



Module 3: Data Collection



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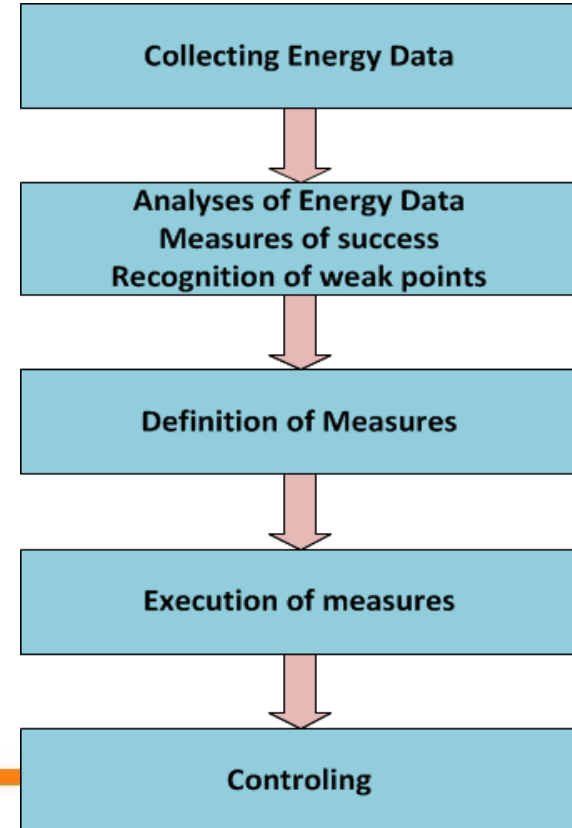


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Set up an Energy management system

Role of the energy manager – TASKS

- Analyses of energy supply, consumption and costs (Secure, stabile and quality of energy supply);
- Energy audits
- Preparation of RES and RUE measures (Energy Action plan);
- Communication between decision makers and maintainers, accouters, etc;
- Measurements of the Environmental impacts;
- To create long-term strategy on energy management;
- Monitoring - **Energy bookkeeping**
- Education, motivate and raise the awareness of all employees.



Energy management system

1 Systematic acquisition of energy data

Building stock – creating building stock of buildings owned by municipality

Energy data – collecting data in regular time intervals, preferably by software - energy bookkeeping.

Preliminary analysis and energy audits

Accurate and correct data collection is a baseline for all the later processing and calculations of EE and RES implementation

 Energy Data Collection Template

2 Processing and analyzing energy data

Analysis of energy data reveals opportunities for:

- understanding patterns
- improvement in buildings (reports, templates, calculations)

 CBA Tool

Associated Tools

3 Implementation of energy efficiency actions

- selection of concrete measures
- feasibility studies
- financial and economic analyses
- implementation
- monitoring & verifying

 Technology Catalogue

 CBA Tool

 MCDA Tool

 Monitoring tool



Baseline year

- EU recommendation: **year 1990**
- However, you are free to choose the year for which you can get the most comprehensive and reliable Energy data.
- **Always keep the same baseline year**, even if targets change.

Energy Data

The key gatekeepers of energy data are:

1. **Public Authorities** (as they are major consumers of energy)
2. **Energy Data Providers** (including major energy producers, consumers, Transmission System Operators (TSOs) and Distribution System Operators (DSOs)).
3. **Energy Planning Facilitators** (including Regional Energy Observatories and academic institutions)

There are no obligations within most EU and national legislative frameworks for TSOs and DSOs to provide local energy data to public authorities at sub-national level. As a result, data exchange is only implemented on a voluntary basis.

Data can be gathered from a variety of sources:

- government departments and statistics agencies
- a country's national GHG inventory report
- universities and research institutes
- scientific and technical articles in environmental books
- journals and reports
- sector experts/stakeholder organizations
- Many data on energy production and consumption per sectors, fuels, etc. are available from energy statistic reports and databases periodically published by energy providers and agencies.

- Start data collection activities with an initial screening of available data sources
- It is preferable to use local and national data over international data
- Data should be from reliable and robust sources
- Data should be time- and geographically-specific to the territorial boundary and technology-specific to the activity being measured
- Missing data will need to be:
 - gained by surveys among energy providers, fuel traders, large and industrial enterprises and other consumers
 - estimated by extrapolating, scaling, ect.
 - measured (generating new data)

Collecting data in the building sector

A **variety of approaches** are likely to be needed to develop an estimate of energy consumption in the building sector. Several options are available, and often a combination of them is necessary to have an overall picture of the energy consumption within the local territory:

1. Getting data for municipal/institutional buildings and facilities
2. Getting data from regional/ national sources
3. Getting data from the market operators
4. Getting data from a consumer survey
5. Managing data quality and uncertainty

1. Getting data for municipal buildings and equipment/facilities

Well-advanced local authorities already have a full energy accounting system in place (EMIS). For other local authorities who have not yet initiated such a process, the energy data collection could require the following ten steps:

- I. identify all buildings and equipment/facilities owned/managed by the Local Authority
- II. identify all energy delivery points (electricity, natural gas, heat from heating district network, fuel oil tanks...);
- III. identify the person/department receiving the invoices and energy data
- IV. organise a centralised collection of these documents/data;
- V. select an appropriate system to store and manage the data (could be a simple spreadsheet or a more elaborate software, available commercially);
- VI. make sure the data are collected and introduced in the system at least every year. Tele measurement is possible and can ease the process of datacollection;
- VII. note that this process of data collection may be the opportunity to deal with other important energy related issues;
- VIII. rationalise the number of energy delivery and invoicing points;
- IX. renew/improve contractual arrangements with energy suppliers;
- X. initiate a real energy management process within the local territory

1. Getting data for municipal buildings and equipment/facilities



- **Heating oil or other energy carriers delivered periodically as bulk:** it is often preferable to install a measurement device (gauge, metre,...) to help determine exactly the quantity of energy consumed during a given period. An alternative is to assume that the fuel purchased each year is equal to fuel consumed. This is a good assumption if the fuel tanks are filled at the same period each year, or if many deliveries of fuel occur each year.
- **Fuel for electricity or district heating/cooling:** It is important that all fuel supplied for purposes of producing electricity or district heating or cooling are tracked and reported separately (as fuel used for electricity and fuel used for district heating/cooling generation)
- **Electricity from renewable sources:** If the local authority and inhabitants buy electricity from renewable sources with guaranteed origin, this will not affect its energy consumption, but it may be counted as a bonus to improve the CO2 emission factor. The quantity and the guarantee of origin can be obtained from the supplier.
- **Public lighting:** The local authority should be able to collect all data regarding Public lighting. If it is not the case, in some cases, it may be necessary to place additional meters (for instance when an electricity supply point feeds both public lighting and building/facilities)

1. Getting data for municipal buildings and equipment/facilities

Sector		FINAL ENERGY CONSUMPTION [MWh]													
		Electricity	District heating and cooling	Fossil fuels						Renewable energy					Total
				Natural gas	Liquid gas	Heating oil	Diesel	Gasoline	Other fossil fuels	Biogas	Biofuel	Other biomass	Solar thermal	Geothermal	
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES															
Regional/Municipal buildings, equipment/facilities		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Regional/Municipal buildings, equipment/facilities														0.0
	Public lighting														0.0
	Other														0.0
Tertiary buildings, equipment/facilities		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Commercial buildings														0.0
	Other														0.0
Residential buildings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Private dwellings														0.0
Industry		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Non-ETS														0.0
	ETS <i>(not recommended)</i>														0.0
Subtotal		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



Energy Consumption Inventory for buildings, equipment, facilities and industries

1. Getting data for municipal buildings and equipment/facilities

BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES		Total Number	Total Floor area	Renovation status	Type of heating system	Use of renewable energy systems	Building type	Construction/ installation date	Energy class/rating
Public buildings, equipment/facilities									
	Public lighting	x		x				x	
	Public buildings	x	x	x	x	x	x	x	x
	Public facilities	x	(x)	x	(x)	x	x	(x)	x
Tertiary buildings, equipment/facilities									
	Commercial buildings	x	x	x	x	x	x	x	x
	Other	x	x	x	x	x	x	x	x
Residential buildings		x	x	x	x	x	x	x	x
Industry	Non-ETS	x				x			x



The advanced inventory tab allow planners to identify and encompass specific variables to obtain a more precise estimation

2. Getting data from regional/national sources

► National central databases and tools:

At EU level, several directives include recommendations for the Member States to encourage and facilitate the implementation of the sustainable energy action plans at local level and in some Member States (Netherlands, Denmark and Cyprus, as well as the UK) this was further supported with development a central database and/or tool to provide local specific data to local authorities - **check what is already available at regional or national level!** (from statistical, energy, environmental or economic ministries or agencies or from regulatory authorities for gas and electricity).

► Regional Energy and GHG emission observatories

Regional data centres existed before CoM, and were later further extended with the help of Data4Action and EnergyWatch. “Regional Energy and GHG Emissions Observatories” proposed a collaboration model for local data sharing in which a third party provides one-stop shop services and is responsible for brokering all collaboration agreements and the data exchange process between the energy data providers and local authorities.

► Covenant coordinators

Many Regional Authorities, in particular the ones officially acting as Covenant Coordinators, have taken upon them to provide data to the local authorities under their coordination (e.g. Italy and Spain). The list of the Covenant Coordinators is publicly available on the Covenant of Mayors website.

3. Getting data from the market operators

- Energy suppliers and grid operators may be **reluctant to provide consumption data** to the LA (confidentiality, commercial secrecy, and administrative burden especially in the case where many local authorities would ask similar data from the same operators).

- There is an increasing pressure on the market operators to share data with LAs

Under the Directive 2012/27/EU (42) on Energy Efficiency (Article 7), the energy market operators which are designated by the state, shall provide on request, but not more than once a year, aggregated statistical information on their final customers, including, where applicable, customer segmentation and geographical location of customers to an agency assigned by the Government.

- It may be easier to contact **grid operators** (for heat, gas and electricity) instead of energy suppliers!

It is possible only aggregated data will be obtained. Ideally a disaggregation between the residential, tertiary and industry activity sectors, for the different energy carriers (electricity, natural gas...) for all the postal code(s) that relate to the local municipality should be obtained.

4. Getting data from the consumer survey

May be necessary when all data cannot be obtained by any other previously mentioned approaches. This may be the case for energy carriers which do not pass through a centralised grid (e.g. fuel supplied in bulk) or if it is not possible to identify all suppliers.

Options:

1. For sectors where there is a **large number of small consumers** (like the residential sector), it is recommended addressing a questionnaire to a representative sample of the population (depending on the size of the population). Determine the size of needed sample with sample calculator (CheckMarket: <https://www.checkmarket.com/sample-size-calculator>)
2. For sectors **where the number of players is limited**, it may be worthwhile addressing the questionnaire to all energy consumers (this may be the case for example for the industrial sector).
3. For **sectors where there is a great number of players, but where there are some large ones** (e.g. tertiary sector), it may be worthwhile making sure to address the questionnaire at least to all large players (e.g. all supermarkets, hospitals, universities, housing companies, large office buildings, etc.). Identify them through:
 - knowledge, statistical or commercial data (such as telephone directories)
 - inquiry to the grid operator (ask who are the main electricity/gas consumers in the local territory)
 - ask grid operators the identity of all consumers connected to the middle and high voltage distribution networks (or even to the transmission network in some rare cases).

Collection of data on local production of energy

Local production of electricity:

- ▶ **In many cases, the information on local production is directly available or assessable from the local (private or public) electricity provider, costumer and/or unit operator.** For the large plants (such as CHPs), the information on the (distributed or centralised) local electricity production can usually be obtained via direct contact with the plant manager or with the operators of the distribution network.
- ▶ **In other cases, the data can either be obtained through questionnaires to the local producers/suppliers (e.g., energy communities) and/or costumers or be derived from statistics** (e.g., number of permits delivered, if required; number of subsidies granted) related to the amount of installations and power. Energy market operators may also have data about entities that provide electricity to the grid (e.g., from the certified green electricity).

Collection of data on local production of energy

Local production of heat/cold:

- ▶ collect the data on:
 - heat/cold produced on the local territory, energy inputs and associated emissions (in tCO₂ or tCO₂-eq);
 - heat/cold exported outside the local territory and associated energy input and emissions (in tCO₂ or tCO₂-eq);
 - heat/cold imported in the local territory and associated energy input and emissions (in tCO₂ or tCO₂-eq).

- ▶ **The data should be obtained via direct contact (or questionnaires) with the plant managers.**

- ▶ When heat/cold from a plant located in the territory of the local authority is partly used in the local territory and partly exported, based on your BEI accounting approach be mindful, to **include only the heat/cold produced, energy input and emissions corresponding to the share of heat consumed in the local territory.**

- ▶ Similar approach should be used for imported heat/cold, i.e. **only the heat/cold produced, energy input and emissions corresponding to the share of heat consumed in the local territory should be included.**

Collection of data on local production of energy



Energy production inventory

Local renewable energy production	Renewable energy produced [MWh]	Installed capacity [MW]
Wind		
Hydroelectric		
Photovoltaics		
Geothermal		
Sustainable biomass		
Other		
TOTAL	0.0	0.0

B1. Local/distributed electricity production (Renewable energy only)

Local electricity production plants	Electricity produced [MWh]		Energy carrier input [MWh]										
			Fossil fuels					Waste	Plant oil	Other biomass	Biogas	Other renewable	Other
	from renewable sources	from non-renewable sources	Natural gas	Liquid gas	Heating oil	Lignite	Coal						
Combined Heat and Power													
Other (ETS and large-scale plants > 20 MW not recommended)													
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

B2. Local/distributed electricity production

Local heat/cold production plants	Heat/cold produced [MWh]		Energy carrier input [MWh]										
			Fossil fuels					Waste	Plant oil	Other biomass	Biogas	Other renewable	Other
	from renewable sources	from non-renewable sources	Natural gas	Liquid gas	Heating oil	Lignite	Coal						
Combined Heat and Power													
District heating (heat-only)													
Other													
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

B3. Local heat/cold production

Collecting data in the transport sector

Emission sources in the transport sector by **transit mode**:

- **On-road transportation** (including electric and fuelpowered cars, taxis, buses, etc.)
- **Railway** (including trams, urban railway subway systems, regional (inter-city) commuter rail transport, national rail system, and international rail systems, etc.)
- **Water-borne transportation** (including sightseeing ferries, domestic inter-city vehicles, or international water-borne vehicles.)
- **Aviation** (including helicopters, domestic inter-city flights, and international flights, etc.)
- **Off-road transportation** (including airport ground support equipment, agricultural tractors, chain saws, forklifts, snowmobiles, etc.)

Collecting data in the transport sector

TRANSPORT															
Regional/ Municipal fleet		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Road														0.0
	Other														0.0
Public transport		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Road														0.0
	Rail														0.0
	Local and domestic waterways														0.0
	Other														0.0
Private and commercial transport		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Road														0.0
	Rail														0.0
	Local and domestic waterways														0.0
	Other														0.0
Subtotal		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



Energy Consumption Inventory for Transport

Collecting data in the transport sector

- **If it is possible, identify sub-categories within each transit mode:** municipal fleet, public transport, private and commercial transport ect.
- This is not always possible > **but make note to specify which of the above individual activity sectors are included in the aggregated data.**

Recommendations (CoM):

- The data to be collected can mainly concern the road and rail transport. Air and waterborne transport can be excluded. Exception may be the **local ferries** used for public transport.
- **Road and rail transport** should be included if it is serving mainly the local territory and/or regulated by the local authority, meaning, that you can exclude highways and regional trains if no actions are foreseen to be implemented by local authority (e.g. in SECAP)
- **The off-road transportation** should be included only if related actions are foreseen (e.g. in SECAP).

- ▶ This category includes vehicles such as buses, cars, trucks, motorcycles, on-road waste collection and transportation vehicles (e.g. compactor trucks), etc.
- ▶ Most vehicles burn liquid or gaseous fuel in internal combustion engines. The combustion of these fuels produces **CO₂, CH₄, and N₂O**, often referred to collectively as tailpipe emissions.
- ▶ Electric or hybrid vehicles can be charged at stations within or outside the city. Charging stations might be at homes or workplaces that are already included in other categories, so it is important to **ensure energy used for electric vehicle charging is separate** (included in stationary energy categories) and not double counted.

The energy consumption and associated emissions in road transport could be accounted for in different ways. Among the most common methodologies are:

- **fuel sales method**
- **territorial method**
- **residential method**
- **city induced method**

Basic data and potential sources for estimating emissions from road transportation



DATA	SOURCE
Vehicle kilometres travelled	
Vehicle flow and mileage driven for transport planning purposes	Local transport department, public
- Travel Surveys including numbers of vehicles passing fixed points per unit time (traffic volumes) - Household transport surveys (origin and destination surveys)	Some surveys count vehicle numbers by type of vehicle, but information on the fuel (e.g. diesel or gasoline) is usually not available.
Average daily traffic volumes for the whole EU	Open Transport Map: http://opentransportmap.info/
Data on transport infrastructure and standardised indicators on transport, covering 35 European cities	UITP: http://www.uitp.org/ (not free of charge not free of charge)
“Big data” such as smart phones and other travel data loggers that can provide details of trips	Various voluntary web apps

Basic data and potential sources for estimating emissions from road transportation

DATA	SOURCE
Vehicle fleet distribution	
Data on mode share for many European cities	Eurostat: https://ec.europa.eu/eurostat/web/cities/data/database
Passenger travel mode share surveys	Various national or city-level surveys
Average fuel consumption per km	
Fuel consumption per km and vehicle type	EMEP/EEA 2016 air pollutant emission inventory guidebook 2016 (EEA, 2016)
Fuel efficiency and CO2 emission data sources for vehicle types	National inventories of vehicles
Local estimates of fuel economy for different vehicle types	Local vehicle registration data
Fuel NCV	
Default Net Calorific Value in TJ/Gg	IPCC (2006)

Rail transportation

The rail transportation in the local territory can be divided into two parts:

1. **Urban rail transportation:** for example, tram, metro and local trains. **The inclusion of this urban rail transportation in the BEI is strongly recommended.**
2. **Other rail transportation,** which covers the long-distance, intercity and regional rail transportation that occurs in the local territory. Other rail transportation does not only serve the local territory, but a larger area. Other rail transportation includes also freight transport. **These emissions can be included in the BEI if the local authority has included measures to reduce these emissions in the SECAP.**

There are two types of data for rail transportation: consumption of electricity and consumption of fuel in diesel locomotives. Use of diesel locomotives in urban rail transportation is less common for local services.

Number of providers of rail transport in the local territory is usually low. The LA is recommended to ask the annual electricity and fuel use data directly from the service providers by fuel types and by application (e.g., transit system, freight, etc.)

