Project „EU4 Energy Transition: Covenant of Mayors in the Western Balkans and Turkey"
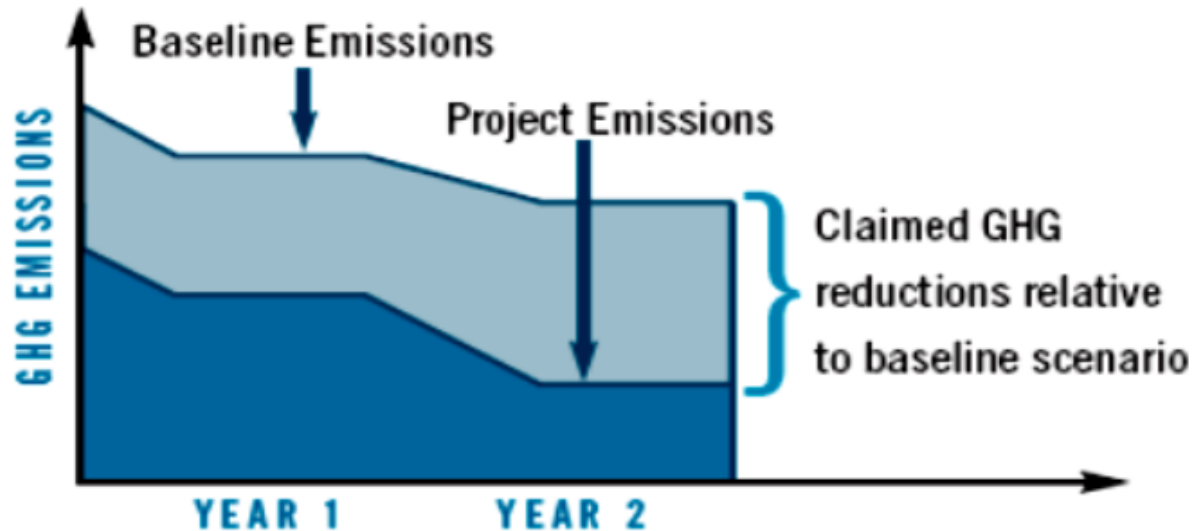
BASELINE EMISSION INVENTORY (BEI)

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WHY BASELINE EMISSION INVENTORY IS IMPORTANT?

A baseline provides a snapshot of an municipalities **GHG emissions at a year for which reliable and comprehensive data is available** and acts as a reference point for measuring changes in the amount of GHGs you emit from your baseline year and onward. **Ultimately, a baseline serves as the primary starting point for emissions sourcing, calculation, target-setting, tracking, progress measurement, and reporting**.
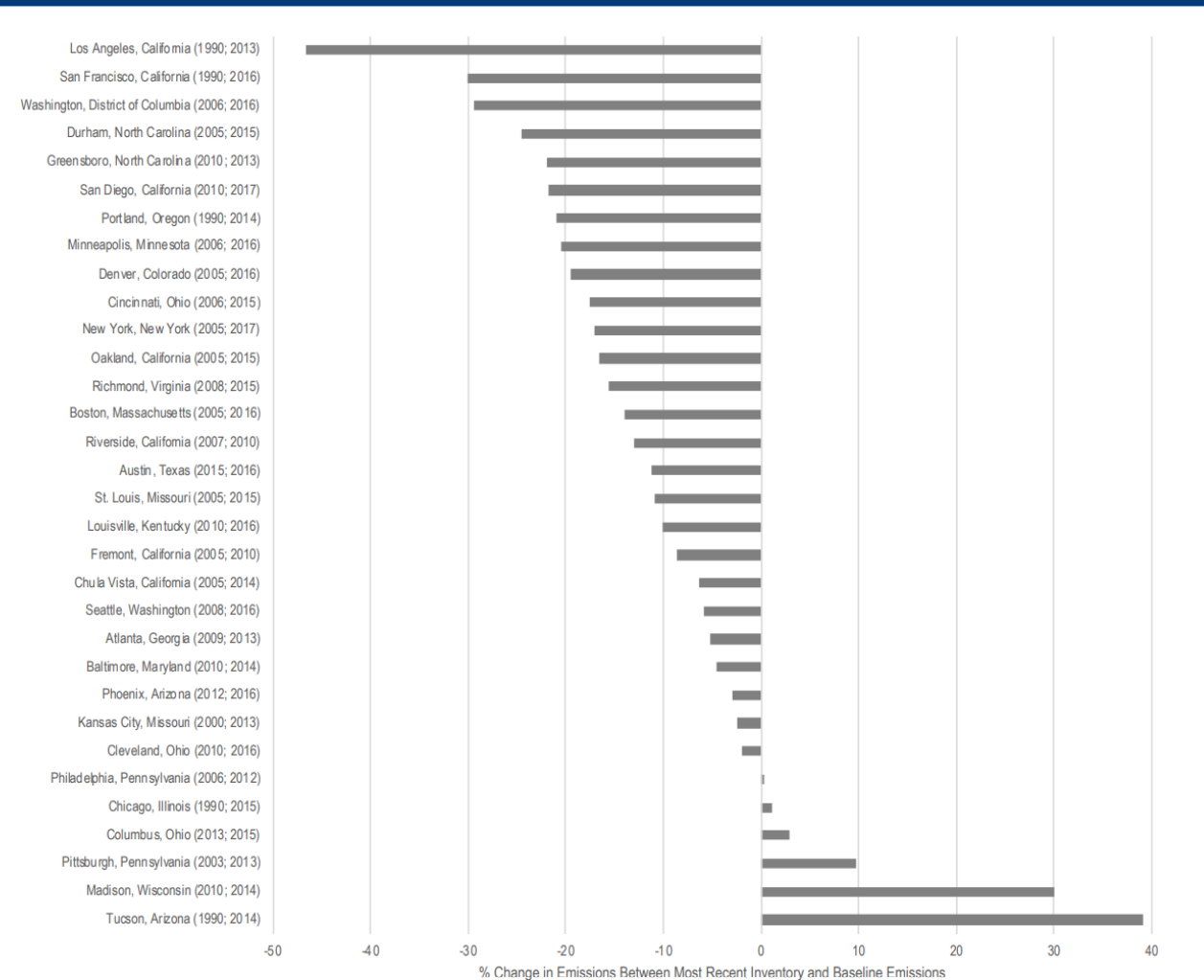
WHY BASELINE EMISSION INVENTORY IS IMPORTANT?

The BEI identifies the sectors contributing most to the amount of CO2 and other activity sectors opted for reporting in the local territory for the baseline year. It allows to identify the principal anthropogenic sources of CO2 (and other GHGs) emissions and to prioritize the reduction measures accordingly.

Percent change between most recent GHG inventory and baseline emissions
% Change in Emissions Between Most Recent Inventory and Baseline Emissions
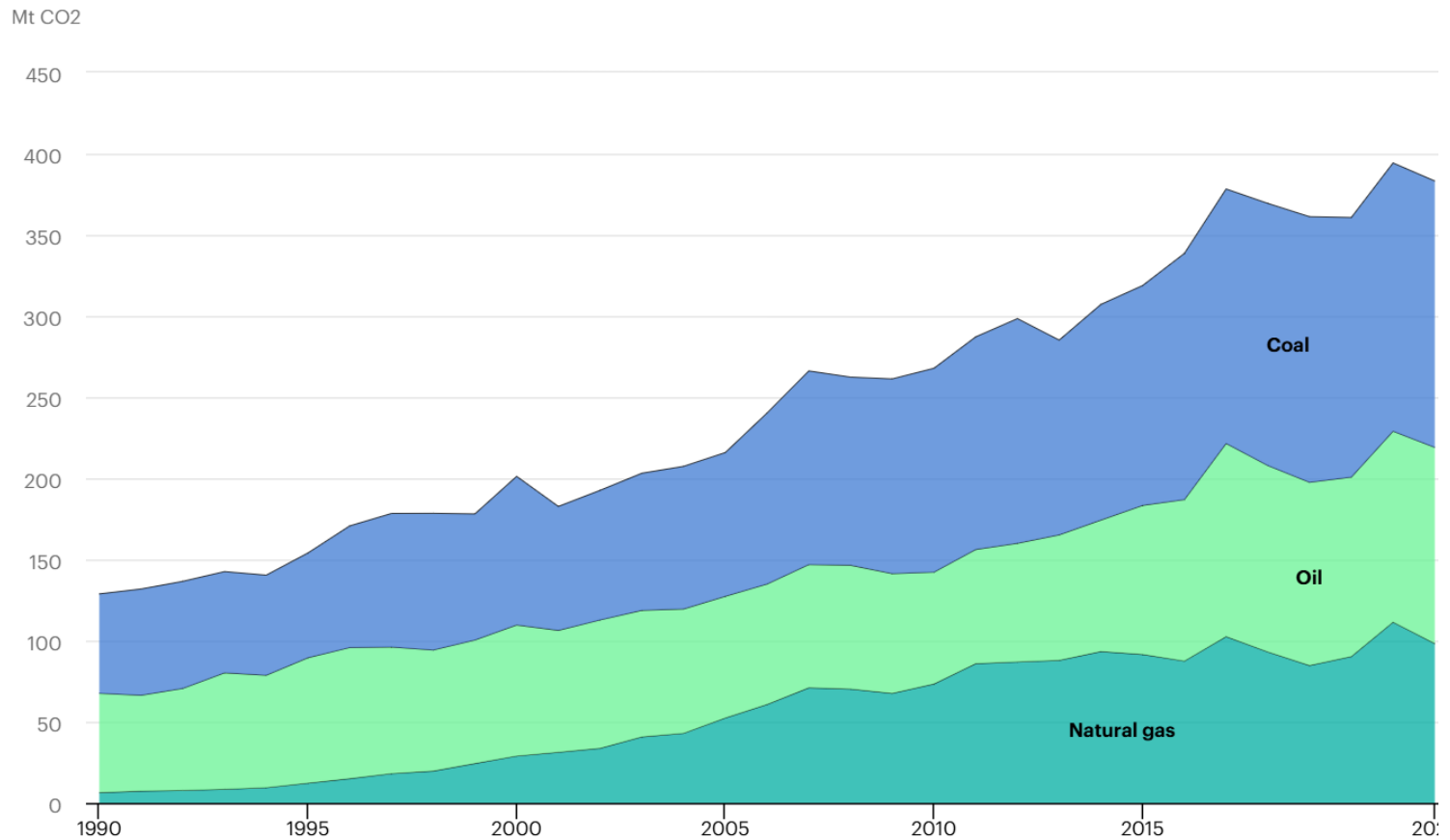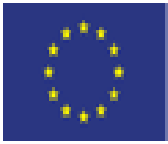
WHY BASELINE EMISSION INVENTORY IS IMPORTANT?

CO2 emissions by energy source, Republic of Turkiye, 1990-2022

WHY BASELINE EMISSION INVENTORY IS IMPORTANT?

CO2 emissions by sector, Republic of Turkiye, 1990-2022

Mt CO2

- Electricity and heat producers
- Industry
- Transport
- Residential
- Commercial and public services
- Agriculture
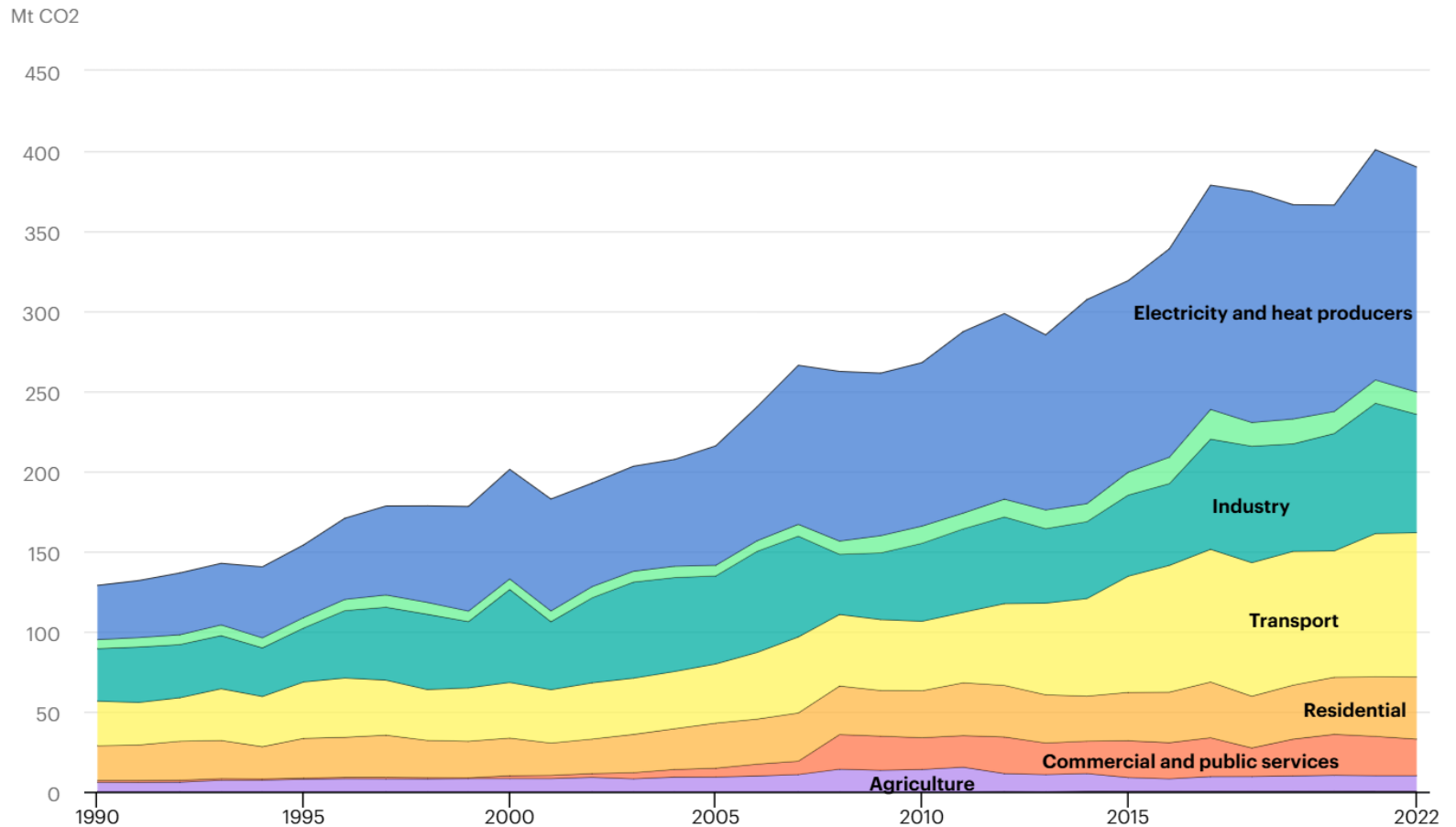
KEY SECTORS OF BEI

Local authorities shall report final energy consumption and emission factors for all sources of emissions (direct and indirect and non-energy related) per sector and energy carrier.

Main macro-sectors:

> Buildings, equipment & facilities
>
> Transport
>
> Non-energy related
>
> Energy supply

At least 3 key sectors shall be included in the emission inventories:

> **Municipal buildings, equipment/ facilities**
>
> **Tertiary (non-municipal) buildings, equipment/facilities**
>
> **Transport**

SECTORS NOT INCLUDED IN BEI

The activity sectors not recommended or explicitly excluded:

— Aviation and Shipping (except local ferries)

— Nuclear energy

— AFOLU and other non-energy related sources

— Carbon Capture and Storage (CCS) technologies

— Emission credits purchased or sold on the carbon market

— All fugitive emissions from the supply chain

— Process emissions from industrial plants

— Other source included under the Industrial Processes and Product Use (IPPU) sector.
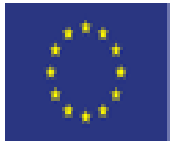
MAIN PRINCIPLES AND METHODS OF BEI

The BEI should conform to the following principles and methods:

— **Relevance**: The BEI data should allow assessing final energy consumption and CO_2 emissions by energy carrier and by activity sector. They should be relevant to the particular situation of the local authority.

— **Flexibility:** The methodology is based on the principles of simplicity of use and flexibility to suit various regional and local situations, and accommodate cities of various sizes and resources, reflecting the specific activities and policy-making needs of the city by taking into account its capacity and regulatory context

— **Sector coverage**: The BEI shall cover the key sectors. The emission inventory also should include other activity sectors in the scope of the CoM, for which the signatory plans to include actions in its SECAP.

— **Completeness**: The BEI inventories are not meant to be exhaustive GHG inventories but to focus on emissions from final energy consumption in key sectors. In order to be complete, the BEIshall cover all emission sources under the scope of CoM in these sectors.
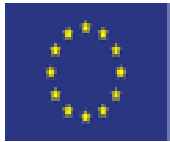
MAIN PRINCIPLES AND METHODS OF BEI

— Availability: The data should allow building emission inventories until the target year. Therefore the sources of data used should be available in the future: it is important to identify from the beginning all the data sources, including departments and external stakeholders that will be able to provide data over such a long time period.

— Accuracy: The BEI should be accurate, or at least represent a vision of the reality. This requires, in particular, using reliable local activity data and robust methodologies, based on internationally agreed definitions, standards and emission factors.

— Consistency: The methodology, data sources and emission factors should be in line with CoM specifications and consistent through the years.

— Documentation: The data collection process, data sources and methodology for calculating the BEI should be well documented, if not in the SECAP official document, then at least in the local authority's records. The main aggregated results of the BEI used to fill-in the on-line template should be reported in the SECAP document.

MAIN STEPS IN DATA COLLECTION

Start a new BEI

Collect data from avalable data sources

Check if there is new sources and replace the old ones

Use IPCC for calculation GHG estimations and removals

Document all data collected, decisions made and contacts used
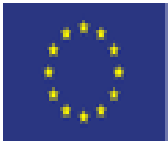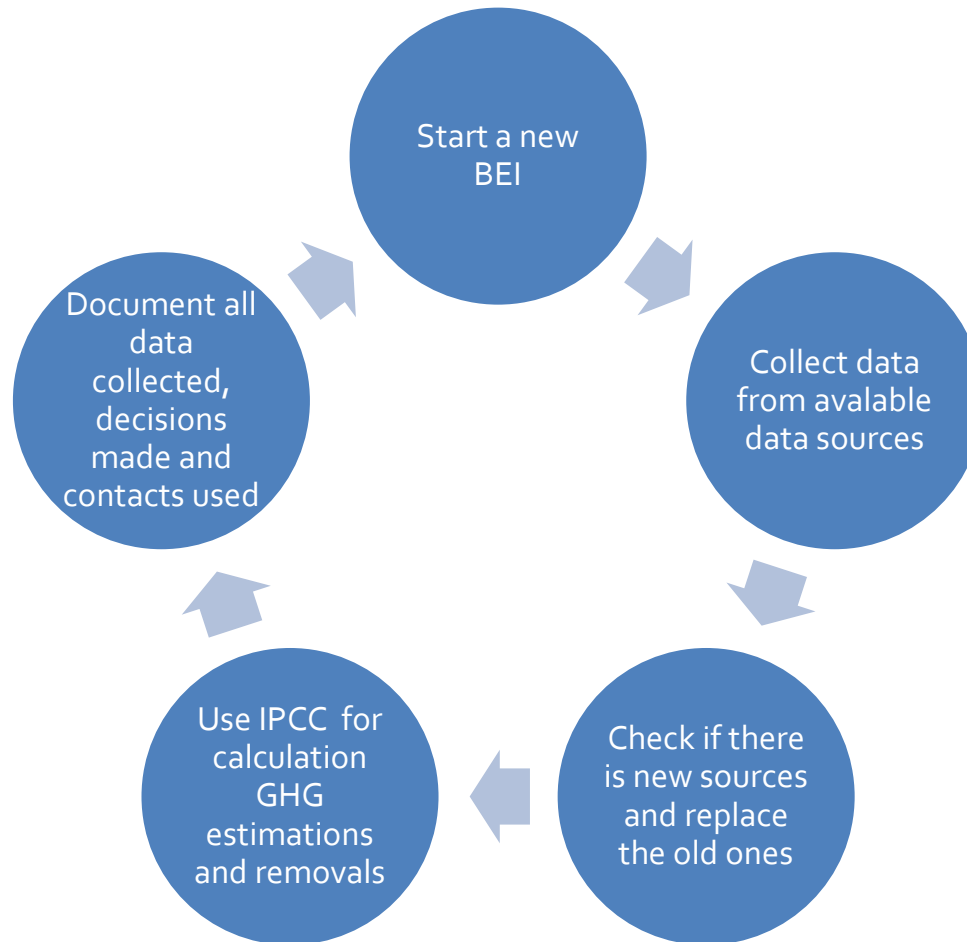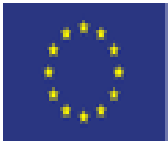
MAIN STEPS IN DATA COLLECTION

Getting data from:
- **National/regional/local sources (databases, tools, reports etc.)**
- municipal/institutional buildings and facilities
- the market operators
- consumer survey
- Identify all buildings and equipment/facilities owned/managed by the Local Authority,
- Identify all energy delivery points (electricity, natural gas, heat from district heating network, fuel oil tanks…)
- Identify the person / department receiving the invoices and energy data
- Select an appropriate system to store and manage the data
- Make sure the data are collected and introduced in the system at least every year.
- Keep all correspondence and archive data with relevant dates

MAIN STEPS IN DATA COLLECTION

Sector		FINAL ENERGY CONSUMPTION [MWh]																
		Electricity	District heating and cooling	Fossil fuels								Renewable energies						Total
				Natural gas	Liquid gas	Heating oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Biogas	Plant oil	Biofuel	Other biomass	Solar thermal	Geothermal	
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES																		
Municipal buildings, equipment/facilities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Municipal buildings, equipment/facilities	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Public lighting	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Tertiary (non municipal) buildings, equipment/facilities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Institutional buildings	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Residential buildings		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Industry	Non-ETS	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	ETS (not recommended)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Buildings, equipment/facilities and industries not allocated		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Subtotal		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0
TRANSPORT																		
Municipal fleet		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Road	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Public transport		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Road	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Rail	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Local and domestic waterways	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Private and commercial transport		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Road	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Rail	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Local and domestic waterways	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Local aviation	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
	Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Transport not allocated		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Subtotal		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0
OTHER																		
Agriculture, Forestry, Fisheries		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Other not allocated		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0
Subtotal		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0
TOTAL		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0

MAIN STEPS IN DATA COLLECTION

Fuel Emission Factors Database

CoM Template Energy carriers		Fossil fuels											
		Natural gas	Liquid gas		Heating Oil	Diesel	Gasoline	Lignite	Coal			Other fossil fuels	
IPCC Energy carriers		Natural gas	Liquified Petroleum Gases	Natural Gas Liquids	Gas/Diesel oil	Gas/Diesel oil	Motor gasoline	Lignite	Anthracite	Other Bituminous Coal	Sub-Bituminous Coal	Municipal Wastes (non-biomass fraction)	Peat
Sustainability criteria [a]													
IPCC	t CO₂/MWh	0,202	0,227	0,231	0,267	0,267	0,249	0,364	0,354	0,341	0,346	0,330	0,382
	t CO₂ eq./MWh [b]	0,202	0,227	0,232	0,268	0,268 [c]	0,250 [c]	0,365	0,356	0,342	0,348	0,337	0,383
LCA	t CO₂/MWh	0,221	n.a.	n.a.	0,292	0,292	0,299	0,368	0,379	0,366	0,371	0,181	0,386
	t CO₂ eq./MWh	0,237	n.a.	n.a.	0,305	0,305	0,307	0,375	0,393	0,380	0,385	0,174	0,392

MAIN STEPS IN DATA COLLECTION

Sector		CO₂ emissions [t] / CO₂ eq. emissions [t]														
				Fossil fuels								Renewable energies				
		Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Biofuel	Plant oil	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES																	
Municipal buildings, equipment/facilities		3239	0	1833	0	0	0	0	0	0	0	0	0	0	0	0	**5071**
Tertiary (non municipal) buildings, equipment/facilities		397875	0	73174	2322	0	0	0	0	0	0	0	0	0	0	0	**473371,0**
Residential buildings		218376	0	331164	7492	0	0	0	22574	0	0	0	0	0	0	0	**579605,4**
Public lighting		6568	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**6568,3**
Industry	Non-ETS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	ETS (not recommended)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Subtotal		626057	0	406170	9815	0	0	0	22574	0	0	0	0	0	0	0	**1064616,1**
TRANSPORT																	
Municipal fleet		0	0	0	0	0	906	0	0	0	0	0	0	0	0	0	**906**
Public transport		6823	0	0	0	0	3208	0	0	0	0	0	0	0	0	0	**10030**
Private and commercial transport		0	0	0	37294	0	461249	45227	0	0	734	0	0	0	0	0	**544504**
Subtotal		6823	0	0	37294	0	465362	45227	0	0	734	0	0	0	0	0	**555440,2**
OTHER																	
Agriculture, Forestry, Fisheries		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
OTHER NON-ENERGY RELATED																	
Waste management																	**99749,2**
Waste water management																	**131906,6**
Other non-energy related																	**0**
TOTAL		632880	0	406170	47109	0	465362	45227	22574	0	734	0	0	0	0	0	**1851712,1**
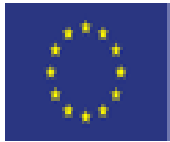
BASELINE EMISSIONS INVENTORY TOOLS

The City Inventory Reporting and Information System (CIRIS) is an accessible and easy-to-use Excel-based tool for managing, calculating and reporting city greenhouse gas emissions inventory data. CIRIS provides a systematic and templated way for cities to input information and use it for a variety of processes. It is based on the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) standard, and facilitates a transparent calculation and reporting of emissions for all sectors:
•Stationary energy (buildings).
•Transportation.
•Waste.
•Industrial processes and product use (IPPU).
•Agriculture, forestry and other land use (AFOLU).
Once completed, CIRIS supports cities to report their emissions in the Global Covenant of Mayors' (GCoM) Common Reporting F

Tools   May 2022

City Inventory Reporting and Information System (CIRIS)

Climate Action Planning

BASELINE EMISSIONS INVENTORY TOOLS

EPA's Local Greenhouse Gas Inventory Tool
•**Cost:** Free
•**Ease of Use:** User-friendly spreadsheet tool with pre-programmed emission factors.
•**Key Features:** Calculates GHG emissions for various sectors (residential, commercial, transportation, waste, and water management). Offers modules for both community-wide and local government operations inventories.
•**Link:**
https://www.epa.gov/statelocalenergy/local-greenhouse-gas-inventory-tool

Local Greenhouse Gas Inventory Tool

EPA's Local Greenhouse Gas Inventory Tool was developed to help communities across the United States to evaluate their greenhouse gas emissions. Use this tool to compile a greenhouse gas (GHG) inventory for your entire community or for local government operations in particular.

Download the Local Greenhouse Gas Inventory Tool and sign up for updates (Updated January 2025)

Watch a 1-hour webinar overview of the Local Greenhouse Gas Inventory Tool

What is the Local Greenhouse Gas Inventory Tool?

This free, interactive spreadsheet tool calculates GHG emissions for many sectors, including residential, commercial, transportation, and waste and water management. The tool is comprised of two separate modules: one for community-wide inventories, the other for inventories of local government operations only. You may choose to use one or both modules.

The tool is pre-programmed with default emission factors and system assumptions needed to calculate emissions or you may enter municipality-specific information. The tool is scalable to accommodate different levels of activity data (ranging from city-wide to individual meters) to meet the needs and constraints of different local governments.

Who should use the Local Greenhouse Gas Inventory Tool?

The tool is designed for governments interested in compiling a relatively quick and simple GHG inventory. People interested in emissions from specific facilities should consult EPA data on greenhouse gas emissions from large facilities. The data set includes public information from facilities in nine industry groups that directly emit large quantities of GHGs, as well as suppliers of certain fossil fuels.

WHAT CHALLENGES ARE WAITING?

- Amount of data sources – identification and responsible persons;

- Difference in statistics from institutions, statistics not based on municipalities, but national or regional/county;

- Information is reported on different tools or platforms;

- Amount of data itself, reliability of data available;

- Different units, conversion;

- Challenges to choose activity sectors;

- Avoid double counting using data from different sources

TIPS FOR MUNICIPAL BEI PREPARATION

1. **Define Clear Goals and Scope**:
- Establish Objectives: Is it for setting reduction targets, tracking progress, or informing policy decisions?
- Set Boundaries: Define time period (baseline year), and emission sources to be included (e.g., transportation, buildings, waste).
- Prioritize Sectors: Focus on the most significant emission sources in your municipality to streamline data collection efforts.

2. **Choose the Right Methodology and Tools:**
- Select a Standard: Use recognized methodologies like those from the IPCC or the GHG Protocol for consistent and comparable results.
- Utilize Available Tools: Leverage free tools like the CIRIS or US EPA's Local Greenhouse Gas Inventory Tool to simplify calculations.
- Consider Software: For more complex inventories, explore dedicated software solutions that offer advanced features and data management capabilities.

3. **Gather High-Quality Data**:
- Identify Data Sources: Determine where to obtain relevant data, such as utility companies, transportation agencies, waste management facilities, and government databases.
- Prioritize Local Data: Use local data whenever possible for greater accuracy and relevance to your municipality's specific context.
- Address Data Gaps: If data is missing, use appropriate estimation methods or proxies, and clearly document any assumptions made.

TIPS FOR MUNICIPAL BEI PREPARATION

4. Ensure Accuracy and Consistency:

Use Consistent Units: Employ standardized units (e.g., metric tons of CO2 equivalent) for all emissions calculations.

Document Everything: Meticulously record all data sources, methodologies, assumptions, and calculations for transparency and reproducibility.

Conduct Quality Control: Review and verify the data and calculations to minimize errors and ensure accuracy.

5. Engage Stakeholders:

Involve Key Parties: Collaborate with relevant departments within the municipality, as well as external stakeholders like businesses, community groups, and residents.

Communicate Progress: Keep stakeholders informed about the inventory process and findings to foster support and collaboration.

6. Plan for Updates and Improvements:

Establish a Timeline: Determine how frequently the inventory will be updated to track progress and inform ongoing climate action efforts.

Identify Areas for Improvement: Continuously assess the inventory process and data collection methods to enhance accuracy and efficiency in future update

Teşekkür ederim!