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 Łódź

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Summary

Textual element
The City of Łodź has an ambitious aspirational target to reach climate neutrality in 2030 and developed GHG emissions inventory, emissions monitoring and assessment tool, as well as the portfolio of actions and projects that would help to close the gap between current emission levels, impacts of existing policies and the climate neutrality target. For the purpose of Climate Neutral and Smart City Mission 2018 is selected as a baseline year. Achieving climate neutrality in line with the Climate Neutral and Smart City Mission requirements requires reducing the GHG emissions from all sectors and sources within the city's boundary, including stationary energy sector, vehicles and transport, consumption of electricity and district heating/cooling, as well as waste sector. To reach the climate neutrality goal the city would need to double GHG emission reductions compared to the trajectory set under existing policies and in particular, Sustainable Energy and Climate Action Plan for the Period till 2030. Additional GHG emissions reductions are estimated at the level of 1.4 million tonnes CO2e. The City of Łodź will focus on the following early changes that will set grounds for the achievement of climate neutrality target: • Replacement of coal-fired heating sources with a combination of renewable energy and other low-carbon solutions, such as heat pumps, solar collectors, district heating and others. • Improving efficiency and decarbonization of district heating system in the city due to replacement of coal with biomass and natural gas. • Increasing the number of PV installations on private, municipal and commercial buildings. • Deployment of wind turbines as a renewable energy source for residential and other buildings. • Piloting the use of contractual instruments such as PPAs for renewable energy purchase. • Development of EV charging infrastructure and extending the network of charging stations to create enabling conditions for private transport fleet electrification. • Construction of the cross-city tunnel in Łódź. • Public transport system electrification. • Construction of Łódź Recycling Center (Łódzkie Centrum Recyklingu). • Tree planting and developing of green zones in the city within the Greening Strategy. • Launching subsidy scheme to conduct energy audits for buildings to determine the most cost-effective modernization measures. The government of The City of Łodź will continuously work on further expansion of the list of impact pathways, including technology and infrastructure solutions, but also focusing on innovative governance and policy tools, regulations, social innovation, citizen engagement, capacity development, new finance tools and local development strategies.

Abbreviations and acronyms

Abbreviations and acronyms	Definition
AFOLU	Agriculture, Forestry and Other Land Use
CCC	City Climate Contract
CCM	City Climate Mission or Mission / Climate-Neutral and Smart Cities
EPP	Environmental Protection Program
EU	The European Union
EU ETS	EU Emissions Trading Scheme
EV	Electric vehicle
GHG	Greenhouse gases
GUS	Statistics Poland / Główny Urząd Statystyczny

IPCC	The Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
MPA	Municipal Plan for Adaptation to Climate Change
PPA	Power purchase agreement
SECAP	Sustainable Energy and Climate Action Plan
UML	Government of The City of Łodź / Urząd Miasta Łodzi

Introduction

Introduction

The City of Łodź is located in central Poland and is the capital of Łódź Voivodeship. As of 2023, Łódź has a population of 655 thousand citizens making it the country's fourth largest city.

Łodź historically was one of the largest industrial centres in Poland and is now actively transforming, including large-scale development of transport infrastructure, energy system and revitalization of city areas and territories. Łódź is considered as one of the fastest growing cities in Central and Eastern Europe.

The development of the city is based on the Regional Development Strategy with modern textile and fashion industries, as well as advanced construction materials, IT and telecommunications being the most active economic sectors.

The City of Łodź is one of the key academic and educational centres of Poland with 21 universities and approximately 70,000 students from Poland and many other countries. Large number of young professionals and scientific and research expertise create valuable opportunities for fostering economic development and innovation, including green and climate technologies.

The territory of Łódź covers approximately 293 square kilometres and includes large green areas and urban forests.

The City of Łodź also benefits from its geographical location in the centre of Poland and serves as an important logistic and transportation hub with major motorways, A1 spanning from the north to the south of Poland, and A2 going from the east to the west, intersecting northeast of the city. A1 and A2 highways are part of the Trans-European Transport Network (TEN-T) connecting Western Europe with Eastern Europe and the Baltic countries with the southern part of the continent. The S8 expressway connecting Łódź with Wrocław, located south of the city, is also of international importance. Łódź has good rail connections with all the major cities in Poland. There are two international airports near Łódź (in Łódź and Warsaw).

This CCC Climate Neutrality Action Plan (CCC Action Plan) refers to the 2030 climate-neutrality target and sets a vision for closing the gap to achieve net-zero by 2030. Thus, the CCC Action Plan focuses specifically on the measures that are additional to the activities included in existing policies and are required to achieve climate neutrality already in 2030.

Such ambitious target requires significant intensification of climate action both at national and local level and foresees at least doubling the efforts for GHG emission reduction compared to the trajectory set in the Sustainable Energy and Climate Action Plan (SECAP) with the climate neutrality target for 2050.

SECAP is a local planning document describing climate change mitigation and adaptation action and is developed within the Covenant of Mayors for Climate and Energy initiative - a European voluntary movement involving local authorities in the development and implementation of sustainable energy and climate policies.

Achievement of climate neutrality target in 2030 requires working with all stakeholders to develop and implement new transformational decarbonization projects and to accelerate the implementation of the long-term actions foreseen in the SECAP to achieve the GHG emissions earlier.

2030 Climate Neutrality Action Plan developed within the City Climate Contract (CCC Action Plan) serves as an umbrella document for SECAP and other climate-related local planning documents and focuses on the gaps between existing policies and climate neutrality aspirations of the city.

Łódź CCC Action Plan details the strategies and actions needed to close the climate neutrality gap to 2030, as well as the governance strategy, enabling and supporting measures, and the main principles of implementing city-wide, transformative climate action.

Taking into account the scale of GHG emissions reduction required and the remaining time, the achievement of this ambitious climate neutrality target will require access to new and additional sources of financing and investment, enhancement of national and local policies to create enabling environment, as well strengthened cooperation and commitment from various stakeholders.

The actions are defined using the portfolio approach and describing the key transformative changes required to close the gap and achieve climate neutrality, while more detailed information on specific actions and projects would be available at later stages and could be included in the next iterations of the action plan. These actions will be complemented by the impacts of broader changes at national and EU level, including reduced carbon intensity of vehicle fleet and further electricity grid decarbonization, which will also support the achievement of ambitious climate neutrality target.

The CCC Action Plan is designed as a live document that will be regularly updated based on ongoing stakeholder consultation and citizen engagement processes, including additional information and details on the actions planned. Thus, the document clearly acknowledges the existing gaps and foresees actions to fill them following the plan's modular approach

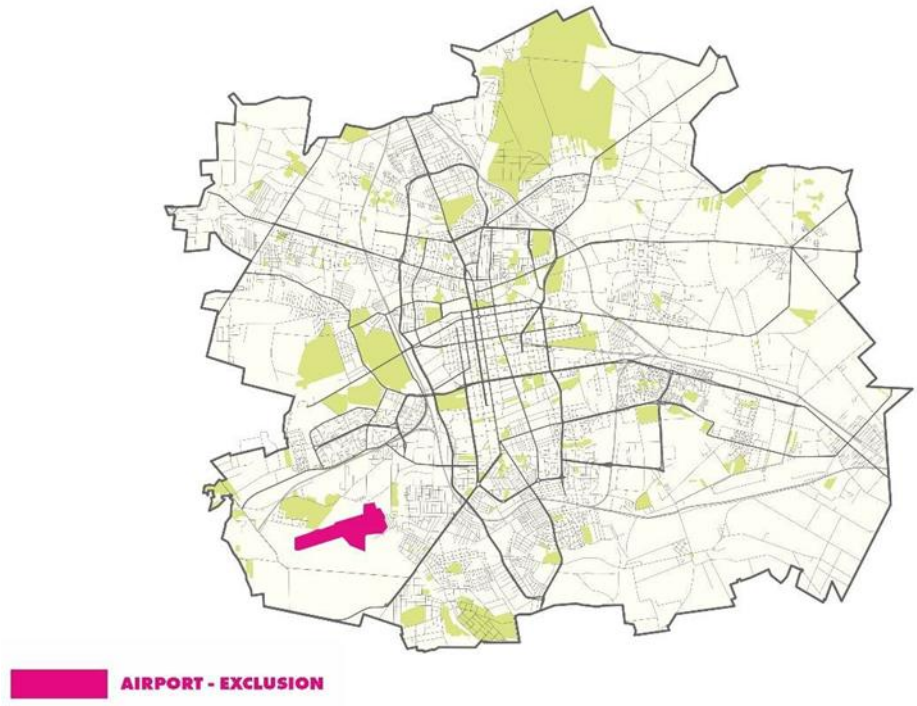
Table I-1.1: Climate Neutrality Target by 2030

Sectors	Scope 1	Scope 2	Scope 3
Stationary energy	Included	Included	Excluded
	Emissions from industrial buildings and facilities are excluded.	Emissions from industrial buildings and facilities are excluded.	Excluded
Transport	Included	Included	Excluded
	Emissions from mobile combustion from aviation transport is excluded (i.e. fuel consumption by aircrafts).[1]		
Waste/wastewater	Preliminary estimated based on national data and population of the city. Emissions from energy consumption for waste collection and management within the city boundaries are accounted within "Municipal buildings, equipment/facilities" sub- sector and	Not applicable	Preliminary estimated based on national data and population of the city.

[1] In the Expression of Interested it was proposed to exclude the Władysław Reymont airport area from the plans because for economic, legal and technological reasons, the city was not able to guarantee that it will be possible to reduce CO2 emissions at the airport to the levels described in the Climate-Neutral and Smart Cities Mission

	"Municipal transport" sub-sector.		
IPPU	Not applicable	Not applicable	Excluded
	No material sources or greenhouse gases emissions identified.	-	-
AFOLU	Included	Not applicable	Excluded
	Emissions from major land use changes are estimated and included.	-	-
Other	To be defined	To be defined	To be defined
Geographical boundary	**Same as city administrative boundary**	**Smaller than city administrative boundary**	**Larger than city administrative boundary**
(Tick correct option)	x		
Specify excluded/additional areas	Not applicable		

Map



2. Part A – Current State of Climate Action

2.1 Module A-1 Greenhouse Gas Emissions Baseline Inventory

This section details and describes the city's GHG inventory covering the geographical boundaries of the city.

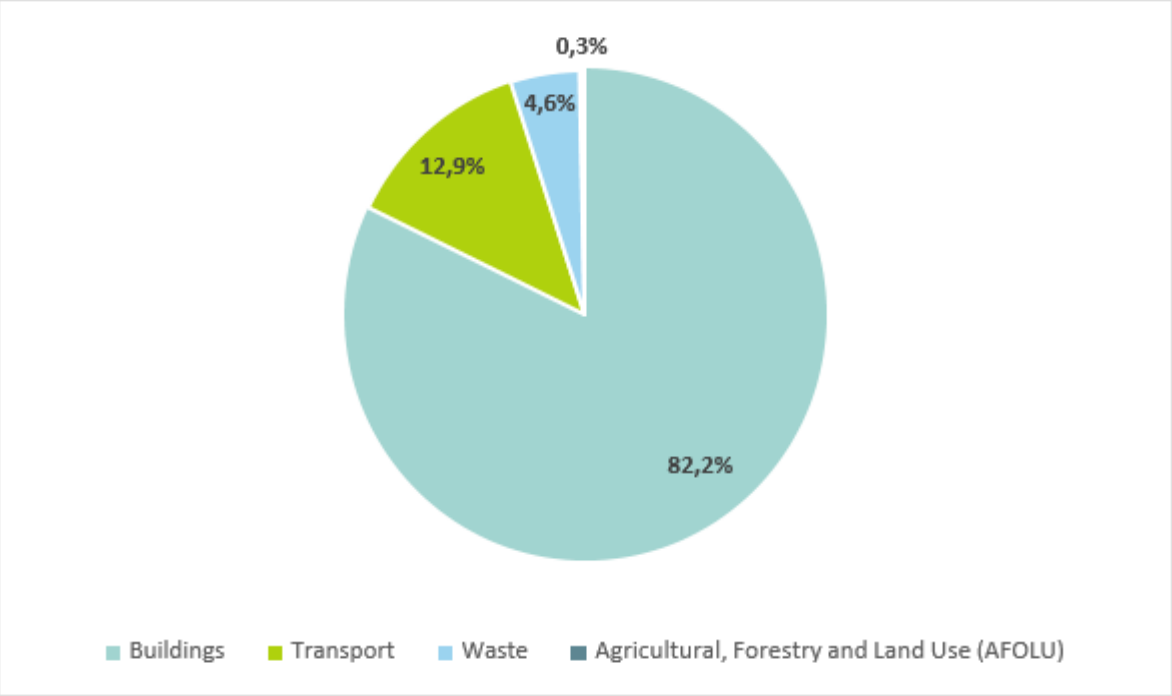
GhG Emissions Baseline inventory

The City of Łodź has developed its first GHG emissions inventory in 2024 covering the period from 2010 till 2022. The tool used for the calculation of baseline emissions is designed for continuous monitoring of GHG emission levels and regular update of emission inventory.

The GHG baseline emissions inventory has been developed as a part of Łódź Climate Package (Łódzki Pakiet Klimatyczny) – a comprehensive set of strategic documents on climate and environmental aspects with the overall common goal of identifying the actions required for the achievement of climate neutrality. The Łódź Climate Package includes Sustainable Energy and Climate Action Plan (SECAP), updated Municipal Plan for Adaptation to Climate Change (MPA), updated Environmental Protection Program (EPP), Greening strategy for Łódź, as well carbon footprint calculation tool and accompanying explanatory reports.

The baseline emission inventory along with the accompanying GHG emissions calculation tool is used to understand the current level of GHG emissions generated by the city, as well as track progress of the ongoing and future decarbonization efforts.

The baseline GHG emissions inventory will be used for the needs of Climate City Mission and any other activities or initiatives to ensure consistent assessment and monitoring of climate actions. For the purpose of Climate City Mission 2018 is selected as a baseline year.



Structure of GHG emissions in the baseline year (2018)

Baseline emission inventory for The City of Łodź has been prepared following the guidance provided by the Covenant of Mayors for Energy and Climate[2], as well as IPCC guidance on national emission inventories[3] and other relevant industry and relevant national documents and reports.

The baseline emission inventory covers the administrative boundaries of Łódź. It, however, did not covered some sectors required by CCM, in particular, Waste and AFOLU, and additional estimation of GHG emissions from these sectors were performed as described in Annex 3 and Annex 4 of this action plan.

The following sectors and sub-sectors are included in the scope of the baseline emission inventory:

- Municipal buildings, equipment/facilities,
- Public lighting,
- Tertiary (non-municipal) buildings, equipment/facilities,
- Residential buildings,
- Municipal fleet,
- Public transport,
- Private and commercial transport.

Achieving climate neutrality in line with the Climate Neutral and Smart City Mission requirements requires reducing the GHG emissions from all sectors and sources within the city's boundary, including:

- Emissions from combustion of fossil fuels in all buildings and facilities ('stationary energy') - including residential, commercial buildings, as well as municipal buildings and public lighting within the city boundary;
- Emissions from combustion of fossil fuels for all vehicles and transport within the city boundary;
- Emissions arising from the consumption of electricity and district heating/cooling within the city's boundary, from power plants located within or outside the city boundary;
- Emissions arising from waste generated within the city boundary, treated/managed/disposed within or outside the city boundary;
- Emissions from changes in land use including agriculture, forestry and other land uses (collectively referred to as 'AFOLU') within the city boundary;
- Emissions from chemical processes in industry (collectively referred to as Industrial Process and Product Use or 'IPPU') within the city boundary.

GHG emissions from **stationary energy sector** are included in the baseline inventory and reflected in subsectors of "Municipal buildings, equipment/facilities", "Tertiary (non-municipal) buildings, equipment/facilities", and "Residential buildings". GHG emissions associated with stationary energy consumption by industrial buildings are excluded from the inventory as the city has limited information and limited impact on decarbonization efforts by industrial sector.
GHG emissions from combustion of fossil fuels for all **vehicles and transport** are included in the baseline inventory and reflected in subsectors of "Municipal fleet", "Public transport", and "Private and commercial transport". Emissions from aviation transport and airport operation are excluded (i.e. fuel consumption by aircrafts). The exclusion is justified as for economic, legal and technological reasons, the city is not able to ensure CO_2 emissions reduction from aviation transport to the levels described in the Climate-Neutral and Smart Cities Mission. Stationary energy consumption in the buildings of airport

[2] Bertoldi P. (editor), Guidebook 'How to develop a Sustainable Energy and Climate Action Plan (SECAP) – Part 2 - Baseline Emission Inventory (BEI) and Risk and Vulnerability Assessment (RVA), EUR 29412 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-96929-4, doi:10.2760/118857, JRC112986
[3] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, https://www.ipcc-nggip.iges.or.jp/public/2006gl/

in the baseline inventory is covered in Stationary Energy consumption sector as it is based on city-wide data from energy suppliers but is not covered by the CCC Action Plan. At the same time, Łódź Airport itself carries out a number of activities aimed at, on the one hand, reducing the airport's impact on the natural environment and, on the other hand, increasing the airport's resilience to climate change. Łódź Airport is associated in the ACI NET ZERO network and has signed the Toulouse Declaration, where it has committed to taking actions to reduce the carbon footprint. Łódź Airport has prepared a road map to reach zero emissions by 2030.

Emissions arising from the **consumption of electricity and district heating/cooling** within the city's boundary are included in the baseline inventory and reflected in subsectors of "Municipal buildings, equipment/facilities", "Public lighting", "Tertiary (non-municipal) buildings, equipment/facilities", and "Residential buildings". GHG emissions from the consumption of electricity and district heating are calculated based on the local emission factors that take into account characteristics of CHP units (installations within the EU ETS) that cover the largest share of heat and electricity demand in the city. Though emissions from installations covered by EU ETS are typically excluded from cities' inventories due to very limited influence over their operation from the municipalities, the CHP units are indirectly covered by the baseline emission inventory since they ensure significant share of stationary energy consumption in the city and decarbonization measures are foreseen to support climate neutrality aspirations.

Waste sector has not been covered by the baseline emission inventory and preliminary estimated using national data (see Annex 3 for details). GHG emissions from energy consumption for waste collection and management within the city are accounted for within "Municipal buildings, equipment/facilities" sub-sector and "Municipal transport" sub-sector. Emissions from waste management (Scope 1 and Scope 3) were additionally estimated using the national data on GHG emissions from waste sector and taking into account population of the Łódź city (see Annex 3 for details). Such additional estimations were made to account for the misalignment between the coverage of inventory and the climate-neutrality target. The city will further work on understanding its waste sector GHG emissions, including with respect to waste generation data, waste management practices and locations, as well as their impact on climate neutrality target.

GHG emissions from the **Industrial Processes and Product Use (IPPU) sector** are produced from specific industrial activities and processes that chemically or physically transform materials, including mineral industry, chemical industry, and metal industry. There were no sources of such GHG emissions identified for the Łódź city. The city will be tracking the appearance of such GHG sources and will include them in the next revisions of emission inventories if identified. Though industrial facilities generate significant volumes of GHGs emissions in the city, they are mostly related to the generation of heat energy and are covered in Stationary Energy sector (via electricity and heat energy consumption in buildings and electricity consumption in transport).

AFOLU (Agriculture, forestry and other land uses) sector includes changes in direct GHG emissions associated with any changes in land use giving rise to (sources) or sequestering (sinks) emissions (if significant). This includes any potential changes in land use, including agriculture, forestry and other land uses within the city boundary. Land use change can lead to GHGs emissions in case of changes, for instance, from forest areas to built-in areas, or also lead to carbon sequestration (i.e. land area serve as a carbon sink) in case of, for instance, tree planting on the territory not covered by trees before. Information on land use changes within the city boundary have been analysed for the period 2017-2023 and GHG emissions from the AFOLU sector were additionally calculated (see Annex 4 for details). Such additional estimations were made to account for the misalignment between the coverage of inventory and the climate-neutrality target.

The baseline GHG emissions inventory is used as a basis for designing impact pathways and climate actions as it provides a breakdown of emissions by sector and allows to define the key drivers of remaining emissions.

The description of the current GHG inventory, including the current state of each emitting sector and monitoring system in place, is provided in the tables and sub-sections below.

Detailed methodology for the calculation of GHG emissions is documented in the GHG emissions

calculation tool and described in the Annexes.

GHG emissions generated by the city are divided by the following scopes:

- Scope 1 GHG emissions (direct emissions) for the city within its geographic boundary - includes emissions from buildings, facilities, industry, transport, waste treatment (solid waste and wastewater), agriculture and forestry and from other activities (depending on the applicability of specific sources).
- Scope 2 GHG emissions (indirect emissions) for the city – include emissions from indirect emissions due to consumption of grid-supplied electricity within the geographic boundary and indirect emissions due to consumption of grid-supplied heat or cold within the geographic boundary.
- Scope 3 GHG emissions (out-of-boundary emissions) for the city include out-of boundary emissions from treatment of waste produced within the geographic boundary (required source) and could also include other sources of indirect emissions in the future (e.g. out-of-boundary emissions from transmission and distribution of energy consumed within the geographic boundary, out-of boundary emissions from transportation of citizens living within the geographic boundary, out-of-boundary emissions from consumption made within the geographic boundary (food, clothes, furniture, materials, etc.) and other indirect emissions).

A-1.1: Final energy use by source sectors			
Base year	2018		
Unit	MWh		
Source and types of energy use	**Scope 1**	**Scope 2**	**Scope 3**
Buildings	**2 982 876**	**4 834 848**	
Electricity		2 075 683	
District heating		2 759 165	
Natural gas	968 199		
Coal	1 641 904		
Heating oil	119 065		
Biogas	33 589		
LPG	167 935		
Biomass	50 267		
Solar energy	1 918		
Transport	**1 704 892**	**87 889**	
Diesel fuel	875 193		
Petrol	605 701		
LPG	223 998		
Electricity		87 889	
CNG	0		
Waste			
(Fuel type/ energy used)	IE	IE	Not available
Industrial Process and Product Use (IPPU)			
(Fuel type/ energy used)	Excluded	Excluded	
Agricultural, Forestry and Land Use (AFOLU)	-	-	-
(Fuel type/ energy used)	Not applicable	Not applicable	Not applicable

IE – included elsewhere (energy consumption for waste management within the city is included in stationary energy sector).

A-1.2: Emission factors applied

(Please specify for primary energy type and GHG emission factor according to methodology used).

For calculation in t or MWh of primary energy

Primary energy/ energy source	Carbon Dioxide (CO_2)	Methane (CH_4)	Nitrous Oxide (N_2O)	F-gases (hydrofluorocarbons and perfluorocarbons)	Sulphur hexafluoride (SF_6)	Nitrogen trifluoride (NF_3)
Local data	IPCC, national, local	IPCC	IPCC	Not estimated, assumed to be not material	No material sources	No material sources

A-1.3: GHG emissions by source sectors

Base year		**2018**			
Unit		t CO_2e			
		Scope 1	**Scope 2**	**Scope 3**	**Total**
Buildings		818 430	2 274 078		3 092 507
Transport		435 508	49 605		485 113
Waste		69 355		104 033	173 388
Industrial Process and Product Use (IPPU)		Not identified	Not identified	Not identified	Not identified
Agricultural, Forestry and Land Use (AFOLU)	Sources (positive emissions)	12 728	Not applicable	Not applicable	12 728
	Sinks (negative emissions)	Not identified	Not applicable	Not identified	Not identified
Total		**1 336 021**	**2 323 682**	**104 033**	**3 763 735**

A-1.4: Activity by source sectors.

Base year		2018	
	Scope 1	Scope 2	Scope 3
Sector: Buildings			
Installed capacity of PV installations within the city (MW)		2,08	
Sector: Transport			
Number of registered electric vehicles in the city (number of units)		73	
Share of electric vehicles from the total number of light vehicles registered in the city (%)		0,02%	
Number of passengers using public transport (million passengers)	224,8		
Total distance travelled by public transport (trams and buses) (million kilometres)	53,6		
Sector: Waste			

Total volume of municipal solid waste generated in the city	250 855		
Sector: Industrial Process and Product Use (IPPU)			
(Activity)			
Sector: Agricultural, Forestry and Land Use (AFOLU)			
Share of green areas in the total territory of the city (%)	13,54%		

2.2 Module A-2 Current Policies and Strategies Assessment

This section lists and assesses existing policies, strategies, initiatives, or regulation from local, regional, and national level, relevant to the city's climate neutrality transition. The section also describes the gap between the emissions reduction due to existing initiatives and the city´s 2030 climate neutrality target.

A-2.1: Description & assessment of policies

In 2024 The City of Łodź has developed a Sustainable Energy and Climate Action Plan for the Period till 2030. The SECAP uses 2010 as a baseline year and has a target to reduce GHG emissions by at least 40% till 2030 and achieve climate neutrality by 2050.

The action portfolio in section B-2 does not include measures from the SECAP as the current action plan is focused on the emission gap between the existing policies and climate neutrality ambition of the city. The remaining gap to 2030 climate neutrality is estimated at the level of 1.4 million tonnes of CO_2e (the difference between the required emission reduction to reach the defined climate neutrality target in 2030, the emission reduction foreseen in the SECAP and emission reduction already achieved between 2018 and 2022). The residual emissions are estimated at the level of 0.75 million tonnes of CO_2e (estimated as 20% of the GHG emissions in 2018). Such approach is in line with the Climate-Neutral and Smart Cities Mission requirements, which recommend aiming for a level of 'residual emissions' within the city boundary in 2030 that does not exceed 20% of the baseline GHG inventory, with the possibility that the remainder could be accounted for using carbon sinks or credits.

Local government units within the Łódź Metropolitan Area Association (Stowarzyszenia Łódzki Obszar Metropolitalny) are also developing the Sustainable Urban Mobility Plan for the Łódź Metropolitan Area (SUMP) (Plan Zrównoważonej Mobilności Miejskiej dla Łódzkiego Obszaru Metropolitalnego). The document will guide the development of public transportation systems in a sustainable and low-carbon manner to improve the quality of life and reduce the negative impact of road transport on the environment and climate.

Other important national and regional policy documents and programs include the following:

- **Anti-smog Resolution** adopted by the Assembly of the Łódź Voivodeship in 2017 and updated in 2022, which puts restrictions on the use of old inefficient boilers for heating and hot water production. In particular, from January 1, 2025, it will be prohibited to use boilers commissioned before May 1, 2018 that do not meet the requirements of class 3, 4 or 5. Furthermore, from January 1, 2026, stoves and fireplaces (piece i kominki) put into operation before May 1, 2018 that do not meet the requirements of class 3, 4 or 5 must be replaced. In addition, from January 1, 2028, all heating sources that do not meet the requirements of class 3 and 4 shall be replaced.
- **Warm Housing Program (Ciepłe Mieszkanie)** – is a complex program that supports replacement of inefficient heating sources, connecting of residential buildings to district heating networks, installation of efficient and clean energy heating sources, installation of windows,

mechanical ventilation system, etc. Implementation of such activities directly support GHG emission reduction from residential buildings.

- **Clean Air Program (Czyste Powietrze)** – is a complex program aimed at reducing the emissions of dust and other polluting substances from individual residential buildings. Though the focus of the program is on air quality, the measures supported via the program include replacement of coal fired heating sources and energy efficiency improvements of buildings, and, thus, support climate mitigation activities.

- **Targeted subsidies from the city budget of Łódź for investment projects aimed at air protection-** In 2024, the city also awarded subsidies and investment projects for air protection, consisting in permanent exclusion of solid fuel heat sources from use in order to reduce low emissions, implemented in the city of Łódź, for natural persons, housing communities, legal entities, entrepreneurs and public finance sector units that are municipal or district legal entities. The purpose of targeted subsidies for the implementation of investment projects consisting in permanently decommissioning a solid fuel heat source and changing the heating system to:
  - connection to the heating network with the possibility of connecting hot utility water;
  - connection to the gas network with installation of a heating source;
  - installation of an electric heating source;
  - installation of a heat pump for heating purposes.

There are also other subsidy programs for residents aimed at counteracting the negative effects of climate change, such as:

- **The GreeningMY program** is addressed to recipients based in the revitalization area. This is an action aimed at reducing the negative phenomenon of the urban heat island by introducing greenery into the center. The program was created to enable the inhabitants of Łódź to implement their own projects contributing to reducing the effects of climate change and has been successfully continued for several years.
- **The Collecting Rainwater program** concerns projects involving systems for collecting and using rainwater in order to protect Łódź's water resources. The subsidy can be used for: the purchase of rainwater tanks with installation for connecting to the gutter, the creation of bioretention systems, the construction of permeable surfaces and irrigation systems. The program was created to enable the inhabitants of Łódź to implement their own projects contributing to reducing the negative effects of climate change and has been successfully continued for several years.

- Starting from July, 2021 all building owners and managers are obliged to report the heating source to the **Central Emission Register of Buildings (CEEB)** via online platform or using paper forms, which provides information on the structure of heating sources and fuel types used for heating. The information collected allow better planning of local climate policy and tracking the progress with achievement of climate mitigation goals.

- **Electromobility and Alternative Fuels Act (Ustawa o elektromobilności i paliwach alternatywnych)** adopted in 2018, which put requirements on local authorities to support the development of electromobility, including creation of charging infrastructure, replacement of municipal vehicles with electric or other low-emissions vehicles, as well as provides an opportunity for the establishment of low-emissions zones within the city (the feasibility of establishing such zones in Łódź city is investigated in cooperation with the Polish Association of Alternative Fuels). In particular, the act put a requirement to have at least 30% share of electric vehicles from the total number of vehicles serving the municipal government. Besides, from 2025, at least 20% of buses in public transport system shall be zero-emissions buses.

- **Biocomponents and Biofuels Act (Ustawa o biokomponentach i biopaliwach ciekłych)** adopted in 2006 (with amendments), which puts in place minimum biofuel content requirements for different types of petrol and diesel fuel. In line with the biofuel targets of the EU RED II directive, the share of biofuels in transport sector is expected to reach 14% in 2030.

Other important national documents that set climate goals include National Energy and Climate Plan for the period 2021-2030 (Krajowy Plan na rzecz energii I klimatu na lata 2021 – 2030), Energy Policy Strategy till 2040 (Polityka Energetyczna Polski do roku 2040) and Transport Sustainable Development Strategy till 2030 (Strategia Zrównoważonego Rozwoju Transportu do 2030 roku).
There are also local development plans and strategies that integrate low-carbon and sustainable development priorities.
In particular, the City Development Strategy 2030+4 devotes particular attention to creating "a greener city", a sustainable economy, infrastructure and transport, as well as building mechanisms for enhanced participation and human capital development. The document includes four strategic goals:

- **Strategic goal 1** – Strong and resilient Łódź: ensuring that the environment and infrastructure is kept in the best possible condition for stable functioning of the city, and ensuring resilience to internal and external shocks, including climate change impacts.
- **Strategic goal 2** – Economic and social development of Łódź: development of economic and social capital for current and future generations, investment in the quality of life and doing business.
- **Strategic goal 3** – Łódź responding to stakeholder expectations: ensuring the highest possible quality of public services and conditions for development, as well as quality of urban space and environmental conditions.
- **Strategic goal 4** – Wonderful Łódź: inspiring residents and providing a basis for pride.

City Development Strategy 2030+[4] includes 12 packages of strategic initiatives many of which are aligned with the climate neutrality aspirations of the city, including development of low-emission public transport system (Package 1), modernization of city's road network (Package 2), revitalization program (Package 3), air quality protection and CO2 emission reduction program (Package 5), modernization of buildings of educational institutions (Package 6), and green transformation of the city (Package 12).
Implementation of the CCC Action Plan will contribute to the achievement of all strategic goals but most significantly to the strategic goal 1 - Strong and resilient Łódź. Under strategic goal 1 the city's actions, in particular, will be focused on participation in the implementation of the European Green Deal, which include decarbonization among key priorities.
In 2018, Łódź City Council adopted a document defining its vision of the city's spatial development for the coming years - The Spatial Development Conditions and Directions Study for Łódź. The study's urban development model considers both the need to limit excessive urbanisation and the need to revitalise the Greater Łódź Urban Zone. Key directions of changes in shaping the city's spatial development policy include, among others, combating urban sprawl and limiting urbanised areas to existing structures and intensification of investment activities in a limited and strictly defined area ensuring quality of urban development.

Other relevant local sectoral strategic documents and policies include the following[5]:

- Policy on municipal infrastructure and environmental protection,
- Housing policy,

[4] Uchwała Nr L/1535/21 Rady Miejskiej w Łodzi z dnia 17 listopada 2021 r. w sprawie przyjęcia „Strategii Rozwoju Miasta Łodzi 2030+", https://bip.uml.lodz.pl/samorzad/akty-prawne-i-projekty-aktow-prawnych/aktyprawne/?tx_edgelegalacts_legalacts%5Baction%5D=show&tx_edgelegalacts_legalacts%5Bcontroller%5D=Legal Act&tx_edgelegalacts_legalacts%5BlegalAct%5D=57603

[5] UML, https://bip.uml.lodz.pl/miasto/dokumenty-strategiczne-miasta/

- Educational development policy.

Łódź participates in many initiatives aimed at cooperation of local governments. Firstly, Association of Łódź Metropolitan Area is made of 31 local self-government units and acts as Integrated Territorial Investment Association. Secondly, The City of Łódź is a member of the Association of Polish Cities, which enables the sharing of knowledge, skills and best practices. The uniqueness of cooperation within the association lies in the possibility of permanent cooperation with other cities on a wide range of topics. In addition, The City of Łódź has 20 sister cities and extensive experience in realization of international projects.

The City of Łodź also actively participates in the European and **international initiatives** on climate change mitigation and adaptation to exchange experience, build capacity and scale up climate action. The Mayor of Łódź, Hanna Zdanowska, as a member of the European Committee of the Regions, is involved in the work of: ENVE Commission - Committee on the Environment, Climate Change and Energy, SEDEC Commission - Committee on Social Policy, Education, Employment, Research and Culture, Working Group of the European Committee of the Regions on Green Deal Going Local. The Mayor of Łódź also serves as the National Ambassador for the Covenant of Mayors and is the Ambassador of the European Climate Pact. The city of Łódź is a member of international networks, organizations and associations, such as Adaptation to Climate Change Mission, Urban Transition Mission, Eurocities, CrAFtCities, ICLEI, Global Covenant of Mayors for Climate & Energy, Cities Race to Zero.

Active work of the city on implementation of decarbonization measures has already resulted in significant GHG emission reductions. During 2010-2022 GHGs emissions within the city's SECAP boundaries have been reduced by 19% from more than 3.7 million t CO_2 to about 3 million t CO_2. This represents a reduction from 5.1 t CO_2 to 4.6 t CO_2 per capita. This has been achieved by a combination of energy efficiency, renewable energy and fuel switch activities supported by national and local policy measures. Emission reductions were achieved mainly in municipal and residential buildings sectors and in local energy production, while transport sector demonstrated an increase in GHGs emissions due to the growth in the number of vehicles and traffic intensity on the streets of the city.

Residential buildings are responsible for more than half of GHGs emissions within the SECAP boundaries and from 2010 till 2022 emissions were reduced by 29%. The most significant result was achieved due to phasing down coal consumption both in district heating system and in individual buildings. In district heating system coal consumption was reduced due to increase in the share of biomass consumption at CHP installations, as well as energy efficiency improvements in heat energy generation and transportation. Coal consumption in residential buildings was reduced as a result of the ongoing national and municipal programs supporting replacement of coal fired heating sources with modern and efficient heating systems or connection to the district heating network.

Municipal buildings are responsible for small share of energy consumption and GHG emissions but also demonstrated reduction of climate impact by about 25%. The effect was achieved due to the significant efforts of the city to improve energy efficiency of the buildings both via investment projects (e.g. thermal insulation, heating system modernization, renewable energy, etc.) and organizational measures. Decarbonization of local heat energy and electricity generation has also contributed to GHGs emissions reduction.

Commercial buildings do not demonstrate a clear declining trend in energy consumption and GHG emissions. The effect of decarbonization of local heat energy and electricity production is compensated by growing energy demand (e.g. electricity, heat energy and other energy carriers) in the commercial buildings sector due to the active development of the city.
Transport sector requires significant efforts to achieve deep emission reductions not only in the transport sector itself but also in decarbonization of national electricity grid, city planning changes and

behaviour changes. Examples of current city's efforts to reduce emissions from transport include procurement or long-term leasing of electric vehicles for the needs of different municipal units and divisions, procurement of electric buses and development of related charging infrastructure, as well as large-scale investment in low carbon public transport infrastructure, including tram network modernization and procurement of new rolling stock.
It should be added that in the case of public transport, programs encouraging its use are important (so that residents limit private transport and replace it with public transport). E.g.:

- The Łódź Citizen Card, in the form of a mobile phone application or a traditional plastic card, is a system of promotions and discounts prepared especially for Łódź residents, which can be used throughout the city. One of the bonuses of the Łódź Citizen Card is the opportunity to purchase season tickets at lower prices.

- Changes to the ticket tariff at MPK (municipal transport company)

At the beginning of 2025, a new ticket tariff for public transport will come into force. In order to encourage residents to use public transport (instead of cars), new time-based tickets have been introduced, as well as the option to purchase an annual ticket (the most popular form for people who use public transport "to a large extent") in the so-called Streaming (monthly fees).

In addition to a change in tariffs, it is also planned to close certain streets to traffic and allow only public transport on them, in order to reduce delays for buses and trams, which is also intended to encourage them to travel. Another measure will be to increase the number of bus lanes in the city.

Improvement of city road network also indirectly could support decarbonization efforts, as construction of sections of bypasses and connections to the bypasses allows reducing the travel distance and transit traffic on city's streets. Besides, expansion of cycling paths network within the city (the length of cycling lanes has increased from 69.4 km in 2011 to 185 km in 2022 (with additional 55 km of lanes for bicycles marked on the streets) and operation of bikes renting system within the city (Łódzki Rower Miejski: 1,500 bicycles at 150 bicycle stations equipped with 2,250 bicycle racks) also contribute to current decarbonization efforts. It is also worth mentioning that there are NGOs in Łódź aimed at promoting bicycle transport. They are willing to speak out, e.g. during public consultations (so as to improve bicycle infrastructure and encourage the use of bicycle transport).

Existing national and local policies will further support the reduction of GHG emissions before 2030. However, further deep emission reduction aligned with climate neutrality aspirations would also require deep transformational changes, including development of public transport and active movement infrastructure to reduce private vehicles use, phasing out coal consumption for heating of the buildings, and deployment of renewable energy installations at scale.

	(1) Baseline emissions	(2) Emissions Reduction Target 2030		(3) Emission reduction through other Action Plans		(4) Emissions Gap		(5) Emissions reduction through the CCC Action Plan to address the Gap		(6) Residual emissions	
	Baseline emissions - 2018	The emissions reduction target for 2030 is 80% reduction from the 2018 baseline.		These are the emissions reductions that have been already achieved between 2018 and 2022 and that would be achieved through the implementation of SECAP.		(4) = (2) – (3)		Quantified emission reduction associated with the action portfolios outlined in module B-2. Ideally, this equals the gap		(6) = (1) – (2)	
	t CO_2e	t CO_2e	(%)	t CO_2e	(%)	t CO_2e	(%)	t CO_2e	(%)	t CO_2e	(%)
Buildings	3,092,507	2,597,706	84%	1,540,253	50%	1,057,453	34%	1,052,000	34%	494,801	16%
Transport	485,113	349,281	72%	84,714	17%	264,567	55%	261,000	54%	135,832	28%
Waste	173,388	52,016	30%	0	0%	52,016	30%	50,000	29%	121,371	70%
Industrial Process and Product Use (IPPU)	Not identified	-	-	-	-	-	-	-	-	-	-
Agricultural, Forestry and Land Use (AFOLU)	12,728	12,728	100%	0	0%	12,728	100%	12,728	100%	0	0%
Total	**3,763,735**	**3,011,731**	**80%**	**1,624,967**	**43%**	**1,386,764**	**37%**	**1,375,728**	**37%**	**752,004**	**20%**

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

This section provides the results of a systems and stakeholder mapping aimed at identifying systemic barriers and opportunities.

A-3.1: Description of urban systems, systemic barriers, and opportunities

The following systems are relevant to the achievement of ambitious climate neutrality target of Łódź:

- Technological and infrastructural systems: deployment of new technologies and infrastructure are important for climate mitigation actions in Energy Systems sector and Mobility and Transport sector. Large scale deployment of renewable energy requires availability and affordability of relevant energy generation technologies (e.g. small-scale wind turbines, PV systems, energy storage systems, heat pumps, etc.). Rapid increase of the share of electric vehicles requires availability of wide network of charging points within the city in locations that are convenient for drivers.

- Institutional and organizational systems: implementation of climate mitigation measures financed from municipal budget and attraction of external financial resources from national and EU programs, as well other sources of climate financing require strong institutional capacity of the local government and municipal organizations. This relates to the development of potential projects from concept ideas to securing financing and implementation, preparation of applications for financing, and monitoring of project implementation and achieved emission reductions.

- Financial systems: all actions required for the achievement of climate neutrality target requires attraction of significant additional financial resources and addressing barriers related to the limited internal capacity to attract finance for climate action, public finance limitations and difficulties in mobilizing private capital.

- Regulatory systems: supportive regulatory frameworks are important for creating the enabling environment for climate mitigation projects in the area of renewable energy, energy efficiency, and transport. As uncertainty related to regulatory and policy environment is considered as one of the important barriers for climate mitigation actions, predictable and stable national and local regulations that provides financial incentives or establish regulatory requirements are important for the achievement of climate neutrality target.

- Social and behavioural systems: the success of some key mitigation actions required for the achievement of climate neutrality target will depend on social acceptance and behaviour changes. This includes, for instance, the switching from private vehicles use to public transport for the everyday movement within the city, as significant investment in public transport infrastructure will maximize climate benefits only in case of significant increase in passenger flows.

The development of the above-mentioned urban systems will be tracked using the Impact Pathways indicators described in Module B-3 and other activities described in the action plan.

The description of key barriers and opportunities is provided in the table below.

System	Barriers	Opportunities
Technological and infrastructural systems	Infrastructural gaps relate to road network and public transport system and the city actively addresses this gap via large scale investment in tram network and	Opportunities in transport system include significant potential for citizens of the city to switch from private vehicles to modernized and efficient public transportation system.

	other public transportation systems. Technological gaps include low level of deployment of some renewable energy technologies, such as heat pumps, energy storage, and wind power. Unexploited resources (digital technologies, public transport, renewables).	Well-developed district heating system with significant progress and even larger potential for decarbonization of heat energy generation provides a significant opportunity for GHG emissions reduction in buildings sector. Relatively significant renewable resources, in particular, solar power generation potential, provides an opportunity for energy decarbonization.
Institutional and organizational systems	The scale of the efforts required to reach the climate neutrality target results in insufficient institutional capacity to plan, develop, secure finance, implement and monitor GHG emission reduction projects.	Increasing number of capacity building options provides an opportunity to meet the assistance needs and strengthen internal institutional capacity. Developing GHG emissions monitoring and accounting system provides an opportunity to better understand the dynamics of GHG emissions, driving factors, and the effect of implemented measures. Creating a pipeline of investment project and a portfolio of actions that can integrate additional investment projects create an opportunity to scale up climate action and strengthen cooperation between different stakeholders.
Financial systems	Access to affordable finance is one of the most important gaps for scaling up climate action for local authorities, private companies, and residents of the city.	Well-structured pipelines of investment projects could create opportunities for attracting additional investment using both private and public capital.
Regulatory systems	Regulatory barriers relate to the uncertainty of the nature and pace of implementation of various climate policies at the national and local level, as well as stability of such climate policies over time.	Clear declaration of ambitious climate neutrality target is an opportunity to confirm a stable and long-term support of climate investment in the city.
Social and behavioural systems	Low environmental awareness and low priority of climate change among other environmental concerns create a barrier for behaviour changes and adoption of climate technologies and climate-friendly lifestyles.	Investment in capacity building and awareness raising activities could provide an opportunity to achieve large-scale emission reduction at low cost due to changes of habits and consumption patterns.
The list of systemic opportunities and barriers to the city climate neutrality will be updated throughout the CCC Action Plan implementation period in consultation with stakeholders and taking into account the experience with climate projects and programs.		

The City of Łodź has been working on climate change mitigation and adaptation activities in cooperation with different stakeholders for a long time before joining the Climate-Neutral and Smart Cities Mission.

The groups of stakeholders could be summarized as follows:

- Citizens, including City residents (and sensitive group), Civil society organizations and NGOs, Community-based organisations, Educational organizations ;

- Academic and scientific community (e.g. Lodz University of Technology, University of Lodz and others);

- Business entities, including Technology and Equipment Providers, Utilities, Banks and other financial institutions and other Private companies (e.g. Ikea, Skanska, Echo Investments, Dell Technologies, PWC, OMENAA FOUNDATION and others), trade associations and labour associations;

- Local authorities and organizations, including Local government and internal departments and Municipal organizations;

- Government, including National government, EU authorities, EU Funds (e.g. Ministry of Climate and Environment, Ministry of Funds and Regional Policy, Ministry of Development and Technology, NCBR + Sp. z o.o. (Narodowe Centrum Badań i Rozwoju), NFOŚiGW (Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej), Institute of Environmental Protection - National Research Institute, and the National Economy Bank).

- Climate-Neutral and Smart Cities Mission (Warsaw, Wrocław, Kraków and Rzeszów);

Citizens are the most important stakeholders and opinion-makers for the authorities of The City of Łódź. For many years the City has been working on inclusion the residents in the decision-making processes regarding local policy-making, as well as implementation of projects and activities. Consultation processes are usually carried out through organized consultations, citizen panels, formal and informal meetings, and the Vox Populi online platform[6]. Among different topics, consultations are also carried out on the topics related to the City's activities on climate change mitigation and adaptation. Even before joining the Mission, the City held meetings related to the topic of climate neutrality, in particular, during the development of "Municipal policy and environmental protection of the City of Łódź 2030+" policy document in August-September, 2021. The aim of the consultations was to validate the assumptions, ideas and priorities reflected in the document. As part of the consultations, residents indicated "clean air and renewable energy sources" as the most important thematic area and priority actions included the use of renewable energy sources by the municipal institutions and organizations, businesses, and residents; the replacement of and prohibition of use of polluting heat sources, reducing air pollution, as well as education of children and youth. After joining the Mission, the City held a number of meetings with residents, including information meetings devoted to the possibilities of obtaining subsidies for the replacement of polluting heat sources or thermal modernization of buildings (in single- family buildings).

One of the most **important stakeholder engagement events** was the 2nd Łódź Citizens' Panel (II Łódzki Panel Obywatelski) (2023), where 60 panellists (selected from residents' applications) together with experts, scientists from the University of Łódź and experts from the UML worked on recommendations for the City on reducing greenhouse gas emissions. The topics discussed during the Panel included the identification of climate change related vulnerabilities and risks for the city, impact of carbon-intensive activities on air pollution and associated health benefits of climate change mitigation, as well as aspects related to climate change adaptation. The experts participated in the panel represented a wide area of expertise related to climate change, climate action and related topics: climatologist from the Department of Meteorology and Climatology, Institute of Climatology and Hydrology, Faculty of Geographical Sciences, University of Lodz; medical specialist - from the Clinic of

[6] An online platform for conducting local surveys and voting on various topics, https://vox.uml.lodz.pl/

Pneumonology, N. Barlicki University Hospital in Lodz; PhD in ecology at the European Regional Centre for Ecohydrology, Polish Academy of Sciences; PhD in economics from the Institute of Environmental Protection, National Research Institute; assistant professor at the Department of Econometrics, Faculty of Economics and Sociology, University of Lodz; researcher at the Centre for Energy Conversion and Renewable Sources, Polish Academy of Sciences in Jabłonna. During 5 meetings held as part of the Panel, recommendations were collected for the potential mitigation measures in the four thematic areas (Construction in the City, Energy in the City, Waste Management, Transport). The recommendations proposed (96 in total) were put for voting and 39 recommendations were supported and directed to the Mayor of the City. The list of selected recommendations is included in Annex 5. It should be added that the recommendations for today have been divided into:

- implemented (with most being continuous, e.g. installation of photovoltaic modules on municipal public facilities)
- in implementation (e.g. recommendation: Development and implementation of an educational programme at all levels and in all age groups in the scope of savings and developing environmental attitudes.
- to be implemented in 2024/2025 (e.g. Introduction of the use of technologies and materials that reduce greenhouse gas emissions in tender provisions for municipal construction investments).

All information regarding progress in implementing the recommendations is made available on the city website, so residents have constant access to information.

The next edition of the citizens' panel is currently under consideration.

Another important form of stakeholder engagement is the Civic Budget (an annual event), where any resident can submit an idea for implementation (with a description and cost estimate). After the committee (composed of employees of the Łódź City Hall and City Council members) has assessed all submitted projects, the selected pool of projects is put to a vote by the residents (the final selected projects are implemented the following year). Among the projects submitted, ecology and greening projects are always a large pool, therefore, due to the great interest, we are currently considering creating an CIVIC ECO-BUDGET, which will also focus on activities related to reducing emissions

Additional discussions on the opportunities for reducing greenhouse gas emissions were also held during workshops for residents at the end of 2023.

The outcomes of the consultations with the residents were taken into consideration during the development of the SECAP and CCC Action Plan. Residents' recommendations (in terms of projects due) were reflected in the resulting documents.

The preparation of the Action Plan for the Climate Contract or SECAP did not exhaust the workshop formula. The next step are the planned meetings with residents (in the form of consultations, information or workshops) on issues such as: the development of green areas in the city, renaturation of rivers, possibilities of obtaining subsidies in topics related to e.g. energy, small retention or meetings related to urban transport (changes and encouraging its use). In addition, as may be the case with the SECAP document, it should be pointed out that, e.g. due to a possible change in legislation or new opportunities for implementation, the document will be able to be supplemented and thus subject to a different form of consultation. Therefore, the participation of Łódź's inhabitants did not end with the adoption of the document and remains adaptable to the needs and expectations of the inhabitants resulting from the change of certain conditions.

In its activities, the City does not forget about **the so-called a group particularly sensitive to climate change**, which includes seniors, chronically ill, people with very low income (and the homeless), as well as children and pregnant women. Analyzes from recent years indicate a growing problem of the impact of climate change on urbanized areas. Due to the high population density, the post-industrial character of the city and the large amount of old buildings (Łódź has the most tenement houses in Poland) or its location on a watershed, Łódź is particularly exposed to an increase in the intensity of the urban heat island, torrential rains causing flooding, as well as water deficits in the future. Therefore, it is important to include these people in the transformation process. The voices of vulnerable groups are heard and

taken into account in planning and decision-making processes regarding the climate transition. Meetings are also organized dedicated to these groups, e.g. seniors. Educational campaigns are also carried out to increase the awareness of sensitive groups about climate change and its effects, as well as aid programs for the poorest people. Constant provision of information in an accessible, understandable way and adapted to various recipient groups, e.g. using materials in different languages or formats adapted to people with disabilities.

Education and awareness raising activities are also extremely important for the local authorities of Łódź to support climate mitigation actions. The city has organized an educational campaign with the slogan: "A degree less means more" („Stopień mniej znaczy więcej"). The aim of the campaign was to encourage the residents of Łódź to reduce the heating temperature in their apartments by one degree to decrease energy consumption and air emissions. Educational activities for the youngest residents of Łódź are conducted via "Łódź Schools for Climate" program, which combines different forms of educations and engage participants in real actions for climate protection. Such real actions in a form of different experiments and challenges, which are conducted or solved by children together with their parents and previously also teachers and project staff. Participants faced challenges related to saving energy and water, green transport, limiting meat consumption, food waste reduction, and others. As of 2024, two editions of the program have been held: 6 schools from Łódź participated in the first edition and 12 in the second (primary schools, high schools and technical schools). The program is conducted with the support of business entities (first edition was supported by Echo Investments, Dell Technologies and PWC; and the second edition – by OMENAA FOUNDATION), which demonstrates the importance of cooperation between different stakeholders' groups. It should be added that so far the project has been a pilot project, but thanks to the funding received (Integrated Territorial Investments), the project will be implemented (it will become a city project) and from the end of 2025 it is to be implemented in 123 schools. The project received a lot of interest from other cities and resonated enough to gain the attention of national authorities as well. So much so that representatives of the City are now participating in the work of developing a National Environmental Education Programme.

Other example of awareness raising activities to encourage the youngest residents of Łódź to take care of the environment is the Eco-Experimentarium event organized in the fall of 2023. Eco-Experimentarium is an interactive space, where kids could learn how their daily actions at home impact the climate (e.g. count the carbon footprint of activities performed in connection with running a household). Due to the high level of interest, on the basis of the experience gained, the creation of an Environmental Education Centre is being considered, which would take a permanent and broader form than the earlier experiment. The centre would take the form of puzzle rooms and also involve and educate residents in a workshop format.

Academic and scientific community is not only actively participates in educational and awareness raising activities but is also an important partner for enabling climate neutrality by providing the skilled workforce and expertise to launch innovative climate projects and programs. In the context of climate change mitigation, joint projects with the University of Lodz and the Lodz University of Technology are particularly important. Experts and students take active part in various stakeholder engagement activities (e.g. Citizens' Panel), in the process of designing new green areas, and many technical projects. For instance, the city works on a "New Generation Engineers" project, which unites four entities: UML, Lodz University of Technology, the Embassy of the Kingdom of Denmark and Danfoss company. As part of the project, a group of students appointed by the University of Technology worked on a plan to improve the energy efficiency of buildings selected for analysis by UML This is an example of partnership among government (providing access to available project documentation and energy consumption data but also receiving high-quality analysis of potential interventions to reduce energy consumption), academic and scientific community (providing expertise and knowledge but also receiving practical learning opportunities for students) and business (providing information on potential technological solutions).

It should also be emphasised that in many areas, the city is supported in its many activities by

universities, such as in consultation activities with citizens, the development of strategic documents, and they are also an advisory voice in many city projects. At the same time, the city also supports universities and academia by being a partner in many projects such as those from Horizon, participating in conferences. And also by working with universities on a student internship programme. This allows students to take them to the office to put the knowledge they have already acquired into practice, to exchange it and also to acquire new knowledge from experienced staff. And to develop their skills and acquire new ones.

Further cooperation with the academic community is planned in the near future, including involving students in a project related to supporting ecosystems in forest parks, a project related to managing and monitoring the space around the university, a project to green selected space, involvement in activities related to the 3rd edition of the Local Government Climate Congress, as well as continuing the implementation of the “New Generation Engineers” project, as well as involvement related to the preparation of Urban Future conference).

Business entities are also instrumental for the achievement of climate neutrality target as they are important providers of technological solutions but also finance for a significant share of emission reduction interventions. The City has been working on climate mitigation projects together with businesses for a long time and established an Ecopact - a form of cooperation that allows supporting the City's efforts to build a more environmentally friendly environment. Some of the activities with business began even before joining the Mission and are constantly evolving. As part of the cooperation, companies, institutions and other interested entities can financially support projects such as planting new trees, creating squares, organizing educational workshops, installing air sensors or larger-scale projects that can have a positive impact on the environment. So far, over 50 entities have been involved in cooperation within Ekopakt, including: Veolia, Airly, Tyte&Lyle, MAkoLab, PWC, Warimpex, Puro Hotels, Commerzbank, Orange, Segro, Zespół Szkół Rzemiosła and many others.

Cooperation within Ekopakt is continuing, talks are underway with other companies, so further joint projects are planned for the coming years. In addition, an evaluation of the project is planned for mid-2025 so that it can become an even more effective platform for cooperation between the city and the wider business community.

The dialogue with entrepreneurs is also extremely important for the City. Climate neutrality issues have been raised many times during individual meetings with entrepreneurs, events, and dedicated workshops. An example of such action is the business workshops that took place in March 2024 with participation of many companies (e.g. Skanska, BZB Projekt, Visa, Puro Hotels, ABB, Veolia, InPost, EPSON). The workshops were held in cooperation with Deloitte, and their main goal was to develop common ideas for possible actions that can be implemented by the City and various business entities (not only large enterprises but also small and medium-sized enterprises) to contribute to the pursuit of climate neutrality. The list of ideas developed during the workshops is included in Annex 6. Once the contract has been submitted, a series of further meetings with company representatives is planned from 2025, which will form (according to the recommendations of the workshop held in March) a working group focused on building a dialogue between the entrepreneurs involved, opening up new perspectives for cooperation and enabling further recommendations for action. The plans under consideration for the near future also include the implementation of the recommendations from the meeting, i.e. the creation of a 'Green Fund' from which the city could implement 'green' activities, such as thermal modernisation of city buildings, as well as joint marketing activities (city - entrepreneurs) to share their knowledge and good practices, and educational activities such as: the implementation of educational campaigns to raise the environmental awareness of residents (e.g. on energy saving).

Participation in the Mission will give additional stimulus for strengthening cooperation with businesses. In particular, the City has signed a Letter of Intent with district heating operator to work together in the implementation of the Mission goals and reduce GHG emissions while also supporting sustainable development of the city. The City will also work with other businesses to further accelerate the development of sustainable transport, district heating grid, waste management and other initiatives that

will contribute to the Mission goals and 2030 climate neutrality target. Plans for the end of 2024 include the start of cooperation with Veolia (district heating operator) and Innargi (Danish geothermal leader) to launch a joint project related to the exploration and use of geothermal resources in Łódź (the project is one of the elements of the decarbonisation of the Łódź district heating system, improving energy efficiency based on renewable energy sources). It is also an opportunity to develop new resources in the city and thus the possibility of using geothermal energy as a significant source of heating, as well as producing electricity. Which, in turn, would provide an opportunity to achieve reduction targets in a shorter time.

Government is also a crucial stakeholder for the implementation of the Climate Neutrality Plan, as both EU and national policies and regulations define the policy environment that could either support or hinder climate action. As part of the cooperation between cities and the Ministry of Climate and Environment, several workshop meetings were held in 2024, aimed at obtaining support from the Ministry in preparing Climate Contracts, specifying action plans to help cities achieve climate neutrality faster than required by EU guidelines, including finding new sources of financing for decarbonization projects, or creating a National Energy and Climate Plan. The meetings also involved experts from the Ministry of Funds and Regional Policy, the Ministry of Development and Technology, NCBR + Sp. z o.o. (Narodowe Centrum Badań i Rozwoju), NFOŚiGW (Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej), the Institute of Environmental Protection - National Research Institute, and the National Economy Bank.

In the short term, we plan to continue the dialogue with representatives of the Ministries with regard to the search for new forms of financing and the possible facilitation of applications for funds granted by the Ministries, as well as the shape of the National Energy and Climate Plan 2021-2030. Representatives of the city will also be involved (as a working group) in the participatory process of developing guidelines for the draft strategic action plan for environmental education - a document included in the National Environmental Policy 2030 (the meetings will be attended by representatives of nationwide organisations involved in education, nature protection and Ministries, including the Ministry of National Education and the Ministry of Science and Higher Education).

As part of the **Mission**, ongoing cooperation with other Polish cities involved in the Mission is also extremely important for UML. Representatives of Łódź, Warsaw, Wrocław, Kraków and Rzeszów hold biweekly meetings during which current issues related to the process are discussed, and also participate in other meetings and workshops related to the Mission (e.g. a series of workshops organized by the Center for System Solutions). The cities also closely cooperate within the NEEST project and are also in cooperation with the Ministry of Climate and Environment in the work on the Climate Contract.

The city is actively involved in exchanging experiences and building partnerships during various events organized in the city and other locations and bringing together residents, scientific community, civil servants, businesses and other stakeholders, for instance:

EKOinnovations conference organized in the Łódź Orientarium (2022) - future solutions in the field of energy were presented ;

- Local Government Climate Congress organized by the City (2022 and 2023) - a panel discussion and meetings organized to connect local government, scientific, business and institutional communities - including foreign ones, and to build a network of connections for the exchange of knowledge and experience. The next edition of the event is planned for May 2025 and will provide an excellent opportunity to share knowledge and experience. The academic community and business stakeholders, among others, will be involved in the work of the event. The congress is a unique event that has attracted several hundred participants in previous editions. In addition to leading local government and national decision-makers, representatives of science, business and non-governmental organizations, it also drew the attention of, among others, Representatives of the European Commission who took an active part in the event.

Important initiative for building partnerships is the European City Facility (EUCF) - an initiative supporting local governments in developing investment concepts that contribute to the implementation of activities specified in local climate and energy action plans. The overarching goal is to mobilize investments in

the area of sustainable energy in European cities and municipalities. The main objectives of the EUCF include:

- to provide cities with practical technical and financial knowledge, inspired by European best practices, in order to stimulate public and private investment, build the competences of officials in developing new projects and provide them with tools and opportunities for networking and knowledge transfer;

- to facilitate access to private and EU funding, including: the European Structural and Investment Fund (ESIF), the Horizon 2020 programme and the services of the European Investment Bank (EIB).

Within the EUCF Łódź received a grant to develop an Investment Concept entitled: "Emission reduction in 100 municipal buildings in the historic center of Łódź", which allowed to performed energy audit and feasibility assessment of GHG emissions reduction options in 100 municipal buildings in the historic center of Łódź (renovation, comprehensive thermal modernization, replacement of heat sources and connection to the heating network, PV installations, etc.).

Other opportunity for building partnership and capacity is the European Climate Pact platform, which is aimed at cooperation between local governments and EU institutions. Łódź has been selected for the pilot programme in 2022. This cooperation enables local authorities to connect and share knowledge. This enables them to develop, implement and adapt solutions to deal with, among other things, the energy crisis. One element of the programme was consultative meetings with residents.

Joining the Mission created new opportunities and stimulus to intensify stakeholder engagement activities related to climate action within the city and building partnerships with local, national and international partners. The representatives of Łódź participated in the following events:

• Urban Future conference (an annual event on sustainable development of cities, their future and climate change. This is a major international event dedicated to comprehensive and sustainable urban development. The European Urban Future family includes more than 100 organisations, bringing together designers of change and major institutional authorities to create ready-to-implement urban development solutions. The UF conferences are now among the largest events for sustainable cities in Europe, setting standards in the level of quality and openness in sharing experiences. It is worth noting that the next edition of this international event on sustainable cities will take place in Łódź, Poland, in May 2025. In this way, Łódź will become the first centre in this part of the continent to become the capital of European innovation and creative thinking about the cities of the future. Work is planned for the near future on the preparation of the event (together with its main organiser), which will involve business, NGOs or the scientific community

• PRECOP 2023 – a preparatory event for the UN Climate Summit (talks with UN representatives on energy security, emission reduction and new technologies for the climate);

• Smart City Expo World Congress - Barcelona 2023 (an exhibition providing an excellent opportunity to establish new contacts, exchange experiences and gain knowledge from international on modern pro-climate solutions);

• a conference to launch the work within the "Environmental Partnership for Development" network (with the participation of the Minister of Climate and Environment of Poland);

• a seminar organized as part of the cooperation between the OEES CityLab platform and the InPost Green City program entitled "Climate and environmental challenges in cities";

• a panel "The impact of green investments on the economic development of the region. Lessons from the EU Mission on climate-neutral and smart cities by 2030." (discussion with the participation of representatives of Polish cities in the Mission);

• a panel as part of #LocalTrends in Poznań - "How can business and local government jointly care for the environment and conduct ecological education?".

Information on key stakeholders, their influence on the city's climate neutrality ambition and interests is presented in the table below. The city will also actively work on linking various stakeholders with each other to build strong and efficient alliances and partnerships that could foster climate action on the way to climate neutrality target.

A-3.2: Systems & stakeholder mapping			
System	**Stakeholders**	**Influence on the city´s climate neutrality ambition**	**Interest in the city´s climate neutrality ambition**
Technological and infrastructural system	Technology and equipment providers	**Medium.** Provision of locally relevant and feasible technological solutions	**High.** Sales and market extension
	Citizens[7]	**High.** Adoption of climate technologies and behaviour changes (e.g. switching to public transport)	**Medium.** Improved quality of life in the city
	Municipal organizations	**High.** Implementation of climate mitigation projects and monitoring of impact	**High.** Efficient operation and contribution to climate goals
	Utilities	**High.** Investment in decarbonization efforts (e.g. district heating and power), enabling infrastructure (e.g. for EV charging points, renewables, natural gas or district heating networks connection, etc.).	**Medium.** Synergies with own development plans and decarbonization goals
	Local government and internal departments	**High.** Implementation of local policies and programs, investment from local budgets, fostering cooperation between various stakeholders	**High.** Demonstrating leadership in climate mitigation efforts at the national and regional level
	National government	**High.** Adoption and implementation of national policies and programs (e.g. subsidies, co-financing mechanisms)	**High.** Implementation of national climate goals and fostering green transition
	Banks and other financial institutions	**High.** Provision of financing for climate action	**Low.** Reliable clients for green loans programs (low financed emissions)
	Academic and scientific community	**Medium.** Provision of recommendations on most efficient technological solutions and implementation of pilot projects.	**High.** Practical implementation of the results of scientific and research work, contribution to decarbonization goals. Involvement of experts in training and capacity building activities.

[7] including groups sensitive to climate change

	Private companies	**Low.** Implementation of climate mitigation projects and sharing information on best practices and effect achieved	**Low.** Synergies with own development plans and decarbonization goals

System	Stakeholders	Influence on the city´s climate neutrality ambition	Interest in the city´s climate neutrality ambition
Institutional and organizational systems	Local government and internal departments	**High.** Managing implementation of the projects, monitoring impact, fostering cooperation between various stakeholders	**High.** Demonstrating leadership in climate mitigation efforts at the national and regional level
	National government	**High.** Adoption and implementation of national policies and programs and capacity building activities. Provision of reliable information on mitigation technologies and associated costs.	**High.** Implementation of national climate goals and fostering green transition
	EU authorities	**High.** Capacity building activities and facilitating exchange of best practices in local climate governance	**High.** Implementation of Green Deal policy package at a local level
	Utilities	**Medium.** Data provision for planning GHG emission reduction project and monitoring GHG emissions.	**Medium.** Synergies with own development plans and decarbonization goals
Financial systems	Local government and internal departments	**High.** Prioritization of local climate mitigation actions and financing of priority projects from municipal budget Securing external finance for climate action (e.g. loans, green bonds, PPPs)	**High.** Demonstrating leadership in climate mitigation efforts at the national and regional level
	National government	**High.** Supporting existing and launching new subsidy / co-financing programs for GHG emission reductions Investment in infrastructure projects reducing climate impact	**High.** Implementation of national climate goals and fostering green transition
	Banks and other financial institutions	**Medium.** Provision of green finance, including concessional finance, for climate mitigation projects	**Low.** Reliable clients for green loans programs (low financed emissions)

	EU Funds	**High.** Provision of grant-based and concessional finance for climate mitigation projects Technical assistance and capacity building	**High.** Fostering green transition at local level in line with the established statutory goals

Regulatory systems	Local government and internal departments	**High.** Designing and approving local climate policies to support climate mitigation, including subsidies / co-financing, spatial planning regulations, procurement rules, etc.	**High.** Demonstrating leadership in climate mitigation efforts at the national and regional level
	National government	**High.** Designing and implementing national climate policy.	**High.** Implementation of national climate goals and fostering green transition
Regulatory systems	EU authorities	**High**. Designing and implementing EU level climate policy, including with the focus on local climate action.	**High.** Implementation of Green Deal policy package at a local level
Social and behavioural systems	Citizens[8]	**High.** Impact on the effectiveness of national and local climate policy and investment via adoption of climate technologies and behaviour changes.	**Medium.** Improved quality of life (e.g. air quality, green zones), well-functioning infrastructure and public transport system
	Local government and internal departments	**High.** Promoting the financial and non-financial benefits of climate action, awareness raising and informational activities, fostering collaboration and partnerships among stakeholders.	**High.** Demonstrating leadership in climate mitigation efforts at the national and regional level
	Academic and scientific community	**High.** Participation in capacity building and awareness raising activities both for the residents and local authorities.	**High. C**ontribution to decarbonization goals.
	Civil society organizations and NGOs	**Medium.** Awareness raising and informational activities	**Medium.** Implementation of statutory priorities and incorporation of own projects into a broader local context, building partnerships.
	Community-based organisations	**Low.** Awareness raising and informational activities	**Low.** Improved quality of life

8 including groups sensitive to climate change

	Educational organizations	**Medium.** Awareness raising and informational activities. Providing curricula to train workforce for green transition.	**Medium.** Incorporation of local actions into educational process

The stakeholder mapping table will be updated throughout the CCC Action Plan implementation period.

3 Part B – Pathways towards Climate Neutrality by 2030

3.1 Module B-1 Climate Neutrality Scenarios and Impact Pathways

CCC Action Plan is a cross-sectoral document designed to radically reduce greenhouse gas emissions via supporting the enabling factors ("Levers of Change") for identified action portfolio. Such enabling factors (systemic levers) include, but are not limited to, governance and policy, regulation, technology and infrastructure, culture, social innovation, citizen engagement, capacity development, finance, business models, and local development strategies.

Detailed information on the calculation of direct impacts (emission reductions) is provided in the GHG emission calculation tool, which is used by the city to track GHG emissions within the city and the impact of climate mitigation actions.

B-1.1: Impact Pathways					
Fields of action	**Systemic levers**	**Early changes**	**Late outcomes**	**Direct impacts (emission reductions)**	**Indirect impacts (co-benefits)**
Energy systems	Technology and infrastructure	Replacement of coal-fired heating sources with a combination of renewable energy and other low-carbon solutions, such as heat pumps, solar collectors, district heating and others.	Complete phase-out of coal combustion for heating in residential buildings	153,000 t CO_2	Decrease of air pollution and smog generation in the city (PM10, PM 2.5 and other polluting substances)
		Improving efficiency and decarbonization of district heating system in the city due to replacement of coal with biomass and natural gas	Further reducing carbon footprint of heat energy used in buildings and development of low-carbon district heating system	370,000 t CO_2	More reliable and affordable energy supply

		Increasing the number of PV installations on private, municipal and commercial buildings	Tripling the deployment of solar power systems, increasing the share of renewables and reducing	50,000 t CO_2	Enhanced energy security Economic and social benefits due to savings on electricity cost
			the dependency from grid power supply		Reduced air pollution
		Deployment of wind turbines as a renewable energy source for residential and other buildings	Diversification of renewable energy supply options and reducing the dependency from grid power supply	5,000 t CO_2	Enhanced energy security Economic and social benefits due to savings on electricity cost Reduced air pollution
	Business models	Piloting the use of contractual instruments such as PPAs for renewable energy purchase	Purchase of renewable energy for all public buildings and electric public transport	167,000 t CO_2	N/A
		Development of EV charging infrastructure and extending the network of charging stations to create enabling conditions for private transport fleet electrification	Achieving the share of EVs of at least 20% of all vehicles registered in the city and sufficient charging infrastructure available	225,000 t CO_2	Decrease of air pollution, especially along the main road networks (PM10, PM 2.5 and other polluting substances)

Mobility & transport	Technology and infrastructure	Construction of the cross-city tunnel in Łódź	Reducing the number of vehicles in the centre of the city and increasing the use of urban railway transport	10,000 t CO_2	Decrease of air pollution, especially along the main road networks (PM10, PM 2.5 and other polluting substances) Reducing the travel time for residents Improving convenience of public transportation system
		Public transport system electrification	Reducing the use of private vehicles and improvement the quality of public transportation system	26,000 t CO_2	Decrease of air pollution, especially along the main road networks (PM10, PM 2.5 and other polluting substances)
Waste & circular economy	Technology and infrastructure	Construction of Łódź Recycling Center (Łódzkie Centrum Recyklingu)	Increasing waste recycling rate	50,000 t CO_2 (preliminary assessment of emission reduction from improved waste management)	Contribution to circular economy development
Green infrastructure & nature-based solutions	Governance and policy	Tree planting and developing of green zones in the city within the Greening Strategy	Increased share of the green zones and better quality of green zones	10,000 t CO_2 (removal)	Improved quality of life due to better accessibility of green zones
	Governance and policy	Improving land use efficiency and avoiding GHG emissions from land use change	Protection of green zones	12,728 t CO_2	Improved city development planning and associated economic and social benefits

Built environment	Technology and infrastructure	Launching subsidy scheme to conduct energy audits for buildings to determine the most cost-effective modernization measures	Additional energy efficiency improvements and GHGs emission reductions in buildings sector	307,000 t CO_2	Improved energy security Economic and social benefits due to lower energy costs

B-1.2: Description of impact pathways

The impact pathways to achieve climate neutrality are defined based on the current and expected structure of GHG emissions in the city taking into account the actions planned under the SECAP. The impact pathways are focused on the following sectors:

- **energy systems sector**, which define the carbon intensity of energy used,
- **built environment sector**, which defines the demand for energy, and
- **mobility and transport sector**, where transformational changes are required to reduce both the demand for energy and carbon intensity of transportation services.

The main arguments for the selection of impact pathways include the scale of GHGs emissions in a particular sector, mitigation actions already included in the SECAP, as well as technologies available for further GHG emission reductions.

The impact pathways aimed at additional and deep emission reductions compared to those already planned under existing strategies and plans and are fully aligned with the 2030 Climate Neutrality Commitment.

The government of The City of Łodź will continuously work on further expansion of the list of impact pathways, including technology and infrastructure solutions, but also focusing on innovative governance and policy tools, regulations, social innovation, citizen engagement, capacity development, new finance tools and local development strategies.

Realization of the actions defined under impact pathways will allow achieving the strategic priority of climate neutrality by 2030.

3.2 Module B-2 Climate Neutrality Portfolio Design

B-2.1: Description of action portfolios

Fields of action	**Portfolio description**	
	List of actions	**Descriptions**
	Phase out of coal fired heating in residential sector before 2030	Complete replacement of coal fired heating units in residential sector with the focus on low-carbon alternatives, including heat pumps and other renewable energy sources, using investment from various sources, including national, municipal and private.
	District heating and electricity generation decarbonization	Reconstruction of EC3 infrastructure for the combustion of black pellets - BATII (supporting early implementation of the project and other decarbonization measures in district heating system) in addition to other decarbonization projects foreseen under the SECAP.
	Tripling the deployment of solar power installations	Tripling the deployment of solar power installations in residential and commercial buildings and in other

Energy systems		public and private locations (e.g. construction of a solar power plant at Szczecińska str., installation of solar power systems on the roofs of multi-apartment and individual buildings, public buildings, and other locations).
	Installation of wind turbines in residential sector	Installation of wind turbines with individual capacity of 1-20 kW using the support via "Moja elektrownia wiatrowa" program and other sources of investments. “Moja elektrownia wiatrowa“ program is implemented by Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej (NFOŚiGW) and provides 50% of financing for the installation of wind turbines and energy storage systems).
	Using contractual instruments to procure renewable energy	Using contractual instruments to procure renewable energy (PPAs, guarantees of origin or other instruments) for the needs of public buildings and electric public transport in the city.

B-2.1: Description of action portfolios		
Fields of action	**Portfolio description**	
	List of actions	**Descriptions**
Mobility & transport	Development of EV charging infrastructure and private transport fleet electrification	Investment in public charging points and supporting electrification of the transport via other means to create enabling conditions for the growth of EV share to 20% in 2030 in line with projections for EU average values and close the infrastructure gap (i.e. lower rate of charging points increase compared to EV sales). The action will also support installation of charging points at homes and business locations.
	Construction of the cross-city tunnel in Łódź	Construction of the cross-city railway tunnel with a length of 7.5 km under the centre of Łódź, which will connect the Łódź Fabryczna station with the Łódź Kaliska and Łódź Żabieniec stations and allow reduce the number of private vehicles on the streets of the city.
	Public transport system electrification	Electrification of buses with the goal to replace all diesel fuel buses with electric buses or other low-carbon alternatives.
Waste & circular economy	Construction of Łódź Recycling Center (Łódzkie Centrum Recyklingu)	MPO Łódź is planning to build the Łódź Recycling Center (ŁCR) and launch its operation in 2028. ŁCR will include sorting lines for mixed municipal waste, as well as special lines for the processing of separated waste streams (e.g. plastics and metals, paper, glass, bulk waste, and organic waste. The ŁCR also will include a RDF production installation.
Green infrastructure & nature-based solutions	Tree planting and developing of green zones in the city within the Greening Strategy	Implementing the Greening Strategy to enhance carbon dioxide removals from the atmosphere and contribute to the neutralization of residual emissions. The action includes revitalization of parks and green areas, creation of new urban forests and parks, creation of pocket parks near residential buildings, and greenery along the city's public transport communication system, as well as creation of green parking areas (with geogrid and grass cover). This action also includes gradual restoration and revitalization of river valley areas through Blue-Green Network initiatives and other revitalization projects.

	Improving land use efficiency and avoiding GHG emissions from land use change	Increasing land use efficiency via development of spatial planning documents and prioritization of brownfield projects to avoid additional land conversion from forest land and other green areas to built-up territories by 2030 and beyond.
Built environment	Intensifying energy efficiency improvements in buildings	Implementing energy efficiency projects in buildings with the goal to double energy savings compared to the actions included in the SECAP. This action will include launching a subsidy scheme to conduct energy audits for buildings to determine the most cost-effective modernization measures, supporting capacity building on energy efficiency in buildings and other measures to intensify decarbonization of buildings sector. Additional energy savings will be achieved due to development of urban green and blue infrastructure that will increase comfort and lower energy demand.

The description of key transformative projects on the way to climate neutrality of Lodz City is provided in the table below.

B-2.2: Individual action outlines		
Action outline	Action name	**Phase out of coal fired heating in residential sector before 2030**
	Action type	Fuel switch
	Action description	The action foresees complete replacement of coal fired heating units in residential sector with the focus on low-carbon alternatives, including heat pumps and other renewable energy sources, as well as connection to the district heating network. The action will be implemented via existing programs, such as Clean Air Program (Czyste Powietrze) and Warm Housing Program (Ciepłe Mieszkanie), as well as using private funds of the residents and other sources of finance. Heat pumps could be a promising solution for decarbonization of residential heating sector due to efficiency conversion of ambient energy and rapidly growing market in Poland. Poland demonstrates one of the highest growth rates in terms of heat pump sales with total number of units sold exceeding 200,000 in 2022 and almost one in three units in the total number of space

		heating units sold in Poland was a heat pump.[9] District heating is another low-carbon option, as coal consumption is expected to be reduced significantly and eventually phased-out in the local district heating system.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Technology and infrastructure
	Outcome (according to module B-1.1)	Complete phase-out of coal combustion for heating in residential buildings
Implementation	Responsible bodies/person for implementation	City of Łódź Office (UML), residents of the city, ZLM (Zarząd Lokali Miejskich- Municipal Housing Authority), Assembly of the Łódź Voivodeship[10]
	Action scale & addressed entities	City-wide action
	Involved stakeholders	Real Estate Board of the Łódź Voivodeship, heat suppliers (e.g. Veolia Energia Łódź), "housing cooperatives[11]", "housing communities[12]", Estate Councils
	Comments on implementation – consider mentioning resources, timelines, milestones	The implementation of the action is ongoing with gradual replacement of coal fired heating sources. Estimated coal consumption in residential sector has been reduced from about 1.5 million MWh in 2018 to about 1 million MWh in 2022 (estimates based on the voivodship level data). Due to the scale of the task the action will continue till 2030.
Impact & cost	Generated renewable energy (if applicable)	Not applicable

[9]PORT PC: 2022 was the Year of Heat Pumps in Poland, https://www.ehpa.org/news-and-resources/news/port- pc-2022-was-the-year-of-heat-pumps-in-poland/

[10] Has the competence to adopt an air protection program for the voivodeship, under which it may prohibit the use of specific types of heating boilers.

[11] e.g. particular, housing cooperatives operate in the Śródmieście , Bałuty, Stare Polesie districts

[12] e.g. as above

	Removed/substituted energy, volume, or fuel type	Energy from coal combustion will be substituted with low-carbon alternatives – approximately 1 million MWh per year.
	GHG emissions reduction estimate (total) per emission source sector	153,000 t CO_2e
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	EUR 258 million 84 EUR / t CO_2e (estimated assuming 20 years lifetime of new low-carbon equipment) The costs are based on preliminary estimates based on the results of Clean Air Program and will be updated in the process of CCC Action Plan implementation if more reliable data become available.
Action outline	**Action name**	**District heating and electricity generation decarbonization**
	Action type	Fuel switch
	Action description	SECAP includes a number of large-scale actions focused on the decarbonization of district heating and local power generation systems via switching from coal to biomass and natural gas, as well as energy efficiency improvements before 2030. Reconstruction of EC3 infrastructure for the combustion of black pellets – BATII foresees comprehensive modernization of the EC3 equipment to switch from coal combustion to biomass pellets combustion. The action is included in the SECAP with a post 2030 expected completion date and the city plans to support early implementation of the project and other decarbonization measures in district heating system to ensure its contribution to 2030 climate neutrality aspiration. The City cooperates with district heating operator to identify additional decarbonization opportunities. In particular, the parties are exploring the project of constructing a heat recovery installation at the Group Sewage Treatment Plant in Łódź. The project will improve energy efficiency and energy generated in the process of treating municipal sewage will be used to heat apartments in Łódź. Other project opportunities include renewable energy installations sewage sludge management projects.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Technology and infrastructure
	Outcome (according to module B-1.1)	Further reducing carbon footprint of heat energy used in buildings and development of low-carbon district heating system

Implementation	Responsible bodies/person for implementation	District heating operator
	Action scale & addressed entities	District heating network
	Involved stakeholders	City of Łodź Office (UML), regional and national authorities
	Comments on implementation – consider mentioning resources, timelines, milestones	-
Impact & cost	Generated renewable energy (if applicable)	Approximately 1 million MWh
	Removed/substituted energy, volume, or fuel type	Not applicable
	GHG emissions reduction estimate (total) per emission source sector	370,000 t CO_2
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	Confidential
Action outline	**Action name**	**Tripling the deployment of solar power installations**
	Action type	Renewable energy
	Action description	The action foresees large scale deployment of solar power installations in the city with the goal of tripling the available installed capacity of PV systems. This will include both ground-based and roof-top systems on residential and commercial buildings and in other public and private locations (e.g. construction of a solar power plant at Szczecińska str., installation of solar power systems on the roofs of multi-apartment and individual buildings, public buildings, and other locations).
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Technology and infrastructure
	Outcome (according to module B-1.1)	Tripling the deployment of solar power systems, increasing the share of renewables and reducing the dependency from grid power supply
Implementation	Responsible bodies/person for implementation	City of Łódź Office (UML: especially the Office of Energy and Air Quality), residents of the city, ZLM (Zarząd Lokali Miejskich- Municipal Housing Authority),
	Action scale & addressed entities	City-wide action
	Involved stakeholders	“housing cooperatives[13] ”, “housing communities[14]”, Estate Councils, entrepreneurs, educational units e.g.schools), WFOŚiGW,

[13]. E.g. in particular, housing cooperatives operate in the Retkinia, Teofilów, Dąbrowa, Chojny, Widzew, Radogoszcz housing etates

[14] As above

	Comments on implementation – consider mentioning resources, timelines, milestones	Implementation of the action will be monitored using the data from Polish Energy Comapny (PGE) on the available installed capacity and electricity generation volumes. The action will be financed using various resources, including city's budget for the installations on municipal buildings, private investments from residents, and other sources of financing.
Impact & cost	Generated renewable energy (if applicable)	111,197 MWh
	Removed/substituted energy, volume, or fuel type	Not applicable
	GHG emissions reduction estimate (total) per emission source sector	50,000 t CO_2e
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	EUR 77 million 102 EUR / t CO_2e (estimated assuming 15 years lifetime of new PV systems) The costs are based on preliminary estimates and will be updated in the process of CCC Action Plan implementation if more reliable data become available.
Action outline	**Action name**	**Installation of wind turbines in residential sector**
	Action type	Renewable energy
	Action description	Implementation of the action foresees Installation of wind turbines with individual capacity of 1-20 kW using the support via "Moja elektrownia wiatrowa" program and other sources of investments. "Moja elektrownia wiatrowa" program is implemented by Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej (NFOŚiGW) and has a budget of 400 mln zł and provides 50% of financing for the installation of wind turbines and energy storage systems). Depending on the energy needs expected to be covered by the system (e.g. energy efficiency lighting and small appliances or complete power demand of the building) the capacity of the wind turbine for the residential building could be 3-10 kW or higher. To operate efficiently the system also requires integration of energy storage and the programs foresees additional payments for the installation of batteries with the minimal capacity of 2 kWh.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Technology and infrastructure
	Outcome (according to module B-1.1)	Diversification of renewable energy supply options and reducing the dependency from grid power supply

Implementation	Responsible bodies/person for implementation	City of Łodź Office (UML: : especially the Office of Energy and Air Quality)), residents of the city, , residents of the city, ZLM (Zarząd Lokali Miejskich- Municipal Housing Authority),
	Action scale & addressed entities	City-wide action
	Involved stakeholders	"housing cooperatives [15] ", "housing communities[16]", Estate Councils, NFOŚiGW, entrepreneurs
	Comments on implementation – consider mentioning resources, timelines, milestones	Use of wind turbines in the residential sector in urban areas is an emerging practice and the implementation of the action would require show-casing of good practices from early adopters and overall support and awareness raising activities.
Impact & cost	Generated renewable energy (if applicable)	10,950 MWh
	Removed/substituted energy, volume, or fuel type	Not applicable
	GHG emissions reduction estimate (total) per emission source sector	5,000 t CO_2e
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	EUR 23 million 307 EUR / t CO_2e (estimated assuming 15 years lifetime of new wind turbines and energy storage systems). The costs are based on preliminary estimates and will be updated in the process of CCC Action Plan implementation if more reliable data become available.
Action outline	**Action name**	**Using contractual instruments to procure renewable energy**
	Action type	Renewable energy
	Action description	The action foresees the use of contractual instruments to procure renewable energy (PPAs, guarantees of origin or other instruments) for the needs of public buildings and electric public transport in the city. This would allow minimization of indirect GHG emissions from the generation of electricity used in the city.
Reference to impact pathway	Field of action	Energy systems
	Systemic lever	Business models
	Outcome (according to module B-1.1)	Purchase of renewable energy for all public buildings and electric public transport

[15] . E.g. in particular, housing cooperatives operate in the Retkinia, Teofilów, Dąbrowa, Chojny, Widzew, Radogoszcz housing etates

[16] As above

Implementation	Responsible bodies/person for implementation	Government of The City of Łodź (UML)
	Action scale & addressed entities	The action is focused on the entities under direct control of UML.
	Involved stakeholders	MPK-Łódź Sp. z o.o., electricity suppliers (e.g. PGE) , renewable energy producers
	Comments on implementation – consider mentioning resources, timelines, milestones	Implementation of the action requires legal and regulatory analysis of the options for renewable energy purchase for the local government, identification of specific contractual arrangements and responsible units.
Impact & cost	Generated renewable energy (if applicable)	Not applicable
	Removed/substituted energy, volume, or fuel type	Not applicable
	GHG emissions reduction estimate (total) per emission source sector	167,000 t CO_2e
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	To be defined based on the options available on the market.
Action outline	**Action name**	**Development of EV charging infrastructure and private transport fleet electrification**
	Action type	Transport electrification

	Action description	The action foresees investment in public charging points and supporting electrification of the transport via other means to create enabling conditions for the growth of EV share to 20% in 2030 in line with projections for EU average values and close the infrastructure gap (i.e. lower rate of charging points increase compared to EV sales). The action will also support installation of charging points at homes (incentivizing charging infrastructure for new residential buildings and supporting installation of charging points during building retrofit) and business locations (coordination with main employers and supporting charging points installation). Lack of access to efficient charging infrastructure is one of the most significant barriers to EV purchase and its role is even growing over time since the cost of EVs is declining and driving range is increasing. Investment in public charging infrastructure is thus an important enabler of large-scale EVs deployment in the city with each charging point installed able to trigger at least 10 additional electric vehicles on the roads of the city. The Plan for construction of public charging stations for electric vehicles on the territory of Lodz City approved by Lodz City Council on 20th October, 2021 foresees establishing at least 100 charging stations with 200 charging points (11 kW each) in addition to the 38 charging points existed at the time of the Plan approval. Additional measures, including privately owned charging stations, will be implemented within CCC Action Plan implementation.
	Field of action	Mobility & transport
	Systemic lever	Technology and infrastructure
Reference to impact pathway	Outcome (according to module B-1.1)	Achieving the share of EVs of at least 20% of all vehicles registered in the city and sufficient charging infrastructure available
Implementation	Responsible bodies/person for implementation	City of Łódź Office (UML), ZDiT (Road and Transport Authority) , Representative of the Mayor of Łódź for electromobility and development of fuel infrastructure alternatives
	Action scale & addressed entities	City-wide action
	Involved stakeholders	Real estate developers , household owners associations, owners of commercial real estate, universities, shopping malls
	Comments on implementation – consider mentioning resources, timelines, milestones	Implementation of the action will require efficient coordination between different stakeholders to ensure proper planning.
Impact & cost	Generated renewable energy (if applicable)	Not applicable
	Removed/substituted energy, volume, or fuel type	Not applicable

	GHG emissions reduction estimate (total) per emission source sector	225,000 t CO_2e
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	EUR 2,668 million 791 EUR / t CO_2e (estimated assuming 15 years lifetime of new electric vehicles). The costs are based on preliminary estimates and include both the cost of charging infrastructure (the per kW cost of installing chargers varies from €125 for AC 4-22 kW chargers to €260 for DC 1 MW chargers[17] and the cost of electric vehicles purchase (the average cost is assumed to be EUR 30,000 per vehicle) by residents and companies. The costs will be updated in the process of CCC Action Plan implementation taking into account the decline in the costs of EVs technologies and locally collected data on the cost of implementation of specific projects.
Action outline	**Action name**	**Construction of the cross-city tunnel in Łódź**
	Action type	Transport infrastructure
	Action description	The action foresees construction of a 7.5 km long railway tunnel under the centre of Łódź, which will connect the Łódź Fabryczna station with the Łódź Kaliska and Łódź Żabieniec stations and allow reduce the number of private vehicles on the streets of the city. Implementation of the project will enable a shift from the use of private vehicles to the use of electrified railway transport for traveling within the city. The use of new public transport mode, in particular, will allow commuters to leave the cars and get to work using convenient and fast underground public transport (48.4 thousand workers on average commuted to Lodz city mainly from nearby settlements in 2016). GHG emissions reduction was estimated during project planning stage by comparing project scenario and baseline (without project scenario) using transport modelling and data on the reduction of vehicle-kilometres travelled by vehicles and additional electricity consumption for railway transportation.
Reference to impact pathway	Field of action	Mobility & transport
	Systemic lever	Technology and infrastructure
	Outcome (according to module B-1.1)	Reducing the number of vehicles in the centre of the city and increasing the use of urban railway transport
Implementation	Responsible bodies/person for implementation	PKP Polskie Linie Kolejowe SA (Polish Railways)
	Action scale & addressed entities	Large-scale investment project

[17] ACEA, https://www.acea.auto/files/Research-Whitepaper_A-European-EV-Charging-Infrastructure-Masterplan.pdf

	Involved stakeholders	Government of Łódź City (UML), MPK-Łódź Sp. z o.o., residents of the city, ZDiT (Road and Transport Authority), City Council of Łódź , ŁKA (Łódź Agglomeration Railway)
	Comments on implementation – consider mentioning resources, timelines, milestones	The project has been initiated in 2009 and the construction works started in 2023.
Impact & cost	Generated renewable energy (if applicable)	Not applicable
	Removed/substituted energy, volume, or fuel type	Not applicable
	GHG emissions reduction estimate (total) per emission source sector	10,000 t CO_2e
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	EUR 391 million 782 EUR / t CO_2e (estimated assuming 50 years lifetime for transport infrastructure projects).
Action outline	**Action name**	**Public transport system electrification**
	Action type	Public transport
	Action description	The goal of the action is to replace all diesel fuel buses with electric buses or other low-carbon alternatives. As of 2022, there were 418 diesel buses and only 17 new electric buses operating in the public transport system of the city. The action foresees gradual replacement of all diesel buses with electric or hydrogen fuelled buses. The action will also foresee the development of charging infrastructure to enable efficient operation of electric buses.
Reference to impact pathway	Field of action	Mobility & transport
	Systemic lever	Technology and infrastructure
	Outcome (according to module B-1.1)	Reducing the use of private vehicles and improvement the quality of public transportation system
Implementation	Responsible bodies/person for implementation	MPK-Łódź Sp. z o.o., Representative of the Mayor of Łódź for electromobility and development of fuel infrastructure alternatives
	Action scale & addressed entities	The action is focused on the development of public transportation system.
	Involved stakeholders	City of Łodź Office (UML), residents of the city, City Council of Łódź, ZDiT (Road and Transport Authority)
	Comments on implementation – consider mentioning resources, timelines, milestones	The first 17 electric buses started operation in 2022.
Impact & cost	Generated renewable energy (if applicable)	Not applicable
	Removed/substituted energy, volume, or fuel type	Not applicable

	GHG emissions reduction estimate (total) per emission source sector	26,000 t CO_2e
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	EUR 170 million 437 EUR / t CO_2e (estimated assuming 15 years lifetime for buses operating in public transportation system).
Action outline	**Action name**	**Tree planting and developing of green zones in the city within the Greening Strategy**
	Action type	Green zones
	Action description	The action is focused on implementation of the Greening Strategy of The City of Łodź to enhance carbon dioxide removals from the atmosphere and contribute to the neutralization of residual emissions. The measures include revitalization of parks and green areas, creation of new urban forests and parks, creation of pocket parks near residential buildings, arranging greenery along the city's public transport communication system, river restoration and revitalization, as well as other activities with green components.
Reference to impact pathway	Field of action	Green infrastructure & nature-based solutions
	Systemic lever	Governance and policy
	Outcome (according to module B-1.1)	Increased share of the green zones and better quality of green zones
Implementation	Responsible bodies/person for implementation	City of Łodź Office (UML: especially Environment Management Division)
	Action scale & addressed entities	City-wide action
	Involved stakeholders	ZZM (City Greenery Board), ZIM (Municipal Investment Board), ŁI (Łódź Investments), MPU (Municipal Urban Planning Studio), residents, entrepreneurs[18]
	Comments on implementation – consider mentioning resources, timelines, milestones	The Greening Strategy has been developed in 2024, however, the city continuously implements actions foreseeing increasing and enhancing urban green zones.
Impact & cost	Generated renewable energy (if applicable)	Not applicable
	Removed/substituted energy, volume, or fuel type	Indirect effect due to reduced cooling demand.
	GHG emissions reduction estimate (total) per emission source sector	30,000 t CO_2e
	GHG emissions compensated (natural or technological sinks)	10,000 t CO_2e

[18] Ecopact

	Total costs and costs by CO2e unit	EUR 155 million 129 EUR / t CO_2e (estimated assuming 30 years lifetime).
Action outline	**Action name**	**Intensifying energy efficiency improvements in buildings**
	Action type	Energy efficiency
	Action description	The goal of the action is to double energy savings compared to the actions included in the SECAP. One of the important steps for the achievement of the goal is launching a subsidy scheme to conduct energy audits for buildings and determine the most cost-effective modernization measures. Additional measures will include supporting capacity building on energy efficiency in buildings and other measures to intensify decarbonization of buildings sector. The action will be implemented via existing programs, such as Clean Air Program (Czyste Powietrze) and Warm Housing Program (Ciepłe Mieszkanie), as well as using private funds of the residents and other sources of finance. Additional mitigation benefits could be achieved from reduced energy use of buildings due to the shading and cooling effects of urban trees (reportedly in the range of about 0.9–4.8% annually). Other measures, such as green roofs, green walls and green facades, also contribute to climate change mitigation by improving thermal comfort, lowering the energy demand of buildings (by about 10–30% compared to conventional roofs). The mitigation potentials depend on numerous factors and the scale of implementation. Assuming conservative value of 1% reduction, potential indirect GHG emission reduction would constitute 30,000 t CO_2 per year. Implementation of the action is expected to result in approximately 28% reduction in energy demand for the Buildings sector compared to the baseline year.
Reference to impact pathway	Field of action	Built environment
	Systemic lever	Technology and infrastructure
	Outcome (according to module B-1.1)	Additional energy efficiency improvements and GHGs emission reductions in buildings sector
Implementation	Responsible bodies/person for implementation	City of Łodź Office (UML: especially the Office of Energy and Air Quality and Office of Revitalization and Housing), residents of the city.
	Action scale & addressed entities	City-wide action
	Involved stakeholders	ZLM (Municipal Investment Board), real estate management companies and household owners associations, technology and equipment providers educational institutions, univerities

	Comments on implementation – consider mentioning resources, timelines, milestones	The city continuously implements energy efficiency projects, including large scale revitalization of the historical centre of the city. Large-cale projects are also included in the SECAP.
Impact & cost	Generated renewable energy (if applicable)	Not applicable
	Removed/substituted energy, volume, or fuel type	1,086,790 MWh
	GHG emissions reduction estimate (total) per emission source sector	307,000 t CO_2e
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	EUR 2,777 million 302 EUR / t CO_2e (estimated assuming 30 years lifetime of the buildings). The costs are based on preliminary estimates and will be updated in the process of CCC Action Plan implementation if more reliable data become available.
Action outline	**Action name**	**Construction of Łódź Recycling Center (Łódzkie Centrum Recyklingu)**
	Action type	Waste management
	Action description	MPO Łódź is planning to build the Łódź Recycling Center (ŁCR) and launch its operation in 2028. ŁCR will include sorting lines for mixed municipal waste (up to 120,000 t per year), as well as special lines for the processing of separated waste streams (plastics and metals - up to 30,000 t per year, paper - up to 31,000 t per year, glass - up to 16,000 t per year, bulk waste - up to 20,000 t per year, and organic / kitchen waste - up to 35,000 t per year. The ŁCR also will include a RDF production installation with the capacity of up to 85,000 t per year. The Łódź Recycling Center will also include a roof-top photovoltaic installation with a capacity of 1.68 MW. Mixed waste, after removing the commercial fractions (for recycling), will be subjected to bio-drying (this will reduce the weight by 20%). The remaining waste will be processed into pre-RDF/RDF and will used as a fuel for combustion in thermal power plants and cement plants. Kitchen waste (BIO) will go to the biogas plant and biogas will be used for heat and electricity generation (approximately 3 million m^3 of gas per year). Additional measures to include waste management will include construction of new recycling points for selective collection of municipal waste (PSZOK), in particular, Widzew East (included in the Regional Waste Management Plan) and recycling point at Wersalska street (under construction).
Reference to impact	Field of action	Waste and circular economy
	Systemic lever	Technology and infrastructure

pathway	Outcome (according to module B-1.1)	Increasing waste recycling rate
Implementation	Responsible bodies/person for implementation	MPO-Łódź (Municipal Waste Company)
	Action scale & addressed entities	Large-scale investment project
	Involved stakeholders	City of Łódź Office (WGK-Municipal Management Division)
	Comments on implementation – consider mentioning resources, timelines, milestones	There is an environmental permit and tender documentation available, and implementation of the project is planned to be started soon and completed in 2028.
Impact & cost	Generated renewable energy (if applicable)	Not applicable
	Removed/substituted energy, volume, or fuel type	6,300 MWh of electricity 6,500 MWh of heat energy
	GHG emissions reduction estimate (total) per emission source sector	2,855 t CO_2e from renewable energy generation (accounted for within SECAP) Additional emission reduction will be achieved due to the increased recycling rates and substitution of primary resource consumption with recycled materials. Such emission reductions are typically attributable to the users of recycled materials and not the producer of waste and could be materialized outside the city boundaries. Indicative emission reductions from improved waste management are estimated as 50,000 t CO_2e. The indicative value is based on the assumptions of redirection of paper waste stream from landfill to recycling and organic waste stream from landfill to composting.[19] Similarly to the baseline emissions from the waste sector additional studies will be performed to assess baseline scenario and emissions and project emissions for each waste stream.
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	EUR 92 million
Action outline	**Action name**	**Improving land use efficiency and avoiding GHG emissions from land use change**
	Action type	AFOLU

[19] Based on indicative values of conversion factors from the Carbon Waste and Resources Metric (Carbon WARM), https://www.wrap.ngo/resources/report/carbon-waste-and-resources-metric

	Action description	The action is focused on avoidance of additional GHG emissions from land use changes starting from 2030 and beyond due to the focus on increasing the land use efficiency and avoiding conversion of forest and agricultural land to built-up areas. Any additional conversions is expected to be compensated via additional afforestation and reforestation activities within the territory of the city. Though the city has limited influence on the use of private land and investment decisions that could lead to land use change, the government of the city will prioritize the development of brownfield projects, revitalization activities, increasing land used efficiency via effective spatial planning, and investment projects without the impact on emissions from land use change.
Reference to impact pathway	Field of action	Land use planning
	Systemic lever Outcome (according to module B-1.1)	Technology and infrastructure
Implementation	Responsible bodies/person for implementation	City of Łódź Office (Division of Environmental Protection and Agriculture , Environment Management Division)
	Action scale & addressed entities	City-wide action
	Involved stakeholders	MPU (Municipal Urban Planning Studio)
	Comments on implementation – consider mentioning resources, timelines, milestones	Monitoring of land use changes on an annual basis is in place.
Impact & cost	Generated renewable energy (if applicable)	Not applicable
	Removed/substituted energy, volume, or fuel type	Not applicable
	GHG emissions reduction estimate (total) per emission source sector	12,728 t CO_2e
	GHG emissions compensated (natural or technological sinks)	Not applicable
	Total costs and costs by CO2e unit	Not applicable

B-2.3: Summary strategy for residual emissions

Residual emissions stem mainly from the transport sector due to fossil fuel combustion and buildings sector due to remaining share of natural gas and other fossil fuels for energy generation.
The scale of residual emissions is expected at the level of 20% from 2018 levels or approximately about 750,000 t CO2.

Since it is not possible to reduce GHG emissions to zero under a short timeline the city will also work on carbon dioxide removal projects and initiatives with the focus on nature-based solutions to neutralize the residual emissions. Use of offsets will also be considered in the future for partial compensation of residual emissions with the focus on high-quality carbon credits from projects in Poland (e.g. wetland and peatland restoration projects) and other EU countries or EU neighbouring states.

In 2024, The City of Łodź has developed a Greening Plan till 2030 with the perspective till 2050 (ZIELONA ŁÓDŹ. Plan zazieleniania Łodzi do 2030 roku z perspektywą do 2050 r.) to support its climate neutrality aspirations. The document has been developed based on wide stakeholder consultations during the workshops and meetings.

Based on the total green areas The City of Łodź is one of the greenest cities in Poland. Łódź City benefits from large green areas, which include public parks (666 ha in 2021), urban greenery, municipal forests (1473,78 ha), a botanical garden (67.8 ha) and the City Zoo (170 ha). The overall surface of green zones is more than 3 thousand hectares. Green areas cover 13.92% of the total territory of the city. According to the statistical procedures, the total area of green areas includes walking and recreation parks, street green areas, housing estate green areas, cemeteries and municipal forests, and other green areas. The value of the total vegetation cover is much higher and reach 51% of the city's territory.
Approximately 9.2% of the city's territory are legally protected areas, including the Łódź Hills Landscape Park (Park Krajobrazowy Wzniesień Łódzkich), five nature and landscape complexes, and two nature reserves - Polesie Konstantynowskie and Łagiewnicki Forest.

The City of Łodź is actively working on creation of new urban forest parks at locations, where trees and meadows have naturally grown historically. Such territories are restored and protected from future development works and other anthropogenic impacts via establishing forest parks. During 2021-2023 there were 15 forest parks created with the total area of 150 ha and the work continued in 202420 (e.g. Stoki Park (3 ha), Radogoszcz Park (5.5 ha), etc.).

Further development of green zones and enhancing of existing green zones is one of the priorities of the city to improve the quality of life, urban biodiversity, contribute to clean air objectives, but also contribute to carbon sequestration to neutralize the residual GHG emissions generated in the city.

The city actively implements projects that enhance and expands the green urban infrastructure within the investment projects foreseeing revitalization of squares, reconstruction of streets and pedestrian areas, development of parks and other green zones. The greening components of such projects include planting of trees, bushes, flowers, grass, etc. Tree planting is actively performed along the streets and tram routes throughout the city. Besides, measures to protect existing trees are implemented during all investment projects (e.g. protection of trees during roads reconstruction and repair, utility systems maintenance works, etc.).

Greening Plan till 2030 with the perspective till 2050 foresees the following activities that would contribute to carbon dioxide sequestration:

- Revitalization of parks and green areas;
- Creation of new urban forests and parks;
- Creation of pocket parks near residential buildings;
- Greenery along the city's public transport communication system;
- River restoration and revitalization;
- Other activities with green components (including bike lanes with greenery, recreational infrastructure with greenery, greenery at bus / tram stops, green facades, green roofs, flower beds and meadows, rain gardens and other elements of blue infrastructure solutions), educational activities and improvement of green zones management in the city.

The overall cost of the activities described above is about 718 million zloty for the period 2024-2030.

The actions planned by the city aim to increase the share of green zones from 13.92% from the total area of the city to 14.19% already in 2030 by planting 800,000 new trees during 2024-2030 and increasing the area of urban forests by almost 135 ha (from 1473.78 ha to 1608.41 ha).

The measures foreseen also aimed at enhancing existing green areas. The tree density in urban green areas vary significantly but typically is reported in the range between 50 and 100 trees per hectare but

[20] UML, https://uml.lodz.pl/ekoportal/klimat/zielen/parki-lesne/

could be significantly higher in urban forests (e.g. reaching 300-1000 trees per ha or more). The effect of planting 800,000 of new trees could be an equivalent of creating of several thousand hectares of urban green zones.

Urban forests, parks and trees along the roads, transportation and other locations contribute the most significantly to carbon sequestration.

According to the IPCC Sixth Assessment Report[21], an average carbon storage density of urban tree cover is 7.69 kg C / m^2 (kilograms carbon per square metre) or 28.2 kg CO_2 / m^2 (overall stock). Within urban natural areas, the amount of carbon stored varies widely based on region, vegetation type, tree density, and the species composition. [22] An average carbon sequestration density per unit urban tree cover is 0.226 kg C / m^2 or 8.3 t CO_2 per hectare per year (annual sequestration). The reported value for Europe is about 9.8 t CO_2 per hectare per year. This value has been applied for the assessment of carbon sequestration potential in Łódź City.

The carbon sequestration per tree planted would vary significantly depending on tree species and the age of the tree but on average for an already grown tree it could be assumed in the range of 7-10 kg CO_2 per year.[1323]

Thus, the effect of new tree planting and increasing the area of urban forests could reach about 10,000 t CO_2 per year. Carbon sequestration occurs during the tree growth stage so the planned actions will ensure carbon removals both before and after 2030.

Urban green and blue infrastructure are also important for reducing the urban heat islands effects due to its local cooling effect and other benefits for climate adaptation. Co-benefits of this action also include reducing urban runoff, reducing summer temperatures by 2.5°C–6°C, as well as creating habitat for native plants and animals and protecting local biodiversity.

Climate mitigation results will be achieved both by actions specifically aimed at increasing the green areas and incorporation of greening activities in other development projects (e.g. roads and streets reconstruction).

Development of green areas will involve active participation of the residents at the planning and implementation stages, including expanding the previous experience of establishing rain gardens by schools, initiatives under participatory budget mechanisms, grant support (e.g. the ZazieleniaMY program[24], which provides co-financing to residents of the city for planting trees, shrubs and sowing flower meadows and lawns in the amount of up to PLN 20,000 and up to 80% of total expenses, and ZbieraMY deszczówkę program (Collecting Rainwater program), which provides co-financing to residents of the city for the installation of rainwater tanks, creation of bioretention systems, construction of permeable surfaces and irrigation systems in the amount of up to PLN 10,000 and up to 80% of total expenses), creating inventory of trees using a special web-site Mapa Drzew Łodzi[25] and promoting active stakeholder engagement activities (e.g. educational program Łódzkie Szkoły Dla Klimatu, during which students of the schools take part in practical workshops and trainings on environmental protection).

The main goal of the Greening Plan till 2030 with the perspective till 2050 is to increase the amount and functionality of greenery in the City of Łódź to support the achievement of climate neutrality, improve the quality of life of its inhabitants and increase the attractiveness of the city for current and future generations.

Carbon sequestration potential of urban green areas though being significant is not sufficient to

[21] Chapter 8, Urban Systems and Other Settlements, https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter08.pdf

[22] For instance, carbon sequestration potential reported for Leipzig in Germany is 6.82 kg C / m^2 or 25 kg CO_2 / m^2 or 250 t CO_2 per hectare.

[23] The estimates of carbon sequestration potential is characterized by high uncertainty level.

[24] Dotacja miejska - tworzenie terenów zieleni: Urząd Miasta Łodzi (lodz.pl), https://uml.lodz.pl/ekoportal/klimat/zielen/zazieleniamy/

[25] Mapa Drzew Łodzi - Społeczna inwentaryzacja drzew (mapadrzewlodzi.pl), https://mapadrzewlodzi.pl. The residents of the city can register and fill a survey to add every tree in the city to a specially designed map after the verification process.

compensate the expected levels of residual emissions. The city will work with different stakeholders to identify additional opportunities for compensation and neutralization of residual emissions, including identification of other projects with carbon dioxide removal potential (e.g. consultation with industry on the potential of technological carbon removal projects, such as Biomass for Energy with Carbon Capture and Storage) and the use of carbon credits (e.g. high-quality carbon credits from projects in Poland and neighbouring countries ensuring additional emission reductions and removals).

Significant share of residual emissions will likely be compensated using carbon credits (assumed to be up to 700,000 t CO2e). The cost of carbon credits acquisition could be estimated at the level of EUR 7-14 million. The city will explore voluntary carbon market projects (Verra's Verified Carbon Standard, Gold Standard for Global Goals, MoorFutures2 standard for peatland projects, etc.) and other carbon crediting schemes for identification of suitable sources of carbon credits and legal and organizational mechanisms for acquiring such credits. The work on this task is expected to be initiated in 2027 and to be completed in 2030 with neutralization of all residual emissions. The work will take into account city's progress on reducing GHG emissions and updated Action Plan that will be prepared in September 2026. The types of projects to be considered include Carbon Forests project launched by the State Forests of Poland (afforestation of non-forest and forest land, promotion of natural regeneration, introduction of undergrowth and underplanting, and promotion of good practices in soil preparation for reseeding or restoration), sustainable farming practices in Poland and other neighboring countries, peatland habitat restoration projects and others (such as projects promoted by the Polish Wetlands Conservation Centre, LIFE Climate Mitigation project "Peat Restore" and other organizations and initiatives). The city has already screened such project opportunities and will follow their development in the next two years.

The city will also work with all stakeholders to support the implementation of additional climate mitigation projects and programs to reduce the level of residual emissions.

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

The section contains a selection of indicators to monitor and evaluate progress along the selected impacts pathways and fields of action described in Module B-1. as well as a monitoring and evaluation plan.

For projects co-financed from external funds UML has the experience in monitoring non-financial indicators (e.g. production of energy from a photovoltaic installation, reduction of pollutant emissions into the air in the case of thermal modernisation) and submitting relevant reports on the achievement of the ecological effect to the appropriate institutions (e.g. WFOŚiGW, NFOŚiGW, Marshal's Office).

Monitoring and evaluation procedures applied by UML currently include the following stages:

- Preliminary assessment of the proposed projects (based on project description cards and introductory materials);
- Approval of project implementation;
- Providing comments on project implementation at various stages (e.g. preparation of documentation, construction works, commissioning, etc.);
- Assessment of achieved objectives based on defined measurable indicators and evaluation of projects after completion of implementation (e.g. conducting of energy audits after the completion of thermal modernization of buildings to verify the achievement of the planned energy efficiency improvements).

The City will build on this experience and will develop a monitoring system for tracking the progress for CCC Action Plan implementation.

The City will work on continuous improvement of the monitoring framework and development of user-friendly dashboard based on the monitoring system, including the development of new KPIs, data collection tools and procedures in cooperation with interested stakeholders.

B-3.1: Impact Pathways							
Outcomes/ impacts addressed	Action/ project	**Indicator No.** (unique identified)	Indicator name		Target values		
					2025	2027	2030
Reduction of GHG emissions from 2018 baseline (%)	All actions in the action plan	NZC-I1	Reduction target		40%	50%	80%
Number of coal-fired heating sources in residential buildings (number of units)	Phase out of coal fired heating in residential sector before 2030	NZC-I2	Coal heating		20,000	10,000	0
Installed capacity of PV installations within the city (MW)	Tripling the deployment of solar power installations	NZC-I3	Renewable energy		>100	>150	> 200
Number of registered electric vehicles in the city (number of units)	Development of EV charging infrastructure and private transport fleet electrification	NZC-I4	Electric vehicles		10,000	40,000	88,000
Number of publicly available charging points installed in the city	Development of EV charging infrastructure and private transport fleet electrification	NZC-I5	Chargin points		>100	240	500
Number of passengers using public transport (million passengers)	Construction of the cross-city tunnel in Łódź Public transport system electrification	NZC-I6	Public transport		200	240	300
Share of green areas in the total territory of the city (%)	Tree planting and developing of green zones in the city within the Greening Strategy	NZC-I7	Green areas		14	14.1	14.2

B-3.2: Indicator Metadata	
Indicator Name	Reduction target
Indicator Unit	%
Definition	Reduction of GHG emissions from 2018 baseline (%)
Calculation	Based on the results of GHG emissions inventory update using the GHG emissions monitoring tool
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	Yes
If yes, which emission source sectors does it measure?	All sectors

Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	N/A
Is the indicator useful for monitoring the output/impact of action(s)?	Yes
If yes, which action and impact pathway is it relevant for?	All Impact Pathways
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	No
Data requirements	
Expected data source	GHG emission calculation tool based on the defined input data provided via different stakeholders
Is the data source local or regional/national?	Local
Expected availability	High. Calculation requires implementation of the monitoring procedure developed by UML.
Suggested collection interval	Annually
References	
Deliverables describing the indicator	GHG emissions monitoring tool
Other indicator systems using this indicator	SECAP implementation monitoring
B-3.2: Indicator Metadata	
Indicator Name	Coal heating
Indicator Unit	Number of units
Definition	Number of coal-fired heating sources in residential buildings
Calculation	Based on the analysis of data submitted to the CEEB
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it measure?	N/A
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	N/A
Is the indicator useful for monitoring the output/impact of action(s)?	Yes
If yes, which action and impact pathway is it relevant for?	Energy systems - Replacement of coal-fired heating sources with a combination of renewable energy and other low-carbon solutions, such as heat pumps, solar collectors, district heating and others
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	No
Data requirements	
Expected data source	CEEB
Is the data source local or regional/national?	National / local
Expected availability	High. Data are expected to be provided by CEEB.
Suggested collection interval	According to the target intervals (2025, 2027, 2030)
References	

Deliverables describing the indicator	Extract from the CEEB database and analysis performed based on the data provided.
Other indicator systems using this indicator	-
B-3.2: Indicator Metadata	
Indicator Name	Renewable energy
Indicator Unit	MW
Definition	Installed capacity of PV installations within the city
Calculation	Data provided by Polish Energy Company(PGE)
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it measure?	N/A
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	N/A
Is the indicator useful for monitoring the output/impact of action(s)?	Yes
If yes, which action and impact pathway is it relevant for?	Energy systems - Increasing the number of PV installations on private, municipal and commercial buildings
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	No
Data requirements	
Expected data source	PGE
Is the data source local or regional/national?	Local
Expected availability	High. Data are expected to be provided by PGE.
Suggested collection interval	Annually
References	
Deliverables describing the indicator	Input to the GHG calculation tool
Other indicator systems using this indicator	SECAP implementation monitoring
B-3.2: Indicator Metadata	
Indicator Name	Electric vehicles
Indicator Unit	Number of registered electric vehicles in the city
Definition	Number of units
Calculation	Not applicable / registration data
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it measure?	N/A
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	N/A

Is the indicator useful for monitoring the output/impact of action(s)?	Yes
If yes, which action and impact pathway is it relevant for?	Mobility & transport - Development of EV charging infrastructure and extending the network of charging stations to create enabling conditions for private transport fleet electrification
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	No
Data requirements	
Expected data source	UML
Is the data source local or regional/national?	Local
Expected availability	High.
Suggested collection interval	According to the target intervals (2025, 2027, 2030)
References	
Deliverables describing the indicator	Input to the GHG calculation tool
Other indicator systems using this indicator	SECAP implementation monitoring
B-3.2: Indicator Metadata	
Indicator Name	Charging points
Indicator Unit	Number of publicly available charging points installed in the city
Definition	Number of units
Calculation	Not applicable / Inventory of charging points
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it measure?	N/A
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	N/A
Is the indicator useful for monitoring the output/impact of action(s)?	Yes
If yes, which action and impact pathway is it relevant for?	Mobility & transport - Development of EV charging infrastructure and extending the network of charging stations to create enabling conditions for private transport fleet electrification
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	No
Data requirements	
Expected data source	UML
Is the data source local or regional/national?	Local
Expected availability	High.
Suggested collection interval	According to the target intervals (2025, 2027, 2030)
References	
Deliverables describing the indicator	Monitoring reports
Other indicator systems using this indicator	-
B-3.2: Indicator Metadata	

Indicator Name	Public transport
Indicator Unit	Million passengers
Definition	Number of passengers using public transport
Calculation	Data provided by MPK
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it measure?	N/A
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	N/A
Is the indicator useful for monitoring the output/impact of action(s)?	Yes
If yes, which action and impact pathway is it relevant for?	Mobility & transport - Construction of the cross-city tunnel in Łódź, Public transport system electrification
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	No
Data requirements	
Expected data source	MPK based on operational records of public transportation system
Is the data source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annually
References	
Deliverables describing the indicator	Input to the GHG calculation tool
Other indicator systems using this indicator	SECAP implementation monitoring
B-3.2: Indicator Metadata	
Indicator Name	Green areas
Indicator Unit	%
Definition	Share of green areas in the total territory of the city
Calculation	Based on statistical data from GUS
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	No
If yes, which emission source sectors does it measure?	N/A
Does the indicator measure indirect impacts (i.e., co- benefits)?	No
If yes, which co-benefit does it measure?	N/A
Is the indicator useful for monitoring the output/impact of action(s)?	Yes
If yes, which action and impact pathway is it relevant for?	Green infrastructure & nature-based solutions - Tree planting and developing of green zones in the city within the Greening Strategy

Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	No
Data requirements	
Expected data source	GUS
Is the data source local or regional/national?	Local
Expected availability	High
Suggested collection interval	Annually
References	
Deliverables describing the indicator	Excel tables downloaded from the GUS database
Other indicator systems using this indicator	Monitoring of the implementation of the Greening Strategy

4 Part C – Enabling Climate Neutrality by 2030

The City of Łodź will continuously work on enabling interventions that will foster climate action via enhanced collaboration, better access to data and social innovation. This section provides information on the initial steps and will be updated throughout the implementation of the CCC Action Plan.

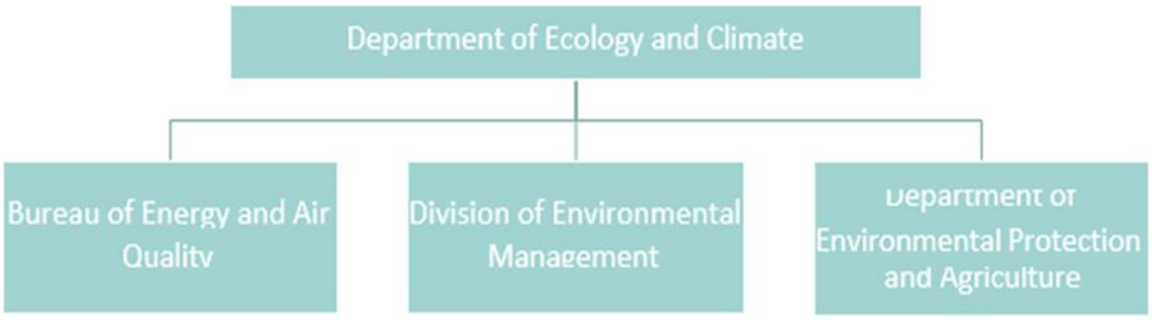
4.1 Module C-1 Governance Innovation Interventions

C-1.1: Description or visualisation of the participatory governance model for climate neutrality

The City of Łodź will work on governance innovations for achieving city climate neutrality by 2030 including via strengthening internal institutional capacity, collaboration with various stakeholders and outreach activities to promote action towards climate neutrality target.

The City of Łódź, being aware of climate change and the need to create effective management structures even before joining the Mission, established the Department of Ecology and Climate and created the Department of Environmental Management and, at a later stage (after joining the Mission), the Office of Energy and Air Quality. In addition to the above-mentioned units, the Department of Ecology and Climate also oversees the Division of Environment and Agriculture.

The overarching aim of the Department is to coordinate the City's activities in the field of climate change adaptation and mitigation, allowing for more efficient management and ensuring oversight of broadly defined greenery and nature-related matters, including investments made in the City. It should also be emphasised that, of course, the City was already taking measures to preserve and increase green spaces, including in terms of ecology in the broadest sense. However, with the creation of this Department, with particular emphasis on the Environmental Design Department, an opportunity arose for a slightly different, more holistic approach to the subject of greenery, from issues related to education, through the design of various types of green spaces, implementation of ecological and environmental projects, providing opinions on projects and investments, to the introduction of changes to local law and development of both strategic and executive documents, and finally to very measurable, as quantifiable, properly planned actions carried out in the form of new planting (both in terms of quantity, type and appropriate selection of species) and exemption from sale of properties on which there is valuable greenery, which translates into an increase in the area covered with greenery in the City.
Department of Ecology and Climate is the main department responsible climate action within the city government.



Division of Environmental Management is responsible for the planning of municipal policy in the area of climate change and development of strategic documents including CCC Action Plan and SECAP. Development of such policies is performed in active collaboration with other departments (e.g. Department of Planning and Economic Development, Department of Property Management, Department of Strategy and Development, Department of Public Finance and others) and municipal entities responsible for different types of infrastructure, as well external stakeholder.

A very important aspect is the strong involvement of the City authorities (in particular Mayor Hanna Zdanowska: ambassador of the Climate Pact, member of the Committee on the Environment, Climate Change and Energy of the European Committee of the Regions, member of the Green Deal Working Group) in the efforts to achieve climate neutrality, which makes the decision-making process quite fast and offers the possibility of rapid change.

The Transition Team though not formalized includes representatives of different units that will work together to accelerate climate action:

- President and First Vice-President of the City – lead the Transition Team, promote city's climate action on international and national level, define strategic priorities and coordinate the implementation of climate action in the city;
- Director of the Department of Ecology and Climate and Director of the Division of Environmental Management – lead the development of CCC and this 2030 Climate Neutrality Action Plan ;

Other Transition Team members:

- Employees of the Division of Environmental Management (aspects related to climate neutrality action plan, local climate policy and strategic planning);
- Director and employees of the Bureau of Energy and Air Quality (aspects related to project development and energy management);
- Director of the Department of Public Finance and employees of Budgetary Division, including the Multiannual Planning and Debt Policy Department (aspects related to municipal finance and investment plan);
- Director of The Department of Environmental Protection and Agriculture (aspects related to environmental protection and land use);
- Director and employees of Urban Activities Office (aspects related to the organizations of workshops, consultations and other stakeholder engagement activities);
- Director of the City Strategy Office (aspects related to the cooperation with the Łódź Metropolitan Area Association, monitoring the implementation of strategic documents and supporting policies, support in obtaining financial resources from the EU funds for strategic investment projects and monitoring the use of external and internal financial resources for the implementation of investment priorities, representing the city's interests before EU institutions);
- Director and employees of the Economic Development and International Cooperation Office (aspects related to cooperation with businesses, assistance in organizing events);
- Director of the Project Management Department (aspects related to the implementation and monitoring of activities aimed at developing public transport, road, bicycle and pedestrian infrastructure with particular emphasis on shaping sustainable urban mobility);
- Director of the Municipal Urban Planning Office and Deputy Director of the Municipal Economy Department - members of the committee of the 2nd Citizens' Panel,
- Employees of the Municipal Economy Department (aspects related to municipal waste management),
- City Engineer's Office (aspects related energy sector and future demand of the city for heat, electricity and gas, as well as coordination of plans developed by energy companies operating in the city.

Such broad involvement of internal stakeholder allows joining efforts, sectoral knowledge and different expertise for a more balanced and efficient planning of climate actions.

Cooperation with certain municipal companies is also extremely important. An important role in action planning in terms of the pursuit of climate neutrality is played by: MPK (Municipal Transport Company) and MPO (Municipal Cleaning Company,). MPK is responsible for urban transport - its development, promotion and, above all, the replacement of the rolling stock with an environmentally friendly one.

MPO plays an extremely important role in the project proposed in the Action Plan: Łódź Recycling Centre. In addition to waste management itself, it also carries out educational activities for local residents on, among other things, proper waste management and care for the environment for both adults and children (workshops in kindergartens and schools).

The city benefits from active involvement of scientific and academic community while planning and implementing local climate action. Cooperation with universities is based on the Council of Universities and Science, which was created by a signed agreement between the Mayor of The City of Łódź and the representatives of the Łódź Universities, Polish Academy of Sciences and Łódź Scientific Society. There is also a separate agreement with the University of Łódź to support the cooperation of local government administration and the scientific community in the area of public procurement, public-private partnership and other initiatives. Together with universities from all over the world, the City of Łódź implements innovative projects such as T-Factor and EuPOLIS, participate in research projects in the field of ecology and sustainable development (in cooperation with Łódź University of Technology and University of Łódż), and conduct consultations with scientists on each strategic document in the field of environmental protection and sustainable development. One prominent example of the cooperation with scientific community is the project “Ecohydrologic rehabilitation of recreational reservoirs "Arturówek" as a model approach to rehabilitation of urban reservoirs” which was implemented by the European Regional Center for Ecohydrology and received the Best LIFE Environment Projects award.

Despite the wide range of people involved in the process of developing a plan to achieve climate neutrality, the establishment of a municipal entity is being considered for the construction and management of municipal renewable energy and energy efficiency projects. Such a solution would accelerate the process of optimising the city's energy consumption, while creating urban renewable energy sources. As indicated above, this is in the consideration phase. Initial studies are currently being carried out on the viability of setting up a possible municipal entity. The idea behind these activities was, among other things, progressive climate change, rising energy prices and indications from both the national and European level of the need to implement RES-based solutions. There is therefore a need for the City to adapt to existing conditions, to which it cannot remain indifferent, also taking into account the need to take actions aimed at reducing the costs of energy consumption by the City in the interests of public finances, as well as expanding RES installations and conducting other activities in the field of power engineering in order to pursue the pursuit of sustainable and zero-emission development of the City.

The city actively involves its residents in climate action via educational and awareness raising activities, co-financing programs and stakeholder consultation activities. Consultation and involvement in decision-making processes are of the greatest importance. Involving the local community in the decision-making process is done through, among other things, civic budgets, citizens' panels, votes conducted by the vox populi platform or organised consultation meetings/walks with residents. These activities are described in detail in the section - Social innovation.

In the era of implementation of ESG strategies by enterprises, cities conducting activities to mitigate and adapt to climate change should involve the private sector as a key stakeholder of change. Without close cooperation with business, local governments cannot achieve climate neutrality goals. It is for this purpose that the “Ecopact for Łódź”[26] was created, a tool for engaging enterprises in climate action not only within their own operations, but also in the place and for the local communities in which they operate. Thus, business entities occupy an important place in the structure.
In addition to the implementation of projects, it is planned to create a **working group** consisting of business representatives. The group will hold regular meetings. The purpose of creating the group will be, among others: developing communication strategies, ideas for new projects, recommendations for actions and, for example, proposals for regulations for entrepreneurs.

Additional information on participatory / collaborative governance models to facilitate the city´s climate neutrality target, including horizontal links among city institutions and vertical links to other levels of

[26] It is intended to encourage all key entities to act together, share knowledge and resources, and cooperate for a better future of our city. As part of Ekopakt, the City of Łódź implements projects with business entities.

government, will be described in the next iterations of the CCC Action Plan as the City will progress on building partnerships and coalitions for promoting climate action.

C.1.2: Sample Table: Relations between governance innovations, systems, and impact pathways

Intervention name	Description	Systemic barriers / opportunities addressed	Leadership and stakeholders involved	Enabling impact	Co-benefits
NEEST– NetZero Emission and Environmentally Sustainable Territories[27]	The aim is to prepare a set of innovative solutions ready for implementation, scaling, and replication The solutions explored will include technical, financial, environmental and social aspects, as well as related Monitoring Evaluation and Learning framework.In Łódź, the area studied is Radiostacja district, which include single-Family houses, apartment blocks, green areas and public infrastructure. Based on cooperation with other cities UML will increase their knowledge, capabilities and organisational capacities to replicate and scale energy	Institutional capacity to plan and develop energy efficiency projects in buildings.	Leadership - Local government and internal departments Other stakeholders – Mission platform, other Polish cities participating in the Mission.	Enabling planning GHG emission reduction projects, cost-efficiency assessment of projects - pilot solutions for representative building quarters or groups of buildings.	Reduced air pollution and improved quality of life

[27] Additional information: https://netzerocities.eu/polands-pilot-activity-neest-netzero-emission-and-environmentally-sustainable-territories/

	efficiency projects in buildings. A guidebook will be introduced to a wide audience which will allow cities with similar types of buildings to test and scale and even improve the model solutions as well as create new models for larger number of types of buildings based on available NEEST models				
GHG emissions monitoring and accounting system for city-wide inventory	Maintaining procedures to collect all required activity data and update emission factors to Regularly update city-wide GHG emissions inventory covering buildings, transport and other sectors.	Institutional capacity to plan and monitor GHG emission reduction projects	Leadership - Local government and internal departments Other stakeholders – utilities.	Enabling data-driven policy making, planning GHG emission reduction projects, monitoring impact of interventions implemented	Not applicable.

City's budget climate tagging	Incorporation into the existing Integrated City Financial Management System of climate tagging based on existing own experience and best practices on sub-national climate budget tagging (selection of the methodology, project types, implementing rules, reporting, etc.).	Institutional capacity to plan and monitor GHG emission reduction projects	Leadership - Local government and internal departmens	Enabling planning GHG emission reduction projects, cost-efficiency assessment of projects, attraction of additional climate finance via demonstration of leadership and commitment to climate action	Tracking finances on projects with significa nt co-benefits

This section will be updated throughout the implementation period describing interventions of the innovative organisational and governance methods, including citizen engagement, as well as policies and regulations for achieving city climate neutrality by 2030.

4.2 Module C-2 Social Innovation Interventions

This section describes the actions to support and foster social innovation initiatives to support climate neutrality aspirations.

C.2.1 Sample Table: Relations between social innovations, systems, and impact pathways					
Intervention name	Description	Systemic barriers / opportunities addressed	Leadership and stakeholders involved	Enabling impact	Co-benefits
(Indicate name of intervention)	(Describe the substance of the intervention)	(Refer to barriers and opportunities identified in Module A-3)	(List leaders and all stakeholder involved and affected, referring to the stakeholders mapped in Module A3)	(Describe how intervention enables climate neutrality)	(Indicate how intervention helps achieve the impact listed in Module B-1)
Working group Decarbonization actions hub	Collecting information on GHG Emission reduction project and project proposals and building partnerships.In	Insufficient institutional capacity to plan, develop, secure finance, implement and monitor GHG emission	Leadership - Local government and internal departments Of the Stakeholders involved - businesses	Building the pipeline of climate mitigation projects and fostering cooperation among stakeholders	Improved air quality

	response to the comments raised during consultations with business such decarbonization action hub could also act as a platform or a working group to facilitate the dialogue between the businesses and UML to find new perspectives for cooperation and implement new investment projects that will support climate neutrality aspirations of the city.	reduction projects			
Local green fund	Creation of a local green fund that could Finance climate Mitigation projects Using contributions From businesses working in the city.	Insufficient access finance	Leadership - Local government and internal departments Of the stakeholders involved - businesses	Structuring project finance for climate action	Improved air quality
Citizens' Budget	Annual opportunity for residents to submit their own projects and for residents to vote on the projects they want to see implemented and funded from the city budget.	Social and behavioural systems Institutional and organisational systems	City of Łódź Office, residents	A strong mandate to implement mitigation and adaptation projects	Improved city development planning and associated economic and social benefits (improving quality of life, co-participation of residents in decision-making processes)
VOXpopuli platform	Platform for local e-referendums	Social and behavioural systems Institutional and organisational systems	City of Łódź Office, residents	A strong mandate to implement mitigation and adaptation projects	Improved city development planning and associated economic and social benefits (improving quality of

					life, co-participation of residents in decision-making processes)
Information and consultation point at the Office of Energy and Air Quality	A point which assists residents in obtaining information about subsidies and submitting applications.	Social and behavioural systems Institutional and organisational systems	City of Łódź Office, residents	A strong mandate to implement mitigation and adaptation projects	improved quality of life, better air quality
Office for Urban Activity	Office working closely with residents and NGOs	Social and behavioural systems Institutional and organisational systems	City of Łódź Office, residents, NGO	A strong mandate to implement mitigation and adaptation projects	Improved city development planning and associated economic and social benefits (improving quality of life, co-participation of residents in decision-making processes)
Ekoportal (webside)	The City's website focusing on all the City's environmental activities.	Social and behavioural systems	City of Łódź Office, residents	A strong mandate to implement mitigation and adaptation projects	co-participation of residents in decision-making processes
Consultation meetings with the city authorities	Cyclical consultation meetings with residents on important projects and new ideas for implementation.	Social and behavioural systems Institutional and organisational systems	City of Łódź Office, Mayor and Deputy Mayors, citizens	A strong mandate to implement mitigation and adaptation projects	Improved city development planning and associated economic and social benefits (improving quality of life, co-participation of residents in decision-making processes)
Local Activity Centres	Places created for citizens and NGOs, creating spaces for collaboration, for the realisation of new ideas.	Social and behavioural systems Institutional and organisational systems	Residents, NGOs	A strong mandate to implement mitigation and adaptation projects	Improved city development planning and associated economic and social benefits (improving quality of life, co-participation of residents in decision-making

					processes
Citizens' panels	A randomly selected group of citizens decides on important decisions for the city, decides on a given issue taking into account the common good of all citizens of Łódź.	Social and behavioural systems Institutional and organisational systems	Residents, Universities, NGOs	A strong mandate to implement mitigation and adaptation projects	Improved city development planning and associated economic and social benefits (improving quality of life, co-participation of residents in decision-making processes)

C-2.2: Description of social innovation interventions

Within the GHG emission accounting and monitoring tool, the city has developed a system to collect information on GHG emission reduction projects and account for their contribution in the achievement of overall GHG emission reduction targets. Building upon this tool and experience the city will actively work with both internal (e.g. departments and divisions, municipal organizations) and external (utilities, private companies, commercial organizations). This could be done via public calls for ideas and project concepts, as well as periodic public events or roundtables to collect information on project and foster cooperation between different stakeholders. The information collected could include both specific projects from municipal organizations, utilities, commercial organizations or other private companies or project concepts and ideas from citizens and other stakeholders. In the former case, projects will be included in the GHG emissions monitoring tool to track the progress over time. In the latter case project ideas will be presented during workshops to build partnerships and jointly find solutions on how to move them from concepts to specific projects.

Citizens' budget

The citizen's budget is a separate part of the budget of the City of Łódź, the allocation of which is decided by the citizens. The Łódź Citizens' Budget is a democratic process whereby the citizens co-decide on public spending in Łódź in the run-up to the next financial year.

This means that:

- residents submit projects, which are then analysed by officials for feasibility and the Łódź City Council's Citizens' Budget Committee, as well as reviewed by neighbourhood councils;
- projects that have received a positive assessment shall be put to a general and direct vote;
- as a result, the projects which have achieved the best result in the voting are earmarked for implementation until the pool of funds is exhausted- entering them in the budget resolution.

VoxPopuli platform

The aim of the VoxPopuli platform is to support the building of a modern civil society, encouraging citizens to actively participate in the decision-making process of local authorities.

Vox Populi is a revolutionary approach to public consultation in which the focus is on the act of voting and the opportunity for residents to express a binding opinion that will be taken into account by local government bodies.

Vox populi allows residents to find out the details of the issue to be voted on, to find out the arguments for the various options of the proposed solution, to read the opinions of experts, to participate in the discussion and to exchange views.

The City of Łódź regularly votes via Voxpopuli - recent consultations have included a greening plan for the pedestrian precinct, area revitalisation issues and investments in public transport.

Information and consultation point at the Office of Energy and Air Quality
Łódź City Hall operates a consultation and information point for the Clean Air Programme. At the point, you can obtain all information on subsidies, get free assistance in preparing an application for a subsidy to replace a heat source and thermo-modernise a single-family building.

Scope of works covered by funding:
replacement of the heat source with solid fuel, including the central heating and hot water system.

- Thermo-modernisation with replacement of windows and external doors
- mechanical ventilation
- photovoltaic installation - only when replacing a heat source

Call for applications: continuous

Office for Urban Activity
An organizational unit at the Łódź City Hall, established for the purpose of close cooperation with residents and non-governmental organizations. It manages cases related to, among other things, community consultations, citizens' budget, support for NGO activities. Residents, either on their own or with the help of an NGO, can submit proposals for local initiatives to the Office of Urban Activity, as well as requests for public consultations.

EKOPORTAL
Ekoportal is a specially created platform that is a treasure trove of knowledge on topics related to urban ecology in the broadest sense. It is a source of information not only on projects, but also on air quality and how to get involved in the city's environmental activities.
https://uml.lodz.pl/ekoportal/

Consultation meetings with the city authorities
Cyclical meetings with residents, either on site or in the form of walks. During the consultation, projects planned by the City are discussed, but residents also put forward ideas for new initiatives/projects. Consultation meetings are often dedicated to specific housing estates, so that as many residents as possible can get involved.

Local Activity Centres
Łódź Local Activity Centres are places in Łódź that open up space for meetings, intergenerational integration, the realisation of ideas, training, workshops, neighbourhood activities, mutual help and interesting leisure activities. These places are for residents of Łódź, volunteers, NGOs and informal groups.

Citizens' Panels
The Citizens' Panel is a form of deliberative democracy. A randomly selected group of citizens decides on important decisions for the city, decides on a given issue taking into account the common good of all citizens of Łódź. The aim of the panel is to jointly develop recommendations on how the city should solve the problems discussed or meet the needs of the people living there. The last of the organized Panels was closely related to the CCC targets and concerned the reduction of greenhouse gases by 2030. The 60 panellists, a group representative of the Łódź community, worked together to develop solutions for building the city's climate neutrality. Meetings were held with the participation and in close cooperation with experts (e.g. from the University of Łódź).

The interventions outlined above show that the city is constantly pursuing social innovation. There is a special emphasis on involving the local community : possibly involving them in the co-decision process and learning about their needs.
The most engaging forms of participation for residents are the citizens' budget, citizens' panels, voting by vox populi and meetings/walks with city officials.
It is also extremely important to have access to reliable information, which is guaranteed above all by the Ekoportal, as well as the entire website run by the City (www.lodz.pl - most information is also published in the form of a newspaper).

Residents will be even more closely involved in the process of co-creating the city, including the pursuit of climate neutrality.
Planning is about involving residents as well as other stakeholders in the next iteration of the Action Plan in order to jointly create the city's future and make a real difference to the quality of life.

5 Outlook and next steps

Plans for next CCC and CCC Action Plan iteration

The CCC Action Plan presents portfolios of actions that will allow closing the gap between the existing policies and projects and ambitious climate neutrality targets. For the preparation of the next iteration of the CCC Action Plan the city will work on complementing the list of portfolios of actions with specific projects and programs, as well including lessons learnt on barriers, opportunities and policies required to foster climate action.

In particular, the city will actively work with businesses and other stakeholders to define the list of projects and support their implementation. The city has launched Ekopakt dla Łodzi initiative[28], which provides an opportunity for businesses and other stakeholders to support the City's efforts to build a more environmentally friendly urban space and implement green projects. The Ekopakt dla Łodzi initiative will serve as a model for collecting information on potential decarbonization projects (e.g. technical details, renewable energy generation potential, energy saving, GHG emission reductions, capital expenditures and operational cost, etc.) and their incorporation into the future iterations of the CCC Action Plan.

The city will also work on better understanding of the sources and structure of GHG emissions in waste management sector, as well as related climate mitigation opportunities.
The next iteration of the CCC Action Plan will be developed within the two years period and is planned in September, 2026.

[28] UML, https://uml.lodz.pl/files/public/uploads/Ekopakt.pdf

6 Annexes

Annex 1. Methodology for GHGs emissions calculations in Stationary Energy sector

A combination of approaches has been applied to estimate overall stationary energy consumption in the city taking into account complexity of data collection from every consumer, confidentiality provisions and other data availability limitations.

For municipal buildings and equipment/facilities, data on final energy consumption has been mostly collected via questionnaires filled by relevant units, divisions and organizations. Data on electricity consumption has been provided both by the central procurement organization (LGZ) and separate entities via questionnaires (for entities not included in LGZ). Data on heat energy consumption from district heating system were provided by district heating operator. Data on electricity consumption for public lighting has been provided by the central procurement organization (LGZ) and additional information have been also collected from the relevant organizations managing public lighting on the streets and in the parks of the city.

For residential buildings, data on final energy consumption has been assessed mostly based on available official statistical data since other sources of information were not available or restricted due to commercial sensitivity or confidentiality arrangements (e.g. data from market operators). Data on heat energy consumption from district heating system were provided by district heating operator.

For tertiary buildings, data on final energy consumption were estimated based on available national figures since other sources of information were not available or restricted due to confidentiality arrangements. Data on heat energy consumption from district heating system were provided by district heating operator.

Electricity, natural gas and district heating covers the largest shares of heating sources in the city. For residential sector solid fuel consumption is also important, while its less important in the non-residential sector. Heating fuel oil represent only a small fraction in the structure of reported heating sources (1% for residential sector and 2% in non-residential). Renewable energy is also used for heat generation but the share among reported heating sources is low (5% in residential sector and 7% in non-residential) with solar collectors more popular in residential sector and heat-pumps – in non-residential sector.

Activity data collected were used to estimate GHGs emissions using relevant emission factors. A combination of data sources was used to define the most accurate and relevant for the local circumstances emission factors for different energy carriers.

For district heating energy, the emission factor provided by district heating operator has been applied. The calculation of the emission factor is based on the annual reports on total GHGs emissions prepared for installations under EUETS requirements. Biomass is considered as a renewable energy sources and CO2 emissions from biomass combustion is not taken into account. Since district heating system relies mainly on heat energy generated by CHPs, the emissions from CHP units were allocated to electricity and heat energy. The energy content method has been used for allocation, where fuel input and associated CO2 emissions are allocated to the produced heat and electricity based on the energy content of the produced products taking into account the efficiency of heat generation process. In addition, emissions associated with heat energy generation by water heating boilers (i.e. boilers installed at CHPs but operating outside the CHP cycle) were taken into account during the estimation of emission factor for heat energy. The reported emission factors represent the emissions relate to final energy consumption (i.e. kg CO2 per MWh of heat energy consumed taking into account transportation losses and heat energy consumption for own needs). The emission factors are based on verified data and are updated on an annual basis by the CHP operator.

For electricity, the calculated local emission factor has been applied. Local emission factor for electricity (EFE) has been calculated based on the formulate provided in the guidance for SECAP development

taking into account total GHGs emissions from local electricity production and national emission factor for the share of electricity consumed within the city in excess to local production.

For fossil fuels (hard coal, natural has, LPG, heating oil), the emission factors used in the Poland's National Emission Inventory Report 2023 were applied.

Annex 2. Methodology for GHGs emissions calculations in Transport sector

The “territorial approach” was applied for estimation of transport-related emissions. Though it requires more extensive data collection and analysis it also provides far more useful information to guide local policy and planning compared to, for instance, methods based on fuel sales within the city boundaries.

Transport activity sectors are categorized according to ownership and functionality criteria, as follows: Municipal fleet; Public transport and Private and commercial transport.

For municipal fleet data on fuel consumption have been collected using questionnaires from different divisions and organizations within the city. Since historical data availability is limited and varies between different organizations the data gaps for some units were covered by extrapolation the average value for the last three years for which data were collected. Electric vehicles represent a small share of municipal fleet and electricity consumption for charging electric vehicles is not tracked separately.

For public transportation system, data on fuel and electricity consumption were provided by MPK (Municipal Transport Company). This includes electricity consumption by trams and electric buses (electric buses currently cover about 1% of distance travelled) and diesel consumption by buses. Limited amount of transportation services were provided by other companies during some years.

In addition, electricity consumption by local trains was also accounted for during calculation. Electricity consumption for the transportation services within the city boundaries were estimated based on the total electricity consumption and transportation volumes within and outside the city boundaries as provided by Łódź Metropolitan Railway (ŁKA).

In case of private and commercial vehicles, CO2 emissions depend on the number of vehicles and their use within the boundaries of the city and the estimates are associated with significant level of uncertainty. For municipal and public transport, fuel and energy consumption data were collected using dedicated questionnaire from relevant organizations and divisions within the city.

The approach to estimate activity level on the street network of the city (number of vehicle kilometres travelled) is based on information on traffic flows and length of the street network. The following step-by-step approach has been applied for the calculation of GHGs emissions from private and commercial transport:

Step 1. Estimate average annual traffic intensity for different for different road categories

Most of the major streets within the city fall into one of the four road categories: National, regional, city,. National and regional roads passing through the city form major streets within the city with the most significant traffic intensity.

Data on traffic intensity for the street network of the city are limited both in terms of temporal (data are available for some years only with different coverage for each specific year) and geographic coverage (data are available for some streets only with the lowest amount of data available for smaller streets). Various data sources were combined during the analysis, which provides the most complete picture of traffic intensity within the city, but also contributed to uncertainty due to the use of different methodologies and approaches for data collection, different reporting methods and types of traffic intensity data collected. In most cases, data available for analysis represent short-term counting campaigns and not the continuous traffic intensity measurements.

Traffic intensity data for national roads are based on General Traffic Measurement which is conducted every five years and provides annual average traffic intensity data for various measurement points throughout the country. The points on national roads entering or crossing the city were selected and data from the years 2010, 2015 and 2020 were used in the analysis. The national roads represent less than 7% of street network length but have the highest traffic intensity and contribute significantly to the overall amount of vehicle kilometers travelled within the city.

Traffic intensity data for other types of road were collected from different sources including traffic counting studies conducted by different service providers for Urban Roads and Transport Board in different years and data from municipal traffic management system for 2022. These traffic intensity data are based on short-term counting campaigns (typically, several one hour periods during one or several days) or data for a single day from the automatic data collection system; and thus does not reflect effectively the variation between different days and months of the year. Reported hourly traffic intensity for morning period between 7.30 and 8.30 were converted using hourly extension factor for this period, which was estimated based on traffic intensity study conducted during 2016 and covering 24 hours period. Available traffic intensity data mostly cover larger streets causing higher uncertainties for estimated data for smaller streets.

Step 2. Multiply traffic intensity per total length of streets in each category to estimate total number of vehicle-kilometers travelled.

The average values of traffic intensity for each category of city's streets estimated for each particular year was multiplied by the total length of the streets in this category as reported by Urban Roads and Transport Board to obtain a total number of vehicle-kilometers travelled within the city boundaries. The four road categories used . There are also approximately 450 km of internal roads within the city, but traffic intensity within them is assumed to be low and not taken into account for the purpose of GHGs emission calculations. High variation of data on traffic intensity on different streets combined with limited data coverage contributes to the uncertainty of the estimates, but provide a good indication of the scale of transport activity within the city and its dynamic over time.

Based on the estimated number of VKTs, the average length of trip is between 9.5 and 11.4 km per registered private vehicle per day while the annual travel distance within the city boundaries would be between 3,500 and 4,200 km per registered vehicle, which represent about one third of total average annual travel distance for private vehicles based on national data, which takes into account intercity travel (12140-13426 km per year) and thus assumed to be representative for the expected level of vehicles used within city's boundaries.

Step 3. Distribute the total number of VKTs per vehicle type and fuel use based on the data on the structure of vehicles registered in the city

The modal shares were defined based on vehicles registration data within the city. Though vehicles registered in other nearby settlements also actively use the road network of Łódź city, the distribution between different types of vehicles and fuel used is assumed to be similar.

Total number of vehicle-kilometers travelled within the city was distributed by types of vehicles and fuel used based on reported vehicle registration numbers for the city. Private vehicles (Samochody osobowe) represent up to 80% of total vehicles registered in the city and the number of registrations grow continuously.

During 2010-2022 the number of registered private vehicles has increased from 419 to 669 vehicles per 1000 residents, which contributes to traffic intensity, fuel consumption and GHGs emissions. In terms of fuel used, about half of private vehicles are using petrol, while the other half is distributed almost equally between vehicles using diesel and LPG fuels. For vehicles equipped for LPG combustion and petrol combustion it was assumed that they are mostly using LPG taking into economic efficiency and national statistical data. Electric vehicles are currently the most efficient in terms of emissions per kilometer travelled but the number of registered electric vehicles remains low and represent only 0.2% of total registered vehicles though demonstrate significant growth rates doubling the number of registered vehicles each year over the last five-year period.

Traffic intensity surveys and the approach applied does not capture efficiently the movement of public transport buses, as estimated vehicle-kilometers travelled by buses represent only between 20% and 30% of reported vehicle-kilometers travelled by buses in public transportation system.

Step 4. Calculate fuel consumption based on the distribution of VKTs and data on average fuel consumption for specific type of vehicles (national data or assumptions).

Fuel consumption has been calculated based on the estimated number of vehicle-kilometers travelled for each main category of the vehicles average fuel consumption rates. Average fuel consumption for private vehicles is based on the national data published every three years in "Energy consumption in households" (Zużycie energii w gospodarstwach domowych") reports that cover different types of fuel. The average value for all fuel types range between 7.4 and 7.7 liters per 100 km, though in urban conditions the actual value could be higher. For buses the same values as for public transport were applied. For trucks the value of 23.9 l per 100 km (for Rigid, 4x2 axle, GVW > 16 t light duty trucks) was applied.

Step 5. Calculate GHGs emissions from fuel consumption by private and commercial transport.

GHGs emissions volumes were calculated based on fuel and electricity consumption data using default and national emission factors

Annex 3. Municipal solid waste management and GHG emissions

Waste sector covers GHG emissions arising from waste generated within the city boundary, treated/managed/disposed within (Scope 1) or outside (Scope 3) the city boundary.

The most significant sources of GHG emissions from the waste sector include emissions from solid waste disposal and wastewater treatment and discharge. On a national level GHG emissions from waste have been decreasing due to development of collection and segregation system, as well as improvement of landfilling system, which resulted in higher recycling rates and lower rates of methane emissions.

The baseline GHG emission inventory includes information on GHGs emissions estimated based on national average values and does not include GHGs emissions assessment for specific waste streams and waste management sites (i.e. no detailed research on waste morphology, degradable organic carbon content, and other parameters, as well as waste processing routes or waste management sites were performed at this stage).

In the national GHG emissions inventory, emissions associated with municipal waste (solid waste and wastewater) management are distributed among several categories:

- Solid Waste Disposal - CH4 emissions;
- Biological Treatment of Solid Waste - CH4 and N2O emissions;
- Incineration of Waste (including industrial and medical waste) - CO2, CH4 and N2O emissions;
- Wastewater Treatment and Discharge - CH4 and N2O emissions;
- Municipal waste and sewage sludge incineration for energy purposes - CH4 and N2O emissions.

During 2023, 261 750 tonnes of municipal solid waste were collected in Łódź City. Information on municipal waste collection volumes for Łódź city in 2023 is presented in the table below.

Table A3-1. Waste collection volumes in Łódź City in 2023

Parameters	Amount, tonnes	Share, %
Total amount of municipal solid waste collected from property owners	**233 942**	**89%**
Municipal waste collected from property owners under contracts with The City of Łódź in 5 sectors of the city	***196 090***	***75%***
Unsorted municipal waste	*131 059*	*50%*
Paper and cardboard	*8 046*	*3%*
Glass	*8 239*	*3%*
Plastic	*19 670*	*8%*
Biodegradable food waste	*12 722*	*5%*
Other biodegradable waste	*7 474*	*3%*
Bulky waste	*8 881*	*3%*
Municipal waste collected from property owners by other authorized entities	***37 853***	***14%***
Unsorted municipal waste	*23 058*	*9%*
Biodegradable waste	*1 436*	*1%*
Other waste	*13 359*	*5%*
Municipal waste collected via other routes	***27 808***	***11%***
Municipal waste collected via recycling centers (PSZOK)	*6 683*	3%
Expired medicines	*30*	0,01%
Municipal waste collected from alternative waste management systems	*20 095*	8%
Parameters	**Amount, tonnes**	**Share, %**
Batteries and accumulators	*14*	0,01%
Waste collected during liquidation of illegal dumps	*986*	0,38%
TOTAL	**261 750**	**100%**

Source: The City of Łódź

There are different types of municipal waste collection system in place and different facilities are used for waste processing.

Information on the waste processing routes is available only for municipal waste collected from property owners under contracts with the City of Łódź in 5 sectors of the city, which represent about three quarters of total waste collected in the city in 2023.

Waste collection from property owners under contracts with The City of Łódź in 2023 was performed by the following three companies: Remondis Sp. z o.o., Municipal Waste Company, PreZero Service Centrum Sp. z o.o.

Based on information available, waste collected in Łódź is directed to installations both within the city and in other settlements. From the waste collected under the contracts with the City of Łódź, 57% or 112 370 tonnes were directed to the sites within the city, including one mechanical-biological treatment plant, composting unit and a site for bulky waste collection. This represents approximately 42% of municipal solid waste collected in the city in 2023.

Table A3-2. Information on waste processing routes for Łódź City in 2023

Parameters	Amount, tonnes	Share, %
Mechanical-biological treatment plant - Ruszczyn, gm. Kamieńsk	41 339	21%
Unsorted municipal waste	35 328	18%
Biodegradable food waste	6 010	3%

Municipal Waste Selective Collection Point (PSZOK) - Kryniczno, gm. Środa Śląska (unsorted municipal waste)	2 109	1%
Waste management site - Ścinawka Dolna, gm. Ścinawka Średnia (unsorted municipal waste)	*3 909*	2%
Mechanical-biological treatment plant - Łodz, ul. Zbąszyńska/Swojska (unsorted municipal waste)	*60 079*	31%
Mechanical-biological treatment plant - Krzyżanówek	*33 536*	17%
Unsorted municipal waste	*26 811*	14%
Biodegradable food waste	*6 725*	3%
Waste management site - Kiełcz (unsorted municipal waste)	*973*	0%
Waste management site - Piotrowo Pierwsze, gm. Czempiń (unsorted municipal waste)	*1 856*	1%
Installation in Łódź at ul. Zamiejska 1 (recyclable materials and bulky waste)	*44 817*	23%
Composting unit - Łódź, ul. Sanitariuszek 70/72	*7 474*	4%
Total	***196 090***	**100%**

Source: The City of Łódź

Information on the operation of the composting unit is presented in the table below

Table A3-3. Information on the operation of composting unit in Łódź City in 2023

Data on operation of composting unit	**Unit**	**2021**	**2022**	**2023**
Mass of organic waste processed	tonnes	18 889	24 442	18 757
Compost production	tonnes	11 900	12 100	8 340
Electricity consumption	MWh	468	280	279
Diesel fuel consumption	l	83 617	81 370	75 797
Petrol consumption	l	900	782	912

Source: The City of Łódź

Composting of organic waste is associated with emissions of methane and N2O (default emission factors applied in national inventories: 4 g CH4/kg treated waste and 0.24 g N2O/kg treated waste (wet weight basis)), however it allows significant reduction of organic waste decomposition on the landfills and achieve overall GHG emissions reduction from organic waste.

Modernization and capacity extension for the composting unit has been completed in 2021. However, additional investment are planned to ensure compliance with all waste storage requirements.

11 068 tonnes of municipal solid waste were collected via three municipal waste selective collection Points (PSZOK).

Table A3-4. Waste collection via recycling centers in Łódź City in 2023

Total MSW collection via municipal waste selective collection points (PSZOK)	**11 068**
Construction and demolition waste	4 385
Other recyclable materials	6 683
PSZOK Zamiejska - ul. Zamiejska 1 (MPO)	7 251
Construction and demolition waste	2 914
Other recyclable materials	4 337
PSZOK Kasprowicza - ul. Kasprowicza 10 (ZGO)	1 936

Construction and demolition waste	641
Other recyclable materials	1 296
PSZOK Graniczna - ul. Graniczna 2 (ZGO)	1 881
Construction and demolition waste	831
Other recyclable materials	1 051

Source: The City of Łódź

Zarząd Gospodarowania Odpadami was established in 2014 and is responsible for the operation of municipal waste management infrastructure.[18][29] This includes a municipal composting unit (ul. Sanitariuszek 70/72) and two municipal waste selective collection points (PSZOK) at Kasprowicza 10 and Graniczna 2, as well as non-operational landfills.
MPO Łódź was established in 1945 and is responsible for municipal solid waste collection in some districts of the city, as well as operation of municipal waste selective collection point (PSZOK) at Zamiejska 1.[19] [30]The recycling center collects and process both recyclable materials and also different types of bulk waste

Based on the information available, approximately 400 kg of municipal solid waste is generated in Łódź per person per year.

The city is actively working on increasing the recycling rate, including via awareness raising and improved waste segregation at source, as well as expanding the recycling infrastructure and increasing the number of people working at recycling centers. Operation of recycling centers allows recovery of various materials from the waste stream and redirection them to further production routes. This includes recycling of paper and cardboard, glass, PET bottles, aluminum, and other recyclable materials. Recycled materials are pressed (paper and cardboard is pressed in separate packages of 500 kg each; PET bottles are pressed in a package of about 250 kg consisting of 6 250 bottles) and sent for further processing. Recycling contributes to overall GHG emissions reduction as allows replacement of the use of natural raw materials for the manufacturing of plastic, paper and other goods. Such avoided emissions potentially occur outside the city boundaries and not accounted for the achievement of climate neutrality target. Recycling contributes not only to climate change mitigation but also to the development of circular economy. In 2023, 31.84% of collected waste was prepared to reuse or recycling (83 341 tonnes).

Only 11.2% of municipal solid waste collected in the city, including residues from sorting municipal waste and residues from the mechanical-biological processing of unsorted (mixed) municipal waste, is directed to landfills (29425,1 tonnes in 2023). Similar amount of waste is directed for thermal treatment – 11% or 28 783 tonnes.

GHG emissions from on-site energy use within the waste and wastewater facilities (e.g., electricity, natural gas, etc.) are accounted for within stationary energy sector, and GHG emissions from energy used for transporting waste to and from the facilities (e.g., diesel used in waste collection vehicles) as well as off-road vehicles operating within the facilities, are accounted for in transport sector.

GHG emissions from waste management at this stage were estimated based on the national data proportionally adjusted using the population of Łódź City.

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29 [18] Zarząd Gospodarowania Odpadami został utworzony z dniem 01 stycznia 2014 roku Uchwałą Rady Miejskiej w Łodzi z dnia 11 grudnia 2013 roku Nr LXXVII/1600/13 w sprawie utworzenia jednostki budżetowej o nazwie ,,Zarząd Gospodarowania Odpadami" i nadania jej statutu (Dz. Urz. Woj. Łódzkiego z 2013 roku poz. 5583), https://zgo.uml.lodz.pl/?o-nas,1

[30] MPO Lodz, https://mpolodz.pl/o-nas/

Table A3-5. National data on GHG emissions from waste management

GHG emission sources	CO_2	CH_4	N_2O	CO_2e
Waste to energy (non-biomass fraction)	5 120	1,4	0,2	5 205
Solid waste disposal		46,5		1 164
Biological treatment of solid waste		7,5	0,5	324
Incineration of waste	275		0,0	275
Wastewater treatment and discharge		74,0	2,6	2 624
Total	**5 395**	**129,5**	**3,2**	**9 591**

Total emissions from all waste management activities in Poland are reported as 9.6 million t CO_2e and the estimated per capita value is 253 kg CO_2 per year. Based on this value total GHG emissions for Łódź City were estimated as 173 388 t CO_2e, which were distributed between Scope 3 (60%) and Scope 1 (40%) emissions based on the proportions of municipal waste treated outside and within the city boundaries. Such estimation serves only as an indication of the scale of GHG emissions associated with waste management and will be refined in the future.

For a comprehensive accounting and management of GHG emissions from waste management the city will work on collecting detailed information on waste treatment pathways, including data on waste stream composition for each treatment facility and technological details of each treatment facility. Both the details on waste streams composition and the technologies applied at each facility significantly impact the volume of GHG emissions. In particular, the more organic waste is sent to landfills the higher would be methane emissions from anaerobic decay of organic matter. On the contrast, if organic waste is treated in anaerobic digestion process, all methane is recovered for energy generation while N_2O emissions from anaerobic digestion are negligible

Annex 4. AFOLU sector and GHG emissions

AFOLU (Agriculture, forestry and other land uses) sector under the CCM includes changes in direct GHG emissions associated with any changes in land use giving rise to (sources) or sequestering (sinks) emissions (if significant). This includes any potential changes in land use, including agriculture, forestry and other land uses within the city boundary.

In line with the guidance[31], an emission source can be considered insignificant if the size of emissions is smaller than any other sub-sector that shall be reported. In addition, the combined emissions from all sources that are considered insignificant should not exceed 5% of total emissions that shall be reported. The sub-sector with the lowest level of emissions is municipal transport with the GHG emission levels of about 5 000 tonnes of CO2e. Thus, this value is considered as a threshold for significance.

Land use change can lead to GHGs emissions in case of changes, for instance, from forest areas to built-in areas or also lead to carbon sequestration (i.e. land area serve as a carbon sink) in case of, for instance, tree planting on the territory not covered by trees before. If not land use changes occur during the year, this sector does not result in any GHG emissions or sinks.

Poland's National GHG Emissions Inventory defines the following land use categories:

- Forest land (managed);
- Cropland;
- Grassland;
- Wetlands;
- Settlements;

[31] Guidance on target setting and emissions inventories for the Climate-neutral and Smart Cities Mission

- Other land.

In Poland, recorded significant changes in the land use categories related to settlements include conversion from managed forest land (about 500 ha per year during recent years nation-wide), cropland (about 5 000 ha per year), grassland (about 17 000 ha) to settlements. Other conversions, such as from cropland to managed forest land or to managed grassland, conversion from grassland to managed forest land or to wetlands are less relevant in the context of city's emissions inventory. Changes between other categories occur only during some years recently and are not significant.

Growing cities requires additional land for buildings and infrastructure driving land use change. In addition, nation-wide significant increase of forest land area conversion is linked to expanding infrastructure (e.g. roads, railways, bridges, and airports) requiring land for construction projects, which in particular is done by clearing the forests. As a result, the Settlements sector is a net source of GHG emissions in Poland with a net CO_2 balance equal to 2.269 million tCO_2 in 2021.[32]

GHG emissions in the sector is defined based on the fundamental equation for estimating change in carbon stocks associated with land-use conversions.[33] The overall approach is based on the difference in carbon stocks before and after conversion (e.g. in biomass stock on forest land and biomass stock in the settlement after conversion)

Depending on the magnitude of carbon stocks in the previous land-use category, land converted to settlements may experience a relatively rapid loss of carbon in the first year (e.g. forests converted to settlements, followed by a more gradual increase in carbon pools subsequently.[34]

GHG emission accounting on a national level could not be directly applied at the local level, however, similar approaches were applied to estimated the impact of AFOLU sector on city's GHG emissions inventory.

Information on land categories within the boundaries of Łódź city during 2017-2023 is presented in the table below. Based on the available statistical data, he most significant conversions include increasing the built-up areas and decreasing the areas of agricultural land. This implies that territories categorized as agricultural land (arable land, orchards, permanent meadows, permanent pastures built-up agricultural land, land covered with trees and shrubs on agricultural land, etc.) are being gradually developed with the construction of residential buildings and industrial facilities. Conversion of forest land is very limited

Table A4-1. Łódź city territory classification by land categories

Land category	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Total change**
Agricultural land	11798	11602	11499	11395	11349	11180	11106	-692
Change from previous year		-196	-103	-104	-46	-169	-74	
Arable land	9223	9086	8989	8910	8827	8669	8616	-607
Change from previous year		-137	-97	-79	-83	-158	-53	
Orchards	262	248	249	248	240	238	231	-31
Change from previous year		-14	1	-1	-8	-2	-7	
Permanent meadows and permanent pastures	1133	1103	1097	1084	1116	1107	1102	-31
Change from previous year		-30	-6	-13	32	-9	-5	
Built-up agricultural land	618	628	626	623	620	617	612	-6
Change from previous year		10	-2	-3	-3	-3	-5	

[32] Poland's national inventory report 2023
[33] Estimations are based on the equation 2.16 contained in IPCC 2006 guidelines of the Volume 4
[34] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use

Land covered with trees and shrubs on agricultural land	397	381	380	375	380	383	376	-21
Change from previous year		-16	-1	-5	5	3	-7	
Other agricultural land	165	156	158	155	166	166	169	4
Change from previous year		-9	2	-3	11	0	3	
Forest land	2489	2475	2467	2460	2484	2484	2477	-12
Change from previous year		-14	-8	-7	24	0	-7	
Built-up land	14769	14999	15114	15222	15323	15491	15568	799
Change from previous year		230	115	108	101	168	77	
Residential areas	4549	4687	4713	4853	4847	4927	5008	459
Industrial areas	1294	1352	1391	1425	1474	1505	1522	228
Roads, rails and other transport infrastructure	4261	4245	4237	4232	4261	4335	4352	91
Other built-up areas	4665	4715	4773	4712	4741	4724	4686	21
Water bodies	137	132	133	134	139	138	139	2
Change from previous year		-5	1	1	5	-1	1	
Ecological areas	97	86	86	86	N/A	N/A	N/A	-
Change from previous year		-11	0	0	N/A	N/A	N/A	
Other land	37	34	29	31	33	35	38	1
Change from previous year		-3	-5	2	2	2	3	
Total	**29327**	**29328**	**29328**	**29328**	**29328**	**29328**	**29328**	**1**

Indicative assessment of GHGs emissions from the AFOLU sector is based on the following assumptions[35]:

- Default biomass carbon stocks removed due to forest land conversion to built-up areas (based on the approach for land conversion from forest land to settlements and default value of above-ground biomass for temperate continental forests in Europe equal to 120 tonnes of dry matter per ha or 60 tonnes of carbon per ha); dry matter content is converted to carbon content using a default carbon fraction of 0.5.
- Default biomass carbon stocks removed due to agricultural arable land conversion to built-up areas (based on the approach for land conversion from cropland to settlements) is 4.7 tonnes of carbon per ha or 10 tonnes of dry matter per ha.
- Default biomass carbon stocks removed due to permanent meadows and permanent pastures conversion to built-up areas (based on the approach for land conversion from grassland to settlements) is 3.25 tonnes of carbon per ha or 6.5 tonnes of dry matter per ha;
- Default biomass carbon stocks removed due to orchards and land covered with trees and shrubs on agricultural land conversion to built-up areas is 63 tonnes of carbon per ha (based on the data for perennial woody biomass in temperate climate zones);
- The biomass carbon stock in the built-up area after the conversion is assumed to be equal zero in line with the default option for Tier 1 approach proposed by the IPCC guidelines for national inventories and the approach applied in the national emission inventory for Poland.
- The carbon content in dead organic matter and soils is not taken into account during the estimation of GHG emissions from the AFOLU sector for the city.
- CO2 emissions from other sources in the AFOLU sector is considered negligible.
- Carbon stock losses are multiplied by 44/12 to convert to CO_2 equivalent and present the CO_2 emissions from the AFOLU sector.

[35] 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Agriculture, Forestry and Other Land Use, Table 8.2, Chapter 8. Settlements, https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_08_Ch8_Settlements.pdf

- The emissions are reported for the year when the change in the land area is a relevant land category has been recorded; it is assumed that the land affected by conversion will remain in the conversion category for at least 20 years, which is reasonable taking into account the lifetime of any buildings or infrastructure.

It is important to highlight that estimation of GHG emissions from the AFOLU sector is characterized by a high level of uncertainty. This relates both to the uncertainty of default biomass carbon stocks values and uncertainty of the activity data. Though information on the area of land categories is based on the official statistical data, they do not track conversion specifically and could also include classification changes that impact assumptions on conversion. In particular, “Ecological areas” category was reported for 2017-2020 but later distributed among other land use categories. Some changes in estimated carbon stocks and reported GHG emissions could be related to reclassification of particular territories over time and not with the actual development of the land plots.

Annex 5. 2nd Łódź Citizens' Panel "How to reduce harmful greenhouse gas emissions on the area of Łódź by 55 percent until 2030?" – RECOMMENDATIONS FOR IMPLEMENTATION

NOR.	Indicato rofsupp	CONTENT OF THE RECOMMENDATION
		CONSTRUCTIONIN THE CITY
B-1	**95.00%**	Creating/introducing standards for the implementation of urban investments, regarding the use of green, low-carbon building technologies and materials, as well as optimising the energy costs of building operation.
B-6	**85.00%**	Systematic valuation and verification of the stock of the municipal register of monuments, in cooperation with the Regional Conservator of Monuments, in order to enable the application of modern low-emission technologies for their modernisation and renovation.
B-7	**88.33%**	Development and promotion of standards among investors for the application in newly constructed and renovated buildings, modern, low-emission building materials, e.g.: photocatalytic concrete.
B-8	**81.67%**	Conducting a pilot project on deployment of the air pollution absorbing bioreactor(s) in the urban space.
B-11	**86.67%**	Introducing the use of greenhouse gas-reducing technologies and materials in tender terms for municipal construction projects
B-12	**98.33%**	Continuation of thermal modernisation works and RES installations on municipal buildings.
B-16	**86.67%**	Introducing standards in the provisions of the Local Spatial Development Plans concerning the protection against development of forest and park areas on municipality-owned land.
B-25	**91.67%**	Striving to reduce greenhouse gas emissions in buildings undergoing renovation as part of the revitalisation programme carried out by the municipality.
		ENERGY IN THE CITY
E-1	**98.33%**	Installation of photovoltaic modules a municipal utility facilities.
E-2	**95.00%**	Installation of photovoltaic modules on city-owned residential buildings (if the monument conservation agrees, also renovated tenement houses).
E-5	**93.33%**	Measures to save heat energy by the city by intensification of thermal modernisation work on buildings owned by the city.

E-7	**90.00%**	Measures for electricity-saving by the city through modernisation of city lighting (i.e. replacement of light bulbs with energy-saving LEDs, installation of photovoltaic modules on street lamp posts where economically viable, installation of smart city lighting).
E-8	**86.67%**	Development and implementation of a comprehensive programme of resident education related to energy saving, including information on the possibility of financial support, promotion of the replacement of old-type cookers (the so-called "black-smoke-belching stoves") with ecological furnaces and ways of obtaining refund for such replacement, educational "anti-coal" indicating the problems of generating energy from coal combustion, especially lignite), the benefits of building a Waste Thermal Treatment Plant.
E-9	**83.33%**	Development and implementation of an educational programme at all levels and in all age groups in the scope of savings and developing environmental attitudes.
E-11	**81.67%**	Introducing free legal assistance for housing associations wishing to invest in renewable energy sources, e.g. for lighting of common parts of blocks of flats and tenement houses. This assistance may consist of support in preparing and submitting a grant application, support in creating project documentation, etc.
E-13	**91.67%**	Intensification of the programme for the replacement of coal-fired furnaces (the so-called "black-smoke-belching stoves") in the city.
E-18	**95.00%**	Striving for energy self-sufficiency in the city through the construction of biogas plants and the development of photovoltaic farms.
E-21	**91.67%**	Modernisation of public transport fleet to reduce energy consumption.
E-22	**91.67%**	Completion of the investment in construction of an urban biogas plant and conducting of an information and education programme on the preparation of waste by residents for use by the biogas plant.
		WASTE MANAGEMENT
O-1	**88.33%**	Increasing the number of "containers" for electro-waste - placing them more densely in housing estates, educational establishments and public utility buildings.
O-2	**81.67%**	Development and implementation of an educational programme, at all levels and in age groups in the scope of reducing consumption and a meat-free diet, as well as waste segregation and the "second life of things".
O-3	**85.00%**	Organisation and implementation of competitions for schools, public area clean-up actions and games with an environmental theme.
O-4	**83.33%**	Active measures for the introduction of national-level restrictions on excessive packaging waste.
O-5	**96.61%**	Intensification and promotion of PSZOK (Selective Municipal Waste Collection Point) activities, launching of a mobile PSZOK

O-9	**91.67%**	Creation and implementation of an app to facilitate waste management by residents and other functionalities developed during the public consultation concerning the app.
O-12	**91.67%**	Intensification of the "Łódź tap water" promotional campaign and installation of water drinkers at schools and in public utility buildings.
O-13	**93.10%**	Restrictions on the purchase of bottled water in municipal institutions and their subordinate units.
O-14	**88.14%**	Limiting purchases of bottled water from municipal subsidies.
O-15	**87.93%**	Implementing green public procurement.
		TRANSPORT IN THE CITY
T-1	**91.67%**	Comprehensive extension of the cycling network in Łódź, aiming at a coherent system of connections, including: construction of cycling routes connecting housing estates with the city centre, without the need for cyclists to use the infrastructure for pedestrians and cars; construction of cycling overpasses separating cycling traffic from car traffic; enhancing cyclists' safety through appropriate infrastructural and architectural solutions separating cycling traffic from car traffic.
T-4	**96.67%**	Development of an integrated agglomeration transport system, including in particular: initiation by the Łódź City Hall of talks with representatives of the Marshal Office, Łódź Agglomeration Railway and PKP Polskie Linie Kolejowe (Polish Railways) to develop a system of routes and connections adapted to the needs of residents; and joint selection of sites for car parks of Park & Ride type, with their subsequent construction.
T-5	**93.33%**	Increasing the frequency and accessibility of public transport, in particular at peak times - commuting to and from work and school.
T-9	**88.33%**	Successive replacement of the tram fleet with low-floor vehicles providing greater comfort and safety for passengers (easier entry, air conditioning, more efficient heating).
T-11	**81.67%**	Completion of a network of internal bypass roads to facilitate traffic and limit entrances to the centre, including the extension of Puszkina Street to Pomorska, Brzezińska and Strykowska streets.
T-13	**85.00%**	Expansion of the bus stop fare system (dynamic fare) including its promotion among residents.
T-21	**98.33%**	Successive improvement and expansion of the public transport network, with particular emphasis on tram networks, including: construction of new tram lines in new locations; extension of current lines through the construction of new tracks; modernisation and maintenance of current tram lines; construction of transfer hubs; designation and construction of new bus lanes.
T-22	**95.00%**	Ongoing search for external sources of investment funding aimed to improve public transport infrastructure.
T-25	**83.33%**	Greening of the railway tracks in Łódź, primarily using sedum, together with seasonal (winter) installation of plant protection against the adverse effects of salt
T-27	**81.67%**	Construction of bicycle racks and parking sites at terminal loops and stops (end stops).

ANNEX 6. City Climate Mission - workshop with business stakeholders

On 19 March 2024, in cooperation with Deloitte, the City of Łódź organised a workshop for company representatives concerning the strive for climate neutrality and developing ideas for decarbonisation measures in three perspectives:

1. the city with business (supporting business through the city in climate actions),
2. business with the city (supporting the city to achieve climate goals through business),
3. business-to-business (business-to-business cooperation to share experience and inspire each other to implement climate actions).

Representatives from more than a dozen companies attended the workshop. The key findings of the workshop are presented below.

The workshop was a preparatory step for further discussions with business, as one of the main ideas developed is the creation of a working group/platform focused on building dialogue between entrepreneurs. The creation of the group and further meetings are planned in autumn 2024.

1. The perspective of the city with business

Key conclusions

Creating a platform or a working group addressed to and driven by business that will focus on building dialogue between the entrepreneurs involved, open new perspectives for collaboration and enable developing of further recommendations for action.

Business representatives identify a great value in continuing the dialogue launched at the workshop as well as their role as a leader in conducting the activities. The city should act as an initiator, liaison and facilitator of the activities.

Awareness-raising communication activities

- **Coherent communication** - the need to develop a single brand or campaign whose slogans become recognisable. The use of a single campaign will allow for the dissemination of materials to a wider audience, support building the city's brand and consequently enhance the visibility of stakeholders.
- **Engaging "champions"** in marketing activities who could both extend the range of the campaign and share their knowledge and good practice with businesses at the beginning of their climate route.
- **Building an entrepreneur-friendly platform with accessible materials** - creatingof a single place for the educational and activation materials (checklists, good practice examples, manuals) significant from the perspective of an entrepreneur. The platform should offer a friendly "user experience".
- **Creation of knowledge exchange fairs or consultation hours** aimed at business education. Meetings could be led by "champions", consulting companies or law firms (e.g. through employee volunteering) as well as universities or NGOs.
- **Using gamification** in communication or promotional activities by creating a scoring system (e.g. as part of a competition or certification) that would also reward small players for making their first steps. Such a solution would also show that climate action is not only about big transformation, but about introducing simple solutions into daily work.

Other supporting measures

- **Energy efficiency rebates or grants** to subsidise or reward involved entities.
- **Creating new forms of financing for city transformation** - greening or thermo-modernisation funds, involving business representatives in the process.

2. The perspective of business with city

Key conclusions

Business can support the city in its strive for climate neutrality at three main levels

1. **Directly**, by engaging (with capital or competence) in activities implemented for the benefit of the city community, beyond "greening" of their own operations;
2. **Indirectly**, by "greening" its own operations - implementing sustainability measures for the company that simultaneously contribute to both reducing its own carbon footprint and that of the

city as a whole;

In the "supporting" areas, e.g. education, communication, employee social engagement, cooperation with municipal entities, etc

Direct activities

- **Involvement in the expansion of the city "green" infrastructure**, e.g. Imposing of the requirements by the city in connection with development investments - the development of so-called "Investment standards", including the need to rebuild/develop additional bicycle infrastructure (cycle paths, secure bicycle racks) and for electric cars (chargers), proper design of investments (in an energy-saving way and using "green" technologies), appropriate design of common spaces and publicly accessible green areas.
- **Involvement in circular and sharing economy initiatives**, e.g. joining initiatives reducing food waste (e.g. community fridges), reuse of equipment and objects (e.g. donation of exchanged equipment to NGOs, cultural and educational institutions).

Establishment of a Green Fund based on which the city could implement "green" measures such as thermal modernisation of city buildings. Such a solution provides a great flexibility to the city, while at the same time companies do not have to finance the full amount of the investment, but can contribute even small amounts. In exchange for the financial contribution to the Fund, companies could receive a number of benefits in the city, such as: discounts for employees (supplementing the benefit programme, e.g. tickets to cultural institutions, sports centres, public transport tickets), entry in the register of "Green Friends of the City" - marketing and image benefits, the possibility to benefit from simplified procedures when performing official activities, e.g. through access to a dedicated tutor in the city hall, an official "fast track", etc. (to the extent possible from the perspective of equal treatment of citizens and compliance with the legally required procedures). In order to ensure equal access to the Fund's benefits, fair rules and "benefit thresholds" would need to be developed, e.g. depending on the size of the enterprise and the relative scale of its involvement.

Indirect activities

- **Investment related to thermal modernisation and increasing the energy efficiency of buildings** (company premises), such as: measuring and monitoring the thermal parameters of buildings, adjusting thermal appliances (e.g. radiators), insulating the elevation, replacing and sealing windows, installing photovoltaic panels and heat pumps, replacing lighting with LED bulbs, etc. An additional benefit for the company arising from such measures is the achievement of tangible financial benefits related to reduced energy consumption.
- **Measures supporting the sustainable supply chain**, such as: using local suppliers where possible (creating local supply chains), reducing packaging and packaging waste and using green solutions (including reusable packaging), replacing the fleet with electric or hybrid cars, optimising delivery rates (shaping the delivery network to minimise so-called "empty runs").

Supporting green attitudes among employees, such as: promoting remote working and flexible working days where possible, subsidising public transport tickets, providing infrastructure in the building to encourage the use of bicycles for daily commuting to work (changing rooms, showers, secure bicycle racks).

Activities in the "supporting" areas

- **Educational activities**, such as: implementation of educational campaigns to raise the environmental awareness of residents (e.g. on smog, waste, energy saving practices, conscious consumption), cooperation with schools and universities - support in providing classes / workshops on sustainable development "in practice".
- **Establishment of long-term partnerships with municipal entities on a barter basis**, so that in return for the business contributing to the green transformation of municipal entities, company employees receive benefits - e.g. tickets to municipal theatres.
- **Cooperation between the city and business in the area of data management**, involving the provision by business to the city of data that will support the calculation of the overall carbon footprint of the urban ecosystem (e.g. data from energy certificates), including, through the city making available a special calculator that will, on the one hand, estimate the impact of a company on the basis of fundamental data on its activities and the infrastructure used and suggest alternative solutions (e.g. changing light bulbs to LED) and the measurable financial benefits associated with such changes and, on the other hand, provide the city with estimates of the carbon footprint of businesses.
- **Engaging employees in sustainability activities**, e.g. through educational activities, competitions promoting environmentally-friendly behaviour, implementation of initiatives for employees (e.g. bicycle inspections, promotion of organic food), etc.

- The business-to-business perspective

Building value

- Creation of **new branches of business** and at the same time, development of new opportunities to earn money, diversify activities and reach new audience.
- Cooperation in **EU-funded calls for tenders and research competitions** (e.g. Horizon Europe) through creation of new consortia and cooperation between business and science.
- The opportunity to **promote oneself,** to build one's presence in the market, but also to increase value among potential investors.

Activities of the city supporting business-to-business cooperation

- **Preparation of the Solutions Catalogue** - one-pager with examples of actions to be taken by less advanced companies; ideally by sector/industry.
- **Platform for the exchange of knowledge/experience** - the city creating a platform for interaction, for example, in order to promote technologies through which companies can reduce emissions.
- **Emissions Calculator** - creating or making available an application for calculating the City's emissions, which will be accessible to representatives of the local business.
- **Policy towards Suppliers** - developing proposals of measures to be taken on the business-to-business line, preference to local market suppliers.
- **Supplier Code** - developing a proposal for a code as mandatory for the conclusion of each contract.
- **Education** - educating on current or upcoming legislative changes and for the purpose of knowledge exchange.

Activities of the City - potential solutions

- Using **non-Brussels vocabulary** i.e. reliance on plain language, language of benefits/advantages/savings.
- **A different message** should be addressed to large companies and a different one to small companies (different scale, different understanding, different starting point)
- **The conference format** is an attractive opportunity for presentation to local businesses
- **DELTA** - it is important to show business change; we do just promote activities, but clearly show the change they have caused
- **Certificate from the City** as a benefit to undertake climate-related activities, including the potential impact of having/not having it on receiving grants.
- Sharing knowledge by **showing small steps** , i.e. where the business should start and what to do next, step by step.
- **Communication"chain"** and showing in social media or other media what the business is already doing and nominating more actors for action.
- **Profits/savings calculator** - educating and demonstrating the financial dimension in communication activities, which can be more motivating to initiate action.
- The city as a Platform for the exchange of experience/innovative ideas, but in a way that **distinguishes both large and small companies** (start-ups, craftsmen).
- Smaller knowledge-sharing formulas such as **business breakfasts**, which can be attractive to entrepreneurs.
- **Gala with the City awards** targeting **small** businesses, recognising their activities with a statuette

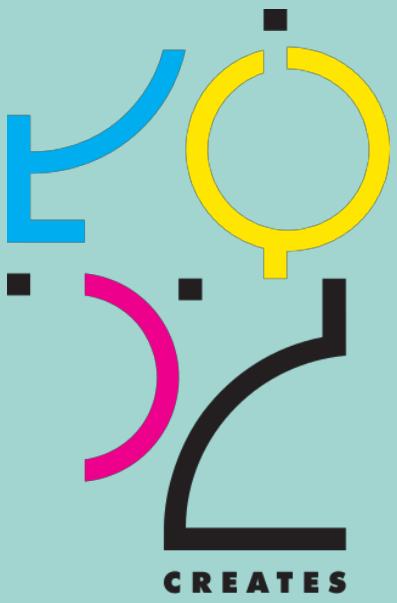
NET ZERO CITIES

EU MISSION PLATFORM | CLIMATE NEUTRAL AND SMART CITIES

Climate City Contract

2030 Climate Neutrality Commitments

The City of Łódź



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1 Introduction

Introduction

Greenhouse gas (GHG) emissions have a considerable impact on climate change. Therefore, in accordance with the European Union policy, The City of Łódź, being aware of the challenges related to environmental protection, has taken a number of measures to reduce emissions of harmful gases and to promote environmentally-friendly activities. One of the City's overarching goals is to ensure a secure future for the next generation of residents in an environment that is adapted and resilient to the adverse effects of climate change, an environment fostering sustainable development in a diversified ecosystem.

The City of Łódź has joined the EU Mission “100 climate-neutral and smart cities by 2030” to accelerate its climate actions and demonstrate leadership in reducing GHG emissions beyond levels planned under existing policies and goals.

In 2022, The City of Łódź has submitted an Expression of Interest, where UML confirmed that the city intends to address all Greenhouse Gases (GHGs) and sectors / sources of emissions to reach climate neutrality by 2030 as defined by the Cities Mission.

In 2024 The City of Łódź has developed a detailed inventory of GHGs emissions within the city boundaries and a Sustainable Energy and Action Plan covering key sectors of city’s energy consumption.

Participation in EU Mission “100 climate-neutral and smart cities by 2030” is aimed at development of additional portfolios of actions and attraction of additional financial resources to foster GHG emissions reduction from buildings and transport via phasing out coal consumption, development of renewable energy, electrification of transport sector and investment in green zones.

Participation in the Mission also demonstrates a high level of ambition and strong political commitment to climate neutrality. With large efforts directed to climate action at a global, regional and national level a clear commitment to climate neutrality and creation of enabling policy environment at the local level provides a competitive advantage for the city in access to green and climate finance via private investment, EU programmes, European Investment Bank and other sources.

Despite many initiatives and large-scale investment projects undertaken in recent years, Lodz City still faces many environmental challenges, including intense air pollution resulting mainly from coal heating and transport. There are thousands of buildings that need urgent renovation and connecting to the district heating system or installation of low emission heating sources. Higher investment in climate action from internal and external resources would not only contribute to climate change mitigation but will also solve many other local problems, including improvement of air quality in the city, enhancing green zones and local urban biodiversity, as well as making the city more comfortable place for living for its citizens.

Joining the Mission also allows The City of Łódź to get access to additional expert support (e.g. in data collection and acquisition, data analysis, technical support of specific projects, financing tools, etc.) that would allow developing innovative projects and initiatives to transform defined priority portfolio of actions into specific bankable projects and policy measures that would accelerate decarbonization in the city. The Mission also provides a unique platform for exchange of experience and good practices between the cities that are leading climate action throughout Europe as only with joint efforts cities can reach ambitious climate neutrality goals.

In addition to the Climate Neutral Cities Mission, the City of Łódź is also involved in other international programmes aimed at achieving climate neutrality:

- Urban Transition Mission (UTM) launched at COP26 in November 2021, which aims to transform the city into a more sustainable, efficient and citizen-friendly place to live through

changes in urban planning, infrastructure, transport, energy, waste management and other areas. It emphasises the role of partnership and cooperation between local authorities, the business community and civil society in the transformation process. Łódź is one of the first cities that joined the UTM.

- Adaptation to Climate Change Mission - a sister mission whose aim is to cooperate and align intents with other signatories, to mobilise resources and develop activities in its local government units to reach the adaptation goals.

- European Climate Pact - a pilot programme where Łódź participates as one of three European cities. The European Climate Pact is a platform for cooperation between local authorities and EU institutions. The aim of the Pact is to raise awareness of climate issues and EU action, encourage climate measures, connect citizens and climate organisations and assist them in learning from each other.

- EU Mission is also involved in the NEEST - NetZero Emission and Environmentally Sustainable Territories project, which aims to create a model climate-neutral quarter in the city offering solutions ready for implementation, scaled and replicated to other areas of the city. The ultimate result will also be a guide to enable cities with similar building types to test and scale and even improve their model solutions, as well as create new models for more building types based on the available NEEST models. In Łódź, the project is implemented on the premises of the Łódź Radio Station.

- Łódź has also joined the Covenant of Mayors for Climate Change, a bottom-up initiative of cities and municipalities from all over Europe that decided to support the implementation of the EU climate and energy policy by implementing its demands on their territory as well as supporting each other in these efforts. As part of its participation in the Covenant, Łódź has developed a Sustainable Energy and Climate Action Plan (SECAP). 2030 Climate Neutrality Action Plan developed within the City Climate Contract (CCC Action Plan) serves as an umbrella document for SECAP and other climate-related local planning documents and focuses on the gaps between existing policies and climate neutrality aspirations of the city.

The commitment of the City authorities to environmentally-friendly activities at an international level is also extremely important. As a member of the European Committee of the Regions, the Mayor of Łódź, Hanna Zdanowska, is engaged in the work of, among others, the ENVE Committee - the Committee on the Environment, Climate Change and Energy, the CoR Working Group on Green Deal Going Local. She also acts as the National Ambassador for the Covenant of Mayors and as an Ambassador for the European Climate Pact.

Achievement of climate neutrality target in 2030 requires working with all stakeholders to develop and implement new transformational decarbonization projects and to accelerate the implementation of the long-term actions. Łódź understands the importance of climate change and the challenges in the scope of solutions to improve the environment. The involvement of a wide range of stakeholders (including, above all, residents, business entities, municipal companies, scientific organisations, experts) in the process of creating a friendly environment, which is the foundation of the municipal strategy, is the driving force behind the changes taking place in the city.

2 Goal: Climate neutrality by 2030

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Goal

The City of Łódź has an ambitious aspirational target to reach climate neutrality in 2030 that cover administrative boundaries of the city, excluding the Władysław Reymont Airport area. This exclusion is fully justified because for economic, legal and technological reasons, Lodz City is not able to guarantee that we will be able to reduce CO2 emissions at the airport to the levels described in the Climate Neutral and Smart Cities Mission.

Achieving climate neutrality in line with the Climate Neutral and Smart City Mission requirements foresees reducing the GHG emissions from all sectors and sources within the city's boundary, including stationary energy sector, vehicles and transport, consumption of electricity and district heating/cooling, as well as waste sector.

GHG emissions reduction target required for the achievement of climate neutrality **is 80%** compared to the GHG emissions level in the selected **2018 baseline year**.

To reach the climate neutrality goal the city would need to double GHG emission reductions compared to the trajectory set under existing policies and in particular, Sustainable Energy and Climate Action Plan for the Period till 2030.

By adopting a climate neutrality target Łódź contributes to the global and national climate action and EU Green Deal at the local level but also creates conditions for additional benefits of the residents and local businesses, in particular:

- **Improved quality of life in the city** – climate mitigation actions have significant co-benefits as they reduce air pollution in the city (e.g. due to phasing out coal-fired heating sources, electrification of transport, public transportation development) and improve the quality and accessibility of green zones.
- **Attraction of investment and additional finance** – the focus on climate action creates opportunity to access concessional and grant-based finance from international financial institutions, EU funds and other sources, as well as attract additional private investment.
- **Health benefits for the residents** – reduction of air pollution stemming from climate mitigation action significantly reduces health risks, while enhanced green zones also provide health benefits and reduce the risks during the heat waves.
- **Economic benefits** - investment in technology and innovation related to climate change adaptation (including, in particular, greenhouse gas emission reduction) can generate new jobs and stimulate economic growth, particularly in sectors associated with renewable energy sources. Adaptation measures also reduce the risk related to extreme climate events, which translates into lower costs of repair and reconstruction after natural disasters.
- **Social benefits -** increasing residents' awareness and knowledge of the need to strive for climate neutrality while undertaking adaptation measures ensures understanding of the city's actions and builds residents' sense of responsibility.
- **Improving the aesthetic image of the surroundings -** despite the considerable amount of greenery in the city, it is planned to increase it, among others due to one of its most important functions - improving air quality through the ability to absorb harmful gases and particulate matter. Increasing the number of trees and greenery in general also means improving the visual qualities of the surroundings as well as providing new recreational areas for inhabitants.

3 Strategic priorities

Strategic priorities

The key strategic systemic priorities of The City of Łódź that will result in additional deep GHG emission reductions and will allow reaching climate neutrality target include the following:

1. **Phasing out coal consumption** – replacing all polluting coal-fired heating sources in residential buildings with renewable energy sources or other low-carbon alternatives and decarbonization of district heating system in the city.

   One of the measures which helps achieve this objective - particularly in residential buildings - is the provision of targeted subsidies for investment projects involving the permanent removal of a solid fuel heat source from use and the change of the heating system to: connection to a district heating network with a possibility of connecting domestic hot water, connection to a gas network with the installation of a heating source, installation of an electric heating source, installation of a heat pump for heating purposes.

2. **Scaling up renewable energy use** – large-scale deployment of solar power in residential, public and commercial buildings and at least tripling the capacity of PV installations in the city, promotion of wind power and energy storage use in residential sector, as well as using renewable energy sources in district heating network.

   At this point, it is worth emphasising that, according to the analyses performed, in the area of the city of Łódź, very good conditions exist, in the Polish context, for the use of solar energy with the adaptation of the type of systems and properties of devices using this energy to the nature, structure and distribution of the solar radiation over time. Therefore, emphasis on solar energy use in particular is recommended.

3. **Investing in energy efficiency** – implementation of large scale programs to support thermal insulation and energy efficiency improvements in buildings, including subsidies for energy audits to determine the most cost-effective measures with significant climate mitigation potential.
4. **Electrification of transport** – investment on charging infrastructure for supporting EV use in the city with an ambitious goal to reach 20% of EVs among registered vehicles, electrification of buses in public transport system, as well as supporting other types of electrified and low-carbon public transport system.

   In terms of transport, one of the directions is also the continued increase in the number of cycle paths and encouraging residents to use bicycles.

5. **Developing green zones** – creation of new urban forests and parks, and enhancement the quality of existing green zones to improve air quality and achieve additional carbon sequestration to partially neutralize residual emissions from buildings and transport.

   It is also important to “decongest” buildings in the city centre with greenery and eliminate urban heat islands by introducing greenery where limited or no greenery has been found so far. The maintenance of green spaces in the Greater Urban area is of particular importance, especially for improving air quality.

The City will work with all stakeholders and will establish a process for continuous monitoring of progress to ensure the achievement of strategic priorities and climate neutrality target. Cooperation with stakeholders involves not only consulting on the measures taken, but also ongoing interaction, as well as seeking new forms of funding and education.

4 Process and principles

Process and principles

For a long time, the City of Łódź has been taking measures to protect and improve air quality, reduce energy consumption and consequently, reduce greenhouse gas emissions, among others:

1. The city undertook thermal modernisation measures for public utility facilities. Due to the thermal modernisation work performed, energy consumption and the operating costs of the facilities have been decreased as well as greenhouse gas emissions have been reduced. As part of the measure a project entitled: “Rationalisation of energy consumption - Thermal modernisation of educational facilities in the City of Łódź” was implemented. The project was carried out on a large scale, with a total of more than 80 educational facilities in Łódź undergoing thermal modernisation as part of five energy efficiency projects.
2. The city completed investment related to the replacement of heat sources with lower-emission and higher-efficiency sources. More than 3,000 solid fuel-fired ovens were removed between 2018 and 2022.
3. As part of the governmental programme “We illuminate Poland”, about 1,000 street lights were replaced with LED in Łódź in 2023 and further funding was obtained to complete the replacement process across the city.
4. The city has taken measures to improve the functioning of the urban cycling system and the system of cycle paths. A number of improvements for cyclists were performed (e.g. removal of potholes, installation of bicycle racks, renovation of footpaths, repair stations for bicycles), which contributed to an improvement in the functioning of the cycling transport. In the years 2018 - 2022, the length of cycle paths in Łódź increased by 72 km.
5. As part of the anti-smog campaign “Łódź oddychaMy”, addressed to the inhabitants of Łódź, with particular emphasis on senior citizens, a series of articles was prepared with the aim of environmental education and informing residents about the need to replace heating sources as well as available financial support programmes. The important role of educational activities is not only to increase knowledge and raise awareness among residents, but also to inspire action.
6. As part of the project “Łódź - an Environmentally Friendly City” aimed at increasing the environmental awareness of inhabitants of Łódź, the following activities were carried out: anti-smog publications, advertising spots regarding subsidies for replacing ovens with a more environmentally friendly source of heat, 25 environmental workshops were provided, environmental education events were co-organised and an urban information campaign on energy saving was conducted.
7. The City's efforts in taking action on the environment and climate and the cooperation that allows it to support the City's efforts to build a more environmentally friendly environment, have resulted in the EKOpakt, which includes a number of initiatives.

The City of Łódź is still actively working on climate mitigation projects, programs and initiatives with broad involvement of citizens, businesses, academic institutions and other stakeholders. During the recent years climate action is being actively incorporated in city-wide strategic documents and dedicated planning documents are being developed to streamline climate mitigation activities.

Strategic documents focused on climate action include Sustainable Energy and Climate Action Plan (SECAP), which defines detailed list of priority interventions in key sectors defined based on broad stakeholder consultations, and 2030 Climate Neutrality Action Plan, which focuses specifically on the measures that are additional to the activities included in existing policies and are required to achieve climate neutrality already in 2030.

Strategic planning to achieve climate neutrality is based on consultations with broad range of stakeholders, including:

- **Citizens (city residents, civil society organizations and NGOs, community-based organisations, educational organizations);**

Residents are extremely important opinion-makers for the authorities of the City of Łódź, therefore for many years, the City has been trying to involve them in the decision-making processes regarding implemented projects and activities. Consultation processes generally take place through organised consultations, citizen panels, meetings, walks, the Vox Populi online platform. NGOs are often involved in these activities. Examples of community engagement activities related to the objectives of the Mission included the 2nd Citizens' Panel (organised in 2023), the subject of which included the identification of the risks caused by greenhouse gas emissions in Łódź and their effects on the health and quality of life in the city, and innovative solutions for reducing greenhouse gas emissions in Łódź, improving air quality in the city and adapting to climate change. During the 5 meetings held as part of the Panel, recommendations on gas emissions were discussed. The recommendations developed and selected for the Mayor of Łódź are presented in the annex to the Action Plan.

The issues of greenhouse gas emission reduction were also discussed during the citizens' workshops held at the end of 2023 which, in addition to the Climate Contract, also formed the basis for the SECAP document.

In the context of the City inhabitants, education is also extremely important for the authorities of Łódź, therefore the City conducts educational campaigns (including topics related to the objectives of the Mission).

Education is also provided tothe youngest inhabitants of Łódź, among others, as part of the "Łódź Schools for Climate" programme. It is a project that combines global and environmental education and, in addition, really engages participants in realistic actions for climate protection.

Education and the acquisition of new knowledge can also take place through participation in numerous events organised by the City. Knowledge can be gained, among others, by interested residents, students, academics and representatives of NGOs. The events also serve for the exchange of knowledge and information between city authorities and experts.

One of them was the "EKOinnowacje" conference (2022) organised at the Łódź Orientarium, which presented solutions for the future in the field of energy. Another example is the Local Government Climate Congress organised by the City. The first editions of the event took place in 2022 and 2023, whereas the next one is planned in May 2025. The Local Government Climate Congress includes panel discussions, meetings with experts as well as with residents. The idea behind organising the Congress is to bring together local government, scientific, business and institutional communities - including foreign ones, building a network of links for the exchange of knowledge and experience. In addition, the mission of the event mission is also to educate, not only at a teaching level in educational institutions, but at an individual level - related to our habits and daily choices. The guest of honour at the previous edition of the Congress was Frans Timmermans, Executive Vice-President of the European Commission, responsible for implementation of the European Green Deal.

- **Academic and scientific community;**

Universities and the broadly understood academic community are also extremely important stakeholders in the process aiming at climate neutrality, among others, because of their expertise. Joint projects with the University of Łódź and the Technical University of Łódź are particularly important. Experts and students are willing to get involved in new projects and meetings.

Experts from the University of Łódź participated very actively, among others, during the Citizens' Panel mentioned earlier. They are also keen to be involved in the design of new greenery areas. On the other hand, the City cooperates with the Technical University of Łódź on a number of technical projects - such as the "Engineers of the New Generation" project which operates under the international partnership and brings together four entities: City Hall of Łódź, Technical University of Łódź, the Royal Danish Embassy and the Danfoss company. As part of the project, a group of students appointed by the University of Technology worked on a plan to improve the energy efficiency of buildings.

- **Business entities (technology and equipment providers, utilities, banks and other financial institutions and other private companies;**

Achieving climate neutrality is not possible without broadly understood involvement of business. The city has been working together with business on climate for a long time. More and more entrepreneurs, organisations, schools and individuals are becoming aware of the threats involved and the need to take steps to counteract the adverse effects of these changes. To this end, the so-called Ecopakt was created - a form of cooperation allowing to support the City's efforts to build a more environmentally-friendly environment. Some of the activities carried out in cooperation with business had already started before joining the Mission and are continuing steadily. In the framework of this cooperation, companies, institutions or other interested parties can, for example, financially support projects such as planting new trees, creating green spaces, organising educational workshops, setting up air sensors or larger-scale projects which can have a positive impact on the environment. To date, more than 50 entities have been involved in cooperation under the Ekopakt,

For the City, the dialogue with entrepreneurs itself is also extremely important. Climate-neutrality issues were repeatedly raised during one-to-one meetings with entrepreneurs, during participation in the events mentioned earlier, but also during dedicated group meetings such as workshops. An example is the business workshop held in March 2024. Representatives from more than a dozen companies attended the workshop.

The main objective was to develop joint ideas for feasible activities that the City and various business actors (not only large companies but also small and medium-sized enterprises) can implement to contribute to climate neutrality. One of the ideas was to create a business-targeted and business-driven platform or working group, which would focus on building dialogue between the entrepreneurs involved, open up new perspectives for collaboration and enable further recommendations for action. The creation of a working group is planned for this autumn. The collection of ideas developed during the workshop is included in an annex to the Action Plan.

- **Local authorities and organizations (local government and internal departments, municipal organizations);**

The preparation of a plan to achieve climate neutrality would not be possible without the involvement of representatives from various departments of the City of Łódź. It was extremely important to involve, among others, the departments responsible for finance, project management, project supervision and raising funds from external sources. Municipal companies, responsible, among others for low-carbon transport or adequate waste management are also crucial.

- **Government (national government, EU authorities, EU Funds.**

Climate neutrality is an extremely hard process and impossible to achieve without governmental support and national funding, therefore, the City of Łódź, together with the other Polish cities associated in the Mission, conducts constant dialogue with the Ministry of Climate and Environment. Several workshops were held in 2024, in order to: receive support from the Ministry in preparing Climate Contracts, specifying action plans to help cities achieve climate neutrality faster than stipulated in the EU guidelines, including finding new sources of funding for decarbonisation projects, or creating the National Energy and Climate Plan. The meetings also involved experts from theMinistry of Development Funds and Regional Policy, Ministry of Development and Technology,NCBR+ Sp. z o.o, NFOŚIGW, Institute of Environmental Protection-State Research Institute and Bank Gospodarstwa Krajowego.

- **Climate-Neutral and Smart Cities Mission and other Polish cities participating in the Mission (Warsaw, Wrocław, Kraków and Rzeszów);**

As part of the Mission, it is also extremely important for Łódź to cooperate on an ongoing basis with other engaged Polish cities. Representatives of Łódź, Warsaw, Wrocław, Kraków and Rzeszów hold regular meetings to discuss current issues related to the process, as well as take part in other meetings and workshops related to the Mission, or participate in events, such as conferences, panels. The cities also cooperate in the NEEST project (discussed later) and under the cooperation with the Ministry of Climate and Environment in the work on the Climate Contract, where the Polish mission cities always “speak with one voice”.

Together with other Polish cities, Łódź is actively involved in the aforementioned NEEST Project. The aim of the project is to prepare a set of innovative solutions ready for implementation, scaled up and replicated on the basis of model implementation simulations, covering technical, financial and environmental, as well as social and so-called MEL (Monitoring Evaluation and Learning) aspects for the wide-ranging and deep energy retrofitting of buildings and the revitalisation of their surroundings. During the pilot project, analyses will be carried out on a selection of five building types in each city, including their surroundings (5 city quarters) and activities involving residents and other stakeholders in the process. At the same time, the solutions modelling process will use (catalogued and improved) technical, financial and environmental, social and knowledge sharing as well as learning solutions previously used in the individual cities, including the best available technologies of the project partners in this area. NEEST will allow to gain experience to be used in all Polish cities.

A more detailed description of stakeholder engagement activities, activities aimed at achieving climate neutrality,and people involved in the process is included in the Action Plan.

In 2024, The City of Łódź has developed it's first GHG emissions inventory and a tool for tracking city-wide GHG emissions, which is also designed for continuous monitoring of GHG emission levels and regular update of emission inventory.

The work under EU Mission "100 climate-neutral and smart cities by 2030" will be based on the following key-principles:

- **Climate justice** – climate mitigation actions will be designed to protect most vulnerable citizens, including via the design of co-financing programs to support replacement of coal heating sources, energy efficiency, and installation of renewable energy systems;
- **Multi-level governance** – the government of The City of Łódź will aim to demonstrate leadership in climate action, but the achievement of deep and rapid GHG emission reduction will require efficient cooperation with the regional and national governmental institutions.
- **Innovation** – the city will actively support innovative solutions in climate change mitigation, including the technologies that directly allows to reduce emissions, such as renewable energy and energy storage, and technologies, that enable climate action by better access to data or more effective management of urban systems and infrastructure.
- **Stakeholder and citizen engagement** – the city is actively working with the citizens in designing and planning climate action and will enhance further such engagement activities in the future, as the deployment of climate technologies and behaviour changes of the citizens will be instrumental to the success of climate action in the city.

The CCC Action Plan is designed as a live document that will be regularly updated based on ongoing stakeholder consultation and citizen engagement processes and gradually including additional information and details on the actions planned.

The next iteration of the Action Plan will be developed within the two years period and is planned in September, 2026.

For the preparation of the next iteration of the CCC, the city will work on complementing the list of portfolios of actions with specific projects and programs, as well including lessons learnt on barriers, opportunities and policies required to foster climate action.

In particular, the city will actively work with businesses and other stakeholders to define the list of projects and support their implementation. The city has launched Ekopakt dla Łodzi initiative[1], which provides an opportunity for businesses and other stakeholders to support the City's efforts to build a more environmentally friendly urban space and implement green projects. The Ekopakt dla Łodzi initiative will serve as a model for collecting information on potential decarbonization projects (e.g. technical details, renewable energy generation potential, energy saving, GHG emission reductions,

[1] UML, https://uml.lodz.pl/files/public/uploads/Ekopakt.pdf

capital expenditures and operational cost, etc.) and their incorporation into the future iterations of the CCC Action Plan. In the next stages, planning is also to establish a working group (with business representatives), which will be an important body supporting the City and helping to set further directions of action.

In the next period, cooperation with residents will also be developed. It gives local authorities the opportunity to present and justify their actions and submit them to public discussion, in which all social groups can present their point of view. Thanks to this, it will be possible to introduce certain corrections and changes to the proposed activities, which will make them better perceived by society and allow for a better achievement of the set goals. Participation will continue in the form of, among others: workshops, consultation meetings, continued participatory budget (and possibly participatory eco-budget)[2]. Educational activities will also be continued (including the "Łódź Schools for Climate" project in 123 schools). The next iteration will present lessons from future activities.

The next iteration will also present results regarding cooperation with Ministries, including the participation of Polish Mission Cities, among others in work on updating documents important for achieving climate neutrality (e.g. National Energy and Climate Plan 2021 – 2030).

The city will also work on better understanding of the sources and structure of GHG emissions in waste management sector, as well as related climate mitigation opportunities.

After the 2026 iteration, the next one is planned another two years (end of 2028). As the climate contract is a "live document', it should be taken into account that many changes and improvements will be introduced as a result - some of the planned tasks will be much more detailed.

[2] More details about planned activities for the future are presented in the Action Plan.

5 Signatories

The table below enlists the signatories[3] who are committing to this CCC, and thereby to help the city achieve its goal to reach climate neutrality by 2030. Specific agreements that articulate the details of the climate action(s) between the municipality and signatories are added to the individual contracts in **Appendix 1.**The number and relevance of signatories' commitments is likely to increase over time.

Name of the signatory (organisation)	Sector / Domain / Level of operation[4]	Legal form	Name of the responsible person	Position of the responsible person
Ministry of Climate and Environment	Government	Government administration	Paulina Hening-Kloska	Minister of of Climate and Environment
InPost	Logistics	Private company	Marta Zalewska	Director of Partnership Relations and the InPost Green City Program
Veolia Energia Łódź	Power engineering (international)	Private company	Maciej Herman Artur Kin	Members of the Board
Puro Hotels	Hotel industry	Private company	Hubert Trela	President of the Board
Idemia	IT Systems	Private company	Bartłomiej Szymański	Managing Director/Member of the Board

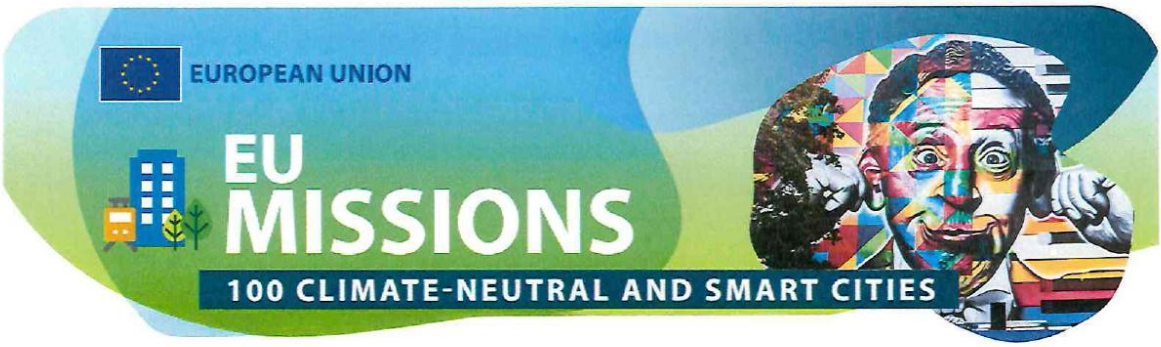
[3] Climate City Contract signatories may be individuals or organisations. They ideally include national and/or regional governments, for example concrete agreements/ commitments made through the multi-level governance engagement processes supported by NetZeroCities, CapaCities, and other emerging national level initiatives.
[4] Please mention if the organisation is active at local, regional, national, or international level.

Lodz Univeristy of Technology (Politechnika Łódzka)	Education	Public organization	Professor Krzysztof Jóźwik	Rector
University of Lodz (Uniwersytet Łódzki)	Education	Public organization	Professor Łukasz Korporowicz	VICE-RECTOR FOR SCIENCE, FIRST DEPUTY OF THE RECTOR
The Polish National Film, Television and Theatre School in Lodz (Szkoła Filmowa w Łodzi)	Education	Public organization	Professor Milenia Fiedler	Rector
Aqua Park Łódź (Aqua Park Fala)	Entertainment	Municipal company	Krzysztof Babij	President of the management board
Municipal Zoological Garden in Łódź	Entertainment, Ecology and Education	Municipal company	Łukasz Goss/Tomasz Jóźwik	President of the management board /Member of the management board
Municipal Communications Company (MPK - Łódź Spółka z o.o)	Public transport	Municipal company	Zbigniew Papierski	President of the management board
Ericsson Poland	Electric Comapny	Private company	Martin Mellor/Anna Olesiejuk-Chacińska	President/ Member of the Board
Atal	Development Company	Private company	Zbigniew Jurioszek	President of the management board

WWF Poland	Ecology	Non-governmental and ecological organization	Mirosław Proppe	Chief Executive Officer WWF Poland
Climate Strategies Poland Foundation	Ecology	Non-for-profit organization	Agnieszka Liszka – Dobrowolska , Łukasz Broniewski	Members of the \Board
Veolia Foundation Poland	Energy	Private company	Izabela Rakuć-Kochaniak	President of the Board
Rex-Bud	Development Company	Private company	Dominik Karczewski	President of the management board
Design Lab Group Poland	Building design, architecture	Private company	Karolina Taczalska	Board Member
Corning Optical Communication Polska	Solutions for industry	Private company	Łukasz Srogosz	Plant Manager
Skanska Property Poland	Development Company	Private company	Anna Themerson	Sustainability Director, Proxy
ETPromo	Services for industry	Private company	Łukasz Tomczak	President of the Board
AMAGI MEDIA	IT industry	Private company	Mariusz Ostoja- Świerczyński	Senior Director of Engineering
Echo Investemnt & Archicom	Development Company	Private company	Echo Investemnt : Maciej Drozd and Rafał Mazurczak Archicom : Waldemar Olbryk and Rafał Zboch	Vi-ce President of the Management Board and Board Member

				President of the Management Board and Board Member
European Reginal Centre for Ecohydrology of the Polish Academy of Sciences	Education	Science Center	Dr hab. Katarzyna Izydorczyk	Director
Łódź Film Center (Łódzkie Centrum Filmowe)	Education, Culture	Municipal company	Anna Moska	President of the Board
Epson Europe B.V.	Electronics manufacturer	Private company	Michał Kolasa	Corporate Account Manager
BZB Projekt p. S.A.	Management in construction	Private company	Bartłomiej Zgorzelski	Owner
University of Music in Łódź	Education	Public organization	Katarzyna Kaźmierczak	Chancellor
Water Supply and Sewerage Plant Company in Łódź (Zakład Wodociągów i Kanalizacji)	Water management	Municipal company	Michał Śmeichowicz	President of the Management Board
ABB Sp. z o.o., ABB E-Mobility Sp. z o.o.	Energy and automation technologies	Private company	Tomasz Wolanowski, Przemysław Zakrzewski	Vice-president of the management board, Vice-president of the management board
IndieBI S.A.	IT industry	Private company	Tomasz Kaczmarczyk	President of the management board

VFM sp. z o.o.	Development Company	Private company	Michał Zaczkowski	Chief Investement Officer



We are witnessing the impact of climate change in our everyday lives. We all notice no clear transitions between the seasons of the year, we experience global warming and torrential downpours leading to floods happening with increasing frequency and becoming more severe, raising concerns. The scientific consensus is clear - the humanity is collectively responsible for the challenging situation we are facing today, and the blame for the global warming progressing at an unprecedented rate, which leads to more negative impacts, can be attributed directly to our actions. Due to the sheer density of the built environment and the extent of the changes to the natural habitats, the cities - which are particularly vulnerable to the impacts of climate change - need to undergo a rapid and efficient transformation to successfully tackle the new challenges.

By joining the Climate-Neutral and Smart Cities EU Mission, Łódź intends to take advantage of this unique opportunity to focus on the transformation efforts and accelerate the processes aimed at achieving climate neutrality and sustainable development of our City. Achieving climate neutrality is not possible without the involvement of a wide variety of stakeholders. This follows one of the objectives in Agenda 2030, which states that sustainable growth needs to be driven by shared responsibility, extensive partnerships and engagement of citizens, businesses, academia, governments and NGOs.
One of the priorities for the City of Łódź is to get citizens, organisations and businesses involved in the efforts aimed at building a friendly environment. We know that achieving great things starts with small steps - as long as we walk together.

This document, presented to the European Commission, is the plan to achieve climate neutrality by 2030 by the City of Łódź. Our strategy and efforts to date have been supported by various stakeholders. Below is a list of some of them, who have decided to voice their official support in the form of a letter of intent.

Mayor of the City of Łódź
Ambassador of the
European Climate Pact

NET ZERO CITIES
EU MISSION PLATFORM

6.Sample contract with signatures

LETTER OF INTENT

Climate Contract of the City of Łódź as part of the Mission for Climate Neutral and Smart Cities, under the auspices of the European Commission

The City of Łódź and …… hereinafter referred to as the Parties, which shall read as follows:

PREAMBLE

By joining the Mission for Climate Neutral and Smart Cities, the City of Łódź is one of a hundred European cities committed to achieving the goal of climate neutrality. This action is fully in line with the Paris Agreement and the European policies implementing it, the overarching goal of which is to ensure a secure future for next generations of citizens in an environment that is adapted and resilient to the negative effects of climate change, an environment that promotes sustainable development in a diverse ecosystem.

The Parties to this letter are aware that achieving desired objectives requires joint and individual action on climate neutrality, building a platform for dialogue, exchange of knowledge and experience. Indeed, public administration is estimated to be responsible for only around 10% of harmful emissions. Therefore, the Parties declare their willingness to act accordingly, both in cooperation and on their own, to accelerate the necessary processes of positive change.

§1

……. expresses support for activities of the City of Łódź in the area of climate change adaptation and mitigation to achieve the goal of climate neutrality and the implementation of the Municipal Climate Contract of the City of Łódź.

§2

The Parties express their intention to take individual actions that are consistent with the assumptions of the Municipal Climate Contract of the City of Łódź, according to available funds.

§3

The Parties are willing to cooperate, communicate, exchange knowledge and experience in the field of climate and environment on an ongoing basis, including, in particular, to participate in each other's advisory, project and working teams in order to find the most optimal solutions.

§4

1. Aware of the need to develop synergies of a wide range of stakeholders, ... expresses its intention to undertake on its own the specific actions to achieve the goal of climate neutrality set out in the appendix to this letter.
2. The appendix, if appropriately reserved, is confidential to entities other than the City of Łódź.