers through the supply/ distribution of bio-waste collection bins (660L) and the separate collection of bio-waste from households through the supply/ distribution of bio-waste collection bins (240lt). The supply of waste collection vehicles (5 and 14 m3) and branch shredders. In addition, through the household composting program, it is planned to supply and distribute household composting bins to Children's centers, School Units and private public areas. Since the full development of the system requires the operation of a composting facility in the Regional Unit of Thessaloniki, which is not planned before 2024-2025, the plan foresees the start of collection from mass production points of bio-waste and schools (2% of the final target in 2022, 2023 and 5% of the final target in 2024).
  The cooperation of FODSA with private biowaste treatment plants and subsequently with the operation of the Bio-Waste Treatment Unit, the plan provides for collection through the network of brown bins and household composting, with the aim of diverting from landfill the pre-sorted biowaste and achieving the 47% Source Separation target for household biowaste.

Land Use & Green Infrastructure

- **Extensive tree planting program in public and common areas of the Municipality of Thessaloniki - removing CO_2 from the atmosphere**
  Planting of trees in public space of the Municipality of Thessaloniki with a total of 50,000 new tree plantings for the expansion of parks and densification of roadside tree rows, corresponding to a 79.4% increase in the number of trees within the city.
- **Addressing heat islands in a district of Thessaloniki**

The aim of the action is to mitigate the heat island in a specific area of the city center (the urban district of **Diikitirio**) with solutions that will increase the green cover and water permeable surfaces of the district to 40% of its total surface area.
A key factor in the creation of the urban heat island phenomenon is the covering of the ground with artificial non-water permeable materials that do not allow rainwater to be absorbed. In addition, buildings and narrow streets trap heat by reducing air flow. Human activities such as heating buildings and driving cars also add heat to the environment. Vegetation and other nature-based applications and solutions (rain gardens, grass and permeable floors in public spaces, artificial water bodies, water mirrors, etc.) help to cool the air, unlike asphalt and concrete which absorb heat, causing a temperature rise.

- **Thessaloniki ConfExPark: redevelopment of TIF - HELEXPO**
  The redevelopment of the central urban island of TIF - HELEXPO constitutes a process of redefining central land use, while at the same time it is an important opportunity for the city to experiment with the creation of a zero urban island as a whole, in terms of public space management, design and construction of the planned structures, as well as in terms of space management, waste management and circularity. The master plan envisages the realization of the above objective through key sustainability factors such as dismantling and circularity, site design and building, choice of materials, operation and management, communication and participation.
- **Metropolitan Park of Memory - Holocaust Museum**
  Creation of a metropolitan memorial park near the Holocaust Museum, on an area of approximately 70 ha resulting from the contribution of the land of the old/commercial railway station.

Smart City and governance

- **Greek Smart Cities: investing in infrastructure and Smart Sustainable Cities (SSC) systems for a sustainable & green urban future**. The project includes the following actions: -Smart pedestrian crossing -Smart surveillance of public spaces -Smart vehicle counting and categorization system using sensors -Smart lighting -Smart lighting control platform (remote management and fault detection) and energy consumption monitoring -Smart lighting control platform (remote management and fault detection) and energy consumption monitoring -System for early warning of natural disasters -Signals wireless internet access - Integrated Education Services - Interconnection of Municipal Authority Buildings to support Smart City - Development of Data Center at City Hall - School energy consumption management - Upgrading of Electronic Citizen Services and development of Participatory Democracy platform
- **Decarbonation Progress Indicator Monitoring System and Climate Transition Observatory**. Development of a methodology and tool aimed at supporting the Municipality of Thessaloniki in monitoring progress towards climate transition and providing information on progress reports to the EU Mission Agency, as well as in decision making for the review of the Action Plan. The methodology and tool will be based on the way the baseline inventory of the Action Plan was created as well as on the multi-source Carbon Footprint monitoring platform developed/ operated by the HIT/ CERTH.

4 Principles and process

Key principles that will guide the Municipality of Thessaloniki to the implementation of the City Climate Contract, such as stakeholders' role and involvement, transparency, new holistic approaches and new models of synergies for the transition to the climate neutrality goal. The processes include principles such as co-creating, innovation, multi-actor and citizen engagement and should be systemic and demand-driven in nature
Reaching the goal of climate neutrality requires, apart from leveraging funding resources, the creation of a Transition team to orchestrate the process of collaboration and coordination actions of multiple actors across sectors. Besides, the goal of transition to climate neutrality by 2030 is a joined vision addressed by the cooperation between local stakeholders under the lens of the

quadruple helix model in planning and decision-making: 1. the business sector, 2. the public sector, 3. research/ academic centers, 4. civil society organizations. At the same time, the Municipality of Thessaloniki collaborates with the Government as a joint effort along with the other five Greek cities participating in the EU Mission “100 climate-neutral and smart cities by 2030” (Athens, Kozani, Trikala, Ioannina, Kalamata), under the context of a mutual platform entitled ClimaNet.

The Municipality of Thessaloniki, considering the required principles and process needed to address climate neutrality, the synergies, the existing barriers, and opportunities, presents a participatory operational and administrative model under the management and competence of the Resilience Office and the Department of Operational Planning and Development Programs Monitoring. The MoT aims to scale up its capacity and human resources by exploiting European development programs (Horizon, Life, etc). The Resilience Office, in cooperation with other competent departments of the Municipality of Thessaloniki, aim to form the Transition team, upskilling and reskilling to monitor the implementation or updates of the CCC.

The MoT developed this CCC in a participatory and robust approach, seeking to co-create a roadmap with multiple stakeholders to reach tangible goals and deploy doable action plan and realistic investment plan to become Thessaloniki climate neutral and smart until 2030. Even more the Municipality joined forces with an interdisciplinary team structured by Thessaloniki’s Development Agency MDAT SA, the CERTH and the Research Unit of AUTH, URENIO elaborating all together in writing and deploying both the Action Plan and Investment Plan. In addition to the City Advisor’s Mr Alvaro Soldevila aid and the NetZero Cities tools, highlighted with the summer school participation and network with other cities such as the Spanish cities and finally the economic model tool provided by Sean Murray in collaboration with Julio Lumbreras.

Particularly, in January 30th and 31st 2023, the inaugural meeting and workshop was held where more than 60 stakeholders from public and private sector, academia and researchers participated and at least 70 officers from all the Municipality’s division in which the EU Mission was presented with the aid and presence of the City Advisor Mr Alvaro Soldevila and the foundation of engagement was set to jointly work on the structuring the Action plan main sectors. An extensive questionnaire followed in which main stakeholders projected their actions or plans of their entity/organization to be considered and linked to the Municipality’s goal for climate neutrality. During the months followed, the MoT organized workshops with students, youth in collaboration with the Action Aid Hellas (Youth Hub Thessaloniki) under the context of a Climate Academy and workshops with Academia postgraduate, master of PhD students in collaboration with the Faculty School of the local University (Aristoteles University of Thessaloniki). In total at least 50 stakeholders (local/regional/national level) and more than 200 people (including teenagers and youth) participated and worked to structure Thessaloniki’s CCC.

The CCC’s principals are inclusivity, accessibility and energy poverty actions for which the MoT made consultation with the National RES organisation responsible for energy poverty affairs at national level.

Additionally, on the national level, Municipality of Thessaloniki along with the other 5 Greek cities and Limassol from Cyprus, sealed their cooperation by creating a platform entitled ClimaNet with the support of the Secretary General of Spatial Planning of the Ministry of Environment and Energy.

The Transition team,is divided into 4 sub-groups, each of which is tasked with addressing existing and future challenges in the sectors: Governance and Policy, Financing, Learning and Education, Citizen Awareness. Each sub-group will be composed of stakeholders and multiple actors and partners across sectors on board, who will discuss on a regular basis and define actions to remove potential barriers identified by sector. The long-term cooperation of the City with stakeholders is ensured through this “Climate City Contract” commitments. The coordination of the group is carried out by the staff of the Department of Operational Planning and Development Programmes Monitoring - Resilience Office.

In addition, the Municipality of Thessaloniki aims to work with large private organizations that will act as “Climate Neutrality Ambassadors”, in order to advocate and commit in climate neutrality actions.

These actions will involve both de-carbonisation of their operations and “green” donations for the wider benefit of the local community.

Particular attention is paid in interaction with the civil society and consulting relations aiming to be established, so that the actions implemented have the maximum impact on the ground, multiplying the co-benefits even on a neighborhood and district level. An open forum for dialogue will be established to actively involve citizens in the decision-making process and monitor progress or becoming agents of transition.

The MoT acknowledges that a participatory governance model is necessary to implement projects both to maximise CO_2 absorption through nature-based solutions and installation of renewable energy systems in public spaces around the city. The experience gained on the Resilient Strategy development and implementation has strengthened staff capacity for the succession of this cooperative model of work. Even more, this model aims to embed a range of cooperative tools such as participatory processes in decision-making, consultations, hearings and meetings with the community and stakeholders, transparency and democratic processes, training and information to develop common understanding and enhance participation. The basic actors, who have already collaborated in co-designing, have consolidated their cooperation in the implementation phase, too. In addition, the Investment Plan aims to leverage a diverse range of investment and funding mechanisms and resources such as the Recovery and Resilience Facility, the Just Transition Fund, EIB and to facilitate the legitimate use of controversial tools like Green Bonds. Monitoring and measurement is essential for the succession of this collaboration and projects’ implementation particularly on renewable energy systems and a platform is going to be set up to publish results, update the CCC and build confidence and safeguard the continuity of the efforts and commitment. For the MoT this participatory governance model aims to encourage the collaboration, transparency, and stakeholder accountability, making them active players to address systemic transformation and seize related opportunities.

5 Signatories

Below is the list of Local Ecosystem Entities that are committed to assist the Municipality of Thessaloniki, in its stake towards the transition to Climate Neutrality by 2030. In the Annex, bilateral agreements, memoranda of understanding and memoranda of cooperation are attached. The list is dynamic and is expected to be enriched.

Name of the institution	Sector/Area	Legal form	Name of the responsible person	Position of the responsible person
Municipality of Thessaloniki	Intersectoral	Local authority	Konstantinos Zervas	Mayor
Ministry of the Environment and Energy	Intersectoral	Central government authority	ThodorosSkylakakis	Minister
Ministry of Digital Governance	Intersectoral Smart City - Governance	Central government authority	Dimitris Papastergiou	Minister
General Secretary of Spatial Planning and Urban Environment Ministry of Environment and Energy	Intersectoral	Central government authority	EfthimiosMpakogiannis	General Secretariat
Region of Central Macedonia (RCM)	Intersectoral	Regional authority	Konstantinos Youtikas	Vice-Regional Head of Development and Environment
Aristotle University of Thessaloniki (AUTh)	Intersectoral Buildings &Electricity	Research Organisation (Universities, Research Centres, Institutes)	Dimitrios koveos	Rector

	Land Use &Green Infrastructure Transport &Logistics			
University of Macedonia (UoM)	Intersectoral Buildings &Electricity Land Use &Green Infrastructure	Research Organisation (Universities, Research Centres, Institutes)	EftichiosSartzetakis	Representative of the Rectorate - Dean of the Faculty of Economics & Regional Studies
National Center for Research and Technological Development (CERTH)	Intersectoral	Research Organisation (Universities, Research Centres, Institutes)	Evangelos Bekiaris	Representative-Vice President of CERTH & Director of HIT
International Hellenic University (IHU)	Intersectoral	Research Organisation (Universities, Research Centres, Institutes)	Stamatis Angelopoulos	Rector
Hellenic Electricity Distribution Network Operator (HEDNO) S.A.	Electricity	Public limitedcompany	Nikolaos Pavlidis	Regional Director
Centre for Renewable Energy Sources and Saving (CRES)	Intersectoral	Legal Representative under Private law Greek organisation for Renewable Energy Sources (RES), Rational Use of Energy (RUE) and Energy Saving (ES) Covenant of Mayors and Energy poverty National Coordinator	Dr. LambrosPyrgiotis	General Director

Thessaloniki Water Supply & Sewerage Co S.A. (EYATH S.A.)	Waste&water management	Public limited company	Anthimos Amanatidis	CEO
Regional Association of Solid Waste Management Agencies of Central Macedonia (FODSAKM)	Waste& water management Transport & Logistics	Regional Solid Waste Management Agency	Michalis Geranis	President
Transport Authority of Thessaloniki (TheTA) S.A.	Transport &Logistics	Public limited company	Ioannis Toskas	CEO
Thessaloniki International Fair (TIF)-HELEXPO SA	Buildings &Electricity Land Use &Green Infrastructure Transport &Logistics	Public limited company	KyriakosPozrikidis Alexander Tsaxirlis	Managing Director Chief Executive Officer
Major Development Agency Thessaloniki (MDAT) S.A.	Intersectoral	Development organization for the local development	Maria Karagianni	President
Technical Chamber of Greece Section of Central Macedonia	Intersectoral	Legal Entity of Public Law	Michael Papastergiou	Representative- Vice President
Thessaloniki Chamber of Commerce and Industry (TCCI)	Buildings Transport &Logistics	Legal Entity of Public Law	Ioannis Masoutis	President
Professional Chamber of Thessaloniki	Buildings Land Use &Green Infrastructure	Legal Entity of Public Law	Akis Poulakas	Representative- President of the Youth Entrepreneurship & Start Up Committee

	Transport &Logistics			
Federation of Industries of Greece (SBE)	Transport &Logistics	Association/ Union	Lucia Sarantis	President
Commercial Association of Thessaloniki	Buildings Land Use &Green Infrastructure Transport &Logistics	Association/ Union	Pantelis Filippidis	President
Thessaloniki Hotels Association (THA)	Buildings Waste management	Association/ Union	Andreas Mandrinos	President

Appendix: Individual Signatory Commitments

Further agreements, memoranda of understanding, memoranda of understanding, etc. that spell out the details of the climate action or actions between the Municipality and other stakeholders (individuals or groups).

SECTION 4- PRINCIPLES & PROCESS: Community and Stakeholder Engagement[1]

I)Inaugural event & workshop 30-31 of January 2023

In January 30th and 31st the inaugural meeting and workshop held with the participation of more than 60 stakeholders from public and private sector, academia and researchers and at least 70 officers from all the Municipality's division in which the EU Mission was presented with the aid and presence of the City Advisor and foundation of engagement was set to jointly work on the development of the Action plan and Investment plan.

[1] All photos are archive of Thessaloniki's NetZero Team


NetZeroCities
Ambition


MISSION

II)Workshops with Students, Youth and Academia

During the following months, the MoT made workshops with students, Youth with the aid of Action Aid Hellas under the lens of Climate Academy and Academia postgraduate, master of PhD students at the Faculty School of the local University (Aristoteles University of Thessaloniki).


Ο χρήστης ΜΑΘ ΑΕ ΑΟΤΑ- Αναπτυξιακή Μείζονος Αστικής Θεσσαλονίκης ΑΕ Αναπτυξιακός ΟΤΑ βρίσκεται στην τοποθεσία Aristotle University of Thessaloniki.
Δημοσιεύτηκε από Arthi Tsakiro · 3 ημ. · Θεσσαλονίκη, Περιφέρεια Κεντρικής Μακεδονίας
Στο πλαίσιο συμμετοχής του Δήμου Θεσσαλονίκης στην Ευρωπαϊκή Αποστολή «Κλιματικά Ουδέτερες και Έξυπνες Πόλεις ως το 2030», οι δράσεις επικοινωνίας και διάχυσης με τη συμμετοχή της Κοινωνίας των Πολιτών συνεχίζονται. Την περασμένη εβδομάδα (Παρασκευή 5/5) πραγματοποιήθηκε εργαστήριο με φοιτητές του Τμήματος Πολιτικών Μηχανικών της Πολυτεχνικής του ΑΠΘ, υπό την επιστημονική επίβλεψη του Καθ. Ιωάννη Πολίτη, και καταγράφηκαν φρέσκες ιδέες και δράσεις για την αναβάθμιση της κινητικότητας που θα μπορούσαν να ενσωματωθούν στο σχετικό Σχέδιο Δράσης που αναπτύσσεται για τη μετάβαση της Πόλης, με έμφαση στο campus του ΑΠΘ.
#netzerothessaloniki
#ClimateNeutrality
#ClimateChange
#ResilientThessaloniki
#MDAT
#AUTH
Resilient Thessaloniki
Georgios Papastergiou
Stella Psarropoulou
Penelope Antoniou
Arthi Tsakiro
Ioannis Politis
Alexandros Sdoukopoulos
+2

III) The ClimaNet: The Greek and Cyprus platform

On the national level, Municipality of Thessaloniki along with the other 5 Greek cities and Limassol from Cyprus, sealed their cooperation under the deployment of a network entitled ClimaNet with the support of the Mr Nikolaides and Mrs Vasilakou and the Secretary General of Spatial Planning of the Ministry of Environment and Energy.

CLIMANET
ΔΙΚΤΥΟ ΠΟΛΕΩΝ ΕΛΛΑΔΑΣ & ΚΥΠΡΟΥ
ΓΙΑ ΤΗΝ ΚΛΙΜΑΤΙΚΗ ΟΥΔΕΤΕΡΟΤΗΤΑ

IV) DISSEMINATION

The Municipality participated in several national, local, or international events and other activities of the EU Mission NetZero Cities (including Summer School in Santander) and Mission Adaptation (also signatory charter) in order to promote and present Thessaloniki's engagement and work towards climate neutrality.

V) CCC Signature Event September, 8th 2023

The Mayor of Thessaloniki along with vital stakeholders signed the Commitments in a special event on September 8th,2023 under the review of the city advisor, the inspiring moderation of Mrs Maria Vasilakou, member of the Mission Board and the presence of city councillors and Deputy Mayors.

OUR TEAM

Operation Planning Department and the Resilient Thessaloniki Officer of the Municipality of Thessaloniki jointed their forces with an interdisciplinary team, structured by the Thessaloniki's Development Agency MDAT SA, the CERTH and the Research Unit of Aristoteles University of Thessaloniki, URENIO, all together elaborating on writing, deploying, and monitoring the Action Plan and Investment Plan.

CITY OF THESSALONIKI

THESSALONIKI URBAN RESILIENCE OBSERVATORY

MAJOR DEVELOPMENT AGENCY THESSALONIKI S.A.

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

URENIO

The MoT team is supported and funded by the National Green Fund