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 Budapest

BUDAPEST

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Budapest towards climate-neutrality

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Document history			
Date	**Version**	**Author**	**Changes**
January 2023	V1	ICLEI	**/**
June 2023	V2	ICLEI	The template was amended to include a front-page note "The Action Plan template is for guidance only. Cities are encouraged to adapt it to their circumstances, while remaining mindful of the CCC Checklist and guidance documents". The description of Table A-1.3 was updated to include the distinction between sectors and actions. The description of Table A-1.5: Graphics and charts was updated to include ", e.g.,sankey diagrams)". The description of Table A-2.3: Emissions gap was updated by eliminating "percentage" in the Baseline emissions heading. Note 1 to Table A-2.3 was edited for clarity. The numbering in the Action Plan Guidance was amended to match the numbering in the Action Plan Template. Page numbers were updated.
November 2023	V2.1	ICLEI	The front-page note was amended to include the following text "The Action Plan template is for guidance only. Cities are encouraged to adapt it to their circumstances and are welcome to incorporate pre-existing documents that may already address their climate neutrality target (e.g., SECAP) to avoid a duplication of effort. Cities should refer to the CCC Checklist and CCC Action Plan guidance document to identify the essential information to be included in their submission". Each module was amended to open with a summary of expected information. Guiding questions were included for each template field (to be replaced with writer´s text). Footnotes were introduced throughout the template to provide definitions for uncommon terms and references to additional (external) guidance. The Introduction was amended to require the administrative territory/ies included in the city´s 2030 climate neutrality target and excluded districts or emission sources, key data on the administrative and political organisation of the city, its demographic and socio-economic characteristics, and climate-relevant sectors, and a description of the work process of developing the city's Action Plan Guidance.

			Module A-1 “Greenhouse Gas Emissions Baseline Inventory” was amended to require references to the boundary of the 2030 climate neutrality target, excluded sectors, sources, scopes, and plans for addressing them. Module A-1 “Greenhouse Gas Emissions Baseline Inventory” was edited to emphasize that the template should not prevail over keeping internal consistency, accuracy, and clarity of the emissions data intact. A note was added encouraging cities to submit the inventory that corresponds to the calculations in the plan together with the plan (including. available documentation on methodology and approaches). Table A-2.1 "List of relevant policies, strategies & regulations" and A2.2 "Description & assessment of policies" were replaced by text boxes to avoid redundancy. Table A-2.3 "Emissions Gap" was relabelled A-2.1 and edited to propose a simplified approach to calculating the emissions gap and residual emissions. Module A-3 “Systemic Barriers and Opportunities to 2030 Climate Neutrality was edited to include references to the evaluation of unexploited resources (e.g., renewable energy sources, digital technologies, etc). The terms referring to stakeholders, actors, citizens were streamlined and clarified. Table A-3.3: "Description or visualisation of participatory model for the city climate neutrality – textual and visual elements" – was eliminated for redundancy and its content is merged with C-1.1: "Description or visualisation of the participatory governance model for climate neutrality". Table A-3.3: “Description or visualisation of participatory model for the city climate neutrality – textual and visual elements” – was eliminated for redundancy and its content is merged with C-1.1: “Description or visualisation of the participatory governance model for climate neutrality”. Description for B-2.3 "Summary strategy for residual emissions" has been expanded to specify "Detail how residual emission will be compensated, if applicable. Include the expected breakdown of natural sinks, permanent sequestration, and offsets". Module C-1 “Organisational and Governance Innovation Intervention" was renamed “Module C-1 Governance Innovation Interventions” and edited to include additional guidance.

			Module C-2 “Social Innovation Interventions” was edited for clarity and concision and to include additional guidance. Module C-3 “Financing of Action Portfolio” was eliminated for redundancy.

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Summary

The world is at a crossroads, where the actions taken in the next few years can have lasting impacts on our future. Global warming is accelerating at an alarming rate, with the global average nearing 1,2°C[1] increase compared to pre-industrial levels. To curb further warming, the Paris Agreement was adopted at the COP21 in 2015, with the goal to keep the global average annual temperature increase below 2°C above pre-industrial levels - an increase that could trigger irreversible processes - with efforts to limit the increase to 1,5°C. For the world to be able to decelerate global warming, however, it is imperative that everyone takes responsibility for combating climate change and contributes to the mitigation of carbon emissions.

The European Commission launched its 100 Climate Neutral and Smart Cities by 2030 Mission with the aim of enabling participating cities to act as innovation hubs for pursuing climate neutrality and to empower all European cities to follow suit by 2050. The project focuses particularly on cities as they are responsible for more than 70% of global emissions and are home to 75% of EU citizens.

Out of the 100 EU and 12 additional pioneering cities, Budapest is one of the largest, which puts it in a prime position to spearhead climate action. The capital, being the economic, scientific, cultural and transport centre of Hungary, also serves as an example for other Hungarian cities to follow, highlighting the importance of Budapest's climate-neutrality ambition. The purpose of this Action Plan is to lay the groundwork for realizing this ambition and outline the path to a carbon-free Budapest.

The document starts with an overview of the context the city operates in with both barriers and opportunities considered. It includes a greenhouse gas (GHG) inventory and policy analysis, followed by a stakeholder mapping that describes the starting point of the city towards climate neutrality and provides the basis for the impact pathways and actions needed to mitigate emissions. The project portfolio builds on strategic documents such as the city's Sustainable Energy and Climate Action Plan (SECAP), Sustainable Urban Mobility Plan (SUMP) and Integrated Urban Development Strategy (IUDS) which serve in general four main objectives:

- Reducing transport need through sustainable and smart city design and developments, and by promoting affordable housing
- Electrifying public transport and providing comprehensive support for active mobility to promote climate-friendly means of transport
- Increasing the energy efficiency of buildings and accelerating the use of renewables in urban areas, with a special focus on residential homes
- Enhancing climate dialogue with key stakeholders, such as businesses, districts and the government.

To support the implementation of the action portfolio, governance and social innovation tools were gathered that respond to the specific barriers and opportunities of the city and that can be scaled up and used to accelerate the transition.

The Action Plan was developed together with local ecosystem members, paying special focus to involving private companies and civil organisations, who have a considerable influence on awareness-raising, mobilizing residents and encouraging green investments.

The document builds on the Commitments document and establishes the basis for the Investment Plan. It is developed through an iterative process and will be reviewed and modified biannually to account for missing sectors and to respond to the changes in the political, social, economic, and technological aspects of the city's ecosystem.

[1] Damian Carrington, *World's top climate scientists expect global heating to blast past 1.5C target* (The Guardian: 2024), Available at: World's top climate scientists expect global heating to blast past 1.5C target | Climate crisis | The Guardian

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Abbreviations and acronyms

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

Abbreviations and acronyms	Definition
GHG	greenhouse gas
SEAP	Sustainable Energy Action Plan
SECAP	Sustainable Energy and Climate Action Plan
CCC	Climate City Contract
ETS	Emission Trading System
CNG	compressed natural gas
LPG	liquefied petroleum gas
IPPU	Industrial Process and Product Use
AFOLU	Agricultural, Forestry and Land Use
BAU	Business as Usual
COP	Conference of the Parties
NECP	National Energy and Climate Plan
SUMP	Sustainable Urban Mobility Plan
TIH	Townscape Image Handbook
IUDS	Integrated Urban Development Strategy
LEZ	Low Emission Zone
ULEZ	Ultra Low Emission Zone
PED	positive energy district
EoL	End-of-life
NZC	Net Zero Cities

1 Introduction

Budapest in context

Budapest, the capital of Hungary, is the country's most populous city with the highest population density. It is home to over 1,7 million people and is a key political centre with many decision-making and administrative functions based here. Its economy is dominated by the pharmaceutical, chemical, gas, and oil industries, with the service sector also being a major contributor. Additionally, Budapest plays a leading role in education, research, and development, and has a population with relatively high income and education levels compared to the country's average, providing favourable conditions to pioneer climate action.

As a major transport and economic hub, Budapest grapples with significant environmental pressures. The city is the centre of a radial system of railways and roads and the country's international airport is located there. The extensive space required for traffic and parked cars, as well as the high proportion of paved surfaces, hinders efforts to mitigate GHG emissions in the city. Moreover, due to COVID and growing suburbanization, the modal split has changed, i.e. the proportion of public transport, cycling, walking, and individual transport has also shifted in favour of private car use.

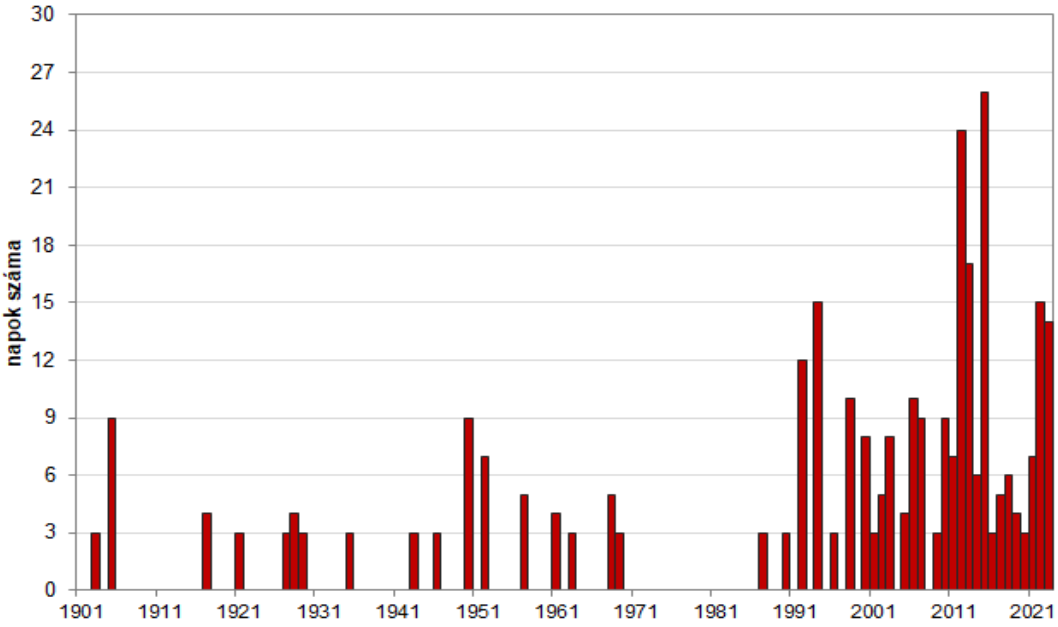
The large number of old and non-energy efficient, obsolete buildings as well as the capital's disorderly rental housing system also contributes to the growing environmental pressure on Budapest. Since the end of communism in 1989, there has been a notable rise in private homeownership, a trend that continues to this day. Subsequently, the number of social rented housing units owned by the municipality is low, and few new rented housing units have been built recently. In the private rental sector, rent in Budapest is nearly one and a half times the national average. As housing prices rise, a growing number of households find it unaffordable to live in the capital and decide to move outside the city, fuelling suburbanization. As a result, commuting and motorization are increasing, causing transport difficulties, and further escalating environmental pressures in Budapest. Meanwhile, the rapidly expanding suburban towns face infrastructure and supply problems and social tension due to their fast growth.

The city's dual self-government system, wherein the Municipality of Budapest coexists with the independent local governments of the city's 23 districts, adds another layer of complexity to the provision of infrastructure and public services. Despite belonging to the same geographical entity, Budapest and its metropolitan districts function independently from an administrative standpoint, further complicating coordination and optimization efforts.

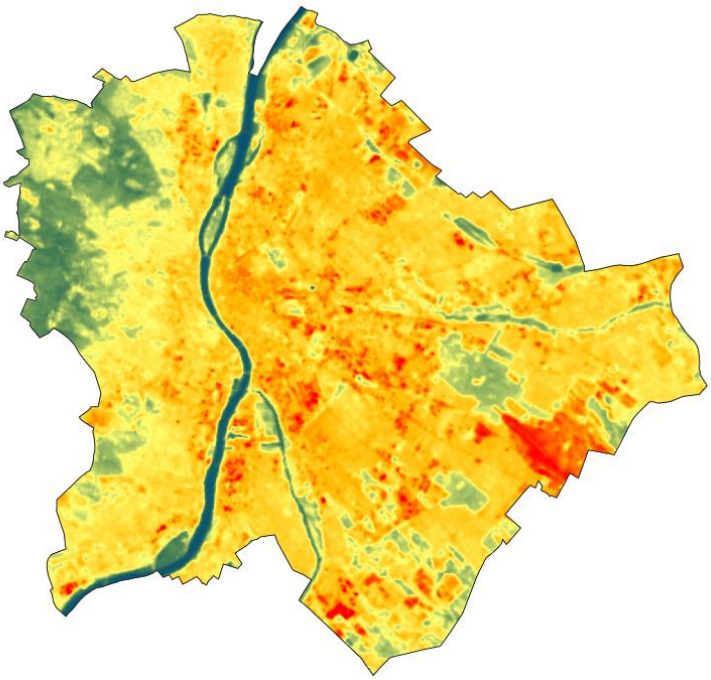
Additionally, the capital's heavy reliance on fossil fuels impedes the city's ability to mitigate GHG emissions. Domestic electricity production is largely based on hydrocarbons, with the share of renewable energy sources remaining low despite the city's favourable characteristics for harvesting solar and geothermal energy. Due to these factors, Budapest faces several environmental challenges including extreme heat waves, long droughts, and flash floods, which pose serious health and economic risks to the city and its residents.

As climate change is affecting all of us and a shift is inevitable, staying passive and bearing the consequences is not an option – we need to fundamentally transform the way our city operates.

1. Figure: Annual number of heat-wave days with a daily mean temperature of at least 27 °C for at least 3 days in the Budapest area between 1901 and 2023, based on homogenized data (Source: Hungarian Meteorological Institute, OMSZ)



2. Figure: The city's heat map on June 29 2022, when the air temperature exceeded 35 °C and a third level heat warning was in force (Source: Sentinel Hub EO Browser)[2]



[2] https://apps.sentinel-hub.com/

Budapest's climate neutrality target and scope

To start out on this journey, in 2008, the Municipality of Budapest joined the Covenant of Mayors and prepared **Budapest's Sustainable Energy Action Plan** (SEAP), in which the city aimed to reduce CO_2 emissions by at least 21% by 2020. After the Paris Agreement was adopted in 2015, Budapest also joined the **Under 2 Coalition**, which aims to keep global warming below 2°C and greenhouse gas emissions below 2 tonnes per capita per year by 2050. By signing the Memorandum of Understanding, Budapest has also committed to reduce its GHG emissions by at least 80% by 2050 compared to 1990 levels or to reduce local GHG emissions to less than 2 tonnes per capita per year by 2050. With the submission of the Sustainable Energy and Climate Action Plan (SECAP) in 2022, Budapest committed to a 40% reduction in CO_2 emissions by 2030 compared to the 2015 base year.

To raise this ambition and accelerate the transition towards climate neutrality, in 2022 Budapest applied to the European Commission's 100 Climate Neutral and Smart Cities by 2030 Mission and by joining the Mission committed to preparing the city's Climate City Contract (CCC) together with its local stakeholders. The aim of the CCC Action Plan is to build on the measures of the SECAP to achieve climate neutrality by 2030, i.e. to define the actions necessary to achieve a net 100% emission reduction in Budapest. Besides the SECAP, the CCC Action Plan was prepared in line with the city's other environmental and developmental concepts and action plans. Its strategic objectives reflect them and include:

- Reducing transport need through sustainable and smart city design and developments, and by promoting affordable housing
- Electrifying public transport and providing comprehensive support for active mobility to promote climate-friendly means of transport
- Increasing the energy efficiency of buildings and accelerating the use of renewables in urban areas, with a special focus on residential homes
- Enhancing climate dialogue with key stakeholders, such as businesses, districts and the government.

Budapest's 2030 climate neutrality target covers the entire administrative territory of the city. However, in terms of emission sources, exclusion areas include Emission Trading System (ETS) participants, aviation, national railways (suburban trains are included), coaches and water-borne transportation due to the complexity of data collection. In terms of GHGs, only CO_2 emissions are accounted for currently. Future iterations will attempt to address these gaps and provide a more accurate emission inventory for the city.

Work process of developing the Action Plan

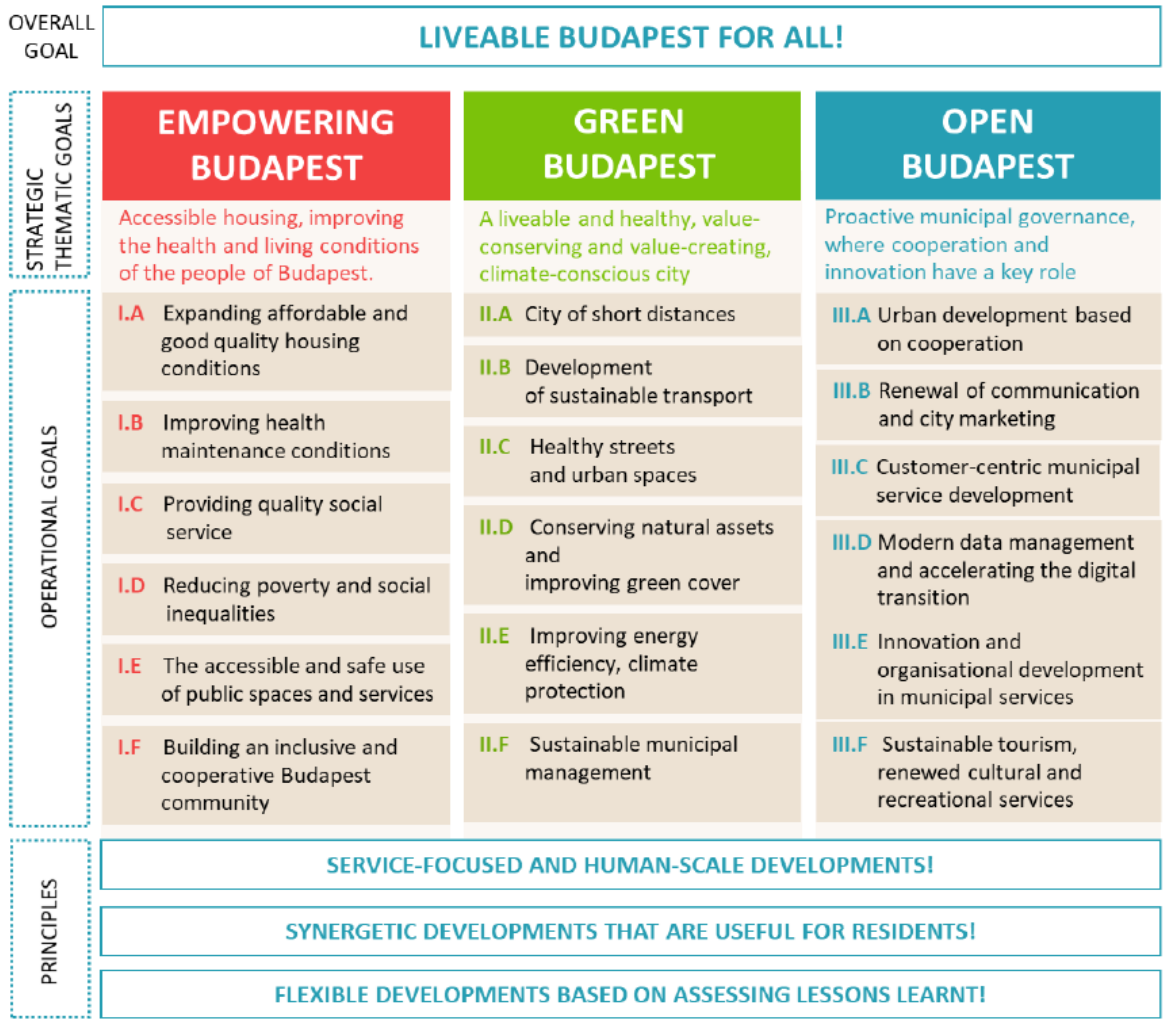
Budapest has a long history of environmentally conscious city operations and has been **building a strong mandate** for climate protection since 2008. It has developed various strategies and programmes to set strategic objectives and directions for urban development. In 2019, the newly elected City Council pledged to build a green, opportunity-rich, and democratically functioning city. Affirming its vision, the city has identified three strategic pillars, including creating a green Budapest, integrating climate protection into the municipality's operation.

The City's three main pillars:

- **Empowering Budapest:** ensuring affordable housing for all segments of society, improving the health and living conditions of the people of Budapest.

- **Green Budapest:** creating the conditions for a liveable and healthy, value-conserving and value-creating, climate-conscious city.
- **Open Budapest**: proactive municipal governance, where cooperation and innovation have a key role.

3. Figure: Strategic thematic goals of the Municipality (Source: IUDS, 2021)



The transition of Budapest towards a climate-neutral future is a complex challenge, however, that requires stakeholders from the entire local ecosystem to collaborate. The Action Plan was developed by the **Mission Team,** an internal core group of people within the Municipality supported by the **Mission Group** – a governance structure involving the Municipality, private and public companies, academia, and the civil sector. A more detailed description of the work of the City's Mission Team and Mission Group can be found in *Module C-1 Governance Innovation Interventions.*

The process began with onboarding important stakeholders and mobilizing the Mission Group. This was followed by an extensive data collection process to **understand the systems** the city operates in. Data about the environmental status of Budapest has been gathered every year since 2011 and used for the Environmental Status Assessment Report, which not only provides the public with professional and reliable information on the trends that emerge year by year, but also forms the basis for the next period of Budapest's environmental programme, and for the development of other environmental strategies and measures. For the creation of the CCC, additional data was collected through the Economic Model process.

For **designing the action portfolio**, Mission Group members were consulted, and existing strategic documents were reviewed to ensure the CCC aligns with the city's and its actors' key strategic objectives and builds on actions already in progress. Special attention was paid to involving private companies, civil organizations and research hubs in the process as they play a key part in providing expertise across various sectors of urban systems, awareness-raising, mobilizing residents and encouraging green investments. The Municipality has organised several workshops for them to collect their input, develop rapport and engage them in the Mission.

4. Figure: Picture from the city's climate protection workshops organised for local companies

Not part of the team but still key in enabling the transition are **citizens** that the city government – supported by the Mission Group – informs and mobilizes. A particularly important aim of the city leadership is to actively include citizens in decision-making and planning processes. For this reason, the Municipality of Budapest has multiple deliberation initiatives and participatory processes encouraging citizens to share their ideas and make decisions regarding climate mitigation and adaptation actions. Initiatives since 2020 have included:

- **Community planning of the parks in Budapest:** The design and development of Budapest's parks are done through community planning, whereby the public can share their opinions through a consultation procedure, and a questionnaire.
- **Citizen assemblies:** In September 2020 Budapest held its first citizen assembly, whereby a group of randomly chosen local residents gathered at the Budapest City Hall to discuss the issue of climate change and propose solutions to tackle it. Since then, a citizen assembly was held on the topic of Budapest in Europe, and air pollution from transport as well.

- **Participatory budgeting**: The citizens of Budapest can decide on the allocation of 1 billion Forints annually. One of the categories where people can send in their ideas is called Green Budapest, giving green projects priority in the process.
- **Citizen involvement in traffic calming projects:** Instead of immediate, expensive and permanent interventions, the Municipality of Budapest tested traffic calming ideas with temporary solutions in a series of pilot projects, giving the city's residents time to get used to and evaluate their effects. After a trial period of a few months, the Municipality asked residents for their opinions and suggestions.
- **Renewal of the Civil Regulation of the Municipality of Budapest:** The new regulation, which was adopted in 2021, makes it easier for civil society organisations to be involved in the decision-making processes of the capital and facilitates dialogue with the relevant professional units of the City Hall.

5. Figure: Picture from Budapest's first citizen assembly on climate emergency

Outlook and iterations

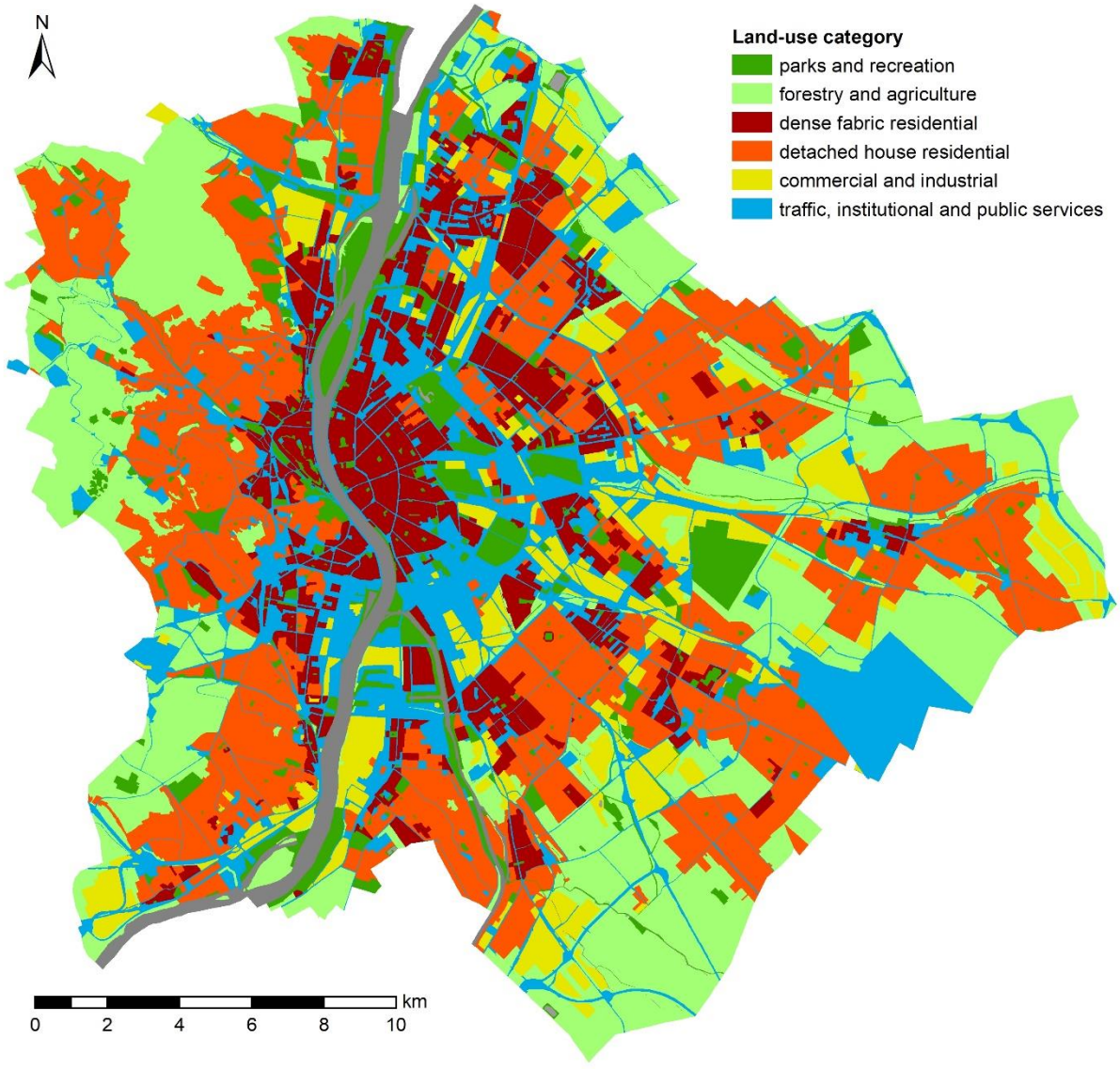
The Action Plan builds on the Commitments document and establishes the basis for the Investment Plan. It is an iterative document that will be reviewed and modified biannually to account for missing data and sectors and to respond to the changes in the political, social, economic, and technological aspects of the environment. Stakeholder engagement activity started as part of the CCC process will continue with the hopes of mobilizing more private, public and civil actors to find synergies, build rapport, and strengthen the city’s commitment to climate neutrality.

1-1. Table: Climate Neutrality Target by 2030

Table I-1.1: Climate Neutrality Target by 2030			
Sectors	**Scope 1**	**Scope 2[3]**	**Scope 3**
Stationary energy	**Included**	**Included**	Optional information
	Exclusions: CH_4, N_2O	Exclusions: CH_4, N_2O	Optional information
Transport	**Included**	**Included**	Optional information
	Exclusions: Aviation, national railways, water-borne transport CH_4, N_2O	Exclusions: Aviation, national railways, water-borne transport CH_4, N_2O	Optional information
Waste/wastewater	**Included**[4]	Not applicable	**Included**[5]
	Exclusions: CH_4, N_2O	Not applicable	Exclusion: CH_4, N_2O
IPPU	**Included**	Not applicable	Optional information
	Exclusions: CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Not applicable	Optional information
AFOLU	**Included**	Not applicable	Optional information
	Exclusions: CH_4, N_2O	Not applicable	Optional information
Other	Insignificant	Insignificant	Insignificant
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	Everything is included, there are no added areas.		
Map			

[3] Scope 2 energy use and emissions are shown under Electricity in Tables 2-1., 2-3., 2-4., and 2-5.
[4] Emissions from waste generated and managed/sent to landfill within the city boundary.
[5] Scope 3 energy use and emissions from waste are shown under Scope 1 (as a cumulative number) in Tables 2-1., 2-3.,2-4., and 2-5.

6. Figure: Land use map of Budapest



2 Part A – Current State of Climate Action

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

2.1 Module A-1 Greenhouse Gas Emissions Baseline Inventory

2-1. Table: Final energy use by source sectors

A-1.1: Final energy use by source sectors			
Base year	2022		
Unit	MWh		
	Scope 1	Scope 2	Scope 3
Transport	**6 914 217**		
CNG	21 965		
LPG	26 697		
Diesel	3 698 934		
Gasoline	3 166 621		
Biofuel	11		
Buildings & Heating	**14 533 288**		
District heating/cooling	2 674 285		
Natural gas	11 577 003		
Liquid gas	226		
Heating oil	11 091		
Gasoline	613		
Coal	81 960		
Other biomass	163 947		
Solar thermal	1 594		
Geothermal	22 569		
Electricity		**7 123 268**	
Waste[6]			
Industrial Process and Product Use (IPPU)	**35 033**		
Liquid gas	35 033		
Agricultural, Forestry and Land Use (AFOLU)	**5 407**		
Natural gas	5 407		

[6] Final energy use for waste management is included in Buildings & Heating as waste heat is utilized in buildings. Emissions from waste are shown separately in Tables 2-4. and 2-5.

2-2. Table: Emission factors

A-1.2: Emission factors applied						
For calculation in MWh and t of primary energy						
The emission factors were given using the IPCC methodology, but some factors, such as the one for district heating/ cooling and incineration were based on calculations of Budapest Public Utilities.						
Primary energy/ energy source	Carbon Dioxide (CO_2)	Methane (CH_4)	Nitrous Oxide (N_2O)	F-gases	Sulphur hexafluoride (SF_6)	Nitrogen trifluoride (NF_3)
Electricity (not primary energy)	0,23 t/MWh					
District heating/cooling	0,167 t/MWh					
Natural gas	0,202 t/MWh					
Liquid gas	0,231 t/MWh					
Heating oil	0,267 t/MWh					
Diesel	0,267 t/MWh					
Gasoline	0,249 t/MWh					
Lignite	0,364 t/MWh					
Coal	0,346 t/MWh					
Other fossil fuels	0,403 t/MWh					
Renewable sources	0,0 t/MWh					
Incineration	0,883 t/t incinerated					

GHG Emissions Baseline inventory

The total volume of energy used was **28 611 223** MWh and the volume of related CO_2 equivalent emission was **6 351 443** tons in Budapest in the base year of 2022. The inventory covers the entire administrative boundary of the city. Exclusion areas include ETS participants, aviation, national railways (suburban trains are included), coaches and water-borne transportation due to the complexity of data collection. In terms of GHGs, only CO_2 emissions are accounted for currently. Future iterations will attempt to address these gaps and provide a more accurate picture of the emissions in the city.

For the establishment of the inventory, the Economic Model was used. Due to the nature of the model, municipal waste is all shown under Scope 3 and Electricity is shown as a separate emission source. Budapest's SECAP and the inventory uploaded to MyCovenant are structured differently, and the amount of electricity used for buildings, transport and others, along with their related emissions can be seen separately there.

The establishment of the GHG inventory was preceded by extensive data collection from the SECAP, municipally owned utility companies (Budapest Public Utilities, BKK Centre for Budapest Transport), the Hungarian Central Statistical Office, and HungaroMet (Hungarian Meteorological Service). As most data was available in 2022, it was chosen as the baseline year of the inventory.

2-3. Table: GHG Emissions by Source Sector - Baseline Year

A-1.3a: GHG Emissions by Source Sector - Baseline Year					
Base year	2022				
Unit	t CO_2 equivalent/year				
	Scope 1	Scope 2	Scope 3	Total	% of Total
Transport	1 617 327			1 617 327	25%
Buildings & Heating	2 737 593			2 737 593	43%
Electricity		1 675 587		1 675 587	26%
Waste			311 700	311 700	5%
IPPU	8145			8145	0%
AFOLU	1092			1092	0%
Total	4 364 156	1 675 587	311 700	6 351 443	100%

For the Action Plan, the BAU scenario is used to define the emission gap. The Economic Model utilizes a number of assumptions for the establishment of the BAU inventory. Some of the assumptions include:

- Transportation need assumed to increase at the same rate as the expected population increase
- ICE improvements (incl. hybrids) for new vehicles according to EU fleet-wide targets
- Increased efficiency of ICE buses as the bus fleet is replaced by Euro VI buses (100% by 2030)
- The total building stock is assumed to increase at the same rate as the population growth
- Renovation rate continues its current trend
- Total electricity demand until 2030 assumed to increase at the same rate as the expected population increase
- The total amount of waste collected is assumed to increase at the same rate as the expected population increase
- Packaging materials are assumed to reach at a minimum EU's recycling targets for packaging waste by 2030

The full list of assumptions and the description of the methodology can be accessed through the following link:
https://netzerocities.app/group-capabilitybuildingprogrammebuildingastrongeconomiccase

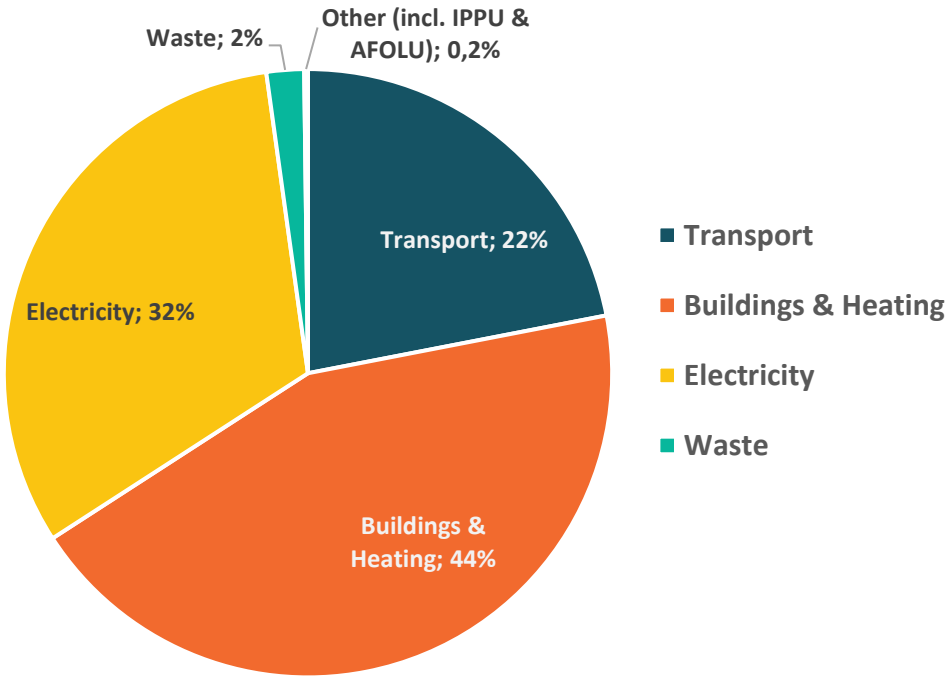
2-4. Table: GHG Emissions by Source Sector - Business as Usual (BAU) 2030

A-1.3b: GHG Emissions by Source Sector - Business as Usual (BAU) 2030					
Base year	2022				
Unit	t CO_2 equivalent/year				
	Scope 1	Scope 2	Scope 3	Total	% of Total
Transport	1 193 708			1 193 708	22%
Buildings & Heating	2 411 060			2 411 060	44%
Electricity		1 734 753		1 734 753	32%
Waste			134 417	134 417	2%
IPPU	8145			8145	0%
AFOLU	1092			1092	0%
Total	3 616 910	1 734 753	134 417	5 483 175	100%

2-5. Table: Activity by Source Sector (from economic model data inputs)

A-1.4: Activity by Source Sector (from economic model data inputs)			
Base Year		2022	
	Scope 1	Scope 2	Scope 3
Transport			
Transport need - passenger cars + motorcycles (M km/year)	4 446		
Transport need - buses (M km/year)	64		
Transport need - trains/metro (M km/year)	13		
Transport need - light duty trucks (<3.5 t) (M km/year)	475		
Transport need - heavy duty trucks (>3.5 t) (M km/year)	1 140		
Buildings & Heating			
Heating demand (space heating + domestic hot water)(GWh/year)	14 533		
Electricity			
Electricity demand within city boundaries (GWh/year)		7 123	
Waste			
Collected waste within city boundaries (tonnes)			722 423
Other (incl. IPPU & AFOLU)			

7. Figure: Sectoral distribution of CO_2 emissions (BAU 2030)



Buildings and heating

Based on the inventory, the largest portion of CO_2 emissions can be linked to the heating of buildings, representing 43% of total emissions. Within buildings, the consumption of residential homes is responsible for the largest portion of emissions, due to the high proportion of obsolete buildings, and residents' high energy consumption as a consequence of artificially low utility prices.

According to data for the year 2022[7], 28% of dwellings in Budapest are heated by district heating, with the number of district-heated dwellings increasing by 10,6% in 11 years. Among dwellings using local heating, 89% rely exclusively on natural gas, while the share of those heated by electricity is only 7%. Wood heating accounts for 2%, with the number of wood-only households decreasing considerably in recent years.[8]

According to a survey[9] conducted among 2000 owner-occupied households in 2023, **70-80% of the respondents were not considering any type of intervention** (be it energy-related or not) **even if they had enough money**. Contrary to expectations, even changes in the energy price structure at the end of 2022 seem to have had a low impact on renovation assumptions. The explanation lies in the way the new price structure was implemented. Family houses have been much more affected by the gas price increase (most probably due to their larger floor area and external envelope), but most of the housing stock (about 80%) in Budapest consists of multi-family apartment buildings, the residents of which did not experience substantial change in their costs for gas in the 2022/2023 heating season. As a result, they were not encouraged to implement energy-efficient interventions to reduce costs. This underlies the importance of resident incentives, awareness-raising and technical as well as managerial help when it comes to renovations and energy efficiency interventions.

Electricity

Electricity is the second largest emission source in Budapest, being responsible for 26% of total emissions. The amount of electricity transmitted in Budapest in 2022 was 7,12 million MWh, 2,8% higher than in 2021 and 5,4% higher than in 2015.[10] This number is expected to grow as electrification increases.

A significant share (34%) of domestic electricity generation relies on hydrocarbons, while nuclear energy and renewables account for 43% and 22% of electricity generation, respectively.

The electricity network covers the entire area of Budapest so that the supply to consumers can be considered as practically complete; they also have reserves to meet demand. These reserves are complemented by local electricity generating installations, which include small power plants with an installed capacity of between 500 kW and 5 MW (15-20 units), gas-fired power generation units (5-10 units) and small household-scale power plants, including solar and wind power (around 200 units).[11]

Transport

The third largest emitter is transport, accounting for 25% of total emissions. This is partly due to the growing suburbanization of Budapest, which has led to the rise of daily trips across the city boundary as

[7] Municipality of Budapest, *Budapest Környezeti Állapotértékelése* (2023), p. 207, Available at: Budapest portál | Budapest Környezeti Állapotértékelése
[8] From data directly requested from the Hungarian Central Statistical Office
[9] The survey was carried out as part of the Horizon Europe Budapest CARES project.
[10] Municipality of Budapest, *Budapest Környezeti Állapotértékelése* (2023), p. 210, Available at: Budapest portál | Budapest Környezeti Állapotértékelése
[11] Municipality of Budapest, *Budapest Környezeti Állapotértékelése* (2023), p. 210, Available at: Budapest portál | Budapest Környezeti Állapotértékelése

people move to the metropolitan area while jobs, schools, institutions and other travel destinations remain in the capital. About 1,2 million people cross the border of Budapest in both directions every day, of which 202 000 travel on the high-speed railway lines, 47 000 on local railways, 198 000 on intercity buses, and 755 000 by car.[12] This means that almost two-thirds of commuter traffic happen by car.

The modal split data within the capital show a more favourable picture. Active mobility modes (walking, cycling) and public transport dominate intra-city transport. About 2300 public transport vehicles depart every day, carrying approximately 3,3 million passengers to 4631 stops across the city. Trams on lines 4 and 6 alone, which are among the busiest tram lines in Europe, are used 330-350 000 times on an average working day.[13]

Besides public transport, cycling is becoming an increasingly prominent mode of transport thanks to the complex cycle-friendly improvements to the capital's main cycling network. The city also has a public bike-sharing system, better known as MOL Bubi, that has been operating, expanding, and developing for a decade now. In 2023, passengers used the system more than 3,4 million times and travelled 7 million kilometres, according to the BKK Centre for Budapest Transport .[14] The number of pick-up points exceeded 200, 400 new bicycles were added, and tens of thousands of new users joined the system.

In addition to MOL Bubi, a number of community-based bike-sharing and other micro-mobility services have emerged in Budapest in recent years (Donkey Republic, Lime, Bird, Tier, etc). The capital is also seeing a steady expansion of car-sharing services. The scheme was launched in 2016 with electric vehicles from GreenGo Kia, followed by MOL-Limo and Share Now (currently WIGO) in 2018.

Despite these improvements, road traffic still accounts for 35%[15] of intra-city trips, weakening the city's liveability and causing conflicts over public space due to the need for parking space. While there are a number of initiatives to stop motorization, the number of passenger cars in the capital has been rising steadily since 2013, with a pre-pandemic increase of around 2-4% per year.[16] From 2020 onwards this intense growth has slowed down but did not stop. Although the number of electric and hybrid vehicles has been continuously growing, they still account for a small portion of passenger vehicles, ultimately leading to high emissions from transport.

8. Figure: Change in modal split in Budapest (Source: SUMP, 2023)

[12] BKK Centre for Budapest Transport, *BUDAPESTI MOBILITÁSI TERV 2030, I. Célrendszer és intézkedések* (2023), p. 24, Available at: A 2023-as Budapesti Mobilitási Terv (BKK.hu)
[13] BKK Centre for Budapest Transport, *A BKK számokban* (n.d.), n. p., Available at: A BKK számokban
[14] BKK Centre for Budapest Transport, *Közel 7 millió kilométert tekertek tavaly a MOL Bubizók* (2024), n.p., Available at: Közel 7 millió kilométert tekertek tavaly a MOL Bubizók (BKK.hu)
[15] BKK Centre for Budapest Transport, *BUDAPESTI MOBILITÁSI TERV 2030, I. Célrendszer és intézkedések* (2023), p. 24, Available at: A 2023-as Budapesti Mobilitási Terv (BKK.hu)
[16] Municipality of Budapest, *Budapest Környezeti Állapotértékelése* (2023), p. 237, Available at: Budapest portál | Budapest Környezeti Állapotértékelése

Waste

From 1st July 2023, the concession company, MOHU took over the municipal waste management services for solid waste in Hungary by law. Over the next 35 years, MOHU will be responsible for providing domestic waste management services including the handling and treatment of waste as well as undertaking related investments.

Despite significant infrastructure improvements in the area of selective waste collection over the past decades (e.g. door-to-door service provided by Budapest), the proportion of recyclable waste collected has stagnated at an unsatisfactory 10-20% across various waste fractions and most of the municipal waste collected in Budapest still ends up in landfill or is incinerated.[17] To address this issue and reduce emissions from waste management, the current wasteful lifestyle of society ("buy - use - throw away - buy new") needs to be replaced by a more-conscious, circular approach to material use.

Others

Emissions from IPPU and AFOLU are negligible, accounting for less than 1% of total emissions.

2.2 Module A-2 Current Policies and Strategies Assessment

The highest body of the UN Framework Convention on Climate Change, signed in June 1992, is the Conference of the Parties (COP), which is held annually. The third COP adopted an additional protocol to the Convention in Kyoto in 1997, in which Hungary committed to a 6% reduction compared to its average emissions in the period 1985-1987. At the COP21 in Paris in 2015, a new global climate agreement (Paris Agreement) was concluded. The main target of the agreement is to keep the global average annual temperature increase well below 2°C above pre-industrial levels and efforts to limit the temperature increase to 1,5°C.

On the national level, the primary domestic policy document on climate change is the **Second National Climate Change Strategy**, which has two main objectives: 'sustainable development in a changing world' and 'understanding our capabilities, opportunities and constraints'.

The strategy identifies four thematic sub-objectives:

- Decarbonisation (low carbon economy, reducing GHG emissions, promoting carbon sinks).
- Climate vulnerability assessment (spatial data system to support decision-making and planning).
- Adaptation and preparedness (resource conservation, resilience building).
- Climate partnership (partnerships, awareness-raising, leading by example).

Closely related to the Second National Climate Change Strategy is the **National Energy and Climate Plan** (NECP), whose key objective is to promote energy sovereignty, strengthen energy security, maintain energy price subsidies, and the decarbonisation of energy production, which – according to the NECP – is deemed possible through a combination of nuclear energy and renewable energy sources. As a priority of energy policy, the strategy identifies the need to reduce energy import dependency, and as a strategic objective, aims to decrease the share of natural gas in the energy mix. Additionally, energy independence is sought to be realised through demand reduction and energy

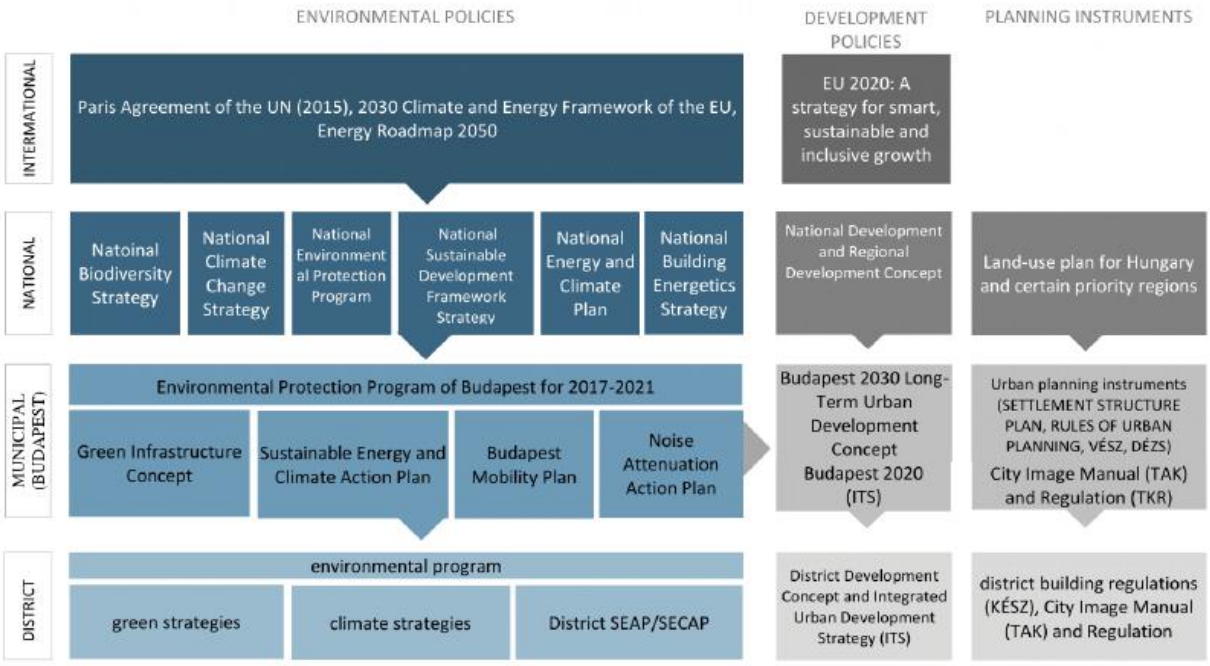
[17] From municipal waste data provided by Budapest Public Utilities.

efficiency improvements, diversification and use of alternative energy sources, and electrification measures.

The national objective is to ensure that the largest share of Hungary's electricity generation comes from two sources: nuclear and renewable energy, the renewables mainly from solar power plants. With the combination of solar and nuclear energy, 90% of Hungary's electricity production could be carbon-free by 2030. While the two national policies are in line with global targets, the commitments made are not followed up by meaningful climate action as opposed to Budapest, where climate protection has been made one of the key pillars of the Municipality's work.

In support of global goals, national strategies and local climate objectives, Budapest has joined international initiatives aiming to support taking actions to combat climate change and achieve climate neutrality. To start out on this journey, in 2008, the Municipality of Budapest joined the Covenant of Mayors and prepared **Budapest's Sustainable Energy Action Plan** (SEAP), in which the city aimed to reduce CO_2 emissions by at least 21% by 2020. After the Paris Agreement was adopted in 2015, Budapest also joined the **Under 2 Coalition**, which aims to keep global warming below 2°C and greenhouse gas emissions below 2 tonnes per capita per year by 2050. By signing the Memorandum of Understanding, Budapest has also committed to reduce its GHG emissions by at least 80% by 2050 compared to 1990 levels or to reduce local GHG emissions to less than 2 tonnes per capita per year by 2050.

9. Figure: The environmental, developmental policies and planning instruments affecting the city's climate-neutrality ambition (Source: SECAP, 2021)



Beyond the international initiatives and national strategies, the Municipality developed its comprehensive, horizontal strategic planning document as well. Budapest's **Environmental Protection Programme** for the period 2021-2026 aims to protect and improve the environment of the capital and,

ensure that sustainability aspects are considered in the development of the city. The programme outlines 5 main objectives[18]:

- Ensuring a healthy, safe environment, which means managing natural resources (soil, water, air) with as little environmental impact as possible and improving climate resilience.
- Protecting the city's natural assets, including halting the loss of biodiversity and maintaining the quality of natural assets.
- Creating sustainable resource management, whereby optimizing the city's management and operations would enhance well-being while also reducing carbon emissions and negative impacts on the environment.
- Implementing environmentally friendly governance to ensure that the decisions of the Municipality are guided by environmental considerations.
- Enhancing environmental awareness to promote sustainable consumption habits and environmentally conscious attitudes.

In line with the Environmental Protection Programme, several sector-specific strategies were developed including Budapest's **Green Infrastructure Development and Maintenance Action Plan**, **SUMP**, and **Noise Attenuation Action Plan**. These relate and contribute to the city's climate-neutrality ambition by outlining tasks necessary to mitigate carbon emissions by either improving urban green infrastructure or promoting environmentally friendly transport modes and reducing traffic. The city's urban development documents, the **Budapest 2030 Long-Term Urban Development Concept,** and the **Integrated Urban Development Strategy 2027,** as well as other urban planning instruments also include climate protection and energy efficiency in their objectives. Because of the city's dual self-government system, the 23 districts of the capital also have their own green, climate strategies, SEAPs/SECAPs, development concepts and regulations.

Up until now, the city's main emission reduction document had been the **Sustainable Energy and Climate Action Plan** of Budapest, in which the city committed to a 40% reduction in CO_2 emissions by 2030 compared to the 2015 base year. The cornerstones of the plan were that:

- Major energy refurbishment is realized in 1/3 of the apartments in Budapest,
- the total photovoltaic capacity in Budapest increases to 1 500 MW,
- district heating uses at least 50% renewable energy, 50% waste heat, 75% cogenerated heat or 50% of a combination of such energy and heat,
- the proportion of car users is reduced at least to 30%,
- the per capita size of green areas grows by 1m^2,
- the size of protected natural areas of local importance grows by 350 ha.

The aim of the CCC is to build on the measures of the SECAP to achieve climate neutrality by 2030, i.e. to define the actions necessary to achieve a net 100% emission reduction in Budapest. The CCC was prepared in line with the Budapest Environmental Programme and the other environmental and development concepts and action plans of the capital. The strategic documents are, therefore, included in the calculation of the emission gap addressed in this action plan.

[18] Municipality of Budapest, *Environmental Program of Budapest for 2021-2026* (n. d.), p. 9, Available at: Budapest Környezetvédelmi Programja és Környezeti Állapotértékelése

The table below summarizes all the relevant programmes, strategies and policies that are linked to the Climate City Contract and support this objective.

2-6. Table: List of relevant policies, strategies & regulations

List of relevant policies, strategies & regulations				
Type	**Level**	**Name & Title**	**Description**	**Relevance**
Agreement and action plan	EU	Paris Agreement	EU countries agreed to set the EU on a path to become the first climate-neutral economy and society by 2050.	The long-term plan is to keep the global average annual temperature increase well below 2°C above pre-industrial levels and to work towards a temperature rise of only 1,5°C.
Policy framework	EU	2030 Framework for Climate and Energy	The 2030 framework includes targets and actions to make the EU economy and energy system more competitive, secure and sustainable. It sets targets for reducing GHG emissions and increasing the use of renewable energy sources and proposes a new governance framework and performance indicators.	Related objectives: - To reduce EU GHG emissions by at least 40% by 2030 compared to 1990 levels - at least 27% of energy used should come from renewable energy sources - an EU target to improve energy efficiency by 27% compared to projected energy consumption in 2030
Roadmap	EU	Energy Roadmap 2050	The paper on the transition to a low-carbon economy presents several different scenarios to achieve the environmental targets set for 2050.	According to the Energy Roadmap 2050, decarbonisation can be achieved by transforming the energy system.
Strategy	National	Second National Climate Change Strategy	The highest-level domestic policy document on climate change is the Second National Climate Change Strategy, which has two main objectives: 'Survival and sustainable development in a changing world' and 'Understanding our capabilities, opportunities and constraints'.	The strategy includes the National Decarbonisation Roadmap with targets, priorities and actions for reducing GHG emissions up to 2050.
Strategy	National	National Energy and Climate Plan (NECP)	In line with the objectives of the National Energy Strategy, the main objectives of the NECP are to strengthen energy sovereignty and security and to decarbonise.	The NECP sets a target to reduce gross GHG emissions by at least 50% by 2030 compared to 1990. It also aims to further reduce the GHG intensity of the Hungarian economy (i.e. the GHG emissions per unit of GDP).
Strategy	National	National Environmental	Its task is to define the country's environmental objectives and the actions and	The NEPP is a policy strategy, which primarily covers the period up to

		Protection Programme	means required to achieve them, taking into account the country's environmental status, the development objectives of society and the obligations arising from international cooperation and EU membership.	2026, but also looks beyond, contributing to the achievement of the targets up to 2030 (e.g. 73% reduction of sulphur dioxide emissions by 2030 compared to 2005) and 2050 (making Hungary climate neutral by 2050). One of the strategic areas of the NEPP is to reduce GHG emissions and prepare for the impacts of climate change.
Strategy	National	National Sustainable Development Framework Strategy	The Framework Strategy aims to contribute to building a national consensus on sustainability. It summarises the challenges arising from international and EU programmes and the state of our national resources.	It defines indicators for measuring sustainability that provide information on quantitative and qualitative changes in factors that are important for our future well-being. It includes the quantity of GHG emissions as an indicator.
Strategy	National	3rd National Biodiversity Strategy	The 3rd National Biodiversity Strategy provides a comprehensive framework for the long-term survival of domestic wildlife and natural resources and defines the objectives to be achieved by 2030, as well as the measures to achieve them.	Healthy, well-managed habitats and ecosystems play a key role in global climate regulation, such as CO_2 sequestration, carbon storage and microclimate regulation, filtration, flood risk reduction, and water retention. These are also essential for climate change prevention and adaptation activities.
Strategy	National	National Building Energetics Strategy	In order to achieve the goals set out in the National Energy Strategy, the NBES sets out the objectives and main directions that will enable the modernisation of the Hungarian building stock and a significant reduction in energy consumption in the period up to 2020, with a view to 2030.	According to the NBES, primary energy use in buildings accounts for about 40% of the national primary energy use. Residential buildings account for the largest share of energy use in buildings, with almost 60%. One of the overarching objectives of the strategy is to reduce GHG emissions.
Concept	National	National Development and Regional Development Concept	The concept sets out a long-term vision, development policy objectives and principles, based on the country's social, economic, sectoral and territorial development needs. These national policy priorities for the 2014-2020 development	The Concept is aligned with national strategic planning documents, provides a common direction for policies in terms of development and spatial development, and provides the basis for the design and implementation of policy programmes for

			period. It sets out a vision and a set of objectives up to 2030.	development purposes to achieve national climate protection objectives.
Programme	Local	Environmental Protection Program of Budapest for 2021-2027	The programme sets out objectives and tasks to protect the environment.	The programme's aims include climate protection and energy efficiency.
Action Plan	Local	Green Infrastructure Development and Maintenance Action Plan	The Action Plan provides a comprehensive description of the tasks related to the development and maintenance of green infrastructure, guided by the principles of sustainability and liveability.	The objectives of the Action Plan contribute primarily to adaptation and not to emission reductions, however, as green infrastructure is a considerable carbon sink, the concept contributes to the residual emission strategy of the city.
Action Plan	Local	Budapest Mobility Plan	The SUMP is a comprehensive development plan for Budapest's transport until 2030, with the main objectives of ensuring a climate-neutral and liveable urban environment, safe, inclusive and integrated transport, and open and cooperative regional connections.	The plan aims to create a climate-neutral and liveable urban environment. It will contribute to reducing emissions by promoting climate-friendly transport improvements and less environmentally damaging modes of transport.
Action Plan	Local	Noise Attenuation Action Plan	The aim of the plan is to reduce noise pollution by reducing noise from road, rail, air and industrial operations and by protecting against noise generated.	The plan will indirectly contribute to reducing congestion by reducing road traffic.
Action Plan	Local	Sustainable Energy and Climate Action Plan	The Action Plan includes actions needed for a 40% emission reduction, adaptation to climate change and awareness raising.	The action plan aims to help reduce emissions and adapt to climate change.
Programme	Local	Budapest 2030 Long-Term Urban Development Concept	The concept sets out the directions for urban development for 10 years, in response to expected challenges, by defining 17 development objectives.	The objectives of the concept include climate protection and energy efficiency, as well as other indirect objectives (e.g. sustainable transport).
Strategy	Local	Budapest 2027 Urban Development Strategy	The strategy is based on the Budapest 2030 concept and defines the strategic development directions for the short term, which form the basis for further sectoral and territorial strategies, programmes, action plans and projects.	The objectives of the strategy include climate protection and energy efficiency, as well as other indirect objectives (e.g. developing sustainable transport).

	Baseline emissions	Emissions Reduction Target 2030		Emissions reduction through the CCC Action Plan to address the Gap		Remaining Emissions		Residual Emissions Offsetting		Emissions Gap (amount necessary to achieve net-zero)	
	(absolute) (specify units)	(absolute)	(% of BAU 2030)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)
Transport	1194	886	74%	886	74%	307	26%	307	26%	0	0%
Buildings & Heating	2411	1766	73%	1766	73%	645	27%	645	27%	0	0%
Electricity	1735	1648	95%	1648	95%	87	5%	87	5%	0	0%
Waste	134	84	62%	84	62%	50	38%	50	38%	0	0%
Other (incl. IPPU & AFOLU)	9	7	80%	7	80%	2	20%	2	20%	0	0%
Total	**5483**	**4392**	**80%**	**4392**	**80%**	**1092**	**20%**	**1092**	**20%**	**0**	**0%**

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

To have a clear and more complex picture of the starting point of Budapest, different challenges, and opportunities of the urban systems relevant to the city's climate neutrality target were considered. Barriers and opportunities have been collected before in different strategic documents such as the SECAP, the SUMP and the Environmental Status Assessment Report in Budapest. The section below summarizes the key findings of these documents and describes the inputs from our Mission Group discussions. An overview of the emission domain and system-specific barriers and opportunities can be found in the *Annexes*.

General barriers to achieving climate neutrality in Budapest:

High degree of fragmentation

Arguably, one of the biggest hindering factors in the transition to climate neutrality in Budapest is the high degree of vertical and horizontal fragmentation of competences within the city.

As Budapest has been governed by the political opposition since 2019, achieving coordination and cooperation poses some challenges between the Municipality and the Government of Hungary. The political conflict and the reluctance to work together on the shared concern of climate change can not only set back long-term planning, jeopardize funding, and slow down implementation but can also lead to conflicting measures within the city. Therefore, it would be crucial that climate and environment protection is not politicized to facilitate effective and collective action against climate change.

Fragmentation is also visible horizontally, which can be attributed to the legal, institutional, and regulatory context not supporting sensible cooperation between actors. This is most vividly illustrated by the inefficient coordination of urban and peri-urban transportation institutions in Budapest, whereby public transport in the city is managed by the municipality-owned BKK Centre for Budapest Transport, while the railway, suburban train, and long-distance bus networks in and around Budapest are managed by the state-owned organization, MÁV-VOLÁN. The coexistence of the two institutions leads to the inevitable duplication of some services, hinders modern development, and causes operational problems.

Horizontal fragmentation is also brought about by the dual self-government system in Budapest, wherein the Municipality of Budapest coexists with the independent local governments of the city's 23 districts. This means that the General Assembly of Budapest and the district bodies of representatives are equal in terms of their basic rights, with no hierarchic relationship between them. While a division of labour has emerged between the capital and the district governments, due to the lack of hierarchy, it is hard to implement city-wide initiatives. The Municipality of Budapest can make suggestions and requests when it comes to, for example, new constructions or interventions planned on district-owned grounds, however, districts have the authority to decline them. Collaboration is particularly difficult with districts led by the political opposition, who can veto any projects planned on district-owned grounds. Subsequently, for the complete implementation of the Action Plan, it is crucial that the support of district municipalities is secured.

Regulatory framework

Besides the lack of cooperation between some district governments and the Municipality of Budapest, another significant challenge arising from the dual self-government system of Budapest regarding

climate neutrality is the co-existence of different regulations and strategies across the city. Counting all regulations including the Building Code Regulations of the districts, the specific rules on visual environment of settlements, and the Townscape Image Handbook (TIH), we arrive at over 100 distinct regulations in Budapest solely concerning buildings. Similar fragmentation exists with regard to regulations on taxation of buildings and motor vehicles, as well as in the powers to regulate or act as public authority - in matters such as trees and use of environment or public spaces, housing matters, parking by locals -, while a great part of legislative and official power relevant to mitigation and adaptation is held by central governement itself. This is a significant obstacle to implementing city-wide initiatives and makes planning extremely unpredictable.

A concrete example that accurately illustrates the problem of multiple, non-universal regulations across districts is the regulations around installing solar panels. Two districts (districts VIII. and XVI.) prohibit installations on flat roofs, while district X. allows installations on a maximum of 15% of the surface area. District XIX. only prohibits installations at Wekerletelep (a residential area with relatively old houses), while district XX. requires mandatory professional consultation of the chief architect before any installation. With such divergent regulations existing parallel to each other, integrated urban planning, strategy building, and implementation are evidently difficult. This issue persists beyond just solar panels, extending to parking regulations and building requirements as well.

While the multitude of different regulations poses a significant challenge to achieving climate neutrality, the regulatory framework, in general, is also not ideal for the implementation of green actions. This issue is particularly prominent in urban planning, notably concerning buildings as there are strict regulations governing the renovation of heritage sites and protecting the cityscape. Staying with the solar panel example, in the regulations of each district, it is a special rule that no solar collectors or solar panels can be installed on a listed building or heritage building. The wording in the Budapest TIH covers a significant area, which means large parts of the most densely built-up inner districts on both sides of the Danube are subject to the restriction. The solar ban covers 4 555 684 m^2 (plus 111 710 919 m^2 in the buffer zone) of roof area, and 63 556 kW (plus 92 487 kW in the buffer zone) of solar PV generation potential. In addition to the Budapest TIH, several districts have introduced similar regulations on the visibility of solar panels in smaller and larger areas, thereby diminishing the renewable energy generation potential of the city. Strict regulations are also a problem when it comes to the insulation of historic buildings that make up most of the inner city and would be most in need of energy retrofitting. Conversely, the absence, inflexibility, and leniency of the regulatory framework can also hinder mitigating efforts. Some examples include lenient parking regulations for residents and inflexible regulations regarding energy communities.

Financial barriers

Another significant challenge of the city's climate-neutrality mission is the lack of financial resources available for green investments. This is mainly due to the challenging financial situation of the Municipality of Budapest (mainly brought about by the reduction in business tax revenues and the increase in the so-called solidarity tax to be paid to the central government by municipalities with good business environment and relatively vivid economy producing relatively high net annual turnover), the unpredictable flow of EU funds and the lack of private investments. Because of these reasons, the predictability and availability of resources allocated to tasks and developments are highly uncertain. Resources often arrive at the last minute, making long-term planning extremely difficult. The impact of the economic crisis, exacerbated by geopolitical uncertainty and energy insecurity, is further worsening financial conditions for both public and private green investments. Given that the Municipality of Budapest has direct control of only about 5% of total emissions, the encouragement of private climate investment would be of utmost importance. While the recent energy crisis can be a catalyst of change, with inflation soaring high and the cost of living going up, the pace of green investments is unpredictable.

A more detailed description of financial barriers is included in the Investment Plan's *Barriers to Climate Investment* chapter.

Increasing suburbanization

Another barrier for Budapest to become climate-neutral is the continuous sprawling of the city, which puts immense pressure on the existing infrastructure and creates an ever-growing demand for energy, water, and motorization.

Suburbanization around Budapest gained momentum in the 1990s and has continued ever since due to the growing desire of people for a more pleasant living environment, better housing, and lower living costs. This phenomenon is well-illustrated by the population shift from the city centre to the outer circles of Budapest, with some inner districts showing an over 20% decline, and many outer districts seeing an almost 10% growth in their population since 2000.[19] Additionally, sprawling of the city has also been fuelled by urbanization and the influx of people moving to the capital from other parts of the country, contributing to a considerable 58% rise in the agglomeration's population between 1990 and 2022.[20]

The migration of people into the outer districts and the agglomeration zone is causing mainly infrastructural problems and transport difficulties, with increasingly negative environmental consequences. The biggest challenge in terms of our climate-neutrality goal is that people living in suburban areas generally take up more space, have a higher energy and water use and mainly use individual motorization to move around. According to a survey conducted in 2022[21], about 75% of commutes taking place in the agglomeration are towards Budapest, which is typically because those who move out of the capital continue to work or study there. The majority of journeys are also done by cars - a problem that is exacerbated by the lack of P+R and B+R parking lots, and the fact that none of the four metro lines reaches the suburbs. The unattractiveness of using public transport from the agglomeration is reinforced by an obsolete and unreliable railway system operated by state owned companies and the physical and info-communicational inaccessibility of subway and metro lines. Until recently, with few exceptions, surface services in the inner suburbs have also been disconnected from lines in the outer suburbs further driving car use in the city.

Lack of information

Finally, a general factor impeding the acceleration of climate-neutrality initiatives is the lack of sufficient information people receive on the severity of climate change and the importance of adapting to its effects. This problem is further deepened by the continuous cuts in public education funding and the monopolization of mass media by the government. News regarding climate emergency is not given priority and the increasing consumption of goods is encouraged. Due to social media, imprecise and misleading information can also appear concerning climate change, which can negatively impact attitudes.

As the municipality has direct control over only 5% of total emissions, it would be crucial that individuals receive reliable information about climate change, what they can do to counter it and the support available for them. Every year, as part of the yearly Environmental Status Assessment of Budapest,

[19] Municipality of Budapest, *Budapest Környezeti Állapotértékelése* (2023), p. 197, Available at: Budapest portál | Budapest Környezeti Állapotértékelése
[20] Municipality of Budapest, *Budapest Környezeti Állapotértékelése* (2023), p. 396, Available at: Budapest portál | Budapest Környezeti Állapotértékelése
[21] Municipality of Budapest, *Budapest Környezeti Állapotértékelése* (2023), p. 398, Available at: Budapest portál | Budapest Környezeti Állapotértékelése

citizens are asked in surveys about their stance on climate protection. From the surveys, it is clear that a big proportion of the population is already environmentally conscious. Therefore, with widespread awareness-raising, the improvement of public education and the introduction of media education, the flow of accurate and sufficient information could be improved.

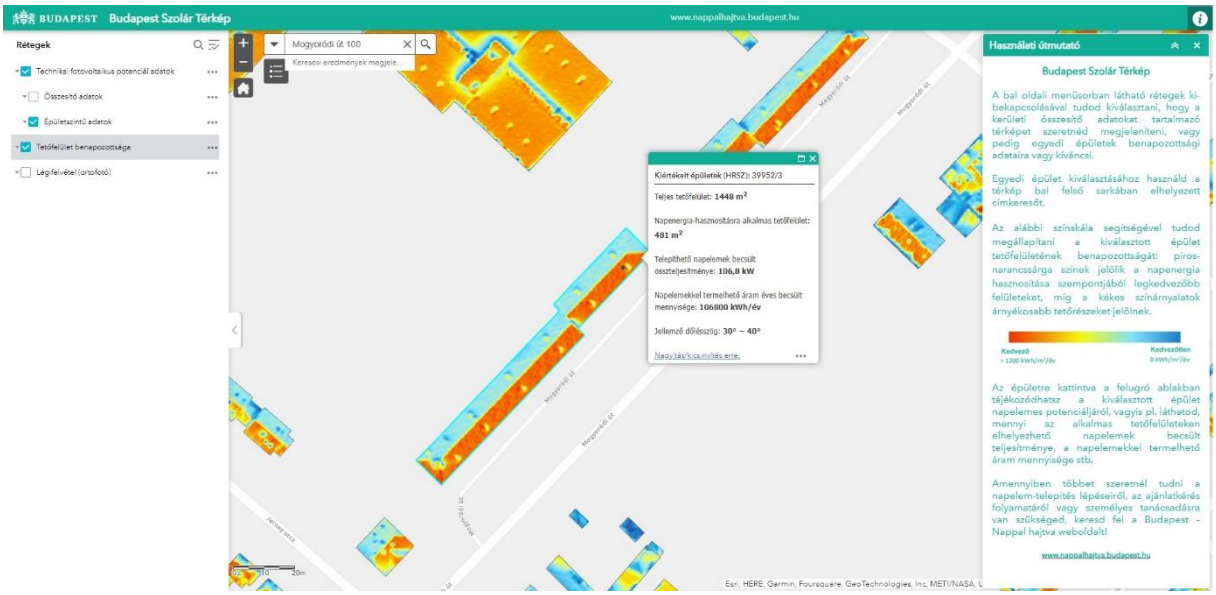
General opportunities to achieving climate neutrality in Budapest:

Renewable energy potential

Because of the geographic and climatic conditions in Budapest, there is great potential in utilising renewable energy sources, particularly solar and geothermal energy in the city.

According to the data available[22], the portion of the buildings and roofs in Budapest which are suitable for the utilization of solar energy, and the areas suitable for being used for this purpose are sufficient for the installation of solar panels of a total installed capacity of 1500 MW (1750 MWp). This would require a roof area of ca. 10 million m^2. However, it is to be noted, that photovoltaic systems may be installed not only on roofs but also on walls, on the ground, as well as on stands above parking spaces, etc.

10. Figure: The publicly available solar map of Budapest, showing the solar energy capacity of roofs



Overall, Budapest also has excellent geothermal potential, but there is a lot of local variability, with different ways of harnessing the earth's thermal energy from place to place within a district[23]. A good example of geothermal energy utilization is the capital's zoo, whose animal houses, and other facilities, 29 buildings in total, are largely heated by waste heat from the thermal water of the neighbouring Széchenyi Spa. The heating system based on condensing boilers is therefore only used as an auxiliary

[22] Municipality of Budapest, *Sustainable Energy and Climate Action Plan of Budapest (SECAP)* (2021), p. 47, Available at: Klímastratégia (budapest.hu)
[23] Hungarian Energy and Public Utility Regulatory Authority, Geotermikus Budapest (2020), p. 119, Available at: geotermikus_budapest.pdf (mekh.hu)

system during periods when the energy of the thermal heat alone would not be sufficient to provide the required temperature due to the exceptionally low temperatures. In recent years, Budapest Public Utilities has been working with Icelandic, Hungarian and Danish partners to integrate more geothermal energy in the district heating system. Based on the example of Vienna, Budapest Public Utilities is also investigating the possibility of using wastewater from Budapest's wastewater treatment plants for district heating in Budapest through heat pumping. With lower risks than geothermal energy, the hope is that this will increase the volume of green district heating production by up to one million gigajoules per year.

Brownfield sites

Budapest is rich in brownfield sites - areas with the potential to be rehabilitated and used to increase green spaces, improve railway infrastructure, or create positive energy districts in the city. The municipality has created a brownfield register for the purpose of keeping track of them and their particularities that can be later used by developers for the rehabilitation of reserve areas. In the assessment of these areas, particular attention is paid to the urban structure, the presence of built and natural assets, the infrastructure and the function of the surrounding areas, the environmental impacts as well as the potential uses of the site. As of 2023, 2737,5 ha brownfield sites can be found in Budapest.[24]

Act LXXVIII of 2020 introduced the concept of the “Rust Belt Action Area”, which will provide the locations for the housing development programme under the City Home Creation Programme in the coming years.[25] The government was granted the power to designate action areas and establish specific building requirements, while the Municipality of Budapest has the right to express an opinion (under Decision 9/2020-10-15/FKT). Under the Act, all developments in rust belt action areas will be priority investments. When taking advantage of the option to express its opinion, an important task of the Municipality will be to represent the interests of the residents.

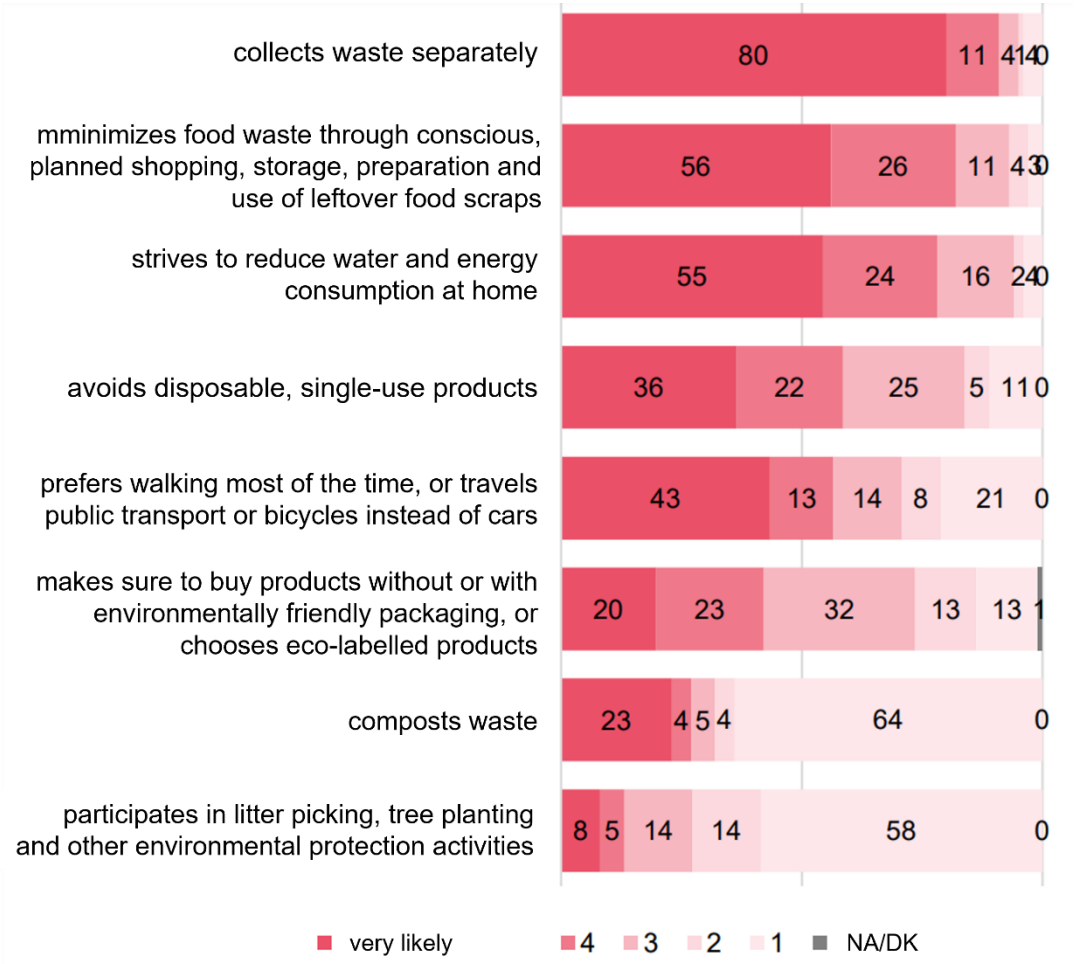
Environmental consciousness of society

A positive trend in society towards a more environmentally friendly and active lifestyle is taking form in the growing spread of cycling, solar panels, and recycling. A survey conducted by the Municipality in 2020 also showed that people, in general, are concerned about climate change, ranking their worries 61 on a scale from 0 to 100 (0 meaning not afraid at all and 100 meaning very afraid).[26] This presents a great opportunity for the city to mobilize its citizens and encourage them to take action. As more and more companies realise their responsibility towards their community in creating a greener sustainable city, they can also be a catalyst of change in their employees’ and consumers’ life.

According to a survey conducted in 2021[27], selective waste collection is already widespread among people but avoiding food waste and reducing water and energy consumption at home are also common behaviours.

[24] Municipality of Budapest, *Barnamezős kataszter* (2023), p.9, Available at: Metodika.pdf (budapest.hu)
[25] Municipality of Budapest, *Integrated Urban Development Strategy* (2021), p. 73
[26] Municipality of Budapest, *Sustainable Energy and Climate Action Plan of Budapest (SECAP)* (2021), p. 26, Available at: Klímastratégia (budapest.hu)
[27] Municipality of Budapest, *Budapest Környezeti Állapotértékelése* (2023), p. 380, Available at: Budapest portál | Budapest Környezeti Állapotértékelése

11. Figure: Prevalence of environmentally conscious behaviours in Budapest in 2021



Stakeholder mapping

The transition towards climate neutrality is a complex challenge that requires the coordinated action of relevant local actors. The following table illustrates the stakeholder groups of Budapest's climate neutrality target that populate the urban systems described in the previous section. These are the local actors that have a considerable influence on and interest in the city's climate-neutrality ambition and hence, should be an integral part of the mission process.

List of stakeholders in Budapest's climate neutrality ambition				
Emission domains	**Stakeholders**	**Systems**	**Influence on the city´s climate neutrality ambition**	**Interest in the city´s climate neutrality ambition**
City-wide	The European Union	Institutional/ regulatory Political Financial	Regulatory, political, and financial influence	The reduction of GHG emissions in Europe, and the acceleration of the carbon neutral transition across member states.

	The Government of Hungary	Institutional/ regulatory Technological/ infrastructural Political Financial	Regulatory, infrastructural, political, and financial influence on a national level	Transitioning towards a low carbon economy, and reducing GHG emissions
	The Municipality of Budapest	Institutional/ regulatory Organizational Political Financial	Regulatory, organizational, political, and financial influence on a city level	Making Budapest a greener, more liveable place for everyone.
	District local governments	Institutional/ regulatory Political Financial	Regulatory, political, and financial influence on a district level	Making districts greener and more liveable for residents.
	Financial institutions and commercial banks	Financial	Influence on the funding of projects and the loans issued for climate-protection measures.	Investing in technologies and projects that will be an integral part of the future.
	Local private companies and chambers of commerce	Behavioural/ social Technological/ infrastructural Financial	Influence on consumer behaviour, employees, innovation and investments	Mitigating climate change-related risks, lowering long-term costs and maintaining a positive public perception
	Higher education institutions	Technological/ infrastructural	Research on urban problems and challenges, developing innovative solutions, partnering in international tenders.	Accumulation and transfer of knowledge
	Residents and civil society	Behavioural/ social	Individual actions, influence on public discourse	Living in a greener, more liveable city
Transport	BKK Centre for Budapest Transport (the city's transport management authority)	Technological/ infrastructural Organizational	Responsibility for the operation and development of public transport in Budapest.	The spread of active mobility, modal shift, and the decarbonisation of public transport
	Budapest Public Roads Ltd. (public road maintenance company)	Technological/ infrastructural	Maintenance and development of public road infrastructure	Adapting to changing needs and conditions.

	MÁV-VOLÁN (national transport company)	Technological/ infrastructural Organizational	Infrastructural and organizational influence on regional and suburban transport	Making mobility in Budapest and the agglomeration more efficient and convenient
	Sharing economy actors	Technological/ infrastructural	Technological, and infrastructural influence on the sharing economy	The spread and development of sharing services
	Logistics companies	Technological/ infrastructural	Technological, and infrastructural influence on city logistics	The optimization of their own operations and city logistics
Buildings, heating and electricity	Budapest Public Utilities Ltd. - FŐTÁV (district heating division)	Technological/ infrastructural	Infrastructural influence on district heating	Construction of inner-city district heating pipelines, connection of island district heating systems, geothermal projects, energy upgrading of sites.
	Hungarian Energy and Public Utility Regulatory Authority	Institutional/ regulatory	Regulatory influence on energy and public utilities	The development of the energy market and utilities and the spread of environmentally friendly technologies
	Energy providers (e.g. DSO)	Technological/ infrastructural Financial	Investing in energy related and energy efficiency projects.	Complying with the Energy Efficiency Obligation Scheme.
	Budapest Climate Agency	Technological/ infrastructural Financial	Providing back office support for energy efficiency renovations.	Buildings in the city becoming more energy efficient
	Hungarian Energy Efficiency Institute	Political Behavioural/ social	Research on energy efficiency used for awareness-raising, education, policy proposals and to introduce issues into the public debate	The reduction of energy use in buildings.
	Representatives of condominiums	Organizational	Education and consensus building among residents	Making condominiums more energy-efficient and comfortable for residents
	Energy Club (an NGO)	Political Behavioural/ social	Education and knowledge transfer on energy efficiency, renewables and climate protection	The rational use of resources, and an economy standing on diverse, local resources
Waste	Budapest Public Utilities Ltd. - FKF (waste management division)	Technological/ infrastructural Organizational Behavioural/ social	Infrastructural, organizational, and educational influence on waste management	The spread of circular economy and making Budapest a cleaner city
	MOHU (waste management company)	Technological/ infrastructural Organizational	Infrastructural, organizational, financial and educational	Establishing HUHA2 (the second waste recovery plant in Budapest) as well as

		Financial Behavioural/ social	influence on waste management	further developing and spreading recycling.
	Reuse schemes (e.g. Cseriti, Rakun)	Behavioural/ social	Promoting the reuse/upcycling of products instead of producing more and more waste	The spread of circular economy
Green infrastructure & nature-based solutions	BKM – Főkert (public gardening division)	Technological/ infrastructural Organizational	Green space maintenance and development work	Making Budapest a greener, more liveable place
	Community gardens	Behavioural/ social	Individual actions, advocacy for a circular economy and community building	Making Budapest a greener and more self-sufficient place

3 Part B – Pathways towards Climate Neutrality by 2030

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

3.1 Module B-1 Climate Neutrality Scenarios and Impact Pathways

Based on the GHG inventory of Budapest, which highlights significant emissions from transport and buildings, the extent to which the Municipality can directly control each emission source, as well as the barriers and opportunities of the transition - particularly those related to stakeholder relations and capacities - the following strategic objectives and key priorities were identified:

- Reducing transport need through sustainable and smart city design and developments, and by promoting affordable housing
- Electrifying public transport and providing comprehensive support for active mobility to promote climate-friendly means of transport
- Increasing the energy efficiency of buildings and accelerating the use of renewables in urban areas, with a special focus on residential homes
- Enhancing climate dialogue with key stakeholders, such as businesses, districts and the government.

Because a big proportion of emissions fall under the influence of residents and enterprises, a big proportion of impact pathways are related to collaborations, awareness-raising and incentive creation as a way to mobilize private actors. For incentives, we will place more focus on financial instruments combined with non-refundable grants and the work of the Climate Agency in financing retrofitting (with 2,5 billion HUF coming from the Municipality), and negotiating with commercial banks (for another 5 billion HUF), along with district municipalities (for another 2,5 billion HUF) to contribute to the programme. Technological, infrastructural and organizational measures are also emphasized as they can be more directly influenced by the Municipality and can significantly impact the city's transition towards net zero. Regulatory impact pathways are scarce, as the Municipality's ability to influence the regulatory framework is limited – most things fall under the authority of the Government of Hungary and some are distributed between district municipalities and the Municipality of Budapest. Since 2010, policymaking regarding climate change has not been progressive. Today, interventions are mainly limited to some aspects of the zoning plan and building code as regulated by the Gov. Regulation no. 419/2021 (VII. 15.) called the "settlement plan", which is under preparation, allowing the Municipality to incorporate a climate-neutral approach into building regulations. Despite the limited room for manoeuvre, the Municipality is trying to influence and support policymaking by identifying key regulatory interventions by sector through its projects (e.g. Budapest Solar Powered, LIFE in Runoff, food projects, Air Quality Plan). Budapest also regularly comments Eurocities policy proposals and is an active member of city-level lobbying groups such as Local Alliance. In the impact pathways, key regulatory interventions were identified where the Municipality can act independently and where it should put political pressure on legislators.

The table below summarizes the key impact pathways, their early changes and late outcomes, and both their direct and indirect impacts (co-benefits). Direct impacts and some of the co-benefits such as air

quality, and noise pollution are regularly measured and monitored by the Municipality. However, other co-benefits including health benefits, job creation, increased cooperation and property value are harder to measure and link to specific actions. It is also difficult to see how certain impact pathways affect the social, economic and cultural dimensions of the city. While they all have a positive environmental impact, actions can lead to long-standing issues in other facets of city life, such as gentrification, increased inequality or job loss.

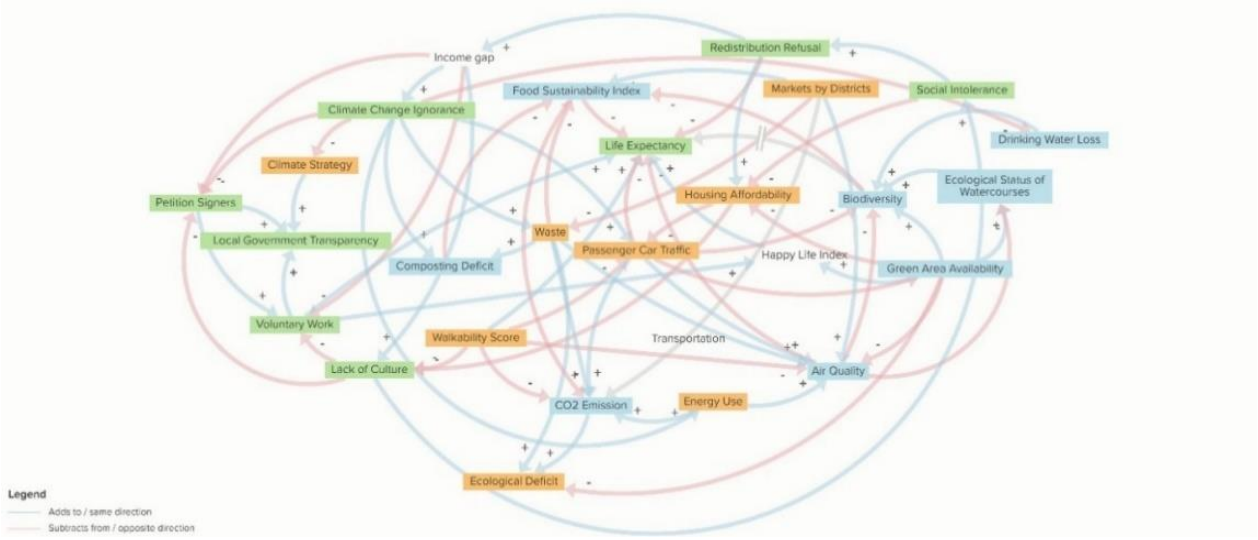
The Municipality finds it important that **the transition to a climate-neutral Budapest happens in a socially fair and economically sustainable way.** For this reason, the Municipality used the **Budapest Degrowth Doughnut**[28] created by the Budapest Corvinus University, which analyses the capital's current social and ecological sustainability status (strengths, shortcomings, unexploited opportunities) in relation to the sustainability transition. It identifies important indicators and links them to each other to see the impact they have on one another.

The Budapest Degrowth Doughnut can be structurally divided into three equal parts, the cultural, socio-economic and biophysical dimensions. There are two types of indicators within the safe and just space marked in green. On the outer rim are the upper limit indicators and on the inner rim are the lower limit ones. Zones marked in red indicate that the limit values have been exceeded.

The Doughnut allows the Municipality to have a more overarching view of the climate-neutrality transition, consider its effect on other aspects of city life and develop the Action Plan accordingly. For example, extensive renovations of residential buildings will lead to a rise in rents, causing gentrification and increased suburbanization. To address this, an important sub-action under the impact pathway *Public building renovations* is the transformation of unused municipal buildings into affordable social housing. The discovery of cause-and-effect relationships between the indicators defined in the Budapest Degrowth Doughnut analysis framework was supported by the system map created during the research process.

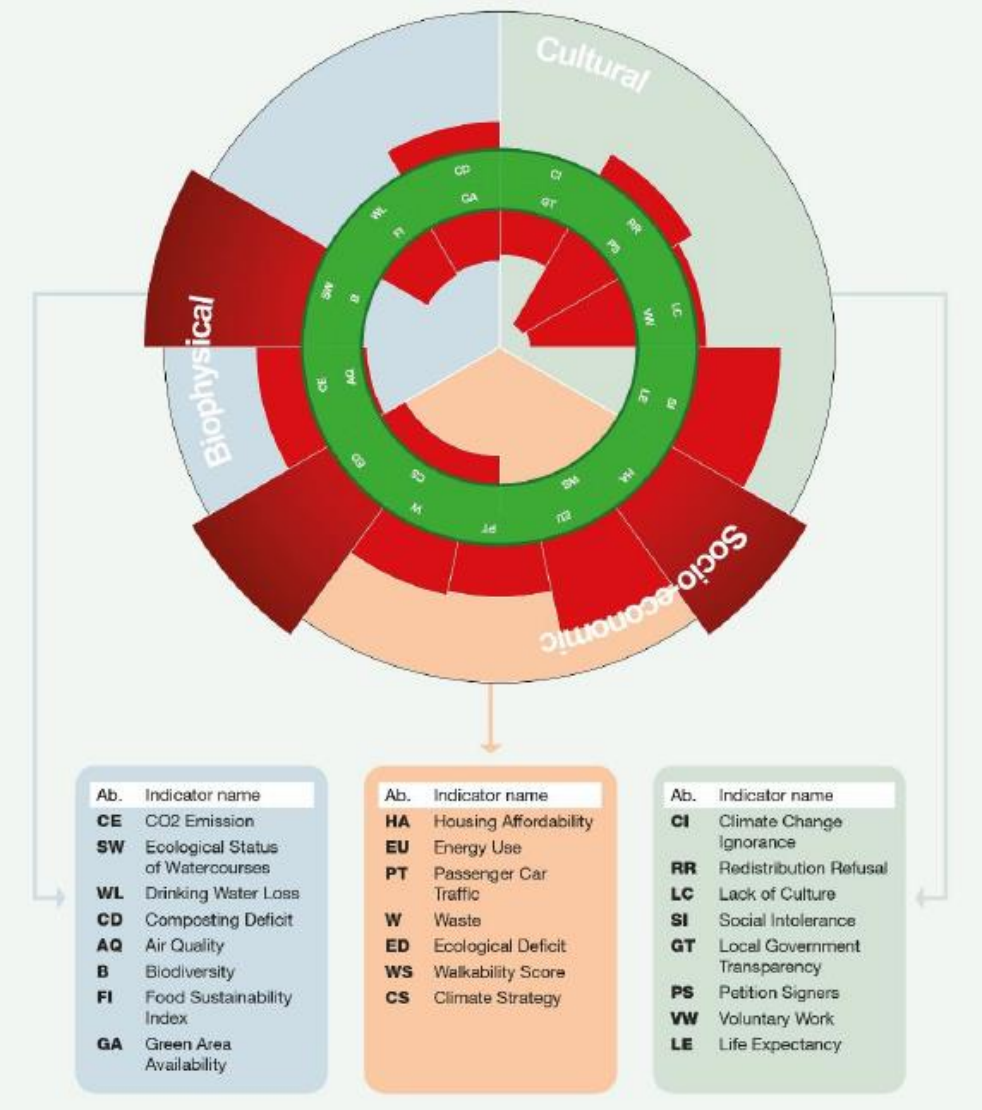
The indicators of the Degrowth Doughnut also cover most of the co-benefits not yet monitored regularly, while the rest can be later added to the model if deemed more important than the current indicators.

12. Figure: System map of the Degrowth Donut of Budapest



[28] Fischer, Máté and Kiss, Gabriella and Kiss, Veronika and Köves, Alexandra and Domazet, Mladen (2024) *Budapest Nemnövekedés-Fánk. Ökológia*ilag és társadalmilag fenntartható, biztonságos és igazságos átmenethez. Project Report. Budapesti Corvinus Egyetem, Budapest. Available at: https://unipub.lib.uni-corvinus.hu/10303/

13. Figure: Indicator set of the Degrowth Donut of Budapest



3-1. Table: Impact Pathways

B-1.1: Impact Pathways						
Fields of action	**Actions**	**Systemic levers**	**Early changes (1-2 years)**	**Late outcomes (3-4 years)**	**Direct impacts (Year 2030 Emission Reductions - kt CO_2e)**	**Indirect impacts (co-benefits)**
Transport	Reduced motorized passenger transportation need	Technological/ infrastructural	Creation of multifunctional neighbourhoods	Reduced travelling times due to short distances	171	Less congestion, air and noise pollution

		Organizational /financial	Projects aimed at creating affordable housing	Less people moving to the agglomeration and commuting daily		Health benefits Function change of freed up parking and road spaces
		Behavioural/ social	Promotion of flexible working hours and home office	Home office becoming the norm for most companies		
		Institutional/ regulatory	Regulations aimed at restricting motorized transport	Reduced motorized transportation		
	Shift to public & non-motorized transport	Technological/ infrastructural	Developing public transport and active mobility infrastructure and services	More people opting for non-motorized and public transport	188	Less congestion, air and noise pollution Health benefits Function change of freed up parking and road spaces
		Institutional/ regulatory	Regulations aimed at making non-motorized and public transportation more convenient options			
		Behavioural/ social	Awareness raising to promote alternative transport modes	The spread of alternative transport modes		
	Increased carpooling	Institutional/ regulatory	Conversations with the Government about the review of the regulatory environment	Favourable changes in the regulatory environment that support the spread of car-pooling	84	Less congestion, air and noise pollution Function change of freed up parking and road spaces
		Organizational	Bigger companies introducing car-pooling schemes	People being more familiar with the concept of car-pooling		
	Electrification of cars + motorcycles	Technological/ infrastructural	Development of charging infrastructure and user experience	Increased rate of electric vehicles due to more favourable conditions	115	Less air and noise pollution Health benefits
		Institutional/ regulatory	Regulations favouring electric vehicles			
	Electrification of buses	Technological/ infrastructural	Change of buses with combustion engines to electric ones and	Increased rate of electric buses	31	Less air and noise pollution Health benefits

			increasing the trolley fleet			
	Optimized logistics	Technological/ infrastructural	Development of an integrated urban loading area network	An integrated and more efficient city logistics loading system	257	Less congestion, air and noise pollution Health benefits
		Institutional/ regulatory	Introduction of policy proposals based on data analysis	A more predictable city logistics policy framework		
	Electrification of trucks	Organizational	Transfer to electric vehicles through minihubs	Increased rate of electric trucks	41	Less air and noise pollution Health benefits
		Institutional/ regulatory	Introducing gradual restrictions regarding the entry of non-electric trucks into the city			
		Organizational	Conversation with freight transport companies	Better understanding of private sector needs		
Buildings & heating	Building renovations (envelope)	Organizational /financial	Provision of technical, managerial and financial support to residents to carry out renovations	Increased rate of residential building renovations	431	Cost savings Health benefits Increased property value Job creation
		Behavioural/ social	Awareness raising about the importance of energy upgrading homes			
		Technological/ infrastructural	Public building renovations	Increased energy efficiency of public buildings		
	New energy-efficient buildings	Organizational	Conversation and cooperation with the private sector to facilitate knowledge sharing	Know-how and technology regarding smart technologies are shared among local actors	12	Increased cooperation Cost savings Health benefits
		Technological/ infrastructural	Pilot projects testing Positive	The spread of PEDs		

			Energy Districts (PED)			
	Efficient lighting & appliances	Technological/ infrastructural	Reconstruction and energy upgrading of the public lighting system	Increased efficiency of public lighting and appliances	221	Increased cooperation Cost savings
			Lighting upgrade of the buildings and facilities of the Municipality			
	Decarbonizing heating generation	Organizational / financial	Provision of technical, managerial and financial support to residents to modernise and decarbonise their heating system	More residents switching to more energy efficient or renewable heating generation technologies	1101	Better air quality Health benefits Stable energy prices Energy independence Job creation
		Behavioural/ social	Awareness raising about the importance of modernising and decarbonising heating systems			
		Technological/ infrastructural	Development and decarbonisation of the district heating system	More energy efficient and less fossil fuel-dependent district heating system		
Electricity	Decarbonizing electricity generation	Technological/ infrastructural	Exploration of opportunities to utilize renewable energy in electricity generation	Increased rate of renewables in private electricity generation	1648	Long-term cost savings Energy independence Job creation
		Technological/ infrastructural	Public investment in renewable energy developments	Increased rate of renewables in municipal electricity generation		
		Organizational	Conversation with the private sector about the opportunities of renewable electricity generation	Increased rate of solar energy generated on roofs and car parks owned by private companies		
		Technological/ infrastructural	Exploring opportunities to facilitate the creation of energy communities and implement large-	The emergence of energy communities		

			scale electricity storage	Increased storage capacities		
Waste	Increased waste recycling	Technological/ infrastructural	Development of the separate waste collection and recycling infrastructure	Increased rate of recycling and composting	84	Better air quality Health benefits Cost savings
		Behavioural/ social	Awareness raising to promote waste reduction, recycling and composting	The reduction in household waste and the spread of recycling and composting		
			Promoting reuse schemes	The spread of reuse schemes		
		Organizational	Upscaling sustainable food projects to the city level	Sustainable food systems		
Other	Decarbonizing IPPU and AFOLU	Organizational	Assisting businesses by providing information on state-of-the-art technologies and finding optimal sources for financing	Best practices for technologies and financing structures are shared among actors		

3.2 Module B-2 Climate Neutrality Portfolio Design

The table below includes the specific actions of Budapest's Climate Neutrality Action Plan. The table mainly includes 'what' needs to be done. The depth of detail on the 'how' is diverging across actions as they are in different development phases. Nevertheless, to have an overall and comprehensive plan about the implementation of the whole Action Plan, the Municipality will develop a road map and dedicate responsibilities for outlining the implementation of each action.

3-2. Table: Description of action portfolios

B-2.1: Description of action portfolios		
Fields of Action	**List of Actions**	**Description**
All[29]	Developing a Budapest Energy Strategy	The strategy will focus on enhancing energy efficiency, switching to renewables, increasing energy independence; reducing energy costs per m^2 of municipal buildings, as well as identifying and optimizing municipal-owned networks of local

[29] The content of the actions overlaps with a lot of other interventions. Hence, a separate detailed action description will not be provided.

		interest and other synergies; so as to ensure the steady growth of renewable electricity generation, and the increase of current storage capacities. This will be preceded by basic surveys and research on the subject of the feasibility and application of sustainable energy management.
	Raising knowledge and awareness	Collaborating with businesses and districts to mobilize public activity in climate actions
	Building government relations, raising funds and policy making	Working together with the Government of Hungary to develop and implement urban regulations and mitigation proposals, and support climate-conscious policy-making by sharing information, experience and knowledge on the urban aspects of climate change.
Transport	Reduced motorized passenger transportation need	
	Developing compact neighbourhoods	Creating mixed-function neighbourhoods by strengthening existing and potential centres in the city, and developing a network of sub-centres, which also operate as easily accessible transport nodes.
	Providing affordable housing to stop suburbanization	Currently, Budapest has the highest rents relative to wages of any capital city in the European Union. The aim of the action is to tackle this issue and provide secure, affordable housing to those in need in Budapest, thereby also stopping the increasing outflow of people from the city to the suburbs.
	Supporting flexible working hours and home office	To respond to the growing demand for flexible working arrangements, the Municipality offers its employees the option to work from home and actively encourages this initiative across its companies and institutions. This aligns with broader efforts to reduce urban congestion, lower carbon emissions, and improve overall quality of life by decreasing the need for daily commuting.
	Introducing stricter rules regarding the movement and parking of tourist coaches	Considerable reduction in motorized transport needs requires to some extent restrictive measures such as introducing stricter rules regarding the movement and parking of tourist coaches.
	Shift to public & non-motorized transport	
	Public transport network developments	The action involves improving modal split by reducing walking distances and transfers, improving inter-regional connections, and integrating new and underserved areas into the public transport system.
	New vehicles	The action involves the continuous renewal of the suburban train, tram, and metro fleet.
	Prioritizing public transport vehicles with traffic management solutions	The measure mainly involves the designation of bus lanes on busy urban road sections where regular congestion hinders the movement of buses.
	Bicycle infrastructure and bike sharing developments	The action focuses on creating a coherent network of new pedestrian and cycle-friendly public spaces in Budapest and the improvement of the city's bike-sharing system, MOL Bubi.
	Prioritizing active and micro-mobility in road and public space developments	The action includes the introduction of LEZ, ULEZ, traffic calming initiatives, reallocating public spaces, improving walking comfort and safety, applying the Healthy Street approach, and developing modal shift options.
	Parking regulation, P+R tariff integration with public transport	The action involves changes in parking and P+R regulations to encourage a shift from passenger cars to public transport and active or micromobility.

	BudapestGO app further developments	With the further development of the BudapestGO app, additional features will be added, mainly customer and user experience improvement and MaaS initiatives. These developments will stabilise the current user base, while the inclusion of new transport tools and services (e.g. shared mobility) will broaden the target group of the app.
	Raising awareness to promote sustainable transport	The action includes organising awareness-raising and educational campaigns, events, and workshops.
	Workplace Mobility Plan	The Municipality has developed a Workplace Mobility Plan that can be adopted by other companies to their employees' transportation habits and needs and to develop an action plan to encourage more sustainable modes of transport.
	Increased car-pooling	
	Creating a favourable environment for car-pooling	For car-pooling to spread, it's essential to create a supportive environment, for example, by revising liability rules in the event of an accident and allowing for charging mechanisms to incentivize participation.
	Conversation with companies about introducing car-pooling at the workplace.	Bigger companies can lead the way in promoting car-pooling by introducing car-pooling schemes for their employees.
	Electrification of cars + motorcycles	
	Creating new mobility stations	The Municipality has created a mobility point concept, which defines three types of service levels. The highest service level, mobility station includes the installation of charging stations at high-frequented public places.
	Introducing smart charging tools to facilitate electrification	The action involves creating smart charging tools (e.g. web application) that provide smart grid integration (e.g. with solar panels) and demand management.
	Free parking for residents with green license plates	The action promotes the electrification of the residential, and car-sharing fleet by offering free parking for EVs with green license plates.
	Creating an e-mobility strategy for Budapest	The strategy will comprehensively cover the promotion of electric vehicles for different purposes and uses, the transport and energy infrastructure associated with their use, and relevant regulations, increasing the understanding of the state of electromobility in the city and exploring new areas of intervention.
	Electrification of buses	
	Procurement of trolleys and electric buses	The action includes the procurement of electric buses and trolleys and the development of related charging infrastructure.
	Optimized logistics	
	Developing a city logistics loading area network	The action focuses on developing a network of designated loading areas and introducing a loading area booking system.
	Developing a sustainable city logistics policy framework	The introduction of a predictable policy framework could provide the basis for additional measures in the field of urban freight transport that could reduce congestion, unwanted land use, pollution and noise emissions resulting from the current unpredictability and disorder.
	Electrification of trucks	
	Transfer to electric vehicles through mini hubs	The aim of the action is to decrease the use of heavy and light-duty trucks with combustion engines in the city and replace them with smaller, electric or active mobility vehicles through micro-consolidation centres.

	Exploring policy interventions	Through the review of the Freight Transport Access Regulation, the Municipality will introduce new policies on protected and restricted zones.
	Conversation with freight transport companies	The action aims to encourage electrification by engaging in active conversation with private actors to explore their needs, barriers and potential collaboration opportunities.
Buildings & Heating	Building renovations (envelope)	
	Providing support for residential energy retrofits by developing tailored funding schemes and with technical expertise	The Budapest Climate Agency plays a significant role in achieving the capital's 2030 decarbonisation targets in the field of building energy. The Agency will manage the development of funding schemes, organise actors in the sector, develop and implement large-scale projects, as well as provide a one-stop-shop service covering the whole process of residential renovation through a customer service network.
	Awareness-raising activities about energy efficiency	The action includes thematic awareness-raising campaigns and informational activities coordinated by the Municipality with special regard to reducing the volume of household energy consumption.
	Refurbishment and energy conscious operation of the buildings and facilities of the Municipality and of its companies	The Municipality of Budapest maintains numerous institutions and companies, thus operating a large number of buildings and facilities and may directly influence their energy consumption and energy-efficient renovation and operation. Provisions have been made for the refurbishment of several buildings maintained by the Municipality and its companies.
	New energy-efficient buildings	
	Creating Positive (and Clean) Energy Districts (PCEDs)	The new zoning and planning policy papers will designate development (action) areas for PCEDs. The action is aimed at gathering energy data (demand, potential, grid capacity, etc.) and developing positive energy districts in mixed (new and existing) built areas. The action also overlaps with *Shift to public & non-motorized transport, Decarbonizing heating generation* and *Decarbonizing electricity generation.*
	Breaking silos to enable knowledge-sharing in both the private and the public sector	Facilitating the conversation and knowledge transfer between different actors, paying special focus to the private sphere who developed smart energy systems.
	Advancing stricter energy efficiency standards in national planning and building requirements (national planning and building requirements - OTÉK, new Urban Plan)	The Municipality will strive to ensure that mandatory compliance with energy requirements (regulated by a separate decree in Hungary) is emphasised in the national urban planning and building regulations under review (Government Decree 253/1997 (XII. 20.)).
	Efficient lighting & appliances	
	Reconstructing and energy upgrading the public lighting system	Out of the 183 thousand luminaires used in Budapest for public lighting, about 110 thousand are worn-out and technically outdated and of high energy consumption and operating cost and will need to be replaced in the next 5 years. The action also involves the use of smart technologies in public lighting.
	Lighting upgrade of the buildings and facilities of the Municipality	The action includes the lighting modernisation of the municipal building stock.

	Decarbonizing heating generation	
	Budapest Climate Agency: Individual retrofits to decarbonize heating of buildings	In addition to insulating buildings, the Budapest Climate Agency also facilitates heating upgrades. The Agency will offer recommendations on the most technologically and economically efficient ways to transition from gas to alternative heating solutions. Additionally, the Agency's front office service provides personalized advice on sizing, design, and installation.
	Awareness raising to promote connecting to sustainable heating methods and opting out of burning wood or waste for heat.	The action includes thematic awareness-raising campaigns and informational activities coordinated by the Municipality with special regard to reducing the volume of household energy consumption.
	District heating: installation of geothermal capacities in several district heating zones	The public utilities company is exploring the possibility of connecting geothermal heat to district heating in several district heating zones.
	District heating: replacing the steam turbine and reconstructing furnaces at the waste recovery plant	According to the plans, replacing the steam turbine and reconstructing the boilers at the waste recovery plant will lead to an additional 50 GWh of electricity generation.
	District heating: the expansion and development of the infrastructure and the energy efficiency reconstruction of the pipelines.	The action includes a number of energy efficiency and infrastructural investments that will contribute to the spread and decarbonization of district heating.
	Connecting new consumers to the district heating system.	Connection of new consumers to the district heating system.
Electricity	Decarbonizing electricity generation	
	Facilitating solar panel development projects on buildings owned by the municipality or its companies	According to the data available, buildings and roofs in Budapest are sufficient for the installation of solar panels with a total installed capacity of 1500 MW (1750 MWp). The Municipality of Budapest intends to promote solar panel development in both non-municipal and municipal buildings and facilities.
	Establishing cooperation with the corporate sector to support renewable electricity generation	The purpose of the measure is to establish cooperation between the Municipality and the private sector, encouraging companies to take part in the expansion and development of solar panel installations.
	Promoting the establishment of energy communities and the implementation of large-scale storage capacities	The establishment of energy communities represents a new opportunity for Budapest regarding renewable electricity generation and consumption. However, if the city wants to ensure the steady growth of renewables, the increase of current storage capacities is also necessary.
Waste	Increased waste recycling and waste reduction	
	Mandatory bottle return system	From 2024, glass, metal, and plastic bottles be returned to collection points all over Budapest.

	Separate waste collection in well-frequented public spaces	The action involves modernising waste yards, increasing the range of waste types they can accept, and thereby increasing the share of waste collected separately.
	Biowaste treatment	The action aims to increase the amount of biowaste treated by introducing a household bio waste collection system.
	Awareness raising to promote composting and recycling	The Municipality is creating a network of community compost stations and organising various awareness-raising activities.
	Creating a city-wide network of reuse centres and schemes	The action involves developing existing Awareness-raising and Reuse Centres and creating a city-wide network of communal repair shops and reuse schemes such as Cseriti, Rakun, and Munch in collaboration with civil organizations and private companies.
	Reducing food waste	The action involves creating an Integrated City Food Strategy, which envisions providing residents with access to healthy and affordable food that benefits both people and the planet by fostering sustainable food chains, thereby contributing to decarbonization efforts.
Other	Decarbonizing IPPU and AFOLU	
	Enhancing mitigation and decarbonisation activities of industrial production and facilities of the tertiary sector	The municipality helps businesses by providing information on state-of-the-art technologies and assisting them in finding optimal sources for financing.

3-3. Table: Individual action outlines

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Reduced motorized passenger transportation need
	Action type	Physical/ spatial interventions Social participation and awareness campaigns Business models Regulatory interventions
	Action description	The city is planning to implement various measures to reduce traffic demand, with the most prominent and important being the creation of compact urban neighbourhoods to eventually materialize a 15-minute city vision. In 2021, a study was commissioned by the Municipality to assess and evaluate the compactness of Budapest and explore actions to achieve the "compact city" objective. This study includes a list of 13 tools and interventions, including the development of Budapest's valuable brownfield sites. The city currently has nearly 8,000 hectares with significant development potential, of which nearly 3,500 hectares can be used for residential development under the capital's urban development plan.

		Other interventions to make the city more compact include launching a digital twin pilot project, organizing awareness-raising programmes and designing and managing so-called thematic streets. Thematic street initiatives are designed to enhance streets where local businesses operate by making them more attractive, expanding their range of functions through events, and ensuring coordinated operation with residential areas. There is also growing emphasis on the support for the use of empty shops on the district level. Such initiatives have so far included a website (kiberelem.hu) that aims to make vacant commercial premises known and attractive to those who want to start a new business or want to place their business on the map of Budapest. A long-term goal of the initiative is the realization of sustainable real estate management, which allows for the utilization of hard-to-use, empty municipal and private properties. The platform also features an interactive map where residents can suggest desired businesses or services for their neighbourhoods. As transport need is also largely driven by the ongoing suburbanization of Budapest due to its rising living costs and rents, another key intervention of reducing motorized transport is ensuring the affordability of housing. For this reason, the Budapest Housing Agency was founded, which offers to take over rental management tasks from landlords in return for lower rents for tenants. Under the umbrella of the Agency, the Municipality will also renovate its disused, non-residential buildings to create additional municipal housing and gain more control over the cost of living in the city. To reduce motorized traffic need and respond to the growing demand for flexible working arrangements, the Municipality offers its employees the option to work from home and actively encourages this initiative across its companies and institutions. This aligns with broader efforts to reduce urban congestion, lower carbon emissions, and improve overall quality of life by decreasing the need for daily commuting. Finally, to achieve a considerable reduction in motorized transport, besides improving the walkability of the city, additional measures are needed such as introducing stricter rules regarding the movement and parking of tourist coaches.
Reference to impact pathway	Field of action	Transport
	Systemic lever	Technological/ infrastructural, organizational/ financial, behavioural/ social, institutional/ regulatory

	Outcome (according to module B-1.1)	Reduced travelling times due to short distances Less people moving to the agglomeration and commuting daily Home office becoming the norm for most companies Reduced motorized transportation
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	Budapest Public Roads, BKK Centre for Budapest Transport, Government of Hungary, district municipalities, Budapest Chamber of Commerce and Industry
	Comments on implementation – consider mentioning resources, timelines, milestones	Plans of compact neighbourhoods and improving housing have already been prepared and projects of smaller scales are being implemented. However, upscaling these actions requires significant government support that the city leadership is trying to achieve through negotiations and by getting the support of residents. Housing Agency: The plan is for the Budapest Housing Agency to manage 2500-9000 dwellings by 2027, contingent on financing possibilities.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Gasoline and diesel
	GHG emissions reduction estimate (total) per emission source sector	171 kt CO_2e from Transport
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	Upfront investment costs assumed to be near-zero, as this lever is assumed to be driven mainly by digitalisation and primarily involves behavioural change.[30]

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Shift to public & non-motorized transport
	Action type	Physical/ spatial interventions Technical interventions Regulatory interventions Social participation and awareness campaigns

[30] .The methodology for calculating costs can be found through the following link: NetZeroCities

	Action description	To facilitate the shift from motorized to public and non-motorized transport, a number of initiatives are being planned and implemented in the city. A major focus is on developing the public transport network by integrating new and underserved areas and making transfers easier and distances shorter. This includes improving transport links between the city and its surrounding areas, including rail service to the airport. In line with EU directives, future developments will also aim to reduce the environmental impact of public transport vehicles in Budapest, in particular by purchasing a new fleet of climate-neutral, state-of-the-art vehicles. The suburban public transport fleet will also be upgraded similarly, and diesel operation in Budapest's suburban rail transport will be phased out. It is also important that public transport is given priority, which involves the designation of bus lanes on busy urban road sections where regular congestion hinders the movement of buses. Another important objective of the Municipality is to encourage cycling in Budapest. The aim is to create a coherent, clearly designed, easy-to-use main cycling network connecting the city's districts, ensuring safe and convenient access for cyclists. Additionally, a key goal is to develop the public bike-sharing system (MOL Bubi), by increasing accessibility, providing additional collection points in new and existing service areas, expanding and diversifying (electric-assisted and specialised bicycles) the fleet by 1500-3500 bicycles, increasing inclusiveness, and improving service management. In addition to developing the cycling infrastructure, giving priority to pedestrian traffic is also crucial. Recent developments have established a new architectural standard, gaining social support for further public space reconstruction and traffic calming. The goal is to prioritize pedestrians in the central parts of the outer districts and to organise pedestrian and cycle-friendly public spaces in the inner districts into a cohesive, liveable urban fabric. A major project by the Municipality is the renewal of the Pest quay, which is regularly closed to cars on summer weekends. This project aims for a complete transformation to make the area greener and more pedestrian- and bike-friendly. The project includes the improvement of active pedestrian-cycle transport conditions, the diversification of accessibility to the Danube bank, the development of 800 m of new community facilities, the regeneration of a World Heritage site, traffic calming along 3,2 km, rethinking road links and the development of 3,2 km of bike lanes along the Lower Quay of Pest.

		Another leading public space renewal initiative is the Healthy Streets programme, which was launched as part of a 300 billion HUF EU development package recently announced by the Mayor. As part of the programme, district municipalities can apply for non-repayable grants ranging from HUF 250 million to HUF 2,5 billion, out of a total budget of HUF 24,16 billion. A similarly key measure is the gradual expansion of paid/controlled parking zones in the city. First, in areas that can reasonably be covered by the current ticket machine network meaning about 30 % of the city's residential area, and then in a further stage with regulation allowing for a lower ticket machine density. Under the current legal framework, the plan includes the introduction of free but time-limited waiting zones across the entire city, eliminating currently non-paying areas used as "quasi-P+R" parking by drivers from the agglomeration. Another effective measure would be increasing parking charges and reducing resident discounts. In addition to parking regulation changes, all P+R car parks would be subject to a fee, and the current fee of HUF 350 for P+R car parks would be linked to the use of public transport. To further curb motorization in the densely built-up areas of the inner and transition zones, the expansion of restricted waiting zones and the designation of Tempo30 zones are ongoing. An additional 12 traffic calming zones are planned throughout the city. Based on the proposal of the road safety strategy and traffic calming plan, differentiated reductions in speed limits will also be introduced on major roads depending on public space conditions. Less impactful but still important measures include developing the BudapestGO app (new transport tools and services e.g. shared mobility), encouraging companies to develop Workplace Mobility Plans and organising awareness-raising campaigns. Carrying out pedestrian and cycling awareness campaigns in schools and organising workshops with drivers and cycling organisations are especially important for the Municipality to mobilize residents.
Reference to impact pathway	Field of action	Transport
	Systemic lever	Technological/ infrastructural, institutional/regulatory, behavioural/ social
	Outcome (according to module B-1.1)	More people opting for non-motorized and public transport The spread of alternative transport modes
Implementation	Responsible bodies/person for implementation	BKK Centre for Budapest Transport, Municipality of Budapest, Budapest Public Roads

	Action scale & addressed entities	City-wide and the agglomeration
	Involved stakeholders	Government of Hungary, district municipalities, civil organizations, municipalities in the agglomeration
	Comments on implementation – consider mentioning resources, timelines, milestones	Plans for the mentioned initiatives have already been prepared, and some are already under implementation. However, for the complete implementation of plans, changes in regulations and more funding are needed, which depend on securing government support. Public transport improvements: A 50-60% public transport share is planned with frequent express bus services, good metro coverage in the wider metro area and strong tram connections. New vehicles: The vehicle fleet is continuously renewed. Currently, the procurement of 51 CAF trams, new electric buses and trolleybuses (more under *Electrification of buses*) are planned. Cycling infrastructure: The plan includes the expansion of the cycle network at the rate of 30-35 km annually. Additionally, the new Bubi 3.0. bike sharing service will be launched in 2026 Q2. Renewal of the Pest quay: Design and construction by the end 2029. Healthy Streets programme: Design and construction of about 30 km by the end of 2027. Traffic calming: By 2030, we would increase the number of roads in Budapest with a 30 km/h speed limit from the current 2200 km to 3200 km, accounting for 60% of the total 5200 km of Budapest road network.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Gasoline and diesel
	GHG emissions reduction estimate (total) per emission source sector	188 kt CO_2e from Transport
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	€ 218m € 1,16m /kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Increased car-pooling
	Action type	Regulatory interventions Business models

	Action description	For car-pooling to spread and average passengers per car and motorcycles to increase by 25% by 2030, changes in the current regulations are necessary, such as revising liability rules in the event of an accident and allowing for charging mechanisms to incentivize participation. Car-pooling could also be encouraged by promoting the use of dedicated platforms among private companies and the wider public. The aim of the Municipality is to facilitate conversations around car-pooling and explore possible avenues for the change in regulations.
Reference to impact pathway	Field of action	Transport
	Systemic lever	Institutional/regulatory, organizational
	Outcome (according to module B-1.1)	Favourable changes in the regulatory environment that support the spread of car-pooling People being more familiar with the concept of car-pooling
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	Government of Hungary, BKK Centre for Budapest Transport Budapest, Public Roads
	Comments on implementation – consider mentioning resources, timelines, milestones	Currently, conversations are ongoing within professional circles, but the timing of specific policy proposals has not yet been determined.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Gasoline and diesel
	GHG emissions reduction estimate (total) per emission source sector	84 kt CO_2e from Transport
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	Assumed to be near zero, as increased car-pooling makes use of existing infrastructure and assets.[31]

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Electrification of cars + motorcycles
	Action type	Technical interventions Physical/spatial interventions
	Action description	Budapest is supporting the electrification of cars and motorcycles through various initiatives, including developing the necessary infrastructure. The city has created a mobility point concept with three service levels. The highest level, known as mobility station, offers a high number of functions and services

[31] The methodology for calculating costs can be found through the following link: NetZeroCities

		including lockers, taxi stands, car sharing and charging stations. The charging network needs to be established with consideration to the infrastructure at home and in facilities attracting traffic, and the establishment and operation of further charging stations in public places must be supported. Additionally, the city is developing smart charging tools, providing smart grid integration (e.g. with solar panels) and demand management. Budapest is also promoting the electrification of the residential and car-sharing fleet by offering free parking for EVs with green license plates. Since October 2015, the green license plate is a mark distinguishing environmentally friendly cars, which has been assigned to cars classified in one of the environmental protection classes 5E, 5P, 5N or 5Z.[32] Finally, the city is also developing a comprehensive electromobility strategy. Preparation of the strategy started in June 2024 and will be completed in September.
Reference to impact pathway	Field of action	Transport
	Systemic lever	Technological/infrastructural, institutional/ regulatory
	Outcome (according to module B-1.1)	Increased rate of electric vehicles due to more favourable conditions
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	BKK Centre for Budapest Transport, Budapest Public Roads
	Comments on implementation – consider mentioning resources, timelines, milestones	Plans for the mentioned initiatives have already been prepared, and some are already under implementation. However, for the complete implementation of plans, more funding is needed, which depends on securing government support. New mobility stations with charging stations: The first mobility stations were put into use in June 2024. The establishment of a further 20-25 stations are planned until 2030. Smart charging tool: It is not possible to change the charging capacity (e.g. 22 kW to 11 kW or much lower level) at publicly available electric vehicle charging stations. Therefore, we had to create a demo environment for the dynamic charging control of the SMAC system in a non-public location.

[32] From 1 September 2024, only fully electric and zero-emission cars will be eligible for green licence plates. The green licence plates previously issued for hybrid electric vehicles will be replaced by white ones.

		Electromobility strategy: Preparation of the strategy started in June 2024 and will be completed in September.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Gasoline and diesel
	GHG emissions reduction estimate (total) per emission source sector	115 kt CO_2e from Transport
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	€ 161m € 1,41m / kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Electrification of buses
	Action type	Technical interventions Physical/spatial interventions
	Action description	The action includes the procurement of new electric buses and the development of charging infrastructure in the city.
Reference to impact pathway	Field of action	Transport
	Systemic lever	Technological/ infrastructural
	Outcome (according to module B-1.1)	Increased rate of electric buses
Implementation	Responsible bodies/person for implementation	Municipality of Budapest, BKK Centre for Budapest Transport Budapest Transport Company
	Action scale & addressed entities	City-wide
	Involved stakeholders	Ministry of Transport and Construction
	Comments on implementation – consider mentioning resources, timelines, milestones	In 2024, a conditional procurement for 160 new trolleybuses will begin. To integrate these into the network, minor overhead lines will need to be built on Kőbányai út, Pongrácz út and Fogarasi út. Additionally, a service procurement contract for 90 electric buses was launched in 2024. These buses are expected to enter into service in 2026. Based on operational experience, the procurement of an additional 200-250 electric buses could commence in 2026-2027.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Gasoline and diesel
	GHG emissions reduction estimate (total) per emission source sector	31 kt CO_2e from Transport
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	€ 31m € 1m / kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Optimized logistics
	Action type	Physical/spatial interventions Regulatory interventions
	Action description	To optimize logistics, the Municipality is planning a series of initiatives to make more efficient use of scarce public spaces. The flagship project focuses on developing a network of designated loading areas and introducing a loading area booking system. The elements of the project are: • Conducting a survey of current public space functions and the existing loading area network in Budapest • Developing a city-wide loading area network to support freight flows • Creating multifunctional service areas, which combine loading areas with facilities such as electric vehicle charging • Equipping loading bays with sensors (including number plate recognition cameras and vehicle detection sensors) to facilitate loading activities and the search for loading bays • Establishing freight transfer points close to the city centre and developing a detailed business and operational model • Developing and implementing a loading bay reservation system, which aims to reduce vehicle journeys by allowing users to view occupancy data and make online reservations Another initiative facilitating the optimization of city logistics in Budapest is the development of a sustainable city logistics policy framework. The project includes: • Identifying the scope of city logistics data required for traffic modelling and data collection and building the IT infrastructure for data storage and analysis • Developing a cooperation framework for data sharing between freight transport companies and municipal institutions • Identifying city logistics intervention areas by 2024 • Launching 2 pilot programmes using the developed city logistics methodology to create specific proposals based on data analysis • Proposing and then introducing changes to the regulatory environment Finally, coordination and collaboration between different actors are necessary to optimize freight

		transport in the city. The Municipality is planning various events and workshops to bring these actors together and create platforms for conversations.
Reference to impact pathway	Field of action	Transport
	Systemic lever	Technological/ infrastructural, institutional/regulatory
	Outcome (according to module B-1.1)	An integrated and more efficient city logistics loading system A more predictable city logistics policy framework
Implementation	Responsible bodies/person for implementation	Municipality of Budapest, BKK Centre for Budapest Transport
	Action scale & addressed entities	City-wide
	Involved stakeholders	Budapest Public Roads, freight transport companies
	Comments on implementation – consider mentioning resources, timelines, milestones	The targets and milestones of the city logistics projects are: • Loading spaces taking up max. 5% of the paying parking spaces by 2030, i.e. about 3,000 loading areas • 2 pilot mini hubs in the next few years that will be increased to a minimum of 10 freight transfer points by 2030 Loading bay reservations will be introduced initially at 15-20 sites. The system will be extended to the whole city by 2030.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Gasoline and diesel
	GHG emissions reduction estimate (total) per emission source sector	257 kt CO_2e from Transport
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	Assuming near zero upfront investments, however such an initiative requires a lot of coordination, but no big infrastructure investments[33]

[33] The methodology for calculating costs can be found through the following link: NetZeroCities

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Electrification of trucks
	Action type	Technical interventions Physical/spatial interventions
	Action description	The Municipality will facilitate the electrification of trucks by establishing mini hubs (consolidation centres), where freight transport companies can transfer to smaller electric vehicles and by engaging in active conversation with private actors to explore their needs, barriers and potential collaboration opportunities. Through the review of the Freight Transport Access Regulation, the Municipality will also introduce new policies on protected and restricted zones and offer entry to protected zones and discounts to restricted zones conditional on electrification. The development of charging infrastructure will also be encouraged, with efforts to streamline and optimize the authorisation process.
Reference to impact pathway	Field of action	Transport
	Systemic lever	Organizational, institutional/ regulatory
	Outcome (according to module B-1.1)	Increased rate of electric trucks Better understanding of private sector needs
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	Budapest Centre for Transport, Budapest Public Roads (BK), freight transport companies
	Comments on implementation – consider mentioning resources, timelines, milestones	The establishment of two mini hubs is expected in 2025. The schedule and funding of further measures is not yet finalized.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Gasoline and diesel
	GHG emissions reduction estimate (total) per emission source sector	41 kt CO_2e from Transport
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	€ 336m € 8,19m / kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Building renovations (envelope)

	Action type	Technical interventions Business models Social participation and awareness campaigns
	Action description	Established in June 2024, the Budapest Climate Agency, a municipality-owned non-profit company, will be responsible for achieving the capital's 2030 decarbonisation targets (and beyond) in the building sector. The Budapest Climate Agency will manage the development of funding schemes relying on various EU, national budgetary or market resources, organise actors in the sector, and develop and implement large-scale projects. In addition to designing and managing targeted programmes, taking into account social, financial and technical aspects, the Budapest Climate Agency will provide a one-stop-shop service covering the whole process of residential renovation (assessment, planning, financing, construction) through a customer service network. This network will be coordinated by the Agency with the help of district authorities and NGOs. This front office service will be provided by the RenoPONT network, launched under the Horizon-funded RenoHUB project. The Agency will also contribute to the radical reduction of CO_2 emissions from buildings by testing innovative solutions and, in case of successful pilot projects, scaling them up, e.g. by creating PED districts based on the results of the Horizon projects already underway (ATELIER, ASCEND). Recognizing the relatively low awareness among residents about the energy efficiency of their homes, awareness-raising programmes will be launched, including: • appearance at events organised by the Municipality or private companies • development of visitors' centres, open days and marketing communication tools • awareness-raising related to specific projects (targeted campaigns and activities). Besides facilitating residential renovations, the Municipality is also facilitating renovations in municipally owned buildings and facilities. Plans are also underway to modernise the building energy database, which will enable the Municipality to launch digital twin projects.
Reference to impact pathway	Field of action	Buildings & heating
	Systemic lever	Organizational/financial, behavioural/social, technological/infrastructural

	Outcome (according to module B-1.1)	Increased rate of residential building renovations Increased energy efficiency of public buildings
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	Commercial banks, international FIs, NGOs, district municipalities, national government, residents
	Comments on implementation – consider mentioning resources, timelines, milestones	The priority of the Municipality is to facilitate residential building retrofitting in order to achieve an annual renovation rate of 4%. As part of its Budapest CARES project, which received €1.5 million in direct EU funding, the Budapest Climate Agency was developed to support and speed up residential building energy efficiency projects both scientifically and institutionally. Until June 2025, in the framework of the Budapest CARES project the following tasks will be done: • Comprehensive database on the energy performance of the building stock in the capital, the savings that can be achieved through renovation, and the willingness of the population to renovate. • Development of a metropolitan building energy strategy. • Creating a network of residential advisors, developing building energy efficiency pilot programs, and identifying and evaluating blended financing opportunities. Following the Budapest CARES project, the Budapest Climate Agency will launch comprehensive investment programmes by scaling up the Budapest CARES pilot projects, make PED developments, and reinvest the savings revenues (Energy Efficiency Obligation Scheme) in the available funds. The Municipality and business associations providing public services are also planning to carry out extensive energy efficiency renovations. A list of completed and planned interventions can be found in the *Monitoring the implementation of the Environment Programme* chapter of the Environmental Status Assessment Report of Budapest.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Natural gas, liquid gas, heating oil, coal
	GHG emissions reduction estimate (total) per emission source sector	431 kt CO_2e from Buildings & heating

	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	€ 4829m € 11,20m / kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	New energy-efficient buildings
	Action type	Technical interventions
	Action description	The project aims to bring together local stakeholders in order to map the technical, legal and social aspects of developing a positive energy district and creating energy communities in Budapest. In a follow-up pilot project called ASCEND, the Municipality, in partnership with District 4, commits to developing a positive energy district along with solar PV installation, mobility decarbonization and public space development. The Municipality also plans to hold several workshops for relevant stakeholders to facilitate the conversation and knowledge transfer between different actors, paying special focus to the private sphere who developed smart energy systems. Moreover, while national regulations are beyond the control of the Municipality, it will strive to ensure that mandatory compliance with energy requirements (regulated by a separate decree in Hungary) is emphasised in the national urban planning and building regulations under review (Government Decree 253/1997 (XII. 20.)).
Reference to impact pathway	Field of action	Buildings & heating
	Systemic lever	Technological/infrastructural, organizational/financial, behavioural/social
	Outcome (according to module B-1.1)	The spread of PEDs Know-how and technology regarding smart technologies are shared among local actors
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	District municipalities, private companies, property investors
	Comments on implementation – consider mentioning resources, timelines, milestones	Plans for the mentioned initiatives have already been prepared, and some are already under implementation. However, for the complete implementation of plans, changes in regulations and more funding are needed, which depend on securing government support.
Impact & cost	Generated renewable energy (if applicable)	Geothermal and solar energy

	Removed/substituted energy, volume, or fuel type	Natural gas, liquid gas, heating oil, coal
	GHG emissions reduction estimate (total) per emission source sector	12 kt CO_2e from Buildings & heating
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	€ 22m € 1,78m / kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Efficient lighting & appliances
	Action type	Technical interventions
	Action description	In response to the energy and climate crisis, the Capital has adopted the first Budapest Energy Package. As an immediate measure, the Municipality decided to shorten decorative lighting by 2 hours a day and to accelerate the LED modernisation programme for street lighting, which has been underway since 2020. In the period 2022-2024, 19,000 luminaires will be replaced, with an additional 5,100 replacements already planned. To optimize energy resources and reduce costs for the Municipality, the use of smart technologies in public lighting will also be explored. Moreover, under the KEHOP-5.2.2-16-2017-00116 project on the energy modernisation of the buildings of the Municipality of Budapest and its institutions, further lighting modernisations will be undertaken. The Municipality will also collaborate with private companies to introduce smart technologies into the public sphere and facilitate know-how sharing between different actors.
Reference to impact pathway	Field of action	Buildings & heating
	Systemic lever	Technological/ infrastructural
	Outcome (according to module B-1.1)	Increased efficiency of public lighting and appliances Lower household energy consumption
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	Budapest Decorative and Street Lighting Ltd, residents
	Comments on implementation – consider mentioning resources, timelines, milestones	Of the 110 thousand luminaires, the City can finance and implement on its own the replacement of 4,000 luminaires per annum, i.e. 20,000 in total. For any additional replacement, external funding and capacity need to be involved. For the complete implementation of plans, residential incentives are needed, which relies on securing government support.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Electricity, diesel
	GHG emissions reduction estimate (total) per emission source sector	221 kt CO_2e from Buildings & heating
	GHG emissions compensated (natural or technological sinks)	N/A

	Total costs and costs by CO_2e unit	€ 1310m € 5,92m / kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Decarbonizing heating generation
	Action type	Technical interventions Business models Social participation and awareness campaigns
	Action description	The interventions mentioned under *Building renovations (envelope)* also apply here, as facilitation programmes of renovations and retrofitting of municipal buildings do not only include envelope renovations but the modernisation of the heating system as well. In particular, the Budapest Climate Agency will play a crucial role in facilitating these heating upgrades. The Agency will offer recommendations on the most technologically and economically efficient ways to transition from gas to alternative heating solutions. Additionally, its front office service will provide personalized advice on sizing, design, and installation to ensure the successful implementation of heating upgrades. Recognizing the relatively low awareness among residents about their energy consumption, awareness-raising programmes will also be launched, including thematic campaigns and informational activities coordinated by the Municipality with special regard to reducing the volume of household energy consumption. Finally, the City is also planning a number of interventions to decarbonize and expand district heating, including : • Exploring the possibility of connecting geothermal heat to district heating: By installing geothermal heat sources and heat exchangers, 292,500 - 477,000 MWh/a of renewable district heat can be produced, resulting in emission reductions of 63,180 - 103,032 tCO_2/year. • Replacing the waste recovery plant's steam turbine and reconstructing the boilers: the heat source modernisation will result in additional electricity generation of about 50 GWh. The replacement of the turbine generator set will result in additional heat sales of about 380 TJ/year and additional electricity sales of about 50 GWh/year. This will result in primary energy savings of about 900 TJ/year and a reduction of CO_2 emissions of about 37,000 tonnes/year.

		• Installing electric boilers with a total thermal capacity of 20-40 MW • Connecting district heating zones: As a result of the initiative, the City expects to achieve annual primary energy savings of 240,000 MWh. This initiative will also reduce CO_2 emissions by 58,000 tonnes annually. • Expanding and developing the district heating infrastructure • Energy efficiency reconstructions of transmission lines, energy efficiency reconstructions of heat exchanges: As a result of the reconstructions, an additional 3,264 (2,529+735) MWh of primary energy savings and 704 (546+158) tCO_2 savings can be realised on the district heating system. As district heating becomes more efficient and increasingly reliant on renewables, efforts are underway to connect new consumers to the network, saving about 137,000 MWh/year of energy and 32,200 tonnes of carbon dioxide emissions by 2030.
Reference to impact pathway	Field of action	Buildings & heating
	Systemic lever	Organizational/financial, behavioural/social, technological/infrastructural
	Outcome (according to module B-1.1)	More residents switching to more energy efficient or renewable heating generation technologies More energy efficient and less fossil fuel-dependent district heating system
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	Commercial banks, international FIs, NGOs, district municipalities, national government, residents, Budapest Public Utilities Plc
	Comments on implementation – consider mentioning resources, timelines, milestones	Plans for the mentioned initiatives have already been prepared, and some are already under implementation. However, the complete implementation of plans relies on additional funding and in the case of district heating, market expansion opportunities. The interventions mentioned under *Building renovations (envelope)* also apply here. Please see the implementation details there. District heating: • Exploring the possibility of connecting geothermal heat to district heating: The potential partners have already submitted a research licence application in 2023, which is currently under evaluation. The Public Utilities also submitted its application for the SM06-GEO

		tender in June 2024, which is also currently under evaluation. Implementation is planned for 2025-2030 • Connecting district heating zones: It is important that planning and implementation can only start if new grant opportunities arise and market expansion is available for district heating. • Replacing the waste recovery plant's steam turbine and reconstructing the boilers: The design of the project is scheduled for 2024-2025, and the implemention for 2025-2026. • Installing electric boilers with a total thermal capacity of 20-40 MW : The installation of an electric boiler is conditional on the availability of green electricity only and on the availability of grants. Mapping of the installation site is ongoing. • Expanding and developing the district heating infrastructure: continuous implementation conditional on the availability of grants. • Energy efficiency reconstructions of transmission lines, energy efficiency reconstructions of heat exchanges: continuous implementation.
Impact & cost	Generated renewable energy (if applicable)	Geothermal and solar energy
	Removed/substituted energy, volume, or fuel type	Natural gas, liquid gas, heating oil, coal
	GHG emissions reduction estimate (total) per emission source sector	1101 kt CO_2e from Buildings & heating
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	€ 1585m € 1,44m / kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Decarbonizing electricity generation
	Action type	Technical interventions Social participation and awareness campaigns
	Action description	Out of all renewable sources, solar energy is the most accessible in the urban context. The Budapest – Solar Powered project therefore concentrates on the city's solar potential. The aim of the work is to explore ways of promoting and supporting the uptake of solar panels. The project also explores administrative and legal barriers, technical as well as economic issues, and social and community attitudes and involvement.

		The Municipality has collected and analysed the district and city-level regulations for the installation of solar panels. The detailed legal analysis helps professionals, municipalities and the general public to navigate through the wide range of rules. Three expert working groups have been set up, involving municipalities, civil society organisations, academics, students and some of the companies involved, to think together and identify solutions to promote the use and uptake of solar panels: By integrating different databases and using geographic information software, the Solar Map of Budapest has been produced. Files containing the buildings and urban planning units of the city and digital surface models of the buildings were imported into the programme and used to build the Budapest Solar Map through various modelling and geodatabase building processes. The final output consists of several output layers, including the results of simulated irradiance modelling for the whole year, the irradiance and estimated electricity generation potential of building roofs, etc. The map aims to provide information to property owners and decision-makers to support the implementation of different solar PV investments. Building on the Budapest – Solar Powered project, a follow-up project is underway, whose main objective is to create a guide to help other cities promote the use of solar energy in urban areas. The project will also carry out benchmarking analysis and, on the basis of the results, propose steps for the integration of solar energy into the energy supply chain. While this can help facilitate residential and commercial investments in solar energy, the Municipality and its business associations are also investing in decarbonizing their own electricity generation by installing solar panels. Furthermore, the roofs of shopping centres and office blocks provide excellent surfaces for the installation of solar panel systems, just like outdoor car parks, where solar panels could be mounted on stands, also providing shade against strong sunshine. This is invaluable in a densely built city, lacking usable space. Hence, it is necessary to establish cooperation with the corporate sector and encourage knowledge sharing in this regard. There are also plans to promote the establishment of energy communities, by facilitating cooperation between condominiums, the electricity provider and offices. The initiative would enable residential buildings with solar panels to sell surplus electricity generated throughout the day. In exchange, offices

		would have access to affordable, green energy, while the electricity provider could prevent network overloads. Finally, if the city wants to ensure the steady growth of renewable electricity generation, the increase of current storage capacities is necessary.
Reference to impact pathway	Field of action	Buildings & heating
	Systemic lever	Technological/infrastructural, organizational/financial, behavioural/social
	Outcome (according to module B-1.1)	Increased rate of renewables in private electricity generation Increased rate of renewables in municipal electricity generation Increased rate of solar energy generated on roofs and car parks owned by private companies The emergence of energy communities Increased storage capacities
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	Energy providers, national government, private companies, residents
	Comments on implementation – consider mentioning resources, timelines, milestones	Plans for the mentioned initiatives have already been prepared, and some are already under implementation. However, for the complete implementation of plans, changes in regulations and more funding are needed, which depend on securing government support.
Impact & cost	Generated renewable energy (if applicable)	Geothermal, solar and wind energy
	Removed/substituted energy, volume, or fuel type	Natural gas
	GHG emissions reduction estimate (total) per emission source sector	1648 kt CO_2e
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	€ 2794m from electricity € 1,70m / kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Increased waste recycling
	Action type	Technical interventions Social participation and awareness campaigns Procurement actions

	Action description	From 1st July 2023, the concession company, MOHU took over the municipal waste management services for solid waste in Hungary. Over the next 35 years, MOHU will be responsible for providing domestic waste management services including the handling and treatment of waste as well as undertaking related investments. As part of initiatives to increase recycling rates, a mandatory bottle return system was launched in 2024, allowing metal, plastic and glass bottles and containers to be returned to designated collection points in return for a HUF 50 return fee. The aim of the return system is to radically reduce the environmental pollution caused by plastic bottles, aluminium cans, and glass bottles and to reuse as much of them as possible. This is supported by an extensive communication campaign and by MOHU's app, featuring return points across Budapest. Recycling will also be facilitated by gradually modernising waste yards, increasing the range of waste types they can accept, and thereby increasing the share of waste collected separately. Another flagship action of MOHU is the introduction of a household biowaste collection system. Initially, this service will be launched in a few condominium zones and then gradually expanded to the rest of Budapest. Residents will receive new bins accompanied by information materials to help the transition. To further spread the habit of composting, the Municipality will further develop its community composting network and organise various awareness-raising activities. The Municipality of Budapest is also exploring other ways with the help of the Prevention Platform - a group of waste management experts - to reduce the amount of waste generated in the city. This includes developing existing Awareness-raising and Reuse Centres, creating a city-wide network of community repair shops and reuse schemes such as Cseriti, Rakun, and Munch, as well as considering policy interventions, public-private partnerships (PPPs), and awareness-raising activities. The Municipality is also developing an Integrated City Food Strategy, which envisions providing residents with access to healthy and affordable food that benefits both people and the planet by fostering sustainable food chains, thereby contributing to decarbonization efforts. To achieve this, the Municipality will: ○ Help build **short food chains** by strengthening urban-rural links (farmers' markets, shopping

		communities, community-supported agriculture, etc.) ○ Help **reduce food waste** at retail, commercial and public levels, with particular attention to supporting socially vulnerable groups ○ Promote the uptake of **urban agriculture** (e.g. community gardens, small gardens, other innovative solutions) ○ Provide **sustainable and healthy public catering** in its own facilities ○ Organize **awareness-raising** activities and set an example to other cities
Reference to impact pathway	Field of action	Waste
	Systemic lever	Technological/infrastructural, behavioural/social, organizational
	Outcome (according to module B-1.1)	Increased rate of recycling and composting The reduction in household waste and the spread of recycling and composting The spread of reuse schemes Sustainable food systems
Implementation	Responsible bodies/person for implementation	MOHU, Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	Beverage container distributors, Budapest Public Utilities Ltd, residents
	Comments on implementation – consider mentioning resources, timelines, milestones	Plans for the mentioned initiatives have already been prepared, and some are already under implementation. Mandatory bottle return: Continuous introduction from 1 January 2024 Modernising waste yards: Implementation will start in 2024 Household bio waste collection: Continuous introduction from 1 January 2024. In the first phase of implementation, 15,000 residents, representing about 6,000households will participate in the collection of households biowaste along designated streets of Budapest's XI, XX and XXI districts.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Municipal solid waste
	GHG emissions reduction estimate (total) per emission source sector	84 kt CO_2e from Waste

	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	€ 16m € 0,20m / kt CO_2e

B-2.2: Individual action outlines		
(Fill out one sheet per intervention/project)		
Action outline	Action name	Other
	Action type	Social participation and awareness campaigns
	Action description	The energy demand of premises and buildings of businesses is also quite substantial, the reduction of which could improve their competitiveness by means of the direct reduction of costs. The energy demand of production technologies is also quite high compared to the available standard of technology: the energy intensity of the Hungarian economy is nearly double the EU 28 average. The municipality helps businesses by providing information on state-of-the-art technologies and assisting them in finding optimal sources of financing.
Reference to impact pathway	Field of action	Other
	Systemic lever	Organizational
	Outcome (according to module B-1.1)	Best practices for technologies and financing structures are shared among actors
Implementation	Responsible bodies/person for implementation	Municipality of Budapest
	Action scale & addressed entities	City-wide
	Involved stakeholders	Local companies
	Comments on implementation – consider mentioning resources, timelines, milestones	Cooperation with the tertiary sector is ongoing.
Impact & cost	Generated renewable energy (if applicable)	N/A
	Removed/substituted energy, volume, or fuel type	Natural and liquid gas
	GHG emissions reduction estimate (total) per emission source sector	7 kt CO_2e from Other
	GHG emissions compensated (natural or technological sinks)	N/A
	Total costs and costs by CO_2e unit	N/A[34]

B-2.3: Summary strategy for residual emissions

In order for Budapest to reach climate neutrality, the capacity of carbon sinks in the city needs to be increased. In Budapest there are at present at least 1200 hectares that can be described as brownfield areas whose previous function has ceased or that are underused and require intervention for a new use.

[34] The Economic Model does not calculate the costs of decarbonizing other sectors. As the emissions from IPPU and AFOLU are insignificant, costs are likely to be very low compared to other actions.

Brownfield areas present an excellent opportunity to create new green spaces, thereby increasing the capture of CO_2 and improving the urban climate. Additionally, Budapest's existing green cover system does not adequately fulfil its recreational and environmental roles; there is insufficient and often poor-quality green space. This presents the city with further opportunities to enhance carbon capture and improve its green infrastructure.[35]

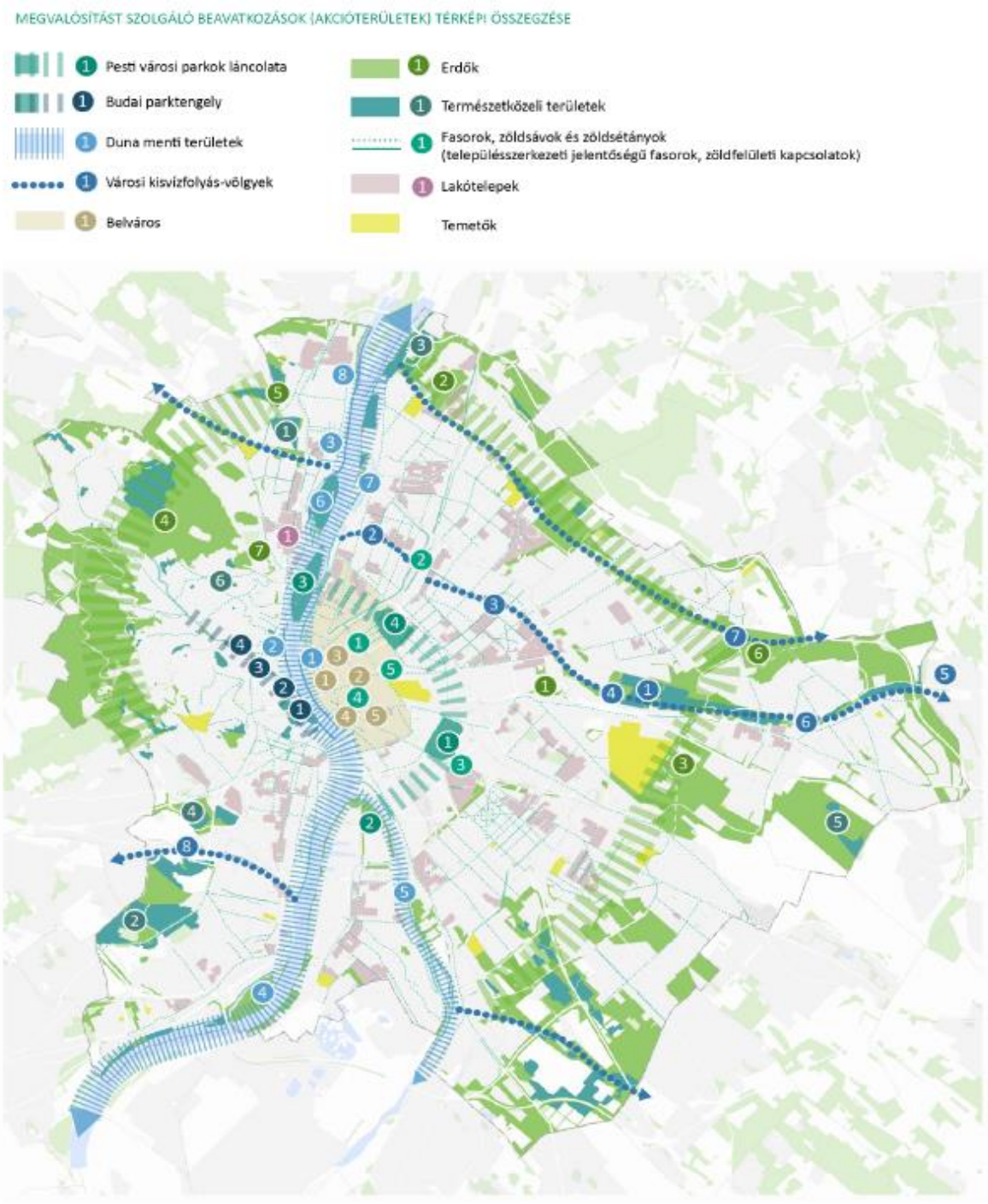
The Municipality has several prepared plans for the integrated recreational and green space development of the city. These are collected and summarized in the Radó Dezső Plan, the city's Green Infrastructure and Maintenance Plan. The plan includes projects in 10 action areas that are summarized below.

Action Area	Development goals	Main tasks
URBAN PARKS IN PEST	The protection, renewal and development of existing and planned urban park elements should be prepared by reviewing urban green infrastructure and involving the public; simultaneous implementation of related green space developments	• Improvement of basic infrastructures • Strategic development plans for urban parks • Regulation of public space use
BUDA PARK AXIS	Protecting, renewing and improving elements of the parks axis; strengthening cohesion between the green space elements of the axis; improving functional links between some urban parks and related public facilities	• Renewal of walking and cycling infrastructure • Improvement of basic infrastructures • Strategic development plans for urban parks • Regulation of public space use • Improving the cohesion of the park axis
DANUBE RIVERSIDE	Strengthening the public use of riverside areas, their role in the green network and ensuring their accessibility; protecting existing riverside vegetation and gallery forests; enhancing natural functions and improving the intensity of green spaces	• Floodplain forest regeneration, rehabilitation, protection of floodplain woodland habitats • Protection and enhancement of natural and cultural heritage • Provision of public spaces and green areas for riverside developments • Reconstruction and improvement of flood protection structures
URBAN SMALL WATERCOURSES	Improving the ecological function of small watercourses (wetland revitalisation, species conservation), improving water connectivity, coordinated ecological and recreational regeneration of riparian areas and the preservation of the natural assets of stream valleys in complex revitalisation	• Stream revitalisation, water management, development of a complex revitalisation protocol • Conservation and reconstruction of natural habitats • Feasibility studies and master plans
DOWNTOWN	Improving the functionality and urban ecology of existing green spaces; promoting and supporting the creation of alternative green spaces	• Renewal and replacement of public trees, creation of new tree planting opportunities • Courtyard, roof and fire wall greening programme • Preparation of a publication on the possibilities for transitional greening
FORESTS	Preventing the loss of forest areas, increasing forest areas; ensuring public welfare functions and sustainable management; ensuring the maintenance of forest and other semi-natural ecosystems and habitats, preserving and, where possible, improving biodiversity; developing the outer Pest green ring.	• Preservation of existing forest areas, qualitative and quantitative improvement • Maintaining a complex approach to forest management to ensure continuous forest cover • Continuous monitoring of forest health • Recreational development of forests taking into account natural aspects

[35] Municipality of Budapest, *Integrated Urban Development Strategy* (2021)

		• Suitability assessment of areas classified as forest but without afforestation, development of a reforestation programme
SEMI NATURAL AREAS	Ensuring the preservation and improvement of natural areas and valuable habitat, strengthening the role of semi-natural areas in the green infrastructure of the city: recreational development taking into account nature conservation aspects	• Conservation and reconstruction of natural habitats • Continuous monitoring of semi-natural areas • Protection of valuable natural areas • Preparation of a biodiversity strategy • Mapping ecosystem services • Development of ecotourism infrastructure and services
TREE-LINES, GREEN STRIPS AND GREEN WALKWAYS	Increasing the number of trees in public spaces, and improving their living conditions in order to achieve the best possible conditioning effect	• Creation of a unified Budapest tree register • Initiating amendments to higher level legislation to better protect trees • Harmonisation of district municipalities' green space and tree protection/compensation ordinances • Updating the relevant regulations of the Municipality for better protection of trees • Developing a 2030 timeframe for afforestation, with an annual timetable • Introduction and dissemination of quality, modern urban afforestation solutions
APARTMENT BLOCKS	The qualitative renewal of their recreational functions and the infrastructure that serves them, adapting to changing environmental factors and the recreational needs of the local population; creating diversity; implementing sustainability principles	• High quality renewal and professional maintenance of green spaces and infrastructure in residential areas • Model project for the complex rehabilitation of a housing estate • Protection of green spaces, enhancement of ecosystem services • Enhancing recreational functions • Encouraging the construction of community gardens • Production of a publication on green space design and maintenance in residential areas as part of the Green Infrastructure booklet series
CEMETERIES	Protection, qualitative renewal and ongoing professional maintenance of green infrastructure; development of an ecological approach to cemeteries; development and co-designing of public cemeteries; recreational use of operational cemeteries; public use of closed cemeteries; temporary green space use of disused cemeteries	• Development of a plan of measures for the development of green infrastructure and the use of green networks in cemeteries • Protection, quality renewal and professional maintenance of green infrastructure • Better use of the recreational potential of existing cemeteries, public use of closed cemeteries, temporary use of disused cemeteries for green infrastructure • Survey and inventory of cemetery infrastructure • Inventory and condition assessment of cemetery trees • Promotion of alternative burial methods; designation of areas in the capital suitable for forest or tree burial • Preparation of comprehensive development plans for each public cemetery

14. Figure: Action areas of the Green Infrastructure and Maintenance Plan



It is important to mention that the qualitative and quantitative development of the city's green infrastructure in itself, is not sufficient enough to offset residual emissions within the city border. Technological solutions are relatively novel in Hungary, however, the Municipality is open to working together with the private sector and research hubs who have started experimenting with or are already planning on using CO_2 removal technologies. With regard to private actors that have limited capacity to

completely eliminate their emissions within the city border, the use of carbon credits focused on projects close to Budapest or in the country will be encouraged.

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

3-4. Table: Indicators

B-3.1: Indicators							
Outcomes/ impacts addressed	Action/ project	**Indicator No.** (unique identified)	Indicator name		Target values		
					2025	2027	2030
(List early changes/ late outcomes and impacts to be evaluated by indicator)	(List action/ pilot project if applicable)	(Indicate unique identifier)	(Insert indicator name)		(List one value per indicator)	(List one value per indicator)	(List one value per indicator)
Because of the extensive list of outcomes, please see under *Buildings and heating* on pages 41-42	Building renovations (envelope) New energy-efficient buildings Efficient lighting & appliances Decarbonising heating generation	1	GHG emission from stationary energy including district heating/cooling (kt CO_2e/year)		1822	1234	645
Because of the extensive list of outcomes, please see under *Transport* on pages 39-41	Reduced motorized passenger transportation need Shift to public & non-motorized transport Increased car-pooling Electrification of cars + motorcycles Electrification of buses Optimized logistics	2	GHG emission from transport (kt CO_2e/year)		898	602	307

	Electrification of trucks						
Because of the extensive list of outcomes, please see under *Waste* on page 42	Increased waste recycling	3	GHG emission from waste (kt CO_2e/year)		106	78	50
Because of the extensive list of outcomes, please see under *Other* on page 42		4	GHG emission from IPPU (kt CO_2e/year)		5,9	3,7	1,6
Because of the extensive list of outcomes, please see under *Other* on page 42		5	GHG emissions from AFOLU (kt CO_2e/year)		0,8	0,5	0,2
Because of the extensive list of outcomes, please see under *Elecricity* on page 41	Decarbonising electricity generation	6	GHG emission from electricity (kt CO_2e/year)		1186	636	87
Overall development of the climate neutrality work	All actions	7	Residual emissions (% of baseline BAU 2030 emissions)		73%	47%	20%

3-5. Table: Indicator Metadata

B-3.2: Indicator Metadata	
1	
Indicator Name	GHG emission from stationary energy
Indicator Unit	t CO_2 equivalent
Definition	Greenhouse gas emissions from the operations of buildings and facilities.
Calculation	The cumulative amount of GHG emissions from the operations of buildings including district heating/cooling, excluding electricity.
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it measure?	Buildings and heating
Does the indicator measure indirect impacts (i.e., co- benefits)?	no
If yes, which co-benefit does it measure?	-
Is the indicator useful for monitoring the output/impact of action(s)?	yes
If yes, which action and impact pathway is it relevant for?	Buildings & heating

Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	yes
Data requirements	
Expected data source	Municipal institutions, municipal companies, MVM Főgáz Natural Gas Network Ltd., National Tax and Customs Administration of Hungary
Is the data source local or regional/national?	local
Expected availability	available
Suggested collection interval	annually
References	
Deliverables describing the indicator	SECAP emissions inventory
Other indicator systems using this indicator	-

B-3.2: Indicator Metadata	
2	
Indicator Name	GHG emission from transport
Indicator Unit	t CO_2 equivalent
Definition	Greenhouse gas emissions from the operations of on-road vehicles.
Calculation	The cumulative amount of GHG emissions from transport minus electricity
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it measure?	Transport
Does the indicator measure indirect impacts (i.e., co- benefits)?	no
If yes, which co-benefit does it measure?	-
Is the indicator useful for monitoring the output/impact of action(s)?	yes
If yes, which action and impact pathway is it relevant for?	Transport
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	yes
Data requirements	
Expected data source	National Tax and Customs Administration of Hungary
Is the data source local or regional/national?	national
Expected availability	available
Suggested collection interval	annually
References	
Deliverables describing the indicator	SECAP emissions inventory
Other indicator systems using this indicator	-

B-3.2: Indicator Metadata	
3	
Indicator Name	GHG emission from waste
Indicator Unit	t CO_2 equivalent
Definition	Greenhouse gas emissions from waste treatment, waste incineration and landfills
Calculation	Quantity of waste per End-of-life (EoL) treatment type x emission factors per EoL treatment
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it measure?	Waste
Does the indicator measure indirect impacts (i.e., co- benefits)?	no
If yes, which co-benefit does it measure?	-
Is the indicator useful for monitoring the output/impact of action(s)?	yes
If yes, which action and impact pathway is it relevant for?	Waste
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	no
Data requirements	
Expected data source	MOHU
Is the data source local or regional/national?	local
Expected availability	available
Suggested collection interval	annually
References	
Deliverables describing the indicator	-
Other indicator systems using this indicator	-

B-3.2: Indicator Metadata	
4	
Indicator Name	GHG emission from IPPU
Indicator Unit	t CO_2 equivalent
Definition	Greenhouse gas emissions from use of energy sources related to industrial processes
Calculation	The cumulative amount of GHG emissions from the use of liquid gas in industrial processes.
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it measure?	Other
Does the indicator measure indirect impacts (i.e., co- benefits)?	no

If yes, which co-benefit does it measure?	
Is the indicator useful for monitoring the output/impact of action(s)?	yes
If yes, which action and impact pathway is it relevant for?	Other
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	yes
Data requirements	
Expected data source	National Tax and Customs Administration of Hungary
Is the data source local or regional/national?	national
Expected availability	available
Suggested collection interval	annually
References	
Deliverables describing the indicator	SECAP emissions inventory
Other indicator systems using this indicator	-

B-3.2: Indicator Metadata	
5	
Indicator Name	GHG emission from AFOLU
Indicator Unit	t CO_2 equivalent
Definition	Greenhouse gas emissions from the use of energy sources related to agriculture
Calculation	The cumulative amount of GHG emissions from the use of natural gas in agriculture and land use
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it measure?	Other
Does the indicator measure indirect impacts (i.e., co- benefits)?	no
If yes, which co-benefit does it measure?	-
Is the indicator useful for monitoring the output/impact of action(s)?	yes
If yes, which action and impact pathway is it relevant for?	Other
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	yes
Data requirements	
Expected data source	MVM Főgáz Natural Gas Network Ltd.
Is the data source local or regional/national?	national
Expected availability	available
Suggested collection interval	annually
References	

Deliverables describing the indicator	SECAP emissions inventory
Other indicator systems using this indicator	-

B-3.2: Indicator Metadata	
6	
Indicator Name	GHG emission from grid supplied energy - electricity
Indicator Unit	t CO_2 equivalent
Definition	GHG emissions occurring as a consequence of the use of grid-supplied electricity within the city boundary
Calculation	The cumulative amount of GHG emissions from electricity
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it measure?	Electricity
Does the indicator measure indirect impacts (i.e., co- benefits)?	no
If yes, which co-benefit does it measure?	-
Is the indicator useful for monitoring the output/impact of action(s)?	yes
If yes, which action and impact pathway is it relevant for?	Electricity, Transport, Buildings and heating, Other
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	yes
Data requirements	
Expected data source	ELMŰ Power Distribution
Is the data source local or regional/national?	local
Expected availability	available
Suggested collection interval	annually
References	
Deliverables describing the indicator	SECAP emissions inventory
Other indicator systems using this indicator	-

B-3.2: Indicator Metadata	
7	
Indicator Name	Residual emissions
Indicator Unit	%
Definition	The difference between the city's GHG emissions inventory and their 2030 climate neutrality target.
Calculation	The city's annual GHG emissions divided by GHG emissions in the baseline inventory.
Indicator Context	
Does the indicator measure direct impacts (reduction in greenhouse gas emissions?)	yes
If yes, which emission source sectors does it measure?	all
Does the indicator measure indirect impacts (i.e., co- benefits)?	no
If yes, which co-benefit does it measure?	-
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
Is the indicator captured by the existing CDP/ SCIS/ Covenant of Mayors platforms?	no
Data requirements	
Expected data source	GHG inventory
Is the data source local or regional/national?	local
Expected availability	available
Suggested collection interval	annually
References	
Deliverables describing the indicator	Action Plan Guidance
Other indicator systems using this indicator	-

4 Part C – Enabling Climate Neutrality by 2030

Part C "Enabling Climate Neutrality by 2030" aims to outline any enabling interventions, i.e., regarding organizational setting or collaborative governance models or related to social innovations – designed to support the climate action portfolios (Module B-2) as well as aiming to achieve co-benefits outlined in the impact pathway (Module B-1). These interventions also address the identified opportunities, gaps and barriers identified Module A-2 and A-3.

4.1 Module C-1 Governance Innovation Interventions

The transition of Budapest towards a climate-neutral future is a complex challenge that requires stakeholders from the entire local ecosystem to collaborate. In the centre of this transition is the Municipality of Budapest, whose responsibility is to encourage, enable and facilitate intra- and inter-institutional innovations, local, national, and international partnerships as well as participatory processes that support the implementation of the Action Plan by 2030.

The main facilitators and coordinators of environmental projects in the city are the Department for Climate and Environmental Affairs and the Department of Landscape Architecture, the former of which was established in 2019 with the aim of making **environment protection one of the key pillars** of city governance. To ensure the integration of sustainability into the operation of the Municipality, the Department was granted authority to review and advise on proposals related to climate and environmental protection and other relevant materials and initiatives based on their adherence to the city's Sustainable Energy and Climate Action Plan. Moreover, to improve the quality and consistency of data, the municipality has introduced a Sustainability Reporting System for public companies whereby they report on their energy consumption and emissions annually. Finally, the Environmental Protection Fund and the Green Budapest Foundation were set up to secure funding for sustainability initiatives in the city.

Since its establishment the Department has worked together with various stakeholders to combat climate change and accelerate adaptation, however, none of the projects compares in size or complexity to the challenge of achieving climate neutrality. For this reason, the Municipality of Budapest has established a so-called **Mission Group** based on NZC's Transition Team Model A, a collaborative governance structure involving the Municipality, private and public companies, academia, and the civil sector who help develop and implement the city's climate neutrality strategy. The cooperation model of the Municipality differs slightly from the NZC's model in that sectoral groups within the Mission Group, known as **Transition Teams** were defined, creating new and utilizing already existing platforms. The Mission Group is led by the **Mission Team**, a core group of people within the city administration solely responsible for managing the mission process. They establish the working modality, oversee, and coordinate the creation of the city's climate-neutral strategy, involve stakeholders, as well as support and facilitate the work of the Mission Group. The team works under the Department for Climate and Environmental Affairs and is closely supported by different departments, including the Department of Finance and Accounting, and the Department of Budget Planning and Supervision, as well as BKK Centre for Budapest Transport and Budapest Public Utilities Ltd, which provide professional help to make sure plans are prepared to the best of their fields' expertise.

Other members of the Mission Group include KÖVET Association, a civil organization specialised in sustainability training for companies, Budapest Corvinus University, where the Degrowth Doughnut of Budapest has been prepared and two networks serving as platforms for private companies and civil organizations where they can engage in dialogue with each other and the city governance regarding climate change.

Members of the Mission Group meet each other periodically, in smaller or bigger groups depending on whether the issue in discussion is inter-sectoral or sector specific.

Members include:

- The Municipality of Budapest
- BKK Centre for Budapest Transport
- Budapest Public Utilities Ltd.
- Budapest Global, a network of private companies working together with the municipality.
- Green Budapest working group, a network of civil organizations dedicated to climate protection.
- KÖVET Association
- Budapest Corvinus University

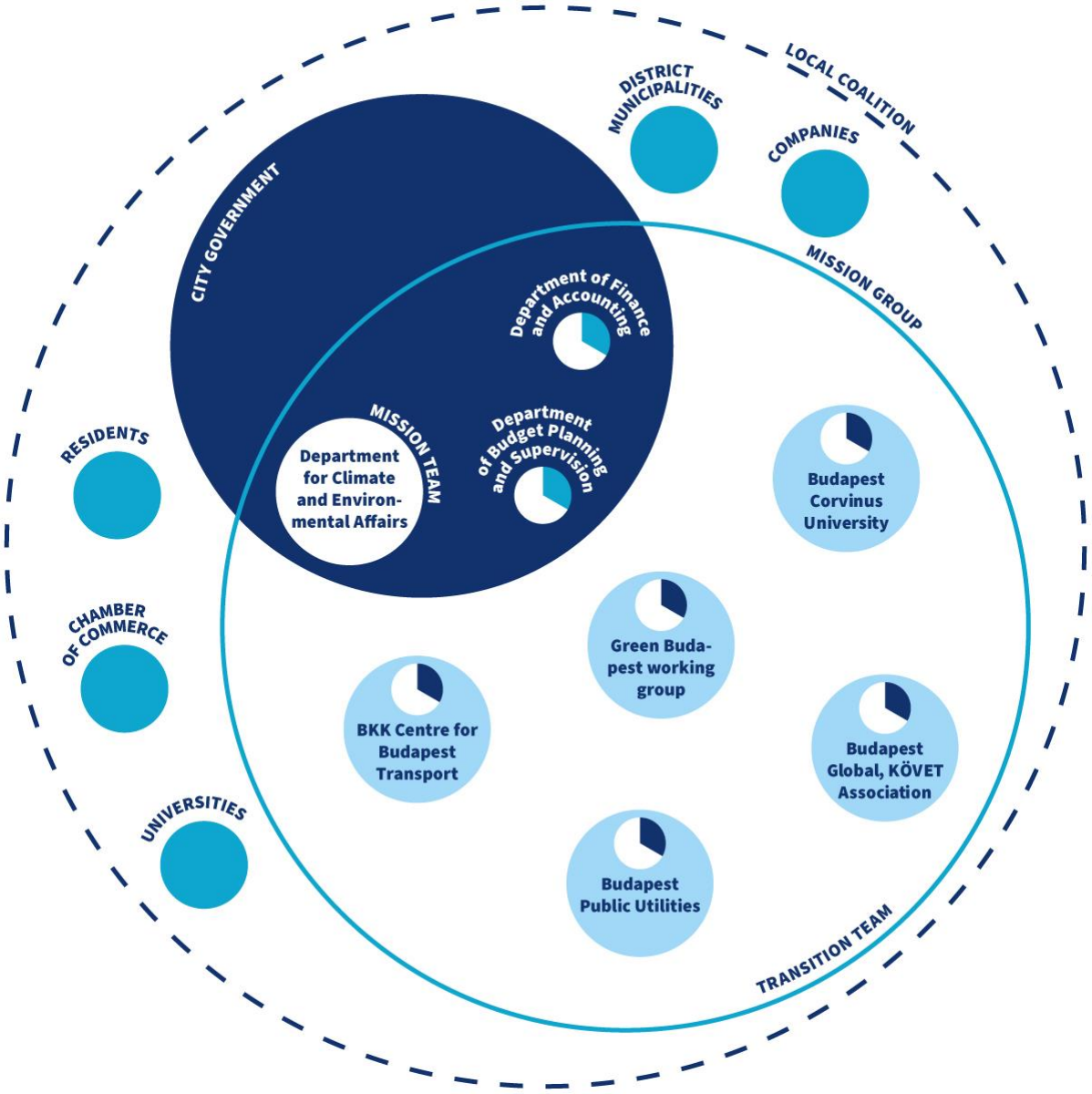
Private companies - both global and local; large- and medium-sized businesses - were invited to join the Mission Group. In cooperation with the Budapest Global association, a public NGO responsible for corporate relations, the Department for Climate and Environmental Affairs reached out to companies through multiple channels. Together with the KÖVET Association, we have organised corporate workshops to introduce the ongoing project and activities being carried out by the Department to showcase and identify potential cooperation areas with companies along 4 thematic areas: mobility, energy, circular economy and green infrastructure. As a result of the workshops, we have organised personal meetings with companies to discuss the details and framework of the cooperation. Many of the personal meetings resulted in the involvement of additional businesses, based on the established partnerships of the given companies.

As an additional channel, we have reached out to business organisations active in Hungary, such as foreign chambers (e.g. The American Chamber of Commerce in Hungary and French-Hungarian Chamber of Commerce and Industry, etc) and BCSDH - The Business Council for Sustainable Development. These organisations provided a platform for us to meet companies and introduce the Department's efforts for climate transition, as well as outline the approach and potential involvement with the Mission.

Establishing new connections with businesses and reaching out to additional companies are still planned and ongoing. The discussions have begun with organisations such as the Hungary Green Building Council (HuGBC) on the involvement of their members. Additionally, we are planning to represent the Municipality of Budapest and the Mission on the Office Week (which is an annual key event in the real estate market), and have leveraged the 'snowball effect', by establishing connections that support the outreach to many others through existing cooperation.

The next step in the engagement of companies is to organize regular events, such as business breakfasts to facilitate joint actions that support the climate neutrality transition, identify synergies between companies' ongoing climate actions, address companies' main pain points in their sustainability operations, and develop joint actions and projects to overcome systematic barriers.

15. Figure: The governance model of Budapest's climate neutrality transition



Also key in enabling the transition are **residents** that the city government – with the help of the Mission Group – informs and mobilizes. A particularly important aim of the city leadership is to actively include citizens in decision-making and planning processes. For this reason, the Municipality of Budapest has multiple deliberation initiatives and participatory processes encouraging citizens to share their ideas and make decisions regarding climate mitigation and adaptation actions. Initiatives since 2020 have included surveys, online questionnaires, citizen involvement in traffic calming projects, participatory budgeting, and citizen assemblies. In 2020, the Municipality organized its first citizen assembly[36], whereby 8 interventions were proposed by participants. In developing the CCC, mitigation proposals were integrated into the Action Plan.

[36] A detailed description of the assembly and the proposals can be found through the following link: Citizens' Assembly on climate, Budapest, 2020 (demnet.hu).

Finally, getting **district governments** on board is also crucial as they play an important role, alongside civil society organisations, in engaging the public, raising awareness and encouraging small-scale climate actions at a local level. Additionally, recognising the role of **universities** in research and development, more focus will be placed on their mobilization in the future too.

The table below summarizes the key governance innovation planned or already in place to reach climate neutrality:

4-1. Table: Relations between governance innovations, systems, and impact pathways

C.1.2: Relations between governance innovations, systems, and impact pathways					
Intervention name	**Description**	**Systemic barriers / opportunities addressed**	**Leadership and stakeholders involved**	**Enabling impact**	**Co-benefits**
Budapest Global	A network of local private companies dedicated to take an active role in driving change in the city including transitioning towards climate neutrality.	High degree of fragmentation Lack of information	**Municipality of Budapest** Private companies	Knowledge and information sharing Synergies between the companies' and the municipality's climate neutrality target	Relationship building with local stakeholders
Climate Platform	A collaborative platform led by the city administration. It engages external partners from the public sphere, academia, and the civil sector on climate issues.	High degree of fragmentation Lack of information	**Municipality of Budapest** Academia Civil organizations Public companies	Knowledge and information sharing	Relationship building with local stakeholders
Green Budapest Working Group	A collaborative coordination group of civil organizations and the municipality working together on making the city greener and sustainable.	High degree of fragmentation Lack of information	**Municipality of Budapest** Civil organizations	Knowledge and information sharing Synergies between organizations	Relationship building with local stakeholders
Sustainable City Logistics Group	A forum where stakeholders have the opportunity to learn about planned development directions and regulatory aspects affecting city logistics, and freight traffic restrictions, and to discuss and formulate	High degree of fragmentation Lack of information	**BKK Centre for Budapest Transport** Academia Private companies	Knowledge and information sharing Synergies between organizations	Relationship building with local stakeholders

	proposals in a collaborative way.				
Balázs Mór Committee	The committee has been a key forum for institutional and professional consultation during the development of the SUMP. Its members include the Budapest Municipality, the Budapest Transport Centre and delegates from the public and private sector.	High degree of fragmentation Lack of information	**BKK Centre for Budapest Transport** Municipality of Budapest Private companies	Knowledge and information sharing	Enhanced internal awareness Relationship building with local stakeholders
Sustainability reporting	A universal reporting scheme developed by the municipality for public companies to track their progress towards climate neutrality and create motivation for the transition.	High degree of fragmentation Lack of information	**Municipality of Budapest** Public companies	The reporting helps the municipality and its companies to track their progress towards climate neutrality.	Enhanced internal awareness
nvironmental Status Assessment Report of Budapest	An annual report describing the environmental status of Budapest with special focus on green surfaces, waters, soil condition, air quality, and climatic conditions	Lack of information	**Municipality of Budapest** Public companies Wider City	It provides information about the status of the environment that can guide prioritizing and decision-making.	Enhanced public awareness Increased transparency and accountability
Proposal review based on adherence to SECAP	To integrate climate protection measures during the preparation and review of urban development and thematic sectoral strategies, the Department for Climate and Environmental Affairs can review and advise on relevant proposals and measures.	High degree of fragmentation	**Municipality of Budapest**	The measure formalizes a higher municipal commitment to climate protection and makes sure environmental aspects are considered where relevant.	Increased accountability Enhanced internal awareness
Green budgeting	A budgeting tool currently in development to track green spending and support decision-making.	Lack of information Financial barriers	**Municipality of Budapest**	The tool will enable climate investment tracking and support decision-making	Enhanced public awareness Increased transparency and accountability

Environment Protection Fund	A fund financed by fines and donations that civil organizations, schools and kindergartens can apply for to implement green projects.	Financial barriers	**Municipality of Budapest** Civil organizations Public institutions	The fund can only be spent on green projects	Community engagement
Green Budapest Foundation	The goal of the foundation is to channel private funding into green projects and developments of the City.	Financial barriers	**Municipality of Budapest** Private companies	Donations are spent on greening projects and interventions.	Stronger cooperation with the private sector
Green Budapest Label	The Municipality developed the label as part of its green brand, in appreciation of organizations' actions and targets towards climate neutrality. The '**Green Budapest – We're doing our part'** label is provided to organisations that are contributing to the transition. The label recognises the quality of efforts and contributions of signatories and can be used for communications and PR purposes in line with the Mission and activities defined in the individual MoUs.	Lack of information Financial barriers Environmental consciousness of society	**Municipality of Budapest** Private companies Civil organizations Public instiutions Academia Districts	Synergies between the companies' and the municipality's climate neutrality target Knowledge and information sharing Cooperation in R+D+I and awareness raising projects	Increased engagement of private stakeholders Increased awareness on climate action by the Municipality

4.2 Module C-2 Social Innovation Interventions

Social innovation interventions are crucial to the Municipality of Budapest to address complex societal challenges and to ensure inclusive decision-making with the consideration of environmental and social aspects. These interventions aim to improve urban management and development endeavours of Budapest. Table *C.2.1* lists **social innovations** initiated and driven **by both the Municipality of Budapest and non-governmental organisations**. Social innovations were gathered with the involvement of the civil sector: a sub-working group of the Green Budapest working group was established, and the civil thematic working group dedicated one of its sessions to collecting social innovations initiated by NGOs in Budapest. The table below contains the most relevant and crucial initiatives supporting the transition towards climate neutrality.

Even though the listed social innovations represent over-arching benefits and advantages, the innovations were grouped **into 5 sub-groups based on the main sectors** they impact. A 'Government'

group was also created. As the initiatives listed there deeply depend on social inclusion, directly involve society and reflect residents' perspectives to a great extent, they seemed to fit more into the social innovation module than into the governance innovation section.

The barriers and opportunities listed in Table 4-2. go beyond the description of *2.3 Module A-3* and provide a more detailed description of barriers and opportunities. They offer additional information on the obstacles the initiatives aim to overcome, and potential opportunities for scaling up the innovations. Marginalised groups are impacted in several ways – e.g. through their direct involvement in governance-related social innovations that ensure their participation in decision-making, most interventions are accessible irrespective of income, origin or social status. Just to name a few, the Repair Café supports people to extend the life cycle of products to decrease consumption; innovative financial loans, offered by both RenoPonts and the Budapest Climate Agency are designed to be accessible to low-income households too; placemaking initiatives are offering free public spaces and cultural event to all residents. These social innovations all have the potential to be scaled up and spread throughout Budapest. Public sources are already available for funding – such as the Participatory Budget, or the green grants and tenders – with limited financial resources, and mainly are capable of funding few initiatives in the long run. However, private funding may be directed into these initiatives, as we are working on establishing stronger cooperations with companies, they are becoming more open to investing in solutions that align with their ESG and sustainability targets. Therefore, the Municipality of Budapest may be a facilitator of cooperation between companies, NGOs and residents.

4-2. Table: Relations between social innovations, systems, and impact pathways

C.2.1 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)*
Transportation					
Bike-sharing program & micromobility points	**MOL Bubi** is BKK Centre for Budapest Transport's public transport service with 24/7 availability. Bikes can be picked and dropped off at the MOL Bubi stations. There are 197 stations with 2460 bikes. The public bikes can be used with the MOL Bubi app with a monthly or annual pass or at a pay-as-you-go rate. The MOL Bubi can be easily combined with other modes of transport.	**Barriers** Spread of individual motorisation **Opportunities** Strategic growth of micro- and e-mobility infrastructure	BKK Centre for Budapest Transport, Sharing economy actors, The Municipality of Budapest, District governments	Promotes active mobility and the sharing economy over the use of passenger cars. Shared vehicles complement the public transport system especially by offering active and electric	Shift to public & non-motorized transport Reduced motorised transportation need Health benefits – improved air quality

	BKK Centre for Budapest Transport have installed micromobility stations (**Mobi points**) for private and shared bikes and scooters, aiming to provide an organised parking solution for shared vehicles. The micromobility points are also able to host Mol Bubi bikes temporarily. Mobi points contribute to a more well-ordered cityscape, promotes more sustainable mobility and a liveable city.	Increasing popularity of active and environmentally friendly mobility		mobility solutions for first mile/last mile transports.	Improved cityscape – a more organised and well-ordered urban landscape
BudapestGO	**BudapestGO** is the BKK Centre for Budapest Transport's mobility app bringing together various elements of public transport use into one service. Journey planning is based on real-time data, push notifications inform the passenger in case of traffic changes. Tickets and passes can also be purchased in the app. The MOL Bubi public bike-sharing system is included in route planning function.	**Barriers** Spread of individual motorisation **Opportunities** Strategic growth of micro- and e-mobility infrastructure Increasing popularity of active and environmentally friendly mobility	BKK Centre for Budapest Transport.	Promotes active mobility and the sharing economy over using cars. The BudapestGO makes public transportation more popular as ticket purchase, travel planning and traffic information is in one app.	Shift to public & non-motorized transport Reduced motorised transportation need Less congestion, air and noise pollution Health benefits – improved air quality
Bikebus and **Bike to work** initiatives to promote cycling	Hungarian Cyclists' Club as a civil organisation, promotes cycling as an active mode of transport. Both initiatives strengthen this endeavour. The **'Bicibusz'** (bike bus) initiative is based on the well-known example from Barcelona. With the **Bicibusz** (bikebus) initiative, the Hungarian Cyclists' Club aims to implement the bikebus framework nationally to support children travel to school by bicycle or scooter in organised groups, on a predetermined route and at a predetermined time. The rides, led by adult volunteers, are fun and effective in promoting a positive image of the neighbourhood and a cleaner environment. The **'Bike to Work'** initiative promotes cycling to work amongst employees and companies. By	**Barriers** Spread of individual motorisation **Opportunities** Strategic growth of micro- and e-mobility infrastructure Increasing popularity of active and environmentally friendly mobility	Hungarian Cycling Club, BKK Centre for Budapest Transport, The Municipality of Budapest, District governments	Promotes active mobility and local partnerships over motorised	Shift to public & non-motorized transport Reduced motorised transportation need Decreased congestion, air and noise pollution Health benefits – improved air quality Stronger local communities

	highlighting the benefits of cycling, the initiative targets both employees through awareness-raising campaigns (e.g. bike breakfasts, challenges and games through the dedicated app, etc.) and employers through establishing B2B partnerships to support the uptake of cycling.				
Cargo-bike courier services	As part of the **HungAiry** project's city logistic actions, the Municipality of Budapest plans to purchase two cargo bikes to demonstrate the advantages and potential uses of cargo bikes. The purchase of cargo bicycles serves awareness-raising endeavours to introduce alternatives to institutional, corporate, family and general users of passenger and goods transport by private vehicles. **Cargonomia** promotes sustainable urban living and a resilient urban environment by integrating sustainable transportation with local food systems. They offer solutions for environmentally friendly urban freight transport. It is also a logistics centre for sustainable urban transport solutions where community members can borrow, rent and buy our locally manufactured cargo bikes. Additionally, the organisation aims to integrate eco-friendly transportation solutions with local food distribution by directly connecting producers with customers. Cargonomia also offers community space for events, workshops, etc. The **Gólya** Cooperative's bike courier service delivers packages on the last mile of major logistics systems in Budapest (e.g. pre-ordered lunch menus, goods from companies to companies, or available for immediate deliveries and furniture delivery).	**Barriers** Increasing consumption of products Growth of online shopping **Opportunities** Strategic growth of micro- and e-mobility infrastructure City logistics initiatives and improvements	The Municipality of Budapest, Herman Ottó Institute Nonprofit Ltd., BKK Centre for Budapest Transport Cargonomia, Gólya, citizens, food producers and companies	Promotes zero or low emission freight transport modes for last mile transport.	Optimised city logistics Decreased congestion, air and noise pollution Stronger local communities
Energy systems					

Renopont	The **RenoPont** (organised by the Hungarian Energy Efficiency Institute) aims to support home renovations in a one-stop-shop model. It provides technical assistance during the renovations: consultations on the home renovation process, preparation of energy assessments and energy efficiency certificates, development of the renovation plan, information on financial possibilities, official matters (e.g. permits), referral of professionals, project management, technical inspections, etc.	**Barriers** Low willingness of renovation Financial barriers **Opportunities** Financial advantages for homeowners of renovations Available incentives and subsidies Awareness-raising activities	The Municipality of Budapest, Energiaklub, MEHI, AACM, MCSTE, financial institutions, consultants / technical specialists	Innovative solution to facilitate residential building renovation by supporting homeowners with financial and technical support	Energy efficiency improvements Reduced energy demand Lowered utility costs Enhanced living comfort
Kazán Energy Community	The **energy community** was created in a building co-habited by multiple NGOs (Kazán Community House) and the Gólya Cooperative. A solar panel system has been installed on the roof of the building. The income generated by its energy production will be used to form an energy community fund to make energy-efficiency improvements in the building.	**Barriers** Policy and administrative barriers Low willingness of investments Financial barriers **Opportunities** Knowledge and good practice exchange with foreign cities in projects Available incentives and subsidies.	Citizens, NGOs, The Municipality of Budapest,	Promotes low carbon, local and decentralised energy production.	Lowered energy costs Stronger local communities Know-how exchange Pilot of innovative solutions and best practices Climate resilient energy production
Budapest Climate Agency	As part of the Budapest CARES project, the **Budapest Climate Agency** was developed to support and speed up residential building energy efficiency projects. With the aim of accelerating residential building renovations, the Agency will create a comprehensive database on the energy performance of the building stock in the capital; develop a metropolitan building strategy, create a network of residential advisors, develop building energy efficiency pilot programs, identify and evaluate blended financing opportunities and launch comprehensive investment programmes.	**Barriers** Low willingness of renovation. Financial barriers. Diversity of the housing stock. Stalled EU funds **Opportunities** Market access opportunity for financial institutions. Opportunities of large-scale project implementation Financial advantages for	The Municipality of Budapest, Budapest Climate Agency, districts, Financial institutions, consultants / technical specialists	Innovative solution to facilitate residential building renovation by supporting homeowners with new green loans, technical assistance and guidance during the renovation process. Facilitating large-scale building renovations with significant impact.	Energy efficiency improvements Reduced energy demand Lowered utility costs Enhanced living comfort Stronger local communities

		homeowners of renovations. Available incentives and subsidies. Awareness-raising activities			
Environment					
Placemaking	Placemaking initiatives in Budapest aim to renew and utilise urban spaces according to the needs of the community. The initiatives are often initiated by civil organisations such as the **Valyo** with the support of the municipality, but the **Municipality of Budapest** also launched a placemaking call to support local initiatives. Placemaking promotes the reinterpretation of underused areas, showcases alternative potentials for sustainable land uses with temporary facilities and leisure activities, makes urban areas more open, attractive and liveable, and supports community building and implementation of events and programmes initiated by citizens. In Budapest, these initiatives take form in initiatives such as Valyo Harbor, LibBridge, QUAY~2023, or parklets established in the VII. district.	**Barriers** Conflicts with current urban land use (often takes space from motorised transport). Administrative hurdles. **Opportunities** Shift in urban land use and planning. Changing needs of the public. Awareness-raising activities	The Municipality of Budapest, districts, BKK Centre for Budapest Transport, Valyo & other NGOs, residents	Placemaking initiatives promotes improved used of urban spaces, support active and climate-friendly modes of transport, land use and provides spaces for and fosters human interactions, ultimately contributing to decreased GHG emissions.	Health benefits – improved air quality, reduced noise pollution Stronger communities Improved liveability of the city Improved well-being of citizens Improved green infrastructure and urban biodiversity
Grants and tenders	The Municipality of Budapest supports civil and public initiatives for a greener Budapest through various **grant and tender** opportunities. Aimed at supporting project to increase environmental sustainability of the city in several areas – e.g. to support greening of courtyards and facades in densely-built areas to combat urban heat islands, promoting urban gardening and improving quality of green spaces through adoption of neglected areas, or promoting environmentally sustainable end eco-friendly lifestyles such as composting and gardening.	**Barriers** Lack of available financial resources Fragmentation of the local administrative system **Opportunities** Shift in urban land use and planning Changing needs of the public. Awareness-raising activities	The Municipality of Budapest, districts, residents, NGOs,	Grants and tenders improve green infrastructure and spaces, improves well-being of residents, supports urban biodiversity,increases urban resilience and reduces GHG emissions.	Health benefits – improved air quality, reduced noise pollution Stronger communities Improved liveability of the city Improved well-being of citizens

Green Budapest Foundation	The **Green Budapest Foundation** aims to improve the environmental condition of the capital, to protect, maintain and develop the green spaces of the capital. The Foundation supports local environmental and nature conservation initiatives, the protection of natural values, the maintenance and expansion of green infrastructure and the implementation of social development projects. Through the Foundation, companies interested in reducing their carbon footprint and other investors can support Budapest's sustainability efforts and projects.	**Barriers** Lack of available financial resources **Opportunities** Synergies with corporate ESG targets Utilization of brownfield areas	The Municipality of Budapest, districts, companies, residents, NGOs,	The Municipality of Budapest has identified the main urban GI development needs. The foundations aim to channel external, mainly private funds to development projects to protect and improve the environmental state of Budapest.	Health benefits – improved air quality, reduced noise pollution Stronger communities Improved liveability of the city Improved well-being of citizens
Transition Communities /Towns	The aim of the Transition Communities - such as the **Transition Wekerle** - movement is to make local communities resilient and adaptable - able to cope with the challenges of climate change and energy scarcity. The Transition Wekerle initiative aims to strengthen communities and community relations, through the creation of local sources of food and energy; gardening, economical use of resources, promoting environmentally friendly household and transport practices; strengthening the local economy, local producers and small businesses, and the exchange of second-hand goods.	**Barriers** Administrative hurdles Economic challenges **Opportunities** Grants and tenders Utilization of brownfield areas	District municipality, NGOs, residents	Promoting local economy and self-sustaining lifestyles. Provides independence from across several sectors – energy, food supply and global economy.	Stronger communities Health benefits – improved air quality, reduced noise pollution Improved liveability of the city Improved well-being of citizens Strong local economy Independence and resilience
Community gardens	Organised by KÉK (Hungarian Contemporary Architecture Centre) and supported by the Municipality of Budapest, **community gardens** provide opportunities and space for residents to practice urban gardening. The gardens provide gardening opportunities for nearly 800 city dwellers, they act as a meeting point, a cultural and community space, and an innovation platform to test and showcase sustainable urban solutions and tools. In addition to their community-building and	**Barriers** Lack of urban space **Opportunities** Grants and tenders Utilization of underused / brownfield areas	The Municipality of Budapest, District municipalities, KÉK & other NGOs, residents	Promotes sustainable urban living, health preservation, strengthens social relations, contributes to environmental protection and awareness-raising.	Stronger communities Health benefits – improved air quality, reduced noise pollution Improved liveability of the city Improved well-being of citizens

	educational functions, the gardens provide fresh vegetables, fruit and herbs for residents. Community gardens are an example of environmentally conscious and sustainable living, highlight the need for behavioural change, and provide an alternative for urban space use, community development and sustainability education.				
Community Composting	Community composting – offered by initiatives such as the **Humusz Association** or the **Auróra climate garden** - utilises organic waste from several households to make compost. A community works together to set up composting sites. The finished compost is used collectively or according to their own needs, for example under flowerbeds or in balcony boxes. Community composting supports the building of local communities, introduces and promotes sustainable and environment-friendly lifestyles, useful for educational and awareness-raising activities.	**Barriers** Awareness on benefits of composing Different public perception on composting Conflicts between urban land uses **Opportunities** Grants and tenders Utilization of underused / brownfield areas	The Municipality of Budapest, District municipalities, Humusz, Auróra & other NGOs, residents	Provides an alternative for organic waste management, reducing methane emissions, decreases landfilled waste, supports urban gardening.	Stronger communities Improved waste management Improved liveability of the city Improved well-being of citizens Promotes organic farming
Circular economy					
Repair Café	The community repair shop was initiated by Para-fitt SE and was funded by the participatory budget of Budapest. **Repair Café** is a place for residents to meet and jointly repair things such as clothes, furniture, electrical household appliances, bicycles, toys, etc. with the support of professionals. The repair shop operates as a community space, and provides the experience of repairing objects with your own hands while also promoting a circular economy by extending the life cycle and promoting the re-use of products.	**Barriers** Financial barriers – funding and low revenue **Opportunities** Grants and tenders Synergies with corporate ESG targets	The Municipality of Budapest, District municipalities, Para-fitt SE & NGOs, technicians, residents	Promotes circular economy – extended life cycle of product, increases re-use and recycle of materials, reduces; fosters sustainable consumption.	Stronger communities Promotes sustainable consumption Technical skill development
Shopping and thematic street management cooperative	**BUM** – based on the example of Vienna – aims to create harmony between residents, tourists and local businesses. The initiative brings businesses together, promotes local businesses and	**Barriers** Coordination between many actors	District municipalities, Companies, BUM & other NGOs, residents	Promotes sustainable business strategies, walkable and friendly streets,	Stronger communities Strong local economy

	initiatives, and supports the organisation of programmes and events to get residents actively involved in the life of the city, Thematic street initiatives are designed to enhance the liveability of streets and local businesses' operations by making them more attractive, expanding the range of functions, and ensuring coordinated operation with residential areas. There is also a growing emphasis on the support for the use of empty shops and business premises.	Lack of experience **Opportunities** Implementation of good practices Financial benefits for companies		supports local economy, supports adaptive business models.	Improved liveability of the city Improved well-being of citizens
Sustainable public catering projects	Facilitated by the Municipality of Budapest, food projects aim to involve sustainability aspects in public catering. As part of this endeavour, an integrated urban food policy for a sustainable food system and a strategy will be developed (**FOODCLIC** project), healthy and sustainable eating options are to be incorporated in the procurement and preparation practices, and awareness-raising activities for students are carried out (**SCHOOLFOOD4CHANGE**). Additionally, the **DIVINFOOD** project aims to increase the usage of neglected and underutilized crops in food chains to support healthier diets and more sustainable food systems.	**Barriers** Lack of financial resources Fragmentation of the administrative system **Opportunities** EU grants and tenders Cooperation with companies	The Municipality of Budapest, District municipalities, Companies, schools and students	Promotes healthy diets, reduces food waste, utilises seasonal and organic materials, improves health conditions of students.	Stronger communities Better social interactions Awareness-raising and education Local partnerships More sustainable and nutritious ingredients.
Community buying groups	**Community buying groups** (also known as basket communities) are voluntary groups that bring together local food producers with consumers. Producers, consumers and volunteers work together as a community to organise the delivery of food from the producer to the customer. The goal of the initiative is to provide a market for locally produced food, provide consumers with healthy products, support local economies, support community building, and raise awareness of sustainable and eco-friendly lifestyles. Several basket groups were established in Budapest such as **Budafoki Kosár**	**Barriers** Administrative hurdles Coordination between many actors Financial barriers **Opportunities** Grants and tenders Cooperation with companies	District municipalities, NGOs, residents	Promotes sustainable urban lifestyles and consumption of locally farmed, organic and seasonal products. Reduces emissions from freight transport.	Stronger communities Awareness-raising and education Local partnerships Health benefits – healthy and organic products

	Közösség, Végtelen Kosár-Budapest and the **Szatyor Shopping Community**.				
Cargonomia	In addition to its cargo-bike courier services, **Cargonomia** is also a distribution centre for local and regional organic food. Its aim is to directly connect producers with customers by creating a community point where food can be picked up or delivered in an environmentally friendly way. Cargonomia connects its partner, Zsámboki Biogarden with the consumers, providing high-quality, seasonable and organic products to support shifting to more sustainable eating practices.	**Barriers** Administrative hurdles Coordination between many actors Financial barriers **Opportunities** Grants and tenders Cooperation with companies	District municipalities, Cargonomia and other NGOs, food producers, residents	Promotes sustainable urban lifestyles and consumption of locally farmed, organic and seasonal products. Reduces emissions from freight transport.	Stronger communities Awareness-raising and education Local partnerships Health benefits – healthy and organic products Supports urban logistics
Governance					
Participatory Budgeting	The Municipality of Budapest has launched its participatory in 2020 to allow residents to propose ideas on how to spend a certain amount of the municipal budget. Under the Participatory Budget initiative, the municipality allocates over 1 billion HUF to implement the most popular ideas submitted by residents. The municipality expects citizens to propose smaller investment projects to improve the liveability of the city keeping in mind the principles of equality, community approach, functional adequacy, safety and sustainability.	**Barriers** Financial barriers – lack of funds **Opportunities** Channelling private investments Cooperation with companies	The Municipality of Budapest, District municipalities Citizens, public companies	Participatory budgeting gives the opportunity to citizens to have a more active involvement in the allocation of the municipal budget and direct it towards green projects.	Increased knowledge about green investments Opportunity for marginalized groups to contribute to decision-making processes. Stronger communities Awareness-raising and education
Budapest Resident's Assembly	The Residents' Assembly gives the people of Budapest the right, opportunity and means to have their say. Citizens above 14 years old, who have an address or residency in Budapest is eligible to vote. Voting is possible online or in person at the City Hall. The Assembly aims to involve citizens and decide on matters that affect the majority of the residents – e.g which means of transport are allowed on the Chain Bridge, on investment matters on a brownfield area (Rákosrendező), or regarding the operation and	**Barriers** Administrative hurdles Coordination between many actors Financial barriers **Opportunities** Inclusive decision-making Targeted solutions and resource allocation	The Municipality of Budapest, District municipalities Citizens, public companies		Stronger communities Opportunity for marginalized groups to contribute to decision-making processes Improved liveability of the city Improved well-being of citizens

	development of the district's health clinics.				Awareness-raising and education
Budapest Community Meeting	The Community Meetings brings together people from Budapest from all walks of life to talk about important issues. At the meeting, participants gain new, accurate knowledge about the issue, share their thoughts with each other, and finally make recommendations on how to address the problem. Community meetings are used to support decision-making in governments, parliaments and local authorities. So far, the Municipality have organised three community meetings: in 2020 on climate emergency, at the end of 2021 on the European Union and in 2022 on reducing air pollution in Budapest.	**Barriers** Administrative hurdles Coordination between many actors Financial barriers **Opportunities** Inclusive decision-making Targeted solutions and resource allocation Encouraging innovative ideas	The Municipality of Budapest, District municipalities Citizens, public companies		Stronger communities Opportunity for marginalized groups to contribute to decision-making processes Improved liveability of the city Improved well-being of citizens Awareness-raising and education

5 Outlook and next steps

The Action Plan aims to outline the roadmap and necessary steps to achieve climate neutrality in Budapest, as well as the barriers and the opportunities lying ahead. The plan mainly focuses on actions within the control of the Municipality but also identifies key interventions beyond its authority, where cooperation and advocacy with public bodies - with special focus on the national government and district municipalities - can enable the transition.

The Action Plan is an iterative document that will be reviewed and modified biannually to account for missing data and sectors and to respond to the changes in the political, social, economic, and technological aspects of the environment. Deviations from target values will be identified, duly analysed and corrective measures will be defined. The Municipality's work regarding climate protection will continue, with the pilot project Budapest CARES being the flagship project of the Mission. Stakeholder engagement activity started as part of the CCC process will also resume after the submission, with the hopes of mobilizing further private, public and civil actors to find synergies, build rapport, and strengthen the city's commitment to climate neutrality.

6 Annexes

The annexes contain any textual or **visual material** to the 2030 Climate Neutrality Action Plan as necessary.

Emissions source specific barriers and opportunities:

Emission domains	Systems	Systemic barriers	Systemic opportunities
Energy systems	Technological/ infrastructural	Because of the uncoordinated and uneven installation of solar panels, in some areas, distribution grids are under excessive load. Lack of expansion and maintenance of the electricity network limits capacity, refeeding and hence, the proliferation of solar panels. No detailed, up-to-date, and real data available concerning the energy performance of buildings or the use of renewables.	Favourable irradiation conditions for solar panel installation. Budapest is rich in thermal water, which creates potential for establishing geothermal heat generation capacities. Potential for increasing waste-based heat generation. Positive energy district projects can serve as example. Energy Efficiency Obligation Scheme
	Institutional/ regulatory	Cityscape protection makes the mass installation of PVs in Budapest controversial.	Regulatory framework for creating renewable energy communities could be improved.
	Organizational	Legal and financial regulatory environment does currently not facilitate the implementation of energy communities	Energy communities are still a novel phenomenon in the city presenting an opportunity for more efficient energy-use.
	Behavioural/ social	Intensive suburbanization creates higher energy and water use as people move into energy intensive detached houses.	Energy-saving trainings in schools. Solar and heat pump systems are spreading gradually.
Mobility and Transport	Technological/ infrastructural	Road network is tailored to cars instead of public transport and micromobility users. The persistent neglect of maintenance of both the infrastructure and the vehicle fleet of public transport due to mainly budgetary reasons Budapest is centre of a radial transport network with significant transit traffic. Little and neglected spaces for pedestrians.	Strategic growth of micro- and e-mobility infrastructure allowing for easy transfer. Establishment of a city logistics system could rationalize cargo traffic in the city. Improving accessibility of public transport could encourage more people to switch transport modes. 15-minute city vision

		Average age of cars is well above the EU average.	Creation of more car-free streets. Developing and increasing the capacity of the P+R and B+R network.
	Institutional/ regulatory	The legal, institutional, and regulatory context does not support meaningful cooperation especially as regards transit ransoport end transport from and to the agglomeration. There is a need for more effective enforcement of regulations related to speeding and parking.	The introduction of low emission zones and traffic calming regulations. Parking regulations could free up space for city logistics, pedestrians and cyclists and contribute to modal split.
	Organizational	Ralilways and especially Suburban railways under the control of the state, not the municipality. No existing platform for coordination on the metropolitan level (functional urban area of Budapest).	Housing Agency model can contribute to urban sprawl mitigation.
	Financial	State aid is available for purchasing cars, whose number has been growing continuously since 2013. Parking subsidy is very high offered by districts for their residents and businesses.	Public transport is free for pensioners, people under 14 and subsidized for students as well as people with disability. State aid is available for companies for purchasing electric cars.
	Political	Developments are focused on meeting the needs of car traffic and increasing its capacity.	Prioritizing social welfare and the improvement of housing in Budapest could put a stop to suburbanization.
	Behavioural/ social	Increasing suburbanization and the uncoordinated sprawling of the city drive further spreading of individual motorisation. Comfort diminishes motivation for people to opt for alternative modes of transport over cars. Since the COVID19 pandemic, a big portion of people have opted out of public transport.	There is an ever-growing demand for electric and hybrid vehicles. People are more and more open to using sharing services (e.g. car renting, car sharing, bike sharing) Due to changing behaviours e.g. the spread of home office, mobility needs can be reduced
Waste & Circular Economy	Technological/ infrastructural	Limited capacity and capability of recycling centres	Growing network of re-use centres, selective waste collection points and community gardens.

		Biowaste collection is not yet introduced, only small scale tests has been done	New bottle return and biological waste collection system.
	Institutional/ regulatory	Food hygiene regulations Budapest has very limited impact on waste management strategy	Recycling embedded in public space use permits
	Political	There is a conflict of interest between GDP growth and consumption reduction.	Creating support schemes and policies that encourage green transition.
	Behavioural/ social	The wasteful lifestyle of a consumer society encouraged by the media.	Eco schools and kindergartens in the forefront of educating children about recycling and composting. Community composting and "model parks" with information boards
Green infrastructure and nature-based solutions	Technological/ infrastructural	The high infrastructural density of the city makes it hard to create new large green spaces. Without a unified and up-to-date inventory of green assets for the entire territory of the capital, green space management is difficult. Breaking up pavement and revitalizing green spaces can cause flooding of basements, leading to tension around such interventions	Green walls and roofs are relatively underutilized tools. Greening of underused land. Creating bee pastures and community gardens. Revitalization, regreening of public spaces e.g. Pünkösdfürdő.
	Institutional/ regulatory	Enforcement of green infrastructure maintenance standards is not effective and not uniform across the capital and its districts. Operation of separate rainwater management systems lack funding as costs cannot be integrated into sewage fee according to law. Implementation of complex rainwater management and harvesting projects require unprecedented cooperation of designers and new paradigms in planning, which are not supported by prevailing methodologies and standards.	Environmental criteria for public procurement Reclassification of non-protected green areas
	Organizational	Public utilities and private developers are not always aware of and consider ecological aspects during interventions. Share of responsibilties between districts and Budapest of maintainance	The city's Green Infrastructure Development and Maintenance Action Plan outlines the main areas of intervention and the green infrastructure vision for the city.

		and development of rainwater management is unclear.	
	Financial	In some European cities, 4-5% of the total budget is spent on maintaining and improving green infrastructure. In Budapest this figure is around 1-1.5%.	There is great potential in attracting more private capital (green roofs and walls, park instead of parking space)
	Behavioural/ social	Green spaces both private and public are often paved increasing heat island effect in the city.	Growing commitment in society to nature conservation and environmental protection
Built environment	Technological/ infrastructural	There is a high rate of old, energy-obsolete buildings. Uncontrolled district heating results in overheating and wasteful energy use.	Expansion of district heating and heat pumps.
	Institutional/ regulatory	Heritage protection makes the insulation of old, downtown buildings challenging. Regulation and controll of building activities is within the power of central government	The application of more stringent energy requirements for buildings.
	Organizational	The municipality owns a very small proportion of buildings making it difficult to influence retrofitting and rental market.	Professional organizations could be better involved in the decision-making process before the amendment of legal rules governing energy.
	Financial	Owners of buildings most in need of energy-efficiency retrofitting, have no financial or technical capacity to invest in deep renovations. Public utility charge reduction removes incentive for citizens to invest in energy-efficiency renovations and investment in renewables.	Diversifying utility subsidies by giving more support to energy poor households Establishing a more stable regulatory and subsidy framework could reduce hesitations and encourage investment in renewable energy.
	Behavioural/ social	Retrofitting in many condominiums requires the consensus of residents. Energy poverty and the lack of incentives is preventing renovation of condominiums in poverty stricken areas of the city. A significant proportion of people do not prioritize home renovations in their plans even if they can afford them.	Citizens are generally open to renewables, with special regard to solar panels.