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 City of Athens

CITY OF ATHENS

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Summary

Through its participation to the European Mission of '100 Climate Neutral and Smart Cities by 2030', the Municipality of Athens aims to work together with the stakeholders and citizens of Athens to **achieve the transformation of the city to climate neutrality by 2030**. Towards this goal, the Municipality of Athens developed a Climate City Contract (CCC), aiming to achieve a reduction of greenhouse gas (GHG) emissions from the city's activities by 80%, offset the remaining 20% mainly through nature-based solutions, and at the same time make Athens green, beautiful, clean, with strong social cohesion, and a sustainable economy. This document describes a detailed action plan for achieving these goals, complementing the strategic priorities that are presented in the CCC Commitments document. The CCC Investment Plan is then assessing the investment needs for achieving these strategies and actions and explores different options for securing these investments.

The Action Plan starts with an introduction to the city of Athens, including its socio-demographics and climate data, before diving into the climate action of the Municipality of Athens and previous action plans that have been developed. Athens has experienced several climate impacts in the last decade, such as heatwaves of increased duration and intensity as well as increased floods and wildfires in the wider Attica region. To address these impacts, **the Municipality of Athens has a long history of systematic climate action and planning**, stemming from its participation in global initiatives in the context of climate change mitigation and adaptation. The city actively participates in influential global networks related to climate topics since 2008, including the C40 Cities network, ICLEI, Eurocities, the Global Covenant of Mayors, the Global Resilient Cities Network, and the Milan Urban Food Policy Pact. Since 2016, the Municipality of Athens has developed a series of strategic documents, including a Resilience Strategy and two Climate Action Plans. The latest Climate Action Plan of Athens (2022) set a goal for 61% emission reduction in the city by 2030 (compared to 2018) and climate neutrality by 2050.

The Climate City Contract of Athens is partially based on the 2022 Climate Action Plan as well as on insights stemming from engagement activities during the last decade with stakeholders from Athens and the networks and initiatives that Athens belongs to. The CCC raises the ambition of the previous plan significantly, by bringing the target to climate neutrality from 2050 forward to 2030, along with an updated set of objectives and a portfolio of actions to realise this target. The goal for climate neutrality by 2030 will be primarily achieved through extensive emissions cuts within all emissions-intensive sectors of the city, including energy supply, the built environment, transportation and mobility, and waste. In line with the climate neutrality definition pursued by the Cities Mission, **the target for emissions cuts is set to 80% compared to a 'Business-as-Usual' scenario**—i.e., assuming that the Municipality did not develop any further climate policy after 2019. **The residual chunk of 20% of emissions will be covered through nature-based solutions**, by expanding the city's green infrastructure and afforestation/reforestation activities in the region. The climate neutrality target covers all administrative territories within the Municipality and all emission sources, sectors, and relevant GHG emissions.

Part A of the action plan then continues with **an evaluation of the current state of climate action in Athens** (Module A-1). The Municipality has been measuring and reporting its emissions since 2014 using the City Inventory Reporting and Information System provided by the global network of C40 Cities and based on the GHG Protocol for Cities. The inventories cover the entire geographical boundaries of the city without any exception and include all relevant GHG emissions which are then reported to the Carbon Disclosure Project (CDP). While the most recent emissions inventory available is for 2021, in consultation with the NetZeroCities advisors, it was decided to use the 2019 inventory to avoid any data anomalies due to the impact of COVID-19. GHG emissions within the boundaries of the Municipality of Athens were estimated at 2,759 kilotonnes of CO_2e for 2019, or about 4.3 tonnes of CO_2e per capita. The distribution of these GHG emissions is 71% due to energy consumption in buildings and street

lighting, 17% of GHG emissions due to transport and mobility within the Municipality of Athens, and 12% due to the management of the Municipality's wastewater and the disposal of solid waste in landfills.

Although emissions in most sectors have decreased from 2014 to 2021, the decrease is mainly due to changes outside the Municipality's control (such as the delignitisation of the national electricity mix) rather than to more direct actions, relating e.g. to reducing energy consumption in buildings and transport or the amount of waste. There are significant opportunities to reduce emissions across sectors, with electricity GHG emissions in the built environment being top priority, mainly using local renewable energy sources (RES) and measures for consumption reduction, followed by transport GHG emissions by means of reduction of private vehicle use, and then by solid waste-related emissions by boosting recycling and composting.

Module A-2 then proceeds with an assessment of existing climate policies and the emissions gap between the 2030 GHG reduction projected by existing policies and the climate neutrality goal envisioned. 16 policies and strategies at local, regional, national, and European levels of relevance to Athens' climate action are evaluated, included the Sustainable Urban Mobility Plan of the Municipality, the Regional Plan for Adaptation to Climate Change of Attica, and the National Energy and Climate Plan (NECP). The assessment shows that although the examined **previous policies** can support the climate ambitions of the Municipality of Athens, they **are not sufficient for the climate neutrality of Athens in 2030**.

To understand this gap in more detail, a reference scenario with no climate policy after 2019 was simulated ('Business as Usual') as well as a scenario that achieves an 80% emission reduction for the Municipality of Athens compared to the reference scenario. The simulation was done based on the economic model of the NetZeroCities programme and with the guidance and support of programme advisors. Based on the simulation, the GHG emissions for 2030 need to be reduced from 2,386 (Business as Usual) to 442 kt CO_2e to achieve an 80% reduction, so the emissions difference is calculated at 1,909 kt CO_2e. However, there is already national and EU policy since 2019 that can affect the climate neutrality of Athens; most importantly, the updated NECP that aims for a 59% reduction of GHG emissions in 2030. Thus, the **emissions gap is 1,152 kt CO_2e** by comparing the goals of the Athens' CCC with the NECP and assuming that the 59% reduction of the NECP would apply uniformly for all territories in Greece. This significant gap indicates clearly that the Municipality of Athens will need to significantly raise its climate ambition in relation to the national goals.

The last part of Part A (Module A-3) examines barriers and opportunities on the different systems related to the city's GHG emission sectors, such as infrastructure and the wider technological system, the institutional, regulatory, and organisational system, the financial system, as well as the political, social, and behavioural systems. **The barriers to the transition towards climate neutrality are many and multidimensional.** They include issues at a national or European level (e.g., insufficient finance for energy upgrades in buildings) but also conditions that mainly concern the Municipality of Athens, such as its **limited authority over the power grid, the public transportation network and the major avenues of Athens** or the increased tourism in the city centre and its impact on emissions. At the same time, there are various opportunities and co-benefits through climate actions, such as increasing green jobs in the city's building sector through increasing the rate of energy upgrades.

The module then analyses **stakeholders that can potentially help Athens to overcome these barriers**. Stakeholders from all relevant categories are examined such as other public institutions (e.g., the Ministry of Environment and Energy), administrative and regulatory bodies (e.g., grid operators, public transport operator, and the waste management authority in Attica), financial institutions (e.g., the Green Fund and the European Investment Bank), city networks (e.g., NetZeroCities, C40 Cities, and ICLEI), universities and researchers (e.g., National Technical University of Athens and National Observatory of Athens), companies and professional associations (e.g., General Confederation of

Professional, Craft Merchants of Greece and the Athens Chamber of Commerce), and civil society (e.g., Greenpeace, WWF, ELLET, Hyperion).

Part B is the core of the CCC Action Plan and describes how the Municipality of Athens will reach the goal of climate neutrality in 2030. Based on the inventory of the Municipality's greenhouse gas emissions as well as the analysis of policies, barriers, opportunities and stakeholders in Part A, **ten strategic priorities were formulated** for the Municipality of Athens such as covering 88% of the Municipality's electricity demand from renewable energy sources and reducing car and motorcycle traffic within the Municipality by 50% compared to 2019 (Module B-1). Athens faces the challenge of meeting its ambitious climate goals in less than seven years, despite the constraints imposed by the City's limited jurisdiction on key infrastructure and policies. However, the municipal authority demonstrates its commitment to change by starting in areas where it has direct responsibility, such as improving public buildings, waste management, and promoting green and blue infrastructure. At the same time, the Municipality will take on the role of the mediator with the various other bodies that have jurisdiction in Athens (e.g., Ministries, or regional government) and mobilise them to take action.

Based on these priorities, detailed impact pathways are drawn up for the main emission sectors of the city. For the energy systems, one of the main targets of the Municipality is to cover 16% of electricity consumption from **local renewable sources**, promoting the creation of energy communities and installing solar panel systems with batteries on city buildings' rooftops. For the built environment, the main goal is to **accelerate the energy upgrades of buildings** within the Municipality so that at least 90% of municipal buildings, 50% of tertiary sector buildings, and 30% of the residential buildings have energy class B or above. In relation to transportation, the aim is to significantly reduce the use of passenger cars (and to a lesser extent in motorcycles), **increase active mobility** (walking, cycling), and accelerate the electrification of transport. The Municipality's priority for 2030 is to treat over 85% of waste within its territory through **recycling and composting** processes. This target is translated into individual targets per waste stream, namely 90% recycling of paper, glass, and metals; 60% recycling of plastic; and 85% composting of organic waste.

Impact pathways are also created for green infrastructure and nature-based solutions as they will contribute to the offsetting of 20% of the emissions and foster resilience to the impacts of climate change on the city, such as an ever-increasing overheating, the urban heat island phenomenon and the floods and fires in areas in and around Athens. There are several pathways and actions that could partly lead to the absorption of the remaining emissions such as the **planting of 35,000 trees** (or, conditionally, more) **by 2030** and the expansion of green infrastructure, such as in the area of Elaionas in the context of Double Redevelopment. Although these measures will have a significant impact on the city's living conditions, the absorption of emissions will cover a minimal part and thus its it is necessary to carry out **afforestation and reforestation actions outside the Municipality of Athens**. The plan also discusses the applicability of other methods for addressing residual emissions such as storage of emissions in soil using biochar and increasing the albedo of surfaces of the built environment through cool-painting roofs and sidewalks.

Based on these impact pathways, **a first portfolio of actions is created for each sector** and presented in Module B-2. It is noted that these mostly include actions that are already planned or soon-to-be planned. For energy systems, this includes PV systems in most schools of Athens and in municipal buildings, support measures for boosting energy communities and rooftop PV installations, and capacity development with neighbouring municipalities (**Athenian Energy Alliance, Climate and Energy Academy**), as well as the **municipal energy community 'Faethon'**. For the built environment, actions include energy upgrades in school complexes and municipal buildings of low energy performance, the operationalisation of the **Energy Poverty Alleviation Office**, and the establishment of financial support tools for energy upgrades of buildings. For transport and mobility, this includes measures to reduce traffic and parking in the centre of Athens, **the creation of pilot Superblocks and 15-minute**

neighbourhoods, and EV chargers in municipal buildings. For waste and circular economy, the Municipality will ensure that there are composting bins available in all neighbourhoods, **expand the recycling network**, and promote re-use and responsible consumption. Finally, in terms of green infrastructure, existing green spaces will be improved, more trees will be planted, and Athens' streams and water bodies will be protected.

To further support the **monitoring of implementation**, Athens will set in place a digital dashboard on the Kausal platform, enabling smarter collaboration around key indicators, helping the Municipality turn its climate goals into action. Module B-3 describes 21 indicators for the CCC plan that measure the progress of key climate actions in all relevant sectors, which will be then visualised in the dashboard. The dashboard in the Kausal platform is funded through the EU project ARSINOE, and the overall goal would be to bring together impactful stakeholders of the city to (voluntarily) monitor their actions by compiling their data in a systematic way.

Part C starts by detailing the city´s **governance innovations for achieving city climate neutrality by 2030**, describing interventions in institutional design, in leadership, and in collaborative and outreach processes, whether they are inter-organisational or internal to the key organisations responsible for the city´s climate neutrality target. Module C-1 starts by listing the initial principles that will guide the governance of climate action in the context of CCC and presents five core governance innovations that have been or will soon be introduced by the Municipality of Athens along with stakeholder engagement activities that had already occurred. Governance innovations include the **Athens Climate Forum** (an institutionalised continuous engagement process with stakeholders and citizens of Athens), the **Athens Climate Youth Assembly** (an engagement process with Athens' youth on climate issues), the **Athenian Energy Alliance** (capacity development and cooperation network with 17 neighbouring municipalities). Major initiatives also include the internal re-organisation of the Municipality to ensure horizontal cooperation between its Directorates on climate action and the governance of the CCC investment plan through the development of a **Climate Neutrality Investment Council**.

Module C-2 then lists the actions taken by the city to support and foster **social innovation initiatives** or non-technological innovation more broadly (e.g., in entrepreneurship, social economy, social awareness & mobilisation, social cohesion and solidarity, etc.) aimed to address systemic barriers and leverage opportunities. These measures include among others **financial instruments** for PV, energy storage and energy upgrades, the **Athens Business Green Toolkit** to help small enterprises of the municipality to become more energy efficient, the **Youth Climate Action Fund** to support social innovation projects from the young population of Athens, and the **Climate Schools Athens 2030** programme to promote climate awareness and taking climate actions in schools.

The CCC Action Plan closes with an outlook on the process of updating the CCC and **next steps** that need to be taken in future iterations. The CCC will be updated at least once a year, based on the progress of the selected indicators shown in Module B-3 and, ideally, every 3-6 months, based on the feedback from all upcoming sessions of the Climate Forum of Athens. Next CCC updates need to explore impacts to emissions from the increased tourism and Airbnb dwellings in Athens, change of food habits (e.g., more food delivery), and greater use of air conditioning due to the rising temperatures. The CCC Investment Plan will be also further adapted based on simulations with the improved NZC model and on the work of the Climate Neutrality Investment Council that will be established in the coming months. More specific barriers and interactions with national and regional policies will be identified during the implementation of the CCC, and more detail will be added to the climate actions such as estimations on the budget and resulting GHG emission reduction. Finally, a more solid plan for addressing the residual emissions will be developed, along with a detailed analysis of synergies and co-benefits with the goals of climate adaptation.

Abbreviations and acronyms

Abbreviations and acronyms	Definition
BAU	Business as Usual
CDP	Carbon Disclosure Project
GHG	Greenhouse Gas
GPC	Global Protocol for Community-Scale Greenhouse Gas Emission Inventories
IPCC	Intergovernmental Panel on Climate Change
KPI	Key Performance Indicator
NZC	NetZeroCities project
UHI	Urban Heat Island
RES	Renewable Energy Systems

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1. Introduction

Athens Metropolitan area (Greek: Αθήνα, romanised: Athína [aˈθina]) is where the capital city of Greece is situated. With a population close to 4 million it is the largest metropolitan area in Greece, and the 7th largest in the European Union. The City of Athens constitutes a small administrative unit of the entire metropolitan area, with a population of 643,452 (in 2021) within its official limits, and a land area of 38.96 km^2.

Athens is one of the world's oldest cities, with its recorded history spanning over 3,400 years and its earliest human presence beginning somewhere between the 11th and 7th millennia BC. Classical Athens was a powerful city-state. It was a centre for the arts, learning and philosophy, and the home of Plato's Academy and Aristotle's Lyceum. It is widely referred to as the cradle of Western civilisation and the birthplace of democracy, largely because of its cultural and political impact on the European continent—particularly Ancient Rome. In modern times, Athens is a large cosmopolitan metropolis and central to economic, financial, industrial, maritime, political, and cultural life in Greece. In 2021, the city's urban area hosted more than 3.5 million people, which is around 34% of the entire population of Greece. It is also a tourist hotspot, with millions visiting every year. Athens is a Beta-status global city according to the Globalization and World Cities Research Network and one of the biggest economic centres in Southeastern Europe. It also has a considerable financial sector, while its port, Piraeus, is both the largest passenger port in Europe and the third largest in the world.

1.1. Administrative and political organisation

The Municipality of Athens is the most populous municipality of Greece. It belongs to the Regional Unit (PE) of the Central Sector of Athens of the Region of Attica (Figure 1). The Region of Attica is divided into eight Regional Units and includes 66 Municipalities (with 3,814,064 permanent residents), eight of which are islands. The Central Sector of Athens includes seven more Municipalities (Daphnis-Ymittos, Philadelphias-Chalkidones, Galatsiou, Ilioupoli, Kaisarianis, Byronos, Zografou), while the Municipality of Athens consists of seven municipal communities (Figure 2). All seven municipal communities and emissions sources within them will be included in Athens' 2030 climate neutrality target.

Figure 1. Position of Athens municipality within the region of Attica

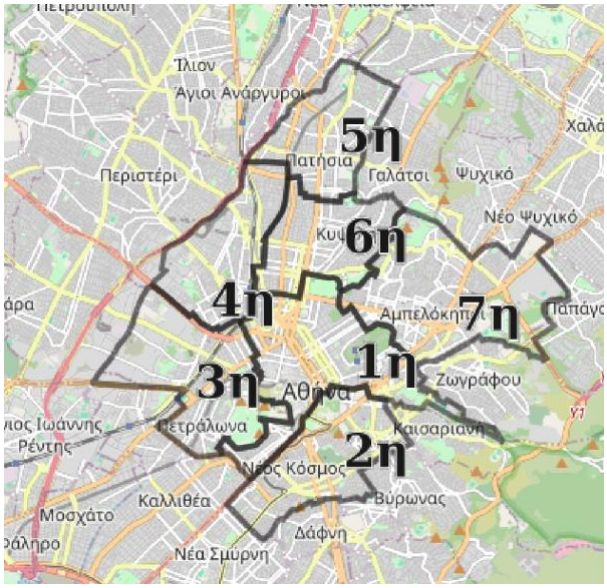


Figure 2. The seven municipal communities of Athens

The Municipality is governed by the Mayor and the Municipal Council. The Mayor appoints deputy mayors, who each manage thematic portfolios in key areas for the city, such as Green, Cleanliness, Urban and Building Infrastructure, Social Solidarity, and Health.

Athens is a metropolitan city that is the political, commercial, administrative, and cultural centre of the country. Nevertheless, its jurisdiction is often limited: the Regional and Central Governments control key jurisdictions over the city, which sometimes complicate the work of local administration. For example, in an important green space located in the Municipality of Athens, 'Pedion tou Areos', the responsibility belongs to the Region of Attica, while central road axes, such as Alexandras Avenue, are under the responsibility of the Ministry of Infrastructure, Transport, and Networks. Public transport is controlled by the Athens Urban Transport Organization, which again is under the Ministry of Infrastructure, Transport, and Networks. The sewerage network, for the most part, is managed by EYDAP. All this defines a very specific framework of actions that the Municipality of Athens can decide and implement to reduce greenhouse gas (GHG) emissions and/or to adapt to the effects of climate change

1.2. Demographics

From the 1950s to the 1980s, the capital developed into a powerful urban centre of metropolitan and national importance. The prevailing social, political, and economic conditions of those decades caused large population movements to the Municipality of Athens, creating huge needs for housing and new infrastructure in the city (such as for transport, energy, and water), while the practice of providing compensation for building high-rise apartment buildings since then largely shaped the urban landscape of the capital. The resulting pressure of urban congestion, traffic, noise and air pollution led to a mass exodus of urbanites to the suburbs from the 1980s onwards (13% decline, 1991 census). In the absence of comprehensive planning, the pressure on the natural environment highly increased. The massive and unregulated construction and the rapidly developing road network led to the depletion of peri-urban greenery and the covering of important water resources of the city and the basin, including both rivers that once ran through Athens (Kifissos and Ilissos).

In the following decades, new forms of population mobility have been observed: movements between urban centres, economic migration, and intra-urban movements. The massive influx of immigrants in

1991-2001 more-than-quadrupled the share of foreign residents in Athens, who settled in the empty, abandoned, and therefore cheap building stock of Athens while Greek nationals decreased by 20% (moving mainly to the suburbs). The Great Recession contributed to further reduction of the permanent population, with shifts to financially safer places (province, suburbs, abroad). The city began to show an image of abandonment, with infrastructure and public space degrading and decaying, and at the same time social and cooperative initiatives began to flourish to support the ever-growing affected groups of the population. The 2010s refugee crisis, primarily due to the Syrian Civil War, significantly boosted the number of refugees and immigrants mainly from Middle Eastern countries.

Although there has been a decrease in population since the 1980s (-16% between the 2001 and 2011 censuses), Athens remains one of the most densely populated cities in Greece and Europe, mainly due to the tall building standards applied. The population of Athens amounts to 643,452 inhabitants (ELSTAT 2021) with a density of up to 17,070 inhabitants per square kilometre (see Figure 3 for more details on density). According to Eurostat (2018), the life expectancy of the residents of the Attica Region for the year 2016 was 81 years, slightly less than the national average (81.5 years) and equal to the European average, while the mix of the population consists of 77% Greeks and 23% foreign citizens.

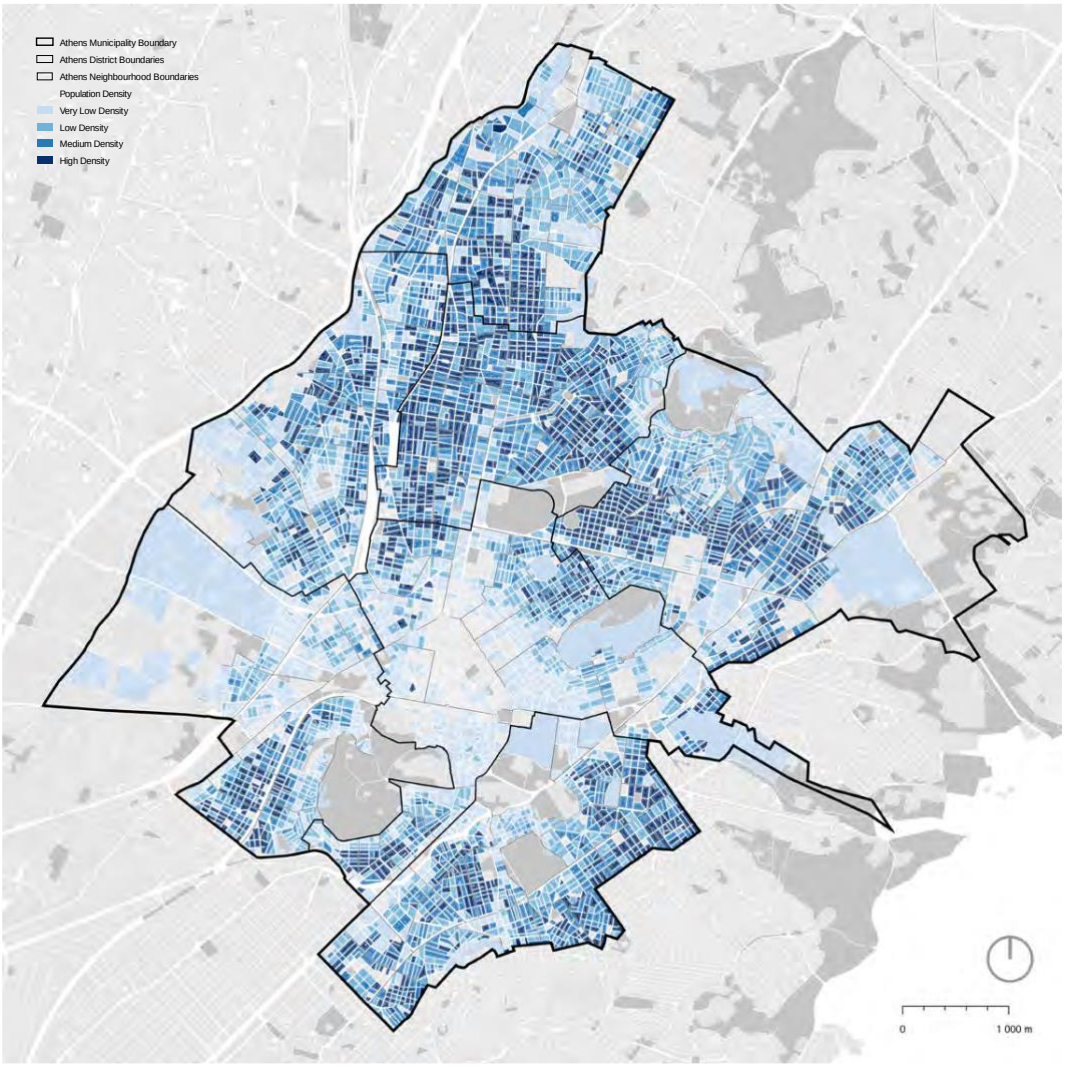


Figure 3. Population density (Data source: ELSTAT 2011, Processing: Norman Foster Institute – Athens Cohort, 2024)

The average age of the population of Attica was 41.3 years a decade ago (ELSTAT 2014). In the City of Athens, in particular, a large number of elderly people are accumulating, in relation to the younger ages, with an ever-worsening demographic problem, especially after the Great Recession, and thus with increasing projections for lower productivity in the future. The observed ageing index is high (1.73—i.e., 100 children under 15 years old correspond to 173 elderly people over 65 years old) while school-age children make up approximately 15% of the Municipality's population.

1.3. Socio-economic data

Most businesses operating within the Municipality concern retail and wholesale trade (33.9%), followed by professional and other technical activities (18.2%), and accommodation and catering as well as information and communication services (both 11%). The Municipality of Athens has a considerably higher GDP than the rest of Greece, with increasing trends from 2014 onwards (see Figure 4): according to the latest data (Eurostat, 2021[1]), the per capita Gross Domestic Product (GDP) for the Central Sector of Athens is €33,400, while for the Attica Region and Greece it is €23,300 and €17,100, respectively.

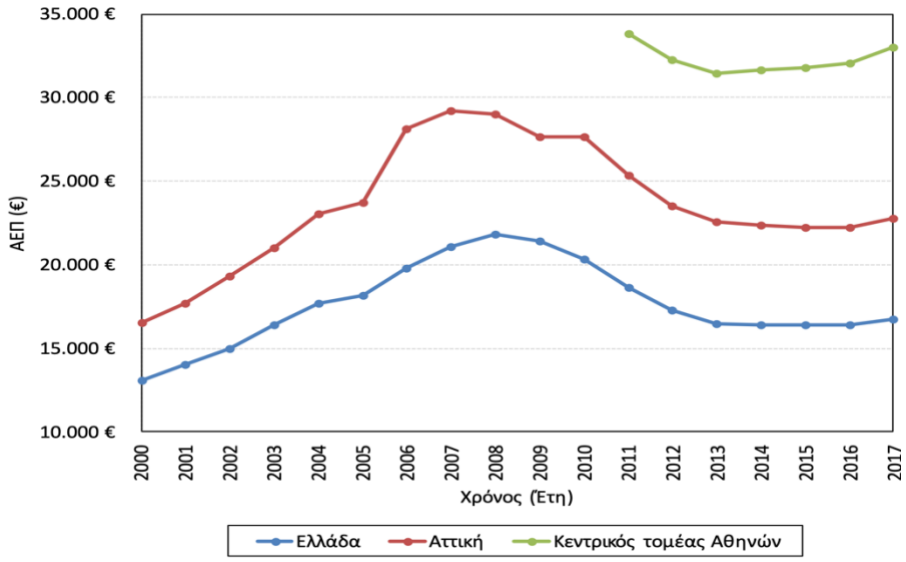


Figure 4. Gross Domestic Product in Greece (blue line), Attica (red line), and the Central Sector of Athens (green line), based on existing data. Source data: ELSTAT (2017)

Given Athens' unique history and culture, one of the most important drivers of the Municipality's economy in recent years is tourism. The city of Athens has been a popular tourist destination due to its culture and art, the vibrancy and potential of the city, its hospitality, gastronomy and favourable climatic conditions (especially in spring and autumn). Tourism in the city has increased significantly since 2012, with the number of visitors reaching 6.4 million in 2019, thereby boosting business activity in the tourism sector, despite the considerable yet temporary setback amid the COVID-19 pandemic. In a 2019 survey on tourist satisfaction and hotel performance, a very large percentage of visitors appeared to wish to return (87%) and almost all (96%) would recommend Athens as a destination, despite finding the environmental condition of the city and the public space unsatisfactory.

[1] https://ec.europa.eu/eurostat/databrowser/bookmark/41453bae-d2be-4c4e-b93b-40f2907dff87?lang=en

The planning and certification of Athens as a Sustainable Tourist Destination has been an important goal of the city in recent times. In 2021, the Athens Development and Tourism Promotion Company (EATA) completed, in collaboration with the Global Sustainable Tourism Council (GSTC), a holistic and innovative assessment of Athens as a tourist destination. This assessment aims to help the city integrate the 17 United Nations (UN) Sustainable Development Goals (SDGs) into the city's plans and strategies for tourism and urban development. This effort takes into account the common interests of visitors, residents, and businesses, and properly prepares the city for increased tourism flows, which in turn bring increased demands in terms of energy and resource use, waste management, transport, biodiversity and landscape conservation, and effective management of cultural heritage.

Despite the touristic image of Athens, socio-economic living conditions for its residents have been challenging in the past two decades, especially due to the recent economic recession and confinements due to COVID-19. The share of the population at risk of poverty or social exclusion amounts to 13.7% in the Region of Attica (ELSTAT 2019), which includes the city of Athens. This is also reflected in terms of energy poverty: around 23% of Athenian households have faced energy poverty in the last decade. Poverty rates are further exacerbated by the upward trend of the prices of consumer goods in the country recently. This in turn has affected the affordability of real estate in Athens as, after a historic low in 2013, real estate prices and rents have rapidly increased. These altogether shape an uncertain environment for any transition to climate neutrality, to the extent that transitioning bears costs and socioeconomic consequences for all involved.

In this context, the Municipality of Athens pays particular attention to socially vulnerable groups. For instance, it strives to secure nutritional adequacy for the poor, homeless, and children accommodated in its nurseries, by preparing suitable meals. In 2018, for example, 1,588,000 meals were prepared and distributed at the Athens Municipal Nursery. Additionally, within the administrative boundaries of the Municipality, there are many public health structures, such as hospitals, which serve citizens of both the Municipality and the Region as well as the entire country, regardless of their insurance status. The Municipality of Athens has six Municipal Clinics divided into six different Municipal Communities so that Primary Health Care is provided to all citizens as close as possible to their residence and workplace.

1.4. Built environment

Based on the last reported building census by ELSTAT in 2011, the total number of buildings within the Municipality of Athens is 61,764. From these, 55% are buildings with exclusive use as residences while 27.5% are buildings with mixed use where the main use is for residence. Office and store buildings comprise around 12% of the total buildings and the rest include schools, hospitals, hotels, etc. While the most important building use of buildings is for residential purposes, not all available dwellings are used for that purpose. The number of dwellings on 2021 is estimated at around 437,188 (ELSTAT, 2021), while empty dwellings were estimated by ELSTAT to around 117,137 in 2021 and dwellings used for Airbnb are currently estimated to around 13,500[2]. These data also reflect the looming housing crisis and the rapid increase of rents in the Municipality in the last years after COVID-19.

Almost 75% of all buildings were built before 1970, indicating a rather old building stock. While renovations and energy upgrades have been ongoing and have sped up in the last five years, they are estimated to cover a very short share of the buildings (see Section 3.1.3 for more details). Similarly, it is expected that new buildings after 2011 comprise only a minor share of the total buildings, due to the reduced economic activity due to the economic crisis and the lack of space within the Municipality. Figure 5 showcases the distribution of buildings with insulation in the different neighbourhood in Athens indicating that 75% of the building stock in the Municipality of Athens was not insulated by 2011. A more

[2] https://insideairbnb.com/athens/

detailed analysis of the built environment is found in the analysis of the Athens Cohort of the Norman Foster Institute in Annex A.

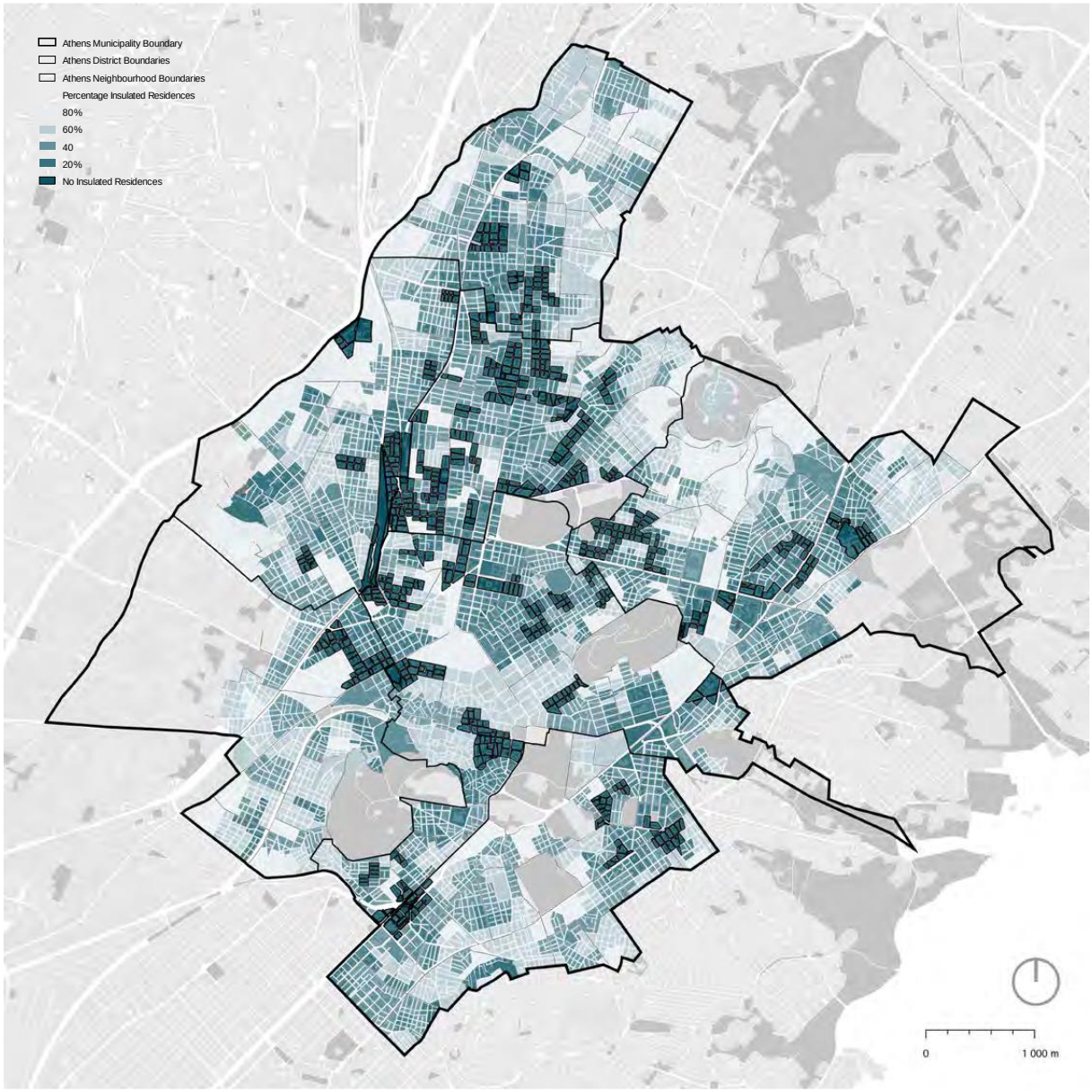


Figure 5. Percentage of insulated residences in the neighbourhoods of Athens (Data source: ELSTAT 2011, Processing: Norman Foster Institute – Athens Cohort, 2024)

1.5. Transport

As shown by the transportation measurements of the Google Environmental Insights Explorer for 2021 (Figure 6), more than 60% of transportation is done by car (measured in terms of kilometres per mode), while around 13% is done by motorcycle. Metro and trains are covering less than 10% of the measured transportation while buses less than 5%. Active mobility (walking, biking) covers around 10% of the transportation. However, it should be noted that around 70%of the trips measured here are inbound or outbound of the Municipality of Athens, thus their origin or destination is outside of the Municipality. The in-boundary trips are expected to have less reliance on car since the Municipality of Athens include the city centre of Athens where parking is limited. Nevertheless, addressing transboundary transportation would require coordination with the neighbouring Municipalities which has already started with the initiative of the Municipality of Athens (see Athenian Energy Alliance in Part C)

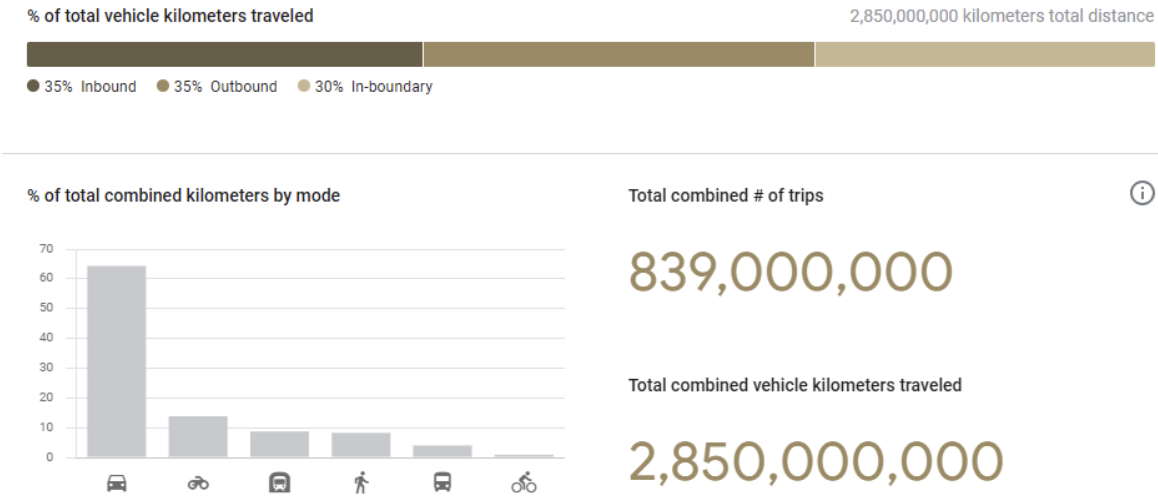


Figure 6. Transportation data for Athens in 2021 (Data source: Google Environmental Insights Explorer, 2021)

Despite the increased car usage, public transportation coverage is somewhat high within the Municipality. As shown in the Figure 7, more than 60% of the neighbourhoods of Athens have access to at least one metro line, while this figure is expected to increase to 75% with the development of the 4th metro line (expected around 2030). The bus network is even more dense, with more than 95% of the neighbourhoods having access to at least one bus line. A more detailed analysis of the transportation system is found in the analysis of the Athens Cohort of the Norman Foster Institute in Annex A.

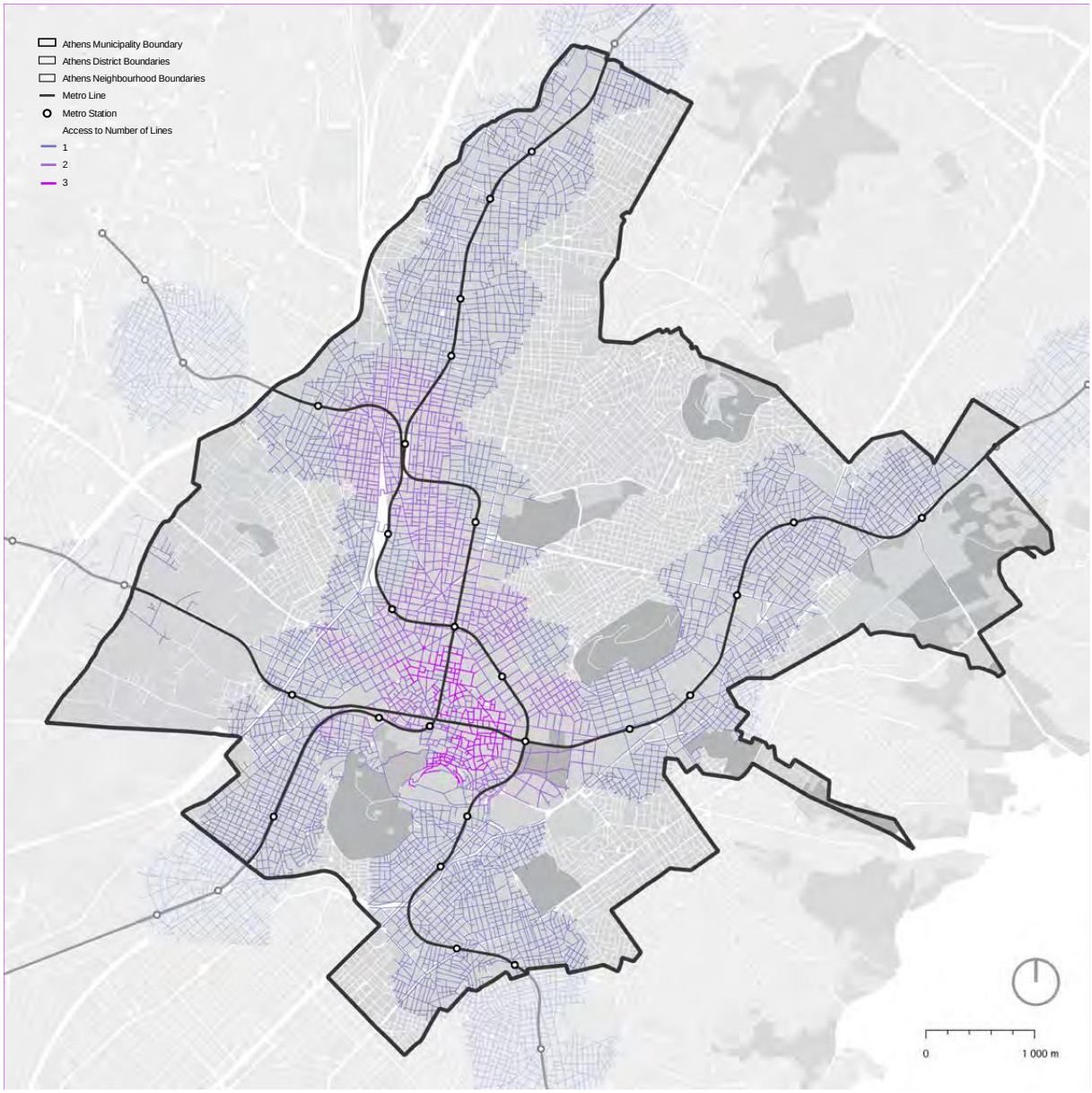


Figure 7. Access to number of metro lines (Data source: Athens Geoportal, 2021; Processing: Norman Foster Institute – Athens Cohort, 2024)

1.6. Climate and green infrastructure

The city of Athens is located within the Attica basin and is the centre of Metropolitan Athens. It is located at an average altitude of 130m above sea level, at latitude 38 º and longitude 24 º, and occupies an area of around 39 km^2. The basin is surrounded by four mountain ranges (Mount Egaleo in the west, Parnitha in the north, Penteli in the northeast, and Ymittos in the east) and the Saronic Gulf in the south. Due to the morphology of the basin, which is often characterised by temperature inversion, the movement of gas masses is severely hindered, resulting in pollutants being accumulated/trapped in the atmosphere. This is when the photochemical cloud phenomenon is observed (and continuously monitored by the National Observatory of Athens) and especially in the summer period, due to the intense sunshine. The phenomenon of smog (due to soot produced by the combustion of unsuitable materials in combustion

hearths) was notably strong in Athens during the years of the Great Recession. The limited peri-urban and metropolitan greenery in Attica, which is mainly concentrated in the mountainous areas of the basin, in synergy with the equally scarce greenery in the city, is of paramount importance, as it helps reduce air pollution, flooding, high temperatures, and the urban heat island effect, which is exacerbated by the non-water-permeable and heat-permeable materials that cover 80% of the city. Figure 8 showcases the mean daytime surface temperature within the Municipality which is especially high in the area of Elaionas at the west of the Municipality.

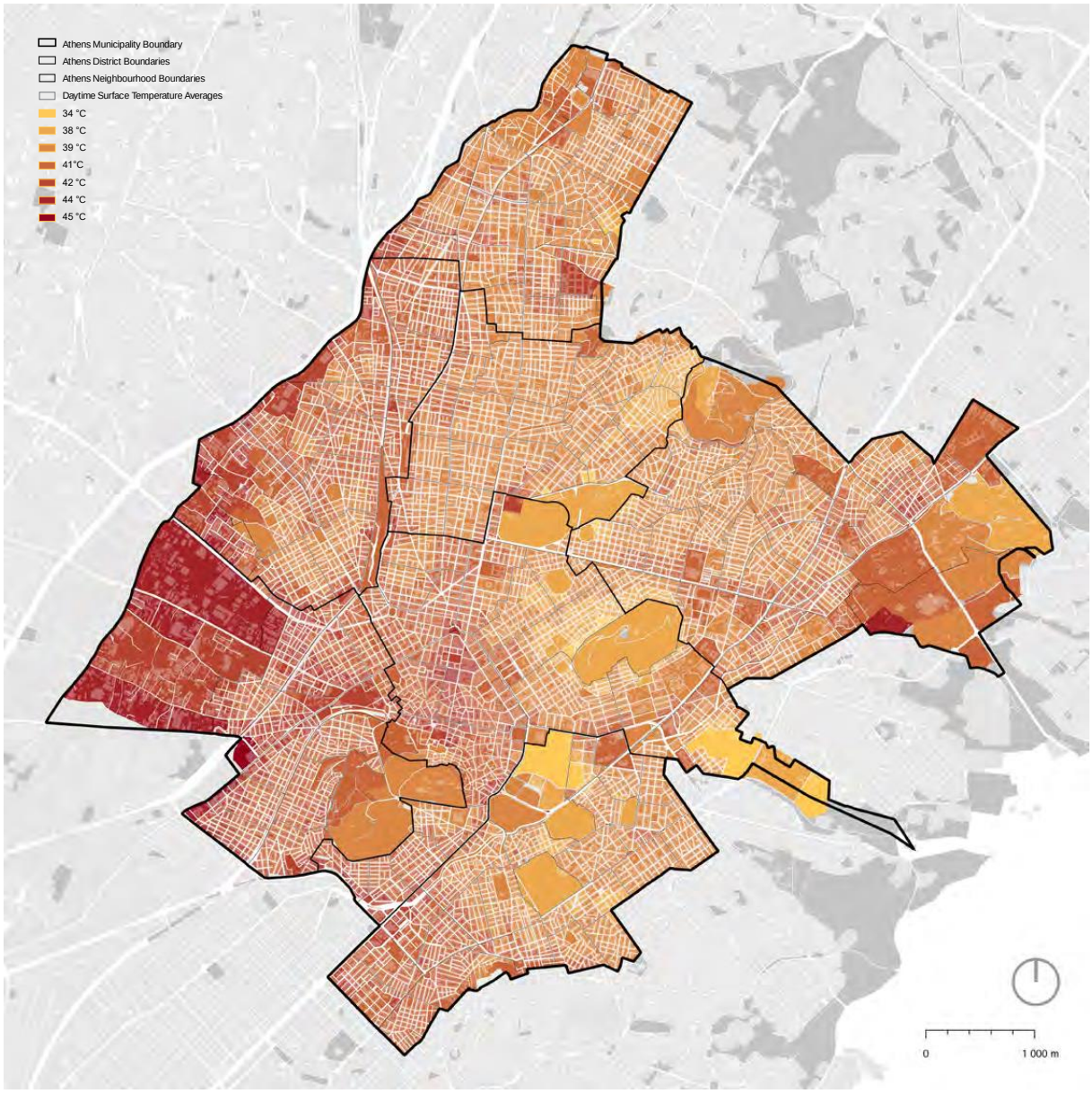


Figure 8. Mean daytime surface temperature (Data source: Athens Geoportal, Processing: Norman Foster Institute – Athens Cohort, 2024)

In contrast, the green spaces that are shown in Figure 9 help to keep their respective neighbourhoods of Athens in much lower temperatures. Nevertheless, only 17.87% of the municipality is a green space, while only 40% of the residents live within 300m to one of these spaces (NFI, 2024). This is translated to around 0.96 m^2 of green space per person which is much lower than the 9-50 m^2 per person suggested

by the World Health Organisation standard (NFI, 2024). The number of trees is also quite low, with 91,117 street tree plots measured by the Municipality of Athens in 2024, which is translated to 2 trees per linear meter per neighbourhood.

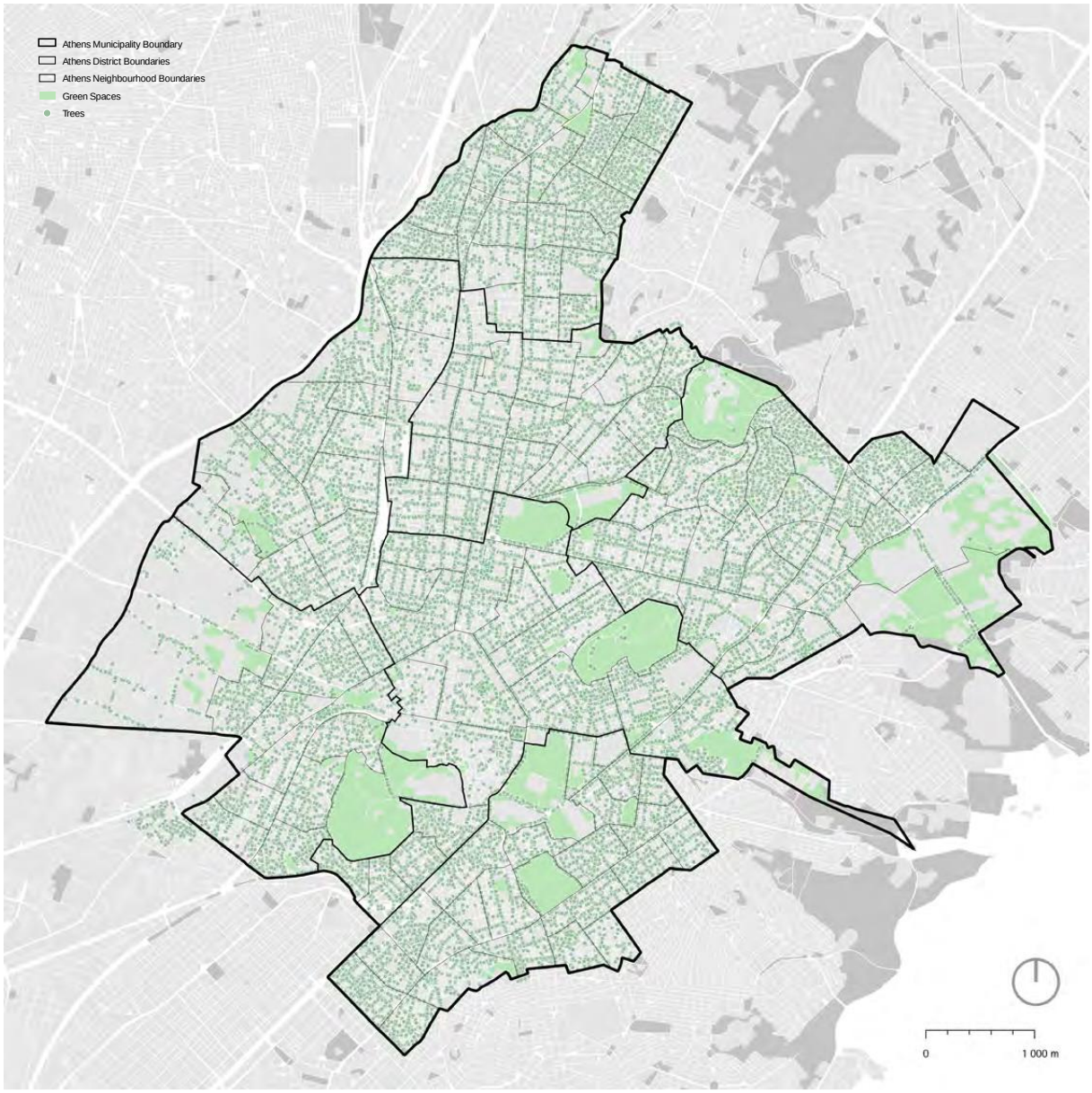


Figure 9. Green spaces and trees within the Municipality of Athens (Data source: Athens Geoportal, Processing: Norman Foster Institute – Athens Cohort, 2024)

The climate of Athens is characterised as subtropical, Mediterranean, with prolonged hot and dry summers and mild winters, with moderate rainfall. The average annual temperature is 17.7°C, based on the Thiseion weather station. As shown in Table 1, in recent years, the centre of the municipality has experienced quite elevated temperatures in the summer period (maximum 42.8 ºC in July), while from December to March the temperature can drop below 0 ° C. Average rainfall is relatively low (378mm per year), as is wind speed (around 2m/s average annual wind speed). According to the Regional Adaptation Plan to Climate Change (RCPCA, 2020) and two future global warming scenarios, the moderate

(RCP4.5) and the extreme (RCP 8.5), the following changes in climate parameters are expected in Athens for the period 2031-2050 compared to the reference period (1981-2000).

Table 1. Climatic parameters for the Region of Attica

Climatic Parameters	Reference period 1981-2000	Change	2031-2050 RCP4.5	2031-2050 RCP8.5
Average maximum annual temperature (°C)	21.2 °C	Increase (°C)	+1.51	+1.61-1.62
Average minimum annual temperature (°C) *	14 ºC	Increase (°C)	+1,5	+1,6
Average minimum temperature (°C) winter (heating demand)	3 °C	Increase (°C)	+1.26	+1.35
Average summer maximum temperature (°C) **	20.98 ° C	Increase (°C)	+1,7	+2
Average number of very hot days (>35°C)	67 days	Increase (days)	+17	+20
Average number of tropical nights (>20°C) the reference period	67 days	Increase (days)	+25	+29
Average rainfall	401.04 mm	Decrease (%)	-3.5%	-12.5 %
Average annual relative humidity	61%	Decrease (%)	2%	3%
Wind speed	2m/s	Increase (%)	2%	2%
Cloud cover	-	Decrease (%)	0%	-5%
Annual wind speed values (summer months)	2.03 m/s	Increase (%)	9%	9%
Average number of days with average annual maximum temperature >26° C (overheating of buildings)	129 days	Increase (days)	+15	+23
Cooling Degree Days (CDD) weighted by the surface area of normal dwellings (cooling energy demand) *	414 grade days	Increase (grade days)	647	697
Number of days with Fire Weather Index >30 *	90 days	Increase (days)	+12	+19
Heating Degree Days (HDD) weighted by households	1714 grade days	Decrease (grade days)	1425	1380
* Represents data from the PESPKA Attica for the Region of Attica ** Refers to data from the PESPKA Attica for the Central Sector of the Region of Attica *** Refers to data from the PESPKA Attica for the urban areas of the Region of Attica				

The expected increase in the average annual temperature in the city may extend the tourist season in Athens by expanding the lifecycle of its touristic “product” (culture, nature, history, gastronomy). However, when the temperature rises in the very hot months of July and August, the tourist traffic in Athens is expected to decrease, especially in terms of commercial traffic and overnight stays in the city.

Additionally, the effects of climate change are expected to increase energy demand for cooling and raise the prices of basic goods (energy, water, necessities), leading to higher cost of living. Similarly, the risk of flooding is also exacerbated, especially for some areas of the Municipality, as shown in Figure 10.

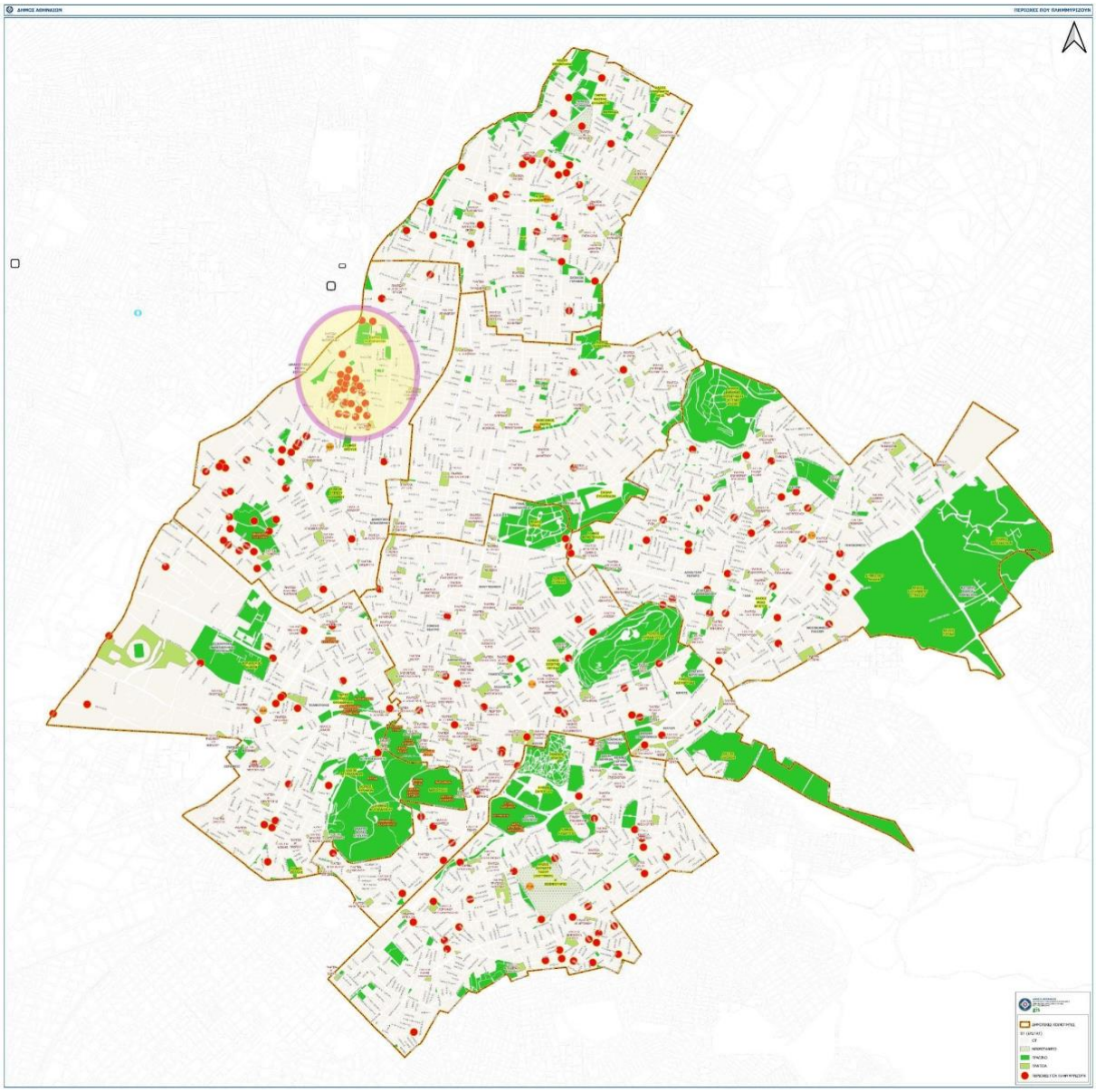


Figure 10. Areas under flooding risk within the Municipality of Athens shown with red dots (Data source: Athens Geoportal)

1.7. Climate action and previous action plans

The Municipality of Athens has a long history of systematic climate action and planning, stemming from its participation in global initiatives in the context of climate change mitigation and adaptation. Since 2008, Athens actively participates in the global climate network of **C40 Cities** that supports cities to act together to deal with climate change, through partnerships, exchange of scientific knowledge, experiences, know-how, and best practices. The Municipality also signed the **Covenant of Mayors** in

2014 and the Compact of Mayors in 2015 (merged since 2016 to the Global Covenant of Mayors for Climate & Energy), with the commitment to tackle climate change and increase energy efficiency and the use of renewable energy sources (RES) in their regions. In addition, the Municipality of Athens was selected to participate in the Global network of **100 Resilient Cities** (today Global Resilient Cities Network[3]) and signed the **Milan Urban Food Policy Pact**[4] in 2015 with the aim to develop sustainable food systems while minimising waste and mitigating emissions and overall climate change impacts.

The Office of Urban Resilience and Sustainability was created in the Mayor's office in 2016, with the mandate to draw up strategies and support all horizontal actions of the Municipality of Athens and issues related to climate change. In 2018, the office was upgraded to the **Department of Resilience and Sustainability,** as part of the Directorate of Strategic Planning, Resilience, Innovation & Documentation, which has the jurisdiction and responsibility to deal inter alia with the update and monitoring of the city's climate strategy as well as with the coordination of its climate actions. Since 2017, two interdepartmental working groups have been established to work closely with the department: one for the Reduction of Greenhouse Gas Emissions and another for Adaptation to Climate Change, by Mayor's Decision.

The Municipality of Athens began recording its emissions systematically in 2015, and in 2017 it managed to prepare the first comprehensive Climate Action Plan in Greece to reduce GHG emissions and adapt to climate change. The **2017 Climate Action Plan** was an integral part of the Resilience Strategy of Athens for 2030, as part of the Municipality's participation in the 100 Resilient Cities network. The plan included targets for 2030 and consisted of two parts: the first part, the *Greenhouse Gas Emissions Reduction Plan*, aimed to reduce GHG emissions by 40% in 2030 compared to base year emissions (2014), while the second part, the *Climate Change Adaptation Plan,* aimed at protecting the population and adapting the city to extreme weather events. The plan was developed using inputs from Eurocities, ICLEI, C40 Cities, Resilient Cities Network, Climate-KIC, CityLab, Bloomberg Associates and Philanthropies, and the LSE Cities programme, as well as through extensive stakeholder engagement. By the end of 2017, there had been 40+ workshops with people inside and outside the Municipality of Athens, individual campaigns and questionnaires, conferences, and public events with the participation of more than 850 citizens and around 140 public, private, and non-profit organisations.

Athens committed, in 2018, to update its Climate Action Plan to achieve climate neutrality by 2050. To reach net zero emissions by 2050, the **2022 Climate Action Plan**[5] increased the ambition of the 2030 target to 61% emission reductions (compared to 2018). This target was based on a projection of the city's GHG emissions until 2050 using the Pathways tool[6] by the company Ricardo, with the initiative and funding of C40 Cities and in collaboration with the Services of the Municipality of Athens and other stakeholders during September 2020 - January 2021. The preparation of the 2022 plan was carried out through consultation processes within the Municipality and with external stakeholders, including four thematic workshops with 200 participants in total and a survey with more than 1700 citizens. As a result, the Municipality's Climate Operational Plan was largely coordinated and is equivalent and comparable to its five-year operational plan. Also, the parallel preparation of the Sustainable Urban Mobility Plan (SUMP) contributed to great synergies between the two action plans, considering the Integrated Spatial Intervention Plan (ISAP) within the boundaries of the CIP, as well as the €55 million worth of investments funded by the European Investment Bank based on the Athens 2030 Resilience Strategy.

The emissions reduction pathway of the 2022 Climate Action Plan is illustrated in Figure 11 while other objectives beyond emissions reduction are given in Annex B. Apart from the overall goal of 61%

[3] https://resilientcitiesnetwork.org
[4] http://www.milanurbanfoodpolicypact.org/
[5] https://www.cityofathens.gr/wp-content/uploads/2022/08/schedio-gia-tin-klimatiki-allagi-9-6-2022.pdf
[6] https://2050pathways.org/about/c40/

emissions reductions in 2030 (compared to 2018), the Climate Action Plan had the following sub-sector targets for 2030:

- Support energy upgrades in 30% of residential buildings and 50% of tertiary buildings.
- Produce 60% of hot water from solar thermal elements.
- Upgrade all street lighting to become energy efficient.
- Increase walking and cycling (from 12.4% in 2018 to 25.7% in 2030) and reduce car use (from 28.3% in 2018 to 15.8% in 2030).
- Electrify 7% of public transport buses.
- Achieve full recycling and composting by 2030.
- Cover 62% of the city's electricity demand by renewable energy sources (assumption over the electricity grid).
- Provide access to a green space with ecosystem functions to 70% of the city's population within a 15-minute walk, by 2030.
- Cover 30% of the city's surface area with green spaces (e.g., tree belts, urban forests) and/or permeable surfaces (e.g., earth surfaces, water permeable materials).

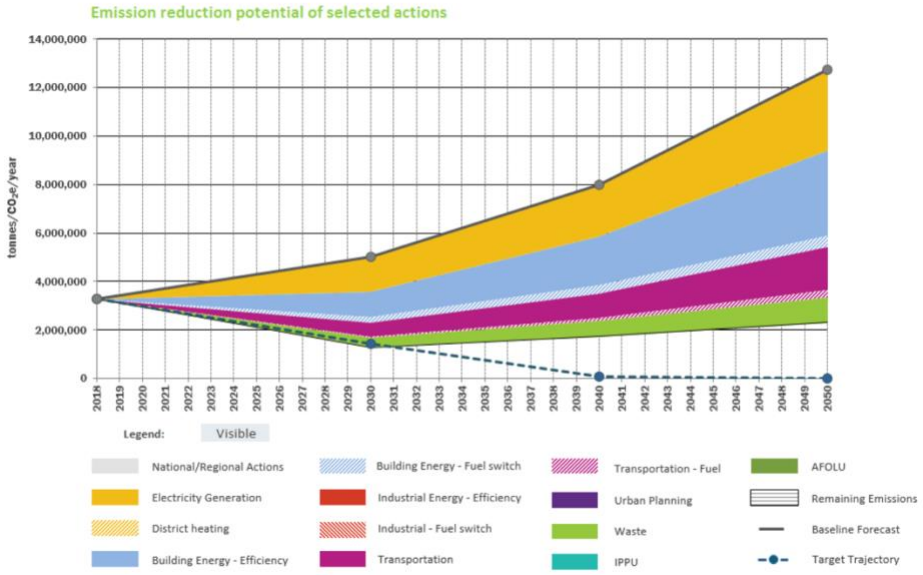


Figure 11. Emission reduction based on the previous Climate Action Plan (Municipality of Athens, 2022)

1.8. Development of the CCC Action Plan

The Climate City Contract of Athens is partially based on the 2022 Climate Action Plan as well as on insights stemming from engagement activities during the last decade with stakeholders from Athens and the networks and initiatives that Athens belongs to. The CCC raises the ambition of the previous plan significantly by bringing the target to climate neutrality from 2050 forward to 2030, along with an updated set of objectives and a portfolio of actions to realise this target. The development of CCC is supported

by the EU-funded NetZeroCities (NZC) project[7], which has developed and operationalised an extensive process for supporting cities that embark in their Cities Mission 2030 journey. Although the process for drafting the Contract was short, several heavy stakeholder consultation activities took place, including two Climate Forums in May and July 2024 as well as a deliberation process within all seven municipal units. These activities will continue as the CCC is a living document that will be further updated in the future.

The goal for climate neutrality by 2030 will be primarily achieved through extensive emissions cuts within all emissions-intensive sectors of the city, including energy supply, the built environment, transportation and mobility, and waste. In line with the climate neutrality definition pursued by the Cities Mission, **the target for emissions cuts is set to 80% compared to a "Business-as-Usual" scenario**—i.e., assuming that the Municipality did not develop any further climate policy after 2019. The residual chunk of **20% of emissions will be covered through Nature-Based Solutions**, by expanding the city's green infrastructure and afforestation/reforestation activities. The climate neutrality target covers all administrative territories within the Municipality and all emission sources, sectors, and relevant GHG emissions. Additionally, no heavy emitting (ETS) facilities, such as power plants or industries, are included within the city's geographical boundaries.

Apart from allowing it to become a pioneering city in the fight against the climate crisis, achieving climate neutrality by 2030 will offer Athens great environmental, social, and economic co-benefits. By using more renewable energy, such as by installing PVs on rooftops or by supporting energy communities in the region, the Municipality will reduce its energy costs and protect its citizens from the volatility of these costs as well as support the creation of green jobs (e.g., in PV installation and maintenance). Similarly, bold energy upgrades to buildings throughout the city can reduce energy costs for households and businesses alike, reduce heating demand and electricity demand for air conditioning, and help mitigate the risk of heat-related health problems through better conditions in the built environment. Apart from cutting transport emissions, reducing car traffic will also significantly improve the city's air quality as well accessibility and safety for pedestrians and bikers. Addressing emissions from waste via recycling and composting can lead to reduced costs of landfill disposal for the municipality and cleaner streets in the city, while planting more trees and investing in the green infrastructure of the city will mitigate risks from extreme heat and flooding.

Additionally, acquiring the Cities Mission label will open many opportunities for Athens such as new funding from the EU and invitations to participate in many projects and innovation actions. Already, initiating the process of co-drafting the CCC with stakeholders alongside the political commitment of the new municipal authority have paved the way for the approval in May 2024 of a pilot programme funded by the NetZeroCities programme (proposal submitted on March 18, 2024). The label is also expected to raise the Municipality's profile in green innovation and attract further investments in these areas, while there is already great interest in partnerships for and participation in innovative schemes of financial instruments. Finally, the Municipality will also receive extensive and tailored support from the NZC programme and will benefit from networking and knowledge exchange programmes with other leading European cities.

Table 2 summarises the sectors and geographical areas that are included in the 2030 climate neutrality target of Athens.

[7] https://netzerocities.eu

Table 2. Climate Neutrality Target by 2030 (I-1.1)

Sectors	Scope 1	Scope 2	Scope 3
Stationary energy	**Included**	**Included**	-
Transport & Mobility	**Included** Note: The target is applied to the in-boundary traffic for all modes. Since transboundary car and motorcycle traffic in Athens is significant, half of this traffic is also counted as Scope 1.	**Included**	-
Waste & wastewater	Included (not occurring)	Not applicable	**Included**
Agricultural, Forestry and Land Use (AFOLU)	**Included**	Not applicable	-
Industrial Process and Product Use (IPPU)	Included (Not occurring) Note: The only industrial activities within the city boundaries relate to food industry, which is included in stationary GHG emissions.	Not applicable	-
Geographical boundary	**Same as city administrative boundary**	**Smaller than city administrative boundary**	**Larger than city administrative boundary**
(Tick correct option)	✓		
Specify excluded/additional areas	-	-	-
Map of the Municipality of Athens and its seven municipal units			

2. Part A – Current State of Climate Action

Part A describes the city's starting point towards climate neutrality, including commitments and strategies developed by or affecting the Municipality of Athens. The objective of this module is to present baseline greenhouse gas (GHG) emissions data and to establish the GHG emissions gap to achieve climate neutrality in 2030, according to the inventory specifications set out in the "Info Kit for Cities"[8] of the Cities' Mission and the process outlined in the CCC Action Plan Guidance and Explanations. The information given will be used in the following parts to formulate strategies to accelerate climate action.

2.1. Module A-1 – Greenhouse Gas Emissions Baseline Inventory

This module details the inventory of GHG emissions for the year 2019 within the geographical boundaries of the Municipality of Athens. Inventorying has been carried out every year since 2014 using the City Inventory Reporting and Information System (CIRIS)[9] provided by the global network of C40 Cities (of which Athens is a member) and based on the GHG Protocol for Cities (GPC)[10].

The inventory covers the entire geographical boundaries of the city without any exception, as shown in Section 1.6 and Table 2. The inventory includes emissions from all major GHGs such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). It also includes all sectors and sources of GHGs of the Municipality, i.e. GHGs from the built environment (buildings and street lighting), transport and mobility (road and rail transportation), waste and wastewater, as well as the agricultural sectors, forestry, and other land uses.

Since the Municipality of Athens essentially covers the centre of metropolitan Athens, which consists mainly of residential and tertiary sector buildings, emissions from agriculture are essentially minimal, while GHG emissions from heavy industrial processes (such as cement production) are virtually non-existent. It is noted that, while the Municipality of Athens does not have responsibility for the climate action of neighbouring municipalities, some actions of the Municipality of Athens are specifically aimed at the joint action with municipalities of metropolitan Athens, such as the establishment of the Athens Energy Alliance and the Municipal Energy Community Phaethon.

While the most recent emissions inventory available is for 2021, in consultation with the NetZeroCities advisors, it was decided to use the 2019 inventory to avoid any data anomalies due to the impact of COVID-19. The same emissions inventory was used in the simulation carried out in the context of Athens' participation in the NZC programme, using the financial model provided by the programme (Material Economics, 2020).

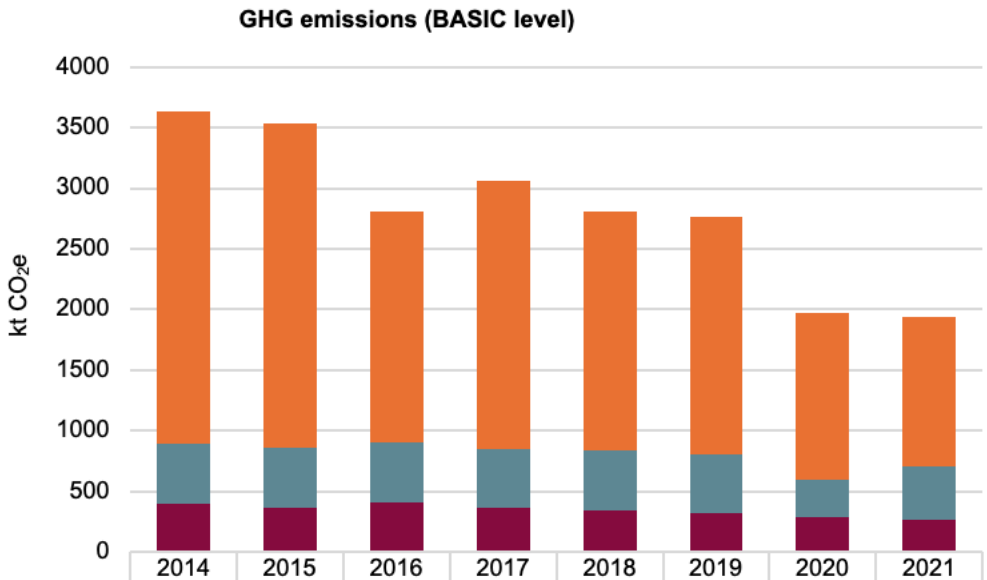
GHG emissions within the boundaries of the Municipality of Athens from 2014 to the last record of 2021 are shown in Figure 12. For 2019, emissions were estimated at 2,759,439 tonnes (t) of CO_2e, or about 4.3 tonnes of CO_2e per capita. The distribution of these GHG emissions for the three main emission sectors is as follows:

- 71% of GHG emissions are due to energy consumption in buildings and street lighting.

[8] https://netzerocities.app/resource-3814
[9] https://www.c40knowledgehub.org/s/article/City-Inventory-Reporting-and-Information-System-CIRIS?language=en_US
[10] https://ghgprotocol.org/ghg-protocol-cities

- 17% of GHG emissions are due to transport and mobility within the Municipality of Athens.
- 12% of GHG emissions are due to the management of the Municipality's wastewater and the disposal of solid waste in landfills.

The CIRIS 2019 inventory also includes GHG emissions from the agriculture, forestry, and other land use sectors, which in the case of the Municipality of Athens are negligible compared to the above sectors (about 2 tonnes CO_2e) and are therefore not displayed here.



	2014	2015	2016	2017	2018	2019	2020	2021
Total (BASIC)	3628	3531	2807	3057	2805	2759	1969	1935
Buildings/Streetlighting	2736	2668	1909	2209	1971	1961	1372	1231
Transport/Mobility	496	499	494	490	492	475	315	443
Waste/Wastewater	397	364	404	359	342	324	282	261
Buildings/Streetlighting	75%	76%	68%	72%	70%	71%	70%	64%
Transport/Mobility	14%	14%	18%	16%	18%	17%	16%	23%
Waste/Wastewater	11%	10%	14%	12%	12%	12%	14%	14%

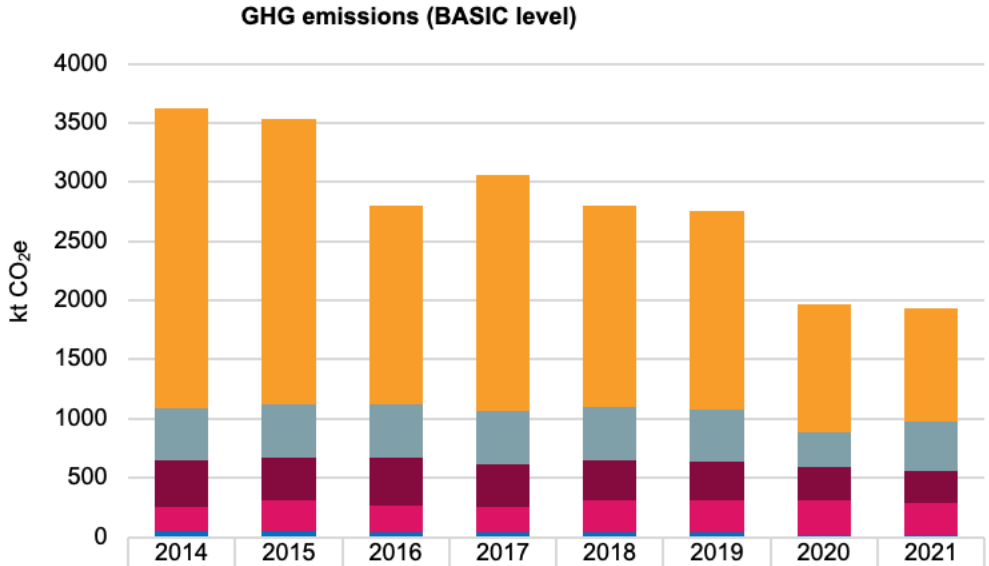
Figure 12. Greenhouse gas emissions within the Municipality of Athens (BASIC level according to the GPC protocol)

It is clarified that these values are calculated based on the "BASIC" reference level of the international GHG protocol, GPC. The GPC separates three levels of implementation or Scopes for the GHG emissions depending on where they are carried out. Scope 1 includes direct emissions that take place within the boundaries of the Municipality of Athens (e.g., due to the use of vehicles within the Municipality), Scope 2 mainly includes emissions from the consumption of electricity within the Municipality, while Scope 3 includes emissions from related activities of the Municipality outside the boundaries of the Municipality (e.g., GHG from waste management at the Phylis Landfill). The BASIC level used here includes Scope 1 and 2 emissions for the built environment and transport as well as emissions of all three Scopes for waste.

So, in the case of Athens, emissions that are not taken into account at the BASIC level and therefore in the objectives of the CCC are the GHG emissions due to electricity network losses (Scope 3 of the built

environment) as well as half of the transboundary traffic through the Municipality of Athens (Scope 3 of transport). It is noted that the other half of transboundary traffic emissions are considered by assumption as Scope 1, based on the proposal of the C40 Cities network. Beyond the suggestion of the NetZeroCities advisors to use the BASIC level, the remaining emissions are outside the jurisdiction of the Municipality of Athens, especially in the context of network losses. Nevertheless, the Municipality of Athens will cooperate with neighbouring municipalities within the framework of the Athens Energy Alliance in order to reduce emissions due to transboundary mobility beyond the share attributable to the Municipality of Athens.

Observing the overall course of GHG emissions from 2014 to 2021, there is a clear reduction of total emissions by almost half (from 3,628 kt CO_2e in 2014 to 1,935 kt CO_2e to 2021), which comes mainly from emissions reductions in the built environment. However, the building sector continues to generate the majority of emissions in 2021, so it is clear that it remains a priority. Figure 13 offers more details on the origin of the emissions. Based on the results for 2019, 61% of GHG emissions come from electricity consumption in buildings and street lighting, followed by 15.8% from transport-related liquid fuels (e.g., for cars, motorbikes, buses, waste collection trucks, trucks, coaches, etc.), 11.7% from decomposition of organic waste in landfills, 10% from heat consumption in buildings (e.g., oil and natural gas boilers), and 1.5% from transport electricity (metro, tram, trolley).

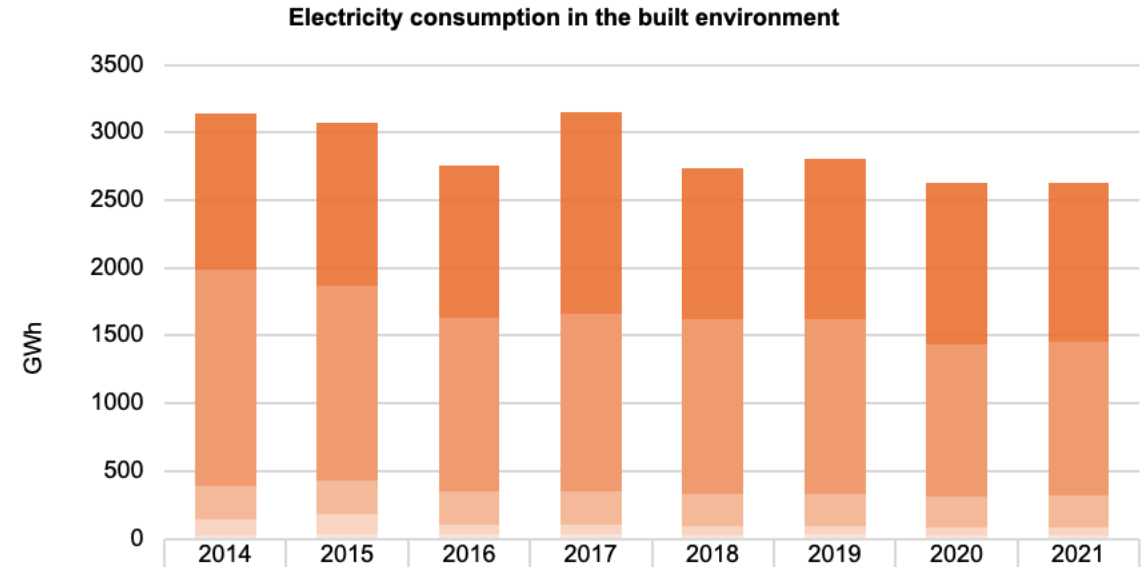


	2014	2015	2016	2017	2018	2019	2020	2021
Total (BASIC)	3628	3531	2807	3057	2805	2759	1969	1935
Stationary (Electricity)	2542	2413	1685	1997	1705	1684	1088	960
Transport (Liquid fuels)	441	446	454	448	451	437	292	421
Waste/Wastewater	397	364	404	359	342	324	282	261
Stationary (Heat)	194	255	225	212	266	277	284	271
Transport (Electricity)	55	53	40	42	40	37	23	21

Figure 13. Greenhouse gas emissions by sub-sector within the Municipality of Athens (BASIC level)

Figure 13 also shows that the reduction in total emissions between 2014 and 2021 comes mainly from the significant reduction in emissions from electricity consumption in the built environment from 2,542 kt CO_2e to 960 kt CO_2e–i.e., a reduction of over 60%. This, however, does not mean that there was a corresponding reduction in the consumption of electricity itself. As shown in Figure 14, there was indeed

a reduction in consumption from 3,145 GWh in 2014 to 2,632 GWh in 2021 (-16%). The most significant decrease is evident in the tertiary sector (shops, services, offices) that, together with residences, is responsible for over 88% of total consumption in 2019, followed by public buildings (approximately 9%), industries/crafts (2%), and street lighting (1%). While consumption in the tertiary sector decreased by 29% between 2014 and 2021, consumption in residences, public buildings and street lighting remained at similar levels to 2014. Thus, the explanation for the significant reduction in emissions lies mainly in the change in the country's power generation mix due to the rapid lignite phaseout in the last decade and parallel increase in RES (Figure 15), alongside a more modest increase in natural gas. As can be seen in Figure 16 below, these changes have led to a significant drop in the emissions of the electricity mix from 33.8 Mt CO_2 to 18.9 Mt CO_2 (i.e., by about 44%), which also explains the large drop in emissions in the building sector within the Municipality of Athens in addition to a 16% consumption drop.



	2014	2015	2016	2017	2018	2019	2020	2021
Total	3145	3073	2755	3152	2733	2805	2630	2632
Residential	1157	1201	1122	1488	1110	1182	1192	1176
Commercial	1593	1441	1286	1313	1288	1287	1123	1136
Institutional	247	249	242	249	245	243	231	238
Industry	120	143	72	67	61	59	53	54
Streelights	28	39	33	35	29	33	30	28

Figure 14. Electricity consumption in buildings and street lighting within the Municipality of Athens

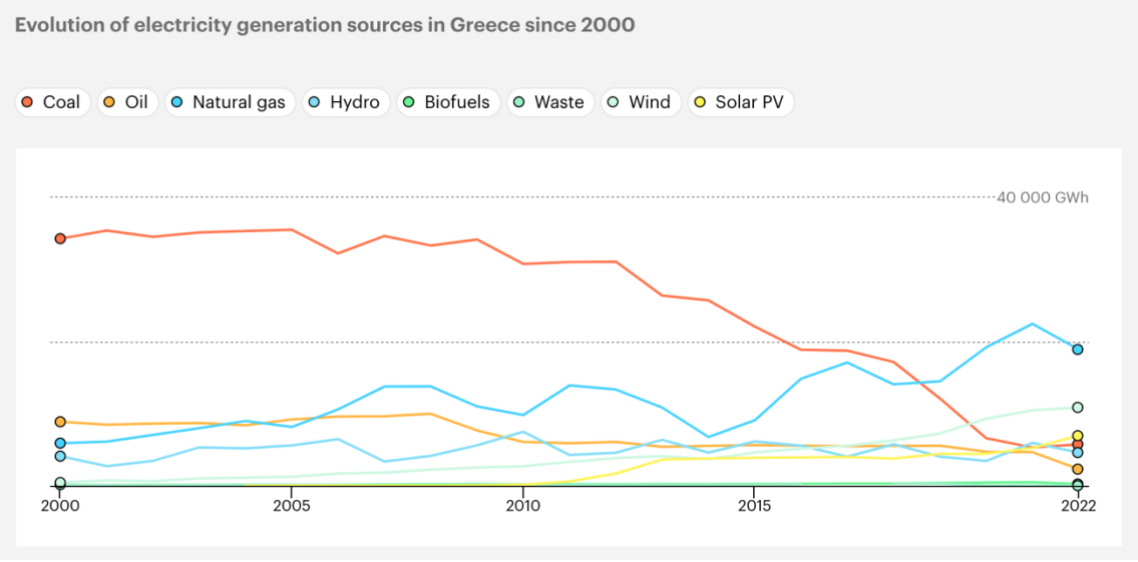


Figure 15. Electricity generation trajectory from various sources in Greece (IEA, 2024)

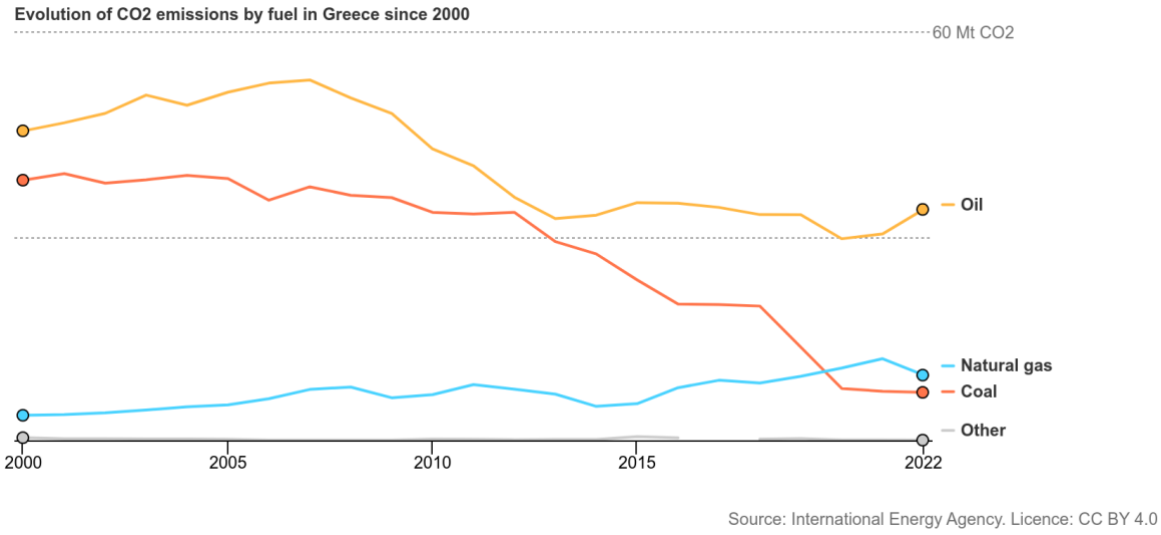
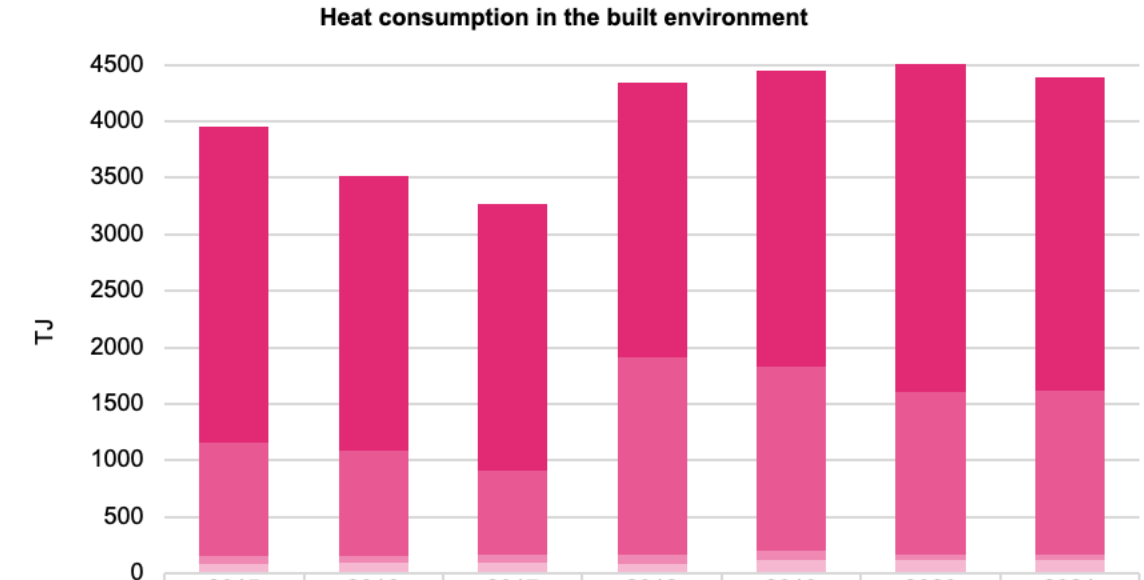


Figure 16. IEA trajectory for various sources of electricity in Greece according to the World Energy Organisation (IEA, 2024)

Contrary to electricity consumption, heat consumption has increased in recent years (Figure 17), with the largest increase occurring in the tertiary sector. Nevertheless, residences are the largest heat consumers within the Municipality (about 59% in 2019), with public buildings and industries following with small shares. Table 3 presents the detailed energy consumption in the built environment for the base year 2019.



	2015	2016	2017	2018	2019	2020	2021
Total	3949	3514	3264	4342	4444	4544	4387
Residential	2792	2429	2358	2430	2615	2933	2773
Commercial	1001	929	741	1741	1629	1438	1452
Institutional	68	58	66	83	81	53	39
Industry	88	98	99	88	119	120	123

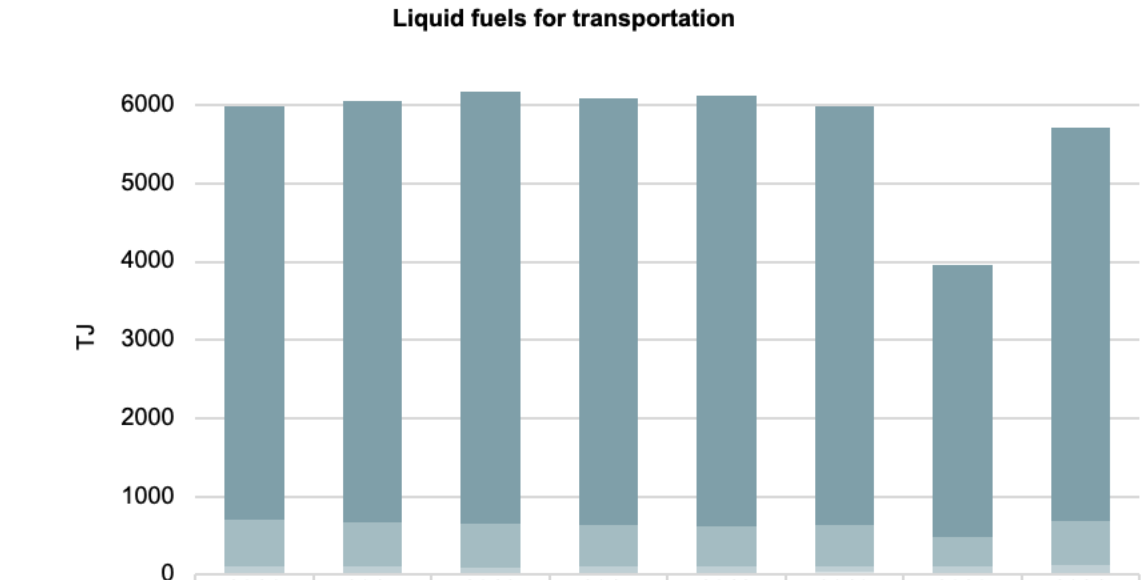
Figure 17. Heat consumption in buildings within the Municipality of Athens

Table 3. Final energy consumption by the built environment (A-1.1a)

Base year: 2019	Scope 1	Scope 2	Scope 3
Residential			
Diesel oil (TJ)	972		
Natural gas (TJ)	1,616		
Wood (TJ)	26		
Electricity (MWh)		1,182,180	
Commercial			
Diesel oil (TJ)	198		
Natural gas (TJ)	1,431		
Electricity (MWh)		1,286,972	
Institutional			
Diesel oil (TJ)	11		
Natural gas (TJ)	70		
Electricity (MWh)		243,439	
Streetlighting			
Electricity (MWh)		32,965	
Manufacturing industries and construction			
Crude oil (TJ)	58		
Natural gas (TJ)	61		
Electricity (MWh)		59,102	
Agriculture, forestry, and fishing activities			
Electricity (MWh)		23	

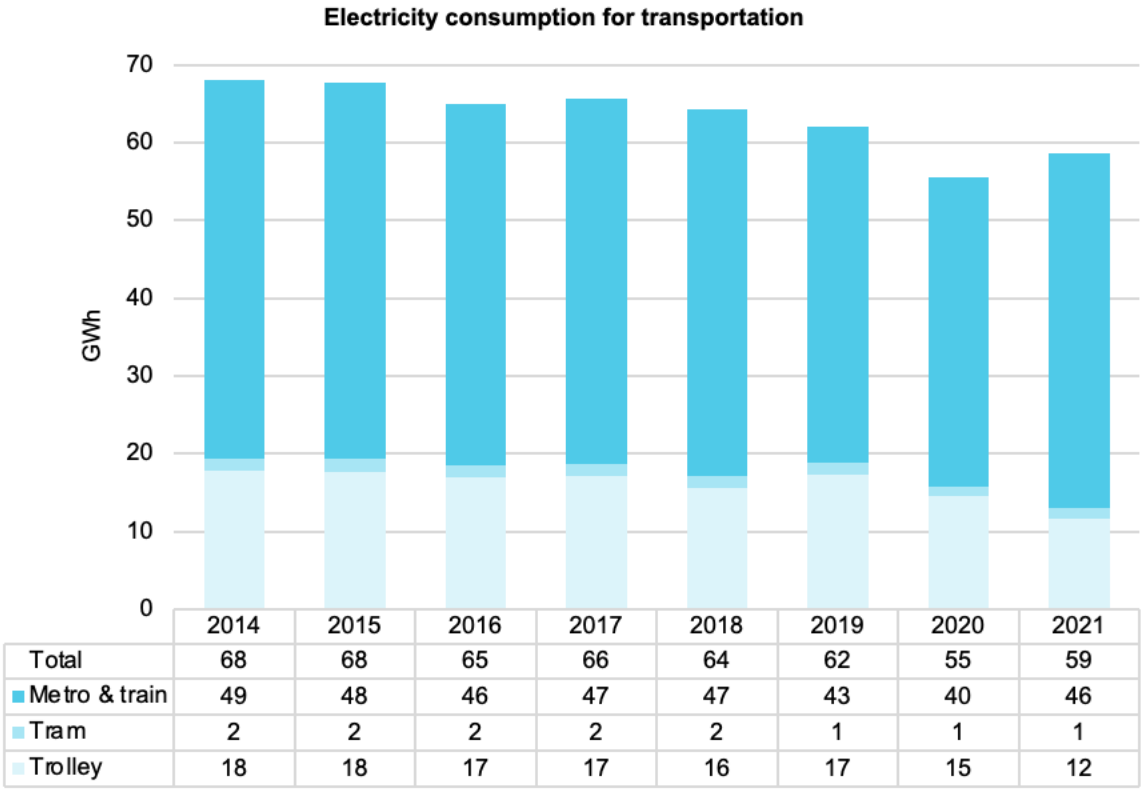
Source: CIRIS 2019 for the Municipality of Athens. For the building sector, Scope 1 includes direct emissions from buildings within the Municipality of Athens (e.g., gas-based heating), Scope 2 mainly includes emissions from the consumption of electricity, while Scope 3 includes emissions that take place outside the boundaries of the Municipality (e.g., network losses).

In the transport sector, over 90% of emissions come from burning liquid fuels in internal combustion engines. Figure 18 shows that the majority of these emissions come from the use of passenger cars within the Municipality of Athens (about 89% of the total consumption of liquid fuels), while the use of passenger cars comes second (9%). As can also be seen from the same figure, this consumption has remained almost at the same levels between 2014 and 2021, with the exception of the 2020 consumption levels that, due to the confinements associated with (state responses to) COVID-19, appears significantly reduced. Consumption (and therefore emissions) from public transport vehicles and buses is minimal compared to the first two categories and has also remained at similar levels in recent years. Similarly, total energy consumption associated with electricity-powered transport modes (Figure 19) is much lower (62 GWh in 2019, or 223.2 TJ) than that of cars and motorcycles (about 6,000 TJ). Most consumption comes from the operation of metro and trains, followed by that of trolleys and the tram network.



	2014	2015	2016	2017	2018	2019	2020	2021
Total	5984	6049	6165	6085	6127	5986	3963	5716
Cars	5281	5373	5509	5444	5502	5356	3475	5029
Motorcycles	589	569	556	539	522	513	375	563
Public vehicles	87	81	75	78	79	84	89	93
Buses	27	26	25	24	24	33	24	31

Figure 18. Liquid fuel consumption for transport and mobility within the Municipality of Athens ("BASIC" level)



	2014	2015	2016	2017	2018	2019	2020	2021
Total	68	68	65	66	64	62	55	59
Metro & train	49	48	46	47	47	43	40	46
Tram	2	2	2	2	2	1	1	1
Trolley	18	18	17	17	16	17	15	12

Figure 19. Electricity consumption for transport and mobility within the Municipality of Athens ("BASIC" level)

It is noted that the majority of emissions are due to inbound or outbound traffic, i.e., commuting from the Municipality of Athens to the neighbouring municipalities and vice versa, while emissions from internal traffic (explicitly within the Municipality) are considerably lower. For example, emissions in 2019 for internal traffic accounted for 35% of all emissions measured at the BASIC level and only 21% at the BASIC+ level (Google EIE, 2024). Final energy use for the Transport and Mobility sector in the base year 2019 is shown in Table 4.

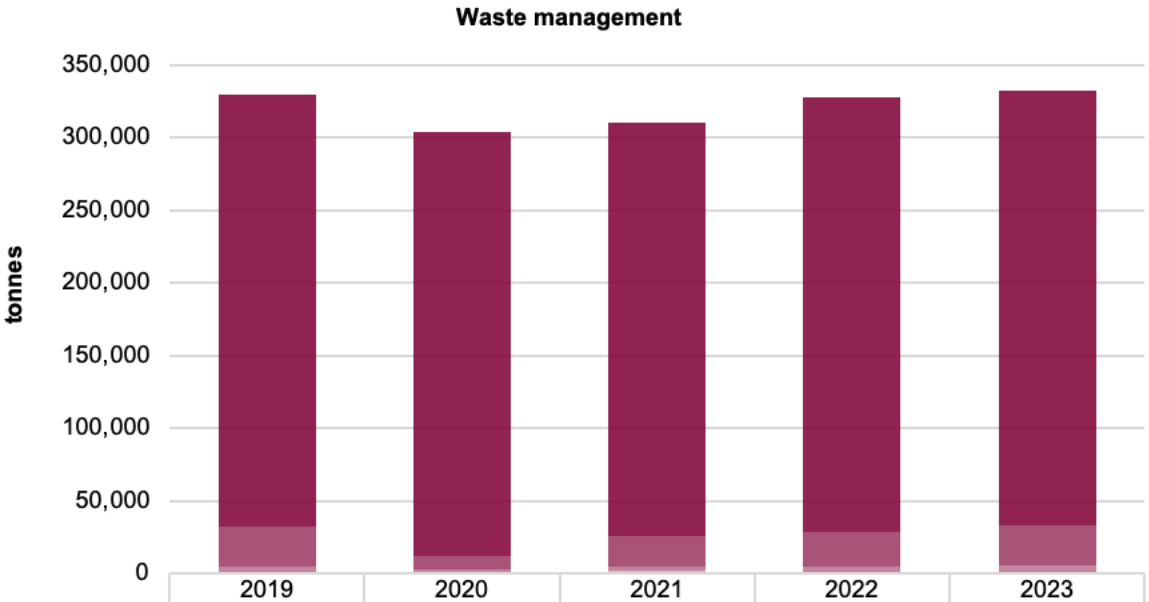
Table 4. Final energy use by the Transport & Mobility sector (A-1.1b)

Base year: 2019	Scope 1	Scope 2	Scope 3
Private automobiles			
Motor gasoline (TJ)	2,265		
Diesel oil (TJ)	2,249		
Other Liquid Biofuels (TJ)	320		
Liquefied Petroleum Gas (TJ)	521		
Private motorcycles			
Motor gasoline (TJ)	513		
Buses and trolleys			
Motor gasoline (TJ)	33		
Electricity (MWh)		17,319	
Metro, trains, and trams			
Electricity (MWh)		44,827	
Municipal vehicles (incl. for waste collection)			

Motor gasoline (TJ)	9		
Diesel oil (TJ)	74		

Source: CIRIS 2019 for the Municipality of Athens. For the transport & mobility sector, Scope 1 includes direct emissions due to vehicle traffic within the Municipality of Athens as well as half of the emissions from transboundary through the Municipality of Athens; Scope 2 includes emissions from electricity consumption for transport while Scope 3 mainly includes the other half of emissions from transboundary traffic.

The waste management sector is the third largest GHG sector of the Municipality of Athens and accounted for 12% of total emissions in 2019. The sector's emissions have been relatively reduced from 397 kt CO_2e in 2014 to 261 kt CO_2e in 2021. Most emissions come from burying solid waste in landfills (306 kt CO_2e in 2019) and to a much lesser extent from wastewater management at the Psittaleia wastewater centre (17 kt CO_2e in 2019). Figure 20 shows that most of the Municipality's solid waste ends up in landfills, while a small percentage is recycled (8% in 2019) and an even smaller share is composted (1% in 2019). These shares have remained at similar levels over the past five years, with the exception of 2020 where recycling decreased significantly, possibly due to the hygiene measures implemented for COVID-19.



	2019	2020	2021	2022	2023
Total	329,482	303,437	310,565	327,911	331,989
Landfill	297,238	291,198	284,628	298,953	298,898
Recycling	26,820	8,800	20,808	23,741	27,522
Composting	3,916	2,019	3,122	3,916	4,416
Incineration	1,508	1,421	2,007	1,301	1,153

Figure 20. Solid waste management by the Municipality of Athens (CIRIS 2019 and data from the Directorate of Cleanliness and Recycling of the Municipality of Athens)

Tables 5, 6 and 7 summarise important data of the CIRIS emission inventory of the Municipality of Athens for 2019, which was set as the base year for the calculation of the CCC emissions gap. This

data includes the GHG emission factors applied to the 2019 CIRIS, the detailed GHG emissions by sector calculated in the inventory, as well as aggregate measures of sector activities used in the model, such as total electricity and heat consumption and total solids of waste. It should be noted that the GHG coefficient for municipal waste is much higher than the corresponding coefficients of other cities because it is calculated based on the data at the Phylis Landfill, where the majority of the waste of the Municipality of Athens ends up.

Table 5. Emission factors applied (A-1.2)

Source (unit)	Carbon Dioxide (CO_2)	Methane (CH_4)	Nitrous Oxide (N_2O)	Total tCO_2e	Source and notes
Electricity (tCO_2e / MWh)	0.5987	0.0003	0.0015	0.6004	NIR, 2019 (Emission factor for national electricity generation)
Diesel oil for heating (tCO_2e / TJ)	73.7069	0.1894	0.6367	74.5331	NIR, 2019 (Common Reporting Format Tables)
Natural gas (tCO_2e / TJ)	55.7506	0.0384	0.0296	55.8187	
Wood (tCO_2e / TJ)	*	*	*	100.8643	
Crude oil (tCO_2e / TJ)	83.5200	0.5751	0.4529	84.5480	
Motor gasoline (tCO_2e / TJ)	73.2600	0.5747	0.4527	74.2874	
Diesel oil for vehicles (tCO_2e / TJ)	73.2300	0.1250	0.5598	73.9148	
Other Liquid Biofuels (tCO_2e / TJ)	68.8969	0.1501	0.6574	69.7045	
Liquefied Petroleum Gas (tCO_2e / TJ)	63.9200	0.2438	0.4333	64.5970	IPCC 5th Assessment Report (2013)
Municipal waste (tCO_2e / tonne)	-	0.0456	-	1.28	Emission factor calculated based on Methane Commitment Model (Eq 8.3 and 8.4 of GPC). Waste composition of 2019 for Greece is used (Table 7.9, NIR 2021) for equation 8.1. The specific characteristics of Fyli Landfill are taken into consideration regarding the fraction of methane in landfill gas and the amount of energy produced from biogas.

*Source: CIRIS 2019 inventory for Athens; * Emission factor for wood calculated directly in tCO_2e. Based on the National Inventory Report (NIR) of Greece to UNFCCC[11] and the IPCC 5th Assessment Report: Climate Change 2013[12]. Global Warming Potential (GWP) based on the IPCC SAR report.*

[11] https://unfccc.int/documents/272918
[12] https://www.ipcc-nggip.iges.or.jp/EFDB/main.php

Table 6. GHG emissions by source sectors (A-1.3)

Base year: 2019	Scope 1	Scope 2	Scope 3	Total	
	t CO_2e / year			t CO_2e / year	%
Built environment	276,956	1,683,901	*	1,960,857	71.1%
Transport & Mobility	437,354	37,312	*	474,666	17.2%
Waste & Wastewater	-	-	323,916	323,916	11.7%
Agricultural, Forestry and Land Use (AFOLU)	2	-	-	2	~0%
Total	**714,312**	**1,721,213**	**323,916**	**2,759,441**	**100%**

Source: CIRIS 2019 for the Municipality of Athens. Cells with an asterisk (*) are provided in CIRIS 2019 but are not included in this analysis, as the Climate City Contract considers BASIC level gas emissions, i.e. Scope 1 & 2 for the built environment and transport and all Scopes for waste and wastewater.

Table 7. Activity by Source Sector (A-1.4)

Base year: 2019	Scope 1	Scope 2	Scope 3
Electricity			
Electricity demand within city boundaries (GWh/year)	-	2,867	-
Transport & Mobility			
Transport need - passenger cars + motorcycles (M km/year)	2.103	-	-
Transport need - buses (M km/year)	7	-	-
Transport need - trains/metro (M km/year)	5	-	-
Transport need - light duty trucks (<3.5 t) (M km/year)	55	-	-
Transport need - heavy duty trucks (>3.5 t) (M km/year)	156	-	-
Buildings & Heating			
Heating demand (space heating + domestic hot water) (GWh/year)	1,201	-	-
Waste			
Collected waste within city boundaries (tonnes)	-	-	329,482
Other (incl. IPPU & AFOLU)	-	-	-

Source: Data inputs for the Municipality of Athens to the NZC economic model (Material Economics, 2020) [model run: July 2024].

In conclusion, although emissions in most sectors have decreased from 2014 to 2021, the decrease is mainly due to changes outside the Municipality's control (such as the delignitisation of the national electricity mix) rather than to more direct actions, relating e.g. to the amount of waste collection or the energy consumption in buildings and transport. In fact, there are indications that energy consumption

will increase in 2024 and perhaps in the coming years unless dedicated measures are taken. June 2024 marked the 13th consecutive month of record-breaking global temperatures, and the 12th in a row above 1.5°C with respect to pre-industrial levels [13], inter alia leading to continuous heatwaves in summer 2024 in Athens and therefore to increased electricity consumption for air conditioning of buildings. Also, judging by the first half of 2024, the Directorate of Cleanliness and Recycling of the Municipality of Athens estimates an annual increase in the amount of waste by 10%, possibly due to increased tourist flows as well as an increase in the consumption of food deliveries. Increased tourism beyond the summer season and throughout the year substantially increases the population estimate, further affecting the Municipality's emissions. All of these factors will be examined in greater detail in future CCC updates and used to update the City's emissions estimates (see Section 5 for next steps).

It is evident that there are significant opportunities to reduce emissions across sectors, with electricity GHG emissions in the built environment being top priority, mainly through the use of RES and measures for consumption reduction, followed by transport GHG emissions by means of reduction of private vehicle use, and then by solid waste-related emissions by boosting recycling and composting. The following sections of Part A focus on existing climate policies and the potential barriers and opportunities to reduce emissions as well as the emissions gap between the 2030 GHG reduction projected by existing policies and the climate neutrality goal envisioned. This emissions gap will be covered by the measures and strategies discussed in Part B, with the support of other agencies and stakeholders listed and discussed in Part C.

13 https://climate.copernicus.eu/copernicus-june-2024-marks-12th-month-global-temperature-reaching-15degc-above-pre-industrial

2.2. Module A-2 – Current Policies and Strategies Assessment

This section documents and assesses existing policies, strategies, initiatives, or regulations from the local, regional, and national level, related to the city's transition towards climate neutrality. This assessment helps to identify the gap between the reduction of GHG emissions due to existing initiatives and the city's 2030 climate neutrality target. Bridging this gap by identifying additional actions and mechanisms to achieve the target of reducing the city's emissions is the main subject of this Action Plan. Assessing current policies and strategies also provides a starting point for exploring barriers and opportunities (see Module A-3).

2.2.1. Policy analysis

Beyond the compatibility that the CCC must have with the policies of all other levels of government, national and regional policies are particularly important since they affect areas over which the Municipality has no control/jurisdiction. For example, the Municipality has no say in the country's electricity network, so national policies to strengthen the network infrastructure will be key to Athens' climate neutrality. Similarly, the Municipality does not have significant authority over most public transport modes and networks, meaning that regional and/or national transport policies such as the construction of metro line 4 or the electrification of buses will directly affect the City's strategy to reduce emissions. Nonetheless, the Municipality will act as a mediator with the Government, the Region, and the European institutions in order to proceed with key actions that will allow the Municipality to reach climate neutrality by 2030. More details about the Municipality's actions regarding participation and communication with other bodies are given in Part C)

Table 9 includes a brief overview of 16 policies and strategies at local, regional, national, and European levels of relevance to Athens' climate action. The following tables A-2.1.1 to A-2.1.16 further analyse the policies, identifying relevant objectives and priorities, their scope (e.g., buildings or transport), their precise relevance to the CCC of Athens as well as their implications for its climate neutrality goal. It is noted that the following list does not include funding programmes, such as ELEKTRA for the energy upgrade of public buildings and the Development and Solidarity Programme for the Local Government "Antonis Tritsis". All relevant financing programmes are analysed in the Investment Plan of the Athens CCC.

Table 8. Overview of relevant policies, strategies, action plans (A-2.1)

Name	Type	Level	Description
Athens' Climate Action Plan 2022	Action plan	Local	The Climate Action Plan (2022) of the Municipality of Athens updates the previous Climate Plan (2017) as well as the Athens Resilience Strategy for 2030 with the aim of climate neutrality in 2050 and the adaptation of the city to the effects of the climate crisis.
Sustainable Urban Mobility Plan (SUMP)	Action plan	Local	Based on Law 4784/2021[14], the Sustainable Urban Mobility Plan is a strategic plan for Local Government Organisations designed with the

[14] https://www.et.gr/api/DownloadFeksApi/?fek_pdf=20210100040

of the Municipality of Athens			aim of sustainably meeting the needs for the mobility of citizens and the transport of goods in the urban and peri-urban areas. The Municipality of Athens prepared the SUMP for Athens with the aim of improving the quality of its citizens' lives and reducing energy consumption and corresponding emissions from transport.
Electric Vehicle Charging Scheme (EVS)	Action plan	Local	This plan includes a strategy for the location of publicly accessible recharging points for electric vehicles (EV) and EV parking spaces, developed by municipalities within their administrative boundaries. The Municipality of Athens completed the EV Charging Plan in 2022 with the construction of 545 EV charging points.
Regional Plan for Adaptation to Climate Change (PESPKA) of Attica	Strategy	Regional	The plan assesses the potential impacts of climate change on the Attica region, focusing on how climate risks might manifest themselves in the 21st century in the case of inaction. The PESPKA also studies the interaction of climate with socio-economic factors, the effects and prioritisation of various adaptation actions against climate risks, the effect of compound interactions of various risks and the assessment of uncertainties in relevant analyses and estimates.
National Energy and Climate Plan (NECP)	Strategy	National	The National Energy and Climate Plan (NECP) of Greece includes a detailed action plan to achieve comparable Energy and Climate Goals by the year 2030 as well as the country's long-term strategy to achieve climate neutrality for the year 2050.
National Climate Law (Law 4936/2022)	Legislation	National	Following the European Climate Law of 2021[15], the National Climate Law of Greece establishes a coherent framework for the country 's adaptation and resilience to climate change and the gradual transition to climate neutrality by the year 2050, in an environmentally sustainable, socially just, and cost-effective way.
National Strategy for Adaptation to Climate Change (ESPKA)	Strategy	National	The ESPKA is a text of strategic orientation with the aim of drawing up guidelines to strengthen the country's resilience to the effects of climate change. As such, it does not analyse in depth the necessary sectoral policies, nor does it decide on the feasibility of individual adaptation measures and actions at the local/regional level, issues that are examined in more detail within the Regional Climate Change Adaptation Plans.

[15]https://climate.ec.europa.eu/eu-action/european-climate-law_en

National Action Plan to promote Green Public Procurements	Action plan	National	This plan aims to promote the Green Public Procurements in Greece, as defined by the European Commission as the processes "whereby public authorities seek to procure goods, services, and works with a reduced environmental impact throughout their life cycle."
National Waste Prevention Program	Strategy	National	The National Waste Prevention Programme concerns the development of a coordinated approach to creating the conditions for lower consumption of raw materials and the transformation of consumption patterns, with the ultimate goal of achieving a gradual reduction in waste production.
National Waste Management Plan	Strategy	National	The National Waste Management Plan is the country's strategic and political planning for waste management based on Law 4936/2020. The preparation of the plan is an obligation of the EU member states and covers a period of 10 years with an evaluation every five years.
Integrated Framework for Waste Management (Law 4819/2021)	Legislation	National	Within this framework, measures for the protection of the environment and human health aimed at preventing the production of waste, reducing the negative consequences of waste production and management, increasing recycling, limiting the overall impact of the use of resources, and improving their efficiency with the aim of transitioning to a circular economy.
European Green Deal	Strategy	EU	The European Green Deal is the EU's strategy to put its member states on a low-carbon path towards the ultimate goal of achieving climate neutrality by 2050. The strategy takes a holistic and cross-sectoral approach to transform the EU into a fair and prosperous society with a competitive and sustainable economy.
Fit for 55	Policy	EU	The Fit for 55 package is a series of proposals for the review and update of EU legislation, defining new initiatives to ensure that EU policies are consistent with the climate goals agreed by the Council and the European Parliament, especially with regard to the European Green Deal.
Energy Performance of Buildings Directive	Legislation	EU	Together with the revised European Energy Performance Directive and the "Renovation Wave" strategy in the EU, the Energy Performance of Buildings Directive will help to achieve a high energy-efficient and zero-emission building stock by 2050 and the creation of a stable investment environment, while enabling consumers and businesses to make

			more informed choices to save energy and money.
Renewable Energy Directive	Legislation	EU	Building on the 2009 and 2018 directives, this revision introduces stricter measures to ensure that all potential for the further development and adoption of renewable energy sources is fully exploited.
New Circular Economy Action Plan	Action plan	EU	The EU's transition to a circular economy will reduce pressure on natural resources and is also a prerequisite for achieving the EU's 2050 climate neutrality target and halting biodiversity loss. The new action plan includes initiatives for energy, emissions, and material reductions throughout the life cycle of the products. It targets the way products are designed, promotes circular economy processes, encourages sustainable consumption, and aims to ensure that waste is prevented, and resources used remain in the EU economy for as long as possible.

Table 9. Detailed description of policies – Athens' Climate Action Plan 2022 (A-2.1.1)

Athens' 2022 Climate Action Plan	
Description	The Climate Action Plan (2022) of the Municipality of Athens updates the previous Climate Plan (2017) as well as the Athens Resilience Strategy for 2030 towards climate neutrality in 2050 and effective adaptation of the city to the effects of climate change.
Goals / priorities	The main objectives of the plan until 2030 included: ● a 61% reduction in GHG emissions (compared to 2018) ● Providing at least 70% of the city's population with access to a green space with ecosystem services within a 15-minute walk radius. ● at least 30% of the Municipality to be covered with green spaces and/or permeable surfaces. The plan is based on the following priorities: ● Energy production from Renewable Energy Sources (RES) and energy upgrades in the built environment ● Acceleration of the transition to sustainable and smart mobility, ● Urban revitalisation, incorporating green and blue infrastructure ● Management and restoration of ecosystems and biodiversity ● Prevention and response to climate risks ● Circularity performance and sustainable water and waste management ● Transition to a green and digital city More information on the 2022 plan and its differences with the Climate City Contract is provided in Sections 1.5 and 1.6 of the Introduction.
Year of publication	2022
Type	Action plan
Policy level	Local
Scope	All sectors
Relevance to the Athens Climate Agreement	Direct relevance since the Climate City Contract builds on this predecessor plan, increasing the ambition in terms of measures and strategies proposed to achieve climate neutrality in 2030, instead of 2050.
Impacts on the climate neutrality of Athens	The 2022 Action Plan aimed to reduce emissions by at least 61% by 2030, while the new Climate City Contract raises this target to 80%.
Source	https://www.cityofathens.gr/wp-content/uploads/2022/08/schedio-gia-tin-klimatiki-allagi-9-6-2022.pdf

Table 10. Detailed description of policies – Sustainable Urban Mobility Plan of the Municipality of Athens (A-2.1.2)

Sustainable Urban Mobility Plan (SUMP) of the Municipality of Athens	
Description	Based on Law 4784/2021[16], the Sustainable Urban Mobility Plan is a strategic plan for Local Government Organisations designed with the aim of sustainably meeting the needs for the mobility of citizens and the transport of goods in the urban and peri-urban areas. The Municipality of Athens prepared the SUMP for Athens with the aim of improving the quality of life of its residents and reducing energy consumption and the corresponding GHG emissions from transport.
Goals / priorities	The SUMP of the Municipality of Athens prescribes the following priorities: 1. Ensuring safe and comfortable travel on foot, with particular emphasis on meeting the needs of vulnerable categories of commuters and people with mobility problems. 2. Improving the level and quality of service provided by public transport. 3. Improving existing, and increasing, open and green spaces 4. Improving road safety and protecting commuters by any means 5. Efficient parking management 6. Better traffic management and in residential areas 7. Promoting biking 8. Protecting the centre and neighbourhoods from transboundary motorised traffic 9. Implementing policies to discourage unnecessary car use 10. Promoting clean vehicles
Year of publication	2021
Type	Action plan
Policy level	Local
Scope	Transportation & Mobility
Relevance to the Athens Climate Agreement	Direct relevance since the Athens CCC also draws on the SUMP, expanding the measures and strategies proposed to achieve climate neutrality.
Impacts on the climate neutrality of Athens	The SUMP does not calculate nor set a target for the transport sector's GHG emissions. However, it contains targets for relevant indicators such as the percentage of car travel and pedestrian travel that are considered in the CCC. The objectives can be seen in detail on pages 70-73 of the SUMP at the link below.
Source	https://www.cityofathens.gr/wp-content/uploads/2023/06/svak-dimou-athinaion-2021.pdf

[16] https://www.et.gr/api/DownloadFeksApi/?fek_pdf=20210100040

Table 11. Detailed description of policies – Electric Vehicle Charging Plan of the Municipality of Athens (A-2.1.3)

Electric Vehicle Charging Plan of the Municipality of Athens	
Description	The plan includes a strategy for the installation of publicly accessible recharging points for electric vehicles (EV) as well as EV parking spaces, developed by the municipalities within their administrative boundaries. The Municipality of Athens completed the EV Charging Plan in 2022 with the installation of 545 EV charging points.
Goals / priorities	The 545 charging points and EV parking spaces were placed in consideration of spatial, urban planning, transportation and social characteristics, as well as the views of the Municipality's bodies and citizens, using a methodology for projecting trends in electric mobility. In more detail, the following are provided for: ● 483 points for private passenger cars ● 26 points for taxis ● 15 points for supply trucks ● 2 points for tourist buses ● 19 points for disability & wheelchair accessible vehicles Figure 21 on the next page shows a map of the 545 charging points. The EV Charging Plan of the Municipality of Athens was developed with the financial support of the Green Fund, while the gradual installation of the charging stations is expected to be completed by 2027.
Year of publication	2022
Type	Action plan
Policy level	Local
Scope	Transportation & Mobility
Relevance to the Athens Climate Agreement	Athens' CCC considers the EV Charging Plan and further reinforces the installation of charging points based on the increased needs for reducing emissions in transport and mobility.
Impacts on the climate neutrality of Athens	The charging points are essential for the enhancement of electric mobility, which is expected to play an important role in the reduction of GHG emissions in transport and mobility.
Source	https://www.cityofathens.gr/oloklirosi-schedioy-fortisis-ilek/

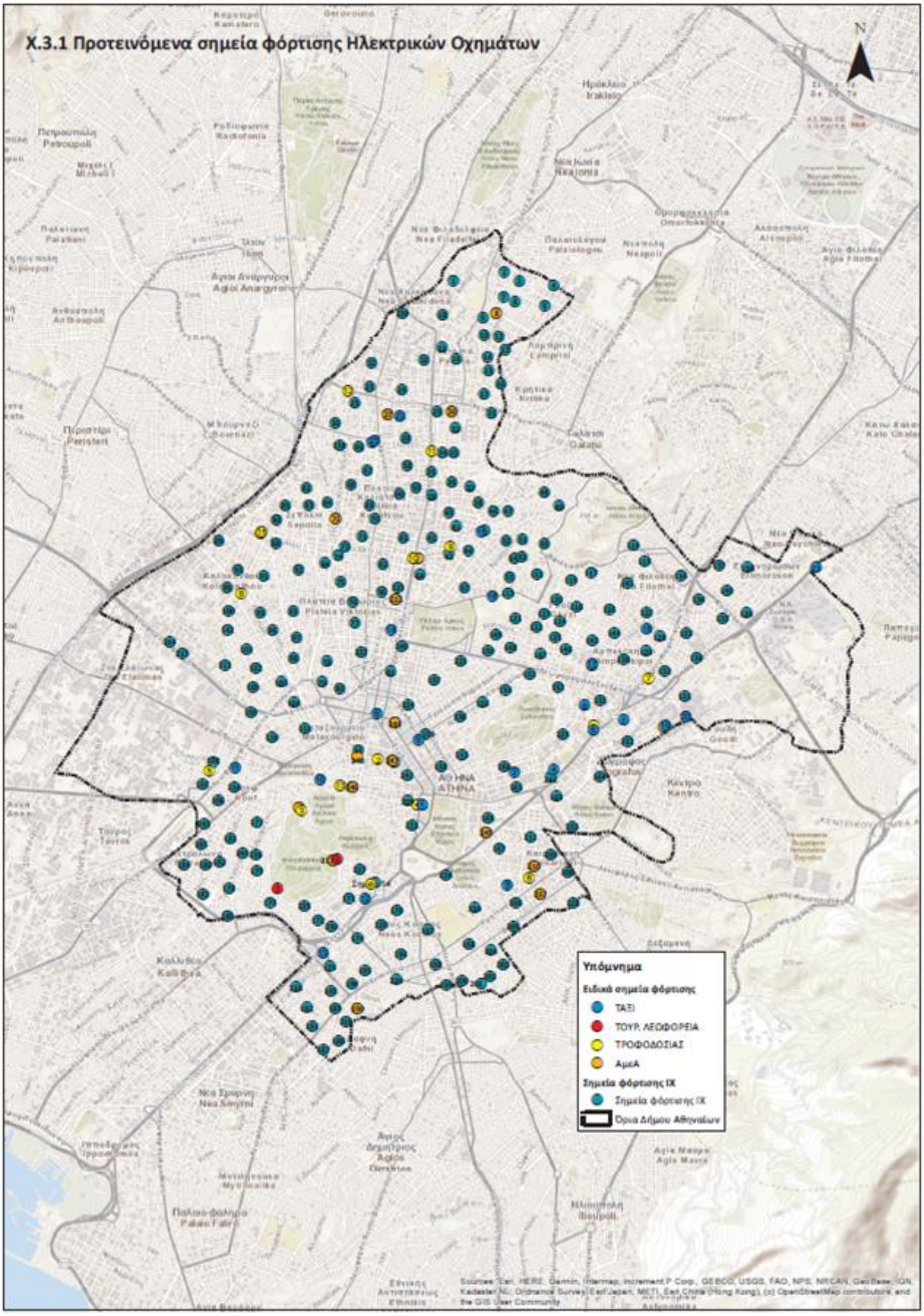


Figure 21. Charging points recommended by the Electric Vehicle Charging Plan of the Municipality of Athens

Table 12. Detailed description of policies – Regional Plan for Adaptation to Climate Change for the region of Attica (A-2.1.4)

Regional Plan for Adaptation to Climate Change (PESPKA) for the region of Attica	
Description	The plan assesses the potential impacts of climate change on the Attica region, focusing on how climate risks might manifest themselves in the 21st century in the absence of action. The PESPKA also studies the interaction of climate with socio-economic factors, the effects and prioritisation of various adaptation actions against climate risks, the effect of compound interactions of risks and the assessment of uncertainties in analyses and estimates.
Goals / priorities	The plan analyses vulnerability, risks and possible adaptation measures for 10 sectors in the Attica region. Specifically for the Municipality of Athens, the most relevant sectors are the following: ● Water Resources & Floods: A decrease in the supply of water-to-water systems, an increase in evaporation and transpiration, an increase in irrigation needs and possibly tourism needs are expected. In this respect, the plan includes a series of measures on water resources and catastrophic flooding. ● Tourism: It is proposed to rebrand the Greek tourist product and reduce touristic flows during the particularly hot season. ● Infrastructure: Improving the capacity to respond to extreme weather events by strengthening the adaptability of the road network and other infrastructure. ● Health: Heat events are expected to become more frequent and intense with climate change. Investment in research on diseases likely to be exacerbated by climate change is needed, as is training for health professionals. ● Built environment and cultural heritage: The Urban Heat Island phenomenon is expected to intensify. The plan stresses the need for valid and coherent data to effectively address this phenomenon.
Year of publication	2022
Type	Strategy
Policy level	Regional
Scope	All sectors are indirectly affected, especially green infrastructure supporting the reduction of GHG emissions and climate resilience.
Relevance to the Athens Climate Agreement	The plan outlines directions for the adaptation measures that will be needed in the Municipality of Athens, and which can affect the measures of the CCC, especially in terms of green infrastructure.
Impacts on the climate neutrality of Athens	It has no direct impact on the city's climate neutrality. However, it features references to important interactions between climate change adaptation and mitigation measures, e.g., targeted tree planting improves adaptation from floods while also reducing emissions.
Source	https://www.patt.gov.gr/koinonia/perivallon/pespka/pespka_ye1/

Table 13. Detailed description of policies – National Energy and Climate Plan (A-2.1.5)

National Energy and Climate Plan (NECP)	
Description	The National Energy and Climate Plan (NECP) of Greece includes a detailed action plan to achieve comparable Energy and Climate Goals by the year 2030 as well as the country's long-term strategy to achieve climate neutrality for the year 2050.
Goals / priorities	The latest NECP update (currently in consultation/being debated) include a 58.6% GHG reduction by 2030 (against the European target of 55%) and a 45.4% share of RES in gross energy consumption (against the European target of 42.5%) and in gross electricity consumption by 76.8% (against the European target of 69%). Other measures include: ● Continuous phaseout of lignite production, with the goal of zero lignite-powered electricity after 2028. ● Connecting the non-interconnected islands to the interconnected system by 2030. ● Strong emphasis on the development of offshore wind farms with the aim of the first projects being operational in 2030. ● Development of sufficient power and capacity of energy storage systems (batteries and pumped storage). ● D emend response measures. ● Further electrification of final energy consumption with an emphasis on buildings and transport, as well as the promotion of self-generation systems from RES.
Year of publication	Initial plan: 2019 (draft in 2018), latest update (currently in consultation): August 2024 (draft in 2023)
Type	Strategy
Policy level	National
Scope	All sectors
Relevance to the Athens Climate Agreement	Direct relevance since the Athens' Climate City Contract largely draws on the NECP's objectives, in terms of actions in power generation to achieve an 80% GHG reduction in 2030.
Impacts on the climate neutrality of Athens	The new NECP is more ambitious than the Climate Law, increasing the GHG reduction to at least 58.6%, compared to 1990. This can be considered as the minimum reduction in the GHG emissions of the Municipality of Athens if it were not for the increased ambition of the CCC. The target for RES in electricity generation also plays an important role, as it affects the GHG emissions of electricity generation for the needs of the Municipality of Athens, which is the most important source of emissions as shown in chapter 2.1.
Source	Last update of 2024: http://www.opengov.gr/minenv/wp-content/uploads/2024/08/Εθνικό-Σχέδιο-για-την-Ενέργεια-και-το-Κλίμα-ΕΣΕΚ_αναθεωρημένη-έκδοση.pdf

Table 14. Detailed description of policies – National Climate Law (A-2.1.6)

National Climate Law	
Description	Following the European Climate Law of 2021 [17], the National Climate Law of Greece establishes a coherent framework for the country 's adaptation and resilience to climate change and the country's gradual transition to climate neutrality by the year 2050, in an environmentally sustainable, socially just, and cost-effective way.
Goals / priorities	Beyond the achievement of climate neutrality in 2050, the reduction of net anthropogenic GHG emissions by at least 55% and 80%, respectively, compared to the base year 1990, are defined as intermediate climate goals for the years 2030 and 2040. The individual objectives of the National Climate Law include the following: • The preparation of a National Strategy for Adaptation to Climate Change (ESPKA) and Regional Plans for Adaptation to Climate Change (PESPKA). The PESPKA are harmonised with the ESPKA, specifying its directions, to achieve its goals at the regional level. • Development of sectoral carbon budgets • Ban on electricity production from solid fossil fuels from 31 December 2028 • Elaboration of Municipal Emission Reduction Plans
Year of publication	2022
Type	Legislation (Law 4936/2022)
Policy level	National
Scope	All sectors
Relevance to the Athens Climate Agreement	The National Climate Law prescribes the preparation of a Municipal Emission Reduction Plan for each municipality, which is fulfilled for Athens with the creation of the 2022 Climate Action Plan and the Climate City Contract.
Impacts on the climate neutrality of Athens	The established target of 55% GHG reduction in 2030 can be a case for the minimum GHG reduction that would have taken place in the Municipality of Athens in 2030 had it not been for the 2022 Climate Action Plan and the CCC, which raise this ambition to 61% and (now) 80%, respectively. Also, the ban on the production of electricity from solid fossil fuels will significantly reduce the emissions of electricity generation, which are the most important for the Municipality.
Source	https://civilprotection.gov.gr/sites/default/files/2023-01/Εθνικός Κλιματικός Νόμος 4936_2022.pdf

[17] https://climate.ec.europa.eu/eu-action/european-climate-law_en

Table 15. Detailed description of policies – National Strategy for Adaptation to Climate Change (A-2.1.7)

National Strategy for Adaptation to Climate Change (NSCA)	
Description	The ESPKA is a text of strategic orientation with the aim of drawing up guidelines to strengthen the country's resilience to the effects of climate change. As such, it does not analyse in depth the necessary sectoral policies, nor does it decide on the feasibility of individual adaptation measures and actions at the local/regional level, issues that are examined in more detail in the Regional Climate Change Adaptation Plans.
Goals / priorities	The main objectives of ESPKA are: ● The systematisation and improvement of the (short- and long-term) decision making process related to adaptation ● Linking adaptation to the promotion of a sustainable development model through regional/local action plans ● The promotion of adaptation actions and policies in all sectors of the Greek economy with an emphasis on the most vulnerable ● The creation of a mechanism for monitoring, evaluating, and updating adaptation actions and policies ● Strengthening the adaptive capacity of Greek society through information and awareness actions. The guiding principles of ESPKA are compatibility between policies, alignment with the latest scientific evidence, citizen participation and consultation, social acceptance and development.
Year of publication	It was issued in 2016 and will be renewed through the European project LIFE – IP AdaptInGR.
Type	Strategy
Policy level	National
Scope	All sectors are indirectly affected, especially green infrastructure.
Relevance to the Athens Climate Agreement	Indirectly, it defines the guidelines for the Regional Climate Change Adaptation Plan of the Attica Region, which in turn influences the adaptation measures of the Municipality of Athens.
Impacts on the climate neutrality of Athens	It has no direct impact on the city's climate neutrality. However, it features references to important interactions between climate change adaptation and mitigation measures, e.g., targeted tree planting improves adaptation from floods while also reducing emissions.
Source	https://ypen.gov.gr/perivallon/klimatiki-allagi/prosarmogi-stin-klimatiki-allagi/

Table 16. Detailed description of policies – National Action Plan for the promotion of Green Public Procurement (A-2.1.8)

National Action Plan for the promotion of Green Public Procurement	
Description	The project aims to promote Green Public Procurements (GPP) in Greece, as defined by the European Commission as the processes "whereby public authorities seek to procure goods, services, and works with a reduced environmental impact throughout their life cycle."
Goals / priorities	● The establishment and implementation of a basic level of adoption of green criteria in public procurement of products, services, and projects. ● The gradual increase in the supply of green products and provision of green services over the next three years in specified sectors of goods, services, and projects. ● The wider integration of product life cycle costing into public procurement. ● Dissemination of the environmental and economic benefits of GPP. ● The awareness and active participation of those involved, such as contracting authorities and economic operators, in the GPP process. ● Monitoring the achievement of goals and updating them.
Year of publication	The first action plan was issued in 2020 and was implemented until 2023.
Type	Action plan
Policy level	National
Scope	All sectors
Relevance to the Athens Climate Agreement	Indirectly, it affects all procurement processes of the Municipality in a greener direction, albeit without defining any target that affects the Athens CCC.
Impacts on the climate neutrality of Athens	There is no quantified estimate as to how much GPPs will help the Municipality's pathway towards climate neutrality, but they are expected to create a more favourable environment for its achievement.
Source	https://gge.mindev.gov.gr/tomeas-dimosion-simvaseon/ethniko-sxedio-drasis-prasines-dimosies-simvaseis/

Table 17. Detailed description of policies – National Waste Management Plan (A-2.1.9)

National Waste Management Plan	
Description	The National Waste Management Plan is the country's strategic and political waste management planning based on Law 4936/2020. The preparation of the plan is an obligation of the EU member states and covers a period of 10 years with an evaluation every five years.
Goals / priorities	The plan describes measures and initiatives to prevent waste generation, promote re-use, increase recycling rates, promote the market for secondary materials, inform and raise awareness among citizens, rapidly develop bio-waste and recyclable material collection networks, create modern facilities for waste and bio-waste management and the utilisation of waste fuels. Among the objectives included in the plan are the following: ● Landfill target of less than 10% in the year 2030 (5 years earlier than corresponding European provisions) ● Reduction of biological and degradable waste (paper and organic) sent to landfills to 35% (by weight) compared to the production levels of the specific waste in 1997.
Year of publication	Issued in 2020, amended in 2023.
Type	Strategy (Cabinet Act 39/31.8.2020, Amending Act 5/18.4.2023)
Policy level	National
Scope	Waste & Circular Economy
Relevance to the Athens Climate Agreement	The quantitative targets defined at the national level also concern Athens. Although they have not been fully legislated, they can be a point of reference for the Municipality's goals for recycling and reducing the amount of waste and processing it in landfills.
Impacts on the climate neutrality of Athens	The goals and measures defined by the framework positively affect the efforts of the Municipality of Athens to reduce emissions from its waste management.
Source	https://ypen.gov.gr/wp-content/uploads/2021/02/εγκριση-ΕΣΔΑ.pdf https://www.elinyae.gr/sites/default/files/2023-04/94A_2023.pdf

Table 18. Detailed description of policies – National Waste Prevention Programme (A-2.1.10)

National Waste Prevention Programme	
Description	The National Waste Prevention Programme concerns the development of a coordinated approach to create the conditions for less consumption of raw materials and the transformation of consumption patterns, with the goal of achieving a gradual reduction in waste production.
Goals	Among the general quality objectives are the following: ● Promoting circular consumption, informing, raising awareness and providing citizens with tools to move from a linear to a circular model of behaviour and consumption. ● Utilisation of the Just Transition Mechanism to support projects focusing on circularity performance. ● Adoption of waste reduction targets for specific streams as part of a wider set of measures aimed at preventing waste generation. ● Promotion of the perception that waste is a resource to be exploited in the wider context of the Circular Economy, with a particular emphasis on single-use plastic products, as well as food. ● Development and promotion of a new industrial strategy to encourage circularity in the production process, prevent waste generation and improve the characteristics of the produced waste. The quantitative targets proposed by the plan include: ● Contributing to the UN target of a 50% reduction in per capita food waste at retail and consumer level, as well as reducing food losses by 2030. ● Reduction of consumption of single-use plastic products by 30% by 2024 and by 60% by 2026.
Year of publication	Issued in 2021, approved in 2022.
Type	Strategy (Act of the Council of Ministers 11 / 29. 4. 202 2)
Policy level	National
Scope	Waste & Circular Economy
Relevance to the Athens Climate Agreement	The goals set at the national level in the framework also concern Athens and affect the CCC. Although these objectives appear relatively changed in the Integrated Waste Management Framework, they can be a reference point for the Municipality's objectives.
Impacts on the climate neutrality of Athens	The goals and measures defined by the framework positively affect the effort of the Municipality of Athens to reduce the emissions caused by its waste management.
Source	http://www.opengov.gr/minenv/wp-content/uploads/downloads/2021/03/EPPDA_04-03-2021_-final-ΔΙΑΒΟΥΛΕΥΣΗ.pdf https://pedmede.gr/wp-content/uploads/2022/05/φεκ-83.pdf

Table 19. Detailed description of policies – Integrated Framework for Waste Management (A-2.1.11)

Integrated Framework for Waste Management (Law 4819/2021)	
Description	This framework adopts measures to protect the environment and human health aimed at preventing waste production, reducing the negative consequences of waste production and management, increasing recycling, limiting the overall impact of resource use, and improving their efficiency with the aim of transitioning to a circular economy. At the same time, it contains provisions concerning the organisation and operation of the Hellenic Recycling Organisation, while other related issues are also regulated.
Goals / priorities	Among the various measures proposed by the framework are the following quantitative recycling targets for the end of 2030: ● Recycling of at least 70% (by weight) of all packaging waste. The aim for the various materials in the packaging is as follows: ○ 55% of plastics ○ 30% of wood ○ 80% of iron metals ○ 60% of aluminium ○ 75% of the glass ○ 85% of paper and cardboard ● 30% reduction in relation to food waste produced in the year 2022 of food waste per capita at retail and consumer level.
Year of publication	2021
Type	Legislation
Policy level	National
Scope	Waste & Circular Economy
Relevance to the Athens Climate Agreement	The quantitative targets defined at the national level in the framework also apply to Athens and are a point of reference for the Municipality's targets for recycling and reducing the amount of waste and processing it in landfills.
Impacts on the climate neutrality of Athens	The goals and measures defined by the framework positively affect the effort of the Municipality of Athens to reduce the emissions caused by its waste management.
Source	https://www.elinyae.gr/sites/default/files/2021-07/129A_2021.pdf

Table 20. Detailed description of policies – European Green Deal (A-2.1.12)

European Green Deal	
Description	The European Green Deal is the EU's strategy to put its member states on a pathway towards the goal of achieving climate neutrality by 2050. The strategy takes a holistic and cross-sectoral approach to transform the EU into a fair and prosperous society with a competitive and sustainable economy.
Goals / priorities	● Net zero greenhouse gas emissions by 2050. ● Economic development is decoupled from the use of resources. ● No one (and no region) left behind
Year of publication	2019
Type	Strategy
Policy level	European
Scope	All areas of GHG
Relevance to the Athens Climate Agreement	Indirectly, as the Cities Mission (under which the CCC is being drawn up) will help create frontrunning cities that will achieve the European Green Deal's goal of climate neutrality as early as in 2030, paving the way for other cities to make it by 2050.
Impacts on the climate neutrality of Athens	Directly, since the objectives of the European Green Deal also apply to Athens and, in fact, most of them must be achieved before 2030.
Source	https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

Table 21. Detailed description of policies – Fit for 55 package (A-2.1.13)

Fit for 55 package	
Description	The Fit for 55 package is a series of measures to revise and update EU legislation, with the aim of ensuring that EU policies are consistent with the climate targets agreed by the Council and the European Parliament. The name 'Fit for 55' refers to the EU target to reduce net GHG emissions by at least 55 % by 2030, which has been legislated under the European Climate Law.
Goals / priorities	The package aims to create a coherent and balanced framework for achieving the EU's climate goals, which: ● ensures a fair and socially just transition, ● maintains and strengthens the innovation and competitiveness of the Union industry, while ensuring equal conditions of competition vis-à-vis the economic institutions of third countries, ● consolidates the EU's position as a global leader in the fight against climate change.
Year of publication	Proposed in 2021, voted in 2023.
Type	Policy
Policy level	European
Scope	All areas of GHGs
Relevance to the Athens Climate Agreement	Indirect since measures of Fit for 55 such as the renewal of the Directive on the Energy Performance of Buildings affect the national goals of Greece, which in turn affect Athens as well.
Impacts on the climate neutrality of Athens	Immediate, since the measures of the package pave the way towards climate neutrality of the Municipality of Athens. Nevertheless, the challenge remains as the Municipality needs to achieve almost double the 2030 emissions reduction target compared to other parts of the EU under the Fit for 55.
Source	https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55/

Table 22. Detailed description of policies – Energy Performance of Buildings Directive (A-2.1.14)

Energy Performance of Buildings Directive	
Description	Together with the revised European Energy Performance Directive and the “Renovation Wave” Strategy in the EU, the Energy Performance of Buildings Directive will help achieve a high energy-efficient and zero-emission building stock by 2050 and the creation of a stable investment environment, while it will enable consumers and businesses to make more informed choices to save energy and money.
Goals / priorities	In particular, the directive contributes to the target of reducing GHG emissions by at least 60% in the building sector by 2030 compared to 2015 as well as achieving a net zero building stock by 2050. To achieve these targets, the directive sets out a number of measures such as: ● A binding target to reduce the average energy efficiency of the national residential building stock by 16% by 2030 compared to 2020. ● Increased deployment of solar technologies on all new buildings and some existing non-residential buildings, where technically and economically feasible. ● Phasing out fossil fuel boilers, starting with a stop on subsidies for these boilers from 1 January 2025. ● One-stop-shops for the energy upgrade of buildings for homeowners, small and medium enterprises and other stakeholders. At the same time, the "Renovation Wave" Strategy aims to double the rate of energy upgrades from 2020 to 2030.
Year of publication	2024 (latest update)
Type	Legislation
Policy level	European
Scope	Building sector (mainly)
Relevance to the Athens Climate Agreement	The above objectives set by the directive are taken into account in the Athens CCC, especially in terms of reducing the energy consumption of homes, which constitute a large part of the city's building stock.
Impacts on the climate neutrality of Athens	To achieve climate neutrality, the GHG reduction target in the buildings of Athens should be much higher than the 60% set by the Directive. The package of measures proposed by the Directive can create a favourable environment for the energy upgrade of the building stock of Athens, which the Municipality can further strengthen with its own measures.
Source	1. https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en 2. https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-directive_en 3. https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en

Table 23. Detailed description of policies – Renewable Energy Directive (A-2.1.15)

Renewable Energy Directive	
Description	Building on the 2009 and 2018 directives, the revised directive introduces stricter measures to ensure that all potential for the further development and adoption of renewable energy sources is fully exploited. This will be crucial to achieving the EU's goal of climate neutrality by 2050 and enhancing Europe's security of energy supply.
Goals / priorities	The directive sets an overall EU renewable energy target of at least 42.5% by 2030—but is aiming for 45%. At the same time, it includes provisions regarding the following: ● A strong political framework that will facilitate electrification of heating and cooling of buildings, transport, industry, etc. ● The promotion of electric vehicles and smart charging. ● Creating an energy-efficient, circular, and renewable energy system that facilitates electrification based on renewable energy sources and promotes the use of renewable fuels, including hydrogen, in sectors such as transport or industry where electrification is not yet a viable option. ● Easier and faster permitting procedures for RES projects through shorter approval periods, the creation of "renewable energy acceleration zones" and the construction of the necessary infrastructure projects. ● Enhanced sustainability criteria for bioenergy.
Issue date	2023 (latest update)
Type	Legislation
Policy level	European
Scope	Energy systems
Relevance to the Athens Climate Agreement	The above objectives set by the directive must be taken into account in the Athens CCC, especially in the matter of the electrification of transport and heating as well as the promotion of electric vehicles.
Impacts on the climate neutrality of Athens	As with the Energy Performance of Buildings Directive, the package of measures proposed by the Renewable Energy Directive will create a favourable climate for the reinforcement of RES in the city, thus reducing the emissions of electricity generation that constitute the largest chunk of GHG emissions in the city.
Source	https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en

Table 24. Detailed description of policies – New Circular Economy Action Plan (A-2.1.16)

New Circular Economy Action Plan	
Description	The EU's transition to a circular economy will reduce pressure on natural resources and halt the loss of biodiversity. The new action plan includes initiatives for energy, emissions, and material reductions throughout the life cycle of the products. It targets the way products are designed, promotes circular economy processes, encourages sustainable consumption and aims to ensure that waste is prevented, and resources used remain in the EU economy for as long as possible.
Goals / priorities	The measures established under the new action plan aim to: ● make sustainable products the norm in the EU, ● empower consumers and public sector buyers. ● focus on sectors that use the most resources and where circularity potential is high (e.g., electronics, batteries, vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients). ● reduce waste, ● make circularity work for citizens, regions and cities, ● place the EU at the forefront of global circular economy efforts.
Issue date	2020 (individual measures have passed in 2020-2023)
Type	Action plan
Policy level	European
Scope	Waste and Circular Economy
Relevance to the Athens Climate Agreement	The measures and initiatives of this European Action Plan influence national policies such as the National Waste Prevention Plan, which in turn influence the CCC's waste management targets.
Impacts on the climate neutrality of Athens	A circular economy is also a prerequisite for achieving the EU's goal of climate neutrality in 2050, and this is also the case for Athens. The measures proposed in the New Circular Economy Action Plan will lead to a favourable environment for increasing the circularity of material flows in Athens and reducing waste.
Source	https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

2.2.2. Emissions gap calculation

Although the aforementioned policies significantly affect the climate ambitions of the Municipality of Athens, they are not sufficient for its climate neutrality in 2030. As for addressing the Municipality's GHG emissions as a whole, the most relevant policies are the previous Climate Action Plan of the Municipality, the National Climate Law (based on the European Climate Law), and the revised NECP, which contain targets for GHG reduction in 2030. It is noted that, in the original policy texts (see Tables A-2.1.1, A-2.1.5, A-2.1.6), these targets are reported relative to a specific base year, e.g., -61% relative to the year 2018 for the 2022 Climate Action Plan. For a better comparison between them, the relative targets were converted to absolute targets measured in kt CO_2e.

In the **2022 Climate Action Plan** of the Municipality of Athens, the relevant goal for 2030 is to reduce the 2018 GHG emissions by 61%. Based on the municipality's emissions inventory (CIRIS 2018), GHG emissions in 2018 were 2,805 kt CO_2e, so the absolute target for 2030 is 1,094 kt CO_2e.

In the **revised NECP** (version of August 2024), the relevant national target for 2030 is to reduce GHG emissions by 59% with a base year of 1990. Based on the assumption that the reduction is relatively uniform throughout Greece, the measures provided for in the NECP will allow for the reduction of the GHG emissions of the Municipality of Athens by 59% compared to the emissions in 1990. Given that the Municipality of Athens started the systematic recording of emissions in 2014, the emissions of 1990 are calculated relative to the total emissions of Greece in 1990.

Based on the emissions inventories of the Municipality of Athens between 2014 and 2021 (Module A-1) as well as the emissions of Greece for the same period from the scientific literature (Jones et al., 2024), it follows that the average percentage of emissions of the Municipality of Athens in relation to the total emissions of Greece is 3.72%. In 1990, Greece's GHG emissions was 105,753 kt CO_2e, so the emissions of the Municipality of Athens would be approximately 3,935 kt CO_2e. Based on this estimate for 1990, the absolute target for the Municipality of Athens in 2030 based on NECP measures is 1,629 kt CO_2e.

For the **National Climate Law** (and the European Climate Law), the target is a bit smaller than the one provided by the NECP, i.e., a 55% reduction in 2030 compared to 1990. Therefore, based on the previous calculations, the absolute target for the Municipality of Athens would be 1,770 kt CO_2e.

The remaining policies contain sectoral objectives and measures taken into account when creating the CCC strategies and actions in Part B of this plan. For example, the objectives of the Sustainable Urban Mobility Plan and EV Charging Plan of the Municipality of Athens are taken into account in the actions of the CCC for transport and mobility, while the recycling objectives of the Integrated Framework for Waste Management are taken into account in the actions to reduce the GHG emissions of waste of the Municipality. The sectoral target of the Municipality of Athens for reducing building emissions should also be greater than the 60% outlined in the Energy Performance of Buildings Directive.

Based on the policy objectives and measures presented in this section as well as the analysis of the existing situation in Module A-1, a reference scenario with no climate policy after 2019 was simulated ('Business as usual') as well as a scenario that achieves an 80% emission reduction for the Municipality of Athens compared to the reference scenario. The simulation was done based on the **economic model of the NetZeroCities programme**[18] and with the guidance and support of the programme advisors. It is noted that, although the 'Business as usual' reference scenario of the model does not incorporate any climate policy after 2019, it takes into account the change in emissions due to the population growth trajectory, as well as to the replacement of vehicles and buildings due to natural wear and tear. In

[18] Materials Economics. (2020). *Understanding the Economic Case for Decarbonising Cities—Why Economic Case Analysis for City Decarbonisation is Crucial.* https://netzerocities.app/resource-3768

practice, population increases tend to be offset by physical replacement of equipment, so the 'Business as Usual' scenario for 2030 tends to be very similar to the base year 2019.

The 80% emission reduction scenario was based on the measures of the 2022 Climate Action Plan (Section 1.6) as well as the targets and measures of other national and European policies in the previous section. Since these measures did not reach the 80% reduction target, their ambition was herein increased based on the current priorities of the Municipality, such as the development of RES on building roofs and in energy communities as well as the development of green infrastructure for city cooling. Table 25 presents the results of the model for the total emissions and for each sector separately as well as the residual emissions to offset.

Table 25. Emissions gap and residual greenhouse gas emissions (A-2.2)

Sectors	Baseline emissions (BAU 2030)	Emissions gap reduced through the measures in CCC Action Plan		Residual emissions to offset	
	kt CO_2e	kt CO_2e	%	kt CO_2e	%
Electricity	1,670	1,420	85%	251	15%
Buildings & Heating	258	211	82%	47	18%
Transportation & Mobility	380	214	56%	166	44%
Waste and sewage	78	64	82%	14	18%
Total	**2,386**	**1,909**	**80%**	**477**	**20%**

Source: Calculation of the NZC economic model (July 2024). Note: GHG emissions from the agriculture, forestry and other land use sectors are negligible compared to the rest of the sectors (about 2 tonnes CO_2e) and are therefore not shown here.

Figure 22 presents four schematic scenarios for the Municipality's GHG path until 2030. These scenarios include the reference scenario (i.e., no climate policy after 2019) as well as three scenarios based on the reductions foreseen by the Climate City Contract targets, of the previous Action Plan of the Municipality, and the revised Greek NECP. Based on the above data, it follows that, in order to achieve climate neutrality, the GHG emissions for 2030 need to be reduced from 2,386 (Business as Usual) to 442 kt CO_2e, so the emissions difference is calculated at 1,909 kt CO_2e. Comparing the CCC target with the previous Action Plan target, it appears that an additional 617 kt CO_2e will need to be addressed through additional CCC actions compared to the actions proposed in 2022. This emissions difference rises to 1,152 kt CO_2e if the actions of the CCC are compared with the goals of the NECP, indicating even more clearly that the Municipality of Athens will need to significantly raise its climate ambition in relation to the national goals.

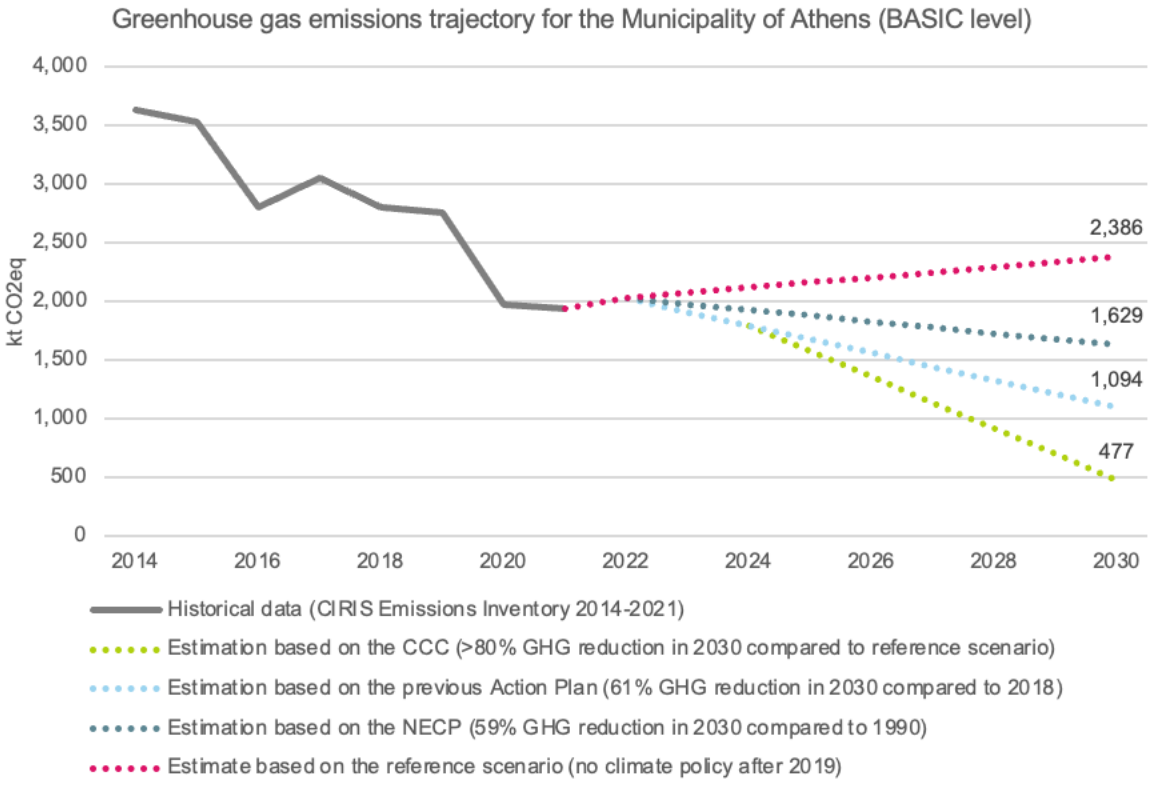


Figure 22. Greenhouse emission trajectory for the Municipality of Athens (BASIC level) based on historical data and estimates for the achievement of various climate targets

Most of this emissions gap will be covered through actions by the Municipality of Athens to rapidly boost local PV and other RES production so that almost all electricity consumption in 2030 comes from RES. The Municipality will also take significant initiatives to reduce emissions in its infrastructure and play a key role through sponsors and financing programmes for private buildings. All strategies, goals, and short-term actions to achieve climate neutrality are presented in detail in Part B. It is noted that the actions presented in the CCC include and reinforce the actions proposed in the 2022 Climate Action Plan. Also, given that the year base of the model is 2019, the reference scenario (Business as Usual) does not contain measures or targets established in the 2022 Climate Action Plan so there is no risk of double counting.

At the same time, the key objectives of the CCC are based on the assumption that the objectives of the NECP will be fulfilled. For example, the strategic priority of the Municipality of Athens for 88% clean electricity is based on the NECP target of 76% RES in gross electricity consumption and reinforces it with local RES projects in Athens (see Part B). However, the target for local RES as well as other "dependent" targets of the CCC take into account uncertainties about whether the NECP targets will be met in 2030 by setting a minimum value for the target and an ideal one, e.g., the share of local RES is defined at 12% and 24% respectively. This means that the real **emission gap** that the CCC actions (including the 2022 plan) must address is 1,152 kt CO_2e, i.e. as much as the 2030 GHG emissions difference between the Athens' CCC scenario and the NECP scenario.

The remaining emissions to be compensated based on the CCC of the Municipality of Athens are estimated at 477 kt CO_2e. These GHG emissions mainly include transport and mobility sector emissions that are deemed very difficult to reduce by 2030 as they would require excessively large changes in the

mobility habits of the citizens of Athens, new metro and tram lines, as well as a steep increase in electrification. At the same time, to eliminate the remaining emissions from the other sectors, it will be necessary to increase recycling to 100%, significantly renovate almost all buildings in the city while installing solar PV in most, which is not considered realistic by 2030. These emissions will be addressed mainly by the development of green infrastructure within the city, with nature-based solutions and reforestation actions around Athens. In addition to reducing the remaining GHG emissions, these actions will have additional adaptation co-benefits for the city, such as reducing warming and or risk of flooding through targeted green infrastructure.

2.3. Module A-3 – Systemic Barriers and Opportunities to 2030 Climate Neutrality

Apart from appropriate policies and strategies that will direct and finance the efforts towards climate neutrality of the Municipality of Athens, major changes are needed at a systemic level that will enable, support, and underpin the implementation of the transition. This module provides a more general analysis of systems related to the city's GHG emission sectors. These systems are broken down into four main groups, which include:

1) Infrastructure and the wider technological system (e.g., electricity networks and their adequacy)
2) Institutional, regulatory, and organisational system (e.g., the power structure between central, regional, and municipal government)
3) Financial system (e.g., funding available for municipalities to carry out projects aimed at reducing their GHG emissions)
4) Political, social, and behavioural systems (e.g., recycling and driving habits)

Section 2.3.1 includes a brief description of the above systems as well as a listing of the possible barriers that exist for each of them on the way to the city's climate neutrality. It also captures opportunities that are not being exploited or not yet considered in each system. Section 2.3.2 then includes a mapping of the stakeholders associated with each system. This includes relevant actors at different levels of governance, such as local, regional, national, and European/supranational administrative bodies and organisations, financial institutions, civil society, Non-Governmental Organisations (NGOs), academic institutions, private- sector actors, and city networks.

In conjunction with the inventory of GHG emissions and the analysis of the current policy framework in the previous two modules of Part A, the analysis reported here serves as a basis for designing actions that address these barriers or capitalise on untapped opportunities in Part B.

2.3.1. Analysis of barriers and opportunities

The barriers to the transition towards climate neutrality are many and multidimensional. They include issues at a national or European level (e.g., insufficient finance for energy upgrades in buildings) but also conditions that mainly concern the Municipality of Athens, such as increased tourism in the centre and its impact on the Municipality's emissions. At the same time, there are various opportunities that could be exploited and the co-benefits of targeted actions, such as increasing green jobs in the city's building sector through increasing the rate of energy upgrades.

The following tables include a brief description of the systems for each of the emissions sectors of the Municipality of Athens (as analysed in Module A-1) as well as the barriers and opportunities that exist in relation to emissions reductions per sector. The overview of barriers and opportunities is largely based on the discussions held at Climate Forums, communication with specific bodies such as the C40 Cities network, as well as the literature. During the implementation of the CCC, further barriers and opportunities are expected to appear, which will be recorded in subsequent editions of the Climate City Contract.

Table 26. Systemic barriers and opportunities – Energy systems (A-3.1.1)

Energy systems		
System	**Description**	**Barriers and opportunities**
Institutional, regulatory, and organisational system	Energy policy in Greece is mainly shaped by the central government (e.g., Ministry of Environment and Energy) and regulated by the Waste, Energy and Water Regulatory Authority (RAAEY). Electricity networks and other infrastructures are the responsibility of the system operators, DEDDIE and ADMIE.	Barriers: - The Municipality of Athens has limited authority over the electricity network or energy production. - The latest version of the National Energy and Climate Plan (August 2024) features very ambitious estimates for RES in the electricity mix, reaching around 76% by 2030 [19]. But what if this is not achieved? Opportunities: - The city can work with network operators to ensure that network capacity is aligned with the increased needs for RES within the city.
Technological system & infrastructure	The city is connected to the national electricity grid and powered by natural gas, lignite, solar, onshore wind, hydro and biomass[20]. PV panels are installed on some rooftops in the city, covering a small part of the electricity demand. PV is a mature technology in Greece, and all relevant stakeholders (e.g., regulators, engineers, ESCOs, installers, etc.) have high expertise and long-term experience in such projects.	Barriers: - Network congestion, need for new network capacities. - Long waiting time for new RES projects in Greece (about 15 GW approved for connection, over 40 GW in the development stage[21]). - Lack of storage capacity at scale. - Competition of photovoltaics with solar water heaters on the roofs of Athens, limited space and difficulty in negotiations between tenants of apartment buildings. Opportunities: - New hybrid panels for the production of electricity and thermal energy for domestic hot water. - The increasing penetration of electrification technologies (e.g., electric vehicles, heat pumps) will enable the use of clean electricity from RES in the transport and heating sector.

[19] https://www.energia.gr/article/220923/neo-esek-me-pio-kostostrefes-ependytiko-plano -
[20] https://www.admie.gr
[21] https://www.euro2day.gr/news/economy/article/2226813/energeia-dihasmenh-h-agora-gia-tis-perikopes-sta-n.html

		- The increased electricity demand for air conditioning due to rising temperatures is usually covered by PV during the day. - Retraining workers in RES technologies (e.g., installing photovoltaics) can boost the energy transition and create more jobs. - Rapid advances in batteries boost the potential for renewable electricity storage.
Financial system	Funding for urban energy systems comes mainly from the central government (e.g., Green Fund, "Rooftop Photovoltaics" program) and European programmes (e.g., NetZeroCities).	Barriers: - Increased uncertainty due to constant changes in RES financing opportunities[22]. Opportunities: - Negligible operation and maintenance costs. - Lower installation costs (CAPEX).
Political, social & behavioural system	Citizens are relatively familiar with decentralised electricity generation technologies such as photovoltaics.	Barriers: - Low energy literacy in part of the population. - Low trust in institutions (Dianeosis, 2024; Nikas et al., 2019). - Politicisation and polarisation around solar and wind technologies, mainly linked to natural disasters (e.g., fires). Opportunities: - Social perception of the unreliability of renewable energy sources has begun to fade.

Table 27. Systemic barriers and opportunities – Built environment (A-3.1.1)

Built environment		
System	**Description**	**Barriers and opportunities**
Institutional, regulatory and organisational system	The building sector involves many and varied stakeholders, such as owners, tenants, construction companies, consulting engineers, the City's town planning department and	Barriers - Ongoing dispute between the central government and municipalities over the jurisdiction of urban planning requirements (e.g., height of buildings).

[22] https://energypress.gr/news/amara-nzero-energeiako-topio-sta-fotoboltaika-stin-ellada-metabasi-apo-net-metering-sto-net

	other relevant regulatory agencies (e.g., the Hellenic Archaeological Service). Municipal buildings are only a small part of the total number of buildings (680 buildings out of a total of 61,764 buildings in the last building census of 2011[23]).	- The Municipality has no control over the flow of funding programmes.
Technological system & infrastructure	Athens' building stock is old, with more than half of the buildings constructed before 1980. However, renovations have increased in recent years, possibly due to tourism and the rise of short-term rental options (e.g., Airbnb) and more favourable economic conditions after the Greek financial crisis. Energy upgrades have also advanced significantly in recent years, boosted by national funding programmes and possibly driven by high energy costs, exacerbated by recent international conflict. Most new buildings are built to high energy standards, but they are few compared to the existing building stock.	Barriers: - The scale of renovation required will be difficult to attain. The rate of deep renovation will need to increase significantly (Frilingou et al., 2024). - Lack of skilled workers for some of the newer building technologies (heat pumps, building energy management systems, etc.). - As temperatures rise due to climate change, the use of air conditioners will increase, leading to higher demand for electricity, and especially peak demand in summer. Opportunities: - In order to reduce the GHG emissions of this sector on a large scale, many investments will be needed, which in turn will bring many economic activities and jobs to the city. - As temperatures rise due to climate change, heating hours during the winter season may decrease.
Financial system	Financing for the construction of new buildings or the renovation of old ones is mainly private. Financing programmes for renovations are also very popular (the "Eksikonomo" program) and take place almost annually.	Barriers: - High upfront costs for the energy upgrade of the building shell. - Extensive renovations will require significant investment. Opportunities: - Energy upgrades lead to lower energy demand and therefore lower operating costs. - Solar water heaters and cooling and heating systems that use clean electricity will make households less vulnerable to fluctuations in fossil fuel prices.

[23] https://www.statistics.gr/census-buildings-2011

		- Heat pumps are becoming more and more affordable. - New financing opportunities will become available as the coverage of the buildings sector by the Emissions Trading System (ETS) is implemented.
Political, social & behavioural system	The majority of buildings in the Municipality of Athens do not belong to a single owner but to many, with all that this entails in terms of management and decision-making. Based on the 2011 census [24], most buildings in the Municipality of Athens are of exclusive residential use (about 55% of buildings) and, specifically, apartment buildings with multiple owners. 30% of the buildings are mixed-use buildings, while most of them (27.5% of total buildings) are primarily used as residences and to a lesser extent as offices/shops.	Barriers: - There is no significant incentive for energy upgrades in rental housing (which is a large part of the housing stock in Athens). Usually, the owner bears the cost of the energy renovations while the tenant enjoys the benefits of the renovations (in terms of reduced energy costs). - While apartment buildings share infrastructure, thus allowing for large-scale changes, residents may not easily agree on the necessary changes. Opportunities: - Reducing energy costs through energy management upgrades and appropriate information campaigns and support can also reduce energy poverty (e.g. through the City's Energy Poverty Alleviation Office).

Table 28. Systemic barriers and opportunities – Transport & mobility (A-3.1.3)

Transport & mobility		
System	**Description**	**Barriers and opportunities**
Institutional, regulatory, and organisational system	Public transport in Athens (including the metro, trams, trolleys, and buses) is managed by OASA, while the trains are managed by Hellenic Train. Most roads in Athens are under the responsibility of the Municipality, however the main avenues of Athens are under the responsibility of the Ministry of Infrastructure and Transport. Sustainable Urban Mobility Plans (SUMPs) have recently been drawn up to coordinate the work of various	Barriers: - The Municipality has limited control over most of the transport system and will need to coordinate with all relevant stakeholders to achieve the transition. - For widespread adoption of electric vehicles (EVs), national legislation and funding programmes will be needed. Opportunities: - The Climate City Contract of Athens can be an opportunity for further coordination of the Municipality with all

[24] https://www.statistics.gr/census-buildings-2011

	institutions towards more sustainable mobility and transport.	stakeholders for transport and mobility in its area. - The Municipality can set an example by electrifying most of its vehicles and, in cooperation with OASA, a large part of the bus fleet.
Technological system & infrastructure	Most mobility and transport requirements in the city are currently covered by the use of vehicles [25], resulting in heavy traffic especially during peak hours. Metro, train and bus lines cover most of the city centre. However, metro coverage is still limited in the northwest of the Municipality and is expected to increase near 2030 with the construction of the fourth metro line. Although walking is widespread (especially in the centre), bicycle use is still limited as cycling roads are few and far from one another.	Barriers: - Walking and biking infrastructure in Athens is not adequate - Biking safety on the streets of Athens is low - Charging infrastructure for electric vehicles is far from widespread, while older buildings and on-street parking facilities will require adaptations to install electric vehicle chargers for private vehicles. - A large number of electric cars can cause congestion in the (current state of the) electricity grid. Opportunities: - Electric vehicles can theoretically also act as batteries, supporting a more flexible demand-responsive grid. - Reducing the number of cars will lead to a reduction in parking space, reclaiming large areas for green spaces that the city lacks. - 15-minute neighbourhoods not only are a way to increase active mobility, but also have many other benefits such as strengthening the local economy and sense of community.
Financial system	Road infrastructure and public transport costs are mainly financed by the central government and municipalities. Financing for the purchase of new electric cars and motorcycles is mainly private, although there are some financing schemes (e.g. the Go Electric scheme).	Barriers: - Significant investment in walking and cycling infrastructure is required. - Significant investment in public transport is required. - High upfront costs for purchasing electric vehicles and installing chargers. - Subsidies have so far been proportional to the purchase cost of electric vehicles and have therefore been used by citizens who could buy electric vehicles without the subsidies.

[25] https://insights.sustainability.google/places/ChIJ8UNwBh-9oRQR3Y1mdkU1Nic?hl=en-US

		Limited opportunities for low-income households. Opportunities: - Synergies with energy production measures can lead to locally produced electricity to electrify the Municipality's electric vehicles, thus reducing operating costs.
Political, social & behavioural system	Car ownership increased after the COVID-19 period (Christidis et al., 2023) while the use of public transport may have decreased slightly.	Barriers: - Resistance by car drivers to abandoning their cars and the associated feeling of freedom they provide. - Perceptions that electric vehicles do not have sufficient range or are not as sustainable (from a lifecycle perspective) are still widespread. Opportunities: - Active mobility can have many benefits such as reducing traffic, improving citizens' health, reducing the need (and time spent) for parking, etc. - Information campaigns dispelling myths about electric vehicles can help shift public opinion in favour of sustainable urban mobility.

Table 29. Systemic barriers and opportunities – Waste & Circular Economy (A-3.1.4)

Waste & Circular Economy		
System	**Description**	**Barriers and opportunities**
Institutional, regulatory & organisational system	The solid waste produced in Athens is collected by the Municipality and then transported to facilities of the Unified Interlevel Association of the Prefecture of Attica (EDSNA). Most solid waste is transported to a landfill (such as the Phylis Landfill) while some is recycled. The overall recycling rate in the Municipality of Athens was approximately 8.29% in 2023, based on the estimate of the Cleanliness Directorate of the Municipality of Athens. Recycling is covered by companies such as the Hellenic Recycling Utilisation	Barriers: - While the Municipality has more control over waste compared to other sectors, coordination efforts between all the different stakeholders will be important, especially considering that EDSNA operates at the regional level. - Composting may require a change in the organisation of waste collection and management services (e.g., frequency of collection, capacity of waste collection vehicles, etc.).

	Company (EEAA) and the Excavation, Construction and Demolition Recycling System (ANAKEM), under the supervision of the Hellenic Recycling Organisation (EOAN). Wastewater is managed by EYDAP.	
Technological system & infrastructure	Composting infrastructure is relatively new in Greece and needs to be expanded significantly. Recycling management also needs to be strengthened.	Barriers: - More recycling and composting bins are needed throughout the city. - Effective management of composting is still incomplete. - Collaboration with consumer goods companies and food producers is needed to reduce waste through strategies at the source (e.g., packaging reduction, longer shelf life).
Financial system	Public funds for waste management are managed at all levels (central and regional government, municipalities). Funding for wastewater treatment is also public, provided by the water and sewerage company (EYDAP) as part of utility bills.	Barriers: - More funds are needed to purchase composting bins on a large scale (both small bins for households and larger ones for waste collection). - Funding and human resources are needed for composting processing infrastructure. Opportunities: - The city can reduce landfill costs by reducing litter and increasing recycling and composting. - Possible creation of more jobs by upgrading composting management.
Political, social & behavioural system	While recycling has become more widespread over the past decade, composting is relatively new and has yet to be implemented on a large scale in most cities.	Barriers: - A significant behavioural change is required to increase the recycling rate and introduce composting on a large scale. - The preconceived notion that recycling is also landfilled can also affect the perception of composting. - Reducing waste also requires significant behavioural change other than the practice of recycling, e.g., avoiding food waste.

2.3.2. Stakeholder analysis

As highlighted in the previous section, one of the most important barriers to the climate neutrality of the Municipality of Athens is that the Municipality does not have direct control over important sectors of GHG emissions, such as the power grid, the public transportation network and the major avenues of Athens. At the same time, there is a need to raise awareness and involve citizens, the tertiary sector, and other stakeholders within the Municipality in order to overcome behavioural barriers and make the transition as inclusive and just as possible.

For a better understanding of the role and impact of various stakeholders in the path to climate neutrality of Athens, this section presents a first mapping of involved organisations, voluntary groups, and in general all relevant parties in the effort of the Municipality of Athens for climate neutrality in 2030. The selection of the interested bodies was based on their participation in the Climate Forum of 2024 and in previous events and workshops for the previous action plans of the Municipality as well as on how influential their action can be in the transition of Athens.

Each stakeholder is analysed based on the transition systems it can affect (e.g., technological, institutional, organisational, financial, and/or behavioural) as well as on the basis of the relevant GHG emission sectors, i.e., the building sector, electricity generation, transport, waste, and green infrastructure. An attempt is also made to analyse the influence and interest of the agencies for achieving climate neutrality in the city based on the following criteria.

- **Analysis of the influence** of each agency on the climate neutrality of the Municipality of Athens:
    - High: operator involvement is required.
    - Moderate: agency involvement is helpful.
    - Low: agency involvement is not particularly influential.
- **Analysis** of each body's interest in the climate neutrality of the Municipality of Athens:
    - High: the object of the organisation is directly related to the transition of the Municipality.
    - Moderate: the body's object has an indirect relevance to the transition of the Municipality.
    - Low: the object of the body has little, if any, relevance to the transition of the Municipality.

It is noted that this analysis is based on the subjective judgement of the authors of the plan. The tables will be updated frequently throughout the implementation of the action plan based on the participation of stakeholders in Climate Forums and other events and programmes of the Municipality of Athens in relation to the transition.

The most important stakeholders for the achievement of all these goals are **the citizens of Athens.** Through open events, workshops, and questionnaires, citizens will participate in all further updates of the Climate City Contract as well as its implementation. Part C provides more details on participatory actions with citizens (and especially the youth) that have so far taken place and will take place in the future.

Public bodies and policymakers at national and European level will also be crucial both for the implementation of the transition actions of the city and for their financing. As shown in Table 30, among the most influential bodies for the city's climate neutrality plan are the European Commission, the Ministry of Environment and Energy, the Ministry of Infrastructure and Transport, the Ministry of Climate Crisis and Civil Protection, the Region of Attica, as well as neighbouring municipalities– especially the participants in the Athens Energy Alliance.

Table 30. Systems & Stakeholder Mapping – Public bodies and policymakers (A-3.2.1)

Public bodies and policymakers	Related systems	Related areas	Influence on the climate neutrality of the city	Interest in the climate neutrality of the city
European Commission	Institutional, Financial	All	High	High
Ministry of Environment and Energy	Institutional, Financial	Energy systems, Buildings	High	High
Ministry of Infrastructure and Transport	Institutional, Financial	Transportation, Waste	High	Moderate
Ministry of Climate Crisis and Civil Protection	Institutional	Green infrastructure	Moderate	High
Ministry of Digital Governance	Institutional, Technological	All	Moderate	Low
Ministry of Interior	Institutional	All	Moderate	Low
Ministry of National Economy and Finance	Institutional	All	Moderate	Low
Ministry of Development	Institutional	All	Moderate	Low
Ministry of Rural Development & Food	Institutional	Circular economy and waste	Moderate	Low
Ministry of Tourism	Institutional	All	Moderate	Moderate
Region of Attica (especially the General Directorate of Sustainable Development and Climate Change)	Institutional	All	High	High
Central Association of Municipalities of Greece (KEDE)	Institutional, Organisational	All	Moderate	Moderate
Athens Energy Alliance (Group of municipalities in the metropolitan area of Athens)	Institutional, Technological	Energy systems	High	High

Network operators and regulatory bodies will be important partners in this transition (Table 31). The key bodies include the Hellenic Electricity Distribution Network Operator (HEDNO, or DEDDIE), the Capital Water Supply and Sewerage Company S.A. (EYDAP), the Athens Urban Transport Organisation (OASA) and the Solid Waste Management Company of the Attica Region (EDSNA). The relevant companies of the Municipality of Athens, i.e., the Anonymous Development Company of Computerization and Business Units OTA (DAEM) and the Athens Development and Tourist Promotion Company (EATA) also play an important role with their expertise and experience.

Table 31. Mapping systems & stakeholders – Administrative and regulatory bodies (A-3.2.2)

Administrative and regulatory bodies	Related systems	Related areas	Influence on the climate neutrality of the city	Interest in the climate neutrality of the city
Hellenic Electricity Distribution Network Operator (HEDNO, or DEDDIE)	Institutional, Technological	Energy systems, Buildings	High	Moderate
Independent Electricity Transmission Operator (IEO)	Institutional, Technological	Energy systems	High	Moderate
Regulatory Authority for Energy, Waste, and Water (RAEWW, or RAAEY)	Institutional, Technological	Energy systems, Waste	High	Moderate
Water Supply and Sewerage Company S.A. (EYDAP)	Institutional, Technological	Wastewater, Buildings	High	High
Athens Urban Transport Organisation (OASA)	Institutional, Technological	Transportation	High	High
Unified Intergrade Association of the Prefecture of Attica (EDSNA)	Institutional, Technological	Energy systems	High	High
Hellenic Society for the Utilisation of Recycling (EEAA)	Technological	Waste	High	High
Hellenic Recycling Organisation (EOAN)	Technological	Waste	High	High
Excavation, Construction and Demolition Recycling System (ANAKEM)	Technological	Waste	Moderate	Moderate
Hellenic Tourism Organisation (HTO)	Institutional	All	Low	Moderate
Union of Municipal Water Supply and Sewerage Companies	Institutional	All	Low	Low

Natural Environment and Climate Change Agency (NECCA, or OFYPEKA)	Institutional	Green infrastructure	Moderate	Moderate
Development and Tourism Promotion Company of Athens (EATA)	Institutional, Technological	All	High	High
Development Company of Computerization and Business Units OTA of the Municipality of Athens (DAEM)	Institutional, Technological	All	High	High

Financial institutions will be necessary to finance the actions outlined in the Athens CCC (Table 32). Among the institutions that already finance or are likely to finance the next climate actions of the Municipality of Athens are the Green Fund, the European Investment Bank, the European Regional Development Bank, the European Bank for Reconstruction and Development, the Climate Bond Initiative, and the Climate Change and Sustainability Centre of the Bank of Greece.

Table 32. Mapping systems & stakeholders – Financial institutions and related organisations (A-3.2.3)

Financial institutions and related organisations	Related systems	Related areas	Influence on the climate neutrality of the city	Interest in the climate neutrality of the city
Green Fund	Financial	All	High	High
European Investment Bank	Financial	All	High	Moderate
European Regional Development Bank	Financial	All	High	Moderate
European Bank for Reconstruction and Development (EBRD)	Financial	All	High	Moderate
European Mortgage and Loan Federation – HYPO	Financial	Buildings	High	Moderate
Climate Bonds Initiative	Financial	All	High	High
Bank of Greece	Financial	All	Moderate	Moderate
Banks in Greece (e.g. Eurobank EFG, Alpha Bank, Piraeus Bank, National Bank of Greece)	Financial	All	Moderate	Low
Centre for Climate Change and Sustainability of the Bank of Greece	Financial	All	Moderate	High

International Capital Market Association (ICMA)	Financial	All	Low	Low
European Mortgage Federation (EMF)	Financial	Buildings	High	High
Arbitrage Real Estate	Financial	Buildings	Low	Low
Green Financing Institution	Financial	Buildings	Moderate	High

City networks for climate and sustainability are already supporting Athens' climate ambitions and are expected to continue to do so in the future. Table 33 includes networks such as NetZeroCities, the C40 Cities climate leadership network, the ICLEI Local Government Sustainability Network, the Global Covenant of Mayors, the Eurocities network, the Resilient Cities Network, and the World Council for Sustainable Tourism. Beyond these, other networks and related organisations already play a big role in the City's climate plans such as Bloomberg Philanthropies through its Youth Climate Action Fund for Athens.

Table 33. Systems & Stakeholder Mapping – City networks (A-3.2.4)

City networks	Related systems	Related areas	Influence on the climate neutrality of the city	Interest in the climate neutrality of the city
NetZeroCities	Technological, Financial	All	High	High
C40 Cities – Climate Leadership Group	Technological, Financial	All	High	High
ICLEI – Local Governments for Sustainability	Technological, Financial	All	High	High
Covenant of Mayors	Technological, Financial	All	High	High
Eurocities Network	Technological, Financial	All	Moderate	High
Resilient Cities Network	Technological, Financial	All	Moderate	High
B40 – Network of Balkan Cities	Technological, Learning	All	Moderate	Moderate
Climate-KIC	Technological, Financial	All	Moderate	Moderate

Smart City Marketplace	Technological	All	Low	Moderate
International Solid Waste Association (ISWA)	Technological	Waste	Moderate	Low
World Council on Sustainable Tourism	Technological	Buildings	Moderate	Moderate
CityLab – Bloomberg Associates and Philanthropies	Technological, Financial	All	Moderate	High

Academic and research institutions as well as expert associations will support with their studies and analyses the planning and implementation of the city's climate actions. Table 34 presents institutions that contribute with their studies to the climate visions of the Municipality such as the National Technical University of Athens, the National Centre for Natural Sciences "Demokritos", the National Meteorological Service, the National Observatory of Athens, and the National Kapodistrian University of Athens as well as Norman Foster Institute on Sustainable Cities. The table also includes expert associations such as the Technical Chamber of Greece (TEE) and research centres such as the Centre for Renewable Energy Sources and Savings (CRES).

Table 34. Mapping systems & stakeholders – Universities, research centres, expert associations (A-3.2.5)

Universities, research centres, expert associations	Related systems	Related areas	Influence on the climate neutrality of the city	Interest in the climate neutrality of the city
National Technical University of Athens	Technological	All	Moderate	High
National Centre for Natural Sciences "Democritos"	Technological	All	Moderate	High
National Weather Service (EMY)	Technological	All	Moderate	High
National Observatory of Athens	Technological	All	Moderate	High
Athens University of Economics and Business	Technological, Financial, Organisational	All	Moderate	High
Agricultural University of Athens	Technological	Green infrastructure	Moderate	High
National Kapodistrian University of Athens (NKUA)	Technological, Financial,	All	Moderate	High
Technical Chamber of Greece (TEE)	Technological	All	Moderate	Moderate

Greek Section of the American Society for Heating, Refrigeration and Air Conditioning ("ASHRAE")	Technological	Buildings	Low	Moderate
Hellenic Passive Building Institute (HIPAK)	Technological	Buildings	Moderate	High
Centre for Renewable Energy Sources and Savings (CRES)	Technological	Energy systems	Moderate	High
"Athina" Research Centre	Technological	All	Moderate	Moderate
Institute for Sustainable Development of the European Public Law Organisation ("EPLO")	Technological	All	Low	Moderate
National Centre for Social Research (NCSR)	Behavioural	All	Low	Moderate
Norman Foster Institute	Technological, Behavioural	All	Moderate	High

Businesses inside and outside the Municipality of Athens will help implement the plan and can play a leading role through special programmes that combine climate action with the strengthening of entrepreneurship (especially in tourism businesses). In addition to energy suppliers, energy service companies, and energy system installers, professionals will play an important role organisations and associations such as the General Confederation of Professional, Craft Merchants of Greece (GSEVEE) and its institute (IME GSEVEE and KEK), the Athens Chamber of Commerce, the Association of Businesses and Industries (SEV), the Athens - Attica & Argosaronic Hotel Association and the Association of Taxi Owners of Attica (SATA). Table 35 presents these organisms in more detail.

Table 35. Systems & stakeholder mapping – Private companies and professional associations (A-3.2.6)

Private companies and professional associations	Related systems	Related areas	Influence on the climate neutrality of the city	Interest in the climate neutrality of the city
Public Power Company S.A. (PPC, or DEI)	Technological	Energy systems, Buildings	High	High
Other energy suppliers (e.g., HERON, nrg, Protergia, Elpedison, etc.)	Technological	Energy systems, Buildings	High	High

Energy Saving Companies (ESCOs) and energy system installers (e.g., Schneider Electric Greece)	Technological	Energy systems, Buildings	High	High
Real estate construction and development companies (e.g., “DIMAND”)	Technological	Buildings	High	Moderate
Food production companies (e.g., Vivartia Group, Coca-Cola Hellas)	Technological	Waste	Moderate	Low
Consumer goods companies (e.g., Fourlis Group, P&G)	Technological	Buildings, Waste	Moderate	Moderate
Consulting companies such as Upgrading S.A.	Technological	All	Moderate	High
Athens, Attica and Argosaronic Hotel Association (EXAAA)	Technological, behavioural	Buildings	Moderate	High
Association of Taxi Drivers of Attica (SATA), Panhellenic Taxi Federation (POEIATA)	Technological, behavioural	Transportation	Moderate	Moderate
General Confederation of Professional, Craft Merchants of Greece (GSEVEE) and its institute (IME GSEVEE and KEK)	Institutional, Organisational	Buildings (mainly of the tertiary sector)	High	High
Commercial Association of Athens	Institutional, Organisational	Buildings (mainly of the tertiary sector)	Moderate	Moderate
Association of Greek Research Firms	Institutional, Organisational	All	Moderate	Moderate
Association of Businesses and Industries (BSE)	Institutional, Organisational	All	Moderate	Moderate

NGOs and civil society organisations will help with their participation to combine climate action with meaningful social policy. Examples of such organisations are shown in Table 36 such as the energy communities around Athens (e.g., Hyperion), the Panhellenic Federation of Property Owners (POMIDA), and the Consumers' Union - Quality of Life (EKPOIZO). International environmental organisations with a strong presence in Greece (e.g. Greenpeace, WWF, Resilient Cities Catalyst), local environmental organisations (e.g., The Green Tank, InCommon, Hellenic Society for Culture and Environment or

ELLET, Hellenic Society for Nature Protection or HSPN, Environmental Alliance 2004, Team for the World), as well as organisations related to sustainable mobility such as Ecocity - Ecomobility, the Cycling Community PodilATTIKI and the organisation for the rights of pedestrians "PEZI" and social economy (Wind of Renewal, INZEB. Electra) are also expected to play an important role in the transition.

Table 36. Systems & Stakeholder Mapping – Civil society (A-3.2.7)

Civil society	Related systems	Related areas	Influence on the climate neutrality of the city	Interest in the climate neutrality of the city
Energy communities around Athens such as HYPERION, ELEKTRA, Wind of Renewal etc.	Technological, social, behavioural	Energy systems, community involvement	High	High
International environmental organisations such as Greenpeace, WWF, Resilient Cities Catalyst	Technological, social, behavioural	All	Moderate	High
Local environmental organisations such as The Green Tank, InCommon, Hellenic Society for Culture and Environment (ELLET), Hellenic Society for the Protection of Nature (HSPN), Environmental Alliance 2004, Team for the World, Upshift, RCC/CC HUB, Citizens' Association for Streams "ROH", Organisation GI, Network Mediterranean SOS, Ecological Society for Recycling, Panhellenic Network of Environmental Organisations	Technological, social, behavioural	All	Moderate	High
Wildlife organisations such as the Association for the Protection and Welfare of Wildlife (ANIMA), Hellenic Ornithological Society	Social, behavioural	Green infrastructure	Low	Low

Athens Partnership	Financial	All	Moderate	High
Panhellenic Federation of Property Owners (POMIDA)	Technological, social, behavioural	Buildings	Moderate	Moderate
Consumers Union - Quality of Life (EKPOIZO)	Social, behavioural	All	Moderate	Moderate
Bodies related to sustainable mobility such as Ecocity-Ecomobility, the Cycling Community PodilATTIKI, the Hellenic Urban Cycling Federation (EOAP) and the organisation for pedestrian rights "PEZI"	Social, behavioural	Transportation	Moderate	High
youth NGO such as Hellenic Youth Participation, Youth Active Minds, Inter Alia, Youth Active Minds, Ecotivity, Amazing Youth, WeFor, Astylab, Erasmus Student Network, and the Cell of Alternative Youth Activities (KEAN)	Social, behavioural	All	Moderate	Low
NGO supporting social groups such as I RCF-Greece, Ithaca, UNICEF, Hellenic Red Cross, ACCMR Athens, SOLIDARITY NOW, Greek Forum of Refugees, PRAKSIS, Terres des Hommes Greece, Ecogenia, The Salvation Army	Social, behavioural	All	Low	Low
Social, cultural and educational institutions and organisations, such as parents' and teachers' associations, Children's Museum and in general students and teachers of the Municipality of Athens	Social, behavioural	All	Moderate	Moderate

Social economy entities, such as the social cooperative enterprise "Myrtilo", Intercultural Steps	Social, behavioural	All	Moderate	Moderate

3. Part B – Pathways towards Climate Neutrality by 2030

Part B is the core of the Athens Climate Neutrality Action Plan. It was formed mainly by the Municipality of Athens and in continuation of the previous Action Plan of 2022. It also reflects the suggestions, concerns, and interests of citizens, local businesses, and other stakeholders of the city of Athens. The comments of these agencies and parties were collected during the writing of the Climate City Contract from March 2024 until September 2024 and will continue to be collected frequently throughout the planning and implementation of Athens' climate actions (see Part C for more details).

The following modules present with a hierarchical structure how the Municipality of Athens will reach the goal of climate neutrality in 2030. Based on the inventory of the Municipality's greenhouse gas emissions as well as the analysis of policies, barriers, opportunities and stakeholders in Part A, 10 strategic priorities were formulated for the Municipality of Athens (Module B-1). The module also includes strategies for five main areas, namely energy systems, the built environment, transport and mobility, waste and the wider circular economy, as well as green infrastructure and nature-based solutions. Module B-2 presents specific actions that implement these strategies. These actions mainly concern short-term projects that have already been launched or will be launched soon and will be the first step towards achieving the strategies and accelerating climate action in Athens. Finally, Module B-3 contains indicators for monitoring and evaluating the implementation of the strategies and the achievement of the objectives of the climate pact that will allow the Municipality to learn from the past and adjust the implementation actions accordingly.

3.1. Module B-1 – Climate Neutrality Scenarios and Impact Pathways

3.1.1. Strategic priorities

As mentioned in the introduction, the 2022 Climate Action Plan of Athens had already defined a series of strategic priorities for the reduction of the city's emissions by 61% by 2030 and achieve climate neutrality by 2050. The Climate City Contract of Athens builds on these initiatives and further increases their ambition to achieve over 80% emissions reductions by 2030, with the remaining emissions to be addressed with nature-based solutions. At the same time, the CCC aims to present in greater detail how strategic initiatives will be achieved, creating impact pathways that link specific immediate actions to short- and medium-term goals. These impact pathways are detailed later in the section, after the strategic priorities.

Beyond the need to increase the ambition for climate neutrality, the municipal authority had formulated since the beginning of 2024 a series of initiatives in response to everyday problems faced by citizens of Athens, such as energy poverty, unaffordable living costs, and road congestion. An important step was the decision to create municipal energy communities that will offer clean and affordable electricity to citizens, thus contributing to the reduction of energy costs and tackling energy poverty. In addition, the municipal authority is committed to improving infrastructure for pedestrians and cyclists as well as improving mobility with reliable and electric public transportation, while promoting the increase of pedestrian mobility and fostering a more sustainable and liveable city. Reducing traffic and emissions will also have significant public health benefits and reduce the number of premature deaths due to pollution and extreme temperatures. Also, the expansion of composting and better management of materials and waste can lead to a cleaner and more sustainable Athens.

These initiatives could not disregard measures to foster resilience to the impacts of climate change on the city, such as an ever-increasing overheating, the urban heat island phenomenon, as well as floods and fires in areas in and around Athens. The municipal authority's commitment to plant at least 25,000 trees by 2028 underlines its commitment to strengthening green infrastructure and improving the quality of life of residents. At the same time, the city's increasing water needs due to high temperatures require greater water conservation but possibly also the utilisation of rainwater, underground water and greywater, and even water after waste treatment. All these actions can contribute both to the adaptation to the new climate data and to the reduction of energy consumption for water transfer and use.

The following strategic priorities of the Climate City Contract embody these commitments (Table 37), helping the city navigate on a path that not only advances climate action, but also empowers the local community.

Table 37. Strategic priorities for 2030

Strategic priorities of Athens' CCC for 2030
1. **Covering 88% of the Municipality's electricity demand from renewable energy sources,** with 16% of the demand covered with active participation and Municipal projects/initiatives. 2. **Energy upgrades of buildings within the Municipality so that at least 34% have an energy class B or higher.** This entails 90% for municipal buildings, 50% for tertiary sector buildings, and 30% for residential buildings. In order to achieve these goals, new, innovative, and accessible financial tools and structures will be developed **with the participation of the** Municipality and other agencies to support households and businesses. 3. **Reduction of car and motorcycle traffic within the Municipality by 50% compared to 2019.** Active support of pedestrian traffic, cycling, public transport as well as green spaces. Aiming for neighbourhoods where citizens will be able to do most of their work and activities within 15 minutes, walking, cycling or using clean, green, and efficient public transport. 4. **Increase in recycling and composting to 85%,** prevention actions to reduce food waste by 30% compared to 2019 and a strong push **towards the circular economy.** 5. **Planting in collaboration with agencies and citizens of more than 35,000 trees within the Municipality until 2030.** Active policy for green and blue infrastructure, nature-based solutions, and 20% ecosystem restoration in the city. Digital recording of all trees and management based on live data. 6. **Integrated water management to avoid flooding and achieve better city cooling,** with an emphasis on green infrastructure for reuse and absorption from the ground, highlighting water in the city, restoring water roads, reducing water consumption from the network, and saving energy. 7. **Creation of corridors for ventilation and cooling of the city,** restoring as much as possible the microclimate, mitigating the urban heat island effect. 8. **Creation of a municipal building stock of near zero energy buildings.** 9. **Strengthening the green, sustainable, and circular economy,** by creating jobs, reinforcing research, education, and training, and emphasising a societally collaborative economy. 10. **The Climate City Contract of Athens will be a tool of social policy,** dealing with the climate, environmental, social, and economic problems of the city in a coherent and just way. All measures aim at a green, clean, sustainable, resilient, and beautiful Athens for the benefit of citizens and the environment, social cohesion, and social justice in the neighbourhoods, with no one left behind.

Comparing these priorities with those of the 2022 Climate Action Plan (Section 1.5), one of the most important differences is in the target of RES in electricity consumption, which rises from 62% to 88%. This is partly due to the updated NECP's increased ambition for 76% RES in the national electricity mix in 2030, but also to efforts to cover a significant part of electricity demand from local PV and energy communities. In addition to electricity consumption being responsible for most emissions in the Municipality, clean electricity will help reduce the emissions in other sectors, such as by electrifying electric vehicles as well as installing air conditioners and heat pumps in buildings. The target for energy upgrades to buildings remains practically the same as in the previous plan, also including the same targets for 30% of housing and 50% of tertiary sector buildings, while also adding a target for 90% of municipal building upgrades.

The target for reducing car traffic has been slightly increased in the present plan. Higher targets are also set for the electrification of transport (e.g., electrification of 50% of OASA buses instead of 7% in the previous plan) as well as for the Municipality's electric vehicle share (90% electrification by 2030). Although the targets for recycling and composting were slightly reduced to make them more realistic and achievable, an additional target to reduce food waste by 30% was also added, which is also present in the Integrated Framework for Waste Management (Law 4819 /2021). Finally, the goals of the previous plan for green infrastructure remained intact but were supplemented with a quantitative target for tree planting as well as the ambition to create an integrated water management strategy and corridors for ventilation and cooling of the city.

Athens faces the challenge of meeting its ambitious climate goals in less than seven years, despite the constraints imposed by the City's limited jurisdiction on key infrastructure and policies, such as the electricity grid and the public transport system. However, the municipal authority demonstrates its commitment to change by taking initiatives in areas where it has direct responsibility, such as improving public buildings, waste management, and promoting green and blue infrastructure. At the same time, the Municipality will take on the role of the mediator with the various other bodies that have jurisdiction in Athens (e.g., Ministries, or regional government) and mobilise them to take action.

Based on the priorities developed in the previous section, **impact pathways** are drawn up outlining the climate action of the Municipality of Athens in the main emission sectors of the city, including buildings and transport. Impact pathways were created based on their definitions in the NZC Theory of Change and the CCC Action Plan Guidance[26]. Beyond the 2030 goals mentioned in the strategic initiatives, impact pathways include short-term changes (about 1-2 years from now) and medium-term outcomes (3-4 years from now). For each emissions sector, an estimate of the emission reductions that would result from these routes is also calculated based on the simulation done with the model of the NZC programme (see Section 2.2.2 for more details). The total emissions resulting from all routes is equivalent to an 80% reduction compared to the Business as Usual, as shown in Section 2.2.2.

It is noted that the impact pathways were appropriately configured to bring about the necessary changes in all systems that can have an impact on the city's climate neutrality, i.e. technology and infrastructure, governance and politics, social innovation, democracy and participation, financing and financial tools, as well as learning and skills. At the same time, the barriers and opportunities identified for changing these systems in Module A-3 form the basis for estimating indirect impacts of impact pathways beyond emissions reduction, such as on urban air quality, adaptation to extreme weather phenomena, mitigation of the urban heat island effect, etc.

[26] https://netzerocities.app/resource-4249

3.1.2. Impact pathways for energy systems

Athens aspires to emerge as a model city in the promotion of renewable energy to reduce its emissions as well as to reduce the energy costs of its citizens and tackle energy poverty. With the goal of climate neutrality, the Municipality will undertake initiatives that do not depend only on the national political changes brought by the NECP for 2030, notably the national goal of 76% RES in electricity consumption. In particular, the Municipal Authority is committed to enhancing the local production of electricity from renewable sources, promoting the creation of energy communities and installing solar panel systems with batteries on city buildings' rooftops.

Through these measures, the Municipality aspires to produce at least 88% of its electricity demand from RES by 2030, thus unlocking large emission reductions outside power supply too (via electrification), mainly in the building sector. Based on the national target of 76% RES in electricity consumption, the Municipality should cover an additional 12% from local PV and other RES to reach the overall target of 88%. Nevertheless, the Municipality raises this additional 'local RES' target to 16%, in order to have a safety margin in case the national target does not reach 76%. The Municipality will carefully monitor the NECP implementation process and may further raise this target correspondingly.

Based on the minimum target of 16% and the total electricity consumption data of the base year 2019 (2,867 GWh), local RES must produce approximately 459 GWh. Assuming that this will be covered only by PV with an efficiency factor of about 16% (Pfenninger & Staffell, 2016), the required PV installations should reach a total power of almost 330 MWp. Of the above requirements for PV installations, it is estimated that the largest part will be covered by municipal energy communities (about 270 MWp) where the Municipality has already started the process of developing the first 20 MW for the energy community "Faethon" (see action A.E.6 in Module B-2).

The new rooftop PV systems are estimated at a total of 60 MWp. Based on the Solar Map of the Municipality of Athens (2021), the maximum power that could be installed in the buildings within the Municipality exceeds 620 MWp, while the average power that could be installed per building based on the available roof space is about 9-10 kWp. The estimation of the Google Environmental Insights Explorer for the total power that can be installed is even greater (979 MW)[27]. Thus, the present 60 MW installation plan is considered technically feasible.

A significant part of the local PV will be placed on the rooftops of buildings of the Municipality of Athens (680 buildings in total) as well as on other buildings (public and non-public) with a large rooftop surface. The first action to install photovoltaic systems in 52 schools of the Municipality has already been launched (see action A.E.1 in Module B-2), combined with energy saving measures, it will produce electricity that will cover the needs of all schools in the municipality by 150%. These actions not only promote sustainability, but also save resources for citizens, boosting the local economy and creating new jobs. Also, the Municipality aims to redistribute income from the production of electricity through the Municipality's photovoltaics to supply vulnerable households in order for green energy to acquire a social dimension.

The Municipal Authority is considering the use of other technologies, such as wind turbines, biomass, and energy storage systems, to further enhance energy sustainability and autonomy. Also, the Municipality will seek collaborations with HEDNO, IPTO, RAEWW and other bodies related to the electricity system in order to overcome obstacles to the installation of new RES projects (see Module A-3) and especially in the issue of networks and finding electricity space. It is indicated that the revised NECP (summer 2024) estimates that the investments between 2025 and 2030 in electricity networks throughout Greece will reach almost 10 billion with about 1.5 billion already available through public funding. At the same time, the "Apollo" programme, which is already launched by the Ministry of

[27] https://insights.sustainability.google/places/ChIJ8UNwBh-9oRQR3Y1mdkU1Nic?ty=2023&hl=en-US

Environment and Energy[28], intends to reduce the energy costs of vulnerable households and self-governing organisations by installing new RES stations and using energy offsetting. There are many opportunities to coordinate the goals of the CCC with the national goals, and the Municipality will take advantage of these opportunities by cooperating actively with the central government and other agencies.

Alongside the above infrastructure and technology projects, the Municipality of Athens will pursue important collaborations with other neighbouring municipalities for knowhow exchange and joint projects. From the beginning of 2024, the Athenian Energy Alliance was established at the initiative of the Municipality of Athens with the participation of at least 16 neighbouring municipalities. Among its first actions, the Climate and Energy Academy has already been launched to train municipal executives in energy and green development issues.

The Municipality of Athens will also play an important role in finding funds from public and private sources to strengthen local RES. Discussions have already taken place on this issue with members from the Climate Bond Initiative, the European Mortgage Federation, and the European Bank for Reconstruction and Development to find suitable financing tools in which the Municipality could play a leading role, e.g., as guarantor. Finally, the Municipality will facilitate the development of RES through support measures beyond financial tools such as campaigns to promote RES programmes, compensatory benefits (especially for businesses) and one-stop-shops to facilitate applications for local RES projects.

An overview of the impact pathways for energy systems can be seen in Table 38.

Table 38. Overview of impact pathways – Energy systems (B-1.1.1)

Systemic Levers	Early Changes (1-2 Years)	Late Outcomes (3-4 years)	Direct Impacts (2030 emission reductions) *	Indirect Impacts (Co-benefits)
Technology & infrastructure	Photovoltaic systems in most schools in Athens Photovoltaic systems in some municipal buildings First photovoltaic parks from energy communities in collaboration with the Municipality	Photovoltaic systems in most municipal buildings Installation of photovoltaic systems on approximately 7-10% of the available total roof surface of buildings in Athens (including storage) More energy communities and new PV parks in collaboration with the Municipality	**1,420 kt CO_2e** (by increasing the share of RES in electricity consumption within the Municipality)	Reducing the volatility of energy costs for citizens Green jobs (e.g., in rooftop PV projects) Reduction of energy costs for the Municipality Promotion of energy democracy Mobilising the transition of neighbouring municipalities

[28] https://ypen.gov.gr/7-erotiseis-apantiseis-gia-to-programma-apollon/

		Installation of other energy systems (e.g., biomass-based systems)		
Governance & politics	Support measures to strengthen energy communities and rooftop PV projects (e.g., promotion campaigns, benefits, one-stop-shops)	Provision of cheap energy produced by the Municipality for energy poor households		
Social innovation				
Democracy & participation				
Financing	Creating new financial tools for energy communities and rooftop PV (e.g., green bonds)	Energy project financing support (e.g. facilitating the process, providing guarantees)		
Learning & skills	Capacity building and cooperation with neighbouring municipalities for energy systems through the Athens Energy Alliance	Escalation of collaborations, expansion to other municipalities of the Attica Region		

** NZC economic model results (Material Economics, 2020) for the Municipality of Athens [simulation: July 2024]. The calculation was made by comparing a scenario leading to over 80% reduction in emissions in 2030 with a scenario without climate policy after 2019 (Business as Usual).*

3.1.3. Impact pathways for the built environment

The building sector is responsible for most greenhouse gas emissions in the Municipality of Athens, generating 71% of total emissions (see Module A-1). Most of these emissions (1,684 kt CO_2e in 2019) are generated by electricity consumption and will be addressed by the measures mentioned above in the category of energy systems. However, electricity aside, heating in buildings leads to non-negligible emissions (277 kt CO_2e in 2019) that must also be addressed. At the same time, the ever-increasing temperatures in Athens are expected to lead to an increase in the use of air conditioning, which together with the electrification of movement and heating (heat pumps) are expected to increase electricity consumption above the levels in 2019. Therefore, there is a need for significant energy upgrades to the shell of most of the Municipality's buildings, in addition to changing heating or cooling equipment to more energy efficient models (and modes).

As presented in the strategic priorities of the Municipality, the goals for the energy upgrade of the Municipality's buildings are for at least 50% of the buildings in the tertiary sector and 30% of the residential buildings to be of energy class B or above. Energy class B is the reference building class according to the Regulation on the Energy Performance of Buildings (KENAK), which for older buildings it indicates that they have been properly upgraded to have a comparable performance with buildings built after 2012. Similar targets existed in the 2022 Action Plan and now a much more ambitious target is added for municipal buildings to reach 90%.

Of course, these targets are quite ambitious given that most buildings in Athens are quite old, and the current rate of energy upgrades is insufficient to reach the 2030 targets. Assuming that the past energy performance certificates mix in the buildings of the Municipality of Athens are close to those of the Region of Attica[29], it is estimated that in 2022 over 60% of the total area of the residential buildings of the Municipality of Athens were classified in the three lowest energy classes, E, Z, and H. This share is approximately 28% for tertiary buildings and 23% for public buildings for 2022. In contrast, the corresponding area percentage for buildings classified in class B and above is approximately 6% for residential buildings, 9% for tertiary buildings, and 9.7% for public buildings.

To boost the current rate of energy upgrades to meet the target, upgrades would be needed in approximately 10,300 residential buildings (~6.88 million $m^{2)}$, 3,400 tertiary sector buildings (~2.16 million $m^{2)}$ and 500 public buildings (~0.34 million $m^{2)}$. It is noted that these buildings will have to be upgraded *in addition to* the current rate of energy upgrades, including the positive effects of national support programmes “Eksikonomo”.

In comparison, the NECP calculates that in the period 2025-2030 the annual rate of renovation of residential buildings will rise to 70,000 renovations per year, so 400,000 for the entire period. Given that the population of the Municipality of Athens compared to the total population of the country is approximately 6.14%, the renovations theoretically attributable to the Municipality are 21,490. Although most of these renovations will not reach the energy class B target, clearly there is also a national effort to increase the renovation rate. Therefore, the Municipality of Athens will seek to cooperate with the central government to achieve an even greater goal of renovation in its territory.

It is also noted that, if the target were adjusted so that at least 30% of residences and 50% of tertiary buildings were of energy class C in 2030, then it would be significantly easier to achieve since the share of buildings of class C was already 20% and 37%, respectively, in 2022. Nevertheless, from the existing model of the NetZeroCities programme, it is not clear to which energy class existing buildings should be renovated to achieve the required reduction in greenhouse gas emissions of the building sector. Thus, we provisionally select the most conservative option of energy class B that is realistic and the highest class of an energy upgrade of a building older than 2012. This option will be reviewed in the coming months using the revised NZC model, which is expected after September 2024.

In addition to interventions in the building envelope through thermal insulation and energy-efficient windows, the upgrades will focus on the installation of solar water heaters for hot water as well as heat pumps. Solar water heaters in particular are very widespread in Greece and are estimated to have contributed approximately 33% of the Domestic Hot Water (DHW) production rate in the Municipality of Athens in 2018. This rate may have increased further in recent years with the use of funding programmes such as “Recycle - Change Water Heater”. For 2030, the Municipality of Athens aims to increase the installation rate of solar thermal elements, especially in homes with old and energy-inefficient water heaters, so that the share of solar water heaters in DHW production reaches 50%.

Heat pumps are less widespread, having been installed in just 0.6% of Greek homes in 2022[30] and with a participation of around 4-5% in final heat consumption of homes based on NECP estimates. According to NECP forecasts for 2030, the percentage of heat consumption will increase significantly and reach approximately 17% in residences, while for the tertiary sector it may reach 60-70%. A ban on new oil burners from 2025 under the National Climate Act will help in this direction. As part of the energy upgrades until 2030, the installation of heat pumps will be further strengthened so that the participation

[29] https://bpes.ypeka.gr/wp-content/uploads/2023_06_30_ETHISSIA_EKTHESI_STATISTIKON_ATFOTELSMATON.pdf

[30] https://www.statistics.gr/documents/20181/18074233/GreeceinFigures_2023Q4_EN.pdf/1e72c05a-0802-1b9d-aca0-dbcb5be5d355

rate in heat consumption reaches 30% for all buildings within the Municipality, with a greater emphasis on buildings in the tertiary sector.

Energy upgrades will start from municipal buildings with low energy efficiency, including public schools within the Municipality in which energy upgrade and PV installation procedures have already started (see action A.B.1 in Module B-2). Similar upgrades should be made to residential and tertiary sector buildings, where the Municipality will play an important role with funding, support, training, and mobilisation programmes. As mentioned above for the energy systems, the Municipality has already started talks with financial institutions such as the European Bank for Reconstruction and Development for the creation of financial tools, while it has already started support programmes for businesses such as Athens Business Green Toolkit (see action A.B.3 in Module B-2). These actions will be intensified in the coming years in order to create a "toolbox" of measures to strengthen energy upgrades in the city.

Beyond actions to support energy upgrades of private buildings within its territory, the Municipality of Athens is considering the possibility of playing a more direct role by means of energy upgrades to part of the residential buildings within the Municipality with the aim of creating a stock of municipal housing. These buildings will be used to address the city's housing problem in the context of corresponding social housing programmes in cities abroad. In the coming months, much more detailed studies will be carried out to assess whether this programme would be feasible and how many buildings could be used.

Alongside the energy upgrade of the city's buildings, the Municipality intends to actively combat energy poverty. Since the beginning of 2024, the Energy Poverty Alleviation Office of the Municipality of Athens has been established with the aim of helping energy-vulnerable households to reduce their energy costs through the provision of appropriate advice, interventions and financial tools. With the support of the C40 Cities network, already a team of 50 energy advisors has been put together and will start audits of vulnerable households in the coming months; these efforts are expected to continue and ramp up.

Finally, for new buildings, although the national building regulations (KENAK) state that all new buildings must have energy class A, a push should be made to ensure that a significant proportion of new buildings within the Municipality will be of energy class A+ to reduce their energy consumption further down.

An overview of the impact pathways for the built environment can be seen in Table 39.

Table 39. Overview of impact pathways – Built environment (B-1.1.2)

Systemic Levers	Early Changes (1-2 Years)	Late Outcomes (3-4 years)	Direct Impacts (2030 emission reductions) *	Indirect Impacts (Co-benefits)
Technology & infrastructure	Energy upgrades in municipal buildings with low energy efficiency Energy upgrade of the overall street lighting of the Municipality	Energy upgrades in approximately 90% of municipal buildings Accelerating private building upgrades (residential & tertiary sector)	**23 kt CO_2e** (building shell upgrades) **89 kt CO_2e** (greater adoption of heat pumps and solar water heaters) **98 kt CO_2e**	Reduced energy costs for households and businesses within the municipality Reduced demand for air conditioning in summer (further reducing energy costs and improving grid stability)
Governance & politics	Promotional campaigns and	Support measures for the construction of		

Learning & skills	rewards for energy upgrades Support programmes for the adoption of heat pumps and solar water heaters	new buildings with near zero energy consumption (category A+)	(energy efficient lighting fixtures & devices in buildings within the Municipality) **1 kt CO_2e** (construction of new buildings with energy class A+ instead of A)	Better thermal comfort and conditions inside buildings (especially with extreme temperatures becoming more intense and frequent in summer) Reduced health problems and mortality due to heatstroke (especially for vulnerable groups such as the elderly) Jobs in the construction sector Sustainable tourism
Social innovation	Measures to tackle energy poverty	Creation of municipal housing stock with zero greenhouse gas emissions		
Democracy & participation				
Financing	Creation of financing tools to support energy upgrades	Application of financing tools, collaborations with national programmes of financing upgrades (e.g. "Eksikonomo" for the Municipality of Athens)		

** NZC economic model results (Material Economics, 2020) for the Municipality of Athens [simulation: July 2024]. The calculation was made by comparing a scenario leading to over 80% reduction in emissions in 2030 with a scenario without climate policy after 2019 (Business as Usual).*

3.1.4. Impact pathways for transport & mobility

Sustainable and smart mobility is an important goal for the Municipality of Athens, offering many benefits from a climate mitigation perspective and improving the quality of life of its citizens. The main objectives of the climate contract of the Municipality of Athens in relation to transportation are to reduce the use of private motor vehicles by 50% (mainly in passenger cars and to a lesser extent in motorcycles) as well as to increase active mobility (walking, cycling).

Although the Municipality of Athens does not have jurisdiction over its major avenues, it can play an important role by intervening in neighbourhoods. For example, one of the most important interventions, which is also a recent initiative of the municipal authority, is the creation of 15-minute neighbourhoods in order to reduce the need for motorised travel and enable citizens to meet most of their needs by commuting within short distances from their home. Measures that are currently examined to support 15-minute neighbourhoods include local traffic regulations at neighbourhood level, the designation of 30 km/h traffic zones and shared space for cars, bicycles, and pedestrians, as well as bicycle parking at public transport stations.

Similarly, the Superblock model will be used to create light-traffic streets within the neighbourhoods of Athens, unlocking urban spaces for pedestrians, cyclists, green infrastructure and other uses. In the coming months, Superblock will be piloted in an Athens neighbourhood through the ASCEND project, funded and supported by the NetZeroCities programme (see action A.T.1 in Module B-2). In parallel with these interventions, the Municipality's sidewalks will be upgraded and widened, while networks of bicycle paths will be constructed to facilitate and boost walking and cycling.

For the planning and implementation of these actions, relevant studies that have already been done for a more sustainable transport and mobility system in Athens based on walking and cycling will be used. These studies include the Sustainable Urban Mobility Plan of the Municipality of Athens (2021), the analysis of the walkability of Athens by the NTUA Sustainable Mobility Unit (2024), as well as the analysis of the Norman Foster Institute for Athens (2024). The latest analysis focuses on measures for light-traffic roads and green infrastructure in the neighbourhood of Kypseli and is available in Annex A.

In addition, the Municipality will aim to reduction of private car usage in the city centre through a number of soft measures, such as a reprogramming of traffic lights to reduce emissions and facilitate pedestrian movement, more strict criteria for the traffic ring of Athens, a pricing policy to discourage car access to the city centre, and, potentially, a introducing a pricing policy to discourage access to the centre by car, such as the ones used in other cities, e.g., London. In addition, the Municipality will reduce traffic from larger vehicles, such as introducing a regulatory framework for the operation of tourist buses, a new strategy for loading and unloading timetables of trucks, and an optimised waste collection programme. In addition to solutions for movement within the Municipality of Athens, solutions will be considered together with the neighbouring municipalities to limit transboundary traffic through the Municipality, which is an important source of emissions (see Module A-1). The promotion of car-pooling programmes by the Municipality of Athens in cooperation with competent bodies and private individuals will also be examined. A mobility observatory with indicator measurements for vehicle traffic, pedestrians, bicycles, micro-mobility vehicles, public transport and pollutants will be also established.

In addition, to the measures for discouraging private car traffic, a comprehensive new parking policy for the Municipality of Athens would be a key tool for freeing up public space for the benefit of active forms of transport. The interventions concern all types of parking in terms of purpose, duration and location. A single digital register of on-street parking spaces would be created in GIS for the entire Municipality of Athens, which is coded as to the exact location and type of use (paid, resident, special use, free, etc.). In addition, policing will be strengthened with regard to parking by extending the responsibilities of the Municipal Police and by expanding the use of technical means (occupancy sensors). The Municipality also plans to create off-street parking spaces (plots, buildings) in residential areas or at public transport transfer stations and removal of corresponding on-street parking spaces. The Municipality is seeking ready-made buildings or land plots for the creation of enclosed parking spaces that are municipal-owned or in partnership with the private sector. Resident parking spaces would be also created in these spaces, in connection with the residential properties. At the same time, at least an equal number of on-street parking spaces shall be removed from the site, to be allocated to soft modes of travel.

In terms of urban transport, one of the most decisive improvements will be the completion of Metro Line 4, which will serve a large part of the Municipality that does not yet have access to a metro station. Officially, the line is expected to be completed in 2030, but it is not unlikely to be further delayed based on latest statements and developments. Although the Municipality does not participate in the operation of urban transport, it will play a decisive role in improving the conditions so that a part of car mobility is replaced by public transport. The use of public transport can be boosted through awareness-raising actions and information campaigns organised by the Municipality as well as through other measures in collaboration with OASA such as, for example, readjustment and optimisation of bus routes in areas with poor connection. Additionally, the public transport operating hours can be extended and the regulation for the transfer of bicycles and micro-mobility units on public transport can be changed. At the same time, the Municipality has already launched the creation of municipal transport through electric buses, which will serve visitors and residents of the city.

Apart from reducing traffic load, another important step is the electrification of cars, motorcycles, and buses. As of May 2024, 140 electric buses have been acquired in Attica, with some of them already serving the Municipality of Athens (together with the existing electric trolleys). This number is expected to increase in the coming years together with the support of the Municipality of Athens through

appropriate programmes in collaboration with OASA and based on its plan for sustainable development[31]. The goal is for 50% of buses to be electric by 2030.

For cars and motorcycles the target is to electrify 20% of their fleet by 2030. Since this target is considerably harder for cars than for motorcycles, the latter will be mainly emphasised, so that approximately 40% of motorcycles and 10% of cars are electric by 2030. The corresponding share of electric cars for the Municipality of Athens based on the revised NECP is estimated at 7% to 11% (for electric and plug-in hybrids), so 15% is almost twice the minimum provided by the NECP. For this reason, this goal may change during the implementation of the climate plan, given that the core priority of the Municipality of Athens is on reducing car use and then, electrification of passenger cars. In this context, the Municipality will seek to create programmes in collaboration with other agencies and individuals for the retirement of old, highly polluting cars and motorcycles, without necessarily the obligation to purchase an electric vehicle but by providing advice on alternative means of transportation.

The Municipality will ensure that the majority (ideally 90%) of municipal vehicles are electric by 2030 and will install chargers that use electricity from renewable sources. Revenue from charging cars with renewable electricity will go to a separate city fund that will support green transition and social justice programmes. Although the statewide goal is one charger per 1,000 residents, the City of Athens will aim to install nearly three times as many to encourage electrification. Of the 545 chargers foreseen in the Electric Vehicle Charging Plan of the Municipality of Athens, ideally at least 1,500 will be installed to meet the burden created by the increase in electricity demand due to the large increase in touristic traffic and passing-through vehicles. With a ratio of about one charger per ten electric cars, as used in other densely populated European countries (Hall & Lutzei, 2021), the number of chargers will be sufficient to address as high a share as the low NECP forecast of 7% (so about 15,000 electric cars in the Municipality of Athens).

An overview of the impact pathways for transport and mobility can be seen in Table 40.

Table 40. Overview of impact pathways – Transport & mobility (B-1.1.3)

Systemic Levers	Early Changes (1-2 Years)	Late Outcomes (3-4 years)	Direct Impacts (2030 emission reductions) *	Indirect Impacts (Co-benefits)
Technology & infrastructure	Expansion of the bicycle path network Upgrading and widening of sidewalks Chargers in municipal buildings Expansion of electric buses and creation of municipal transport	Electrification of the municipality's vehicle fleet Installation of at least one public charger per 500 citizens Electrification of half the bus fleet	**82 kt CO_2e** (reduced need for motorised passenger movements and car-pooling) **90 kt CO_2e** (shift to public and non-motorised transport)	Improved air quality in the city Improved accessibility and safety for pedestrians (especially for citizens with disabilities and/or reduced mobility) Safer and faster cycling in the city

[31]https://oasa.b-cdn.net/wp-content/uploads/2024/04/GR_OASA_SUSTAINABILITY_REPORT_2022_webl.pdf

Governance & politics	Measures to reduce traffic and parking in the centre of Athens Measures to optimise the supply chain of businesses within the Municipality (e.g., truck loading and unloading program)	Zero emission zone in the city centre for heavy vehicles Coordination actions with neighbouring municipalities to limit transboundary traffic	**28 kt CO_2e** (electrification of cars and motorcycles) **5 kt CO_2e** (bus electrification) **9 kt CO_2e** (optimised supply chain)	Reduced road traffic accidents and deaths Reduced commuting time Reduced fuel costs (especially when combined with the provision of cheap electricity) Decentralised neighbourhood development across municipal units (e.g., enhanced local commercial activity) Optimised supply chain and reduced costs and times for truck and van deliveries
Social innovation	Creating pilot Superblocks Creating 15-minute pilot neighbourhoods	Expanding the Superblock programme to other neighbourhoods Extension of 15-minute neighbourhoods		
Democracy & participation				
Learning & skills				
Financing	Support measures to reduce car traffic (e.g., promotion of car-pooling, priority for two-wheelers)	Support programme for citizens in withdrawing their old motorcycles and/or old cars with internal combustion engines		

** NZC economic model results (Material Economics, 2020) for the Municipality of Athens [simulation: July 2024]. The calculation was made by comparing a scenario leading to over 80% reduction in emissions in 2030 with a scenario without climate policy after 2019 (Business as Usual).*

3.1.5. Impact pathways for waste & circular economy

Reducing waste production and increasing recycling and composting are necessary conditions for reducing greenhouse gas emissions from waste generated within the Municipality of Athens. Composting in particular is of key importance since the decomposition of organic waste in landfills is the main source of emissions from the waste sector. At the same time, it will allow the Municipality to move away from the linear model of export, production, use, disposal, and treatment of waste and to support a more circular and sustainable model of material use.

The Municipality's priority for 2030 is to treat over 85% of waste within its territory through recycling and composting processes. This target is translated into individual targets per waste stream, namely 90% recycling of paper, glass, and metals; 60% recycling of plastic; and 85% composting of organic waste.

This is a very significant change from the current situation, since the general recycling rate for 2023 was 8.3% and the composting rate was about 3% (of the total amount of organic waste), based on estimates by the Municipality's Cleaning and Recycling Department.

Although these goals seem difficult to achieve for the Municipality of Athens, the Integrated Framework for Waste Management (Law 4819/2021) contains a goal for 70% recycling of packaging waste, while the National Waste Management Plan (2023) contains a national target to reduce landfill waste to less than 10%. Considering that waste incineration facilities are not projected to be used for Athens' waste until 2030, Athens' recycling/composting rate should ideally be close to 90% (assuming that the Municipalities will contribute almost equally to the national target). The Municipality of Athens will make an effort to reach this upgraded target by 2030 but at a minimum it plans to achieve the target of 85% in order to appropriately reduce emissions from the waste sector.

The Municipality of Athens has direct responsibility for the collection of waste in its territory and therefore also for the quality of the waste streams that end up in the solid waste treatment facilities of EDSNA and in the wastewater treatment facilities of EYDAP. With the aim of immediately increasing the rate of composting, the Municipality will place significantly more brown bins in all neighbourhoods and offer small bins for composting to businesses (especially restaurants) as well as to citizens. The necessary organic collection vehicles already exist but the number of drivers and waste collection workers will need to increase to support the collection of organic waste in the Municipality.

In addition to measures for organic waste, blue recycling bins and recycling corners that provide refunds will be increased, with special attention to plastic packaging waste where separating its materials is much more difficult than other streams. Also, the waste transshipment station will operate in the area of Elaionas, which will optimise the itineraries of the waste trucks, allowing them to be collected more frequently in the neighbourhoods. Waste collection trucks will also travel shorter distances, thereby reducing their fuel consumption and thus their emissions.

Along with measures for better waste treatment, the Municipality of Athens will seek to reduce the amount of waste, especially organic waste. Already within the framework of the European FUSILLI programme (see action A.W.6 in Module B-2), the Municipality will update its action plan for sustainable nutrition and for reducing food waste. In this, in fact, the Municipality will adopt the goal of the national Integrated Framework for Waste Management for a 30% reduction in relation to the produced food waste. Also, the Municipality of Athens will continue and ramp up reuse and responsible consumption programmes in schools and will intensify its efforts through further activities with the city's youth, within the framework of the Athens Youth Climate Assembly and the Youth Climate Action Fund, with the support of Bloomberg Philanthropies.

In addition to the youth, information campaigns will be organised for other social groups to make them aware of reuse but also to promote recycling and composting. Although such campaigns have been organised in the past, the Municipality of Athens will first seek to understand in depth local specificities and behaviours within the Municipality that prevent the increase of recycling and composting. Thus, the Municipality's campaign will become more targeted while at the same time it will be able to escape from the typical assumption that the only obstacle to recycling is the lack of information among citizens.

Complementary to these awareness measures, the Municipality of Athens will create infrastructure to support reuse, such as the construction of a "Green Spot" for the Municipality of Athens in Elaionas, where Athenians can dispose of items that are no longer useful to them, while operating repair workshops for furniture, electrical appliances, etc. In cooperation with social and solidarity economy bodies, urban mining (recovery of useful materials from waste) and repair cafes will also be supported to further reduce the amount of waste.

An overview of the impact pathways for waste and the circular economy can be seen in Table 41.

Table 41. Overview of impact pathways – Waste & circular economy (B-1.1.4)

Systemic Levers	Early Changes (1-2 Years)	Late Outcomes (3-4 years)	Direct Impacts (2030 emission reductions) *	Indirect Impacts (Co-benefits)
Technology & infrastructure	Availability of compost bins in neighbourhoods Expansion of the recycling network	Over 30% of organic waste ends up in composting Installation of underwater bins for different waste streams in several neighbourhoods of the Municipality	**64 kt CO_2e** (increased waste recycling & composting)	waste treatment/landfill costs for the Municipality (including fines from the EU) Reducing the environmental footprint of waste disposal in landfills (e.g., to nearby aquifers) Reducing the use of primary materials Cleaner city streets, with potential public health benefits More jobs in the circular economy and cleaning sectors Reducing food waste and thus food costs
Governance & politics	Strengthening of human resources and capacities of the Department of Cleaning and Recycling	Reducing the environmental footprint of waste collection operations (e.g., optimising collection routes)		
Social innovation Democracy & participation Learning & skills	Campaigns to raise awareness about composting and recycling Campaigns to promote reuse and responsible consumption Integrated green spots to promote reuse	Cooperation programmes with other municipalities and private entities Increase in urban waste extraction and utilisation (urban extraction)		
Financing	Support for businesses (especially restaurants) to acquire small bins for composting	Supporting citizens to acquire small bins for composting		

** NZC economic model results (Material Economics, 2020) for the Municipality of Athens [simulation: July 2024]. The calculation was made by comparing a scenario leading to over 80% reduction in emissions in 2030 with a scenario without climate policy after 2019 (Business as Usual).*

3.1.6. Impact pathways for the green infrastructure and NBS

Green infrastructure and nature-based solutions will play a dual role for the Municipality of Athens. On the one hand, they can directly help to achieve climate neutrality through the absorption of the remaining emissions in 2030, but also indirectly, for example, through a feel temperature drop in the city and therefore the need for air conditioning in the summer. But, above all, they will play a decisive role in climate change adaptation and especially to the overheating of the city and its risks from major flooding events. A detailed description of climate data and future risks for Athens is given in Section 1.4.

One of the main strategic priorities of the Municipality of Athens is to improve green infrastructure by planting more than 25,000 trees during the period 2024-2028. Within the first six months of 2024, the municipal authority already planted over 2,000 trees. This tree planting initiative will extend beyond the boundaries of the Municipality, through partnerships with other municipalities in Attica and beyond. Also, there are already discussions with private entities for the further financial support of this goal to even reach 50,000 new trees. It is noted that the existing trees within the Municipality are approximately 90,000, so this increase is significant.

Planting these trees will also help achieve the goals of the 2022 Action Plan (and which are also adopted in the Climate City Contract): by 2030, 30% of the city's surface must be covered with green spaces or permeable surfaces and 70% of the city's population must have access to green space within 300 meters. These goals are relatively ambitious since the coverage of the city by green surfaces is estimated at around 18% in 2024 while only 40% of its citizens live within 300 meters of a green space (NFI, 2024).

In addition to planting new trees, the Municipality of Athens will improve the existing green spaces in the city through a series of infrastructure projects, such as the green spaces that will be created in Elaionas as part of the Double Redevelopment project. Also, green and blue infrastructure will be strengthened mainly in the area of Lycabettus, according to the "Athens, resilient city and natural capital" plan, while water resources such as the stream of Podoniftis and Prophet Daniel will be restored and highlighted.

At the same time, the climate crisis and the high air pollution in Athens present challenges for the sustainability of the local flora and fauna, requiring adaptation and resilience measures, as well as a careful selection of plant and tree species that are resistant to the difficult conditions. To address these challenges, the Municipality will expand the recording and monitoring of the status of trees and plants within their territory, based on the database created in collaboration with the Agricultural University of Athens for the trees of Athens, as well as in collaboration with the academic community and professional bodies. Citizens are invited to actively participate through citizen science projects, helping to protect and monitor green infrastructure in their neighbourhoods.

In addition, in cooperation with educational and lifelong learning institutions, the Municipality will promote the training of young professionals to work in integrated green-blue infrastructure approaches. At the same time, retraining programmes for more experienced professionals in the field will be developed, thereby strengthening the city's ability to respond to environmental challenges and create sustainable, green solutions for the future. The Municipality will also seek to strengthen the human resources and capabilities of the Department of Greenery and Urban Fauna as well as the training of its staff in nature-based solutions. The Municipality is also actively involved in many research projects on green infrastructure and improving the resilience of Athens to climate change and will seek to participate in even more in the future.

It is noted that, although these infrastructures and actions will be an important first step in shielding the city against the climate crisis, it is clear that larger-scale projects and based on an even more comprehensive design are needed to address the ever-increasing challenges in Athens and to significantly improve its citizens' quality of life. In addition to individual projects, it will be necessary to connect areas with green continuous corridors and ventilation and cooling projects of the city with linear

parks, even larger green and blue infrastructure, as well as openings in areas that face serious problems from the urban heat island effect. For example, a 'green defence' zone could be created against heat waves and pollution, especially along Kifisos / Ethniki, while hill resilience projects and green routes can be done in Lycabettus, Plato Academy, Goudi, Skouze Hill, in the park of the Evelpidon School, etc.

Such large projects will require detailed studies and multiple costs than what is estimated in the investment plan of the CCC, including a significant cost for land expropriations. Since the CCC focuses on climate change mitigation rather than adaptation to it, these flagship projects will not be integrated into the CCC's actions for the time being. In the coming months, the Municipality of Athens seeks to further study the design of these projects in order to formulate a comprehensive action plan for adaptation to climate change that will accompany and strengthen the CCC of Athens.

An overview of the impact pathways for the green infrastructure and nature-based solutions can be seen in Table 42.

Table 42. Overview of impact pathways – Green infrastructure & NBS (B-1.1.5)

Systemic Levers	Early Changes (1-2 Years)	Late Outcomes (3-4 years)	Direct Impacts (2030 emission reductions) *	Indirect Impacts (Co-benefits)
Technology & infrastructure	Over 10,000 new trees within the Municipality Improvement of existing green spaces in the city	Over 15,000 new trees within the Municipality More trees in Attica and other regions of Greece	**477 kt CO_2e** (residual emission offset)	Reduction of temperatures in the summer and improvement of air quality within the Municipality Improving drainage in the city and mitigating the effects of flooding Strengthening natural shading in the municipality Reduction in electricity demand for air conditioning through lower demand for cooling Healthier ecosystems and soil in the Municipality that further supports sequestration of greenhouse gas emissions
Governance & politics	Protection and restoration of the streams and water bodies of Athens Change of the Municipality's regulations on green infrastructure New staff and infrastructure in the Department of Greenery and Urban Wildlife as well as training in nature-based solutions	Collaborations with neighbouring municipalities to facilitate the planting and protection of trees in Attica (including their protection from fires)		
Social innovation	Campaigns to increase public participation in tree planting and	Ecotourism activities in Athens with the support of		

Democracy & participation	protection as well as other nature-based solutions Collaboration with stakeholders to study and monitor the resilience of Athens' trees (e.g., through GIS systems) Research on green infrastructure and improving Athens' resilience to climate change	relevant stakeholders Biodiversity monitoring programmes (e.g., through partnerships with relevant NGOs and citizen science activities) Educational activities on nature-based solutions for the other departments of the Municipality, services, citizens and other stakeholders		
Learning & skills				
Financing	Increased funding sources for green infrastructure within the Municipality (e.g. through donors)	Establishment of funding programmes for nature-based solutions outside the territory of the Municipality		

** NZC economic model results (Material Economics, 2020) for the Municipality of Athens [simulation: July 2024]. The calculation was made by comparing a scenario leading to over 80% reduction in emissions in 2030 with a scenario without climate policy after 2019 (Business as Usual).*

3.1.7. Summary strategy for residual emissions

The remaining emissions based on the CCC targets of the Municipality of Athens are estimated at 477 kt CO_2e. 44% of these emissions include greenhouse gas emissions from the liquid fuel road transport sector, which will hardly be able to abate by 2030 as this requires significant changes in the mobility habits of the citizens of Athens, further metro and tram lines, as well as skyrocketing electrification levels in mobility. Based on the NECP, electrification is expected to be significantly strengthened in Greece after 2030, while the additional changes in public transport will require significant investments at the national level and major projects in metropolitan Athens that are doubtful whether they will be completed by 2030. Even regarding Line 4 of the metro, the construction of which has already started, doubts have been expressed about whether it will be able to be completed by 2030 as originally planned[32]. It is noted that most of the cities expressing interest in the European Cities Mission reported that the majority of their remaining emissions for 2030 would come from the transport and mobility sector (Ulpiani et al., 2024).

Also, despite all interventions to strengthen walking and cycling within the Municipality, transboundary traffic via the main avenues through the Municipality of Athens will not be able to easily reduce. It is

[32] https://www.ethnos.gr/greece/article/321958/grammh4metroexopragmatikotoxronodiagrammatonoktoetonleeitoypoyrgeiopaeipiopisohparadoshths

noteworthy that these emissions are quite significant and correspond to approximately 65% of the total emissions for transport and mobility (BASIC level, see Google EIE, 2024). Part of these can be reduced by measures that discourage entering or passing through the Municipality by car (e.g., reduced availability of parking spaces in the centre of Athens), but most of them should be reduced by a more integrated transport planning with the participation of the municipalities of the Central Sector of Athens or at the regional level. The Municipality of Athens will seek such collaborations with all relevant levels of government in Greece (Municipalities, Regions, Ministry of Infrastructure and Transport) and will offer expertise to neighbouring Municipalities to reduce their emissions from commuting (e.g., in the context of the Athens Energy Alliance).

Residual emissions from electricity consumption, the built environment, as well as waste are considerably lower and account for 15%, 18%, and 18% of total residual emissions, respectively. Addressing all these emissions by 2030 would require energy upgrades to almost all buildings within the Municipality, increasing the share of electricity from RES to 100% and almost complete recycling and composting of solid waste produced within the Municipality. These targets would be extremely challenging to achieve by 2030, given that the 80% emission reduction targets already pose considerable challenges. Nevertheless, the Municipality of Athens will seek to increase the ambition of its climate actions where this is possible until 2030 and even later, with the goal of near-zero emissions by 2050. Similarly, most European cities that have expressed interest in the EU Cities Mission and setting a net target zero for 2030 have stated that additional analysis will be needed to address residual emissions (Ulpiani et al., 2024).

To offset or capture and store residual emissions (and, in particular, CO_2 emissions), there are various methodologies grouped into the following main categories (Rodriguez Mendez et al., 2024):

- Sequestration of emissions in plants and trees (parks, street trees, green roofs)
- Storage of emissions in soil (use of biochar, increase of permeable surfaces)
- Sequestration of emissions in the built environment (e.g., using timber structures and special cement mix)
- Sequestering emissions from inside the buildings through mechanical ventilation systems and storing them in underground spaces.
- Increasing the reflectivity (albedo) of surfaces of the city's-built environment through cool-painting roofs and sidewalks.

Of these solutions, emissions storage in the built environment and sequestration inside buildings are the most difficult to implement in Athens. Not many new buildings in the Municipality are expected, while the storage technology with mechanical systems is still at a very early stage. On the contrary, sequestering emissions in plants and trees is particularly suitable for the case of Athens. In addition to reducing residual emissions, these actions will have an additional impact as climate change adaptation actions necessary for the city, such as reducing warming and curbing the risk of flooding.

There are several impact pathways (Section 3.1.6) and actions (Section 3.2.5) that could lead to the absorption of part of the remaining emissions such as the planting of 35,000 trees (or, conditionally, more) by 2030 and the expansion of green infrastructure, such as in the area of Elaionas in the context of Double Redevelopment. Although these measures will have a significant impact on the city's living conditions, the absorption of emissions will cover a minimal part of the 477 kt target CO_2e. Based on the calculations of the European LIFE programme tool CLIMATREE (2019), the average absorption per (young) tree for various tree varieties in Athens is 20-24 kg CO_2 per year. Thus, the 35,000 trees will absorb about 0.77 kt CO_2e per year, which is a very small part of the total target.

Given the above, it is necessary to carry out afforestation and reforestation actions outside the Municipality of Athens. Such actions could primarily be done in the wider area around Athens within the

Attica Region, since over 37% of Attica's forests (700,000 acres) have burned from 2017 to 2024[33]. Assuming that one acre of trees absorbs about 2-5 t CO_2e depending on the type of tree and the planting density (LIFE CLIMATREE, 2019), the residual emissions of 477 kt CO_2e will require approximately 100,000-240,000 hectares of reforestation, which corresponds almost to the area burned in 2024 or 14-34% of the forest hectares burned in the past eight years in Attica.

It is clear that such a large-scale project would require significant coordination and funding, but it is within a relatively realistic framework given that, based on the National Reforestation Plan of the Ministry of Environment and Energy, half a million acres will be re-/forested in all of Greece until 2030[34]. Indicatively, based on the ratio of the population of the Municipality of Athens to the total population of Greece, approximately 30,000 hectares of trees of the national target would "correspond" to the citizens of the Municipality of Athens. Thus, the Municipality will need at least three times more acres than that to cover its remaining emissions until 2030.

The Municipality will seek coordination with the national government as well as other public and private agencies to finance and implement its goals for reforestation. The Municipality will also collaborate with academic and research institutions in Greece and abroad to ensure that the trees that will be planted will withstand the future conditions due to climate change and will not be vulnerable to fires.

Beyond the main actions to capture residual emissions in plants and trees, the Municipality of Athens will seek to increase the albedo of the city by using cool materials. The use of cool painting has already been initiated in the expansion and replacement of sidewalks throughout the Municipality (see action A.T.3 in Module B-2). At the same time, in the context of the energy upgrades that will be made to reduce the city's emissions, the use of cool painting on the roofs of buildings within the Municipality will be examined, with the cooperation and possible financing of interested entities of the city.

Finally, the use of biochar in the soil could be combined with the reforestation actions of the Municipality in order to achieve even greater sequestration of emissions. However, there are still several uncertainties regarding the effectiveness of this method for carbon sequestration, while it is not particularly widespread in Greece. In the framework of their general cooperation for the protection and recording of the trees of Athens, the Agricultural University of Athens and the Municipality of Athens could study possible soil carbon sequestration methodologies suitable for Athens and Attica and pilot them as new green infrastructure and reforestation.

In any case, all possible offsetting and carbon sequestration methods for the remaining emissions of the Municipality of Athens will be examined in detail within the next year in order to make a more accurate assessment of their effectiveness. In particular, carbon sequestration actions in trees inside and outside the Municipality will be planned in conjunction with the actions of the Municipality and the Region to adapt to catastrophic climate change and to cool the city.

[33] https://meteo.gr/article_view.cfm?entryID=3355
[34] https://ypen.gov.gr/xekina-to-megalytero-programma-anadasoseon-stin-ellada/

3.2. Module B2 – Climate Neutrality Portfolio Design

This module presents an analysis of the actions planned so far to achieve the goals and strategies highlighted in the previous module. While these strategies were formulated in a "top-down" approach to achieving climate neutrality in the various sectors, here a "bottom-up" analysis is attempted to present concrete measures that the Municipality will take. These actions include interventions aimed at directly reducing greenhouse gas emissions and creating/enhancing carbon sequestration to address residual greenhouse gas emissions.

It is noted that, despite all efforts to add all relevant information for each action, some new actions do not yet contain estimates for their financing and costs. Likewise, for most of the actions no assessment has yet been made for the reduction or offsetting of greenhouse gas emissions that will result from their implementation. These figures will result from participatory processes within and outside the Municipality (see Part C) as well as from more detailed analyses of emissions and indirect impacts. The updated elements will be added to the next update of the CCC along with further short- and medium-term actions.

3.2.1. Actions related to energy systems

Table 43 provides an overview of interventions that are already planned or soon-to-be planned for energy systems. Then, Tables 44-50 contain more details for each action, including the type of intervention and information on the relevant strategy, gas emissions sector, scale of the intervention, actors, amount of greenhouse gas emissions reductions, and estimated associated costs.

Table 43. Overview of actions – Energy systems (B-2.1.1)

Code	Action name	Description
A.E.1	Installation of photovoltaic systems in 52 school buildings	Photovoltaic panels on the roofs of 52 schools (about 4,175 kWp). This will be combined with low or medium cost energy reduction measures presented separately in action A.B.1.
A.E.2	Installation of photovoltaic systems in private and public buildings within the municipality	Photovoltaic panels on the roofs of municipal buildings, residences, and buildings of the tertiary sector within the Municipality of Athens. The goal is to install PV with a total power of approximately 56 MWp, together with corresponding energy storage systems with batteries. These systems will lead to an electricity production of approximately 78 GWh per year.
A.E.3	Campaign to promote the installation of RES in buildings within the Municipality	Promotion campaigns and supporting measures to citizens for the installation of photovoltaic panels and storage systems on their buildings (e.g., using Solar Map developed by the Municipality).
A.E.4	Athenian Energy Alliance	An initiative taken by the mayor of Athens, the foundations were laid for the creation of the Athenian Energy Alliance, with the participation of 17 neighbouring municipalities. The main goal of the Athenian Energy Alliance will be the production of green energy and its utilisation in a way that reduces the energy costs of vulnerable households of the cooperating municipalities.

A.E.5	Climate and Energy Academy	In the context of the Athens Energy Alliance, the Municipality of Athens aims to train executives of the cooperating local authorities in new technological developments, institutional frameworks, and financial tools. Training in this Climate and Energy Academy will be provided by academic scientists as well as actors who have stood out in the energy market.
A.E.6	Energy Community of the Municipality of Athens "Faethon"	The Municipality of Athens will develop an energy community for the production of clean energy and its distribution to citizens and, above all, to vulnerable households. The municipality is currently targeting the purchase of the first 20 MW for the energy community of the municipality.
A.E.7	Redistribution of revenues from electricity production through the Municipality's photovoltaics to vulnerable households	Investigating ways in which the Municipality could redistribute income production of electricity from PV of municipal buildings to vulnerable households, reducing their energy costs.

Table 44. Action description – A.E.1

Installation of photovoltaic systems in 52 school buildings		
Action outline	Action code	A.E.1
	Action description	Photovoltaic panels on the roofs of 52 schools (about 4,175 kWp). This will be combined with low to medium cost energy reduction measures such as shades, vertical gardens, roof insulation, energy saving light bulbs, window replacement, measures to enhance natural ventilation, etc.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Technology & infrastructure
	Outcome	Photovoltaic systems in most schools in Athens
Implementation	Status	Finalisation of the feasibility study and partial securing of financing
	Implementing body	Municipality of Athens
	Action scale	52 schools
	Funders	Municipality of Athens and other national programmes
Impact & cost	GHG emissions reduction/sink (tCO_2e)	3,510
	Removed/substituted energy (MWh)	5,850
	Renewable energy generated (MWh)	5,850
	Total costs (€)	€5,000,000
Data source		Integrated Territorial Investment for the Municipality of Athens v. v. 07/2024 (line 7)

Table 45. Action description – A.E.2

Installation of photovoltaic systems in private and public buildings within the Municipality		
Action outline	Action code	A.E.2
	Action description	Photovoltaic panels on the roofs of municipal buildings, residences and buildings of the tertiary sector within the Municipality of Athens. The goal is to install PV with a total capacity of approximately 56 MWp, together with corresponding energy storage systems with batteries. These systems will lead to an electricity production of approximately 78 GWh per year.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Technology & infrastructure
	Outcome	Installation of photovoltaic systems on approximately 8-10% of the available rooftop area of Athens buildings Photovoltaic systems in municipal buildings of Athens
Implementation	Status	Under design
	Implementing body	Municipality of Athens
	Action scale	Photovoltaic systems on approximately 8-10 % of the available roof area in Athens (approximately 5,000-6,000 buildings)
	Funders	Possible financing: ETS (emission rights from companies), grants, European programmes, green bonds
Impact & cost	GHG emissions reduction/sink (tCO_2e)	46,830
	Removed/substituted energy (MWh)	78,000
	Renewable energy generated (MWh)	78,000
	Total costs (€)	€110,000,000
Data source		New proposals - v. 07/2024

Table 46. Action description – A.E.3

Campaign to promote the installation of RES in buildings within the Municipality		
Action outline	Action code	A.E.3
	Action description	Promotion campaigns and supporting measures to citizens for the installation of photovoltaic panels and storage systems on their buildings (e.g. using Solar Map developed by the Municipality). Citizen demonstration and support programmes, mainly through energy communities and social economy. It will be sought to be included as a supporting action in the Integrated Territorial Investment.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Governance & Politics Social Innovation Democracy & Participation
	Outcome	Support measures to strengthen energy communities and photovoltaics on roofs
Implementation	Status	The feasibility study has been finalised, but funding has not been secured at this time.
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	National fund and programmes within the framework of Integrated Territorial Investment.
Impact & cost	GHG emissions reduction/sink (tCO_2e)	It will support all other actions to reduce emissions.
	Removed/substituted energy (MWh)	It will support all other actions to increase production from RES.
	Renewable energy generated (MWh)	There is no estimate yet
	Total costs (€)	€500,000
Data source		Integrated Territorial Investment for the Municipality of Athens v. 07/2024 (line 7)

Table 47. Action description – A.E.4

Athenian Energy Alliance		
Action outline	Action code	A.E.4
	Action description	On the initiative of the mayor of Athens, the foundations were laid for the creation of the Athenian Energy Alliance, with the participation of 17 neighbouring municipalities. The main goal of the Athenian Energy Alliance will be the production of green energy and its utilisation in a way that reduces the energy costs of vulnerable households of the cooperating municipalities.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Governance & Politics Learning & skills
	Outcome	Capacity building and cooperation with neighbouring municipalities for energy systems
Implementation	Status	In progress
	Implementing body	Municipality of Athens and the other municipalities of the Athenian Energy Alliance.
	Action scale	Throughout the territory of the Municipality and in neighbouring municipalities
	Funders	Municipality of Athens and the other municipalities of the Athenian Energy Alliance.
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	Not applicable
	Renewable energy generated (MWh)	There is no estimate yet
	Total costs (€)	There is no estimate yet
Data source		https://energyalliance.cityofathens.gr/

Table 48. Action description – A.E.5

Climate and Energy Academy		
Action outline	Action code	A.E.5
	Action description	In the context of the Athens Energy Alliance, the Municipality of Athens aims to train executives of the cooperating local authorities in new technological developments, institutional frameworks, and financial tools. The training in this Climate and Energy Academy will be provided by academic scientists as well as distinguished professionals in the private sector. The first activities have already begun with the training of Municipality executives, members of the Athenian Energy Alliance, and other stakeholders at the first meeting of the Academy, in collaboration with DAEM of the Municipality of Athens. The Academy will initially have a "mobile" structure and will along the way be hosted in an exclusive building. This next edition of the Academy will provide detailed training programmes, exhibitions and interactive scientific training.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Governance & Politics Learning & skills
	Outcome	Capacity building and cooperation with neighbouring municipalities for energy systems
Implementation	Status	In progress
	Implementing body	Municipality of Athens and the other municipalities of the Athenian Energy Alliance
	Action scale	Throughout the territory of the Municipality and in neighbouring municipalities
	Funders	Current funders: Municipality of Athens and the other municipalities of the Athens Energy Alliance. Possible financing: ETS (emission rights from companies), grants, European programmes, green bonds
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	Not applicable
	Renewable energy generated (MWh)	There is no estimate yet
	Total costs (€)	There is no estimate yet
Data source		https://www.cityofathens.gr/enarxi-tis-akadimias-energeias/

Table 49. Action description – A.E.6

Energy Community of the Municipality of Athens (Faethon)		
Action outline	Action code	A.E.6
	Action description	The Municipality of Athens will develop an energy community to produce clean energy and distribute it to citizens and, above all, to vulnerable households. The initial phase of the community will be implemented in the Municipality of Athens. The Municipality will then offer the other municipalities of the Athenian Energy Alliance the opportunity to participate. The main objectives will be the following: 1) Production, storage, self-consumption or selling of electrical or thermal or cooling energy from RES or Hybrid stations. 2) Supply of energy products, devices, and services to its members, with the aim of reducing energy consumption and the use of conventional fuels as well as improving energy efficiency. 3) Promotion of electrification and supply for its members of electric vehicles, hybrid or otherwise, and in general vehicles that use alternative fuels. 4) Demand-side management to reduce the final use of electricity and representation of producers and consumers in the electricity market. 5) Network development, management, and exploitation of alternative fuel infrastructure or management of sustainable means of transport. The Municipality is currently targeting the purchase of the first 20 MW. The total installed capacity required to achieve the Municipality's strategic priority for electricity produced by energy communities is approximately 270 MW.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Technology & infrastructure Learning & skills
	Outcome	First photovoltaic parks from energy communities in collaboration with the Municipality
Implementation	Status	Under design (technical specifications completed, tender document pending)
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality and in neighbouring municipalities
	Funders	For the first 20 MW (estimated cost approximately €16,000,000), 80% will be a loan and 20% (€3,200,000) will be covered by the Municipality through the Integrated Territorial Investment. The total cost for all required energy communities for the Municipality of Athens (270 MW) is estimated at approximately €216,000,000.

Impact & cost	GHG emissions reduction/sink (tCO_2e)	16,800
	Removed/substituted energy (MWh)	28,000
	Renewable energy generated (MWh)	28,000
	Total costs (€)	€16,000,000
Data source		Integrated Territorial Investment for the Municipality of Athens v. 07/2024 (line 76) – https://www.cityofathens.gr/dimos-athinaion-idrysi-tis-energeiaki-2/

Table 50. Action description – A.E.7

Redistribution of revenues from electricity production through the Municipality's photovoltaics to vulnerable households		
Action outline	Action code	A.E.7
	Action description	Investigating ways (including a financial study), in which the Municipality could allocate the revenues from the production of green energy from municipal buildings to vulnerable households for their energy upgrade and the installation of solar systems, reducing their energy costs. This could also take the form of a support mechanism.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Governance & Politics Social Innovation Democracy & Participation
	Outcome	Support measures to strengthen energy communities and rooftop solar
Implementation	Status	Under design
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	Not yet included in the Integrated Territorial Investment or technical programme (unless funded by the action in line 7 of the Integrated Territorial Investment v. 07/2024).
Impact & cost	GHG emissions reduction/sink (tCO_2e)	Not applicable
	Removed/substituted energy (MWh)	Not applicable
	Renewable energy generated (MWh)	Not applicable
	Total costs (€)	€200,000
Data source		New proposals - v. 07/2024

3.2.2. Actions related to the built environment

Table 51 provides an overview of interventions that are already planned or soon-to-be planned for the built environment. Then, Tables 52-59 contain more details for each action, including the type of intervention and information on the relevant strategy, gas emissions sector, scale of the intervention, actors, amount of greenhouse gas emissions reductions, and estimated associated costs.

Table 51. Overview of actions – Built environment (B-2.1.2)

Code	Action name	Description
A.B.1	Energy upgrading of schools, municipal buildings and other municipal facilities	Schools and other municipal buildings will be upgraded, regarding both their envelope and their cooling and heating systems. The energy certification of all buildings will increase by 2-3 energy classes.
A.B.2	Upgrading the energy efficiency of street lighting	The Municipality of Athens is replacing the existing street lighting with new technologies of lighting elements that aim to improve and strengthen public lighting in every part of Athens.
A.B.3	Athens Business Green Toolkit	Energy upgrades of businesses in the historic centre of Athens.
A.B.4	Energy upgrade of historic buildings	Energy renovation of some historically important buildings, such as the Santaroza building and the Melina cultural centre within the Poulopoulos hat factory.
A.B.5	Energy upgrade of municipal parking lots	Energy upgrades, e.g., thermal insulation and frames, for the municipal parking lots in Klafthmonos and Varvakeio, together with the necessary actions for anti-seismic shielding with new standards and aesthetic upgrades.
A.B.6	Energy upgrading of cultural buildings	Renovation and energy upgrade of the "Eleftherios Venizelos" Museum and the "Aggeliki Hatzimichalis" Museum of Folk Art and Tradition. Energy upgrade of building D2, radio station 98.4 in Technopolis.
A.B.7	Energy Poverty Alleviation Office	The Energy Poverty Alleviation Office is expected to be an emblematic support centre for the city's energy-vulnerable residents. The Office will contribute to the identification of energy-vulnerable households, the assessment of the magnitude of their problems, and the provision of appropriate advice, interventions, and financial tools.
A.B.8	Smart city actions to support energy management	This includes a range of services that can potentially be used to support energy upgrades, such as digital smart neighbourhood services, a personalised citizen-centric city assistant, and network infrastructure upgrades.

Table 52. Action description – A.B.1

Energy upgrading of schools, municipal buildings and other municipal facilities		
Action outline	Action code	A.B.1
	Action description	Schools and other municipal buildings will be upgraded with regard to both their envelope and their cooling and heating systems. The energy certification of all buildings will increase by 2-3 energy classes. In 2024 and 2025, projects for schools and municipal buildings will be completed, including the energy upgrade of the complexes of the 51st Primary School and the 34th Kindergarten of the 1st Municipal Community, the 93rd-95th Primary Schools and the 45th-73rd Kindergartens of the 2nd Municipal Community, and the 76th-138th Primary Schools of the 3rd Municipal Community of the Municipality of Athens as well as the Central Library building of the Municipality of Athens.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Technology & infrastructure
	Outcome	Energy upgrades in municipal buildings with low energy efficiency
Implementation	Status	In progress
	Implementing body	Municipality of Athens
	Action scale	52 public schools and many other public buildings
	Funders	€16,450,000 will be financed by the NSRF and the Municipality of Athens. The rest of the investment can take the form of a loan from the European Investment Bank. €7,675,010 are already part of the budget of the Technical Programme 2024 (codes: 7311.107, 7331.351, 7331.375, 7331.355, 7331.380).
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€94,950,000
Data source		Integrated Territorial Investment for the Municipality of Athens - v. 07/2024 (line 7, deducting the costs for actions A.E.1 & A.E.3). Technical Programme 2024 of the Municipality of Athens (codes: 7311.107, 7331.351, 7331.375, 7331.355, 7331.380).

Table 53. Action description – A.B.2

Upgrading the energy efficiency of street lighting		
Action outline	Action code	A.B.2
	Action description	The Municipality of Athens is replacing the existing street lighting with new lighting technologies that aim to improve and strengthen public lighting in every part of Athens. This completed project will enhance the sense of security of residents both in the neighbourhoods and in the city centre, especially in places where lighting has been observed to be insufficient. At the same time, the benefits will be significant both for the environment and for the city budget, as the reduction of energy consumed for lighting within the city will lead to savings for the Municipality.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Technology & infrastructure
	Outcome	Energy upgrade of the overall street lighting of the Municipality
Implementation	Status	The application is in progress and is expected to be completed within the next few years.
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality.
	Funders	Municipality of Athens
Impact & cost	GHG emissions reduction/sink (tCO_2e)	3,103
	Removed/substituted energy (MWh)	7,500
	Renewable energy generated (MWh)	-
	Total costs (€)	€53,650,000
Data source		Climate Action Plan 2022 of Athens

Table 54. Action description – A.B.3

Athens Business Green Toolkit		
Action outline	Action code	A.B.3
	Action description	Support for small and very small businesses to upgrade their infrastructure based on the principles of energy efficiency and bioclimatic planning (Athens Business Green Toolkit). The aim of this action is to reduce the energy consumption of the tertiary sector, in order to ensure improved internal operating conditions, while simultaneously promoting the low-carbon upgrade of the city's building stock.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Governance & Politics Learning & skills
	Outcome	Promotional campaigns and rewards for energy upgrades
Implementation	Status	In progress
	Implementing body	Municipality of Athens
	Action scale	Mainly in the historical centre of the Municipality.
	Funders	European Regional Development Fund (ERDF)
Impact & cost	GHG emissions reduction/sink (tCO_2e)	14,262
	Removed/substituted energy (MWh)	34,466
	Renewable energy generated (MWh)	-
	Total costs (€)	€1,300,000
Data source		Integrated Territorial Investment for the Municipality of Athens - v. 07/2024 (line 24) https://www.elanet.gr/wp-content/uploads/files/sitefiles/draseis/PEP_Attikis_Green/GREEN_TOOLKIT_3h_trop_210722.pdf

Table 55. Action description – A.B.4

Energy upgrade of historic buildings		
Action outline	Action code	A.B.4
	Action description	Energy renovation of some historically important buildings, such as the Santaroza building and the Melina cultural centre building within the Poulopoulos hat factory.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Technology & infrastructure
	Outcome	Energy upgrades in municipal buildings with low energy efficiency
Implementation	Status	Different phases per building
	Implementing body	Organisation of Culture, Sports and Youth of the Municipality of Athens (OPANDA)
	Action scale	2 historic buildings
	Funders	For the Melina building: Municipality of Athens and OPANDA. For the Santaroza building: Ministry of Justice, Ministry of Culture, Region of Attica, OPANDA.
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€2,824,473
Data source		Integrated Territorial Investment for the Municipality of Athens - v. 07/2024 (lines 80, 50)

Table 56. Action description – A.B.5

Energy upgrade of municipal parking lots		
Action outline	Action code	A.B.5
	Action description	Energy upgrades, e.g., thermal insulation and frames, for the municipal parking lots in Klafthmonos and Varvakeios, together with the necessary works for anti-seismic shielding with new standards and alongside aesthetic upgrades.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Technology & infrastructure
	Outcome	Energy upgrades in municipal buildings with low energy efficiency
Implementation	Status	Under design
	Implementing body	Development Company for Computerisation and Local Business Units of the Municipality of Athens (DAEM)
	Action scale	Municipal parking lots Klafthmonos and Varvakeios
	Funders	Municipality of Athens and DAEM
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€2,000,000
Data source		Integrated Territorial Investment for the Municipality of Athens - v. 07/2024 (line 78)

Table 57. Action description – A.B.6

Energy upgrading of cultural buildings		
Action outline	Action code	A.B.6
	Action description	Renovation and energy upgrade of the "Eleftherios Venizelos" Museum and the "Aggeliki Hatzimichalis" Museum of Folk Art and Tradition. Energy upgrade of building D2, radio station 98.4 in Technopolis.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Technology & infrastructure
	Outcome	Energy upgrades in municipal buildings with low energy efficiency
Implementation	Status	Under design
	Implementing body	Organisation of Culture, Sports and Youth of the Municipality of Athens (OPANDA)
	Action scale	2 museums and 1 cultural site
	Funders	Municipality of Athens and OPANDA. For the project in Technopolis, the financing comes from a loan.
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€1,972,536
Data source		Integrated Territorial Investment for the Municipality of Athens - v. 07/2024 (lines 51 and 52) and Technical Programme 2024 of the Municipality of Athens (code 7331.380 for Technopolis)

Table 58. Action description – A.B.7

Energy Poverty Alleviation Office		
Action outline	Action code	A.B.7
	Action description	The Energy Poverty Alleviation Office is expected to be an important support centre for the city's energy-vulnerable households. The Office will contribute to the identification of energy-vulnerable households, to the assessment of the magnitude of their problems, and to the provision of appropriate advice, interventions, and financial tools. The main objectives of the Office are: - Identifying and recording energy-vulnerable households, in order to create a database to search for the appropriate source of financing. - Supporting the citizens of the Municipality in changing their energy behaviour. - Identifying financing programmes related to energy management and reduction of carbon footprint. - Increasing the active participation of energy-vulnerable citizens, energy communities and citizen initiatives. - Providing information and useful material to citizens.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Social Innovation Democracy & Participation
	Outcome	Measures to tackle energy poverty
Implementation	Status	In progress
	Implementing body	Athens Development and Tourism Promotion Company (EATA)
	Action scale	Throughout the territory of the Municipality
	Funders	Municipality of Athens and OPANDA
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€1,600,000
Data source		Integrated Territorial Investment for the Municipality of Athens - v. 07/2024 (line 6)

Table 59. Action description – A.B.8

Smart city actions to support energy management		
Action outline	Action code	A.B.8
	Action description	This includes a range of services that can potentially be used to support energy upgrading, such as digital smart neighbourhood services, a personalised citizen-centric city assistant, and network infrastructure upgrading.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Governance & Politics Learning & skills
	Outcome	Promotional campaigns and rewards for energy upgrades
Implementation	Status	Under design
	Implementing body	External project contractor
	Action scale	Throughout the territory of the Municipality
	Funders	EU Recovery and Resilience Mechanism
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€9,650,000
Data source		Smart city projects 06/2024 (projects: 3, 5, 6)

3.2.3. Actions related to transport and mobility

Table 60 provides an overview of interventions that are already planned or soon-to-be planned for transport and mobility. Then, Tables 61-70 contain more details for each action, including the type of intervention and information on the relevant strategy, gas emissions sector, scale of the intervention, actors, amount of greenhouse gas emissions reductions, and estimated associated costs.

Table 60. Overview of actions – Transport & Mobility (B-2.1.3)

Code	Action name	Description
A.T.1	ASCEND – Athens Super block	Promoting sustainable mobility, expanding bike lanes, encouraging the use of electric vehicles, and urban reforestation in a specific area of the city based on the Superblocks model.
A.T.2	Creating green routes	Creation of three routes (Exarchia, Akadimia Platonos, Lamprini) connecting green spaces around the city, including the reshaping of sidewalks and the conversion of roads into light traffic roads.
A.T.3	Upgrading and widening of sidewalks, creation of low-traffic roads & footpaths	The existing sidewalks will be upgraded with cool materials, while ramps and tactile pavements will also be constructed.
A.T.4	Utilisation of the Walkable study for the targeted strengthening of pedestrian traffic in Athens	The Municipality of Athens, in collaboration with the Sustainable Mobility Unit of the National Technical University of Athens, designed, implemented, and delivered to the residents and visitors of the Municipality a digital platform (https://walkable.cityofathens.gr) that provides them with updated data on how the city is accessible to pedestrians.
A.T.5	Expansion of the bicycle path network	Cycle paths along the route of Agios Pavlos - Agios Meletios and vertical roads as well as in other areas of the city. Construction will be preceded by public and stakeholder awareness and participation activities.
A.T.6	Vehicle access control and policing system	Integrated vehicle access control and policing system in the commercial area and the sidewalks of Athens.
A.T.7	Electric vehicle charging stations	Installation of publicly accessible electric vehicle charging stations and parking spaces, as part of the implementation of the Electric Vehicle Charging Plan (https://www.sfho.eu) in the Municipality of Athens.
A.T.8	Integrated management system for micromobility and charging stations	Smart system for the management of micromobility vehicles and charging stations in the Municipality of Athens.
A.T.9	Public transportation with 10 minibuses	Municipal public transportation with 10 electric buses to provide access to citizens and visitors to points of interest within the Municipality.

A.T.10	Preparation of a study to optimise waste collection routes	The aim is for waste collection vehicles to be at least 80% full at the end of their route.

Table 61. Action description – A.T.1

ASCEND – Athens Superblock		
Action outline	Action code	A.T.1
	Action description	The ASCEND programme promotes climate neutrality and strengthens urban sustainability through innovative initiatives targeting energy, transport, and green spaces in an inclusive and participatory manner. The pilot activities will be implemented in a multicultural neighbourhood of Athens and aim to be a model for large-scale transitions in the city, actively involving citizens and stakeholders in a just climate transition. Key activities include the installation of solar panels in schools, the development of smart grids, and the energy upgrading of buildings. The pilot will introduce the Superblocks model to promote sustainable transport, expand cycleways, and encourage the use of electric vehicles. In addition, urban reforestation initiatives will be implemented to increase green spaces.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Social Innovation Democracy & Participation Learning & skills
	Outcome	Creating pilot Superblocks
Implementation	Status	Preliminary study
	Implementing body	Municipality of Athens, DAEM and NTUA
	Action scale	Specific area within the municipality for the pilot application of the Superblock
	Funders	European NetZeroCities program
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€517,938
Data source		New proposals - 06/2024

Table 62. Action description – A.T.2

Creating green routes		
Action outline	Action code	A.T.2
	Action description	Creation of three routes (Exarchia, Akadimia Platonos, Lamprini) connecting green spaces around the city, including the reshaping of sidewalks and the conversion of roads into light traffic roads. To improve sustainable mobility in the city, a target has been set for 70% of the city's population to have access to a green space on foot within 15 minutes. In this way, the neighbourhoods of Athens will become more active transport friendly, greener, and more pleasant.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Social Innovation Democracy & Participation Learning & skills
	Outcome	Creating 15-minute pilot neighbourhoods
Implementation	Status	Part of the 2024 Technical Program
	Implementing body	Municipality of Athens
	Action scale	Three routes within the municipality
	Funders	Equity and European Regional Development Fund (ERDF). The Integrated Territorial Investment (July 2024) also has relevant actions and budget (lines 8 and 11), but these are not added here.
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€21,500,000
Data source		Technical Programme 2024 of the Municipality of Athens (codes: 7333.121, 7333.122, 7333.123)

Table 63. Action description – A.T.3

Upgrading and widening of sidewalks, creation of low-traffic roads & footpaths		
Action outline	Action code	A.T.3
	Action description	The existing sidewalks will be upgraded with cool materials, while ramps and tactile pavements will be built on them. In this way, it is expected to both reduce the temperatures in the summer, and improve the walkability and accessibility throughout the city, which is expected to reduce the use of private vehicles and the corresponding greenhouse gas emissions.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Technology & infrastructure
	Outcome	Upgrading and widening of sidewalks
Implementation	Status	Part of the 2024 Technical Program
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality and in neighbouring municipalities
	Funders	Municipality of Athens
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€19,770,489
Data source		Technical Programme 2024 of the Municipality of Athens (codes: 7323.015, 7323.016)

Table 64. Action description – A.T.4

Utilisation of the Walkable study for the targeted strengthening of pedestrian traffic in Athens		
Action outline	Action code	A.T.4
	Action description	The Municipality of Athens, in collaboration with the Sustainable Mobility Unit of the National Technical University of Athens, designed, implemented, and delivered to the residents and visitors of the Municipality a digital platform (https://walkable.cityofathens.gr) that provides them with updated data on how the city is accessible to pedestrians. The flagship actions of the new walking strategy are summarised in the following main points of intervention: - Activation of four cultural routes with a total length of 36 km. - Creation of 17 green routes and green avenues with a total length of 76.5 km running through all municipalities and an increase in trees by 50%. - Creation of universal accessibility routes with a total length of 160 km with new sidewalks, pedestrian crossings, and new urban equipment. - Definition of 3 and 6 revitalisation zones with an emphasis on walking for leisure and walking for shopping, respectively. - Architectural design of a new and unified pedestrian marking system with 8 different types of structures. - Placement of specialised functions and new equipment, such as 19 street parklets, 19 dog parks, 34 sports fields, 6 running paths within the city, 37 metal bicycle parking spaces (bicycle sheds), 7 play roads, etc. - Advancing technological solutions with specialised mobile phone applications for the sense of safety and navigation in the city.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Governance & Politics
	Outcome	Support measures to reduce car traffic
Implementation	Status	The study has been completed; the utilisation of its results is still pending.
	Implementing body	Municipality of Athens and Sustainable Mobility Unit NTUA
	Action scale	Throughout the territory of the Municipality
	Funders	Municipality of Athens and Sustainable Mobility Unit NTUA
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet

	Renewable energy generated (MWh)	-
	Total costs (€)	There is no estimate yet
Data source		New proposals - 06/2024

Table 65. Action description – A.T.5

Expansion of the bicycle path network		
Action outline	Action code	A.T.5
	Action description	Cycling paths along the route of Agios Pavlos - Agios Meletios and vertical roads as well as in other areas of the city. Construction will be preceded by public and stakeholder awareness and participation activities.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Technology & infrastructure
	Outcome	Expansion of the bicycle path network
Implementation	Status	Preliminary study
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality (mainly on the route Agios Pavlos - Agios Meletios)
	Funders	Municipality of Athens
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€2,500,000
Data source		Integrated Territorial Investment for the Municipality of Athens v. 07/2024 (line 2)

Table 66. Action description – A.T.6

Vehicle access control and policing system		
Action outline	Action code	A.T.6
	Action description	Integrated vehicle access control and policing system in the commercial area and the sidewalks of Athens.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Governance & Politics
	Outcome	Measures to reduce traffic and parking in the centre of Athens
Implementation	Status	The bidding process is almost complete.
	Implementing body	External project contractor
	Action scale	City centre
	Funders	EU Recovery and Resilience Mechanism
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€3,000,000
Data source		Smart city projects 06/2024 (project 8)

Table 67. Action description – A.T.7

Electric vehicle charging stations		
Action outline	Action code	A.T.7
	Action description	Installation of publicly accessible electric vehicle charging stations and parking spaces, as part of the implementation of the Electric Vehicle Charging Plan in the Municipality of Athens.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Technology & infrastructure
	Outcome	Chargers in municipal buildings
Implementation	Status	Preliminary study
	Implementing body	DAEM and EATA
	Action scale	Throughout the territory of the Municipality
	Funders	Municipality of Athens and DAEM
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€3,000,000
Data source		Integrated Territorial Investment for the Municipality of Athens v. 07/2024 (line 40)

Table 68. Action description – A.T.8

Integrated management system for micromobility and charging stations		
Action outline	Action code	A.T.8
	Action description	Smart system for the management of micromobility vehicles and charging stations in the Municipality of Athens.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Technology & infrastructure
	Outcome	Chargers in municipal buildings
Implementation	Status	The bidding process is almost complete.
	Implementing body	External project contractor
	Action scale	Throughout the territory of the Municipality
	Funders	EU Recovery and Resilience Mechanism
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€2,000,000
Data source		Smart city projects 06/2024 (project 4)

Table 69. Action description – A.T.9

Public transport with 10 minibuses		
Action outline	Action code	A.T.9
	Action description	Municipal public transport with 10 electric buses to provide access to citizens and visitors to points of interest in the municipality. The capacity of the buses will be 25 people each, while 20 drivers will be hired for their operation.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Technology & infrastructure
	Outcome	Expansion of electric buses and creation of municipal transport
Implementation	Status	Preliminary study
	Implementing body	DAEM and EATA
	Action scale	City centre
	Funders	Municipality of Athens and DAEM
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€2,000,000
Data source		Integrated Territorial Investment for the Municipality of Athens v. 07/2024 (line 73)

Table 70. Action description – A.T.10

Preparation of a study to optimise waste collection routes		
Action outline	Action code	A.T.10
	Action description	The aim is for waste collection vehicles to be at least 80% full at the end of their route. Minimising the number of routes will help reduce emissions and pollutants and will be taken into account in the outcome of the entire operation of the collection system.
Reference to impact pathway	Field of action	Transport & mobility
	Systemic lever	Governance & Politics
	Outcome	Reducing the environmental footprint of waste collection operations (e.g., optimising collection routes)
Implementation	Status	Elaboration of a study
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	Municipality of Athens
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	There is no estimate yet
	Renewable energy generated (MWh)	-
	Total costs (€)	€37,200
Data source		New proposals - 06/2024

3.2.4. Actions related to waste and the circular economy

Table 71 provides an overview of interventions that are already planned or soon-to-be planned for waste and circular economy. Then, Tables 72-80 contain more details for each action, including the type of intervention and information on the relevant strategy, gas emissions sector, scale of the intervention, actors, amount of greenhouse gas emissions reductions, and estimated associated costs.

Table 71. Overview of actions – Waste & Circular Economy (B-2.1.4)

Code	Action name	Description
A.W.1	Separation at source and recycling corners in the Municipality of Athens	The aim of this action is to implement a complete separation-at-source programme for bio-waste and to expand the recycling infrastructure throughout the city, including recycling corners that provide a refund.
A.W.2	Supply of ecological composters	Supply of ecological composters to citizens and businesses within the Municipality.
A.W.3	Design and construction of an integrated green spot	Design and construction of an integrated Green Point for the Municipality of Athens at Building Block 52 in Elaionas.
A.W.4	Waste transfer station and new waste trucks	To reduce the traffic of waste collection trucks, the Municipality of Athens is building a waste transfer station in the area of Elaionas for the temporary storage and collection of waste.
A.W.5	Campaigns to promote reuse and responsible consumption in schools	Several actions were carried out and continue to be carried out to educate the young citizens of Athens in matters related to the climate and effective waste management.
A.W.6	Update of the plan for sustainable nutrition	Extension of the action plan of the Municipality of Athens for sustainable nutrition and, in turn, the transformation of the city's linear nutrition model into a holistic, sustainable, and circular one.
A.W.7	Increase in urban mining	Cooperation with the private sector and in particular with the actors of the social and solidarity economy for urban mining (recovery of useful materials from waste) and for repair cafes.
A.W.8	Separate collection of hazardous household waste	The Department of Cleaning and Recycling, participating in the European LIFE programme, is pilot testing the separate collection of hazardous household waste from the neighbourhoods of the 7th municipal units of Athens.
A.W.9	Strengthening the human resources of the Cleaning and Recycling Department	Recruiting 20 new drivers and 40 waste collection workers to support organic waste collection.

Table 72. Action description – A.W.1

Separation at source and recycling corners in the Municipality of Athens		
Action outline	Action code	A.W.1
	Action description	The aim of this action is to implement a full separation-at-source programme for organic waste and to expand the recycling infrastructure throughout the city, including recycling corners that provide a refund. The number of organic waste facilities (brown bins) will be increased so that citizens across the city have access to organic waste collection points and are encouraged to actively participate in composting.
Reference to impact pathway	Field of action	Waste and circular economy
	Systemic lever	Technology & infrastructure
	Outcome	Expansion of the recycling network
Implementation	Status	Part of the 2024 Technical Program
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	NSRF (€18,259,000) and Antonis Tritsis programme (€9,224,298)
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€27,483,298
Data source		Technical Programme 2024 of the Municipality of Athens (code: 7326.043)

Table 73. Action description – A.W.2

Supply of ecological composters		
Action outline	Action code	A.W.2
	Action description	Supply of ecological composters to citizens and businesses of the Municipality.
Reference to impact pathway	Field of action	Waste and circular economy
	Systemic lever	Technology & infrastructure
	Outcome	Support for citizens and businesses (especially restaurants) to acquire small composting bins
Implementation	Status	Part of the 2024 Technical Program
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	ESPA
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€16,368
Data source		Technical Programme 2024 of the Municipality of Athens (code: 7341.052)

Table 74. Action description – A.W.3

Design and construction of an integrated green spot		
Action outline	Action code	A.W.3
	Action description	In an area of 4.4 acres in Elaionas, citizens will be able to bring waste and objects that are no longer useful to them. The waste streams to be served will be determined by the Cleaning and Recycling Department. This will result in a reduction in the volume of waste, especially bulky waste, which is often illegally dumped in public places or next to bins. It will also improve the cleanliness and aesthetic appearance of neighbourhoods and lead to the collection of reusable items (e.g., furniture, electrical appliances, computers, decorative items, etc.). Also, a workshop will be created for the repair of furniture, useless electrical and electronic devices, etc. in collaboration with OAED. A showroom will be set up with refurbished furniture, electrical appliances, CDs, baby items, decorations, etc. for sale for a minimal fee or for free. Finally, an information and awareness space will be created for schools and other interested groups
Reference to impact pathway	Field of action	Waste and circular economy
	Systemic lever	Technology & infrastructure
	Outcome	Integrated green spots to promote reuse
Implementation	Status	Part of the 2024 Technical Program
	Implementing body	Municipality of Athens
	Action scale	Elaionas area
	Funders	Municipality of Athens
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€250,000
Data source		Technical Programme 2024 of the Municipality of Athens (codes: 7413.119, 7311.120)

Table 75. Action description – A.W.4

Waste transfer station and new waste trucks		
Action outline	Action code	A.W.4
	Action description	In order to reduce the traffic of waste trucks, the Municipality of Athens has built a waste transfer station (WST) in the area of Elaionas for the temporary storage and collection of waste, before placing it in another transport system, while reducing its volume. The project contributes to the integrated management of solid waste in the Attica Region, offering wider environmental benefits, such as the reduction of greenhouse gas emissions from the waste transport system, traffic congestion on the roads, etc. With the full operation of the Waste Transfer Station of Elaionas, the number of routes of waste trucks from the neighbourhoods of Athens to the Phylis Landfill will be reduced. The waste will be driven to the Waste Transfer Station and its contents will be loaded into waste bins and transported by tractor. It is estimated that the pollutants emitted from the routes from the Waste Transfer Station to the landfill and from the landfill to the depot (return) will be reduced, at the beginning of the operation of the station by 50%, and with the gradual integration of the processes there will be a reduction of 70-80% of today's levels, with a corresponding reduction in the pollutants emitted by the combustion of the used fuels.
Reference to impact pathway	Field of action	Waste and circular economy
	Systemic lever	Technology & infrastructure Governance & Politics
	Outcome	Reducing the environmental footprint of waste collection operations (e.g., optimising collection routes)
Implementation	Status	Part of the 2024 Technical Program
	Implementing body	Municipality of Athens
	Action scale	Elaionas area
	Funders	NSRF (2014-2020)
Impact & cost	GHG emissions reduction/sink (tCO_2e)	2,875
	Removed/substituted energy (MWh)	10,700
	Renewable energy generated (MWh)	-
	Total costs (€)	€16,939,106
Data source		Technical Programme 2024 of the Municipality of Athens (code: 7341.035)

Table 76. Action description – A.W.5

Campaigns to promote reuse and responsible consumption in schools		
Action outline	Action code	A.W.5
	Action description	Various actions have been and continue to be carried out to inform/educate citizens about climate issues, including the educational school programmes "The ecological footprint of my school" and "Open schools for mitigating climate change and saving energy". Through workshops and dedicated games, school students learn about climate change and how their personal behaviour can improve climate conditions.
Reference to impact pathway	Field of action	Waste and circular economy
	Systemic lever	Social Innovation Democracy & Participation Learning & skills
	Outcome	Campaigns to promote reuse and responsible consumption Campaigns to raise awareness about composting and recycling
Implementation	Status	In progress
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality and in neighbouring municipalities
	Funders	Municipality of Athens
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€100,000
Data source		Climate Action Plan 2022 of Athens

Table 77. Action description – A.W.6

Update of the plan for sustainable nutrition		
Action outline	Action code	A.W.6
	Action description	The Municipality of Athens participates in the European project Horizon 2020 "Fostering the Urban food System Transformation through Innovative Living Labs Implementation" (FUSILLI), which started in January 2021. The city will have the opportunity to continue its action plan for sustainable nutrition and, in turn, the transformation of the city's linear nutritional model into a holistic, sustainable, circular one, with the aim of: - mitigating greenhouse gas emissions through the reduction of food waste and the active composting of food scraps. - Providing food to socially vulnerable populations. - Increasing awareness of citizens regarding food policies. - Increasing awareness of students through educational activities. Among other actions, the revised Athens Food Action Plan will be developed. More information on the role of Athens in the context of FUSILLI can be found on the website.
Reference to impact pathway	Field of action	Waste and circular economy
	Systemic lever	Governance & Politics Learning & skills
	Outcome	Campaigns to promote reuse and responsible consumption Campaigns to raise awareness about composting and recycling
Implementation	Status	In progress
	Implementing body	Municipality of Athens as part of the project consortium
	Action scale	Throughout the territory of the Municipality and in neighbouring municipalities
	Funders	FUSILLI (European Horizon 2020 project)
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€115,625
Data source		https://fusilli-project.eu

Table 78. Action description – A.W.7

Increase in urban mining		
Action outline	Action code	A.W.7
	Action description	Cooperation with the private sector and especially with social and solidarity economy actors for urban mining (recovery of useful materials from waste) and for repair cafes.
Reference to impact pathway	Field of action	Waste and circular economy
	Systemic lever	Social Innovation Learning & skills
	Outcome	Cooperation programmes with other municipalities and private entities Increase in urban mining
Implementation	Status	The action hasn't started yet
	Implementing body	Municipality of Athens (temporary)
	Action scale	Throughout the territory of the Municipality
	Funders	No funding yet
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	There is no estimate yet
Data source		New proposals - 06/2024

Table 79. Action description – A.W.8

Separate collection of hazardous household waste		
Action outline	Action code	A.W.8
	Action description	The Department of Cleaning and Recycling, participating in the European programme "LIFE", is piloting the separate collection of hazardous household waste from the neighbourhoods of the 7th municipal community of Athens. The programme is in its initial stage and the goal is to expand to two other municipal communities by the end of 2024. Over time, the collection of hazardous household waste will include all 7 municipal communities. Although the quantities collected may not be heavy, their environmental footprint when buried is significant.
Reference to impact pathway	Field of action	Waste and circular economy
	Systemic lever	Technology & infrastructure
	Outcome	Expansion of the recycling network
Implementation	Status	In progress
	Implementing body	Municipality of Athens as part of the project consortium
	Action scale	Throughout the territory of the Municipality
	Funders	European LIFE program
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	There is no estimate yet
Data source		

Table 80. Action description – A.W.9

Strengthening the human resources of the Cleaning and Recycling Department		
Action outline	Action code	A.W.9
	Action description	Recruiting 20 new drivers and 40 waste collection workers to support organic waste collection.
Reference to impact pathway	Field of action	Waste and circular economy
	Systemic lever	Governance & Politics
	Outcome	Strengthening the human resources and capabilities of the Cleaning and Recycling Department
Implementation	Status	The action hasn't started yet
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	No funding yet
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	There is no estimate yet
Data source		New proposals - v. 07/2024

3.2.5. Actions related to green infrastructure & NBS

Table 81 provides an overview of interventions that are already planned or soon-to-be planned for waste and circular economy. Then, Tables 82-90 contain more details for each action, including the type of intervention and information on the relevant strategy, gas emissions sector, scale of the intervention, actors, amount of greenhouse gas emissions reductions, and estimated associated costs.

Table 81. Overview of actions – Green infrastructure & NBS (B-2.1.5)

Code	Action name	Description
A.G.1	Enhancing green spaces in public spaces and planting trees	Expanding the city's green infrastructure, including increasing the number of trees planted each year to 5,000, reaching 25,000 new trees by 2028.
A.G.2	Public space and landscaping projects in the wider area of Double Redevelopment and the Naval Fortress in the area of Elaionas	In the neighbourhood of Elaionas, new roads must be built with the corresponding drainage and lighting systems, green spaces must be created, and all the necessary equipment for the sustainable development of the area must be acquired.
A.G.3	Integration of green and blue infrastructure in the city	Supporting the integration of green and blue infrastructure for the development and redesign of streets and squares, according to the "Athens, Resilient City and Natural Capital" plan.
A.G.4	Highlighting water resources and natural springs of Athens	Protection and restoration of the stream of Podoniftis and the Prophet Daniel stream.
A.G.5	Actions to increase public participation and education activities	Development of information kiosks for citizens, special spaces for the exchange of plants and seeds among citizens to promote plant cultivation and greening in cities, etc. Organisation of training seminars for public services, the public, and relevant associations.
A.G.6	Modernisation of the infrastructure and equipment of the Green Department of the Municipality	Implementation of an Integrated Framework of Actions for the digital upgrade, development, and modernisation of the infrastructure and equipment of the Green Department of the Municipality of Athens to strengthen the greenery in public spaces.
A.G.7	Tree species resilience and biodiversity study	Study of the resilience of tree species in collaboration with the Agricultural University of Athens and based on climate change data. Monitoring through innovative systems and applications (automatic recorders, participation of volunteers from environmental organisations, etc.).
A.G.8	GreenInCities: A holistic approach to address urban inequality	The European GreenInCities project aims to address inequalities in urban regeneration strategies by prioritising public awareness, going beyond conventional greening methods, and incorporating cutting-edge technology. In Athens, the pilot location is Prophet Ilias Square in the Rizoupoli neighbourhood.

A.G.9	Cooling Havens: Water-Powered Neighbourhood Cooling and Engagement Stations	The programme addresses the escalating climate crisis in Athens by installing water-powered public interventions to create new blue and green infrastructure.

Table 82. Action description – A.G.1

Improvement of existing green spaces in the city and planting 25,000 trees within the Municipality by 2028		
Action outline	Action code	A.G.1
	Action description	The city has only 11% of its area covered with trees (about 94,000 trees), when the European average is 30%. A part of this action is to support the goal of planting at least 5,000 new trees every year for the next 5 years. More than 2,000 trees have already been planted for 2024, and a tree planting information system has also recently been developed. With the cooperation of organisations that have expressed interest, tree planting can reach 10,000 trees per year, i.e., 50,000 in total.
Reference to impact pathway	Field of action	Green infrastructure
	Systemic lever	Technology & infrastructure
	Outcome	Improving existing green spaces in the city, planting 25,000 trees within the municipality by 2028
Implementation	Status	Part of the 2024 Technical Program
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	Municipality of Athens (42,250,000 euros) and NSPA (35,445,995 euros)
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€80,695,995
Data source		Technical Programme 2024 of the Municipality of Athens (codes: 7332.059, 7332.061)

Table 83. Action description – A.G.2

Public spaces and landscaping projects in the wider area of the Double Redevelopment and the Naval Fort in the area of Elaionas		
Action outline	Action code	A.G.2
	Action description	In the neighbourhood of Elaionas, new roads must be built with the corresponding drainage and lighting systems, green spaces must be created, and all the necessary equipment for the sustainable development of the area must be acquired.
Reference to impact pathway	Field of action	Green infrastructure
	Systemic lever	Technology & infrastructure
	Outcome	Improvement of existing and creation of new green spaces in the city
Implementation	Status	Part of the 2024 Technical Program
	Implementing body	Municipality of Athens
	Action scale	Elaionas area
	Funders	EU Recovery and Resilience Mechanism
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€37,200,000
Data source		Technical Programme 2024 of the Municipality of Athens (code: 7332.057)

Table 84. Action description – A.G.3

Integration of green and blue infrastructure in the city		
Action outline	Action code	A.G.3
	Action description	Supporting the integration of green and blue infrastructure for the development and redesign of streets and squares, according to the "Athens, Resilient City and Natural Capital" plan. The action will focus on the Lycabettus area and on water management and soil erosion projects.
Reference to impact pathway	Field of action	Green infrastructure
	Systemic lever	Technology & infrastructure
	Outcome	Improvement of existing and creation of new green spaces in the city Protection and restoration of the streams and water bodies of Athens
Implementation	Status	Part of the 2024 Technical Program
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality and mainly in the area of Lycabettus.
	Funders	European Investment Bank
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€4,000,000
Data source		Technical Programme 2024 of the Municipality of Athens (code: 7322.087) and Integrated Territorial Investment v. 07/2024 (line 16)

Table 85. Action description – A.G.4

Highlighting water resources and natural springs of Athens		
Action outline	Action code	A.G.4
	Action description	Protection and restoration of the Podonifti stream (e.g., creating a path along the stream, enhancing biodiversity, tree planting, rain gardens, etc.). Protection and restoration of the Prophet Daniel stream (e.g., Double Redevelopment project).
Reference to impact pathway	Field of action	Green infrastructure
	Systemic lever	Governance & Politics
	Outcome	Protection and restoration of the streams and water bodies of Athens
Implementation	Status	The action hasn't started yet
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality and in neighbouring municipalities
	Funders	Municipality of Athens
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€800,000
Data source		Integrated Territorial Investment for the Municipality of Athens v. 07/2024 (line 64)

Table 86. Action description – A.G.5

Actions to increase public participation and education activities		
Action outline	Action code	A.G.5
	Action description	Development of information kiosks for citizens, dedicated spaces for the exchange of plants and seeds among citizens to promote plant cultivation and greening in cities, etc. Organisation of training seminars for public services, the public and relevant associations.
Reference to impact pathway	Field of action	Green infrastructure
	Systemic lever	Democracy & Participation
	Outcome	Campaigns to increase public participation in tree planting and protection as well as other nature-based solutions
Implementation	Status	The action hasn't started yet
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	No funding yet
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	There is no estimate yet
Data source		New proposals - 06/2024

Table 87. Action description – A.G.6

Modernisation of the infrastructure and equipment of the Department of Greenery and Urban Wildlife		
Action outline	Action code	A.G.6
	Action description	Implementation of an Integrated Framework of Actions for the digital upgrade, development, and modernisation of the infrastructure and equipment of the Department of Greenery and Urban Wildlife of the Municipality of Athens to strengthen the greenery in public spaces.
Reference to impact pathway	Field of action	Green infrastructure
	Systemic lever	Learning & skills
	Outcome	New staff and infrastructure in the Department of Greenery and Urban Wildlife as well as training in nature-based solutions
Implementation	Status	The action hasn't started yet
	Implementing body	Municipality of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	Municipality of Athens
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€5,000,000
Data source		Integrated Territorial Investment for the Municipality of Athens v. 07/2024 (line 71)

Table 88. Action description – A.G.7

Tree species resilience and biodiversity study		
Action outline	Action code	A.G.7
	Action description	Study of the resilience of tree species in collaboration with the Agricultural University of Athens and based on climate change data. Monitoring through innovative systems and applications (automatic recorders, participation of volunteers from environmental organisations, etc.).
Reference to impact pathway	Field of action	Green infrastructure
	Systemic lever	Learning & skills
	Outcome	Cooperation with competent bodies for the study and monitoring of the resistance of tree species to the new climatic conditions of Athens
Implementation	Status	The action hasn't started yet
	Implementing body	Municipality of Athens and Agricultural University of Athens
	Action scale	Throughout the territory of the Municipality
	Funders	No funding yet.
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet.
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	There is no estimate yet.
Data source		New proposals - 06/2024

Table 89. Action description – A.G.8

GreenInCities: A holistic approach to address urban inequality		
Action outline	Action code	A.G.8
	Action description	In neglected urban areas, persistent issues such as pollution, social inequalities and inadequate infrastructure are major problems for communities. Meanwhile, conventional redevelopment strategies and smart technologies have mostly benefited affluent neighbourhoods, exacerbating the urban divide. In this context, the European GreenInCities project aims to tackle inequalities by prioritising social awareness, going beyond conventional greening methods and incorporating cutting-edge technologies. In Athens, Prophet Ilias Square in the Rizoupoli neighbourhood is the pilot location. Focusing on the creation of a regenerated public space, the tentative goal is to improve the microclimate of the area, sustainable mobility, and attractive rest areas for all ages and social groups. Using participatory approaches, residents will be involved in the project targeting biodiversity, safety, and conservation, among other aspects. The redevelopment will develop pavement improvements, accessible and child-friendly infrastructure, shaded rest areas and other potential facilities.
Reference to impact pathway	Field of action	Green infrastructure
	Systemic lever	Democracy & participation Technology & infrastructure Learning & skills
	Outcome	Research on green infrastructure and improving Athens' resilience to climate change. Campaigns to increase public participation in tree planting, tree protection and other nature-based solutions.
Implementation	Status	In progress
	Implementing body	Athens Development and Tourism Promotion Company (EATA) as part of a project consortium
	Action scale	Prophet Ilias square in the neighbourhood of Rizoupoli.
	Funders	EU "Horizon Europe" programme (total funding: €13,049,209; for EATA: €331,931)
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€331,931
Data source		https://www.greenincities.eu

Table 90. Action description – A.G.9

Cooling Havens: Water-Powered Neighbourhood Cooling and Engagement Stations		
Action outline	Action code	A.G.9
	Action description	Athens is grappling with the escalating challenges of the climate crisis, notably extreme urban heat during the summer season and periodic flooding from increased rainfall. The situation is aggravated by the complete absence of water features on the city's surface and the lack of water-sensitive urban planning solutions, as 80% of its total urban area consists of impervious surfaces. The project proposes the installation of a series of water-powered public interventions to create new blue and green infrastructure in the inner city. These interventions will not only act as natural cooling mechanisms but will also serve as community engagement and education platforms that will raise awareness of water conservation and connect water to community life and history. The focus is not simply on water conservation, but on bringing the water element back into the city, making it a key feature of public spaces, and embedding a water-centric ethos in the city's urban planning and lifestyle.
Reference to impact pathway	Field of action	Green infrastructure
	Systemic lever	Technology & infrastructure Democracy & participation
	Outcome	Research on green infrastructure and improving Athens' resilience to climate change. Protection and restoration of the streams and water bodies of Athens.
Implementation	Status	The action hasn't started yet
	Implementing body	Municipality of Athens as part of a consortium
	Action scale	Throughout the territory of the Municipality
	Funders	2nd EUI-IA (European Urban Initiative) call. Funding from ERDF: 4,998,733 euros. Funding from the Municipality of Athens: 1,249,683 euros.
Impact & cost	GHG emissions reduction/sink (tCO_2e)	There is no estimate yet
	Removed/substituted energy (MWh)	-
	Renewable energy generated (MWh)	-
	Total costs (€)	€6,248,417
Data source		https://www.urban-initiative.eu/calls-proposals/second-call-proposals-innovative-actions/selected-projects-eui-ia-2nd-call

3.3. Module B-3 – Indicators for Monitoring, Evaluation and Learning

Module B-3 includes a series of indicators to monitor and evaluate progress along the selected impact pathways and areas described in Module B-1. The indicators were selected according to the objectives identified in the strategic priorities of the Climate City Contract as well as based on the availability of their data for monitoring.

The indicators are mainly quantitative and refer to the five areas discussed in the previous modules, namely energy systems, the built environment, transport and mobility, waste and circular economy, as well as green infrastructure and nature-based solutions. They include the greenhouse gas emission trajectory indicators for the main greenhouse gas emission sectors of Athens, as required by the instructions for completing the Action Plan from the NetZeroCities programme[35]. It also includes some of the suggested indicators from the programme such as local energy production from RES as well as quantities/percentages for the management of various waste streams.

In the coming months, Athens will implement a digital dashboard in the Kausal platform[36] that will enable the visualisation and collaboration around key indicators to help make Athens' climate goals a reality. The Kausal Platform is an open-source, Software-as-a-Service platform with two modules: Kausal Watch and Kausal Paths. Kausal Watch facilitates the management, planning, monitoring, measuring and communicating of local climate actions. It helps to improve the internal cooperation of a city administration by allowing everyone responsible to work on the same platform, insert data and update information. Kausal Paths is a scenario tool to identify relevant goals for climate actions. It collects all climate data in one place and estimates the impact of your climate actions by building interactive visual scenarios.

The creation of the dashboard has already started and will include the CCC indicators (as shown below) as well as targets related to resilience and adaptation to climate change that were set in the 2022 Action Plan. In addition to presenting relevant actions and the progress of the Municipality of Athens in terms of climate action, the platform will also be available to relevant city bodies to monitor their actions, gathering their data in a systematic way. The development of the platform is supported and financed through the European project ARSINOE[37].

In addition to the indicators of the previous plan, other indicators will be monitored through the platform, including the indicators of the Sustainable Urban Mobility Plan (SUMP) of the Municipality of Athens. The plan includes a number of indicators that potentially affect greenhouse gas emissions from the transport and mobility sector, such as the share of light traffic areas, the ratio of the length of cycle paths in relation to the total road network, as well as the area of existing footpaths. The indicators are shown in detail in the SUMP (pages 70-73) [38].

It is noted that, during the implementation of the CCC, the list of indicators will be checked and updated frequently. Depending on the progress and monitoring needs of the CCC, new indicators will probably be added or old ones adjusted. An important role will also be played by the processes of learning and revision of the CCC through the participatory activities and the governance framework analysed in Part C. The Climate Forums, in particular, will be the ideal place to present the monitoring indicators to all interested parties and citizens regularly (e.g., every three months) so that through this participatory process the necessary corrective actions of the Plan can emerge. In this context, qualitative learning

[35] https://netzerocities.app/resource-2910
[36] https://kausal.tech
[37] https://arsinoe-project.eu
[38] https://www.cityofathens.gr/wp-content/uploads/2023/06/svak-dimou-athinaion-2021.pdf

indicators will be added in the future, such as the course of the views of the stakeholders in relation to actions of the Plan, as well as a record of the actions that come from or are mobilised by the organisations.

Table 91 below provides an overview of the selected indicators, including their targets by reference year (2025, 2027, 2030). Then, Tables 92 to 112 include metadata for each indicator such as how the indicator is measured, its relationship to the emission sector, impact pathways and actions from Modules B-1 and B-2, the direct and indirect benefits, as well as evidence of the source and availability of the data.

Table 91. Overview of Key Performance Indicators (B-3.1)

Sector [Actions]	Indicator		Latest data (source & year of measurement)	Target values		
	Code	Name		2025	2027	2030
All sectors [all actions]	I.A.1	Total greenhouse gas emissions of the Municipality of Athens, BASIC level (kt CO_2e)	1,935 (CIRIS, 2021)	1,640	1,100	477
Electricity [all domain actions]	I.E.1	Greenhouse gas emissions from electricity consumption (kt CO_2e)	981 (CIRIS, 2021)	750	500	251
Electricity [all domain actions]	I.E.2	Percentage of the Municipality's electricity consumption covered by RES	42% (Estimation for the total national network from ESE data for 2022)	60%	70%	88%
Electricity [A.E.1, A.E.2, A.E.3, A.E.6, A.A.2]	I.E.3	New photovoltaic systems on roofs within the Municipality and by energy communities, compared to 2019 (MWp of installed capacity)	almost 0 (same estimate for 2019)	20	120	330
Buildings [all domain actions]	I.B. 1	Greenhouse gas emissions from the built environment, excluding electricity (kt CO_2e)	271 (CIRIS, 2021)	250	180	47
Buildings [A.B.1, A.B.4, A.B.5, A.B.6]	I.B. 2	Percentage of municipal buildings of energy class B (measured per m^2 of building surface)	10% (estimate based on data from the Ministry of Environment and Energy[39] for 2022 for the Region of Attica)	20%	70%	90%
Buildings [A.B.3, A.B.8]	I.B. 3	Percentage of buildings in the tertiary sector of energy class B (measured per m^2 of building surface)	9% (estimate based on data from the Ministry of Environment and	18%	30%	50%

[39]https://bpes.ypeka.gr/wp-content/uploads/2023_06_30_ETHISSIA_EKTHESI_STATISTIKON_EPOTELESMATON.pdf

			Energy[40] for 2022 for the Region of Attica)			
Buildings [A.B.7, A.A.3]	I.B. 4	Percentage of residential buildings of energy class B (measured per m^2 of building surface)	6% (estimate based on data from the Ministry of Environment and Energy[41] for 2022 for the Region of Attica)	10%	20%	30%
Transport [all sector actions]	I.T. 1	Greenhouse gas emissions from the transport sector, excluding electricity (kt CO_2e)	421 (CIRIS, 2021)	400	300	1 66
Transportation [A.T.1, A.T.2, A.T.3, A.T.4, A.T.5, A.T.6]	I.T. 2	Percentage of total number of trips within the Municipality of Athens made by car	37 % (Google Environmental Insights Explorer, 2023)	35%	28%	17%
Transportation [A.T.7, A.T.8]	I.T.3	Percentage of electric or plug-in hybrid municipal vehicles	~0 (Municipality of Athens, 2024)	5%	40%	90%
Transportation [A.T.7, A.T.8]	I.T.4	Percentage of electric or plug-in hybrid cars and vans	0.3% (Estimate for 2022 for the Municipality of Athens based on historical data from NCEP)	1%	5%	15%
Transportation [A.T.9]	I.T.5	Percentage of electric buses for public transport within the Municipality of Athens	21% (Estimated based on the number of OASA electric buses and trolleys in 2024[42])	22%	35%	50%
sector actions]	I.W.1	Greenhouse gas emissions from the waste and wastewater sector	261 (CIRIS, 2021)	240	120	14
Waste [all actions]	I.W. 2	Overall recycling rate	8.29% (Directory of Sanitation and Recycling, 2023)	16%	50%	85%
Waste [A.W.5, A.W.6]	I.W. 3	Composting of organic waste	3% (Directory of Sanitation and Recycling, 2023)	6%	50%	85%

[40] see previous source
[41] see previous source
[42] https://www.osy.gr/n-osy-ae/stolos/

Waste [A.W.7, A.W.8]	I.W.4	Organic waste reduction rate compared to 2019	-2% (Directory of Sanitation and Recycling, 2023)	0%	15%	30%
Green infrastructure [all sector actions]	I.G.1	Offsetting greenhouse gas emissions through green infrastructure (kt CO_2e)	-	20	150	477
Green Infrastructure [A.G.1]	I.G.2	New trees planted in the city (compared to 2024)	-	10,000	20,000	35,000
Green infrastructure [A.G.2, A.G.3, A.G.4, A.G.9]	I.G.3	Percentage of city surface coverage with green spaces or permeable surfaces	18% (NFI, 2024)	20%	25%	30%
Green Infrastructure [A.G.8]	I.G.4	Percentage of the city's population with access to a green space within 300 meters	40% (NFI, 2024)	45%	55%	70%

Table 92. Indicator metadata – I.A.1

Total greenhouse gas emissions of the Municipality of Athens (BASIC level)	
Code	I.A.1
Unit	kt CO_2e
Calculation method	Based on the CIRIS emission inventory methodology (2022)
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	Yes, it measures emissions from all emission sources for the Municipality of Athens (see Module A-1 for more details)
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	No
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful all impact paths and all actions are overall (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens. After emissions are inventoried, the CIRIS file is publicly uploaded to the CDP platform (2024).
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annually

3.3.1. Indicators related to energy systems

Table 93. Indicator metadata – I.E.1

Greenhouse gas emissions from electricity consumption	
Code	I.E.1
Unit	kt CO_2e
Calculation method	Based on the CIRIS emission inventory methodology (2022)
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	Yes, it measures emissions from electricity consumption for the Municipality of Athens (see Modules A-1 for more details).
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	No
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact pathways and actions listed in the energy systems sector are (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens. After emissions are inventoried, the CIRIS file is publicly uploaded to the CDP platform (2024).
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annually

Table 94. Indicator metadata – I.E.2

Percentage of the Municipality's electricity consumption covered by RES	
Code	I.E.2
Unit	%
Calculation method	The indicator is calculated based on the national indicator for the percentage of electricity consumption covered by RES in Greece. To this the percentage of the consumption of the Municipality of Athens that is covered by local production of electricity from RES is added (see indicator I.E.2).
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, to some extent it captures the reduction in volatility of energy costs due to volatility in fossil fuel prices (especially natural gas)
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact paths and actions mentioned in the energy systems sector are in terms of increasing RES in the Municipality's electricity consumption, which also has a significant effect on reducing greenhouse gas emissions (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	ELSTAT/ Eurostat (national level)[43], Municipality of Athens (local)
Is the source local or regional/national?	National and local
Expected availability	High
Suggested collection interval	Annually

[43] https://ec.europa.eu/eurostat/databrowser/bookmark/8a2c055c-f87f-40b1-b0a8-39ecf5214abe?lang=en

Table 95. Indicator metadata – I.E.3

New photovoltaic systems on roofs within the Municipality and by energy communities, compared to 2019	
Code	I.E.3
Unit	MWp of installed capacity
Calculation method	Inventory of the power of PV systems to be installed by the Municipality. To these an assessment of the power of all the remaining PV systems within the territory of the Municipality will be added as well as the energy communities that generate electricity for use within the Municipality. The methodology of this assessment will be finalised in the coming months and will probably include elements of the HEDNO and/or GIS recording systems.
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, since the significant increase in local PV installations can create green jobs within the Municipality.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it actually reflects whether the impact paths and actions referred to the installation of local PV in the Municipality are successful, such as the actions with codes A.E.1, A.E.2, A.E.3, A.E.6, and A.A.2 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens and (probably) HEDNO. After emissions are inventoried, the CIRIS file is publicly uploaded to the CDP platform (2024).
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annually

3.3.2. Indicators related to the built environment

Table 96. Indicator metadata – I.B.1

Greenhouse gas emissions from the built environment, excluding electricity	
Code	I.B.1
Unit	kt CO_2e
Calculation method	Based on the CIRIS emission inventory methodology (2022)
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	Yes, it measures emissions from the built environment for the Municipality of Athens apart from emissions from electricity consumption included in the I.E.1 indicator (see Module A-1 for more details).
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	No
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact pathways and actions referred to in the built environment are (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens. After emissions are inventoried, the CIRIS file is publicly uploaded to the CDP platform (2024).
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annually

Table 97. Indicator metadata – I.B.2

Percentage of municipal buildings of energy class B	
Code	I.B.2
Unit	% (measured per m^2 of building surface)
Calculation method	Directly from censuses of the Municipality of Athens for the data of municipal buildings. If the energy classes are not available for all municipal buildings, an estimate of this indicator can be made from statistics of the Inspection Body of the Ministry of Environment and Energy (2022) for the EPCs issued for public buildings within the Attica Region or directly within the Municipality of Athens (if available).
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, it indirectly shows the reduction of energy consumption for municipal buildings. This translates into a reduction in the running costs of the Municipality and thus also in a reduction in municipal fees.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact pathways and actions listed in the municipal buildings are and especially the actions coded A.B.1, A.B.4, A.B.5 and A.B.6 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens and/or Ministry of Foreign Affairs
Is the source local or regional/national?	Local (or regional if local data is not available).
Expected availability	High
Suggested collection interval	Annually (potentially and quarterly)

Table 98. Indicator metadata – I.B.3

Percentage of buildings in the tertiary sector of energy class B	
Code	I.B.3
Unit	% (measured per m^2 of building surface)
Calculation method	An estimate of this indicator can be made from statistics of the Inspection Body of the Ministry of Environment and Energy (2022) for the EPCs issued for buildings of the tertiary sector within the Region of Attica or directly within the Municipality of Athens (if available). More accurate assessment methodologies will be examined in the coming months.
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, it indirectly shows the reduction of energy consumption for the buildings of the tertiary sector and thus also the reduction of operating costs of businesses.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact pathways and actions listed in tertiary sector buildings are, and specifically actions coded A.B.3 and A.B.8 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Not yet, but it may be added to future records of the Municipality of Athens on the CDP platform.
Data requirements	
Expected data source	Ministry of Environment and Energy - Energy Inspection Departments
Is the source local or regional/national?	Regional/national
Expected availability	High
Suggested collection interval	Annually (potentially and quarterly)

Table 99. Indicator metadata – I.B.4

Percentage of residential buildings with energy class B	
Code	I.B.4
Unit	% (measured per m^2 of building surface)
Calculation method	An estimate of this indicator can be made from statistical data of the Inspection Body of the Ministry of Environment and Energy (2022) for the EPCs issued for buildings with exclusive or main use as residences within the Region of Attica or directly within the Municipality of Athens (if available). More accurate assessment methodologies will be examined in the coming months.
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, it indirectly shows the reduction of energy consumption for residential buildings and thus the reduction of energy costs. Also, the reduced cost can have a positive effect on the reduction of energy poverty within the Municipality.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact pathways and actions referred to residential buildings and especially actions coded A.B.7 and A.A.3 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Not yet, but it may be added to future records of the Municipality of Athens on the CDP platform.
Data requirements	
Expected data source	Ministry of Environment and Energy - Energy Inspection Departments
Is the source local or regional/national?	Regional/national
Expected availability	High
Suggested collection interval	Annually (potentially and quarterly)

3.3.3. Indicators related to transport & mobility

Table 100. Indicator metadata – I.T.1

Greenhouse gas emissions from the transport sector, excluding electricity	
Code	I.T.1
Unit	kt CO_2e
Calculation method	Based on the CIRIS emission inventory methodology (2022)
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	Yes, it indirectly measures emissions from transport and mobility within the Municipality of Athens apart from emissions from electricity consumption included in the I.E.1 indicator (see Module A-1 for more details).
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	No
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact pathways and actions related to transport and mobility are (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens. After emissions are inventoried, the CIRIS file is publicly uploaded to the CDP platform (2024). Other specialised indicators related to mobility can be found in the Sustainable Urban Mobility Plan (Municipality of Athens, 2021)
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annually

Table 101. Indicator metadata – I.T.2

Percentage of total number of trips within the territory of the Municipality of Athens travelled by car	
Code	I.T.2
Unit	%
Calculation method	Methodology of the Google Environmental Insights Explorer for the inventory of movements and means of movement within the territory of the Municipality[44].
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, it counts many indirect benefits for the city such as better air quality, better accessibility and safety for pedestrians and bicycles, reduction of traffic and accidents, etc. Most car travel will be replaced mainly by active travel (walking and cycling) and public transport.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it actually reflects the extent to which impact paths and actions related to transport and mobility are successful, and especially actions with codes A.T.1, A.T.2, A.T.3, A.T.4, A.T.5 and A.T.6 (see Modules B-1 and B-2 for more details). Many of these actions strengthen pedestrian and bicycle infrastructure to increase the proportion of active commuting and thus indirectly reduce the proportion of car commuting.
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	No, but it may be registered in the future on the CDP platform.
Data requirements	
Expected data source	Google Environmental Insights Explorer (2024)
Is the source local or regional/national?	Local (in terms of how the data is calculated specifically for the Municipality of Athens)
Expected availability	High
Suggested collection interval	Annually

[44] https://insights.sustainability.google/methodology?hl=en-US

Table 102. Indicator metadata – I.T.3

Percentage of electric or plug-in hybrid municipal vehicles	
Code	I.T.3
Unit	%
Calculation method	Based on the vehicle inventory of municipal vehicles of the Municipality of Athens.
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, it measures indirect benefits for the city such as better air quality and reduced fuel costs (especially if combined with the production of electricity from local RES for the needs of the Municipality)
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful impact pathways and actions refer to transport and mobility and especially actions with codes A.T.7 and A.T.8 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	No, but it may be registered in the future on the CDP platform.
Data requirements	
Expected data source	Municipality of Athens
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	At least annually, probably also semi-annually or quarterly

Table 103. Indicator metadata – I.T.4

Percentage of electric or plug-in hybrid cars and vans	
Code	I.T.4
Unit	%
Calculation method	Estimate for the Municipality of Athens based on the percentage of electric or hybrid plug-in cars in the monthly registration of new cars in Greece. The estimate can be made based on (and adjusted from) the ratio of the population of the Municipality in relation to the total population of the country. In the future, even more precise methodologies will be considered in collaboration with the Association of Automobile Importers and the Ministry of Transport.
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, it measures indirect benefits for the city such as better air quality and reduced fuel costs (especially if combined with the production of electricity from local RES for the needs of the Municipality)
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful impact pathways and actions refer to transport and mobility and especially actions with codes A.T.7 and A.T.8 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	No, but it may be registered in the future on the CDP platform.
Data requirements	
Expected data source	Association of Automobile Importers (SEAA)[45] and European Automobile Manufacturers' Association (ACEA)[46]
Is the source local or regional/national?	Regional/national
Expected availability	High
Suggested collection interval	Monthly

[45] https://seaa.gr/passenger-cars-registrations-in-europe/
[46] https://www.acea.auto/nav/?content=passenger-car-registrations

Table 104. Indicator metadata – I.T.5

Percentage of electric buses for public transport within the Municipality of Athens	
Code	I.T.5
Unit	%
Calculation method	Based on the inventory of electric buses and trolleys of OASA and (in the future) of the inventory of buses for municipal transportation of the Municipality of Athens
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, it measures indirect benefits for the city such as better public transport travel quality, less noise, and better air quality
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact pathways and actions refer to transport and mobility and especially the action coded A.T.9 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, it is recorded on the CDP platform.
Data requirements	
Expected data source	Athens Urban Transport Organisation - OASA[47] and the Municipality of Athens
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annual

[47] https://www.osy.gr/n-osy-ae/stolos/

3.3.4. Indicators related to waste and circular economy

Table 105. Indicator metadata – I.W.1

Greenhouse gas emissions from the waste and wastewater sector	
Code	I.W.1
Unit	kt CO_2e
Calculation method	Based on the CIRIS emission inventory methodology (2022)
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	Yes, it measures emissions from waste and wastewater generated within the Municipality of Athens (see Module B-1 for more details).
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	No
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact pathways and actions refer to waste and the circular economy are (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens. After emissions are inventoried, the CIRIS file is publicly uploaded to the CDP platform (2024).
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annually

Table 106. Indicator metadata – I.W.2

Overall recycling rate	
Code	I.W.2
Unit	%
Calculation method	Assessment of the Cleaning and Recycling Department of the Municipality of Athens based on EDSNA data
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, given that increased recycling reduces the municipal waste disposal fines and thus the municipal fees. It can also reduce the environmental footprint of waste disposal.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful the impact pathways and actions refer to waste and the circular economy are (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens and EDSNA
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annual (official), possible quarterly estimates

Table 107. Indicator metadata – I.W.3

Composting of organic waste	
Code	I.W.3
Unit	%
Calculation method	Assessment of the Department of Sanitation and Recycling of the Municipality of Athens based on EDSNA data
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, given that increased composting reduces the municipal waste disposal fines and thus the municipal fees. It can also reduce the environmental footprint of waste disposal.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it actually reflects how successful the impact paths and actions are related to waste and the circular economy and especially the actions with codes A.W.5 and A.W.6 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Yes, on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens and EDSNA
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annual (official), possible quarterly estimates

Table 108. Indicator metadata – I.W.4

Organic waste reduction rate compared to 2019	
Code	I.W.4
Unit	%
Calculation method	Assessment of the Department of Sanitation and Recycling of the Municipality of Athens based on EDSNA data
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, since the reduction in organic waste will mainly come from reducing the city's food waste through better utilisation of food, possibly also improving the cost of living.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it actually reflects how successful the impact paths and actions are related to waste and the circular economy and especially the actions with codes A.W.7 and A.W.8 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Partially, the amount of food waste is recorded on the CDP platform (2024)
Data requirements	
Expected data source	Municipality of Athens and EDSNA
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annual (official), possible quarterly estimates

3.3.5. Indicators related to green infrastructure & NBS

Table 109. Indicator metadata – I.G.1

Offsetting greenhouse gas emissions through green infrastructure	
Code	I.G.1
Unit	kt CO_2e
Calculation method	Since the indicator did not exist before the first edition of the Athens CCC, the method of its calculation has not yet been finalised. It will probably rely on GIS methodologies to count the new trees inside and outside the Municipality and estimate the emissions they will offset. In the coming months, the Municipality in collaboration with relevant bodies (universities, city networks, NGOs) will examine various methods of calculation and choose the appropriate one.
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	Yes, it measures emissions that will be absorbed by trees inside and outside the Municipality to offset residual emissions from all of the Municipality's greenhouse gas emission sectors and especially transport and mobility (see Section A-2 for more details)
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	No
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful impact pathways and actions related to green infrastructure and nature-based solutions are (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Not yet, but it may be recorded in the future
Data requirements	
Expected data source	Municipality of Athens (not yet finalised and depends on the calculation method).
Is the source local or regional/national?	local (probably)
Expected availability	Unknown
Suggested collection interval	Annually (temporary target)

Table 110. Indicator metadata – I.G.2

New trees planted in the city compared to 2024	
Code	I.G.2
Unit	Number of trees
Calculation method	Census of new trees of the Municipality of Athens
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, it has a multitude of indirect effects such as providing natural shading to the city, reducing extreme temperatures, leading to cleaner air, and improving the drainage capacity of the city.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful impact pathways and actions related to planting new trees such as action code A.G.1 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Not yet, but it may be recorded in the future
Data requirements	
Expected data source	Municipality of Athens[48]
Is the source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Lasting

[48] https://athenstrees.cityofathens.gr

Table 111. Indicator metadata – I.G.3

Percentage of city surface coverage with green spaces or permeable surfaces	
Code	I.G.3
Unit	%
Calculation method	Based on the Norman Foster Institute methodology using GIS systems and data from Open Street Map and Athens Geoportal. This method, as well as a dashboard for monitoring this and other indicators, will be granted after the end of 2024 to the Municipality of Athens.
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, similar to adding new trees, the indicator I.G.2 leads to a number of benefits such as cleaner air and improved drainage capacity of the city.
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it essentially reflects how successful impact pathways and actions related to green or blue infrastructure such as actions with code A.G.2, A.G.3, A.G.4 and A.G.9 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Not yet, but it may be recorded in the future
Data requirements	
Expected data source	Norman Foster Institute[49], Municipality of Athens (Athens Geoportal[50])
Is the source local or regional/national?	Local
Expected availability	Not specified at this time, possibly high
Suggested collection interval	Probably annual

[49] https://normanfosterinstitute.org
[50] http://gis.cityofathens.gr

Table 112. Indicator metadata – I.G.4

Percentage of the city's population with access to a green space within 300 meters	
Code	I.G.4
Unit	%
Calculation method	Based on the Norman Foster Institute methodology using GIS systems and data from Open Street Map and Athens Geoportal. This method, as well as a dashboard for monitoring this and other indicators, will be granted after the end of 2024 to the Municipality of Athens.
Indicator context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?) If yes, which emission source sectors does it measure?	No
Does the indicator measure indirect impacts (i.e., co-benefits)? If yes, which co-benefit does it measure?	Yes, similar to the indicator I.G.2 and I.G.3, leads to a number of benefits such as cleaner air and improved drainage capacity of the city. In addition, this indicator also indicates the uniformity of the installation of green infrastructure in the city and therefore their "democracy".
Is the indicator useful for monitoring the output/impact of action(s)? If yes, which action and impact pathway is it relevant for?	Yes, it actually reflects how successful impact pathways and actions are related to green infrastructure and especially the action with code A.G.8 (see Modules B-1 and B-2 for more details).
Is the indicator captured by the existing CDP, SCIS, Covenant of Mayors platforms?	Not yet, but it may be recorded in the future
Data requirements	
Expected data source	Norman Foster Institute[51], Municipality of Athens (Athens Geoportal[52])
Is the source local or regional/national?	Local
Expected availability	Not specified at this time, possibly high
Suggested collection interval	Probably annual

[51] https://normanfosterinstitute.org
[52] http://gis.cityofathens.gr

4. Part C – Enabling Climate Neutrality by 2030

Part C outlines interventions designed to enable the climate action portfolios. These interventions revolve around collaborative governance models and social innovations facilitating the actions of the Climate City Contract (Module B-2) and help achieve co-benefits outlined in the impact pathways (Module B-1). The interventions also address the identified opportunities, gaps, and barriers identified Module A-2 and A-3.

4.1. Module C-1 – Governance Innovation Interventions

This module details the city´s governance innovations for achieving city climate neutrality by 2030, describing interventions in institutional design, in leadership, and in collaborative and outreach processes, whether they are inter-organisational or internal to the key organisations responsible for the city´s climate neutrality target. Module C-1.1 starts by listing the initial principles that will guide the governance of climate action in the context of CCC and its participatory approach. The module then presents five core governance innovations that have been or will soon be introduced by the Municipality of Athens. The interventions are the following:

1. Athens Climate Forum
2. Athens Climate Youth Assembly
3. Athenian Energy Alliance
4. Internal re-organisation of the Municipality
5. Governance structure of the CCC investment plan

Each intervention is shortly analysed in terms of enabling climate actions and their co-benefits (outlined in Modules B-1 and B-2) as well as in addressing the opportunities, gaps, and barriers identified in Modules A.2 and A.3. Then, Sections 4.1.1 to 4.1.6 describe the core governance innovations, detailing the current progress towards them (such as past Climate Forum events or initial discussions on investment needs) and delineating long-term plans.

Apart from the five core innovations, the module presents smaller governance interventions in the context of EU projects with case studies in Athens, mainly related to the creation of local participatory forums (GreenInCities, ASCEND, Cooling Havens). These projects have already been presented in Module B-2 and will thus not be described here in detail.

4.1.1. General principles and overview of interventions

Apart from supporting the climate neutrality of Athens in 2030, the implementation of the Climate City Contract is an opportunity to bridge the climate and environmental targets with social and financial ones. The CCC is thus envisioned as a Green Social Deal, including climate actions with high positive social impact such as reducing energy poverty through the participation of citizens and small-medium enterprises in energy cooperatives of the Municipality and through measures to increase the energy efficiency of the building stock. Other examples include the creation of green jobs and revitalising the local economy through the implementation of CCC and the mitigation of health problems and premature deaths due to air quality through the development of Nature-Based Solutions for cooling and greening the city. Thus, the principles for guiding the implementation of the CCC are the following:

- Connecting climate action with social justice and social impact, social and green innovation, and inclusiveness (leave no-one behind).

- Climate policy as a tool for modern social policy, climate justice, and sustainability for the local society and economy.
- Inclusiveness and active role for all, including the youth, women, and vulnerable groups, gender equality.
- Integrated coherence among policies for climate, environment, society, and culture.
- Reskilling and upskilling people that are impacted during the transition to a greener working model.
- Better use of financial, human, and natural resources with a lower footprint and higher social value.
- Better quality of life for all at a neighbourhood level and reduction of inequalities in and among the different neighbourhoods of the city.

In order to promote these principles in Athens' transition to climate neutrality we will not use a linear and top-down methodology but a participatory approach. We will use a range of participation methods aiming to involve as many people as possible from the public and all different stakeholder categories shown in Module 1.3, i.e., other public bodies and policymakers, administrative and regulatory bodies, financial institutions, city networks, universities, research centres, expert associations, private companies, professional associations, NGOs, and civil society organisations. We will strive to involve individuals of different cultural and knowledge backgrounds to undertake learning, analysis, and co-design and co-implementation on an equal and sustainable basis. We will use digital and innovative tools in addition to traditional methods of dialogue, including interactive formats such as World Cafes, Game of Roles, etc. Through these activities, we will aim to reduce the gap between stakeholders with different levels of influence and power.

The educational community will have an active role in bringing the neighbourhoods of Athens together with the Municipality. Inclusive and interactive methods will also be used for engaging pupils and students in Athens, without exclusion based on gender, origin, language, knowledge, etc. The experience of previously implemented projects such as "Climate schools" will be used not only for collaborating with schools but also with the whole community at the local level.

In addition, there have been many close collaborations with the civil society in Athens and international organisations and city networks such as C40, C40 Youth Team, UNICEF, UNESCO, and others. In the next few months, we will also develop collaborations with Greek and other European municipalities with the aim of achieving mutual learning on methodologies for public participation on climate action. The Municipality of Athens is also looking for synergies and twinning opportunities with other municipalities and for implementing even more NZC pilot projects.

The Municipality would also need to overcome the institutional-legislative barriers existing today for achieving climate neutrality. There needs to be a reduction in bureaucracy by streamlining and enhancing cooperation with other levels of administration (national and regional) so that the City of Athens can contribute to issues over which it currently has no direct authority (e.g., traffic in avenues of Athens, buses, energy upgrade programmes for private buildings, etc.). In addition, the Municipality will undertake pilot projects in cooperation with academia and various stakeholders and pursuit extensive coordination and cooperation with other actors operating in the city such as utility companies, regulators, and grid operators.

During the development of the first version of the CCC between March and September 2024, numerous consultation and engagement actions have been implemented, including one public event for Climate Neutral Cities, three meetings of the Athens Climate Forum, two meetings of the Athens Climate Youth Assembly and a series of specialised workshops on topics such as on urban warming, financial tools, and public engagement. In addition, meetings were organised with municipal officials and agencies, strengthening the internal participatory procedures for signing the CCC. All implemented engagement

activities are described in detail in the next sections. Stakeholder engagement processes culminated to an event on 12 September 2024[53] where stakeholders and citizens were invited to co-shape and sign, together with the Municipality of Athens, the first version of the Climate City Contract for the climate neutrality of Athens (Figure 23). More than 90 individuals from 75 organisations attended the event with most of them signing the CCC (see the CCC Commitments document for a full list of signatures). The signed CCC was submitted to the NetZeroCities project and the European Commission on the 16 September 2024.

Figure 23. Third session of the Athens Climate Forum on 12 September 2024

Based on the aforementioned principles, Table 113 presents an overview of all governance innovations that have been developed until now and Table 114 provides a short summary of the participatory governance model for planning and achieving climate neutrality in Athens. The five core innovations are further detailed in Sections 4.1.2 to 4.1.6.

Table 113. Relations between governance innovations, systems, and impact pathways (C-1.1)

Intervention name – description	Systemic barriers & opportunities addressed	Leadership & stakeholders involved	Enabling impact and co-benefits
Athens Climate Forum – A	- Limited authority of the Municipality of	- Municipality of Athens (lead)	Main impact: Govern the design and

[53] https://www.cityofathens.gr/o-dimos-athinaion-75-foreis-enonoyn-d/

participatory institution created with the aim of involving the citizens of Athens and representatives of the city's main stakeholder groups in order to shape the Climate City Contract for Athens together. The Climate Forum will frequently run every 3 to 6 months during the implementation of the CCC.	Athens over many domains that are relevant to climate action such as the electricity and public transport networks. - Politicisation and polarisation around technologies that are indispensable for climate action - Opportunity for further coordination of the Municipality with all relevant stakeholders for the built environment, transport, and waste.	- Central government institutions - Regulators and public utilities - Universities and research bodies - NGOs - Professional bodies - Citizens of Athens, including pupils and university students	implementation of climate actions of the CCC with the help of all relevant stakeholders Co-benefits: - Improve the policy alignment and working relationship between the Municipality of Athens and other institutions - Improve environmental awareness - Enhance the legitimacy of climate action
Athens Climate Youth Assembly – A participatory planning process with emphasis on issues that concern young people and on solutions that benefit the climate neutrality and resilience of Athens.	- Athens has many universities and schools and thus a young population that can play an active role for climate action - Young people in the Municipality may often have the motivation and time for climate actions but not the resources to implement them.	- Municipality of Athens (lead) - Universities - Schools - Organisations of parents and teachers - NGOs working with young people	Main impact: Improve awareness of and active interest on climate issues among the young population of Athens and implement interventions designed by young people Co-benefits: - Improve the capacity of young participants for social innovation and entrepreneurship - Address social issues in tandem with climate action (e.g., social housing on energy efficient buildings)
Athenian Energy Alliance – A cooperation among 17 municipalities in Attica (on an initiative of the Mayor of Athens) aiming to produce	- Most traffic in the Municipality of Athens is transboundary, i.e., originates from or goes to another Municipality	- Municipality of Athens (lead) - Municipalities already participating in the Athenian Energy Alliance	Main impact: Develop municipal green energy infrastructure and transfer know-how and best practices on climate action to participating and/or

green energy and utilise it in a way that reduces the energy costs of vulnerable households of these municipalities. https://energyalliance.cityofathens.gr/	- Apart from transportation, there are many climates action-related interconnections between municipalities of Metropolitan Athens such as on waste management - In the context of the EU Cities Mission, cities with the mission label will help other cities become climate neutral by 2050	- Other neighbouring municipalities that can potentially join the Alliance in the future	neighbouring municipalities Co-benefits: - Better communication and policy alignment among the participating Municipalities - A precedent for further collaborations on other issues (e.g., on addressing homelessness)
Internal re-organisation of the Municipality – Strengthening climate governance by integrating the dimensions of climate action and resilience in all activities and plans of the Municipality. This restructuring will eventually include the development of a dedicated Directorate for Climate Policy and Civil Protection.	- Fragmentation of jurisdiction between the different directorates of the Municipality - Lack of coordination for climate action - Lack of personnel that are critical for climate action (e.g., for the collection of organic waste)	- Deputy Mayor for Climate Governance and Social Economy (lead) - All directorates and services of the Municipality of Athens	Main impact: Improve the effectiveness and implementation speed of climate actions of the CCC through an optimal internal organisation of the Municipality Co-benefits: - Improved collaboration and integration between the different Directories - Better municipal services to the public
Climate Neutrality Investment Council – A working group with the participation of the Municipality, experts, and other interested parties, to identify and secure further funding opportunities for the implementation of the CCC and to oversee the implementation of the investment plan.	- Lack of investments for energy upgrades of buildings and RES infrastructure to the level needed for the Athens CCC - Many available climate investment programmes in Europe but the Municipality has mostly experience with national finance programmes	- Municipality of Athens (lead) - Representatives from the regional and central government (e.g., from the Ministry of Environment and Energy). - Relevant academics such as from Athens University of Economics and Business	Main impact: unlock investments to implement all impact pathways and actions shown in Modules B-1 & B-2. Co-benefits: - Unlock investments for relevant social measures, e.g., for creating social housing in energy refurbished buildings in Athens

	- Need for holistic investment planning within a system innovation approach for all main GHG sectors, ensuring synergies between mitigation and adaptation investment needs.	- The Council could potentially include relevant experts and representatives from financial organisations as advisors	- Green jobs through the implementation of the projects - Raising the Municipality's profile in green innovation and increasing its green branding.
ASCEND: Athens Superblock – Promoting sustainable mobility, expanding bike lanes, encouraging the use of electric vehicles, and urban reforestation in a specific area of the city based on the Superblocks model.	- Walking and biking infrastructure in Athens is inadequate - Most areas of the municipality (and especially areas like Kypseli) have a very dense urban environment with high buildings, narrow streets, and relatively few open spaces	- Municipality of Athens (lead) - Municipal unit officials and the public in the area where the first Superblock will be created - NZC advisors - City networks including cities with know-how in the Superblocks model	Main impact: Create the first, successful Superblock in Athens and a local participatory forum on transport Co-benefits: - A more active neighbourhood with more space for pedestrians and community activities - Less noise from cars
GreenInCities – A Horizon Europe project that aims to address inequalities in urban regeneration strategies by prioritising public awareness. https://www.greenincities.eu	- Green infrastructure is not sited uniformly within the municipal units of Athens	- EATA of Municipality of Athens (lead for the case study in Athens) - Other consortium members of the GreenInCities project	Main impact: Create participatory-based solutions for improving the micro-climate of the Prophet Ilias Square in the Rizoupoli neighbourhood and making mobility more sustainable Co-benefits: - Improved engagement of citizens with climate topics - A more attractive square and neighbourhood
Cooling Havens – The programme addresses the escalating climate crisis in Athens by	- Increasingly higher risks of urban heat and periodic flooding in Athens	- Municipality of Athens (lead for the case study in Athens)	Main impact: Create new blue and green infrastructure in the inner city

installing water-powered public interventions to create new blue and green infrastructure. https://www.urban-initiative.eu/calls-proposals/second-call-proposals-innovative-actions/selected-projects-eui-ia-2nd-call	- High impact of the urban heat island effect	- Other consortium members of the Cooling Havens project, including the Athens Water Supply and Sewerage Company, the National Technical University of Athens, etc.	Co-benefits: - Improved natural cooling, reduced extreme temperatures in the summer - Increased awareness on water conservation

Table 114. Summary of the participatory governance model for climate neutrality (C-1.2)

Summary of the participatory governance model for climate neutrality
● The climate agenda will be at the core of the Municipality of Athens governance and administrative structure. This will be supported by an upcoming **internal restructuring** that will strengthen the horizontal coordination between officials from all municipal directorates that are relevant for climate action. ● A well-organised and well-staffed **Directorate for Climate Policy and Civil Protection** will be eventually created within the Municipality, taking the lead in developing climate mitigation and adaptation policies and coordinating climate action with the other directives of the Municipality and with external stakeholders. Until the development of this directorate, the Directorate of Strategic Planning, Resilience, Innovation & Documentation will lead associated efforts. ● The steering and implementation of the Athens CCC will be guided by frequent sessions of the **Athens Climate Forum**, which will consistently engage the citizens of Athens and stakeholders from other public institutions, academia, city networks, NGOs, and financial organisations. This interaction will facilitate the connection of the systems linked to emissions sources and overcome existing barriers, especially related to the fragmented jurisdiction over the emission domains of Athens. ● The **Athenian Energy Alliance** will also play an important role on the horizontal coordination of climate action between the Municipality of Athens and 17 other neighbouring municipalities. ● Financial and investment challenges will be addressed through the development of a **Climate Neutrality Investment Council** with the participation of the Municipality, experts, and other interested parties. ● The **Athens Climate Youth Assembly** will specifically engage with the young people of Athens, empowering them and offering them an active role in the development of climate action in Athens. Both the Youth Assembly and the Climate Forum will be key to involve citizens in the further development of the CCC and its implementation through transparent participatory methods.

4.1.2. Athens Climate Forum

The Athens Climate Forum is a participatory institution that was created with the aim of involving the citizens of Athens and representatives of the city's main stakeholder groups in order to shape the Climate City Contract for Athens together. The Climate Forum will be further developed and improved as the main long-term participatory structure for the implementation of the CCC. Sessions of the forum will be organised frequently, aiming to have a session every three to four months. Apart from discussions about the progress of climate action in Athens, the Climate Forum will be an opportunity for meetings and workshops focused on special topics, such as on energy democracy, city cooling, the green transition of Athens, etc.

The Climate Forum currently includes representatives from over 60 organisations, including the following:

- Central government institutions such as from the Ministry of Environment and Energy, and the Green Fund
- Research bodies and scientific organisations such as the (National and Kapodistrian) University of Athens, the National Technical University of Athens, the National Centre for Social Research, the National Observatory of Athens, and the National Weather Service
- Professional bodies, such as the Hellenic Confederation of Professionals, Craftsmen, and Merchants (GSEVEE) and its institute (IME GSEVEE and KEK) as well as Athens Chamber of Commerce and Industry
- Social, cultural, and educational agencies and organisations, such as EKPOIZO, Children's Museum, ACCMR, SOLIDARITY NOW, Immigrant Forum, PRAKSIS, Terres des Hommes Hellas, KEAN, InCommon, Ecogenes, Greek Red Cross
- Environmental organisations such as WWF, Greenpeace, Hellenic Society for Culture and Environment, Hellenic Society for the Protection of Nature, Green Tank, Environmental Alliance 2004, Team for the World, Upshift, and RCC/CC HUB
- Bodies related to sustainable mobility such as Ecocity-Ecomobility, the Cycling Community PodilATTIKI and the organisation for the rights of pedestrians "PEZI"
- Private bodies such as the Hellenic Property Federation (POMIDA), Red Invest, Anavathmisi S.A.
- Social economy entities, such as ELEKTRA Energy Community, Myrtillo, Intercultural Steps, Proximity
- Organisations with international reference, such as C40, UNICEF, Resilient Cities Catalyst
- Bodies and services of the Municipalities of Athens, including the Directorate of Strategic Planning, deputy mayors and authorised advisors, the Development and Tourism Promotion Company of Athens (EATA), the Development Company of Computerization and Business Units of the Municipality of Athens (DAEM), and members of other Municipalities.
- Young men and women from schools and universities as well as the general public

On 14 May 2024, the **1st Session of the Climate Forum** took place at Serafeio Athletic & Community Complex of the Municipality of Athens (Figure 24). The session was attended by a total of 206 participants representing more than 60 organisations including public institutions, associations, universities and research institutes, companies, NGOs, and schools. This diversity highlighted thus the importance of cooperation between organisations and stakeholders to deal with climate change.

The meeting was an important step towards creating a common framework for action to tackle climate change, combining experience and innovation from different sectors and generations. Representatives from the Municipality and DAEM presented the progress in developing the Athens CCC, including

strategic priorities and examples of climate actions, which were subsequently discussed by the participants. Representatives from the Ministry of Environment and Energy, the Green Fund, and other organisations also presented relevant topics to the efforts of Athens for climate neutrality. The meeting also included the inauguration of the Energy Poverty Alleviation Office of the Municipality of Athens, the 1st Athens Youth Climate Assembly (see next section) and a workshop on “Overheating of the city and actions for mitigation and adaptation”.

Figure 24. First session of the Athens Climate Forum on 14 May 2024

The workshop included presentations on climate impacts and adaptation/mitigation solutions from many leading academics and researchers from the University of Athens, the National Observatory of Athens, the National Meteorological Service, and the Agricultural University of Athens. Among the topics discussed were the following:

- Synergies between actions for mitigation and those for resilience to high temperatures
- The need to protect urban centres from heatwaves through a system of alerts and applications
- The need to have valid and reliable information for citizens through modern systems that make scientific knowledge understandable and useful for many.
- The significance of green infrastructure for addressing mitigation challenges and adaptation to new climate conditions.

The **2nd Session of the Climate Forum** took place on 3 July 2024 again at the Serafeio complex (Figure 25). The event was attended by representatives from a wide range of organisations and institutions (around 46 in total), making it an important platform to discuss and plan actions on climate change and sustainability. The event had a similar format with the first session and included a more detailed

presentation of the Action Plan for the Climate Neutrality in the context of the Athens CCC. The event also included the inauguration of the first electric vehicle charger at Serafeio, as well as the 2nd Youth Climate Assembly and a workshop on financial tools that can support the transition of Athens to climate neutrality by 2030.

Figure 25. Second session of the Athens Climate Forum on 3 July 2024

Among the participating organisations was a representative from the Ministry of Foreign Affairs and the president and executives of the Green Fund, which finances the preparation of the Climate City Contract of Athens as well as other environmental projects and actions. Representatives from the Board of the European Mission for Climate Neutral and Smart Cities also participated in the forum, strengthening the connection between the climate plans of Athens with European climate neutrality initiatives and presenting financial tools that will support climate neutral cities.

The Bank of Greece's Centre for Climate Change and Sustainability provided a scientific and economic approach to climate change issues, highlighting the importance of economic stability and environmental sustainability, inter alia stressing that inaction would cost three times as much as effective action to mitigate and adapt to climate change. The Green Financing Institution focused on (innovative) financial tools, while the Hellenic Passive House Institute presentation of good practices for the energy efficiency of buildings.

The Consumers' Union EKPOIZO participated in the debate with proposals to improve energy efficiency for households and to tackle energy poverty, while the company Anavathmisi S.A. presented possible European and other financial instruments to support the climate neutrality process. The Cycling Community and the Hellenic Urban Cycling Federation as well as the PEZI citizen movement highlighted the importance of sustainable mobility and the promotion of cycling and walking as a sustainable way of commuting in everyday life.

The National Observatory of Athens participated by offering scientific knowledge and support to climate actions, while DAEM emphasised technological solutions for climate management at the local level. The Hellenic Property Federation (POMIDA) referred to tools needed by property owners and tenants for the energy upgrade of buildings, while the Hellenic Society for the Environment and Cultural Heritage (ELLET) focused on issues related to the protection and utilisation of the urban and natural environment, as well as the need to preserve cultural heritage. Finally, a representative of the Hellenic Confederation of Professionals, Craftsmen, and Merchants offered valuable opinions and proposals for the green transition and sustainability in the economy of Athens.

In order to further understand the role of small businesses in the CCC, a **special session with business representatives** was organised at the headquarters of the Hellenic Confederation of Professionals, Craftsmen, and Merchants on July 23, 2024. After a presentation of the CCC Action Plan by the Deputy Mayor for Climate Governance and Social Economy, Nikos Chrysogelos, a fruitful discussion ensued with the president of the Confederation and the president of the Athens Chamber of Tradesmen with the aim to raise business awareness around the green agenda. Shared steps will be specified in the upcoming months future with emphasis on:

- an extensive tree planting programme under the responsibility of businesses,
- improving waste management, especially those related to professional activity and organising a large joint campaign from autumn,
- re-training of the professionals involved in the fields of energy upgrading and renewable energy sources, as well as
- integration of the circular economy dimension into the relevant public debate and planning.

All these ideas as well as the suggestions of the two sessions of the Climate Forum were taken into account in the development of the first version of the CCC. Input and further suggestions from upcoming sessions of the Forum will be used to further revise the Action and Investment Plans of the CCC.

4.1.3. Athens Climate Youth Assembly

In parallel with the Climate Forum, we have established the Athens Climate Youth Assembly with the participation of young people aged 15-30 that live, work, or study in Athens. The role of the Assembly is to propose and implement long-term solutions that will improve both the performance of Athens in terms of its commitment to climate neutrality and the lives of the young people that live in the city. Similar to the Climate Forum, the Climate Youth Assembly is based on a participatory planning process with emphasis on issues that concern young people and on solutions that benefit climate neutrality and the resilience of the city. In addition, the Climate Youth Assembly focuses on topics related to education and training, housing, green job creation, social and green innovation and entrepreneurship, social cohesion, the arts, etc.

The **1st session of the Climate Youth Assembly** took place on May 14, 2024 (Figure 26), alongside the 1st Climate Forum and focused on various proposals and interventions that can be implemented to reduce the consequences of high temperatures and heat waves in Athens. Participants included students and teachers from the 2nd, 4th, 23rd, and 56th High Schools of Athens as well as university students, offering fresh ideas and showing their dedication to creating a sustainable future. The participants acknowledged that the climate crisis is affecting their lives more and more and it is important to look for solutions that are workable and sustainable. The participants were then split into working groups to discuss different problems they have identified related to climate, as well as potential solutions. At the end of the session, the participants presented workable proposals aimed both at mitigating emissions and helping Athens adapt to the new climate conditions.

Figure 26. 1st session of the Athens Climate Youth Assembly on 14 May 2024

The proposals made by the working groups of the 1st Climate Youth Assembly include the following:

- Organised and systematic tree planting at school.
- Hands-on environmental education programmes, such as hands-on lessons in community vegetable gardens and creating rain gardens in urban areas, which can help young people acquire green skills and help protect the environment.
- Development of a carpooling app for the mobility of university students, through which students using their own cars to move to universities can report their routes and share their rides.
- Paid community service in civil protection programmes, focused on combustible biomass removal and flood control projects, which can provide a dual benefit, both for environmental protection and youth employment.
- Informing and raising students' awareness of the importance of environmental awareness when supporting businesses or following social media accounts.
- Clean, safe, and reliable public transport solutions.
- Creating a platform of active citizens and students, which will enhance participation and climate awareness with incentives (e.g., bonus ECTS for students)
- Management of urban green infrastructure and creation of a single map for the surveillance and recording of burnt areas around Athens

The **2nd session of the Climate Youth Assembly** was held with the participation of the Mayor of Athens, Haris Doukas, and the Deputy Mayor for Climate Governance and Social Economy, Nikos Chrysogelos, on July 3, 2024, in the context of the 2nd Climate Forum (Figure 27). The 2nd session focused on strengthening active youth engagement in promoting sustainability and climate justice and on how to sustain the Assembly with further actions and active participation of young citizens. The session was also an opportunity to promote the Youth Climate Action Fund of Athens (funded by Bloomberg Philanthropies) and to urge participants to submit proposals for climate projects in Athens (see Module C-2 for more details).

Figure 27. 2nd session of the Athens Climate Youth Assembly on 3 July 2024

The Mayor referred to various social initiatives and examples of waste management and green infrastructure in Athens, emphasising the need for culture change and active participation of citizens in solving climate and social problems. Similarly, the Deputy Mayor highlighted that climate policy is directly linked to social policy and the improvement of the quality of life, especially in the degraded neighbourhoods of Athens. He pointed out that climate justice means improving living conditions for all, explicitly emphasising vulnerable groups.

Subsequently, the young participants presented new proposals and ideas, including but not limited to the following:

- A student from the University of Athens presented an idea for rain gardens, inspired by Copenhagen. Her proposal focused on water management and the aesthetic improvement of the city, proposing a pilot application in Athens.
- Students from the 4th High School of Athens presented proposals for improving the school environment through shading and green projects on the school roofs.
- A student from the 23rd Junior High School of Ampelokipi presented simple ways to reduce energy consumption at home and to create green spaces.
- A student from the University of Athens asked for greater and more active cooperation and information exchange with universities and integration of students in the city's climate actions.

The meeting closed with a discussion on promoting collaborations with the University of Athens and the National Technical University of Athens for the implementation of climate projects and actions. The Municipality of Athens also promised to support and finance new ideas through the Youth Climate Action Fund.

Apart from the official sessions of the Athens Climate Youth Assembly, the Municipality of Athens supported the **1st Innovation Workshop for Climate**[54] organised by the UNICEF Office in Greece between 20-22 March, at Technopolis of the Municipality of Athens (Figure 28). During the three-day interactive workshop, young people aged 15-24 years old from the Attica region discussed the challenges of climate change and proposed solutions to address environmental issues in their community. Coordination was done by UNICEF, based on the UPSHIFT Programme that aims to empower young people through skills development, social innovation, and entrepreneurship.

[54] https://www.unicef.org/greece/δελτία-τύπου/εργαστήριο-καινοτομίας-για-το-κλίμα

Figure 28. 1st Innovation Workshop for Climate

Under the guidance of an experienced trainer, participants discussed in groups and developed business proposals related to:

- the construction of a park on the banks of the Podonifti River,
- the use of ecological methods of rainwater management in urban areas,
- the reduction of damage caused by flooding, and
- the design of an application for recycling on the beaches of Attica.

Afterwards, the young participants presented their ideas to a group of representatives from the private and public sectors, including the Deputy Mayor of Climate Governance and Social Economy of Athens. The most innovative and creative ideas were selected by the jury and were presented by participants at the Our Ocean Youth Leadership Summit.

4.1.4. Athenian Energy Alliance

With the initiative of the Mayor, Haris Doukas, and with the cooperation of seven neighbouring municipalities (Egaleo, Vyronas, Zografou, Kallithea, Moschatou-Tavros, Papagou-Cholargos, and Nea Ionia), the foundations were laid on March 19, 2024, for the establishment of the Athenian Energy Alliance (Figure 29). Its primary purpose will be the production of green energy from RES at a competitive cost and its utilisation in a way that reduces the energy costs of vulnerable households in the cooperating municipalities. The Alliance also aims to promote education and awareness at the local level on issues of sustainability, energy democracy, and energy transition.

Figure 29. Inauguration of the Athenian Energy Alliance

Since its inauguration, the Alliance has grown considerably and currently includes 17 municipalities. In terms of governance, the Alliance will be an opportunity for aligning climate policy among its members and exchanging best practices and technical information on the transition. On the latter, the Municipality of Athens organised a Climate and Energy Academy aiming to train executives of participating local authorities (including personnel of the Municipality of Athens) in new technological developments, institutional frameworks, and financial tools. Training will be provided by academics as well as distinguished experts from the private sector. The first activities of the Academy have already begun at the first meeting of the Academy between May 27-29, 2024, in collaboration with DAEM. Apart from detailed training programmes, the next edition of the Academy will provide exhibitions and interactive scientific training.

4.1.5. Internal re-organisation of the Municipality

On 12 July 2024, a meeting was held within the Municipality of Athens on the subject of the CCC Action Plan for the official inclusion of the city in the EU Cities Mission. Participants included Deputy Mayors and officials from most Departments and Services of the Municipality as well as relevant stakeholders such as representatives from the C40 Cities network. The main proposals and concerns were focused on strengthening climate governance in the Municipality, cooperation with other agencies, creating structures for investment but also education and awareness about climate change, on the utilisation of historic and free spaces to strengthen the greenery, and the need for synergies and financing for the implementation of the Municipality's plans.

Among the various comments and proposals that were suggested are the following:

- It is important to coordinate the various services of the Municipality to achieve a common planning that incorporates both the objectives and the financial assessment of the CCC.
- The new Action Plan is ambitious and must be translated to a more operational level.

- The Municipality of Athens faces difficulties in supporting certain actions, such as the withdrawal of cars and coordination with OASA. There must be changes on the parking policy and potentially create more parking stations at the perimeter of the Municipality, in collaboration with OASA.
- There is a need to find and understand the terms of different financial tools for supporting the implementation of the projects. There should be a maturation process for each project separately, so that they are effective and not just ambitious.
- An energy production factory can be created using biomass as feedstock. Green infrastructure can also be expanded in unused areas, such as Tourkovounia.
- The Municipality faces many challenges due to lack of staff and the need for skilled personnel to operate the infrastructure. There is especially a need for personnel in bio-waste management and the relevant funding to cover this need.
- There must be clear goals and funding for all climate ambitions.
- It is important to preserve natural space within the city such as the stream of Podoniftis.
- Dammed rivers and streams of Athens should return to their natural form, while the underground aquifer of Athens should be utilised for public purposes. Artificial streams can also be created for cooling and aesthetic upgrading of the city.
- There is a need to educate children for environmental awareness, e.g., through special courses in schools.
- It is important to create a consistent vision for 2030 and to improve the internal organisation of the Municipality for effective climate governance.

These suggestions were considered in the development of the CCC Action Plan and a plan for the internal organisation of the Municipality to ensure the governance of the implementation of the CCC. Primarily, the dimensions of Climate Action and Resilience should be horizontally integrated in all activities and plans of the Municipality, instead of a separate directorate or office—even if a dedicated Directorate is established. Relevant departments include the Directorate of Strategic Planning, Resilience, Innovation & Documentation, the Directorate of Finance, the Directorate of Building Infrastructure, the Directorate of Electrical Engineering, the Directorate of Mechanical Engineering, the Directorate of Roads, Sewerage & Public Spaces, the Directorate of Waste Management & Recycling, the Directorate of Spatial Planning, the Directorate of Greenery & Urban Fauna, the Directorate of Social Solidarity, and the Directorate of Municipal Clinics & Public Health. Similar meetings were organised by the Deputy Mayor of Climate Governance and Social Economy of Athens, Nikos Chrysogelos, with officials from all municipal communities of Athens.

The new organisational structure is currently discussed within the Municipality and will be enacted in the coming months. Some of the initial suggestions for re-organising the Municipality include the following:

- a well-organised and well-staffed Climate Policy and Civil Protection Directorate, with necessary departments and qualified personnel, which however will be closely cooperating with all other directorates and services, and with significant financial resources and equipment/means.
- regular meetings of all deputy mayors and departments to discuss plans and projects in time to adapt them to the requirements of the climate strategy and resilience.
- strengthening a horizontal coordination structure with officials from relevant directorates.
- designating a desk officer in each deputy mayor’s office to monitor and identify climate policy issues in a timely manner.

Finally, apart from the need for financial tools, data-driven tools will play an important role on improving the internal capacity of the Municipality to effectively design and monitor climate actions. This was the topic of a conference organised on 12 June 2024 at the Athens City Hall in collaboration with the ICLEI Europe Cities Network, titled "Data-driven Tools for Cities on the Path to Climate Neutrality". The ICLEI Action Fund will support three projects in the Greek municipalities of Athens, Vari-Voula-Vouliagmeni, and Thessaloniki, utilising different data sources and technologies to implement inclusive climate actions. This initiative, led by ICLEI Europe and funded by Google (Alphabet), will focus on programmes that will be called upon to address critical climate challenges such as energy poverty, fire detection, and air quality management in Greece. All programmes will contribute to the implementation of the European Mission for Climate Neutral and Smart Cities and the Mission for Adaptation to Climate Change.

4.1.6. Governance structure of CCC Investment Plan

One of the most significant barriers for the climate neutrality of Athens is finding the investments required for achieving the goals and envisioned actions of the CCC, especially for energy upgrades of the built environment and for upscaling local PV installation. Significant EU and national investments on climate and energy have already been channelled to the Municipality through programmes such as the European Structural and Investment Funds and the Recovery and Resilience Facility. However, to accelerate Athens' transition and reach 80% of emissions reduction in 2030, capital investments need to ramp up significantly.

The discussion on the investment needs of the CCC and potential funding sources was at the core of the development of CCC. During the 2nd Climate Forum on 3 July 2024, a **workshop** was organised **on financial tools to support Athens' transition to climate neutrality by 2030** (Figure 30). Among the participants and presenters were representatives of the Ministry of Environment and Energy, the Green Fund, the Council of the European Mission for climate neutral and smart cities, IME & KEK GSEVEE, Hellenic Passive House Institute, Cycling Community, Municipality of Nea Smyrni, POMIDA, Migrant Forum, Myrtilo, and Anavathmisi S.A.

Figure 30. Workshop on financial tools

Some of the main findings of the workshop was that the success of the goals for climate neutrality requires the coordinated action of all actors involved as well as overcoming regulatory and institutional barriers. In addition, the importance of training and informing professionals about the green transition was highlighted, as well as the need to integrate green parameters into all projects. Funding was considered critical for the implementation of the actions, while synergies between the agencies are required. Institutional proposals included the possibility of hiring more personnel for climate strategy needs, VAT reductions for related investments, the obligation of energy providers to allocate resources for energy savings, the creation of green bonds, and the allocation of part of the revenue from the climate resilience fee to Municipalities.

Specifically, among the topics discussed during the workshop were the following:

- There is a need to coordinate action of all involved bodies, such as the Municipality, other agencies, citizens, and businesses, to achieve the goals
- There are many financial tools at European and national level that can support Athens' transition to climate neutrality.
- There is European support for climate neutral cities through the EU Mission but also specialised support and the creation of the Capital Hub with the European Investment Bank. Political support and technical training are also critical factors for the successful implementation of climate programmes.
- It is important to incorporate green parameters into all projects while pointing out that failure in climate policy can cost at least as much as three times the resources required for climate neutrality.
- There is a need for training and reskilling professionals in new technologies and green energy and financing tools for climate action adapted to the needs of small and medium-sized businesses.
- There is a need for incentives in energy upgrades as well as targeted programmes by the State. Additionally, apartment buildings face many challenges such as the need for consensus among owners and the difficulty of decision-making.
- There is a need for reliable data and indicators to guide sustainable mobility policies such as on cycling and walking in Athens
- There is often a “recycling” of issues related to climate change and sustainable development without substantial progress.
- There is a need for energy efficiency loans, based on real energy savings without mortgaging the buildings.
- Social dimension should be strongly integrated in all climate efforts.
- A think tank can be created in the Municipality, encouraging specific and targeted proposals for the improvement of the local community.

A similar discussion took place on 2 July 2024 in an **online meeting on green bonds** organised between the Municipality and European financial institutions and organisations, including the Climate Bonds Initiative, the European Mortgage Federation HYPO, the EBRD, and the Green Finance Institute. Participants of the Climate Bonds Initiative stressed the emblematic character of financing actions of the Athens Climate Action Plan. The Climate Bonds Initiative could play a coordinating role in securing funds from EU programmes and private investors. The various financial tools that could be used were discussed at length, with special reference to Green Loans and (Public) Covered Bonds and relevant experiences from London and San Francisco. The importance of equality and strengthening of local societies was underlined, as the stronger they are, the better they cope with crises (climatic, economic, etc.).

Similar meetings were organised with representatives of the Bankers without Borders and Business. The latter organisation enables London to take the lead in the energy transition by utilising innovative tools and can provide best practices for Athens too. An important online briefing was also organised by the General Secretariat of Spatial Planning and Urban Environment of the Ministry of Environment and Energy on the new international financial tools introduced by the European Commission, with the aim of supporting them. Cities that have received the EU Cities Label will have access to financial services from the European Investment Bank. These include the ability to structure financing needs, introduce projects to capital providers, and support during the deal closing process.

In order to continue this work on finding new investment opportunities and governing the implementation of the investment plan of the CCC, we will create a **Climate Neutrality Investment Council** with the participation of the Municipality, professionals, and other interested parties. The council will in practice be a working group that aims to implement the investment plan of the CCC to achieve climate neutrality, as well as the search for funding sources. The group will also ensure that the implementation of the CCC does not lead to financial exclusion and that society and entrepreneurs have access to fair financing tools. Although the City is not yet ready to draw up a complete “climate budget” with indicators and data to monitor the achievement of the 2030 climate neutrality goal, we will train municipal personnel and develop expertise on this issue in the near future. Thus, the role of the group will not only be on finding funds for the climate transition but also building the capacity of the Municipality to fund future activities.

4.2. Module C-2 – Social Innovation Interventions

This module lists the actions taken by the city to support and foster social innovation initiatives or non-technological innovation more broadly (e.g., in entrepreneurship, social economy, social awareness & mobilisation, social cohesion and solidarity, etc.) aimed to address the systemic barriers and leverage the opportunities identified in Module A-3. The approach of NetZeroCities is used for defining social innovation initiatives as ways to address societal challenges using a "bottom-up, collaborative, holistic, and human-centred approach to innovation"[55]. The following categories of social innovation have been identified by the NZC and are adopted for categorising the initiatives of Athens[56]:

- Skills and capacity building
  - Capacity building of public officials and policymakers
  - Skills of citizens and urban stakeholders
- Empowerment and inclusion
  - Co-design of policies with social innovators and urban stakeholders
  - Co-creation of social innovation initiatives with citizens and stakeholders
- Regulation and support
  - Funding/supporting community-led initiatives and small-scale pilots/experimentations
  - Enabling social innovation/entrepreneurship initiatives scale-up beyond pilots
  - Testing and prototyping new funding mechanisms
  - Public procurement of social innovation services for sustainability
- Systemic innovation
  - Urban planning for social innovation
  - Resource circularity

Table 115 is providing a short description of the social innovation initiatives that are currently planned by the Municipality and other stakeholders and are relevant for the CCC. Each initiative is categorised based on the aforementioned categories of social innovations and includes information on the systemic barriers and opportunities that it addresses (from Module A-3), on the involved stakeholders, and on the foreseen impact on climate neutrality and co-benefits. Table 116 provides a narrative with more details on each initiative. Most of the initiatives have direct impact on the targets of the CCC while others are indirectly related, such as projects focusing on social innovation in climate adaptation but with significant synergies for mitigation. It is noted that more social innovation initiatives will be established in the coming months with the input of stakeholders and citizens participating in the Climate Forum and the Athens Climate Youth Assembly.

Table 115. Relations between social innovations, systems, and impact pathways (C-2.1)

Intervention name – description ***[types of social innovation]***	**Systemic barriers & opportunities addressed**	**Leadership & stakeholders involved**	**Enabling impact and co-benefits**
Financial instruments for PV and energy storage – Creation of a supporting mechanism	- The required rate of adding new renewable electricity systems in the CCC	- Municipality of Athens (lead) - Ministry of Environment and Energy	Main impact: secure finance for all CCC actions related to installing new energy systems for Athens;

[55] https://netzerocities.app/QR-Social

[56] https://netzerocities.eu/wp-content/uploads/2023/01/D2.7-Report-on-Indicators-assessment-methods-for-social-innovation-action-plans.pdf

of new financial instruments to support the installation of photovoltaics and energy storage. *[Funding/supporting community-led initiatives and small-scale pilots or experimentations; Enabling social innovation/entrepreneurship initiatives scale-up beyond pilots]*	is much higher than the current rate. - While there are national programmes to help citizens to acquire PVs and storage, the initial costs and bureaucracy can be oftentimes significant. - Emerging energy communities in Athens and elsewhere in Greece have encountered many challenges such as the lack of available (electric) space, grid connection delays, bureaucracy, and frequent policy changes. - The Municipality has already started the process for acquiring 20 MW of PVs for its first energy community. Based on this first pilot, it can then scale more effectively.	- Climate Change and Sustainability of the Bank of Greece - Climate Bonds Initiative - European Bank for Reconstruction and Development - Greek Green Fund - European Structural and Investment Funds - Other cities and city networks with experience in the topic - Existing energy communities of Athens - Relevant NGOs - Athens Energy Alliance	allocate this finance to relevant city stakeholders and citizens in an effective way, without unnecessary bureaucracy. <u>Co-benefits</u>: - The municipality can act as a facilitator for organisational issues such as faster connections to the grid by negotiating with HEDNO. - Provide an example for overcoming barriers in financing local RES installations in other municipalities or even at national scale. - Reducing energy cost volatility for the citizens and business within the Municipality by providing financial solutions to put a PV and storage system on their roof - The instruments could support energy democracy by meaningfully supporting energy communities - Reduce energy poverty by redistributing income from the Municipality's energy communities

Financial instruments to promote energy upgrades – Creating innovative financing tools to promote energy upgrade (focusing on citizens) *[Funding/supporting community-led initiatives and small-scale pilots or experimentations]*	- Deep renovation rate must ramp up in Athens to achieve the CCC targets. - As with the PV support programmes, existing national programmes for energy upgrades can often have significant bureaucracy in applying as well as initial costs that cannot be covered by the building owners (in case that a loan cannot be secured). - The funding support by these programmes can be oftentimes delayed, transferring the financial burden to the constructors that have to implement an upgrade without getting paid at a reasonable time.	- Municipality of Athens (lead) - Ministry of Environment and Energy (including the Energy Inspection Departments) - Climate Change and Sustainability of the Bank of Greece - Climate Bonds Initiative - European Bank for Reconstruction and Development - Greek Green Fund - European Structural and Investment Funds - Other cities and city networks with experience in the topic - Technical Chamber of Greece - Construction companies in Athens (or relevant professional networks) - ESCOs - Athens Energy Alliance	Main impact: secure finance for all CCC actions related to energy upgrades of the building stock within Athens; allocate this finance to relevant city stakeholders and citizens in an effective way, without unnecessary bureaucracy. Co-benefits: - The municipality can act as a facilitator for relevant loans for energy upgrades - The Reduced energy costs for households and businesses within the municipality - Reduce energy poverty by prioritising the funding of buildings with low energy performance and unbearable energy costs for its tenants
Athens Business Green Toolkit – The aim of this action is to support small and very small enterprises of the Municipality of Athens to upgrade their operation based on the principles of energy efficiency and bioclimatic design. Source: https://athensib.gr/images/EFD_FILES/2023/tropopoihseis/GREEN	- The scale of renovation required for business within Athens would be difficult to reach without support programmes (i.e., at least 50% renovated to B until 2030) - Apart from technical measures such as the energy upgrades, the businesses may lack the know-how of optimising their operations (e.g.,	- Municipality of Athens (lead) - Hellenic Confederation of Professional, Craftsmen and Merchants (GSEVEE) and its institute (IME GSEVEE and KEK) - Commercial Association of Athens - Athens – Attica & Argosaronic Hotel Association	Main impact: the target of CCC for energy upgrades in buildings of the tertiary sector is achieved. Co-benefits: - Reduced energy costs for the businesses which can be then reflected on their cost of services - Better and more healthy conditions within upgraded

_TOOLKIT_3h_trop_210722.pdf *[Funding/supporting community-led initiatives and small-scale pilots or experimentations]*	configuring correctly their cooling or heating systems) - Lack of incentives for businesses to perform deep renovations - The programme has been already designed and started already from 2022. It needs to be extended considerably in the coming years.		buildings (e.g., less drafts), especially for buildings related to tourism and the catering sector.
Youth Climate Action Fund – Using a grant by Bloomberg Philanthropies the Municipality will finance the direct implementation of climate actions designed and implemented by young people (aged 15-24). Source: https://ycaf.cityofathens.gr *[Funding/supporting community-led initiatives and small-scale pilots or experimentations; Co-creation of social innovation initiatives with citizens and stakeholders. Skills of citizens and urban stakeholders]*	- Many NGOs and bottom-up initiatives within Athens focus on climate action but most do not have the needs to achieve it. - Youth-led climate initiatives (e.g., climate strikes) are relative weaker in Greece than in other EU countries.	- Municipality of Athens (lead) - Bloomberg Philanthropies - NGOs for the youth such as Hellenic Youth Participation, Inter Alia, Youth Active Minds, Ecotivity, Amazing Youth, WeFor, Astylab, Erasmus Student Network and the Cell of Alternative Youth Activities (KEAN)	Main impact: implement youth-led climate actions within the municipality Co-benefits: - Increased empowerment and awareness on climate among Athens's youth - Creating small but powerful examples of climate action within the cities
Climate Schools Athens 2030 – A continuation of a programme by the Municipality promoting climate awareness and taking climate actions in schools	- Low environmental education among the general population -	- Municipality of Athens (lead) - Schools within the municipality - Organisations of parents and teachers	Main impact: Improve awareness of and active interest on climate issues among the young population of Athens and implement climate

[Skills of citizens and urban stakeholders]			interventions on the schools Co-benefits: - Improve the sense of efficacy and empowerment of students
Climate and Energy Academy – In the context of the Athens Energy Alliance, the Municipality of Athens aims to train executives of the cooperating local authorities in new technological developments, institutional frameworks, and financial tools. *[Capacity building of public officials and policymakers]*	- Low capacity among municipal officials on addressing climate issues and identifying effective solutions - Integrating climate action in the work of municipalities would require specialised knowledge and long-term experience such as on developing emission inventories.	- Municipality of Athens (lead) - Municipalities already participating in the Athenian Energy Alliance - Other neighbouring municipalities that can potentially join the Alliance in the future	Main impact: Improve the capacity of municipal officials and policymakers in terms of successfully designing and implementing climate actions in their jurisdiction Co-benefits: - Strengthen ties between the neighbouring municipalities in Attica -
Energy Poverty Alleviation Office – The Office will contribute to the identification of energy-vulnerable households of the Municipality, the assessment of the magnitude of their problems, and the provision of appropriate advice and interventions. *[Public procurement of social innovation services for sustainability]*	- Low energy literacy among the general population. - Potentially high levels of energy poverty within Athens	- Municipality of Athens (lead) - C40 Cities (funding) - Engineers and energy advisors - Energy poor households	Main impact: Reduce energy poverty within the municipality Co-benefits: - Improve energy literacy in energy vulnerable households

ARSINOE – The aim of the EU-funded ARSINOE is to provide Athens with the foundations of a public consensus towards climate resilience, targeting the key community systems of environment, biodiversity, clean energy, primarily, and transport secondarily. Source: https://arsinoe-project.eu/case-study-1/ *[Capacity building of public officials and policymakers; Co-design of policies with social innovators and urban stakeholders]*	- While nature-based solutions can have significant benefits for both climate adaptation and mitigation, they have not been implemented yet at scale in Athens - Public is often not involved in decisions of green infrastructure	- Municipality of Athens (lead) - University of Thessaly - Other partners of the ARSINOE project - Citizens and stakeholders of Athens	Main impact: better understanding of NBS that are appropriate and acceptable for Athens Co-benefits: - Further establishing a culture of public engagement with climate issues within the city
REACHOUT - As part of the EU-funded REACHOUT project, Athens will develop better flood maps for the city and heat maps of historical and future heat that will illustrate the urban heat island phenomenon. Source: https://reachout-cities.eu/post_type_city/athens/ *[Capacity building of public officials and policymakers]*	- There is a need to understand in more detail and in high resolution the problems of the city in term of urban heat island and flooding	- Municipality of Athens (lead) - Other partners of the REACHOUT project	Main impact: better scientific base for designing new green infrastructure of the city (see Section 3.2.5); better targeting of other interventions within buildings and in the urban environment to address the urban heat island effect Co-benefits: - Improve adaptation of the city to floods and extreme heat

Table 116. Description of social innovation interventions (C-2.2)

C-2.2: Description of social innovation interventions
Besides acquiring the appropriate funding for transition, it is imperative to optimise the way it is distributed to the stakeholders that will implement transition actions. For instance, funds to support building renovations need to be channelled in an efficient way to building owners, potentially similar to the way it has worked for national programmes such as Eksikonomo ("Save"). However, the national programmes have been often criticised for their bureaucracy and delays in releasing the funding to the applicants[57]. These issues will be considered in the design of **financial instruments and tools for supporting PV, energy storage, and energy upgrades** within Athens, with the support of the Municipality. These instruments will be developed in close cooperation with the central government in order to complement national-wide programmes and scale them up to achieve the CCC targets for Athens. Organisations such as the European Investment Bank, the European Social Fund, and the Climate Bonds Initiative will also act as advisors in the development of the initiatives and as potential sources of funding. For instance, the EIB has committed a €2 billion loan to selected European cities with the EU Cities Label, promoting investments in areas such as energy-efficient buildings, district heating systems, renewable energy, sustainable mobility, urban renewal, water infrastructure, and social infrastructure. In addition, the Municipality will launch economic feasibility studies in the coming months (as well as detailed studies later on) for the installation of photovoltaics on the roofs of Athens and for large-scale energy upgrade of Athens' built environment, starting from the municipal buildings. The Municipality is not new in the development of such support programmes and social innovation actions. Since 2022 and continuing through 2024, the **Athens Business Green Toolkit** has been developed to support small and very small enterprises of the Historic Centre of Athens to upgrade their operation based on the principles of energy efficiency and bioclimatic design. The programme supports businesses by financing technical measures such as interventions in the building envelope, upgrades of cooling/heating systems and appliances but also by measures to optimise energy use such as energy management systems and hiring energy consultants. The expected results from the implementation of the programme are energy savings, reduction of carbon dioxide emissions, improvement of the urban environment of the historical centre of the municipality, and co-benefits such as boosting energy security and employment and reducing energy poverty. Supported enterprises should take into account and promote equality between men and women, prevent any discrimination on grounds of sex, race or ethnic origin, religion or belief and ensure that they are accessible to people with disabilities. The Municipality will use the experience with this programme to scale up energy upgrades to buildings of tertiary sector throughout Athens and develop similar programmes for residential buildings during the implementation of CCC. Apart from municipal financial support programmes, the Municipality will evaluate additional instruments in coordination with the national government such as reducing or abolishing VAT on basic goods and services could increase the number of households with solar panels or hybrid systems (electricity and hot water production). Additionally, the Municipality established in May 2024 an **Energy Poverty Alleviation Office** with the aim to identify households that are energy vulnerable and support them with advice and home interventions. In general, the office will provide advice to all citizens of the municipality to help them change wasteful energy behaviours, identify funding programmes related to energy management and carbon footprint reduction, and increasing the active participation of energy vulnerable citizens, energy communities and citizen initiatives. Similarly, the **Climate and Energy Academy** will provide training to policymakers and officials of the municipalities that are part of Athenian Energy

[57] https://news.b2green.gr/32226/τα-αμέτρητα-προβλήματα-του-εξοικονομ

Alliance in new technological developments, institutional frameworks, and financial tools related to the energy and climate transition.

Turning to actions for the young population of Athens, the Municipality will develop a **Youth Climate Action Fund** to finance the implementation of climate actions designed and implemented by young people (aged 15-24). In June 2024 there was the first open call for submission of proposals for climate actions and 27 projects were submitted and evaluated. A number of them were selected to receive financial support of 2000-4500 euro for their implementation using a grant by Bloomberg Philanthropies. This model of financial support to young people who want to undertake direct climate action will be developed as a long-term participatory method focused on young mobilization. The Municipality will secure again in January 2025 an even higher grant (about 90.000 euro) for a second round of call for proposals. The plan is to secure similar flexible financing for the continuous involvement of young people throughout the implementation of the CCC.

From October 2024 on, the Municipality will also start the project **Climate Schools Athens 2030**, which gives an active role to the educational community (pupils, teachers, and parents) in promoting climate awareness and taking climate actions in schools and neighbourhoods. A similar project had already run successfully in the past (Climate Schools 2017-2020) where 73 schools participated, produced interesting outcomes and published proposals for climate action and improvements for their schools. In parallel, the municipality has already prepared an integrated project for installing shading in classrooms that are now overheated, planting trees and bushes at school yards, using LED lighting, and installing photovoltaic systems on the roofs of 52 schools of Athens (see action A.E.1 in Module B-2 for more details). The school community will be invited to participate in these interventions and help co-design them; in that way, it will not only be a technical project but also an educational and participatory one. A governance structure will be established for running the project in the long term, with the participation of the Municipality (Deputy Mayor of Climate Governance and Deputy Mayor of Education), educators, environmental education offices, and NGOs working with schools. Financing for this project has been already secured, while two schools were awarded and will receive additional small grants to install natural shading systems in their schools, based on proposals they have made themselves.

While this CCC is mainly focusing on climate change mitigation, social innovation on climate will need to be designed holistically (when possible) to address the significant climate impacts that Athens is facing now and in the future. The aim of the EU-funded **ARSINOE**[58] project is to harness innovation to adapt to climate change in a range of key systems - from biodiversity to floods and sea-level rise, and from drought and water scarcity to heat waves and deforestation. ARSINOE's aim is to provide Athens with the foundations of a public consensus towards climate resilience, targeting the key community systems of environment, biodiversity, clean energy, primarily, and transport secondarily. ARSINOE will focus on addressing the impacts of climate change on urban biodiversity and public well-being, evaluating the impact of nature-based solutions in mitigating the urban heat island effect in the region. Adaptation options will be assessed by multi-criteria analysis, assessing effectiveness, contribution to climate change adaptation, technical and economic viability and public acceptance. The project is fully aligned with the objectives of the Athens Resilience Strategy for 2030, and its results will be used to guide the development of nature-based solutions included in the CCC by taking into account feedback by citizens and other stakeholders. The total funding for this Horizon 2020 project is 15,643,021 euros and for the EATA of the Municipality of Athens is 308,000 euros.

Similar to the ARSINOE programme, the aim of the EU-funded **REACHOUT**[59] project is to create climate services that will support adaptation decision-making in seven hub cities across Europe. Acting as accelerators for regional and national upgrading, these hubs will serve as laboratories for co-creating services with government, citizens and the private sector. The project is also developing localized (city

[58] https://arsinoe-project.eu/case-study-1/
[59] https://reachout-cities.eu/post_type_city/athens/

specific) ‘Climate Stories’ which translate climate science into information that the local officials, water experts, advisors, citizens and companies can understand and work with. For Athens, the REACHOUT project is an opportunity to develop better flood maps for the city and historical and future heat maps that show the urban heat island phenomenon. These maps will build the capacity of the municipality officials and policymakers to design the urban infrastructure needed for the CCC and in the future in general considering issues of resilience to climate impacts. The total funding for this Horizon 2020 project is 4,998,860 euros and for the Municipality of Athens: 61,875 euros.

5. Outlook and next steps

This first version of Athens' CCC Action Plan serves as a defining starting point for the Municipality of Athens towards climate neutrality in 2030. However, it is clear that this only a high-level action plan that cannot get to a level of fine detail required for implementation. Additionally, the plan had to be fully developed in less than seven months (March 2024 to September 2024) in contrast with the action plans of other cities that may have started working earlier on the CCC programme. While some of the targets and impact pathways were based on the previous 2022 Action Plan, most of the CCC Action Plan was written from scratch based on new simulations using the NZC economic model, the current priorities of the Municipal authority, and recent stakeholder engagement activities. Thus, a plan for iteratively updating Athens' CCC has been devised, along with a list of potential improvements that can take place in the upcoming versions.

The CCC will be updated at least once a year, based on the progress of the selected indicators shown in Module B-3, since most of them are annually updated (e.g., CDP emissions inventory, national statistics indicators etc.). Ad-hoc CCC adaptations will also occur to address the feedback and potentially new requirements of the NetZeroCities programme and the European Commission. Ideally, the CCC will be adjusted every 3-6 months, based on the feedback from all upcoming sessions of the Climate Forum of Athens and other stakeholder and citizen engagement activities (see Section 4.1.2 for more details).

It is acknowledged that this longitudinal process will require a dedicated team within the Municipality that will frequently organise climate engagements, monitor the indicators, and update the plan, apart from other activities related to the CCC's implementation such as coordinating between the Municipality's departments. Thus, the creation of a well-organised and well-staffed Climate Directorate along with the planned internal re-organisation of the Municipality needs to take place as soon as possible, as they will be key for the implementation and further updates of the CCC (Section 4.1.5).

The ongoing stakeholder engagement along the implementation of CCC will also help identify further barriers and opportunities in addition to the ones analysed in Module A-3 as well as more interactions and synergies with regional or national policies, e.g., in the NECP updates (see Module A-2). Similarly, new CCC indicators can be added or existing ones updated based on stakeholder feedback and on their effectiveness in monitoring the CCC. This will be especially the case with qualitative learning indicators which will be added in future updates of the plan to assess learning processes within CCC implementation and iterations of the CCC plan themselves.

In terms of improvements, it is imperative to have a more accurate picture of the emissions of Athens and how these can be impacted by different factors. As discussed in Module A-1, there are already indications that the electricity consumption in 2024 may be higher due to longer use of air conditioning to survive the continuous heatwaves that affected Athens this summer. Additionally, the quantity of waste may be higher due to the increased tourist flows in the city (even beyond the typical summer period) as well as an increase in food deliveries. The increased tourism is also related with the conversion of many dwellings in Athens to Airbnb, which may affect the energy consumption and therefore the emissions from residential buildings. All these aspects need to be further examined in the future and reflected in upcoming emission inventories and CCC updates.

Apart from developing more accurate emission inventories, we will use the upgraded version of the NZC economic model (expected September-October 2024) to simulate and explore different scenarios on Athens' transition. While the current NZC model helped us to identify domains and high-level interventions for reducing the emissions of Athens by 80% in 2030, the new model is expected to allow for more granular parameter input such as different numbers of buildings for residential, tertiary and public sectors or a more detailed simulation of climate actions. This increased level of detail will also

potentially increase the accuracy of the resulting emissions gap (Section 2.2.2), the calculation of co-benefits, as well as the required investments for climate neutrality and their breakdown for all relevant stakeholders. In addition, the model will be online allowing us to easily explore different scenarios on Athens' transition when major changes are needed on the CCC.

The CCC Investment Plan will be further adapted based on new simulations using the improved economic model and on the work of the Climate Neutrality Investment Council that will be established in the coming months by the Municipality (see Section 4.1.6 for more details). The Council will help identify and secure more potential sources of funding for the CCC and help with the design of the required financial instruments to use these investments, e.g., financial tools for Athens' citizens to upgrade their buildings. The Council will also aim to liaison with the central and regional administration for finding available resources and strengthening the available budget from the Greek Green Fund.

Apart from adding new impact pathways and relevant actions in new versions of the CCC, the existing ones will be updated and detailed. Despite all efforts to add all required information for each action, some actions do not yet contain cost estimates. Likewise, for most of the actions no assessment has yet been made for the reduction or offsetting of greenhouse gas emissions that will result from their implementation. These estimations would require more detailed analyses of costs, emissions, and indirect impacts (potentially with the new NZC model or with other tools) and will be documented in future updates of the CCC.

Similarly, a more solid plan for addressing the residual emissions will need to be developed. As suggested in the current plan (Section 3.1.7), offsetting will mainly occur through green infrastructure within the Municipality and afforestation and reforestation actions in the wider region of Attica. These actions will need to be coordinated with the regional and the central government and can build on and expand national initiatives and policies such as the National Reforestation Plan of the Ministry of Environment and Energy. Nature-Based Solutions within and outside the Municipality of Athens will lead to strong synergies with the climate adaptation goals that are critical for the city and the regions, such as reducing overheating, flood risk, and wildfires as well as addressing water shortage and drought. It is noted that such green interventions are not included in the current simulation of the NZC economic model and, thus, a more detailed design and analysis of their costs and impacts are required.

Finally, more governance and social innovations will be explored with the help of stakeholders while the design of the existing ones will be adapted based on their effectiveness. Apart from the major governance innovations that will guide CCC updates, i.e., the Climate Forum, the Climate Youth Assembly, and the Athenian Energy Alliance, it would be important to assess the responsiveness of the stakeholder groups in Module A-3 throughout the CCC implementation and create new engagement processes to approach them. It would be also imperative to develop more wide citizen engagement processes in Athens' neighbourhoods, e.g., through open events, workshops, and questionnaires, to ensure that a wide range of Athenians have a say on the transition. Furthermore, citizens can have a more active role with new social innovations such as through citizen assemblies, mini-publics and other methodologies of deliberative democracy. These interventions will be evaluated in new updates of the CCC along with relevant organisations such as the NetZeroCities programme and the Democratic Odyssey network of the European University Institute.

Table 117. Overview of the plan for the next CCC updates

Plans for next CCC and CCC Action Plan iteration
• The CCC will be updated at least once a year, based on the progress of the selected indicators shown in Module B-3. • Ideally, the CCC will be adjusted every 3-6 months, based on the feedback from all upcoming sessions of the Climate Forum of Athens (Section 4.1.2). • Next CCC updates need to explore impacts to emissions (Module A-1) from increased tourism and Airbnb dwellings in Athens, change of food habits (e.g., more food delivery), and greater use of air conditioning due to the rising temperatures. • An updated simulation will be pursued using the upcoming version of the NZC model, resulting to a more accurate emission gap (Module A-2). • The CCC Investment Plan will be further adapted based on simulations with the improved NZC model and on the work of the Climate Neutrality Investment Council that will be established in the coming months by the Municipality. • More specific barriers and interactions with national and regional policies will be identified during the implementation of the CCC, along with the help of stakeholders of the Climate Forum. • Apart from adding new impact pathways and relevant actions in new versions of the CCC, the existing ones will be updated and detailed, e.g., with estimations on the budget and resulting GHG emission reduction. • A more solid plan for addressing the residual emissions will be developed (Section 3.1.7), along with a detailed analysis of synergies and co-benefits with the goals of climate adaptation. • More governance and social innovations will be explored with the help of stakeholders while the design of the existing ones will be adapted based on their effectiveness.

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Annex 1 – Athens and Kypseli study by Norman Foster Institute

Norman Foster Institute
NFI on Sustainable Cities

Athens, Greece

Climate Action Plan
Supporting Images

August 2024

Norman Foster Institute
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Athens, Greece

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August 2024

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The future of our society is the future of our cities—they are our greatest invention. This course, in a time of climate change, is addressed to those who wish, through practice or education, to improve the quality of life in cities worldwide. In that spirit, the course will combine practical on-site experience with academic inputs from the Norman Foster Foundation's network of international experts. These range from university professors and scientists to planners and property developers.

It will start with tools and skills that can be used to address wide-ranging issues for cities. For instance, leadership, advocacy, communication, presentation, diagramming, mapping, and the understanding and interpretation of data. This approach could be applicable to cities from Asia, the Middle East, South and North America to Africa, Europe and Oceania as well as informal settlements and suburbia.

The use of objective criteria is critical to evaluating the performance of cities and charting moves to improve their quality of life and reduce carbon footprints. There are many metrics in addition to the ones that have been created for this course. Notable are the Sustainable Development Goals (SDGs) developed by the United Nations (UN). Mindful of my role as Advocate of the UN Forum of Mayors, these SDGs will be linked into the curriculum.

However, there is one criterion that is subjective, defies quantification and therefore does not find its way into any of the metrics and that is the aesthetic dimension of a city—its visual DNA. This might be the colourful dynamic of an Asian city, the Renaissance order of a classical European city, the gridded verticality of Manhattan or the picturesque alleys and plazas of a city rooted in a mediaeval past. The identity of a city is also linked to its history. These issues will be addressed in the course.

A major part of the curriculum focuses on three pilot cities that scholars will visit to engage directly with their planners and managers. For study purposes, areas will be selected in each city to raise awareness of the issues that affect the quality of life for those who live or visit there. This small number of well-defined project assignments will be addressed by the scholars working on site and in the studio, either in teams or individually. In this multidisciplinary approach, the scholars will process evidence using the most up-to-date digital tools.

In this second edition of the course, the pilot cities will be African, although the methods will be adaptable to other kinds of cities worldwide. Towards the end of the year, the scholars will present their findings to the city administration and here there will be an emphasis on advocacy and presentation skills. The lessons from these real-life experiences will be documented by film and other media, culminating in a public event. On the basis that historically cities learn from each other, it will be important for the scholars to explore the relevance of their conclusions in the wider context of global cities.

This combination of the best of academia with practical hands-on experience in the field distinguishes this course from others. However, my Co-Director Kent Larson, Director of the City Science Group at the Massachusetts Institute of Technology (MIT), and I felt we should further set it apart by defining our criteria for a new model of the city—this could be shaping an existing city towards a more sustainable future or guiding the creation of a new urbanity. If this is the long-term objective, then the individual pilot projects would be incremental short-term steps towards the same eventual goal. Prof. Larson and I worked together to present that vision as the following Vision Statement.

Norman Foster

Contents

Athens

1 Boundaries + Density

2 Heat Sensation

3 Mean Daytime Surface Temperature

4.1 Street Tree Plots
4.2 Street Tree Distribution By Neighbourhood

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5.3 Access to Types of Green Space

6.1 Access to Metro Lines (Current)
6.2 Access to Metro Lines (Future)

7.1 Access to Bus Routes
7.2 Lack of Access to Bus Routes

8.1 Energy - Natural Gas
8.2 Energy - Natural Gas (No Data)

9.1 Energy - Heating Oil
9.2 Energy - Heating Oil

10.1 Energy - Insulated Building Stock
10.2 Energy - Insulated Building Stock

11.1 Population Density
11.2 Population Density (No Data)

Kypseli

12.1 Parks + Squares
12.2 Points of Interest

13.1 Tree Count
13.2 Optimising Existing Trees

14.1 Dominant Street Type A
14.2 Dominant Street Type B

15 Street Network

16 Street Design Principles

17 Streets

18 Opportunities

19 Triangles

20.1 Road Diet (Before)
20.2 Road Diet (After)

21.1 Transforming Streets (Before)
21.2 Transforming Streets (After)

22.1 Superblocks (Before)
22.2 Superblocks (After)

Bibliography

Layout Guidelines

(No Data) maps indicate absence of data utilized for visualization. Not intended for publication.

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Figure 1

Boundaries + Density

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Hellenic Statistical Authority. “Census 2021 GR” (PDF). Press release, July 19, 2022. Archived (PDF) from the original on October 9, 2022. Accessed September 12, 2022.

Greater Athens
Size
361 km²
Population
2,611,713 people (2021)
Density
7,235 people/km²

Municipality of Athens
Size
38.96 km²
Population
624,452 people (2021) (22,51% 65+ years)
Density
16,514 people/km²

Greater Athens Boundary

Athens Municipality Boundary

Athens Neighbourhood Boundaries

0

5.000

Norman Foster Institute on Sustainable Cities

Figure 2

Heat Sensation*

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

European Space Agency. “Land Surface Temperature in Athens on 15 July 2023.” ESA Multimedia. Last modified August 2023. https://www.esa.int/ESA_Multimedia/Images/2023/08/Land-surface-temperature_in_Athens_on_15_July_2023.

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* Heat Sensation, or thermoception, is the ability to sense temperature, specifically the sensation of hot and cold on the skin. It is mediated by certain channels in the skin that respond to changes in temperature and can be influenced by factors such as inflammation.

Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries

Green Infrastructure
Population Density
Boundaries
Athens Municipality
Athens Neighbourhoods

0
1.000 m

Norman Foster Institute on Sustainable Cities

Figure 3

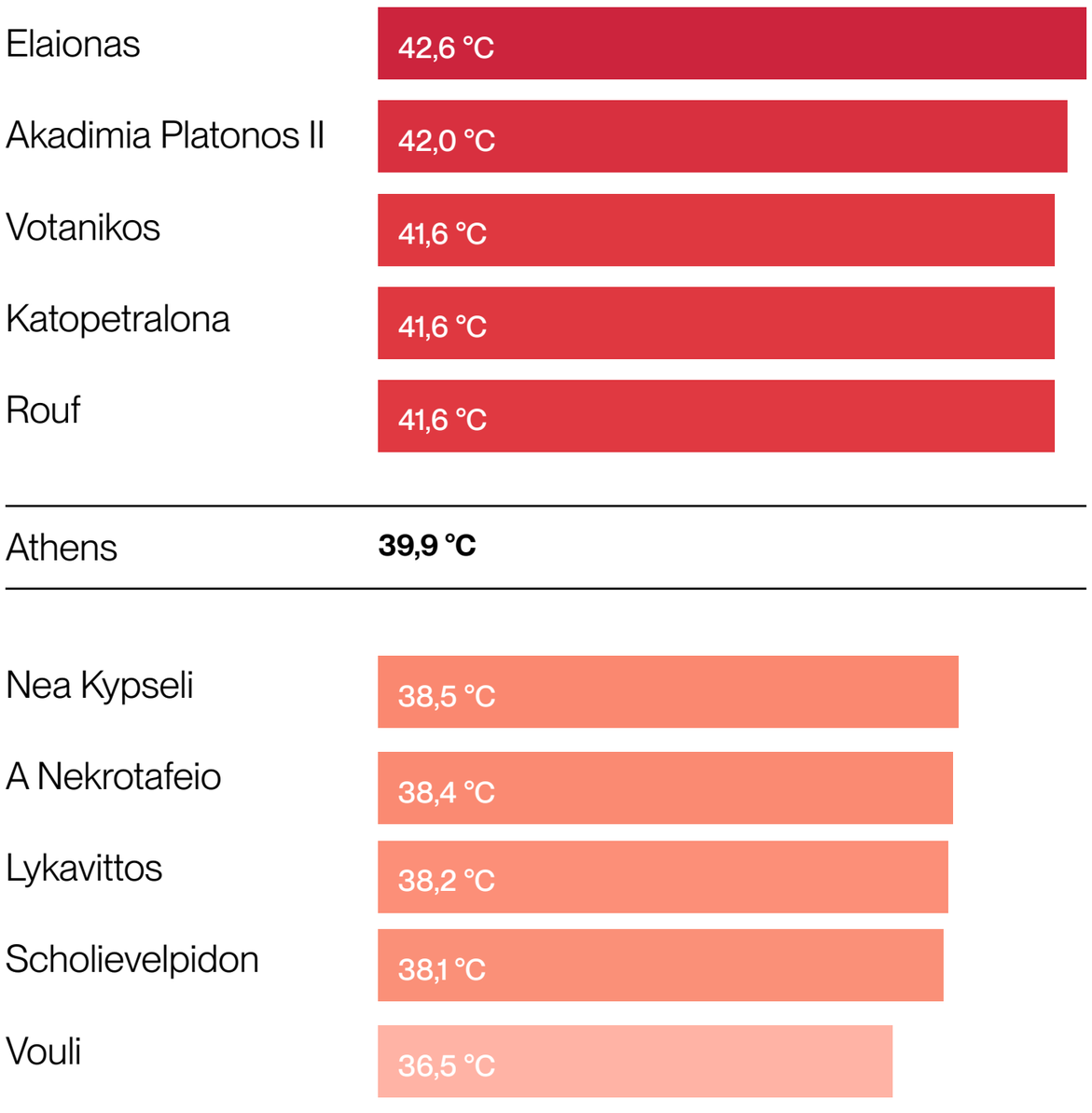
Mean Daytime Surface Temperature

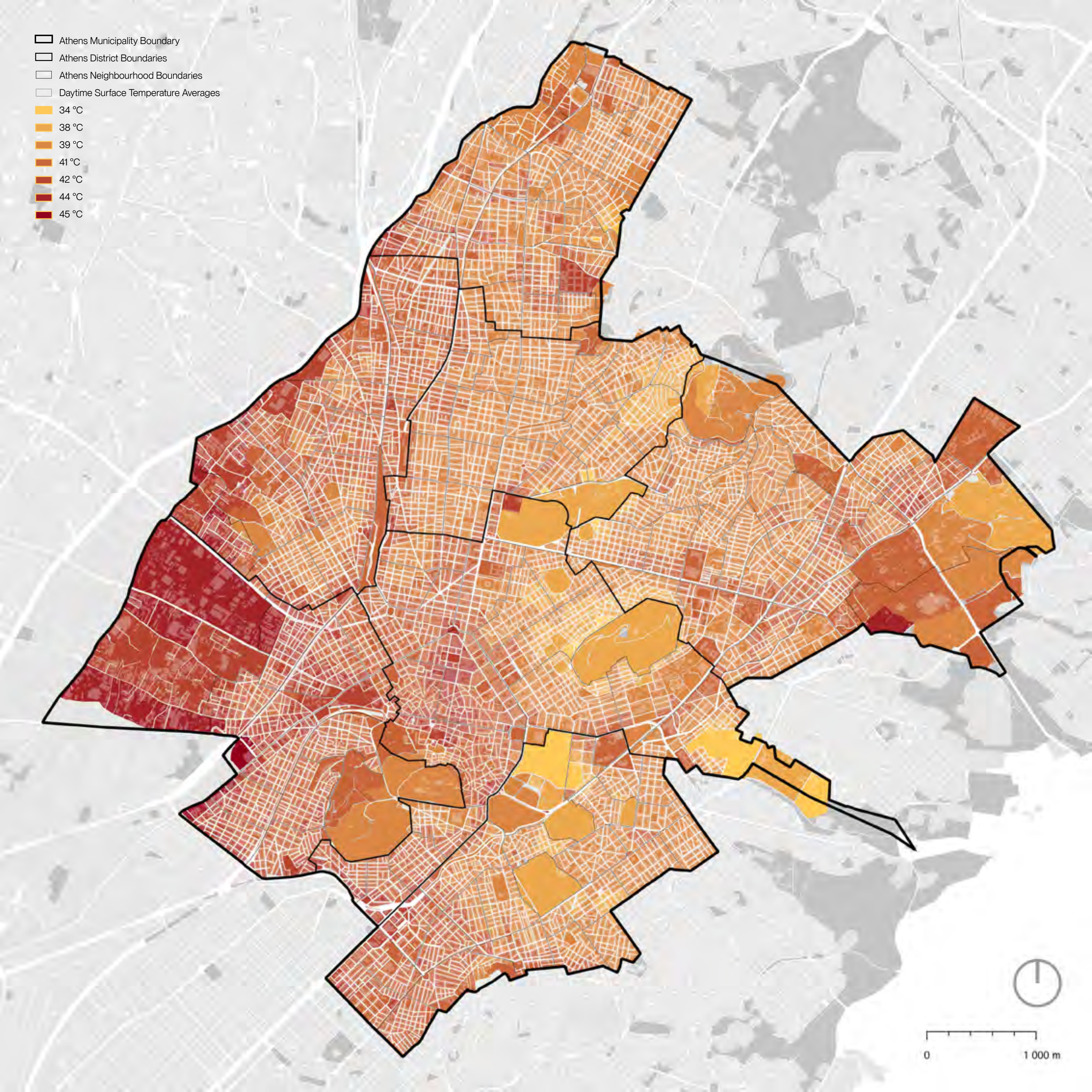
Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

P. Panagiotopoulos. “Athens Temperature Atlas 2016-2020”. Athens Geoportal. Last modified 5 April 2024. Access 5 April 2024. https://www.gis.cityofathens.gr.

Highest & Lowest Neighbourhoods

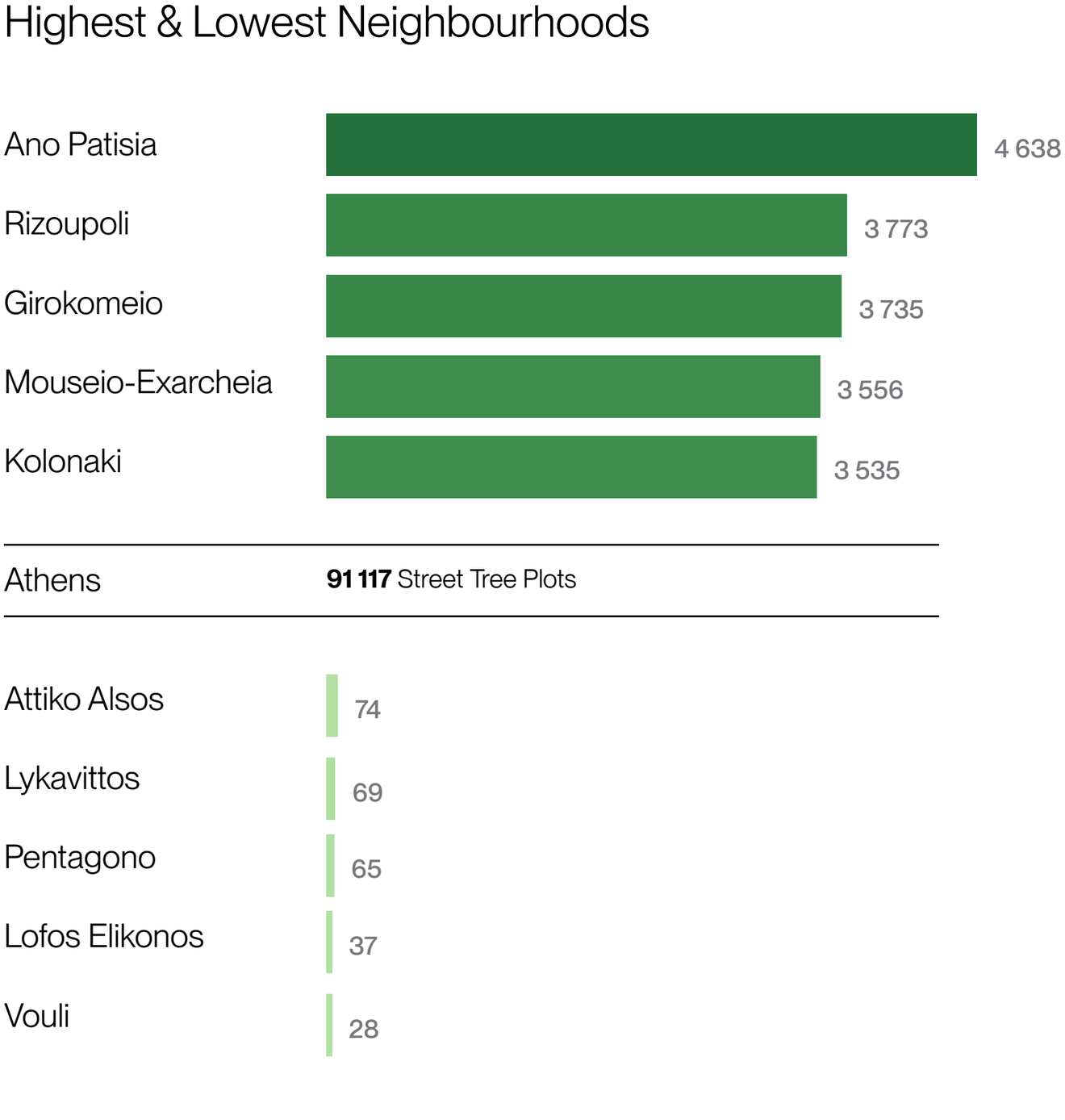



Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Daytime Surface Temperature Averages
34 °C
38 °C
39 °C
41 °C
42 °C
44 °C
45 °C
0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 4.1

Street Tree Plots



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Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Green Spaces
Trees

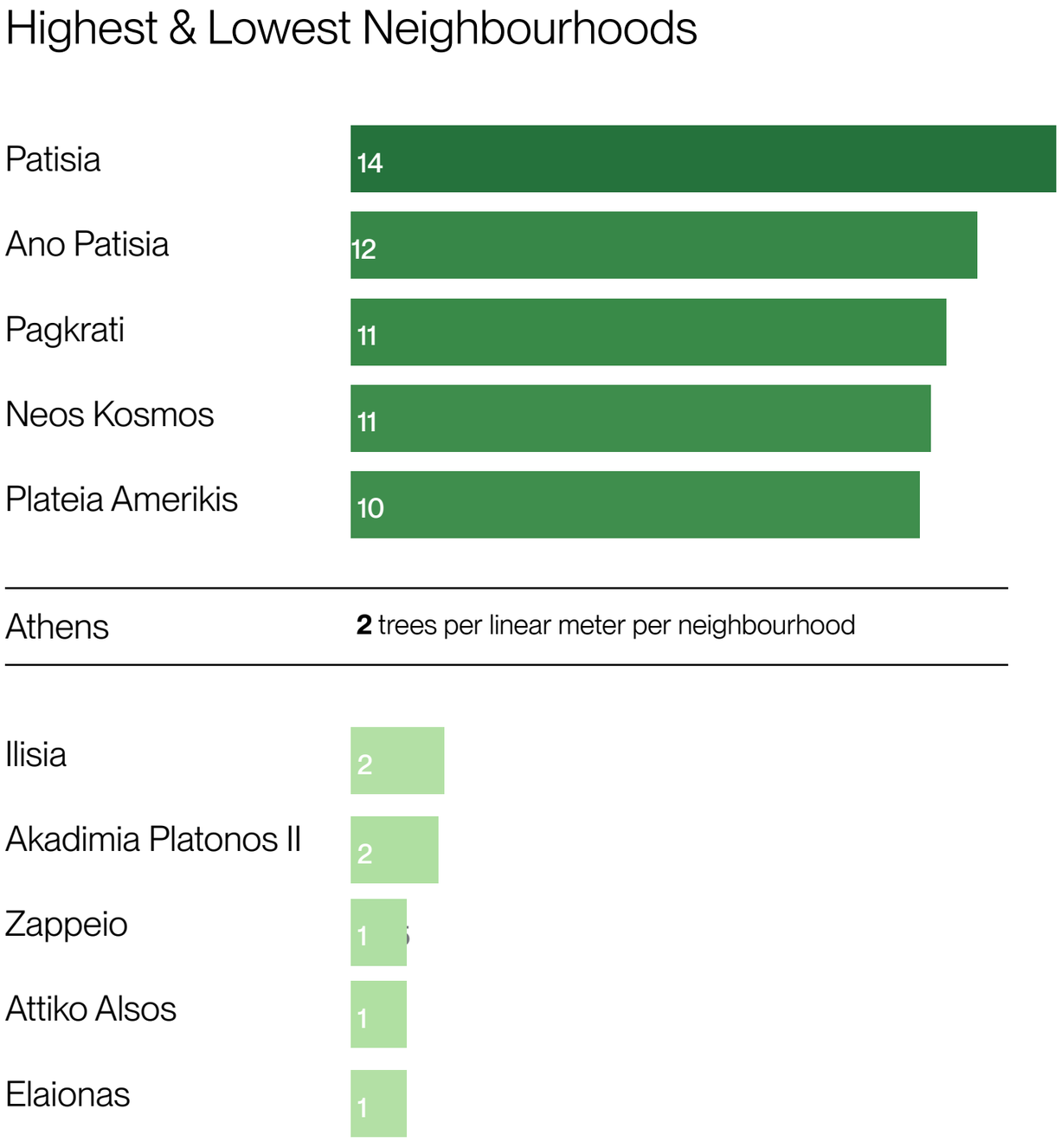
0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 4.2

Street Tree Distribution

By Neighbourhood



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Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
No. of Trees per Linear 100m
0,7 - 1,9
1,9 - 2,0
2,0 - 2,2
2,2 - 2,3
2,3 - 4,4

0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 5.1

Green Space

Pocket Park
0 - 1,5 hectares

Small
1,5 - 6 hectares

Medium
6 - 15 hectares

Large
15+ hectares

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Constantinos Cartalis. “Transforming the city in the era of Climate Change.” National and Kapodistrian University of Athens. https://scholar.google.com/citations?user=n7175PUAAAAJ&hl=el

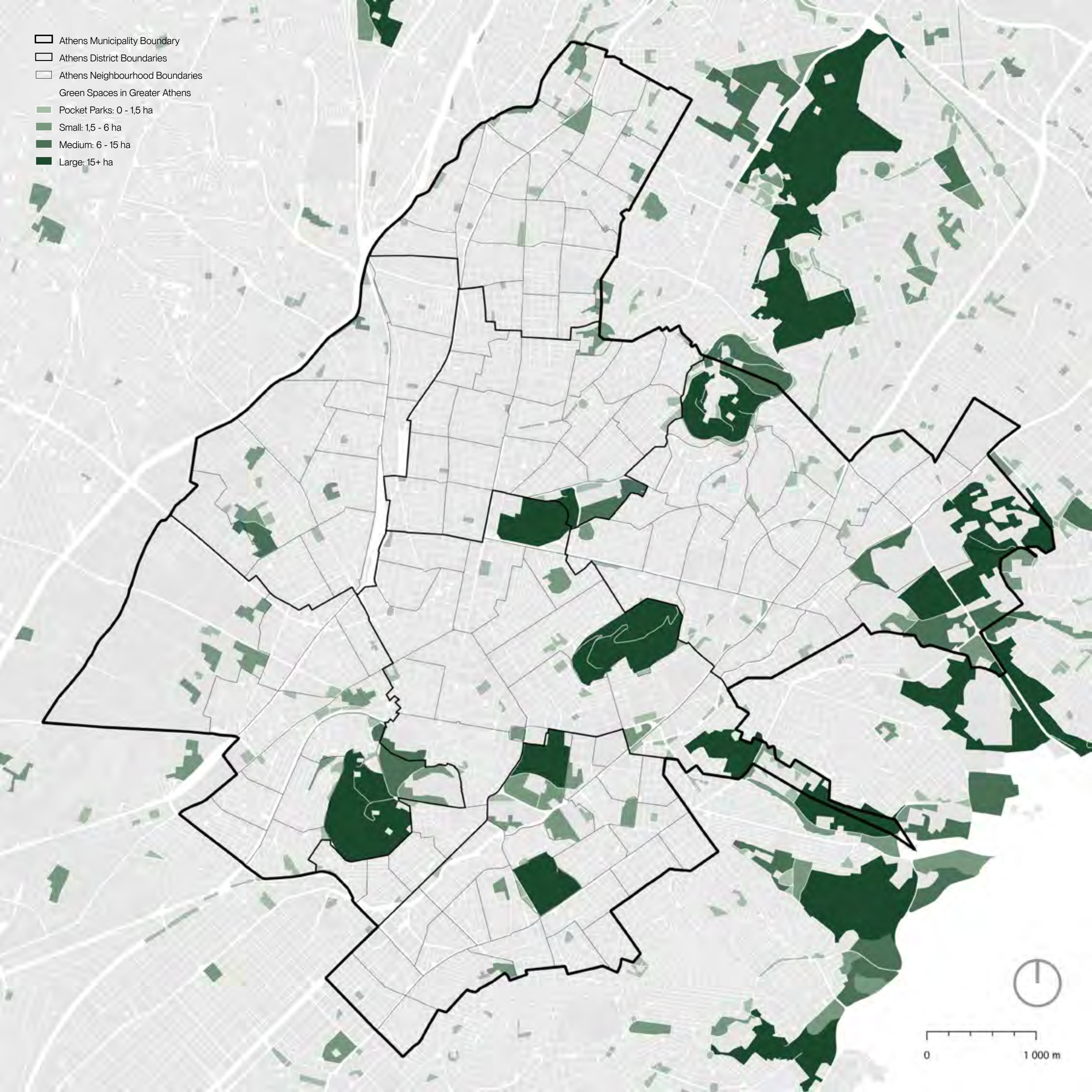
Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Green Spaces in Greater Athens
Pocket Parks: 0 - 1,5 ha
Small: 1,5 - 6 ha
Medium: 6 - 15 ha
Large: 15+ ha
0
1 000 m

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Figure 5.2

Access to Green Space

Municipality of Athens:

17.87%

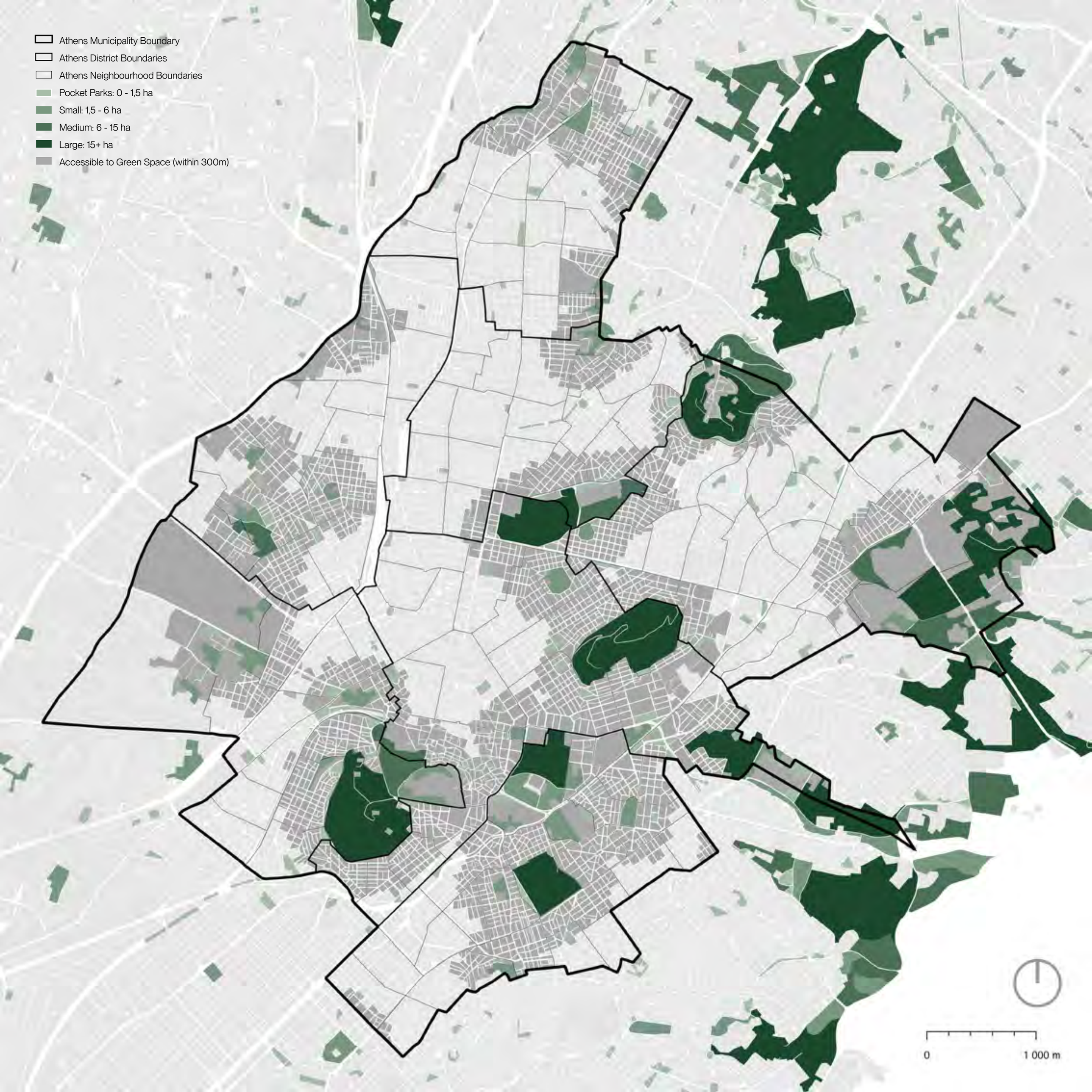
of the municipality is green space
(0,96m^2 of green space per person)

World Health Organization standard:
9-50 m^2 of green spaces per person

40% of residents (248,300) live within 300m to green space

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.


Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Pocket Parks: 0 - 1,5 ha
Small: 1,5 - 6 ha
Medium: 6 - 15 ha
Large: 15+ ha
Accessible to Green Space (within 300m)
0
1 000 m

Norman Foster Institute
NFI on Sustainable Cities

Figure 5.3

Access to Types of Green Space

Pocket Park (100m Catchment)
0 - 1,5 hectares
28.22% people have access

Small (100m Catchment)
1,5 - 6 hectares
7.27% people have access

Medium (300m Catchment)
6 - 15 hectares
8.93% people have access

Large (800m Catchment)
15+ hectares
54.71% people have access

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

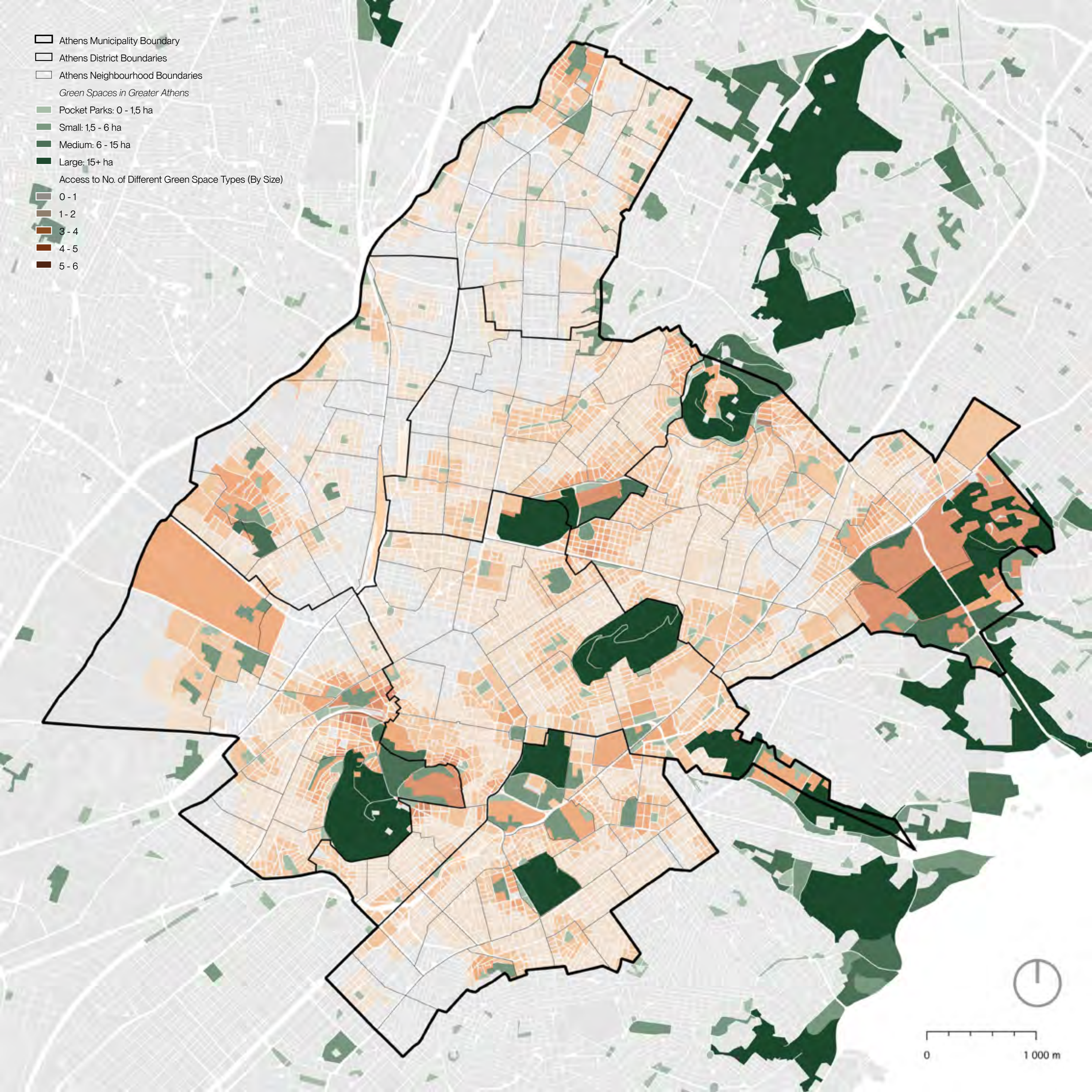

Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Green Spaces in Greater Athens
Pocket Parks: 0 - 1,5 ha
Small: 1,5 - 6 ha
Medium: 6 - 15 ha
Large: 15+ ha
Access to No. of Different Green Space Types (By Size)
0 - 1
1 - 2
3 - 4
4 - 5
5 - 6
0
1 000 m

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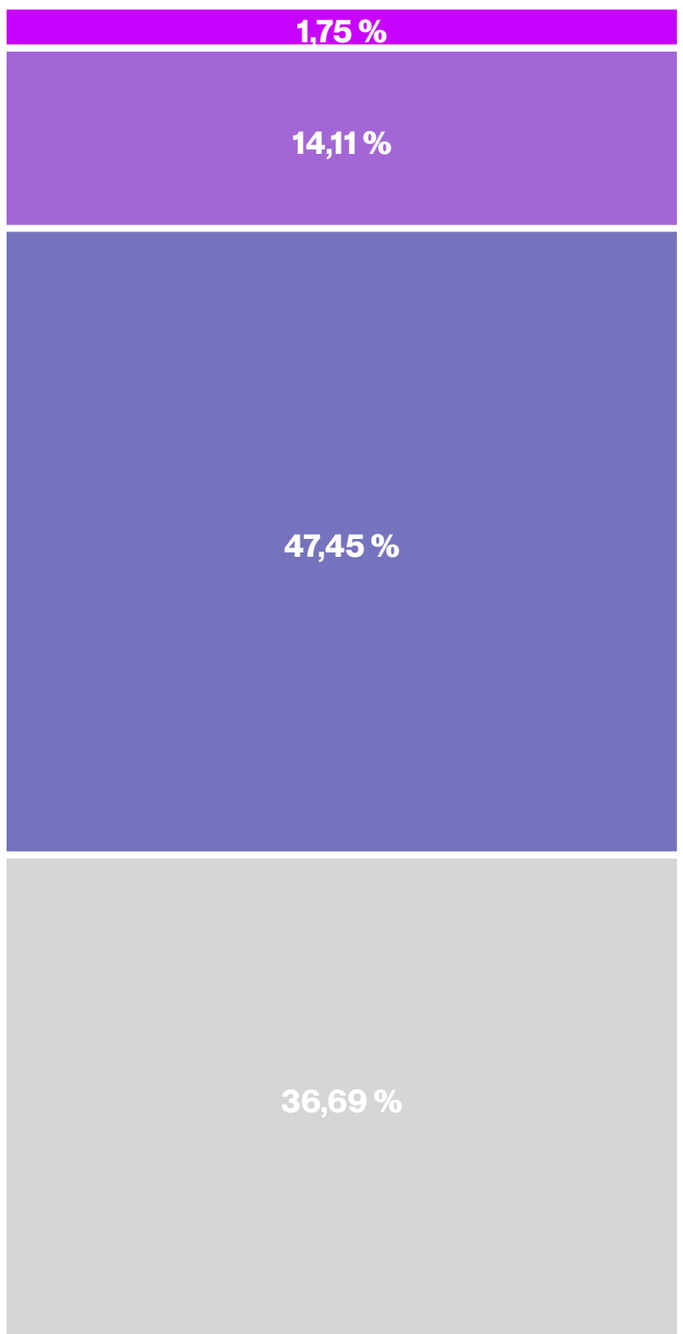
Figure 6.1

Metro Lines (Current)

Access to No. of Lines (Street Network)



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P. Panagiotopoulos. “Metro, Tram, and Rail Athens Network Map.” Athens Geoportal. Last modified September 29, 2021. Accessed April 5, 2024. http://gis.cityofathens.gr/layers/athens_geonode_data:geonode:Stations_0

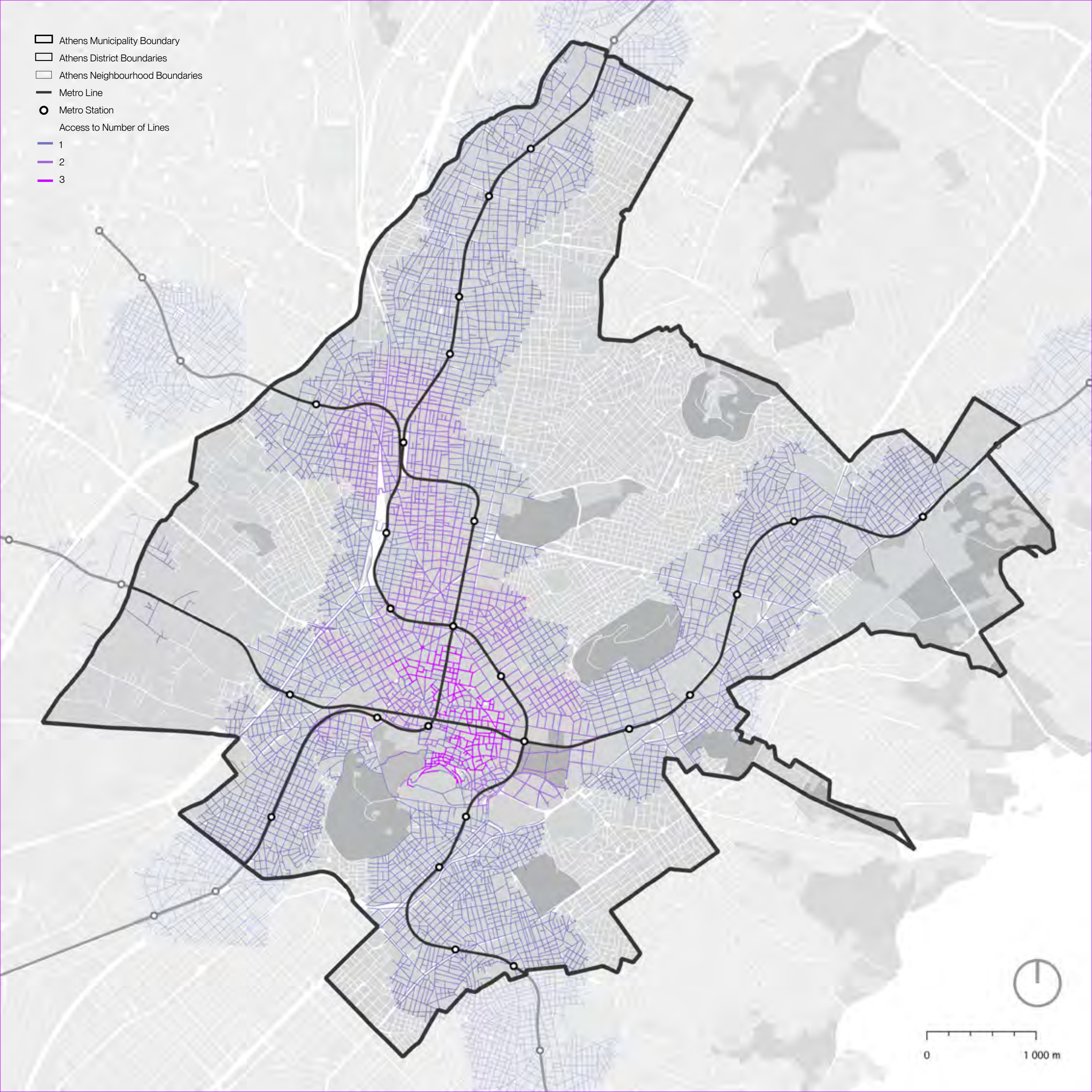
Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Metro Line
Metro Station
Access to Number of Lines
1
2
3
0
1 000 m

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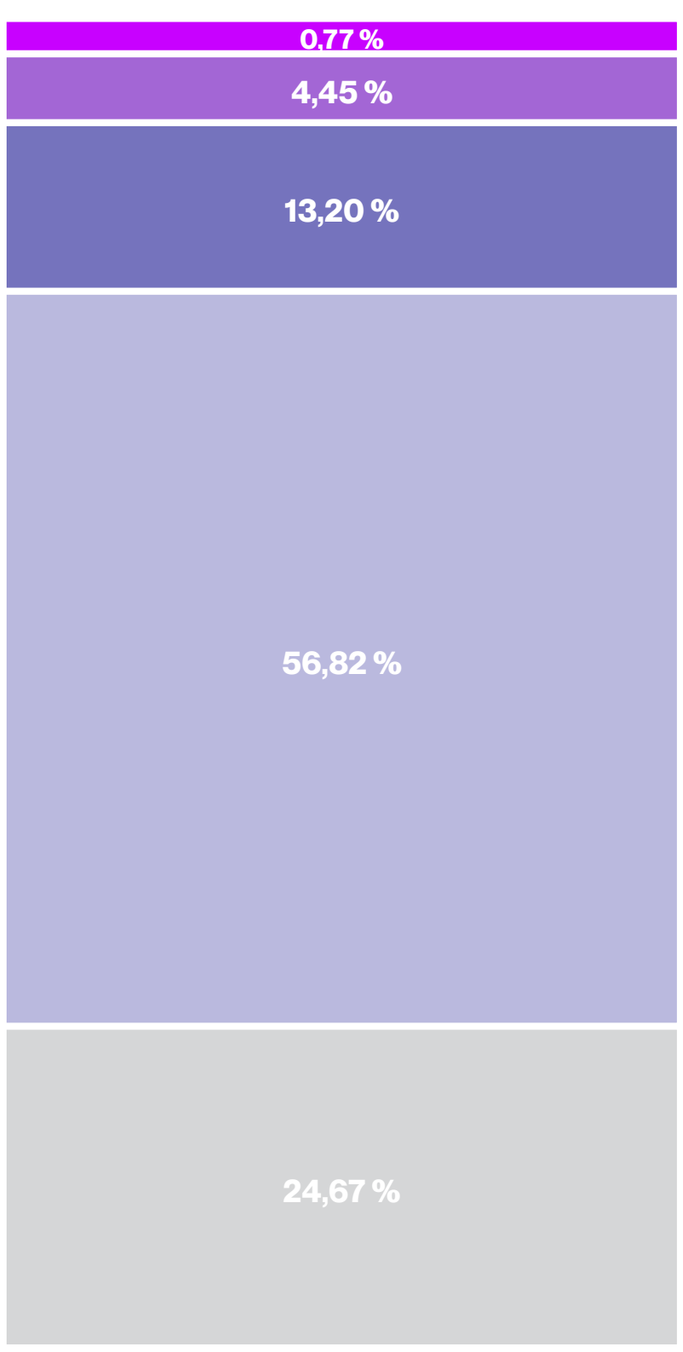
Figure 6.2

Metro Lines (Future)

Access to No. of Lines (Street Network)



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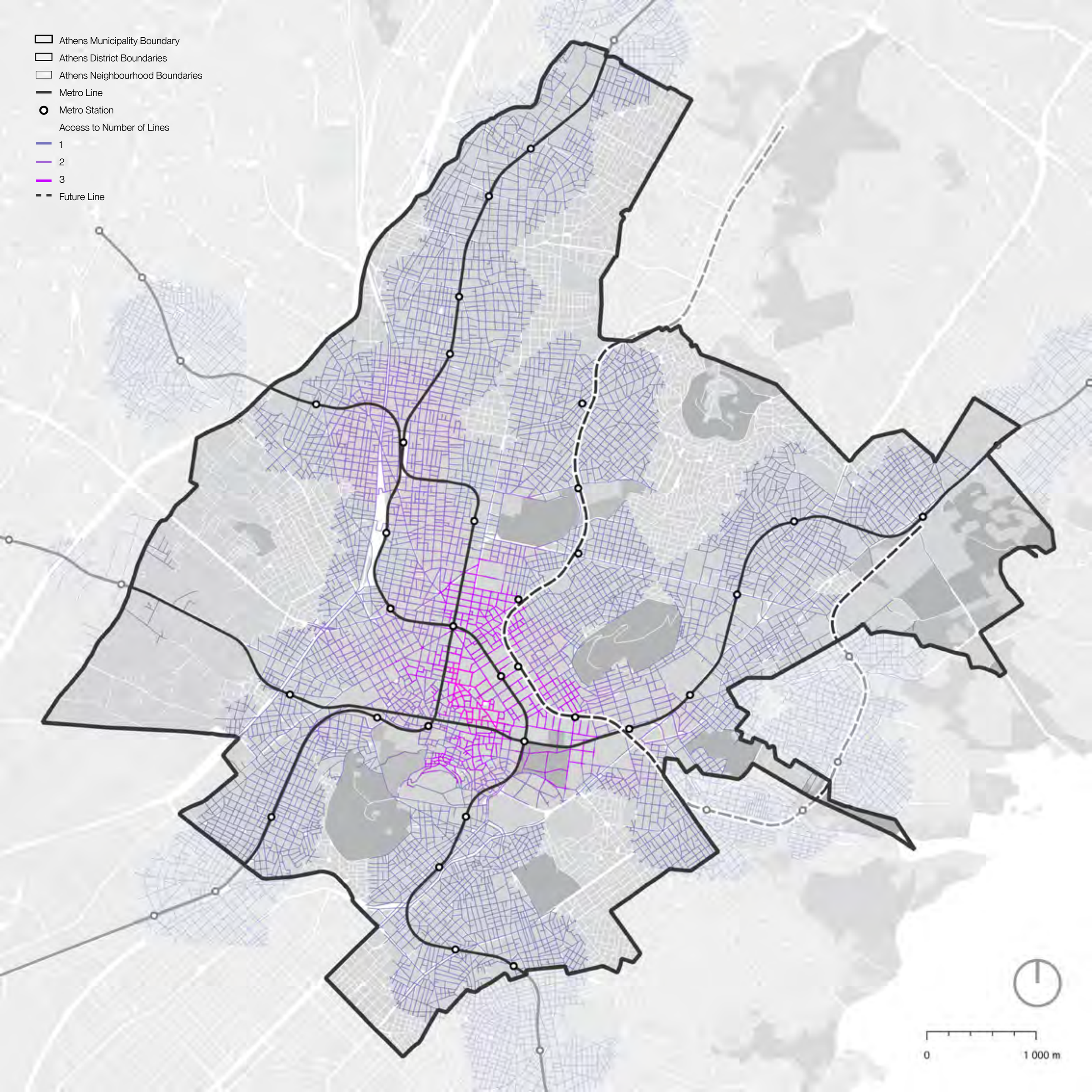
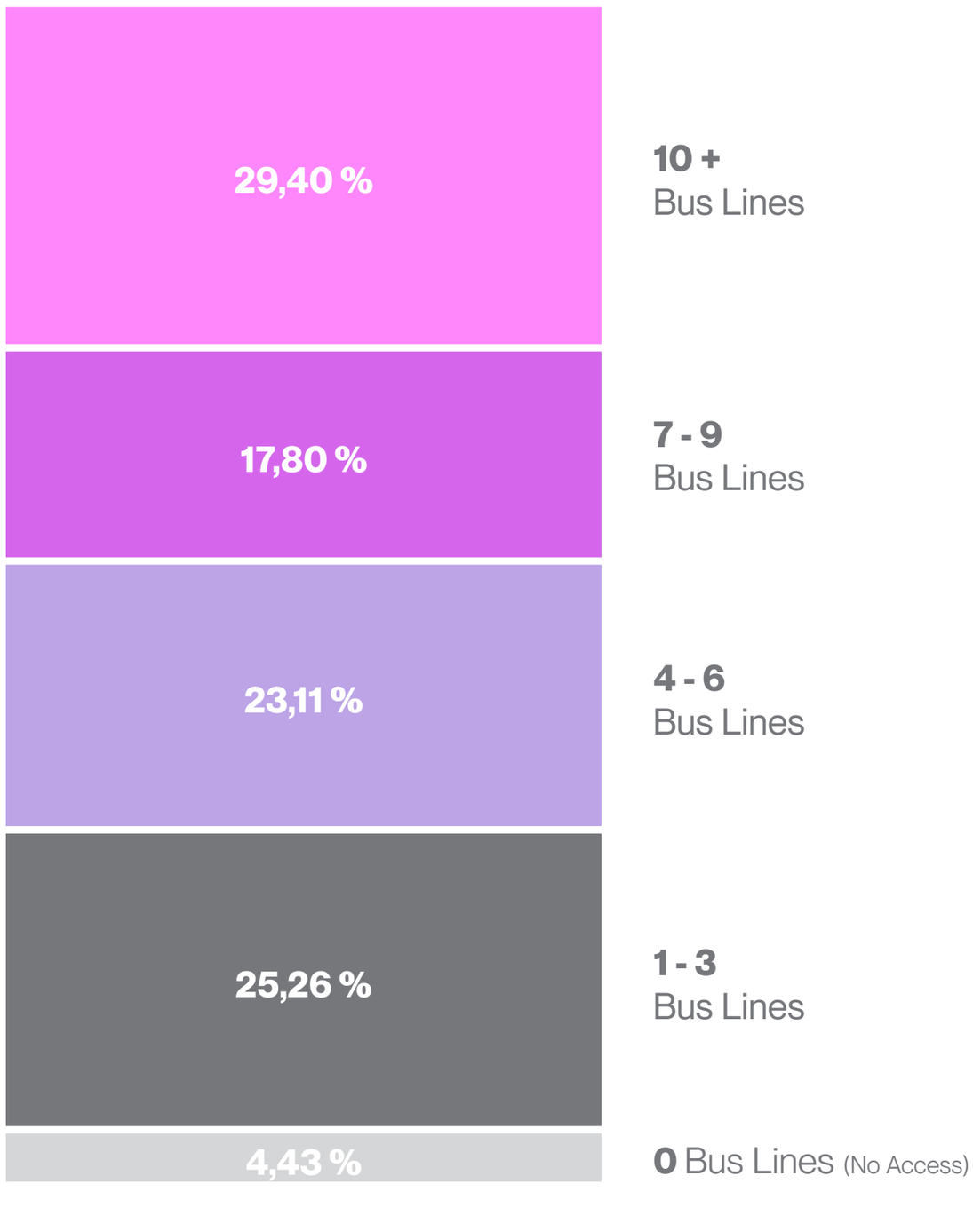

Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Metro Line
Metro Station
Access to Number of Lines
1
2
3
Future Line
0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 7.1

Access to Bus Routes

Access to No. of Routes (Street Network)



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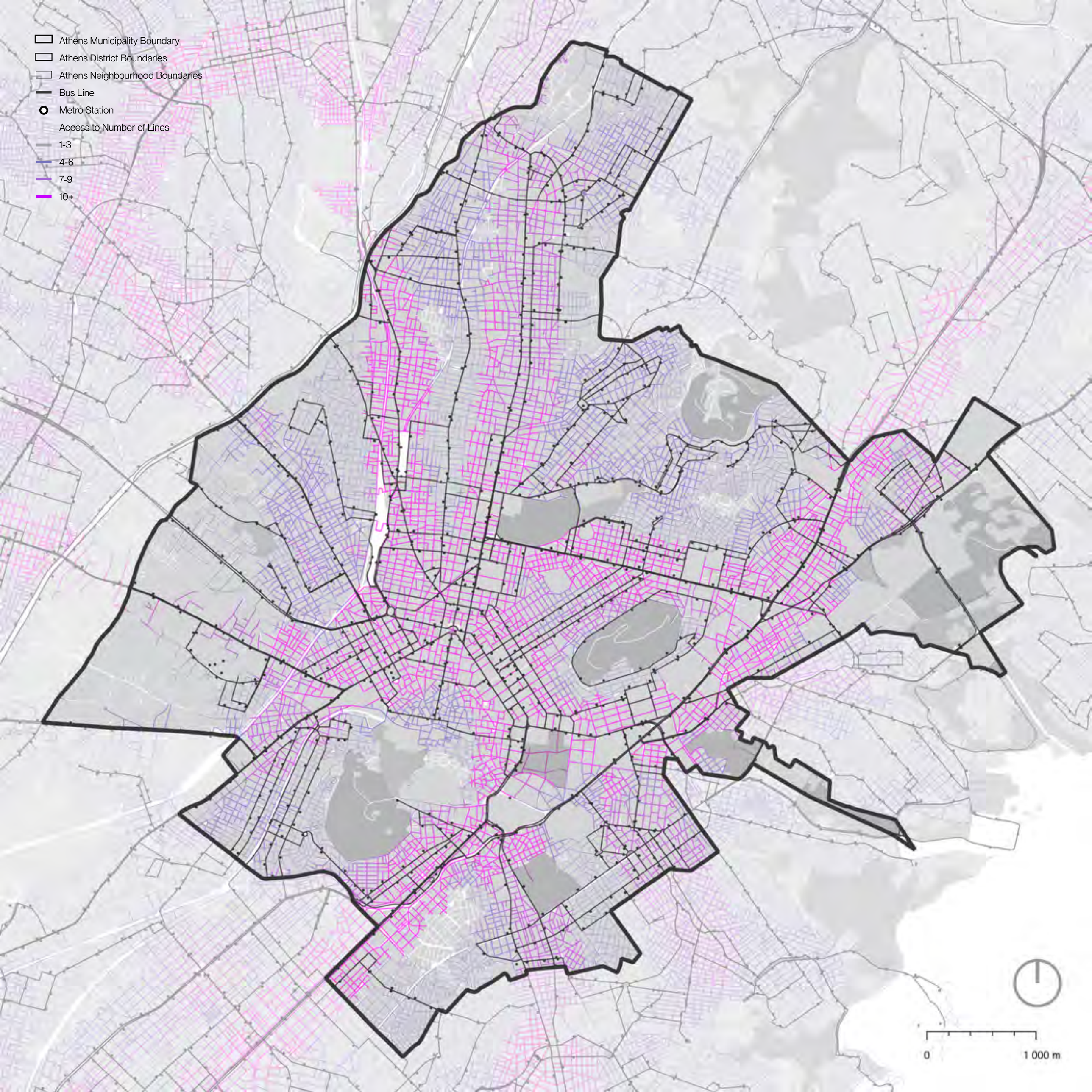
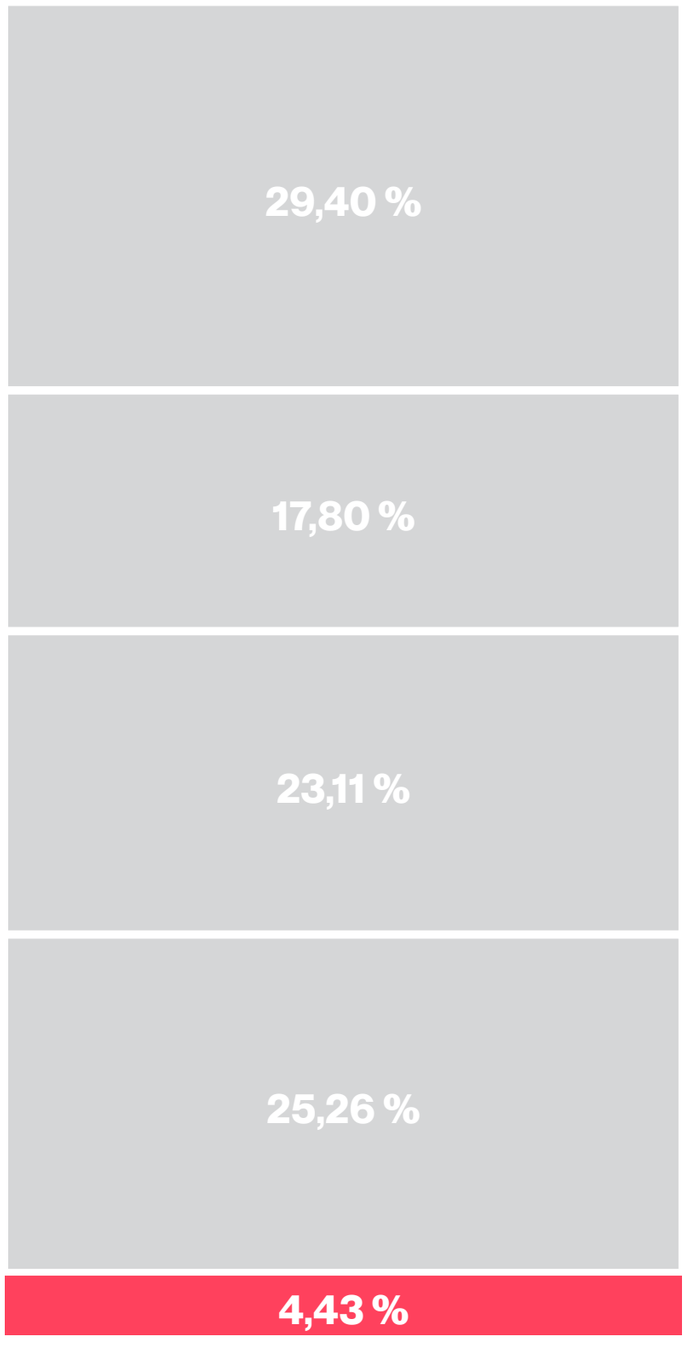

Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Bus Line
Metro Station
Access to Number of Lines
1-3
4-6
7-9
10+
0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 7.2

Lack of Access to Bus Routes

Access to No. of Routes (Street Network)



Source(s)
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OASA Transport for Athens contributors. “OASA Telematics Network”. OASA S.A. Last modified August 27, 2024. Accessed August 27, 2024. https://www.oasa.gr/en/oasa-network

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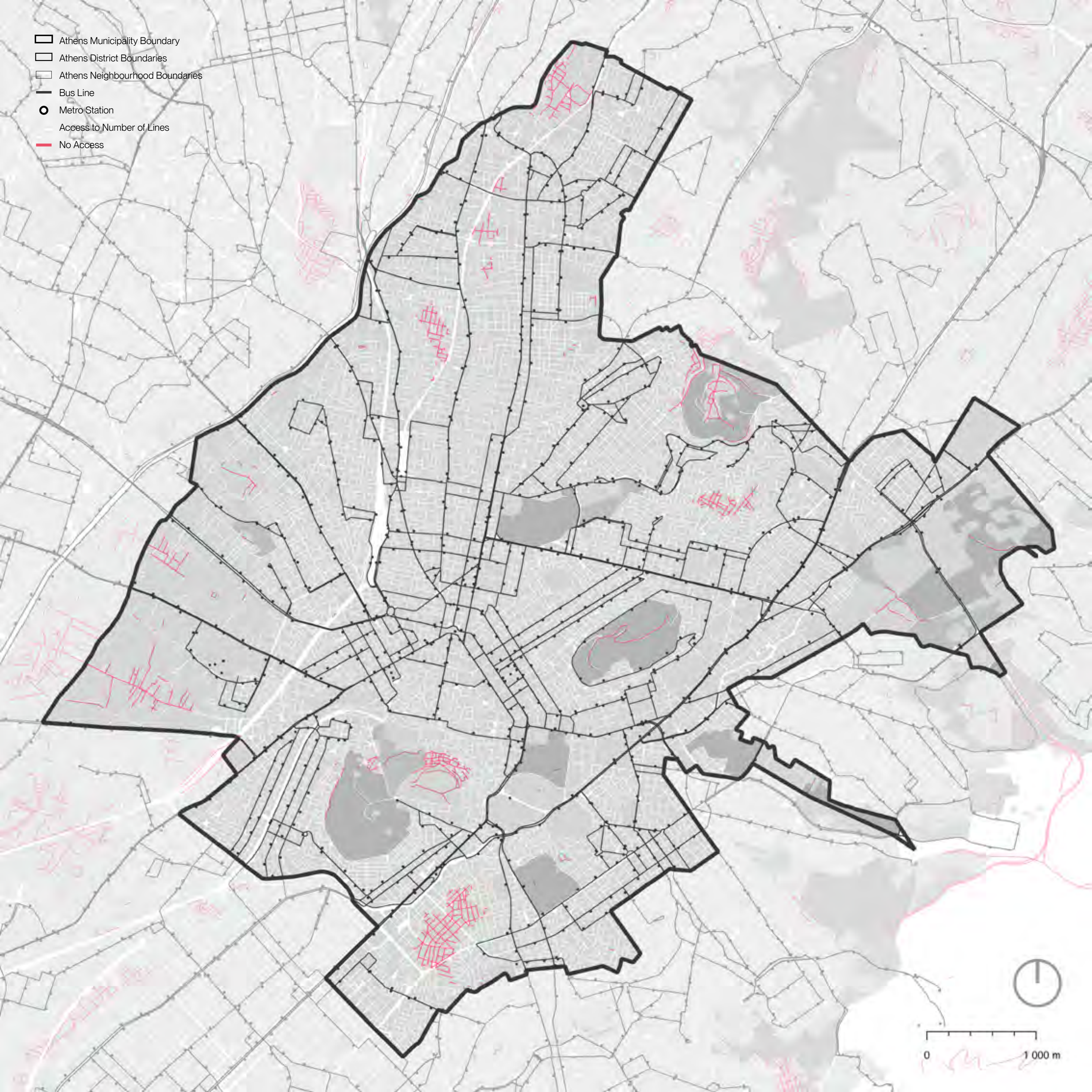
Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Bus Line
Metro Station
Access to Number of Lines
No Access
0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 8.1

Energy - Natural Gas

29.44%

of all Blocks in Athens depend on Natural Gas for heating

Source(s)

Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

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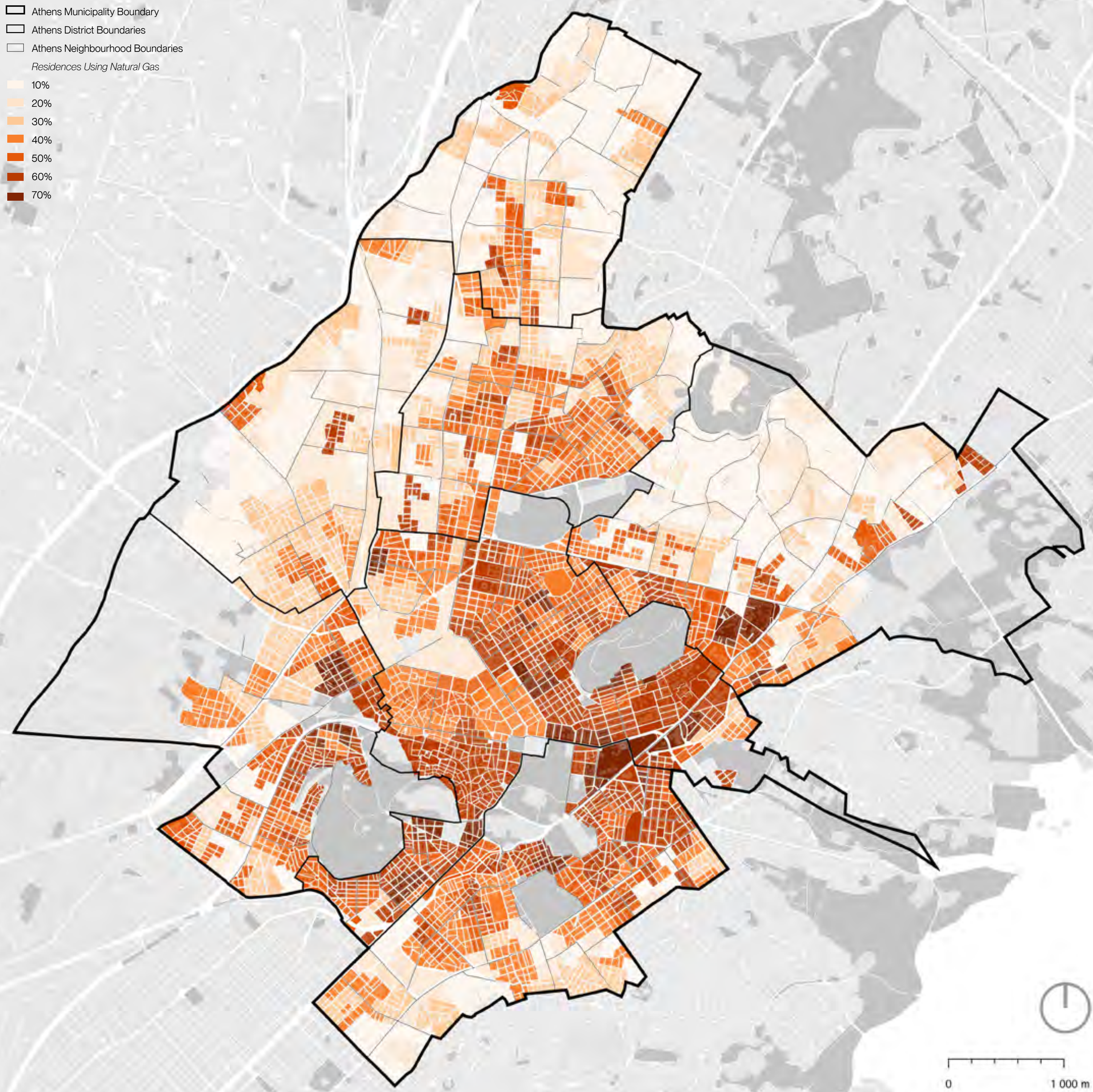
Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Residences Using Natural Gas
10%
20%
30%
40%
50%
60%
70%
0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 8.2

Energy - Natural Gas

(No Data)

Source(s)

Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

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Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
No Data Available

0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 9.1

Energy - Heating Oil

48.53%

of all Blocks in Athens depend on Heating Oil for heating

Source(s)

Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

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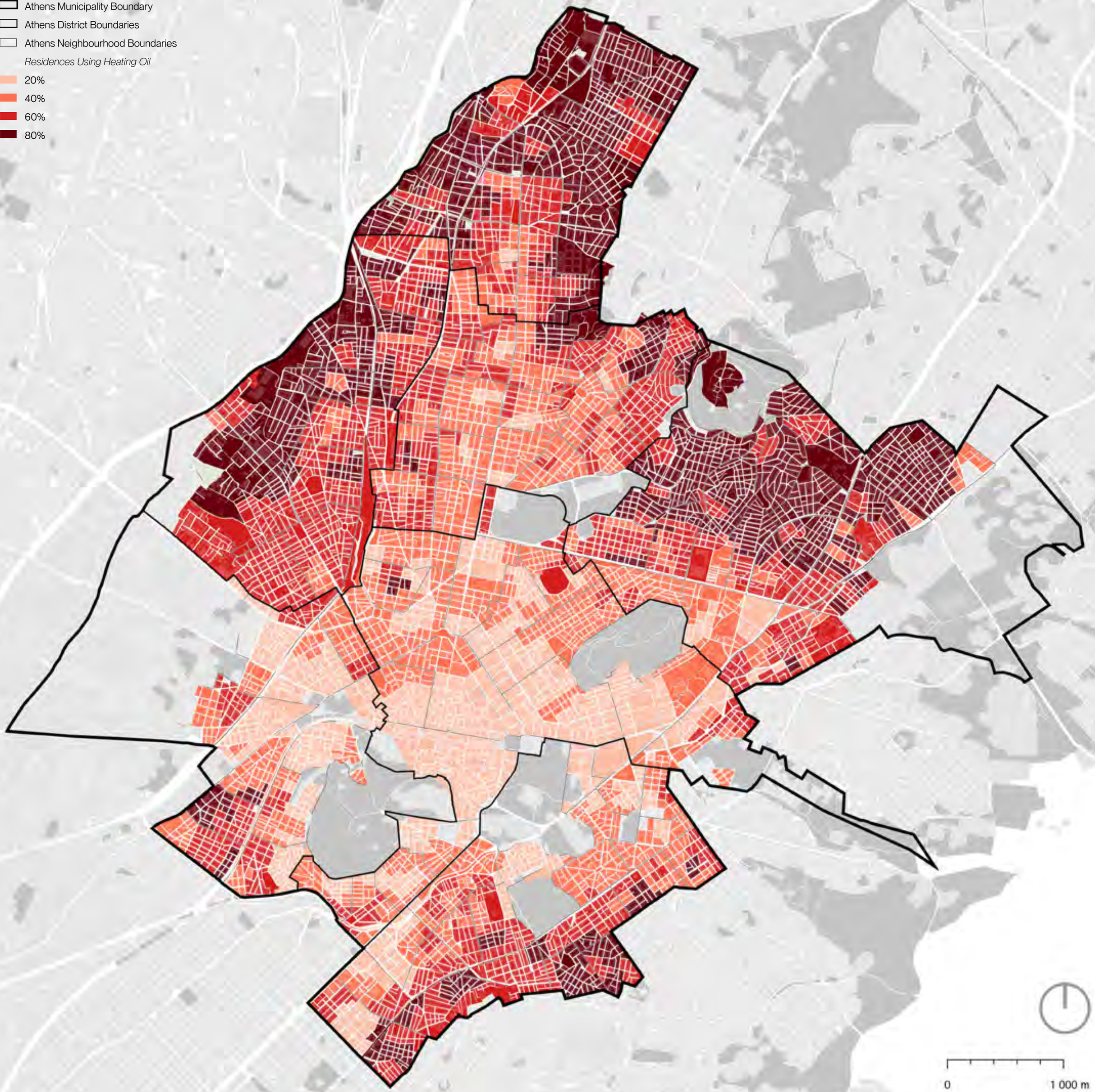
Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries

Residences Using Heating Oil

20%
40%
60%
80%



0 1 000 m

Norman Foster Institute on Sustainable Cities

Figure 9.2

Energy - Heating Oil

(No Data)

Source(s)

Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

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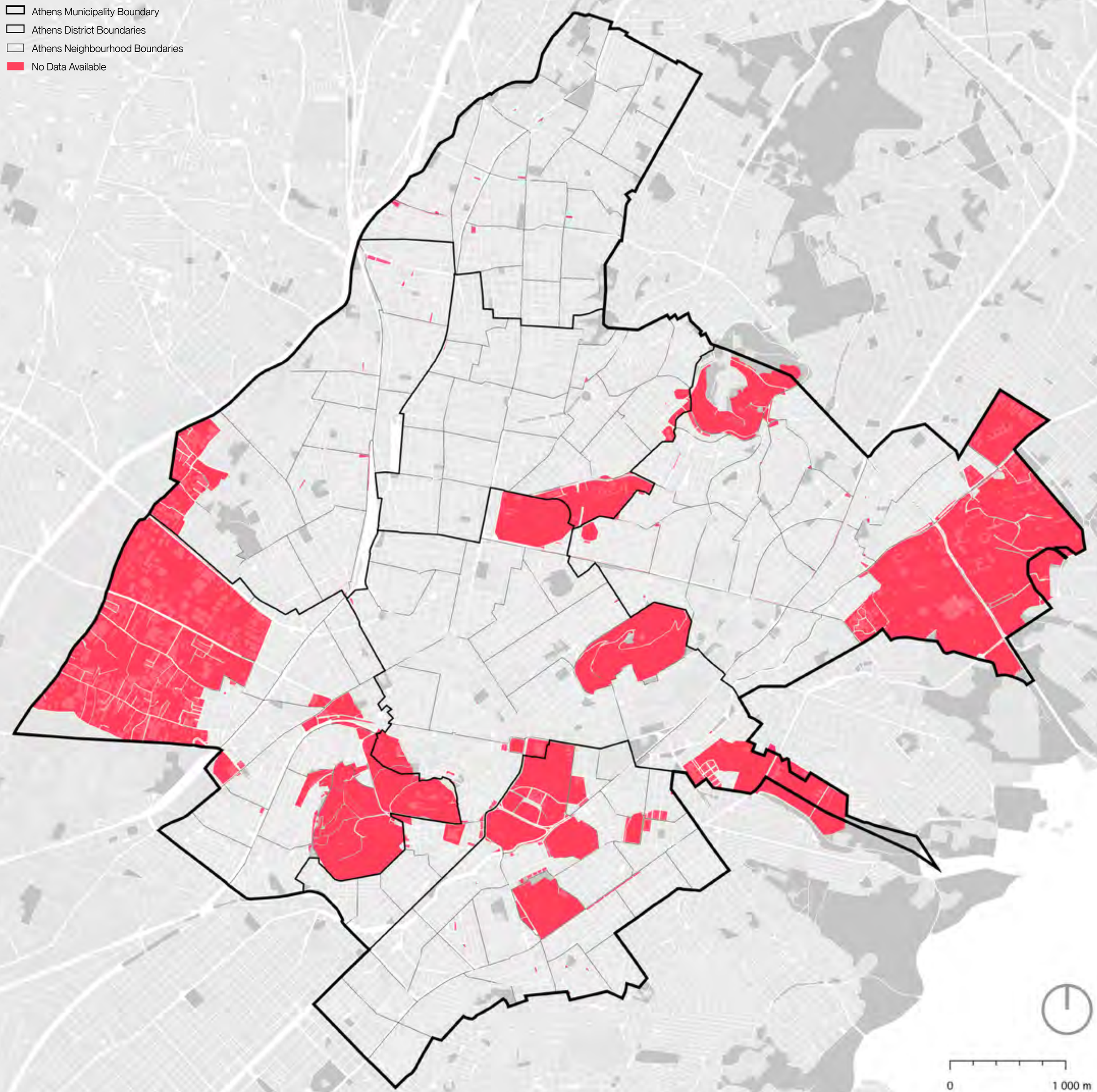

Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
No Data Available
0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 10.1

Energy - Insulated Building Stock

75%

of Building Stock in Municipality ofAthens are not Insulated

Source(s)

Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Chatzikonstantinou, E., and F. Vatavali. “Mapping Energy Poverty in Athens during the Crisis.” In Athens Social Atlas, edited by T. Maloutas and S. Spyrellis. Digital compendium of texts and visual material, 2016. https://www.athenssocialatlas.gr/en/article/energy-poverty/.

Hellenic Statistical Authority. 2011 Population-Housing Census: Final Results. Piraeus: Hellenic Statistical Authority, 2013.

Encounter Athens. ““What “crisis” in the center of Athens? Critical Discourse and Claims for a Just City”. 2011. Accessed July 21, 2024. https://encounterathens.wordpress.com/2011/06/01/enherwsh/

Sardianou, Eleni. “Estimating Space Heating Determinants: An Analysis of Greek Households.” Energy and Buildings 40, no. 6 (2008): 1084–1093.

Hellenic Statistical Authority. “Living Conditions in Greece.” 2015. Accessed July 21, 2024. http://www.statistics.gr/living-conditions-in-greece.

Hellenic Statistical Authority. “Household Budget Survey 2008.” 2010. Accessed July 21, 2024. http://www.statistics.gr/el/home.

Maloutas, Th., D. Emmanouil, and M. Pantelidou Malouta. “Athens: Social Structures, Practices, and Perceptions: New Parameters and Trends of Change 1980-2000.” Athens, 2006. Accessed July 21, 2024. http://www.ekke.gr/open_books/athens_2006.pdf.

Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries

Percentage Insulated Residences

80%
60%
40
20%
No Insulated Residences

0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 10.2

Energy - Insulated Building Stock

(No Data)

Source(s)

Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Chatzikonstantinou, E., and F. Vatavali. “Mapping Energy Poverty in Athens during the Crisis.” In Athens Social Atlas, edited by T. Maloutas and S. Spyrellis. Digital compendium of texts and visual material, 2016. https://www.athenssocialatlas.gr/en/article/energy-poverty/.

Hellenic Statistical Authority. 2011 Population-Housing Census: Final Results. Piraeus: Hellenic Statistical Authority, 2013.

Encounter Athens. ““What “crisis” in the center of Athens? Critical Discourse and Claims for a Just City”. 2011. Accessed July 21, 2024. https://encounterathens.wordpress.com/2011/06/01/enherwsh/

Sardianou, Eleni. “Estimating Space Heating Determinants: An Analysis of Greek Households.” Energy and Buildings 40, no. 6 (2008): 1084–1093.

Hellenic Statistical Authority. “Living Conditions in Greece.” 2015. Accessed July 21, 2024. http://www.statistics.gr/living-conditions-in-greece.

Hellenic Statistical Authority. “Household Budget Survey 2008.” 2010. Accessed July 21, 2024. http://www.statistics.gr/el/home.

Maloutas, Th., D. Emmanouil, and M. Pantelidou Malouta. “Athens: Social Structures, Practices, and Perceptions: New Parameters and Trends of Change 1980-2000.” Athens, 2006. Accessed July 21, 2024. http://www.ekke.gr/open_books/athens_2006.pdf.

Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
No Data Available

0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 11.1

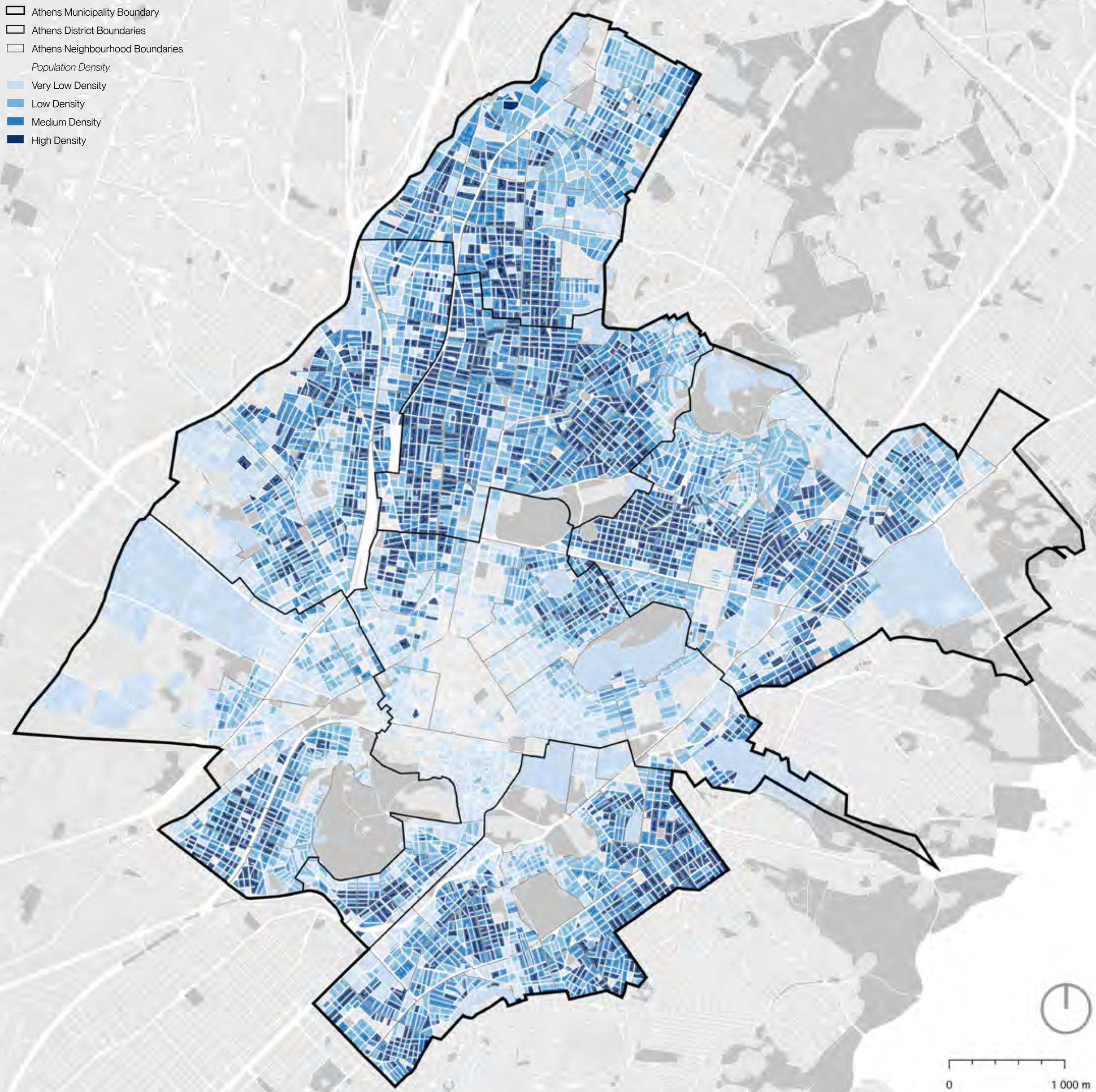
Population Density*

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Hellenic Statistical Authority. 2011 Population-Housing Census: Final Results. Piraeus: Hellenic Statistical Authority, 2013.

**2011 Census. 2021 Census information unavailable.*


Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
Population Density
Very Low Density
Low Density
Medium Density
High Density
0
1 000 m

Norman Foster Institute on Sustainable Cities

Figure 11.2

Population Density

(No Data)

Source(s)

Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Hellenic Statistical Authority. 2011 Population-Housing Census: Final Results. Piraeus: Hellenic Statistical Authority, 2013.

Athens Municipality Boundary
Athens District Boundaries
Athens Neighbourhood Boundaries
No Data Available

0
1 000 m

Norman Foster Institute on Sustainable Cities

Neighbourhood Analytics

Kypseli

Size:

188 hectares

(4.62% of Municipality of Athens)

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Muncipality of Athens

District 6

Municipal Kypseli Neighbourhood

Kypseli (Macro Scale)

Area of Analysis
Green Spaces
Buildings
Neighbourhood Boundaries

0 100 m

Norman Foster Institute
NFI on Sustainable Cities

Figure 12.1

Parks + Squares

Size:

3.2% of Kypseli
(6.05 hectares)

Kanari Square: 1.05 ha
Fokionos Negri Linear Park: 2.35 ha
Plateia Agiou Georgiou: 0.22 ha

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Area of Analysis
Green Spaces
Buildings
Parks + Squares
Metro Line (Future)
Metro Station (Future)

0 100 m

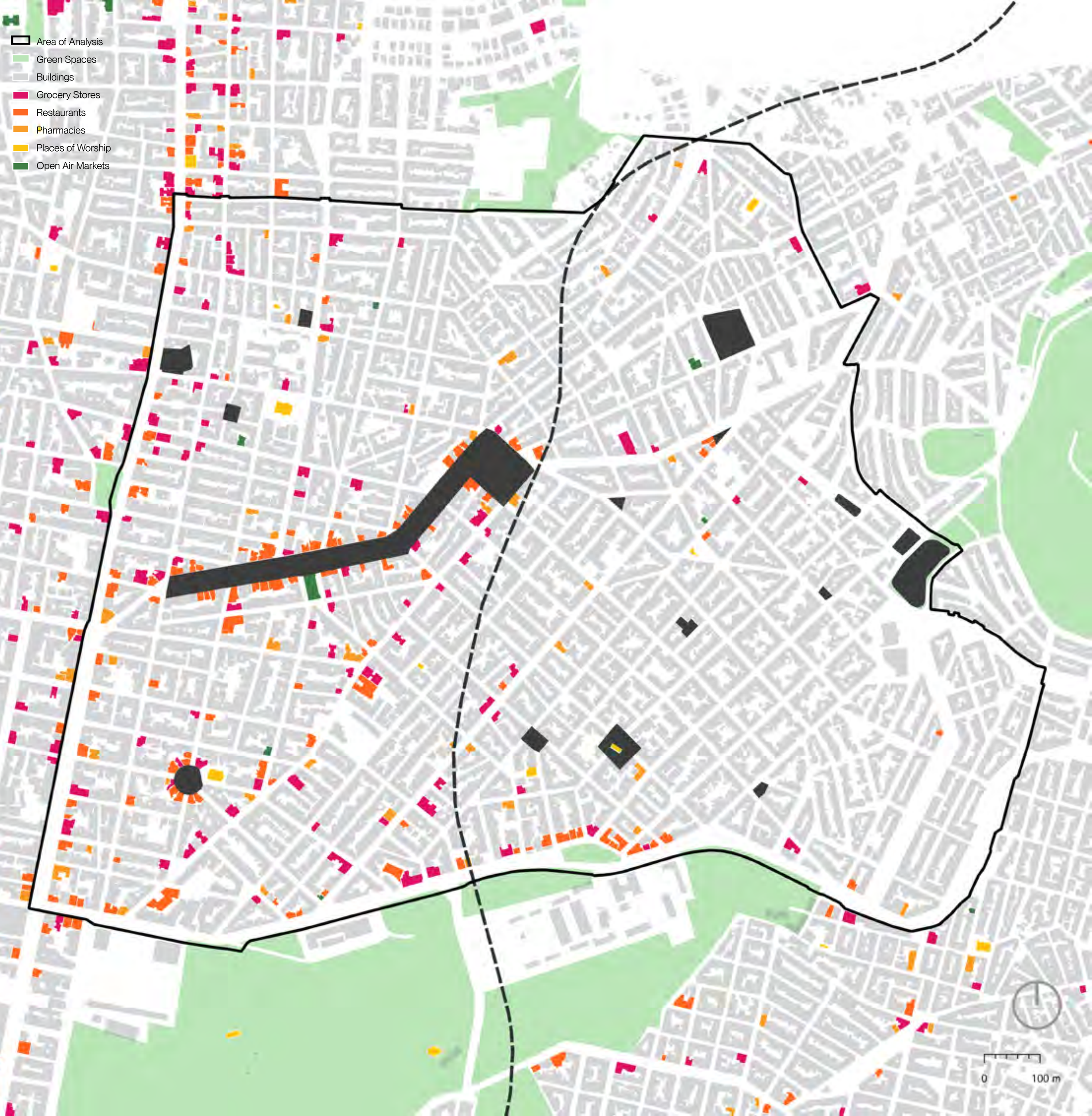
Norman Foster Institute on Sustainable Cities

Figure 12.2

Points of Interest

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.


Area of Analysis
Green Spaces
Buildings
Grocery Stores
Restaurants
Pharmacies
Places of Worship
Open Air Markets
0
100 m

Norman Foster Institute on Sustainable Cities

Figure 13.1

Tree Count

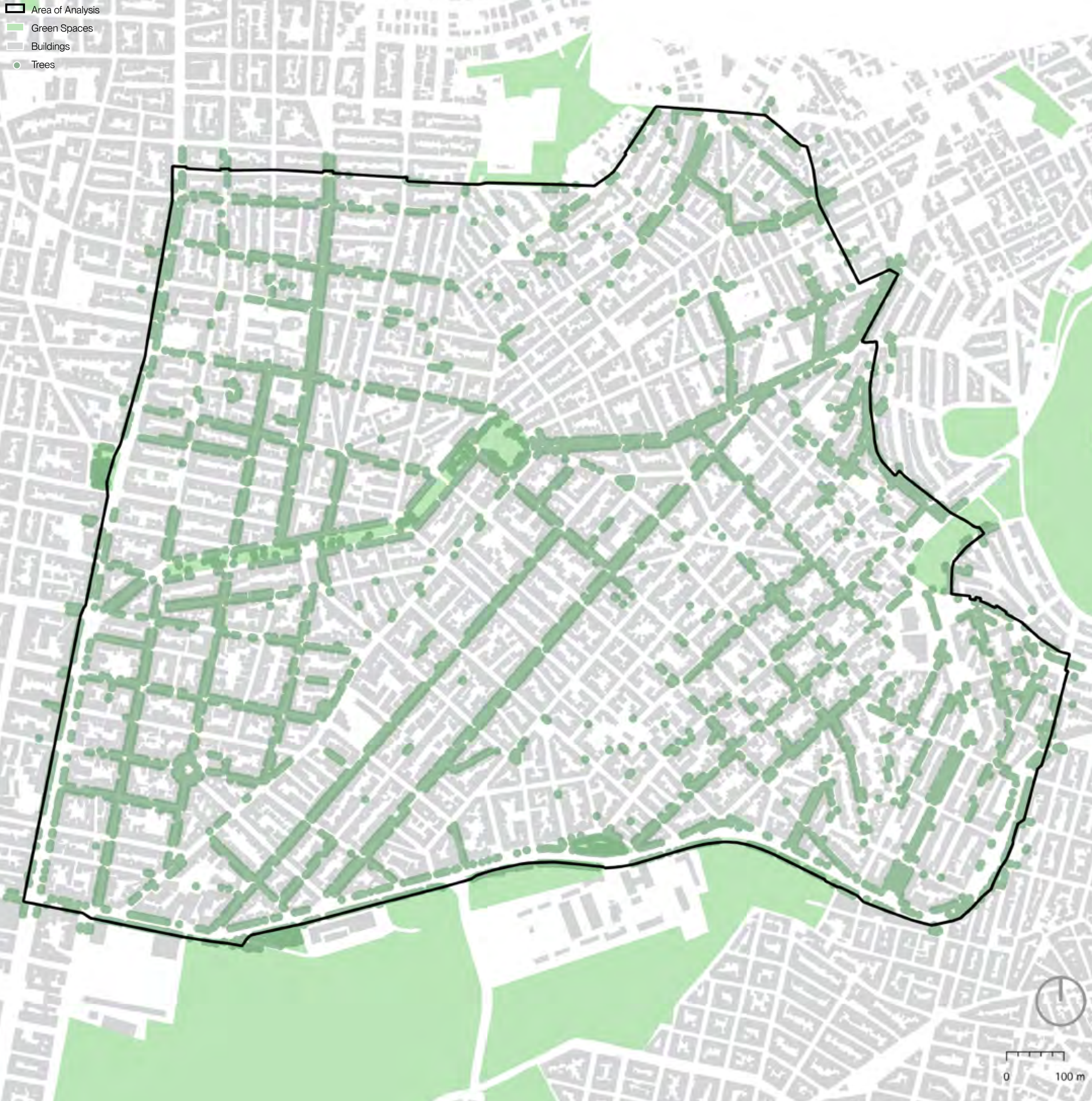
5,792 Trees

Tree Share: 1 Tree / 10.7 People

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Samara, A. “Trees.” Athens Geoportal. Last modified April 5, 2024. Accessed August 5, 2024. https://www.gis.cityofathens.gr


Area of Analysis
Green Spaces
Buildings
Trees
0
100 m

Norman Foster Institute
on Sustainable Cities

Figure 13.2

Optimising Existing Trees

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Area of Analysis
Green Spaces
Buildings
Trees per Linear 100m
0-11
11-14
14-16
16-61,89

0 100 m

Norman Foster Institute
NFI on Sustainable Cities

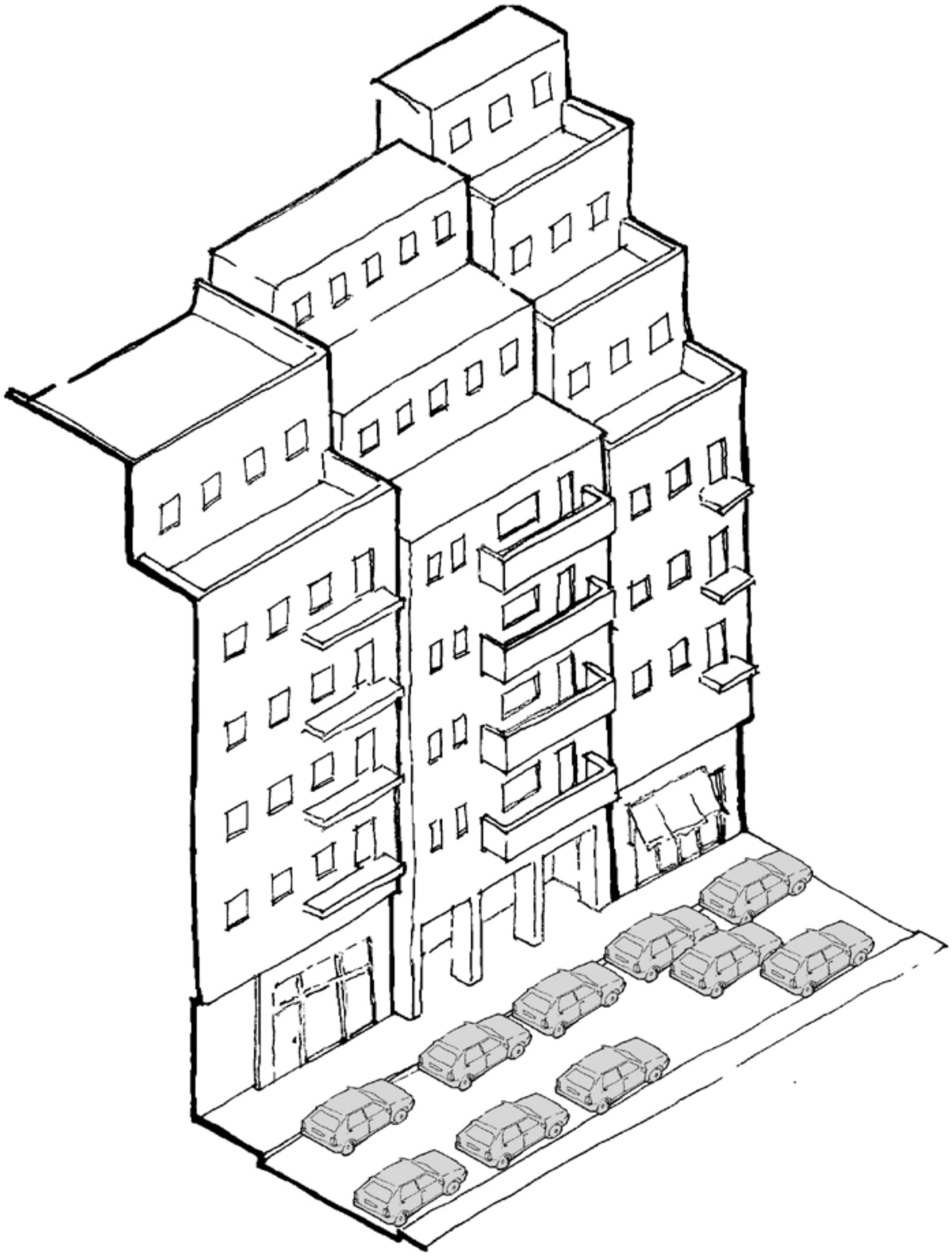
Figure 14.1

Dominant Street Types

Type A

One Directional Traffic with Parking on Both Sides

Source(s)
Norman Foster Institute. Athens Cohort. 2024.



Norman Foster Institute
NFI on Sustainable Cities

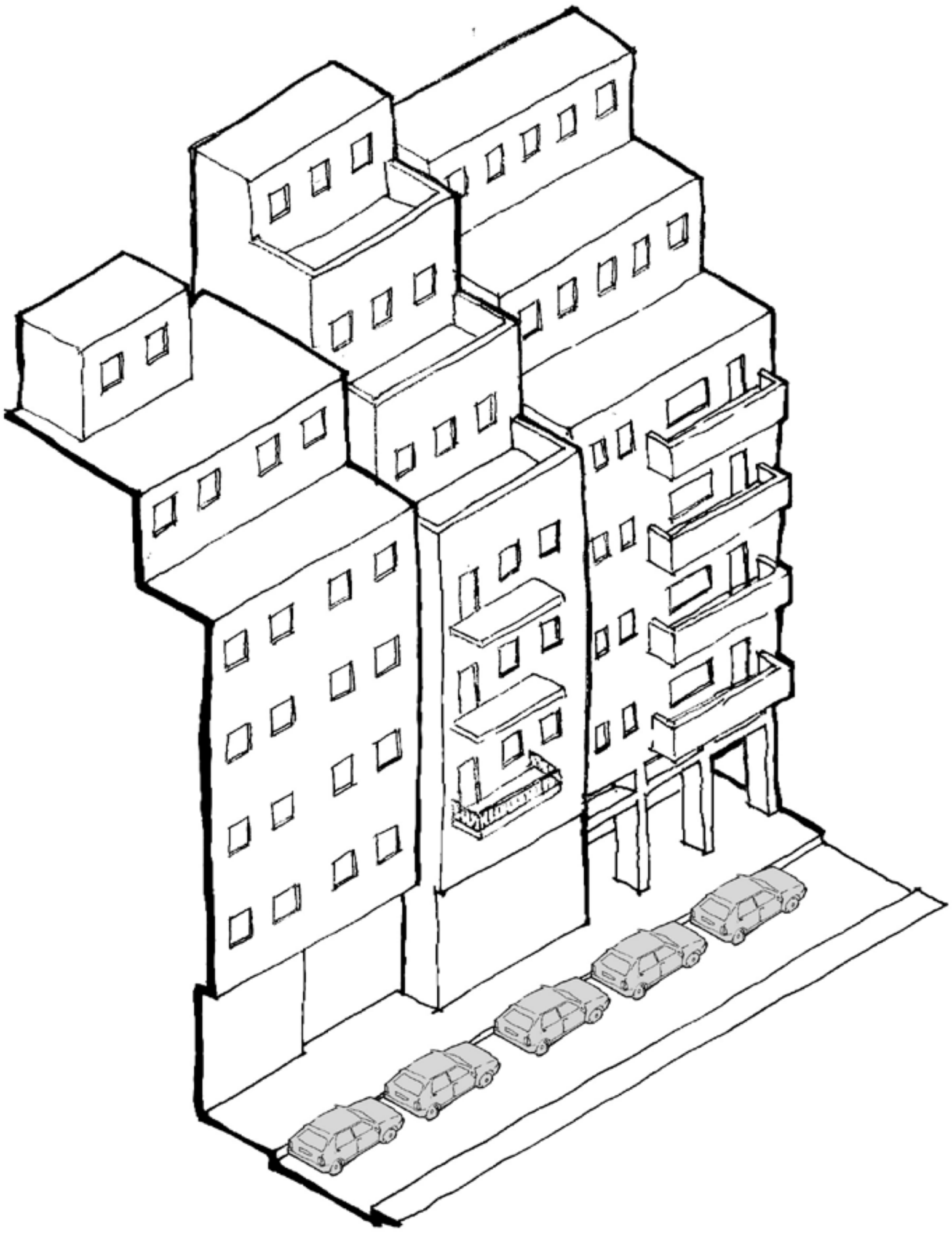
Figure 14.2

Dominant Street Types

Type B

One Directional Traffic with Parking on One Side

Source(s)
Norman Foster Institute. Athens Cohort. 2024.



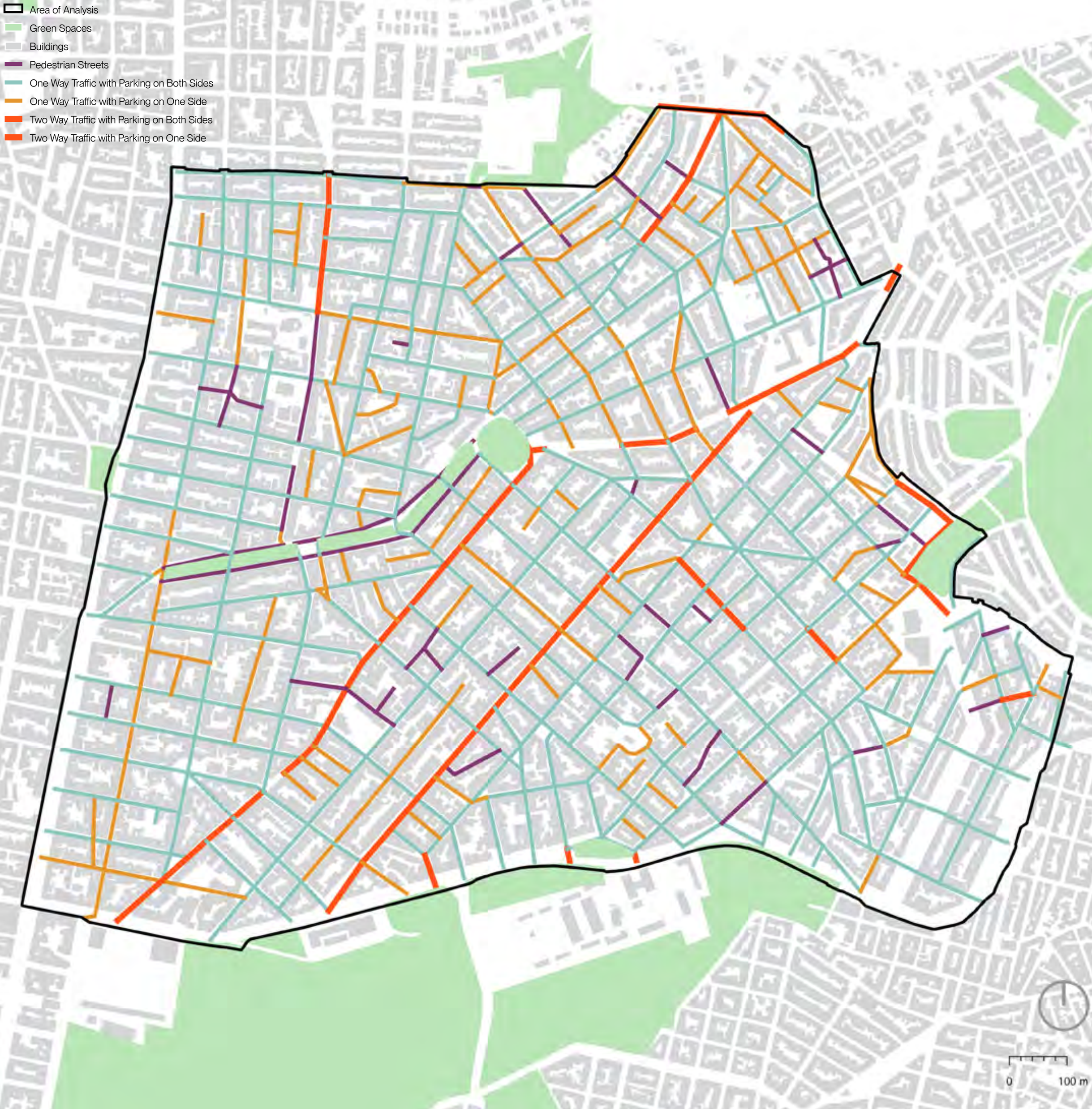
Norman Foster Institute on Sustainable Cities

Figure 15

Street Network

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.


Area of Analysis
Green Spaces
Buildings
Pedestrian Streets
One Way Traffic with Parking on Both Sides
One Way Traffic with Parking on One Side
Two Way Traffic with Parking on Both Sides
Two Way Traffic with Parking on One Side
0
100 m

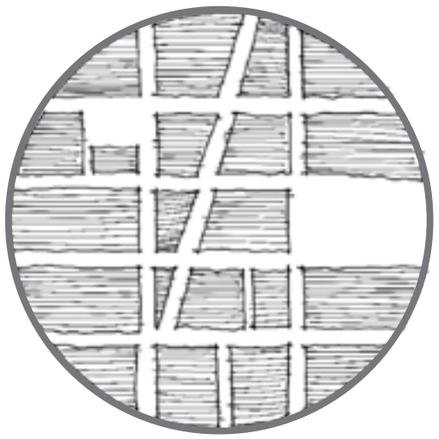
Norman Foster Institute on Sustainable Cities

Figure 16

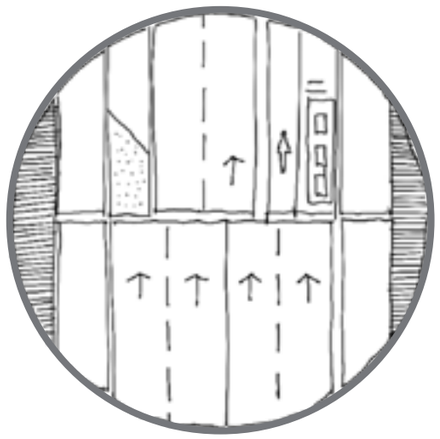
Street Design Principles

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

Global Designing Cities Initiative. Global Street Design Guide. New York: Global Designing Cities Initiative, 2016. https://globaldesigningcities.org/publication/global-street-design- guide/.



Streets are **Public Spaces**



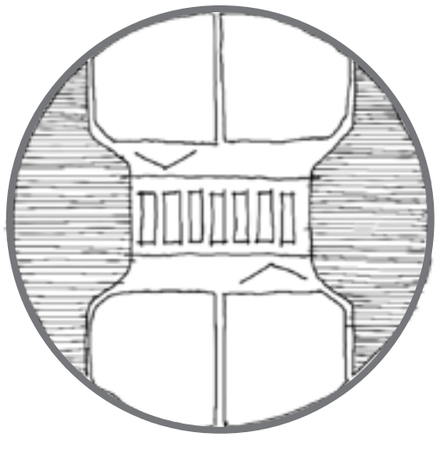
Streets can **Change**

Streets for **Health**

Great Streets can
Create Value

Streets are
Multidimensional Spaces

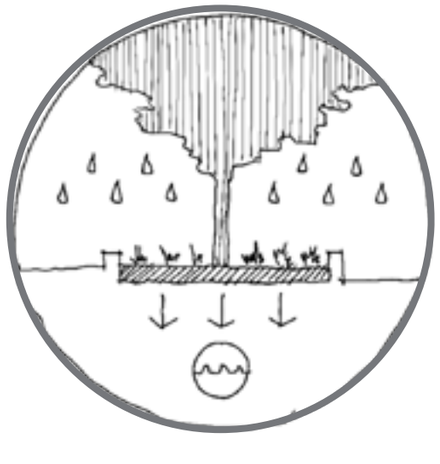
Streets are **Multimodal**



Streets for **Safety**

Streets for **Comfort**

Streets for **Everyone**



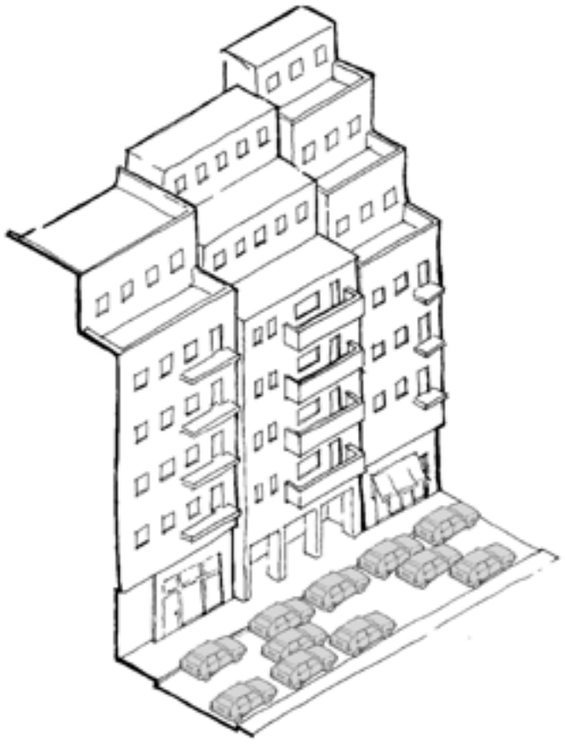
Streets as **Ecosystems**

Norman Foster Institute on Sustainable Cities

Figure 17

Streets

Source(s)
Norman Foster Institute. Athens Cohort. 2024.



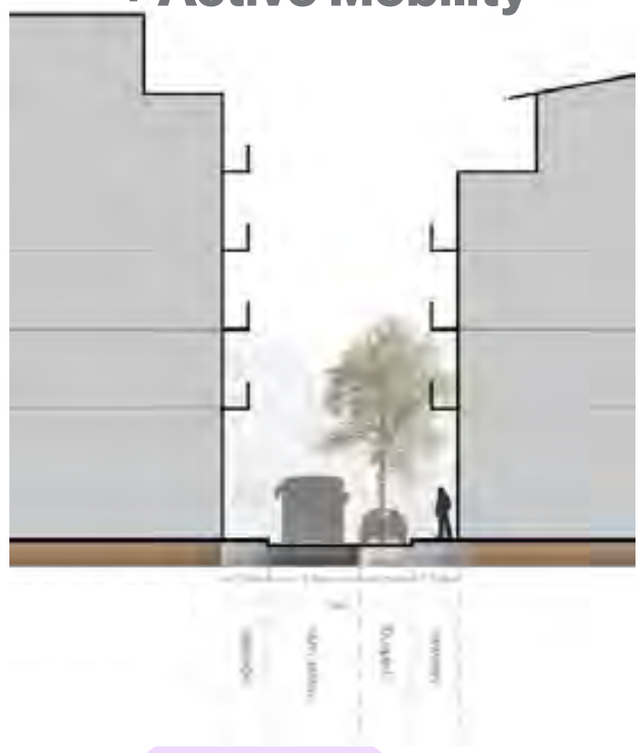
Same Street Type for All Mobility Users

Street Types Supporting Nature + Public Transport

Same Type for **All** Uses

Street Types **Optimized** for
Nature + Active Mobility

Street Types **Optimized** for
Nature + Public Transport + Active Mobility



Norman Foster Institute on Sustainable Cities

Figure 18

Opportunities

Street parking places in Kypseli:

~12,114

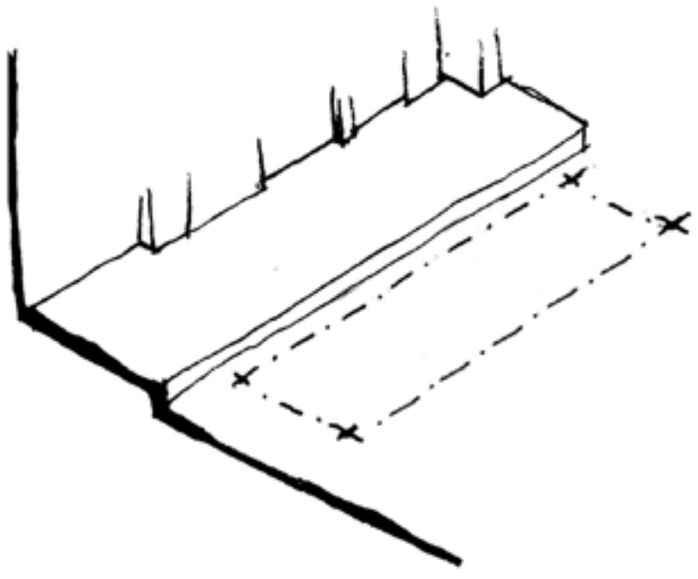
Each street parking place enables to plant:

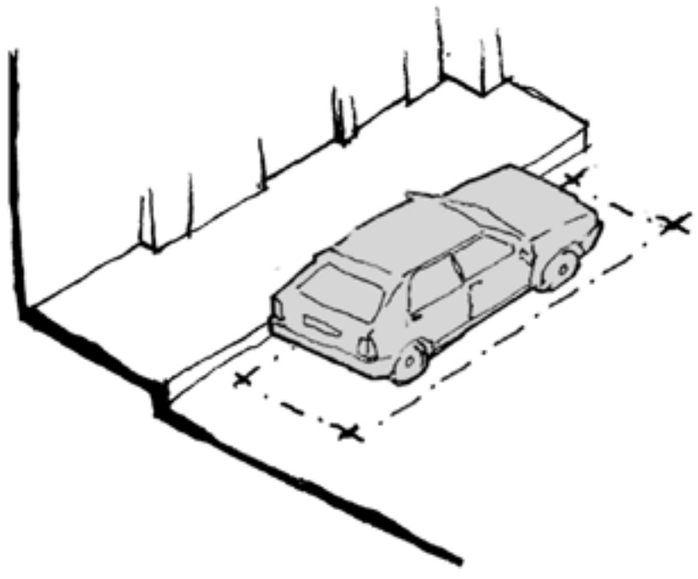
3 Trees

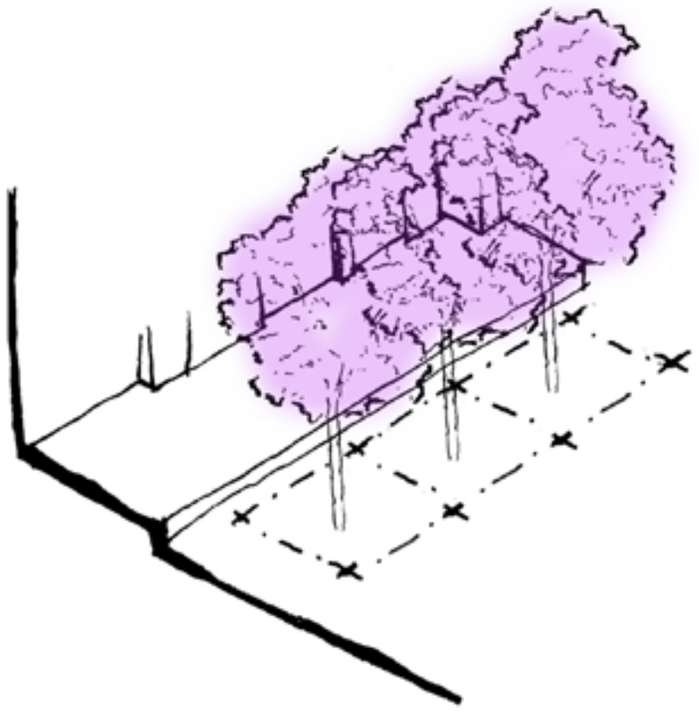
5% = 605 parking places x 3 trees

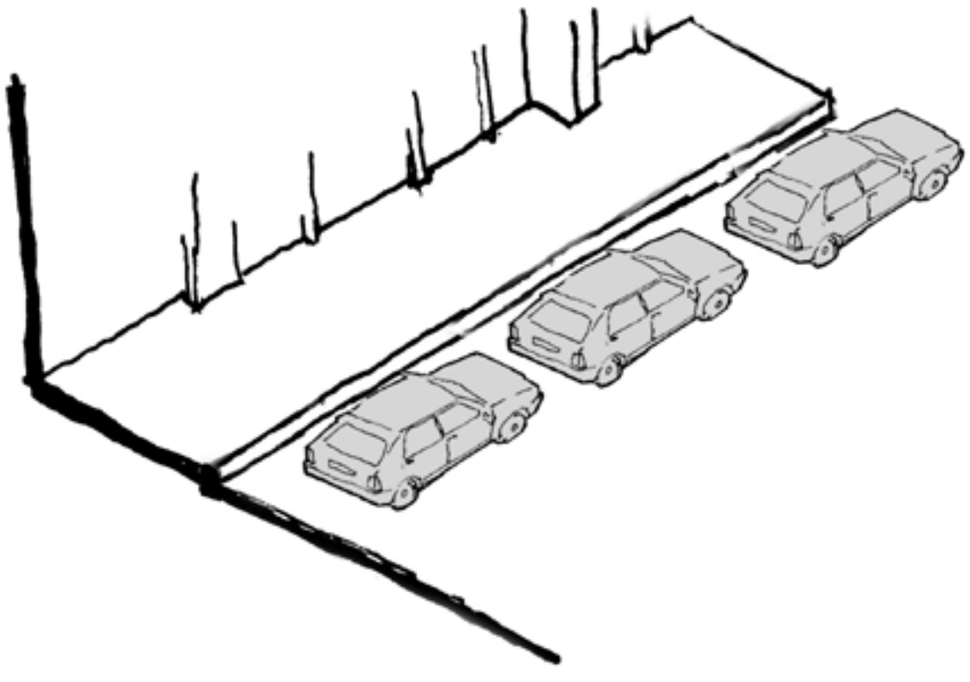
+1,815 trees

Source(s)
Norman Foster Institute. Athens Cohort. 2024.









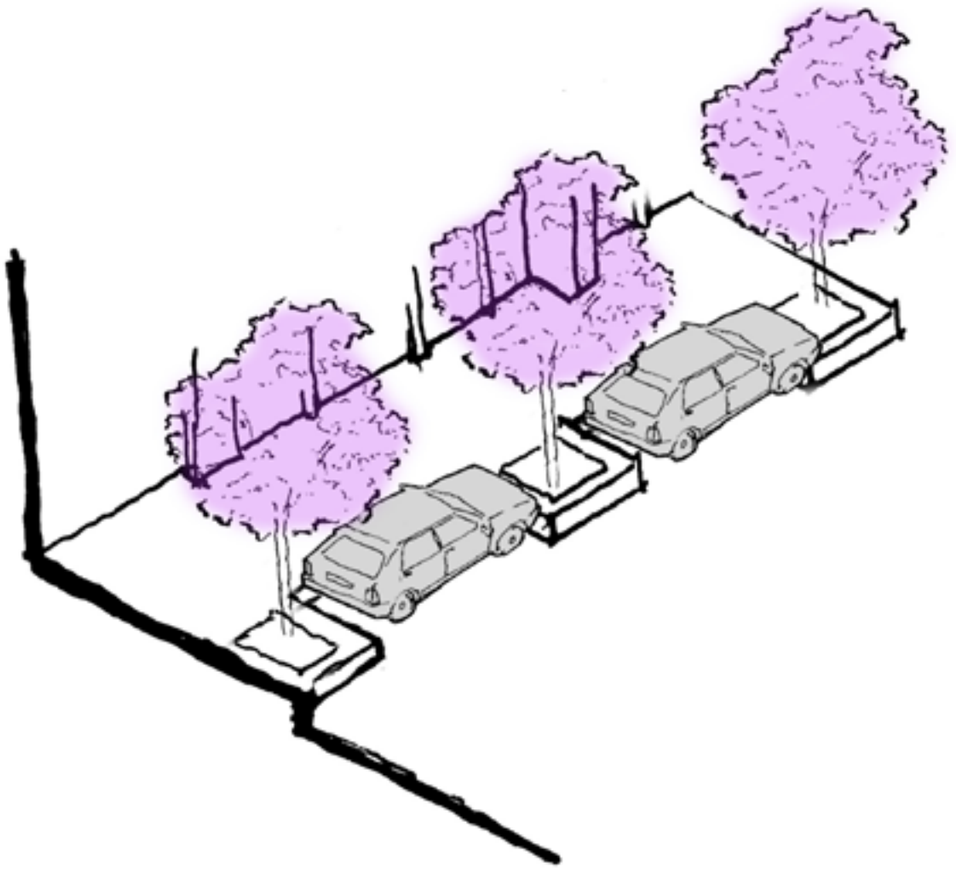
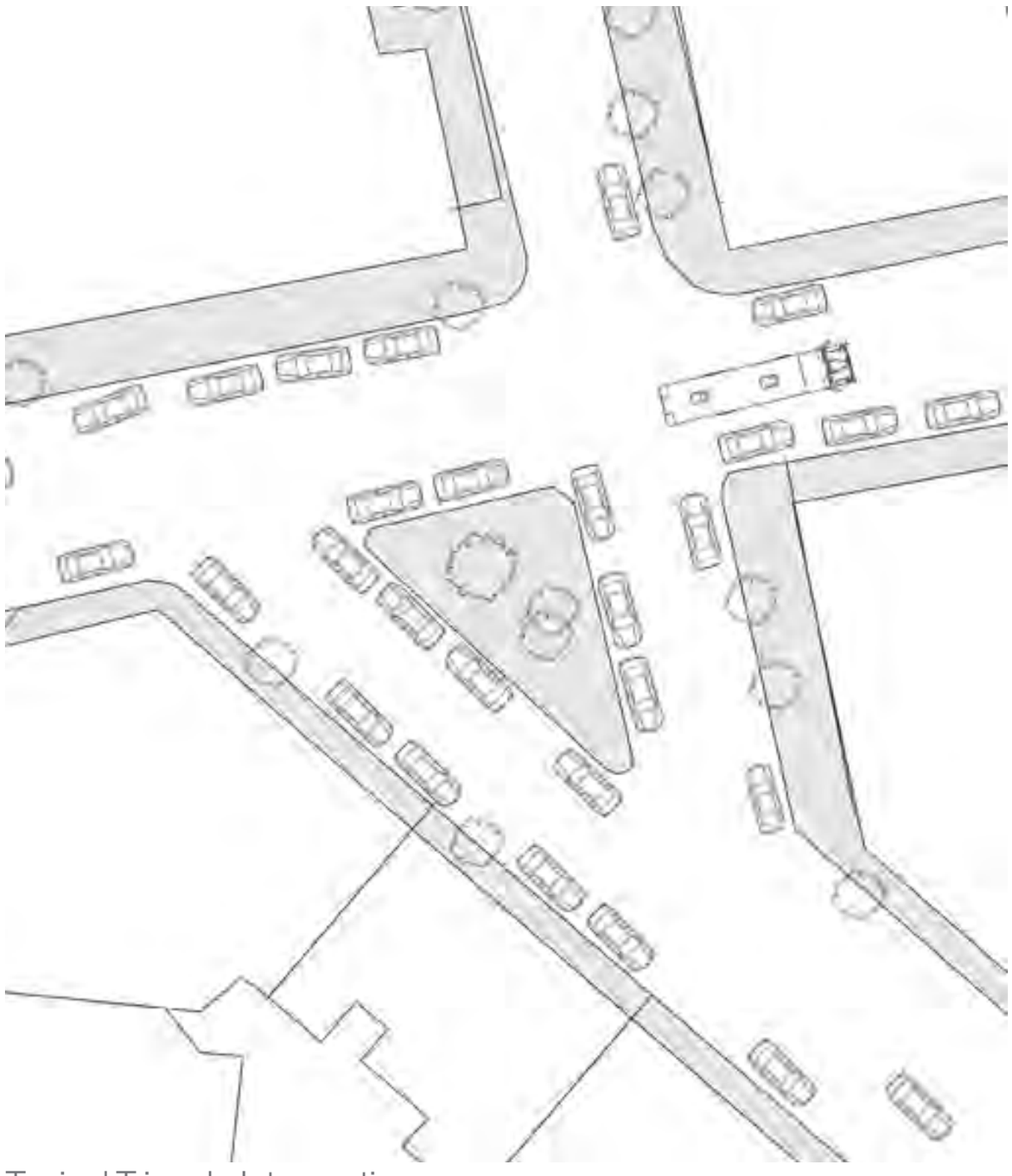


Figure 19

Triangles



Typical Triangle Intersection

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Area of Analysis
Green Spaces
Buildings

Triangles
Area of Study
Area of Study Buildings
Buildings of Athens
Athens Neighbourhoods
Green Space

0 100 200 300 400 500 m

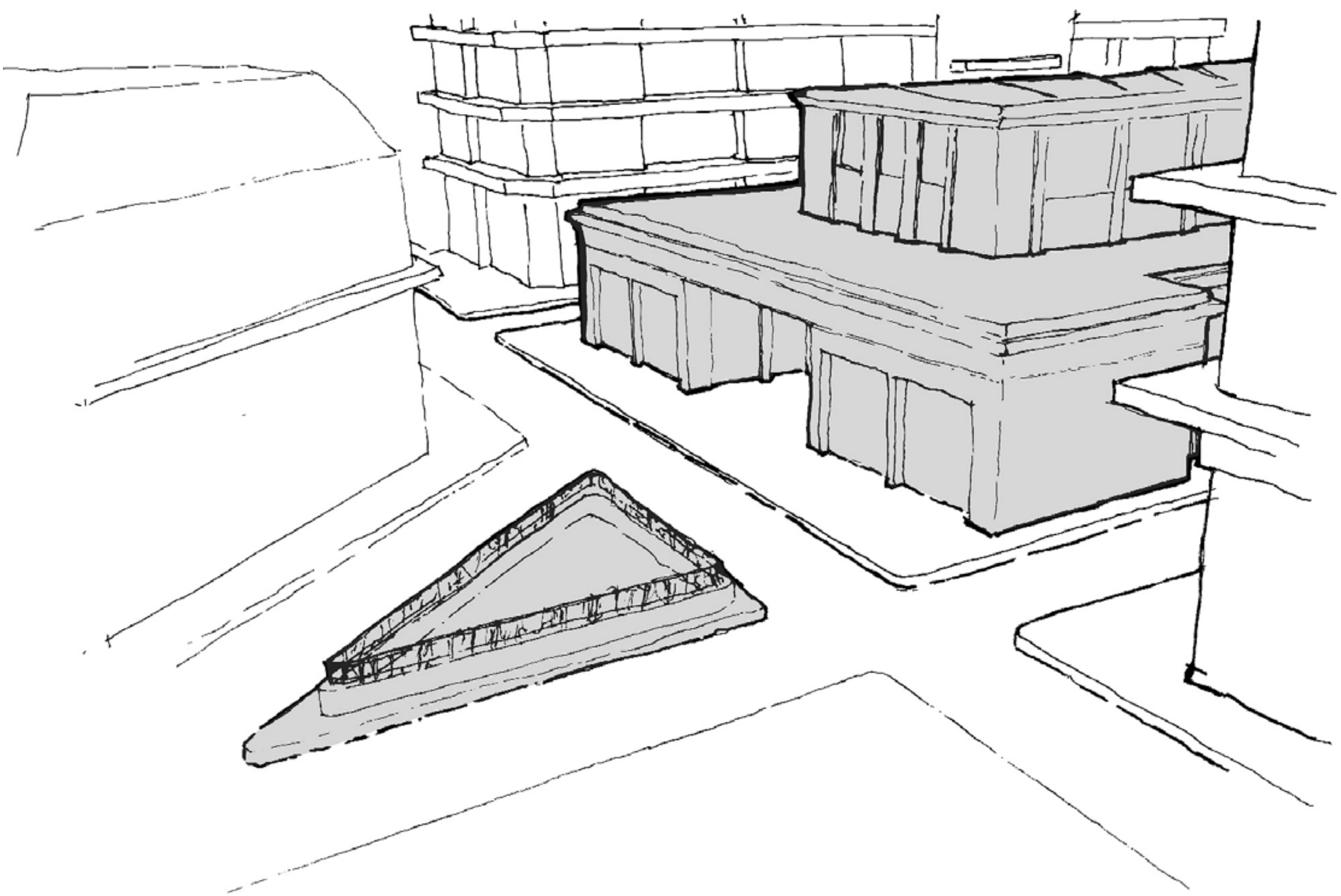
Norman Foster Institute on Sustainable Cities

Figure 20.1

Road Diet
(Before)

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

Global Designing Cities Initiative. Global Street Design Guide. New York: Global Designing Cities Initiative, 2016. https://globaldesigningcities.org/publication/global-street-design- guide/.



Norman Foster Institute on Sustainable Cities

Figure 20.2

Road Diet
(After)

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

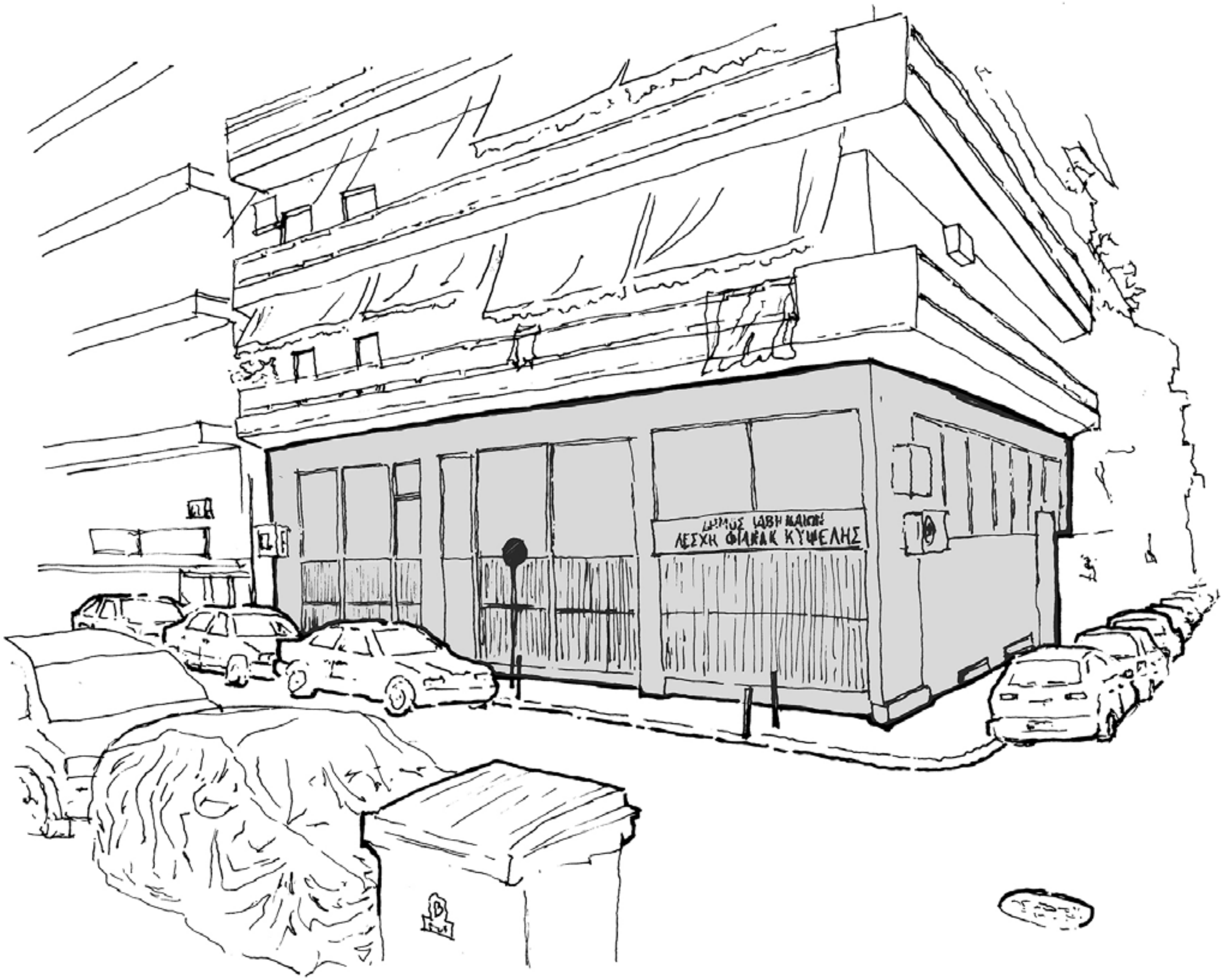
Global Designing Cities Initiative. Global Street Design Guide. New York: Global Designing Cities Initiative, 2016. https://globaldesigningcities.org/publication/global-street-design- guide/.

Norman Foster Institute on Sustainable Cities

Figure 21.1

Transforming Streets
(Before)

Source(s)
Norman Foster Institute. Athens Cohort. 2024.


ΛΕΣΧΗ ΦΙΛΙΚΩΝ ΚΥΨΕΛΗΣ

Norman Foster Institute on Sustainable Cities

Figure 21.2

Transforming Streets

(After)

Source(s)

Norman Foster Institute. Athens Cohort. 2024.


ΛΕΣΧΗ ΦΙΛΙΚΩΝ ΚΥΨΕΛΗΣ

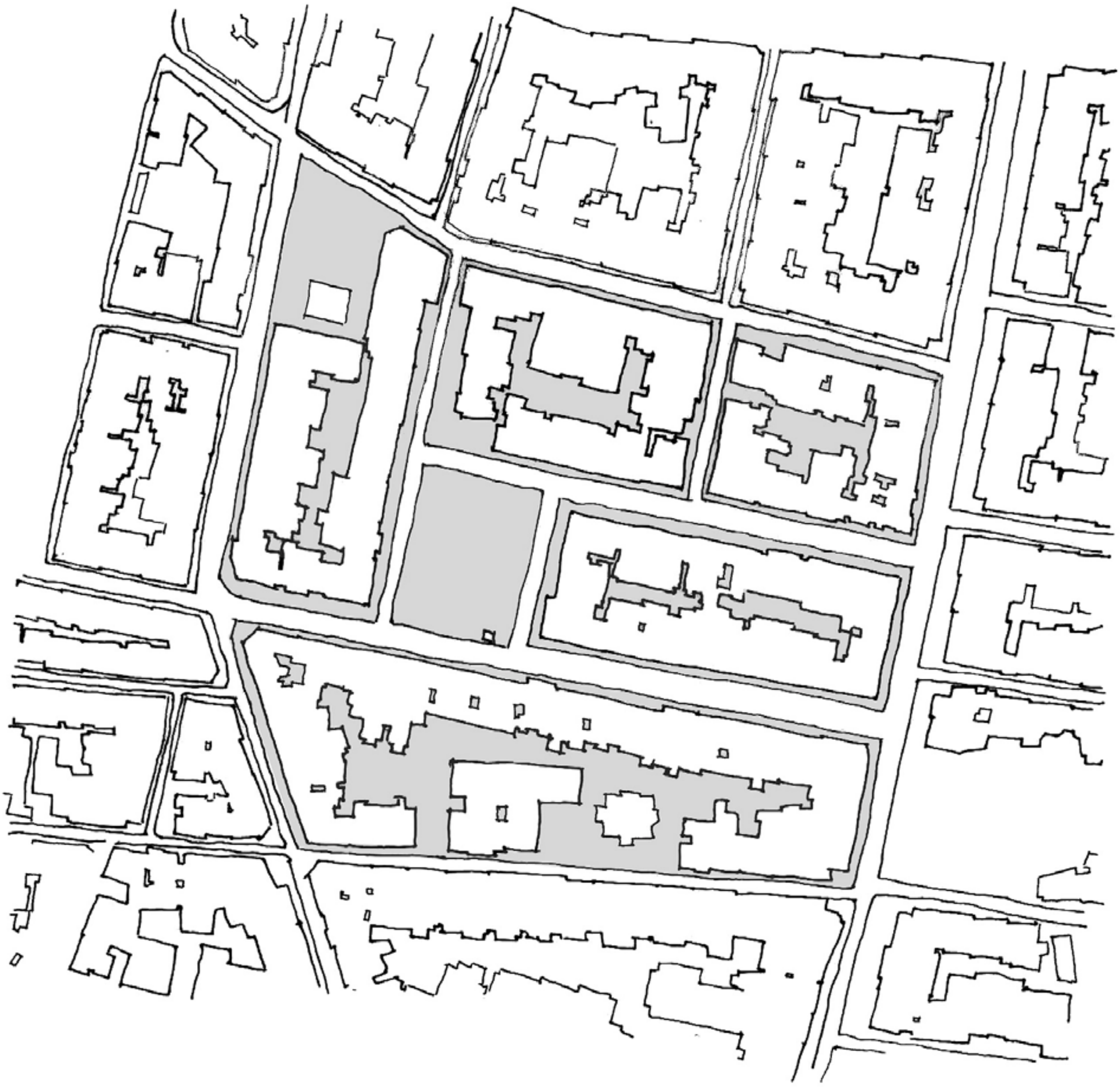
Norman Foster Institute on Sustainable Cities

Figure 22.1

Superblocks
(Before)

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.



Norman Foster Institute
on Sustainable Cities

Figure 22.2

Superblocks
(After)

Source(s)
Norman Foster Institute. Athens Cohort. 2024.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Norman Foster Institute on Sustainable Cities

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Source(s)
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Encounter Athens. “What ‘Crisis’ in the Center of Athens? Critical Discourse and Claims for a Just City.” 2011. Accessed July 21, 2024. https://encounterathens.wordpress.com/2011/06/01/enherwsh/.

Global Designing Cities Initiative. Global Street Design Guide. New York: Global Designing Cities Initiative, 2016. https://globaldesigningcities.org/publication/global-street-design-guide/.

Hellenic Statistical Authority. 2011 Population-Housing Census: Final Results. Piraeus: Hellenic Statistical Authority, 2013.

Hellenic Statistical Authority. “Census 2021 GR” (PDF). Press release, July 19, 2022. Archived (PDF) from the original on October 9, 2022. Accessed September 12, 2022.

Hellenic Statistical Authority. “Household Budget Survey 2008.” 2010. Accessed July 21, 2024. http://www.statistics.gr/el/home.

Hellenic Statistical Authority. “Living Conditions in Greece.” 2015. Accessed July 21, 2024. http://www.statistics.gr/living-conditions-in-greece.

Maloutas, Th., D. Emmanouil, and M. Pantelidou Malouta. “Athens: Social Structures, Practices, and Perceptions: New Parameters and Trends of Change 1980-2000.” Athens, 2006. Accessed July 21, 2024. http://www.ekke.gr/open_books/athens_2006.pdf.

European Space Agency. “Land Surface Temperature in Athens on 15 July 2023.” ESA Multimedia. Last modified August 2023. https://www.esa.int/ESA_Multimedia/Images/2023/08/Land-surface-temperature_in_Athens_on_15_July_2023.

OpenStreetMap contributors. “Map of Athens, Greece.” OpenStreetMap. Last modified August 27, 2024. Accessed August 27, 2024. https://www.openstreetmap.org.

Panagiotopoulos, P. “Athens Temperature Atlas 2016-2020.” Athens Geoportal. Last modified April 5, 2024. Accessed April 5, 2024. http://gis.cityofathens.gr/.

Panagiotopoulos, P. “Metro, Tram, and Rail Athens Network Map.” Athens Geoportal. Last modified September 29, 2021. Accessed April 5, 2024. http://gis.cityofathens.gr/layers/athens_geonode_data:geonode:Stations_0.

Samara, A. “Trees.” Athens Geoportal. Last modified April 5, 2024. Accessed August 5, 2024. https://www.gis.cityofathens.gr.

Sardianou, Eleni. “Estimating Space Heating Determinants: An Analysis of Greek Households.” Energy and Buildings 40, no. 6 (2008): 1084–1093.

Cartalis, Constantinos. “Transforming the City in the Era of Climate Change.” National and Kapodistrian University of Athens.

Layout

Guidelines

Norman Foster Institute on Sustainable Cities

Figure 1

Heading

Source(s):
Norman Foster Institute. Athens Cohort. 2024.
Open Street Map. 2024.

Margin = 10mm

x = 400mm

Legend

Margin = 10mm

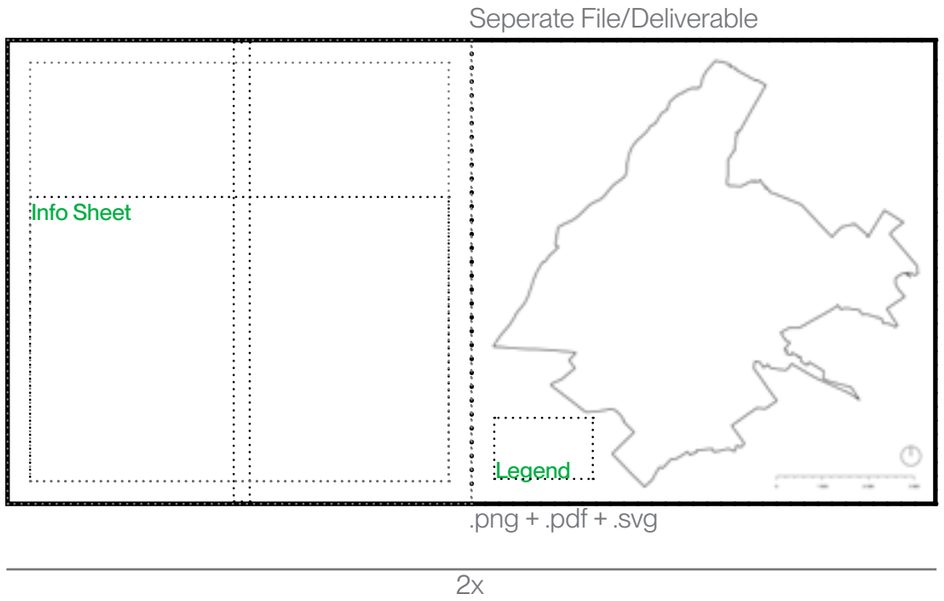
x = 400mm

N

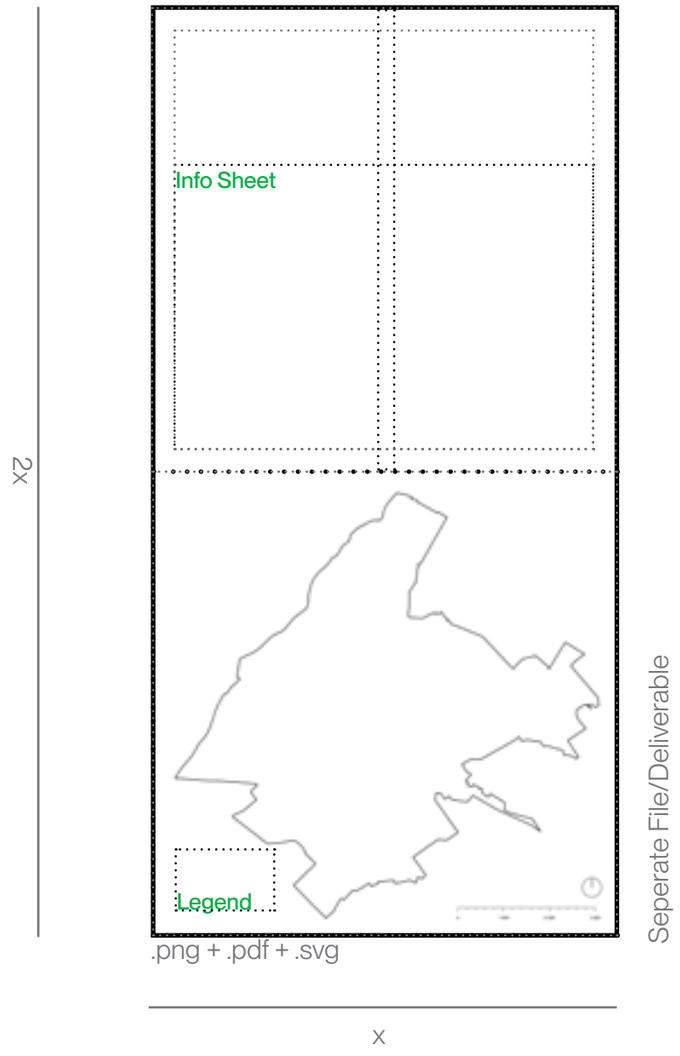
Scale Bar

0 1 000 2 000 3 000

Norman Foster Institute
on Sustainable Cities



Landscape
(Desktop)



Portrait
(Mobile)

01 Macro

Greater Athens

Scale 1 : 100 000

02 Meso

Municipality of Athens

Scale 1 : 25 000

03 Micro

Kypseli Neighbourhood

Scale 1 : 5 000

Templates

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on Sustainable Cities

www.normanfosterinstitute.org

Annex 2 – Targets of Athens Climate Action Plan 2022

An extremely important component for the success of this Action Plan, the Reduction of Greenhouse Gas Emissions in the Municipality of Athens, and the Adaptation and Enhancement of the City's Resilience to the impacts of Climate Change, is its horizontal implementation and its coordination with the rest of the Municipality's strategic and technical plans. The Climate Plan has been prepared taking into account:

- the Integrated Urban Intervention Plan (IAPP) in the centre of Athens (2015)
- the Athens Resilience Strategy 2030 (2017)
- the Climate Plan prepared by the Municipality of Athens (2017)
- the Integrated Sustainable Urban Development Plan of the Municipality of Athens, using the Integrated Spatial Investment Tool (2017)
- the Sustainable Urban Mobility Plan of the Municipality of Athens - SDC (2021)
- The Local Waste Management Plan of the Municipality of Athens (2021)
- the Annual Technical Programme of the Municipality of Athens (2021)
- the planning and prioritisation of the Municipal Authority
- the Municipality of Athens Operational Programme under preparation

In addition to the quantitative objectives mentioned above, other objectives of the previous plan were:

- The reduction of high temperatures in the city and the urban heat island effect
- The reduction of the intensity of local flooding episodes
- Protecting public health and supporting the most vulnerable populations
- Protecting population, natural and built environment from climate risks
- Reducing the cost of rehabilitation
- Enhancing biodiversity and supporting natural resources
- Improving air quality
- Reducing noise pollution
- Enhancing the resilience of infrastructure
- Strengthening the Athenian neighbourhood and supporting social cohesion
- Strengthening the local economy and tourism
- Supporting entrepreneurship and innovation
- Data-based decision making and policies
- Social cohesion and justice
- Informing, educating and raising citizens' awareness of climate change
- Improving quality of life in the city

The axes of the previous Climate Action Plan were:

1. Energy production from Renewable Energy Sources (RES) and energy upgrading of the built environment
   1.1. Energy upgrading, building stock utilisation & New buildings
   1.2. Energy production from RES
   1.3. Energy upgrading of street lighting

2. Accelerating the transition to sustainable and smart mobility
   2.1. Enhancing active mobility
   2.2. Controlled & Smart Parking
   2.3. Electromobility & Fleet Upgrade

3. Urban regeneration by integrating green and blue infrastructure
   3.1. Green and Blue Cultural Routes
   3.2. Maintenance and Upgrading of Built Public Space
   3.3. New Green Spaces

4. Ecosystem and Biodiversity Management and Restoration
   4.1. Maintenance and Upgrading of Existing Green Spaces
   4.2. Protection of Vulnerable Fauna Populations
   4.3. Supporting Ecosystems

5. Preventing and addressing climate risks
   5.1. Flood protection
   5.2. Fire protection
   5.3. Protection, Awareness & Enhancement of Public Health
   5.4. Draft Action Plan to Combat Urban Overheating

6. Circularity and sustainable water and waste management
   6.1. Recycling & Reuse
   6.2. Composting
   6.3. Waste Transport Optimisation
   6.4. Sustainable Water Management
   6.5. Groundwater Utilisation
   6.6. Urban Crops
   6.7. Sustainable food system & nutrition for vulnerable groups

7. Transition to a green and digital city
   7.1. Digital Governance
   7.2. Monitoring of Environmental Parameters and Air Pollution
   7.3. Climate Education Programmes & Dissemination of Good Practices