



Technical report

CommitClimate Simulator Manual

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1. Interface Navigation and Controls

The interface provides a set of consistent navigation and interaction elements available across all pages.

NB! Please, note that refreshing the page will erase all unsaved input data. Therefore, users are advised to regularly save and export their work (see Chapter 5).

1.1. Navigation

The key navigation elements of the interface are presented in Fig. 1 and described in Table 1.

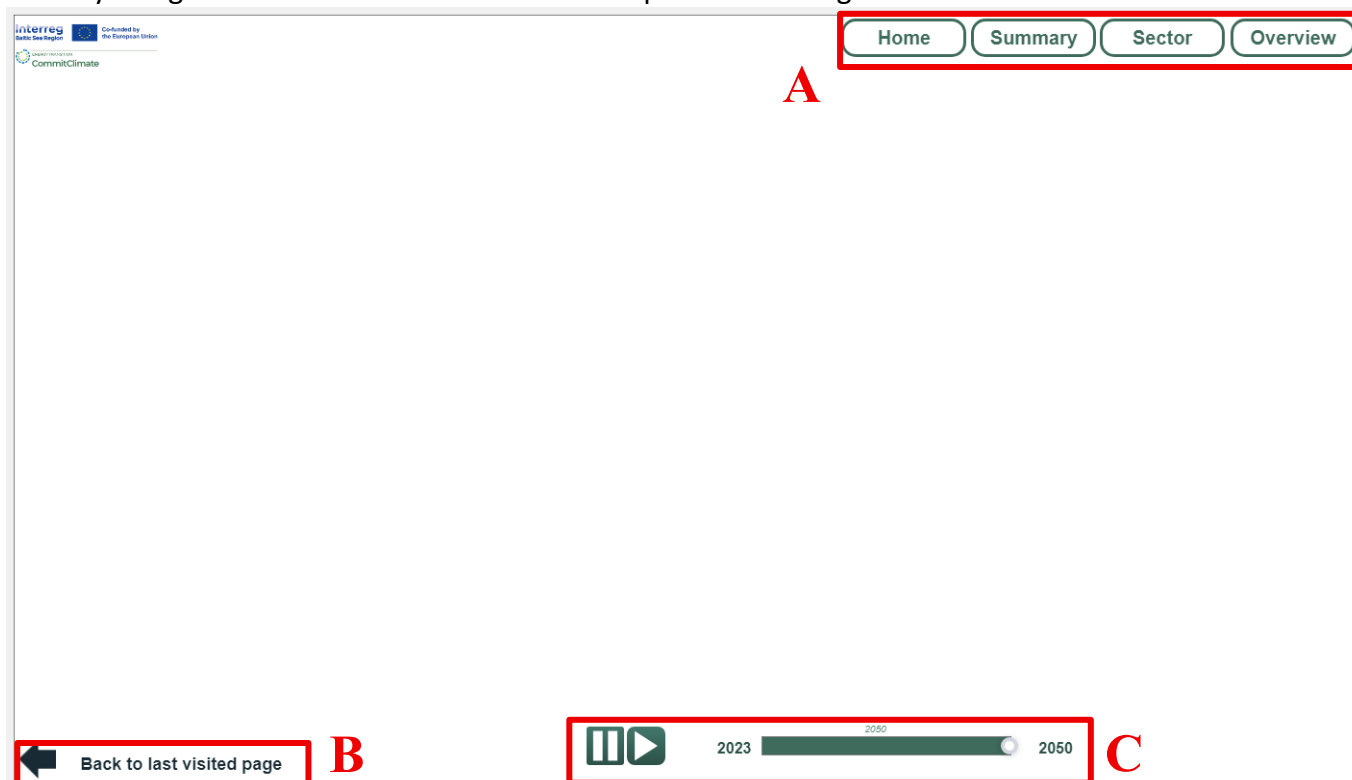


Fig.1. Navigation elements

Table 1. Navigation elements description

Element	Description
A	At the top of each page, a navigation bar allows switching between the main sections of the platform: Homepage, Summary, Sectors, and Overview.
B	In the bottom-left corner of each page, a “Back to last visited page” button enables quick return to the previously opened section.
C	A time slider is available on all pages, allowing the user to select a specific year. By adjusting the slider, the user can observe how results change over time.

1.2. Interactive Controls

The platform includes several interactive icons that enhance usability. The interactive control elements and their functions are summarised in Table 2.

Table 2. Interactive control elements description

Function	Icon	Description
Expand graph		Allows the user to enlarge the selected graph for a more detailed view.
Information		Provides additional explanations about specific sections or input parameters. It also indicates the measurement units if they are not directly displayed in the interface.
Reset value		This icon appears next to any modified input field. By selecting this icon, the user can revert the value to its original default setting, i.e., the value defined in the model before any data import was performed.

2. Homepage

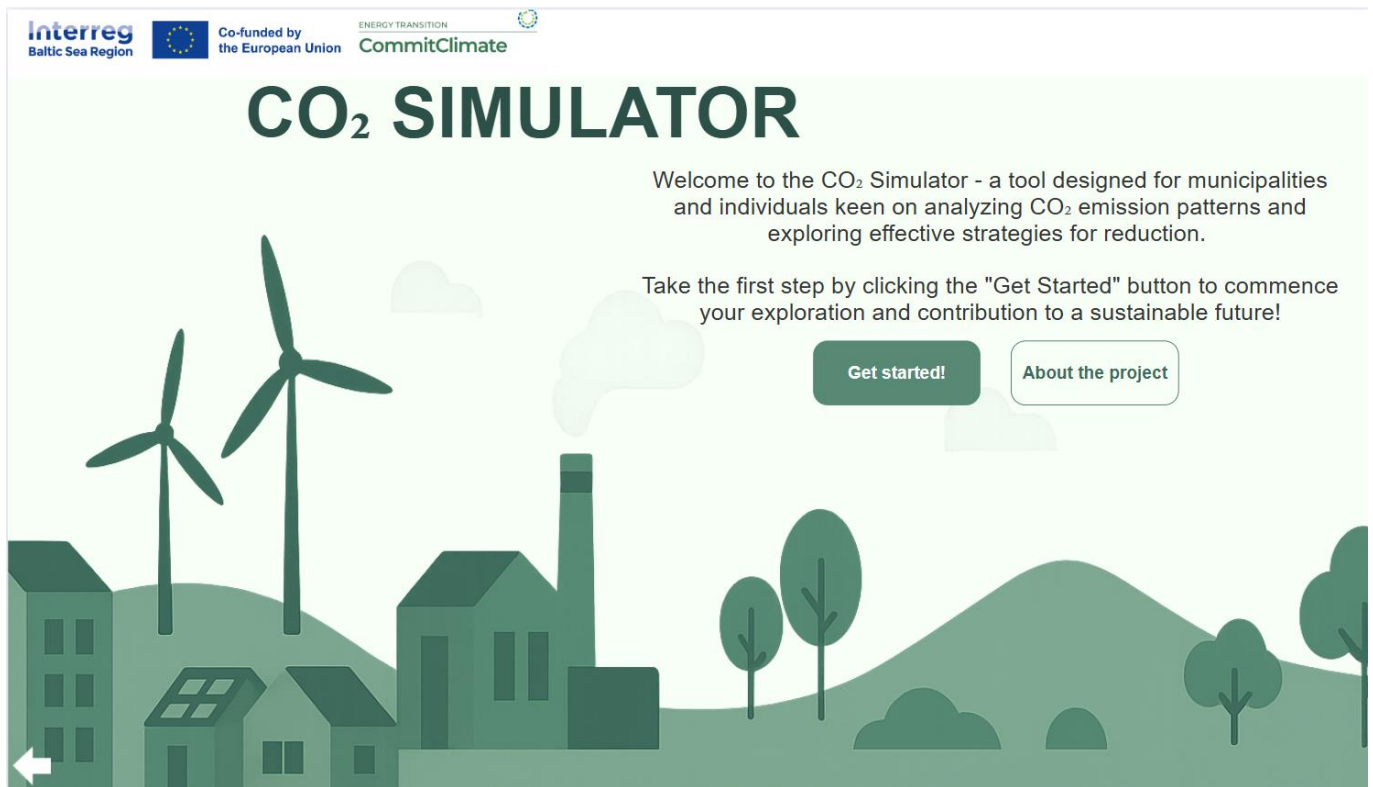


Fig.2. CommitClimate CO₂ Simulator homepage

Upon opening the CommitClimate CO₂ Simulator, the user will be greeted by the Homepage, which contains a short introductory message and two buttons - “Get started!” and “About the project” (Fig.2.)

Clicking on the “About the project” button will open the CommitClimate Online Platform, which contains:

- Descriptions of the project, simulator, online platform, stakeholders and partner testimonials.
- Project objectives, transnational value, activities and key actions.
- The CommitClimate CO₂ Simulator, along with theory, training modules and answers to frequently asked questions.
- Training slides, self-assessment tests, project deliverables and feasibility studies from partner municipalities.
- Partner municipality case studies.
- The CommitClimate Household Simulator, along with various useful resources for municipality citizens - descriptions of citizen workshops, answers to frequently asked questions, citizen survey reports, links to other useful tools, platforms and available support.
- Project partner contact information.

We recommend using the simulator in conjunction with resources from the [online platform](#) for a more comprehensive experience.

To begin working with the simulator, **click the “Get started!” button.**

3. Acknowledgment

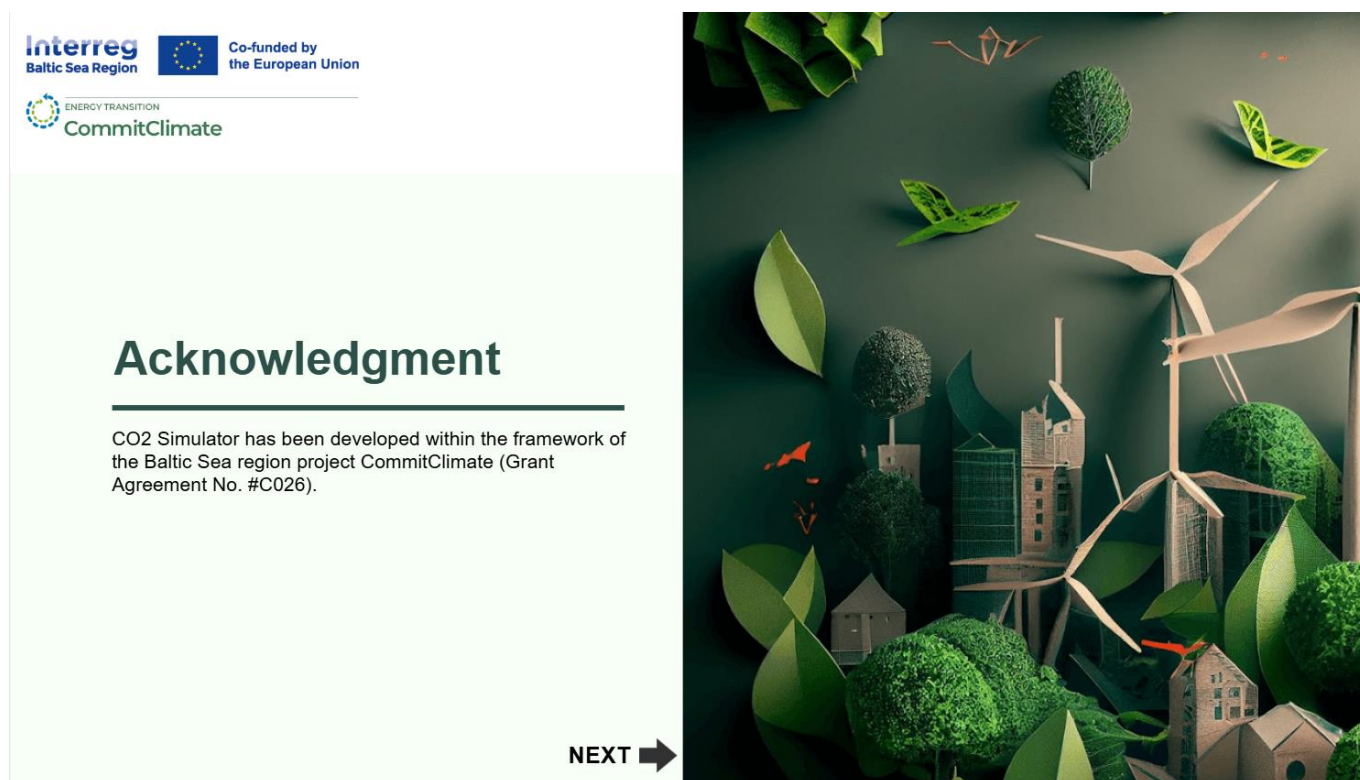


Fig.3. Acknowledgment page

The acknowledgment page (Fig.3.) contains an acknowledgment of European Union funding for the development for the CommitClimate CO₂ Simulator. To proceed, **click the “NEXT” button.**

4. Introduction

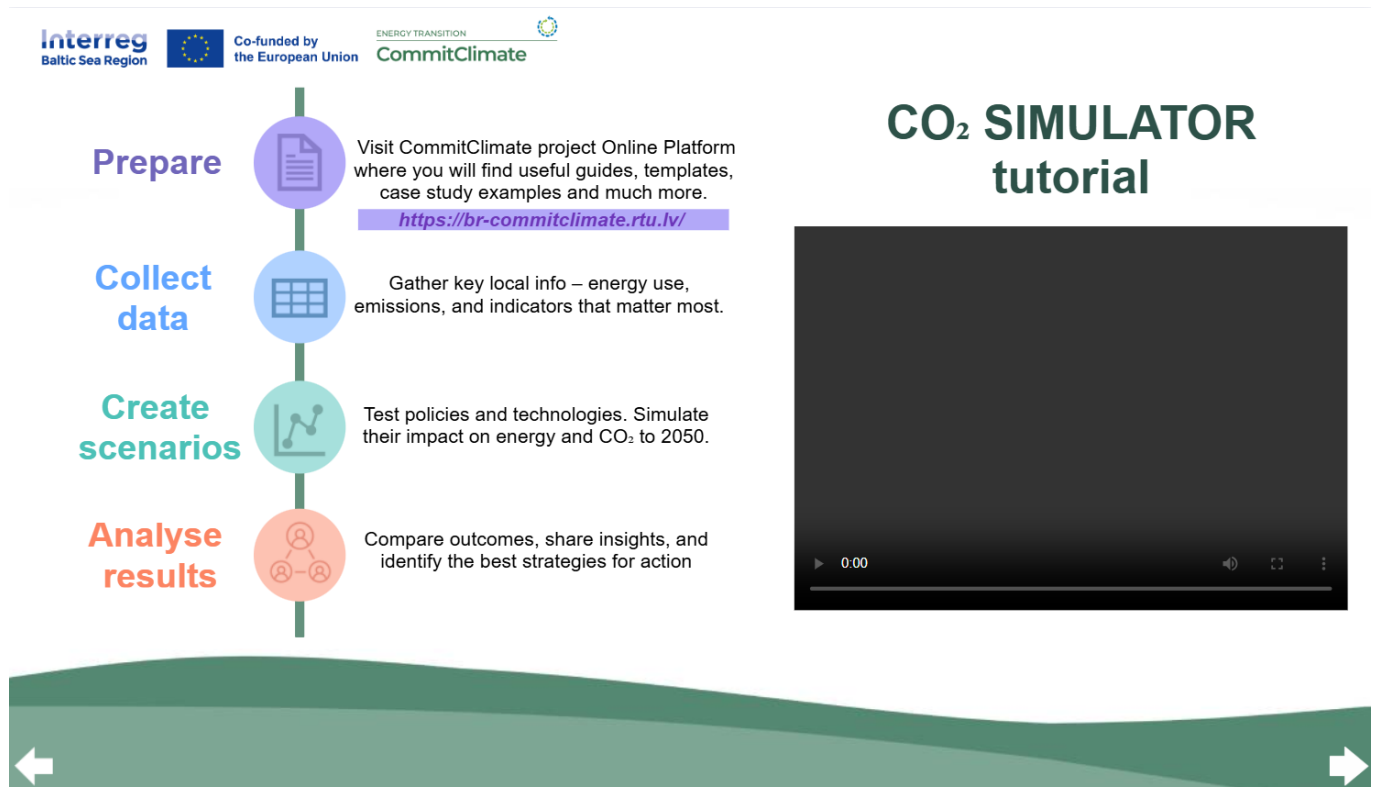


Fig.4. Introduction page

The introduction page provides a basic outline on how to work with the simulator, along with a tutorial video showing a more detailed walkthrough (Fig.4). Using the tool involves implementing four steps:

- 1) **Prepare** – Visit the CommitClimate online platform and explore the simulator manual, guides, reporting templates, case study examples etc.
- 2) **Collect data** - Gather key local information, such as energy use, CO₂ emissions, population and other important indicators.
- 3) **Create scenarios** - Enter municipality data and test different policies and technologies to simulate their impact on energy use and emissions until 2050.
- 4) **Analyse results** - Compare outcomes, share insights and identify the best strategies for action.

To proceed, **click the arrow button** in the lower right corner of the page.

5. Municipality summary

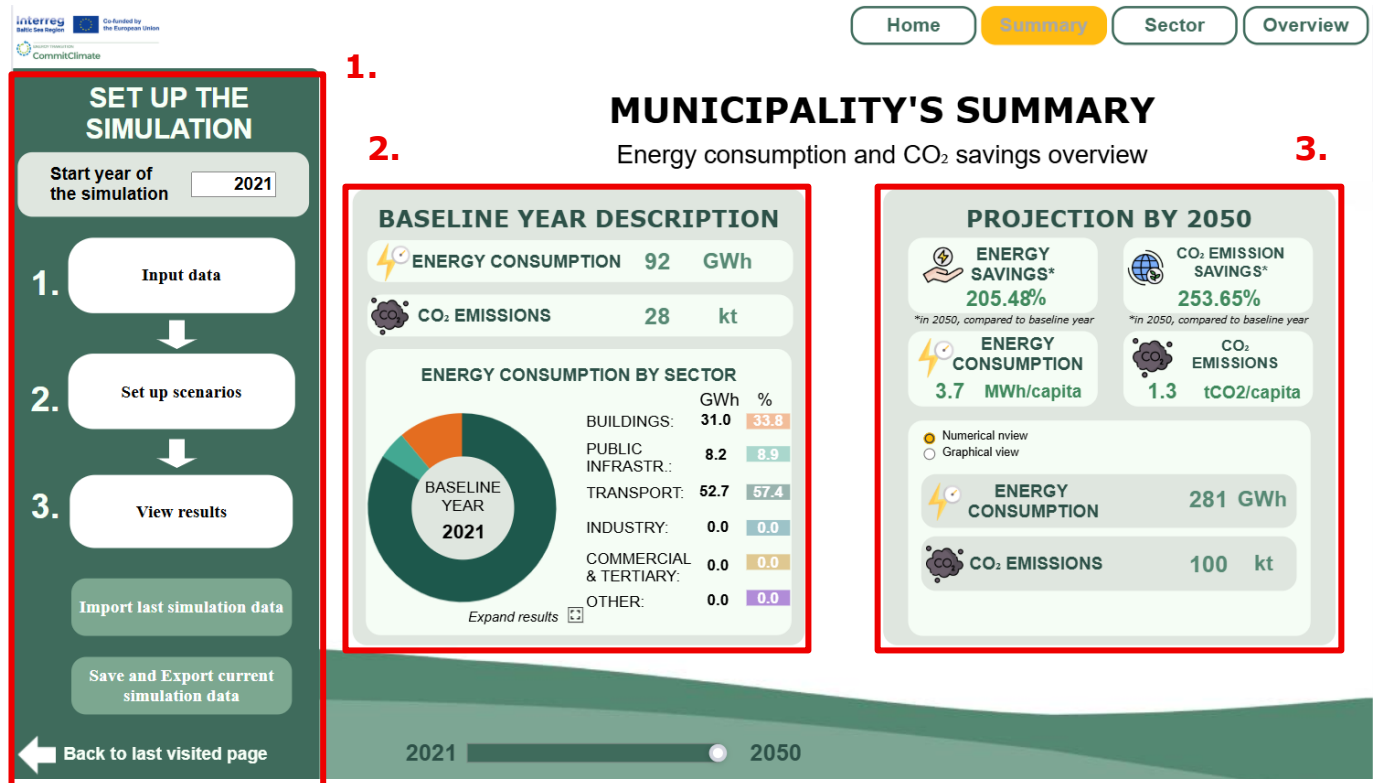


Fig.5. Municipality summary page

The *Municipality Summary* page (Fig. 5) consists of the following sub-sections:

Simulation setup (1) – The user defines the simulation start year (baseline year), which is used as the reference point for all subsequent calculations. The baseline year should be selected based on the availability of data on population, number of vehicles, building area, and other relevant parameters in the municipality.

NB! The final year of the modelling is 2050 and the modelling time step is one year. It is possible to change the start modelling year.

This section also provides navigation to the *Input Data* (Chapter 6.), *Sectors* (Chapter 8-16), and *Scenario Results* (Chapter 17) pages, as well as options to import previously saved simulation data or export the current simulation data for future use.

NB! Please, note that refreshing the page will erase all unsaved input data. Therefore, users are advised to regularly save and export their work.

It is recommended to save data after completing each section, as occasional system interruptions may occur during extended use of the simulator.

- When exporting data, use clear and consistent file names to ensure easy version tracking.

- Importing previously saved simulation data may take some time due to the volume of data being processed.

Baseline year description (2) – This section presents the municipality's current CO₂ emissions (ktCO₂/year) and total energy consumption (GWh/year). Energy consumption is further disaggregated by sector and displayed both numerically (GWh/year; % of total energy consumption) and graphically.

NB! The results in this section are calculated based on the input data provided in the simulator. If no input data has been entered, all values will be equal to zero.

Projection by 2050 (3) – This section presents projected total and per capita CO₂ emissions (ktCO₂/year; tCO₂/capita) and energy consumption (GWh/year; MWh/capita), as well as energy and emission savings (%) compared to the baseline year. These values are calculated based on the defined projections and applied policies across the simulator.

Results can be displayed either as numerical values (showing results for 2050) or as graphs (illustrating changes over time) by switching between the numerical and graphical view options.

NB! On the Summary page, the results for 2050 with selected policies applied are compared to the values calculated for the base year. This shows the overall long-term change between the current situation and the projected outcomes after implementing policies. If you want to see the direct impact of policies in 2050, please refer to the Overview page (Chapter 17.), where the 2050 baseline scenario is compared with the 2050 results after policies are applied.

After reviewing the Municipality Summary page, the user should proceed to **the Input Data page** by selecting the first button on the left-hand side of the interface.

6. Input data

The municipality input data page is used to enter basic data which will be used to calculate energy consumption and greenhouse gas emissions in the simulator. The page consists of three sub-pages – General, Buildings and Travel – which can be accessed using the buttons (see Fig.6.(1)) on the left side of the page.

6.1. General

1. MUNICIPALITY INPUT DATA

2. INPUT DATA

1. POPULATION PROJECTION

Local population* ① Guest population ①
Annual change ① Annual change ①

2. PUBLIC LIGHTING

Number of light bulbs* ① LED lamps share ① RES usage share ①
Planned new street construction ☒

Construction of new streets ① Lamps per km ① Construction start year ① Construction end year ①

3. VEHICLES ①

Municipal vehicle fleet*

SELECT FUEL/ENERGY TYPE

Passenger cars
LDVs
HDVs
Other
Vehicle average lifetime ①

4. GOAL SELECTION

Target year ① Target ①

3. RESULTS

PROJECTED POPULATION 4063

Population projection, total

PROJECTED NUMBER OF LIGHT BULBS 1758

Number of light bulbs

BAU scenario Results

Year	Total population
2030	4583
2031	4555
2032	4528
2033	4501
2034	4474
2035	4447
2036	4420
2037	4394
2038	4367
2039	4341
2040	4315
2041	4289
2042	4264
2043	4238
2044	4213
2045	4187
2046	4162
2047	4137
2048	4112
2049	4088
Final	4063

Fig.6. Municipality input data (General)

The General Input Data page (Fig. 6) consists of the following sections:

Navigation buttons (1) – Used to switch between sub-pages.

Input data (2):

- 1) Population projection** – The user inputs the municipality's current population and the annual change (%/year), which describes the annual population increase (positive value) or decrease (negative value), expressed as a percentage of the total population. By using the number of GUEST population input, the user can enter the guest population (e.g., tourists, city guests, commuters from neighbouring municipalities) in the baseline year, if this group has a significant impact on energy consumption in the municipality's transport sector.
- 2) Public lighting** – The user inputs:
 - the total number of light bulbs used in the municipality's street lighting system,

- the LED lamps share (% of bulbs), expressed as the percentage of LED bulbs in the total number of bulbs, and
- the RES usage share (% of LED bulbs), expressed as the percentage of LED bulbs with integrated renewable energy sources out of the total number of LED bulbs.

By toggling the Planned New Street Construction option, the user can indicate:

- planned new street construction (km),
- the number of lamps per kilometre (bulbs/km), and
- the construction start and end year.

NB! This section is optional; however, if completed, the data will be included in the baseline calculations.

- 3) **Vehicles** – The user specifies the number of vehicles in the municipal fleet by:
- fuel/energy type (Diesel, Gasoline, Liquefied Petroleum Gas (LPG), Compressed Natural Gas (CNG), Hydrogen, Electricity), and
 - vehicle type (Passenger cars, Light-duty vehicles (LDVs), Heavy-duty vehicles (HDVs), Other vehicles),
 - as well as the average vehicle lifetime (years).

Additionally, the user must define the average vehicle lifetime (years). Fuel/energy types are selected from a drop-down list.

- 4) **Goal selection** – If the municipality has set an emission reduction or climate neutrality target, the user must input:
- the target year, and
 - the target value (%), representing the percentage reduction in emissions compared to the baseline year.

NB! These values do not affect the baseline calculation results. Instead, they are used to generate a reference trendline against which the results are compared in the final section.

Results (3)

The graphs display:

- population changes from the baseline year until 2050 (based on the population projection), and
- projected changes in the number of light bulbs (based on the public lighting inputs).

A table next to the graphs displays the population values for each year from the baseline year until 2050.

6.2. Buildings

1. MUNICIPAL BUILDING STOCK

Municipal Building Stock*

Schools

SELECT BUILDING TYPE

Area* ① Renovated area share ①

4500 33

Planned new building construction ☒

New Area ① Start year ① Finish year ①

1000 2025 2050

Declined Area ① Start year ① Finish year ①

300 2025 2050

2. RESIDENTIAL BUILDING STOCK

Residential Building Stock*

Large multi family

SELECT BUILDING TYPE

Area* ① Renovated area share ①

140000 28

Planned new building construction ☒

New Area ① Start year ① Finish year ①

0 2025 2050

Declined Area ① Start year ① Finish year ①

0 2025 2050

RESULTS

1. Total

Public Building Area projection

Square meters

Year

Existing buildings 4200

New buildings 1000

Declined area 300

Total area 5200

Public Building Area broken down by building group, %

2. By type

Public Building Area projection

Square meters

Year

Existing buildings 180000

New buildings 0

Declined area 0

Total area 180000

Residential Building Area broken down by building group, %

Fig.7. Municipality input data (Buildings)

The Buildings Input Data page (Fig. 7) consists of the following sections:

Navigation buttons (1) – Used to switch between sub-pages.

Input data (2):

- Municipal building stock** – The user inputs the total heated building stock area (m²) for each municipal building group (Schools, Kindergartens, Administrative buildings, Sports facilities, Hospitals, Cultural facilities, Other), selected from a drop-down menu.

If applicable, the user can also specify the renovated area share (%) for each building type. In this context, renovated refers to buildings for which further energy efficiency improvements are not considered economically justified; therefore, they are excluded from additional energy efficiency calculations.

NB! In the simulator, renovated buildings are assumed to have 40% lower specific energy consumption compared to non-renovated buildings.

By enabling the Planned New Building Construction option, the user can specify:

- planned new building area (m²), representing newly constructed municipal buildings,

- declined area (m²), representing the demolition of existing buildings, and
 - construction and demolition start and end years.
- 2) **Residential building stock** – The user inputs the total heated building stock area (m²) for each residential building group (Single-family attached, Single-family detached, Large multi-family, Other), selected from a drop-down menu, as well as the renovated area share (%) for each building type.

By enabling the Planned New Building Construction option, the user can specify:

- planned new building area (m²),
- declined area (m²), and
- construction and demolition start and end years.

Results (3) – This section includes graphs showing projections of municipal and residential building areas from the baseline year until 2050.

The graphs can display either:

- total building area, or
- building area by building type.

The displayed building type can be selected using the same drop-down menus as in the input data section, while the display mode can be adjusted using the drop-down menu located in the upper-right corner of each graph.

In addition, this section presents:

- the percentage (%) distribution of municipal and residential building areas by building group, and
- numerical values for:
 - existing building area (baseline year),
 - new building area (planned construction),
 - declined area (demolition), and
 - total building area in 2050 (calculated as baseline area + new construction – declined area).

6.3. Travel

1. MUNICIPALITY INPUT DATA

2. INPUT DATA

1. PASSENGER TRAVEL DEMAND

	LOCAL POPULATION*	GUEST POPULATION
Daily travel distance* ①	50.0	30.0
Travel frequency ①	7.0	3.5
PROJECTED CHANGE		
- in daily travel distance ①	1.0	0.0
- in travel frequency ①	0.0	0.0

2. PASSENGER TRAVEL MODAL SPLIT

	LOCAL POPULATION*	GUEST POPULATION
PRIVATE CAR	85.0	95.0
PUBLIC TRANSPORT	7.0	5.0
WALKING	5.0	0.0
CYCLING	3.0	0.0
TWO-WHEELERS	0.0	0.0
MICRO-MOBILITY	0.0	0.0
	100.00 %	100.00 %

3. GOODS (ROAD) TRANSPORT

	LOCAL CARRIERS*	OTHER CARRIERS
Registered trucks	400	424

3. RESULTS

Individual daily travel

km per day per person

Year

Local citizen (solid line), Other population (dashed line)

Travel mode choice, %

Two-wheelers, Micro-mobility, Public transport, Bicycle, Walking, Car

2023 2050

Fig.8. Municipality input data (Travel)

The Travel input data page (Fig.8.) consists of the following sections:

Navigation buttons (1) – Used to switch between sub-pages.

Input data (2):

- 1) Passenger travel demand - This section describes daily travel demand for both local and guest commuters within the municipality. The number and projected changes of both groups are defined in the *General Input Data* page (Fig. 6).

Using the inputs provided, the user specifies:

- daily travel distance (km/day),
- travel frequency (days/week), and
- projected annual change (%/year) in both distance and frequency,

for both the local population and guest commuters.

- 2) Passengers travel modal split – The user can input the modal split (% of passenger kilometres*(pkm)) by vehicle type (Private car, Public transport, Walking, Cycling, Two-wheelers, Micro-mobility) for both the local and guest population.

NB! It is important to note that the percentages must add up to a total of 100 % for each population, otherwise the simulator will not work correctly.

- 3) Goods (road) transport – The user can opt to include information about the number of registered road freight vehicles (including both LDVs (<3.5t) and HDVs(>3.5t)) both registered locally and ones registered outside the municipality but known to operate regularly in the area for business activities or transit purposes.

Results (3)

This section includes two graphs.

The first graph presents:

- total passenger travel (million pkm/year),
- individual daily travel (km/day/person), and
- individual travel frequency (trips/year),

from the baseline year until 2050 for both local and guest populations. The displayed indicator can be changed using the drop-down menu in the upper-right corner of the graph.

The second graph shows the modal split (%) of travel modes for the municipality's local population.

Note!

***Passenger kilometres (pkm)** represent the total distance travelled by passengers and are calculated as the number of passengers multiplied by the distance travelled. For example, if one person travels 10 km, this corresponds to 10 pkm; if 10 people each travel 10 km, the total is 100 pkm.

The pkm indicator is used in the simulator to model modal share because it reflects the actual transport demand more accurately than the number of trips or vehicles alone. Different transport modes serve trips of varying distances (e.g., walking is typically used for short distances, while private cars or public transport are used for longer trips). Therefore, using pkm allows the model to capture both the number of trips and their length, providing a more realistic representation of how travel demand is distributed between modes. At the municipal level, this is particularly important, as changes in modal share (e.g., shifting from cars to public transport or cycling) affect not only the number of trips but also the total distance travelled and, consequently, energy consumption and emissions.

7. Sectors selection

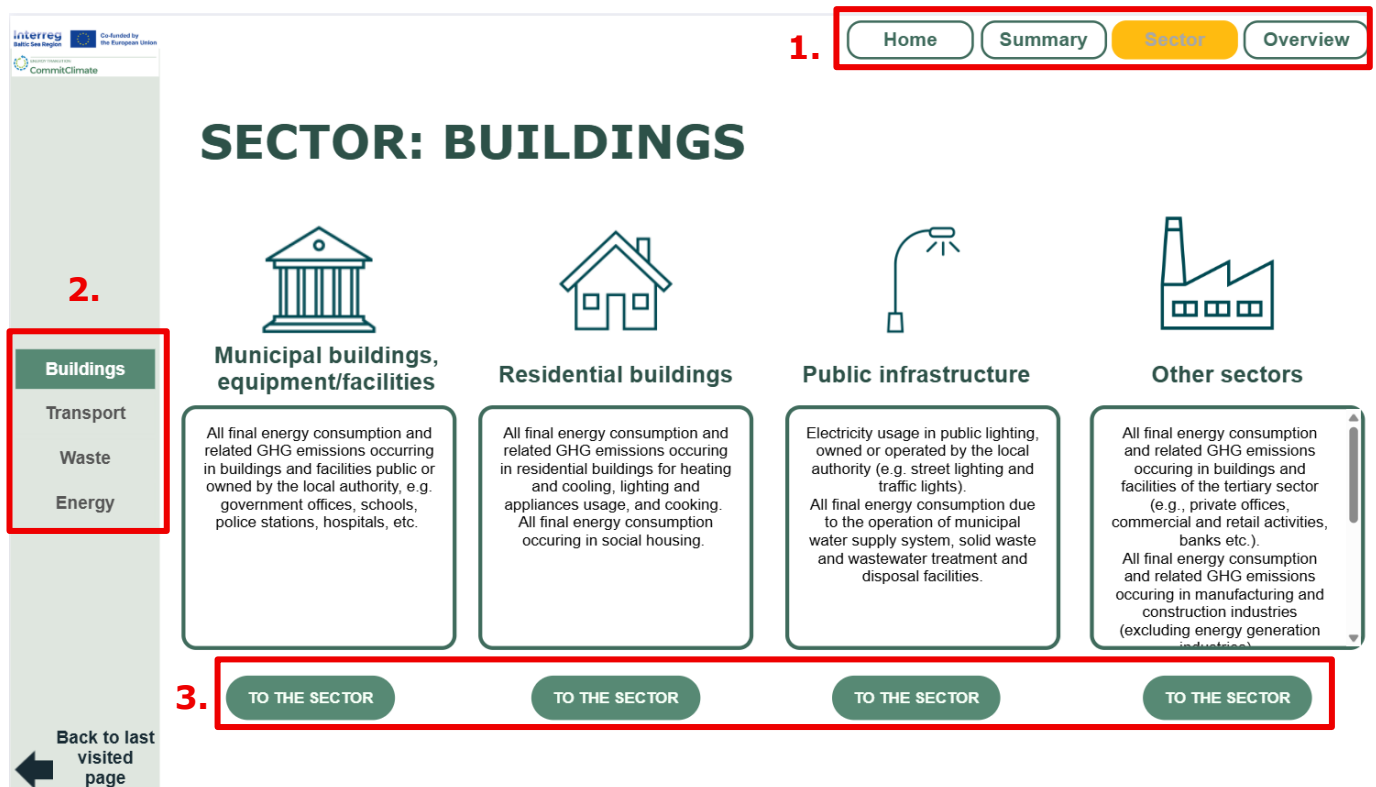


Fig.9. Sector selection page

The Sector Selection page (Fig. 9) can be accessed at any point by selecting the **“Sector”** button (1) in the navigation bar at the top of the interface.

Users can switch between sectors using the **buttons** (2) on the left-hand side of the page and access sub-sector pages by selecting the **“TO THE SECTOR”** buttons (3) located below each sector description.

In total, the Simulator includes four sectors and nine sub-sectors:

Buildings

- Municipal buildings, equipment/facilities – Final energy consumption and related emissions in buildings and facilities owned by the local authority (e.g., government offices, schools, hospitals) (Chapter 8).
- Residential buildings – Final energy consumption and related emissions from heating/cooling, lighting, and appliance use in residential buildings (Chapter 9).
- Public infrastructure – Final energy consumption and related emissions from public lighting, water supply systems, and wastewater treatment and disposal facilities owned by the local authority (Chapter 10).
- Other sectors (Chapter 11) – Final energy consumption and related emissions in:
 - tertiary sector buildings and facilities (e.g., banks, offices, commercial and retail activities),
 - manufacturing and construction industries (excluding energy generation),

- agriculture and forestry buildings and facilities (e.g., livestock facilities, irrigation systems, farm machinery),
- other sectors.

Transport

- Municipality fleet – Final energy consumption and related emissions from fuel combustion and electricity use in road and off-road transport and mobile machinery under the responsibility of the local authority (Chapter 12).
- Public transport – Final energy consumption and related emissions from fuel combustion and electricity use in public road and rail transport (Chapter 13).
- Private transport – Final energy consumption and related emissions from fuel combustion and electricity use in vehicles owned by individuals or private businesses (Chapter 14).

Waste

- Waste sector – GHG emissions not related to energy consumption, arising from solid waste and wastewater management and treatment processes (Chapter 15).

Energy

- Local energy production – Energy production within the municipality, including both heat and electricity. This covers:
 - heat production (including CHP plants and boiler houses supplying district heating/cooling networks), and
 - electricity generation from both non-renewable (e.g., CHP plants, power plants) and renewable sources (e.g., wind, solar, hydropower),

along with the associated energy consumption and emissions (Chapter 16).

8. Municipal buildings

8.1. Baseline scenario

Municipal Building Baseline Scenario pages display results that are calculated from values in the **input data** and **technical assumptions** pages and do not include any policy assumptions. These pages are purely representative and do not contain any inputs or parameters that can be changed.

The municipal buildings sector baseline scenario page is shown in Fig.10.

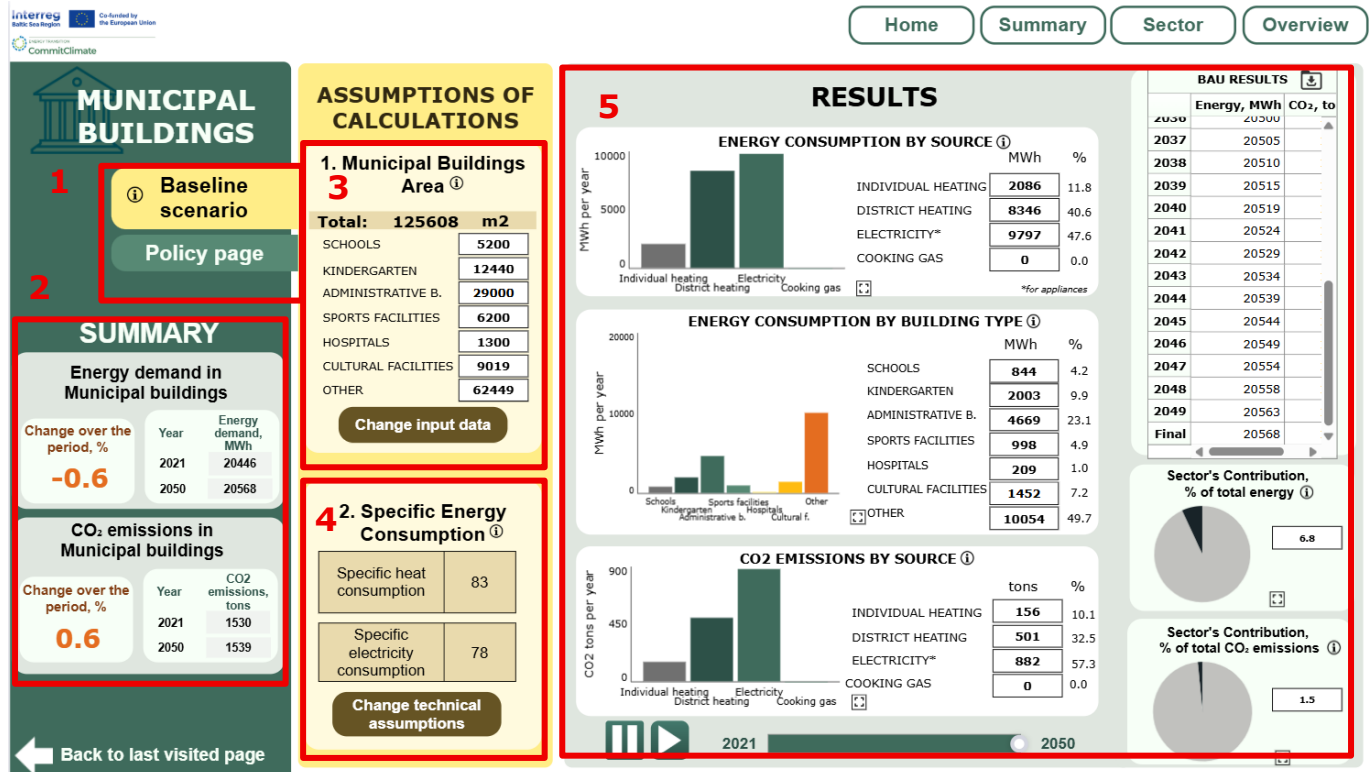


Fig.10. Municipal buildings page (baseline scenario)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the baseline scenario and the policy page.

Sub-sector summary (2)

Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) for municipal buildings, equipment, and facilities in the baseline year and in 2050.

It also shows the percentage (%) change in energy demand and emissions resulting from different factors (e.g., building construction and demolition). Positive values indicate an increase, while negative values indicate a decrease.

Municipal building area (3)

Displays the total municipal building area (m²) in 2050, based on data entered in the *Buildings Input Data* page, as well as the area by building type.

To modify these values, the user must update the data in the *Input Data* page (Chapter 6.2.), accessible via the **“Change input data”** button.

Specific energy consumption (4)

Displays the average specific heat and electricity consumption (kWh/m²) for the municipal building stock. These values are calculated as weighted averages based on the specific consumption values defined for each building type in the *Technical Assumptions* section (Chapter 8.2.).

To modify these values, the user must update the *Technical Assumptions* page, accessible via the **“Change technical assumptions”** button.

NB! If the user does not make any changes to the technical parameters, built-in default values are used for calculations. Default values most often reflect national averages or are based on expert assumptions.

Results (5) – This section includes three graphs:

- The first graph shows energy consumption by energy source (individual heating, district heating, electricity for appliances, cooking gas), presented as both absolute values (MWh/year) and shares (%).
- The second graph shows energy consumption by building type.
- The third graph shows CO₂ emissions by energy source, presented as absolute values (tCO₂/year) and shares (%).

To the right of the graphs, a table displays annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050.

Below the table, two pie charts illustrate the sub-sector’s contribution to total municipal energy consumption and CO₂ emissions (%).

8.2. Technical assumptions

Municipal Building Technical Assumptions page allows users to adjust the values of various parameters used for calculations in the baseline scenario, to achieve results that are more specific to their municipality.

The municipal buildings sector technical assumptions page is shown in Fig.11.

The screenshot displays the 'Municipal Buildings' technical assumptions interface. It includes a sidebar with a 'Municipal Buildings' header and a 'Show energy consumption shares' section. The main content area is divided into three numbered sections: 1. Technical Assumptions, 2. Energy demand in Existing Municipal Buildings by type, and 3. Energy demand in New Municipal Buildings by type. Section 1 contains several sub-sections for defining parameters like building stock, energy consumption, energy supply structure, RES energy generation, technical parameters of individual heating systems, and fuel mix. Sections 2 and 3 each feature a line graph and a table for energy demand.

Fig.11. Municipal buildings page (technical assumptions)

This section is divided into three parts:

Technical assumptions (1)

This part allows the user to define technical parameters for the municipal building sub-sector.

The steps for setting technical assumptions are as follows:

- 1) The user selects a building type from the drop-down menu in the *Municipal Building Stock* section (1).
CO₂ emissions (tCO₂/year) are calculated by multiplying the building area (m²), defined in the *Buildings Input Data* page (Chapter 6.2.), by:
 - specific heat and electricity consumption (kWh/m²/year),
 - cooking gas consumption (m³/year), and
 - the corresponding emission factors (tCO₂/MWh) for district heating and individual heating.
- Emission factors are defined in external datasets (see Section "Energy production" in this report).

Renovated buildings are assumed to have 50% lower specific energy consumption compared to non-renovated buildings. Different emission factors are also applied depending on whether buildings are connected to district heating or use individual heating systems.

2) The user defines:

- specific heat and electricity consumption (kWh/m²/year), and
- cooking gas consumption (m³/year),

for both non-renovated (2A) and renovated (2B) buildings.

Nb! It should be noted that electricity consumption refers to electricity consumption for lighting and equipment. If a building uses electric heating, electricity consumption in this case should be included in heat energy consumption.

3) The user specifies the share (%) of buildings connected to:

- district heating (3A), and
- individual heating systems (3B),

for both non-renovated and renovated buildings.

The total share must equal 100%; otherwise, the simulator will not function correctly.

4) If renewable energy sources are used, the user can enter either:

- installed capacity (kW), or
- generated energy (MWh/year),

for solar photovoltaics, solar collectors, and wind turbines. These values are subtracted from total energy consumption in the baseline scenario.

5) The user defines heat loss (%) and boiler efficiency (%) for individual heating systems (5).

6) The user specifies the fuel mix (%) for individual heating systems (6), including:

- wood biomass,
- coal,
- natural gas,
- other fossil fuels, and
- electricity.

The total share must equal 100%.

Results (2)

The graphs on the right-hand side display heating, electricity, cooking gas, and total energy demand (MWh/year), for both existing and new buildings of the selected type.

The steps described above must be repeated for each municipal building type. If certain parameters (e.g., cooking gas consumption) are unknown, default values may be used.

Advanced parameters (3)

This section is available by enabling the **“Show energy consumption shares”** button.

It allows the user to further refine the distribution of electricity consumption shares, if more detailed data is available.

After defining all technical assumptions, the user can return to the baseline scenario page by selecting **“Back to last visited page”** in the lower-left corner and proceed to the **“Policy page”** (Chapter 8.3.).

8.3. Policies

Municipality Building Policy page allows users to enable various policies that reduce energy consumption and CO₂ emissions in a specific sub-sector and compare baseline and policy scenario results. The municipality building policy page is shown in Fig. 12.

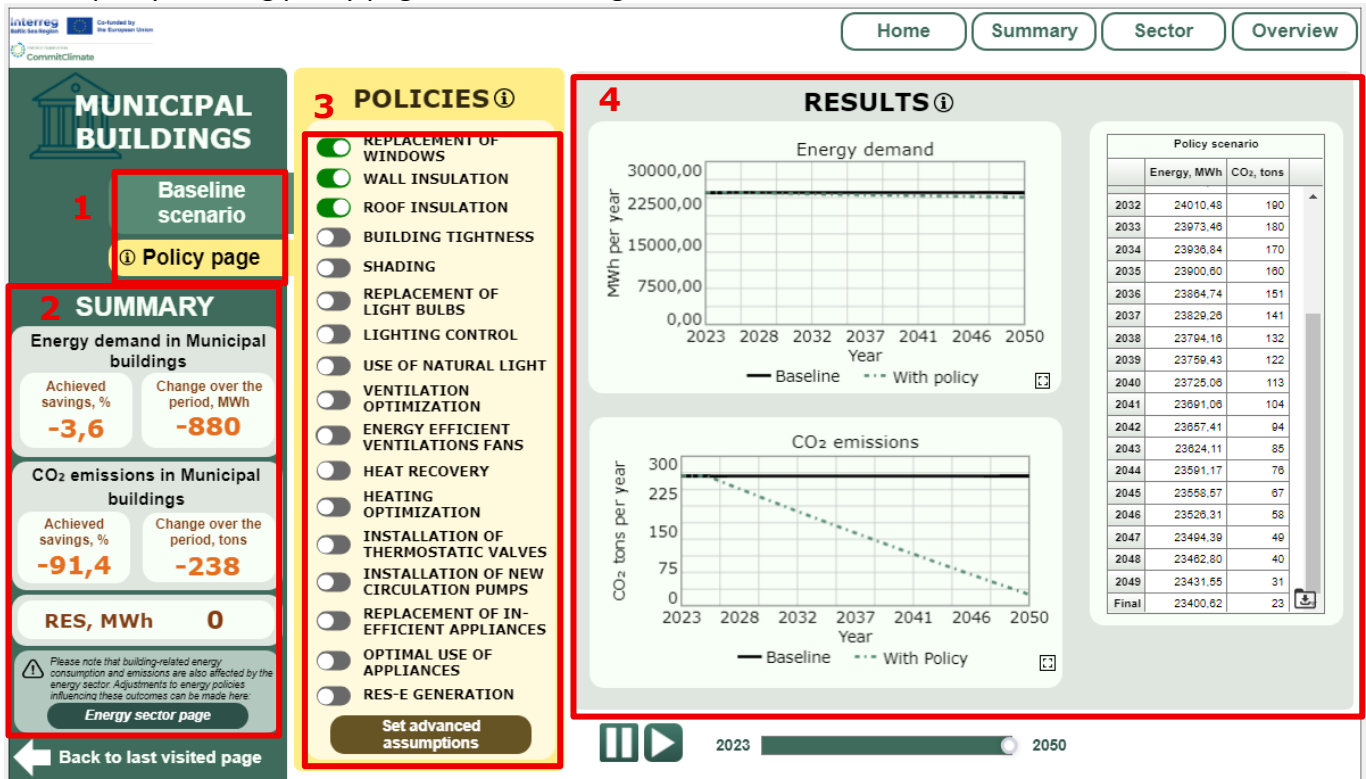


Fig.12. Municipal buildings page (policies)

This page consists of the following sections:

Navigation buttons (1) – Used to switch between the *Policy* page and the *Baseline Scenario*.

Sub-sector summary (2)

Displays the difference in energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in municipal buildings, equipment, and facilities between the baseline year and 2050 under the policy scenario. Positive values indicate an increase, while negative values indicate a decrease. If applicable, the amount of energy produced from renewable sources (MWh/year) is shown below.

Note: Building-related energy consumption and emissions are also influenced by the energy sector. Decarbonization of electricity and heat supply can lead to a reduction in CO₂ emissions even if no building-specific policies are applied.

To review or modify these assumptions, the user can navigate to the *Energy sector* page either by selecting the “**Energy sector page**” button or via the main sector selection page using the navigation bar (see Chapter 7).

Policies (3)

This section contains a list of policies applicable to the municipal buildings sector. Policies can be enabled or disabled using toggle buttons (a policy is active when the switch is green).

The available policies include:

- Replacement of windows
- Wall insulation
- Roof insulation
- Building tightness
- Shading
- Replacement of light bulbs
- Lighting control
- Use of natural light
- Ventilation optimization
- Heat recovery
- Heating optimization
- Installation of thermostatic valves
- Installation of efficient circulation pumps
- Replacement of inefficient appliances
- Optimal use of appliances
- RES-E generation

Each policy includes default values for implementation speed and implementation period (start and end years).

More detailed configuration of these parameters is available in the *Policy Assumptions* section (see Chapter 8.4), which can be accessed by selecting the **“Set advanced assumptions”** button.

Results (4) – This section includes two graphs:

- The first graph shows energy demand (MWh/year) in municipal buildings from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted green line).
- The second graph shows CO₂ emissions (tCO₂/year) over the same period, also comparing baseline and policy scenarios.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050 under the policy scenario.

8.4. Policy assumptions

Municipal Building Policy Assumptions page allows users to adjust certain aspects of policies, to achieve more specific results in the policy scenario. The municipality building policy assumptions page is shown in Fig. 13

Fig.13. Municipal buildings page (policy assumptions)

Policy assumptions (1)

On the *Policy Assumptions* page, policies for the municipal buildings sub-sector are grouped into the following categories:

- **Building envelope (A)** – Replacement of windows, wall insulation, roof insulation, building tightness, shading
- **Building lighting (B)** – Replacement of light bulbs, lighting control, use of natural light
- **HVAC (Heating, ventilation, and air-cooling) (C)** – Ventilation optimization, heat recovery, energy-efficient ventilation fans, heating optimization, thermostatic valves, efficient circulation pumps
- **Appliances (D)** – Energy-efficient appliances, optimal appliance use
- **Renewable and low-carbon technologies (E)** – RES-E generation

For the first four categories, the user selects a policy from a drop-down menu and defines its implementation using three key parameters: **energy savings (%)**, **implementation speed (%/year)**, and the **implementation period (start and end year)**.

Energy savings (%) represent the maximum potential reduction in total energy consumption if the measure is fully implemented across all applicable buildings. The model determines the portion of

the building stock where the policy can be applied based on input data (e.g., non-renovated buildings), and the energy savings parameter defines the achievable reduction for that share.

Implementation speed (%/year) defines how quickly this potential is realized. It represents the share of the remaining applicable building stock that is affected each year, meaning implementation follows a progressive (compounding) approach. For example, if a 50%/year implementation speed is applied, 50% of the remaining buildings are renovated each year, resulting in 75% coverage after two years.

The **implementation period (start and end year)** defines when the policy is active and how long it is applied. The total achieved impact therefore depends on both the implementation speed and the duration of the policy.

For **renewable and low-carbon technologies**, the approach differs slightly. The user selects a technology (e.g., solar PV or wind) and defines the **target installed capacity (MW)** or generated energy, along with the implementation start and end years. These technologies reduce net energy demand by substituting conventional energy sources. This policy assumes that RES energy replaces:

- Heat pumps and solar collectors -> replaces individual heat demand
- Biomass boiler -> adds biomass use to individual heat supply
- RES electricity generation, energy storage -> reduces electricity demand
- Increase in electricity consumption due to installation of heat pumps -> increase in electricity demand

Note: The Renewable and low-carbon technologies policy section allows the user to modify calculation assumptions related to renewable energy technologies. By selecting the “Specify calculation parameters” button, the user can adjust parameters defining the performance and impact of RES technologies. This step is optional and only required if more detailed customization is needed. The same parameter values are also applied in the residential buildings sub-sector and can be further adjusted in the Residential Buildings Policy Assumptions page if necessary.

Results (2)

On the right-hand side of the page, two graphs illustrate how selected policies affect the average specific heat and electricity consumption (kWh/m²/year) in municipal buildings from the baseline year until 2050. After adjusting the policies, the user can return to the *Policy Scenario* page by selecting **“Back to last visited page”** to evaluate the overall impact of the chosen measures.

9. Residential buildings

9.1. Baseline scenario

The *Residential Building Baseline Scenario* page is shown in Fig. 14.

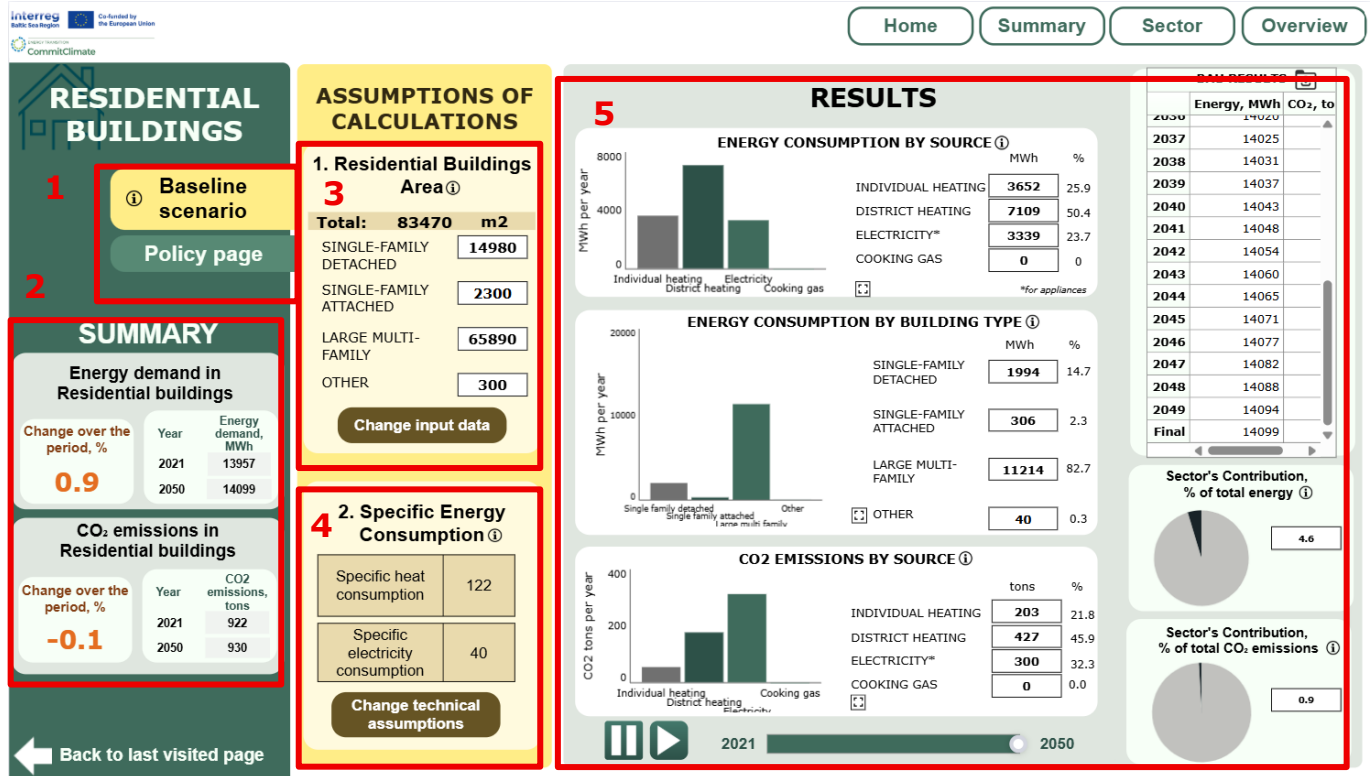


Fig.14. Residential buildings page (baseline scenario)

The residential buildings sub-sector follows the same principles as the municipal buildings sub-sector. The *Baseline Scenario* page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Baseline Scenario* and the *Policy* page.

Sub-sector summary (2)

Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in residential buildings for the baseline year and for 2050.

It also shows the percentage (%) change in energy demand and emissions resulting from factors such as building construction and demolition. Positive values indicate an increase, while negative values indicate a decrease.

Residential building area (3)

Displays the total residential building area (m²) in 2050, based on data entered in the *Buildings Input Data* page, as well as the area by building type.

To modify these values, the user must update the *Input Data* page (Chapter 6.2.), accessible via the “Change input data” button.

Specific energy consumption (4)

Displays the average specific heat and electricity consumption (kWh/m²) for the residential building stock. These values are calculated as weighted averages based on the specific consumption values defined for each building type in the *Residential Buildings Technical Assumptions* section (Chapter 9.2.).

To modify these values, the user must update the *Technical Assumptions* page, accessible via the “**Change technical assumptions**” button.

NB! If the user does not make any changes to the technical parameters, built-in default values are used for calculations. Default values most often reflect national averages or are based on expert assumptions.

Results (5)

This section includes three graphs:

- The first graph shows energy consumption by energy source (individual heating, district heating, electricity for appliances, cooking gas), presented as both absolute values (MWh/year) and shares (%).
- The second graph shows energy consumption by building type.
- The third graph shows CO₂ emissions by energy source, presented as absolute values (tCO₂/year) and shares (%).

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050.

Below the table, two pie charts illustrate the sub-sector’s contribution to total municipal energy consumption and CO₂ emissions (%).

9.2. Technical assumptions

The *Residential Buildings Sector Technical Assumptions* page is shown in Fig.15

1 TECHNICAL ASSUMPTIONS

1 Residential Building Stock* ①: Single family detached

2.A Energy consumption in Existing Buildings ①: Heat 111, Electricity 32, Cooking gas 0

2.B Energy consumption in New Buildings ①: Heat 80, Electricity 30, Cooking gas 0

3.A Energy Supply Structure in Existing Buildings: District heating 20, Cooking gas 10

3.B Energy Supply Structure in New Buildings: District heating 20, Cooking gas 10

4 RES energy generation ①: Solar PV 0, Solar collector 170000, Wind turbine 0

5 Technical parameters of individual heating systems: Heat loss 10, Boiler efficiency 85

6 Fuel mix in individual heating ①: Wood biomass 50.0, Coal 0.0, Natural gas 0.0, Other fossil 0.0, Electricity 50.0

2 Energy demand in Existing Municipal Buildings by type

MWh per year

Energy Type	Value
DISTRICT HEAT	15969
ELECTRICITY	7819,543
BIOMASS	11677
NATURAL GAS	0
OTHER FOSSIL	0

1. Single family detached

Single family detached

WOOD BIOMASS
COAL
NATURAL GAS
OTHER FOSSIL
ELECTRICITY

2023 2050

Fig.15. Residential buildings page (technical assumptions)

This section is divided into three parts:

Technical assumptions (1)

This part allows the user to define technical parameters for the municipal building sub-sector.

The steps for setting technical assumptions are as follows:

- 1) The user selects a building type from the drop-down menu in the *Municipal Building Stock* section (1).

CO₂ emissions (tCO₂/year) are calculated by multiplying the building area (m²), defined in the *Buildings Input Data* page (Chapter 6.2.), by:

- specific heat and electricity consumption (kWh/m²/year),
- cooking gas consumption (m³/year), and
- the corresponding emission factors (tCO₂/MWh) for district heating and individual heating.
- Emission factors are defined in external datasets (see Section “Energy production” in this report).

Renovated buildings are assumed to have 50% lower specific energy consumption compared to non-renovated buildings. Different emission factors are also applied depending on whether buildings are connected to district heating or use individual heating systems.

- 2) The user defines:

- specific heat and electricity consumption (kWh/m²/year), and

- cooking gas consumption (m³/year),
- for both non-renovated (2A) and renovated (2B) buildings.

NB! It should be noted that electricity consumption refers to electricity consumption for lighting and equipment. If a building uses electric heating, electricity consumption in this case should be included in heat energy consumption.

3) The user specifies the share (%) of buildings connected to:

- district heating (3A), and
- individual heating systems (3B),

for both non-renovated and renovated buildings.

The total share must equal 100%; otherwise, the simulator will not function correctly.

4) If renewable energy sources are used, the user can enter either:

- installed capacity (kW), or
- generated energy (MWh/year),

for solar photovoltaics, solar collectors, and wind turbines. These values are subtracted from total energy consumption in the baseline scenario.

5) The user defines heat loss (%) and boiler efficiency (%) for individual heating systems (5).

6) The user specifies the fuel mix (%) for individual heating systems (6), including:

- wood biomass,
- coal,
- natural gas,
- other fossil fuels, and
- electricity.

The total share must equal 100%.

Results (2)

The graphs on the right-hand side display heating, electricity, cooking gas, and total energy demand (MWh/year), for both existing and new buildings of the selected type.

The steps described above must be repeated for each municipal building type. If certain parameters (e.g., cooking gas consumption) are unknown, default values may be used.

After defining all technical assumptions, the user can return to the baseline scenario page by selecting **“Back to last visited page”** in the lower-left corner and proceed to the **“Policy page”** (Chapter 9.3.).

9.3. Policies

The *Residential Building Policy* page is shown in Fig. 16.

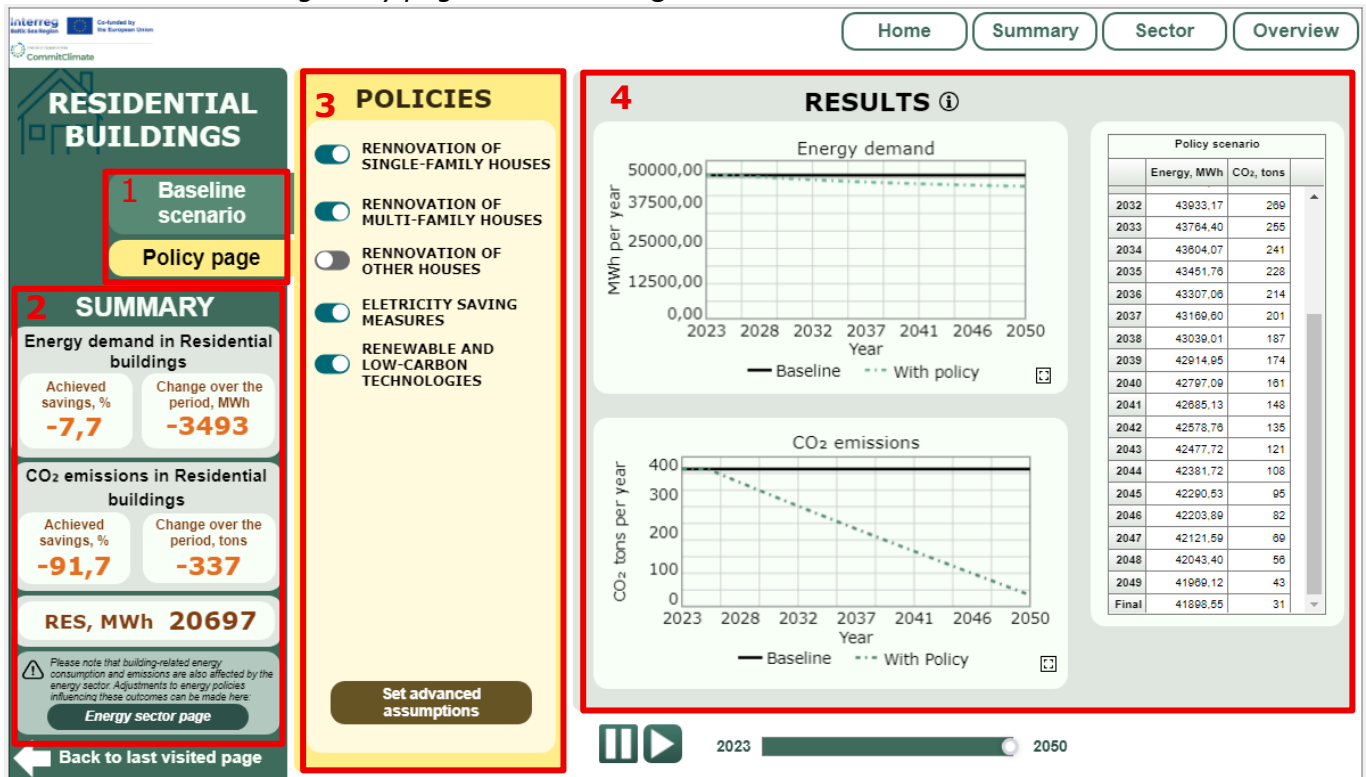


Fig.16. Residential buildings page (policies)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Policy* page and the *Baseline Scenario*.

Sub-sector summary (2)

Displays the difference in energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in residential buildings between the baseline year and 2050 under the policy scenario.

Positive values indicate an increase, while negative values indicate a decrease. If applicable, the amount of energy produced from renewable energy sources (MWh/year) is shown below.

Note: Building-related energy consumption and emissions are also influenced by the energy sector. Decarbonization of electricity and heat supply can lead to a reduction in CO₂ emissions even if no building-specific policies are applied.

Policies (3)

This section contains a list of policies applicable to the residential buildings sector. Policies can be enabled or disabled using toggle buttons (a policy is active when the switch is green).

The available policies include:

- Renovation of single-family homes
- Renovation of multi-family homes
- Renovation of other residential buildings
- Electricity-saving measures
- Renewable and low-carbon technologies

Each policy includes default values for implementation speed and implementation period (start and end years).

To modify these parameters, the user must access the *Policy Assumptions page* (Chapter 9.4.) by selecting the “**Set advanced assumptions**” button.

Results (4)

This section includes two graphs:

- The first graph shows energy demand (MWh/year) in residential buildings from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted green line).
- The second graph shows CO₂ emissions (tCO₂/year) over the same period, also comparing baseline and policy scenarios.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050 under the policy scenario.

9.4. Policy assumptions

The *Residential Buildings Policy Assumptions* page is shown in Fig. 17.

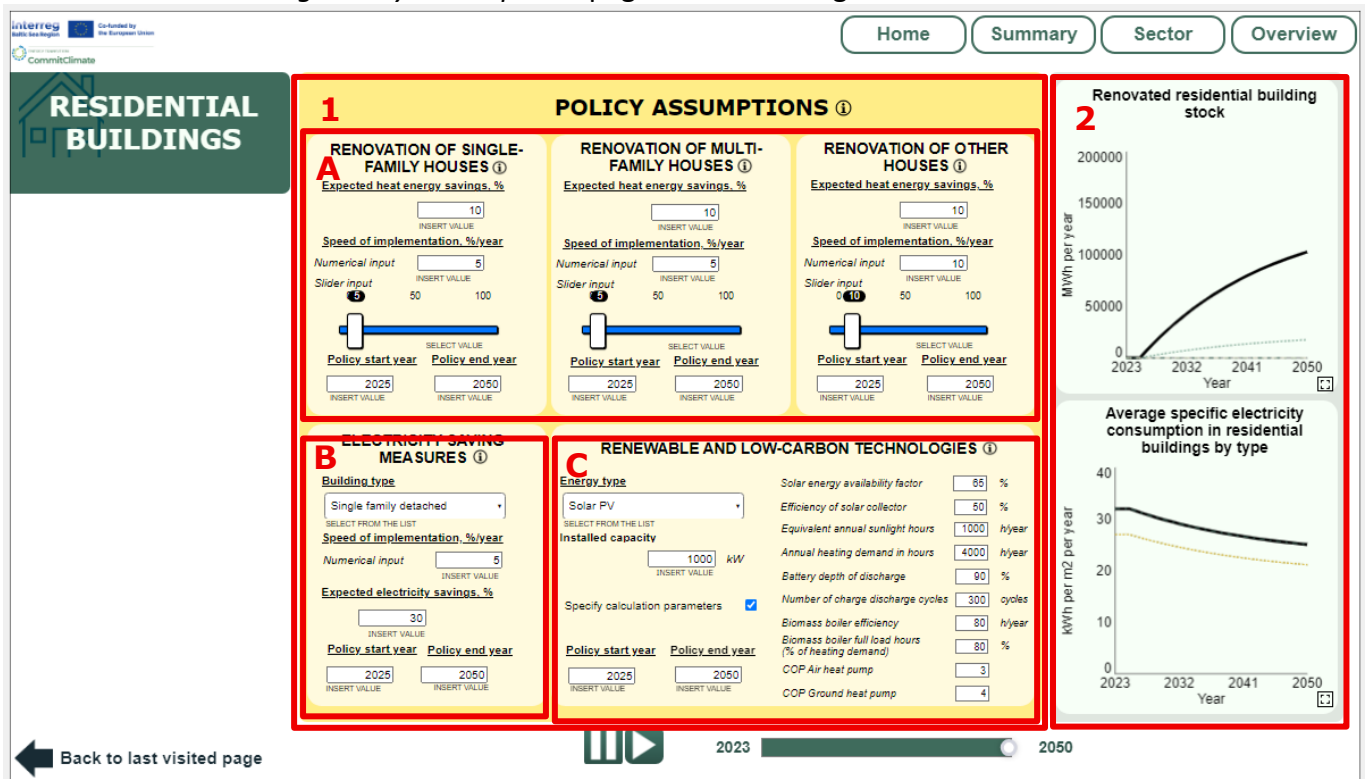


Fig.17. Residential buildings page (policy assumptions)

Policy assumptions (1)

1) For **renovation policies (A)**, the user defines:

- expected heat energy savings (%),
- implementation speed (%/year), and
- policy implementation period (start and end years).

Energy savings (%) represent the *maximum potential reduction in heat energy consumption* if the measure is fully implemented across all applicable buildings. The model determines the share of the building stock where renovation can be applied (e.g., non-renovated buildings), while the specified savings define the achievable reduction for that share.

Implementation speed (%/year) defines how quickly this potential is realized. It represents the share of the remaining applicable buildings that are renovated each year, following a progressive (compounding) approach.

2) For the **electricity-saving measures (B)** policy, the user selects a building type from the drop-down menu and defines:

- expected electricity savings (%),
- implementation speed (%/year), and
- policy implementation period (start and end years).

3) In the **Renewable and low-carbon technologies (C)** section, the user selects a technology from the drop-down menu and specifies the target installed capacity (MW), along with the implementation start and end years. These technologies reduce net energy demand by substituting conventional energy sources. This policy assumes that RES energy replaces:

- Heat pumps and solar collectors -> replaces individual heat demand
- Biomass boiler -> adds biomass use to individual heat supply
- RES electricity generation, energy storage -> reduces electricity demand
- Increase in electricity consumption due to installation of heat pumps -> increase in electricity demand

Note: The Renewable and low-carbon technologies policy section allows the user to modify calculation assumptions related to renewable energy technologies. By selecting the “Specify calculation parameters” button, the user can adjust parameters defining the performance and impact of RES technologies. This step is optional and only required if more detailed customization is needed. The same parameter values are also applied in the residential buildings sub-sector and can be further adjusted in the Residential Buildings Policy Assumptions page if necessary.

Results (2)

On the right-hand side of the page, two graphs illustrate how the selected policies affect the average specific electricity and heat consumption (kWh/m²/year) in residential buildings from the baseline year until 2050.

After adjusting the policies, the user can return to the *Policy Scenario* page by selecting “**Back to last visited page**” to evaluate the impact of the chosen measures.

10. Public infrastructure

10.1. Baseline scenario

The public infrastructure sector baseline scenario page is shown in Fig.18.

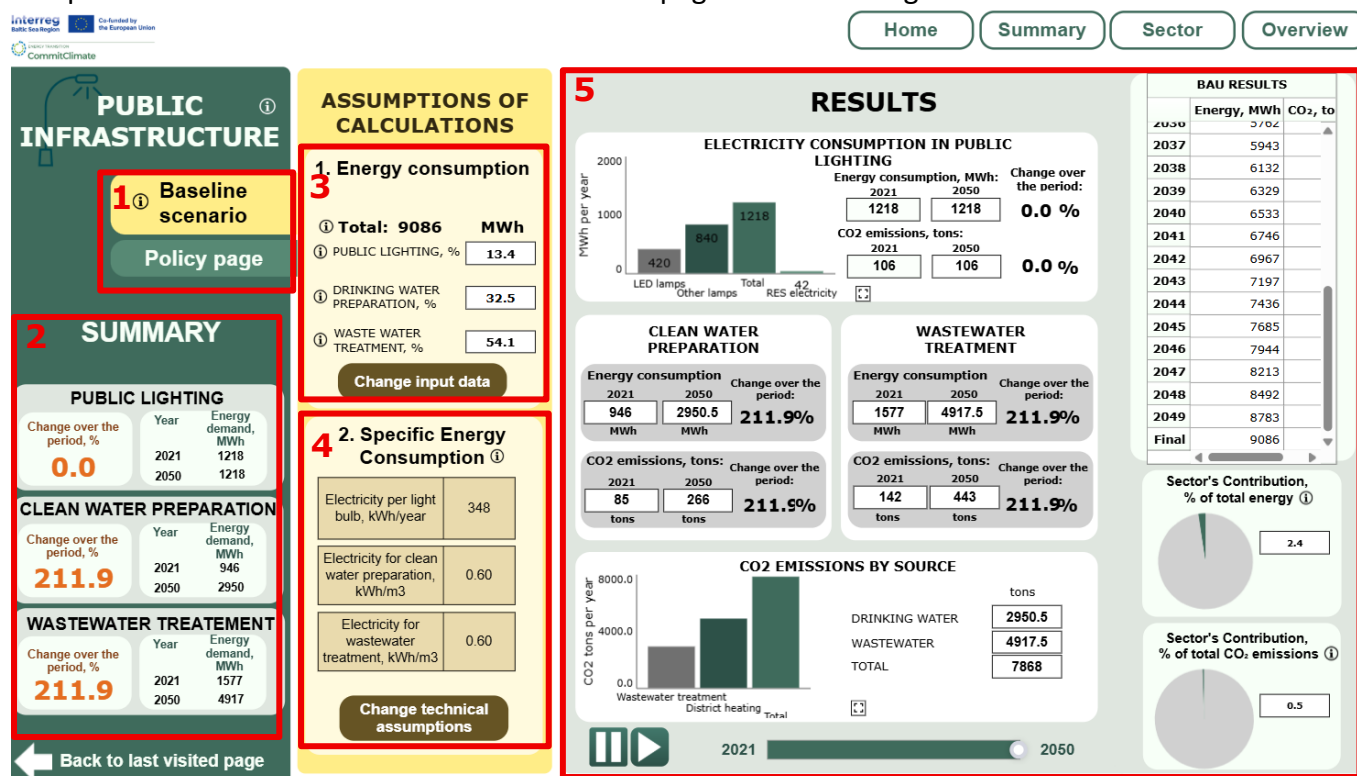


Fig.18. Public infrastructure page (baseline scenario)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Baseline Scenario* and the *Policy* page.

Sub-sector summary (2)

Displays energy demand (MWh/year) for public lighting, clean water preparation, and wastewater treatment in the baseline year and in 2050.

It also shows the percentage (%) change in energy demand resulting from population changes. Positive values indicate an increase, while negative values indicate a decrease.

Energy consumption (3)

Displays total energy consumption (MWh/year) in public infrastructure in 2050, along with its percentage (%) breakdown by category.

To modify these values, the user must update the *Input Data* page (Chapter 6.1.), accessible via the “Change input data” button.

Specific energy consumption (4)

Displays specific electricity consumption values for:

- public lighting (kWh/year per light bulb),
- clean water preparation (kWh/m³), and
- wastewater treatment (kWh/m³).

To modify these values, the user must update the *Technical Assumptions* page (Chapter 10.2.), accessible via the **“Change technical assumptions”** button.

NB! If the user does not make any changes to the technical parameters, built-in default values are used for calculations. Default values most often reflect national averages or are based on expert assumptions.

Results (5)

This section includes multiple visualizations:

- The top graph shows energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from public lighting, broken down by lighting type (LED lamps, other lamps, RES electricity, total).
- Adjacent fields display energy consumption and CO₂ emissions for the baseline year and 2050, as well as the percentage (%) change over the period.
- Below, two indicator fields present energy consumption and CO₂ emissions for clean water preparation and wastewater treatment, including baseline values, 2050 values, and percentage (%) change.
- The bottom graph shows CO₂ emissions (tCO₂/year) by source (public lighting, clean water preparation, wastewater treatment).

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050.

Below the table, two pie charts illustrate the sub-sector's contribution to total municipal energy consumption and CO₂ emissions (%).

10.2. Technical assumptions

The public infrastructure sector technical assumptions page is shown in Fig.19.

PUBLIC INFRASTRUCTURE

TECHNICAL ASSUMPTIONS ⓘ

1 Public lighting ⓘ

LED input power, W

Other lamp input power, W

Usage time, hours per year

2 Clean water preparation ⓘ

Units per capita m3 per day Change %/year

Unit electricity consumption kWh per m3 Change %/year

3 Wastewater treatment ⓘ

Units per capita m3 per day Change %/year

Unit electricity consumption kWh per m3 Change %/year

BAU RESULTS

	Energy, MWh	CO ₂ , tons
2036	1314,82	0
2037	1312,03	0
2038	1309,28	0
2039	1306,51	0
2040	1303,77	0
2041	1301,05	0
2042	1298,34	0
2043	1295,65	0
2044	1292,98	0
2045	1290,32	0
2046	1287,68	0
2047	1285,06	0
2048	1282,45	0
2049	1279,85	0
Final	1277,28	0

Sector's Contribution, % of total energy ⓘ

Sector's Contribution, % of total CO₂ emissions ⓘ

Back to last visited page

2023

Fig.19 Public infrastructure page (technical assumptions)

The *Public Infrastructure Technical Assumptions* page consists of the following sections:

Public lighting (1)

The user specifies:

- input power (W) for LED lamps and other lamps in the municipality's public lighting system, and
- average operating time (h/year).

Clean water preparation (2)

The user defines:

- average clean water consumption per capita (m³/capita/day), and
- average electricity consumption (kWh/m³) required to produce 1 m³ of clean water.

If relevant factors influencing water or electricity consumption are known, projected changes (%/year) can be specified in the corresponding fields.

Wastewater treatment (3)

The user defines:

- average wastewater generation per capita ($\text{m}^3/\text{capita}/\text{day}$), and
- average electricity consumption (kWh/m^3) required to treat 1 m^3 of wastewater.

If relevant factors influencing wastewater generation or electricity consumption are known, projected changes ($\%/ \text{year}$) can be specified in the corresponding fields.

Results (4)

On the right-hand side of the page, a table presents annual values for energy consumption (MWh/year) and CO_2 emissions (tCO_2/year) in public infrastructure from the baseline year until 2050.

Below the table, two pie charts illustrate the sub-sector's contribution to total municipal energy consumption and CO_2 emissions ($\%$).

After defining all technical assumptions, the user can return to the *Baseline Scenario* page by selecting **"Back to last visited page"** in the lower-left corner and proceed to the *Policy* page (Chapter 10.3.).

10.3. Policies

The residential building policy page is shown in Fig. 20.

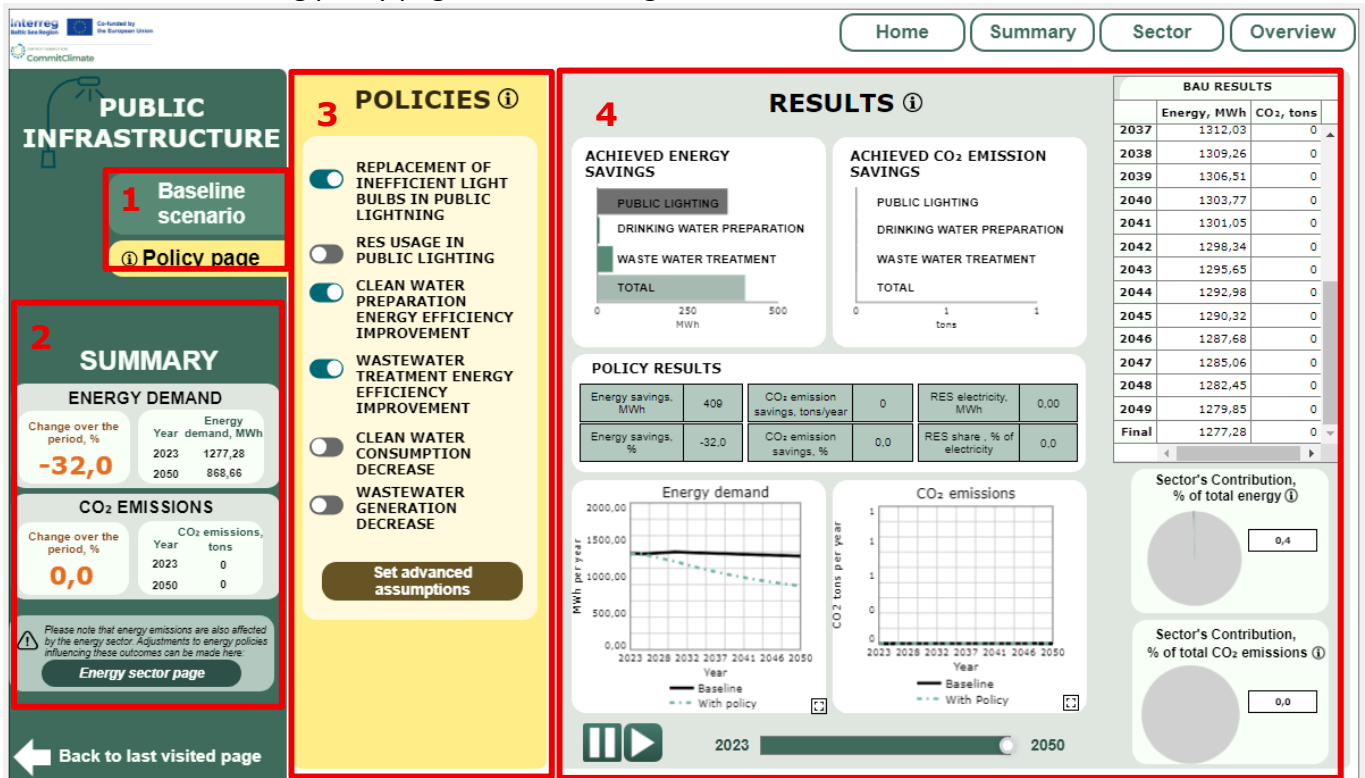


Fig.20. Public infrastructure page (policies)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Policy* page and the *Baseline Scenario*.

Sub-sector summary (2)

Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in public infrastructure for the baseline year and for 2050 under the policy scenario.

It also shows the percentage (%) change in energy demand and emissions. Positive values indicate an increase, while negative values indicate a decrease.

Policies (3)

This section contains a list of policies applicable to the public infrastructure sector. Policies can be enabled or disabled using toggle buttons (a policy is active when the switch is green).

The available policies include:

- Replacement of inefficient light bulbs in public lighting
- RES use in public lighting
- Energy efficiency improvement in clean water preparation

- Energy efficiency improvement in wastewater treatment
- Reduction of clean water consumption
- Reduction of wastewater generation

Each policy includes default values for implementation speed and implementation period (start and end years).

To modify these parameters, the user must access the *Policy Assumptions* page (Chapter 10.4.) by selecting the **“Set advanced assumptions”** button.

Results (4)

This section includes multiple visualizations:

- The top graphs show achieved energy savings (MWh/year) and CO₂ emission savings (tCO₂/year) for public lighting, clean water preparation, and wastewater treatment, as well as total savings for the public infrastructure sector.
- The policy results section below presents:
 - energy savings (MWh/year and % compared to the baseline year),
 - CO₂ emission savings (tCO₂/year and %), and
 - renewable electricity use (MWh/year) and its share (%) in total electricity consumption.
- At the bottom of the page, two graphs show changes in energy demand (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted teal line).

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) under the policy scenario.

Below the table, two pie charts illustrate the sub-sector’s contribution to total municipal energy consumption and CO₂ emissions (%).

10.4. Policy assumptions

The public infrastructure policy assumptions page is shown in Fig. 21.

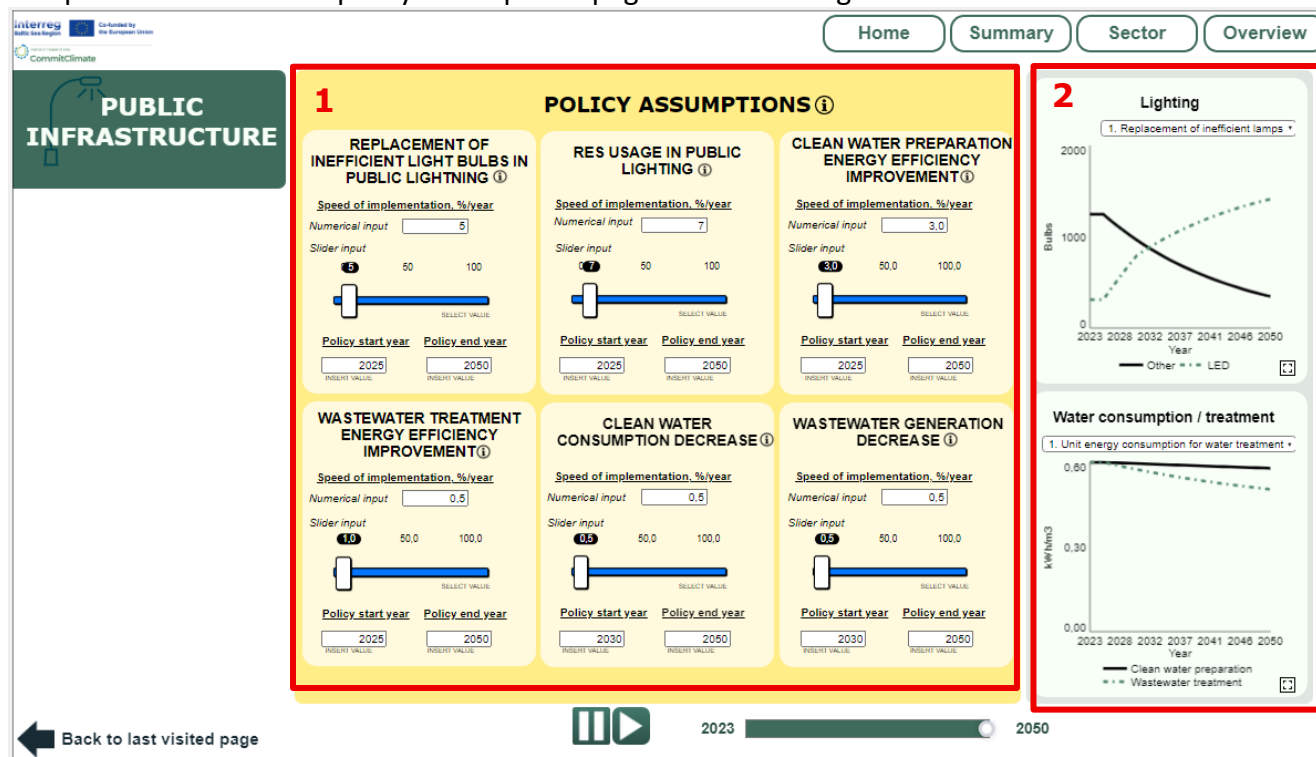


Fig.21. Public infrastructure page (policy assumptions)

Policy assumptions (1)

On this page, the user can adjust the **policy implementation speed (%/year)** either by using the slider or by entering the value manually in the numerical input field. The **policy implementation start and end years** can be defined using the numerical inputs below the sliders.

Results (2)

On the right-hand side of the page, two graphs are displayed:

- The first graph shows either:
 - the replacement of light bulbs (number of bulbs) in the municipality's public lighting system over time, where the dotted green line represents LED bulbs and the solid black line represents other bulbs, or
 - the installation of RES-based lighting, where the solid line represents standard LED bulbs and the dotted line represents LED bulbs powered by renewable energy sources.

The displayed parameters can be changed using the drop-down menu in the upper-right corner of the graph.

- The second graph shows either:
 - electricity consumption (kWh/m³) for clean water preparation (solid black line) and wastewater treatment (dotted green line), or

- clean water consumption (m³/capita/day) (solid line) and wastewater generation (m³/capita/day) (dotted line),
- over time. The displayed parameters can also be changed using the drop-down menu in the upper-right corner of the graph.

After adjusting the policies, the user can return to the *Policy Scenario* page by selecting **“Back to last visited page”** to evaluate how the changes have affected the results.

11. Other sectors

11.1. Baseline scenario

The other sectors baseline scenario page is shown in Fig.22.

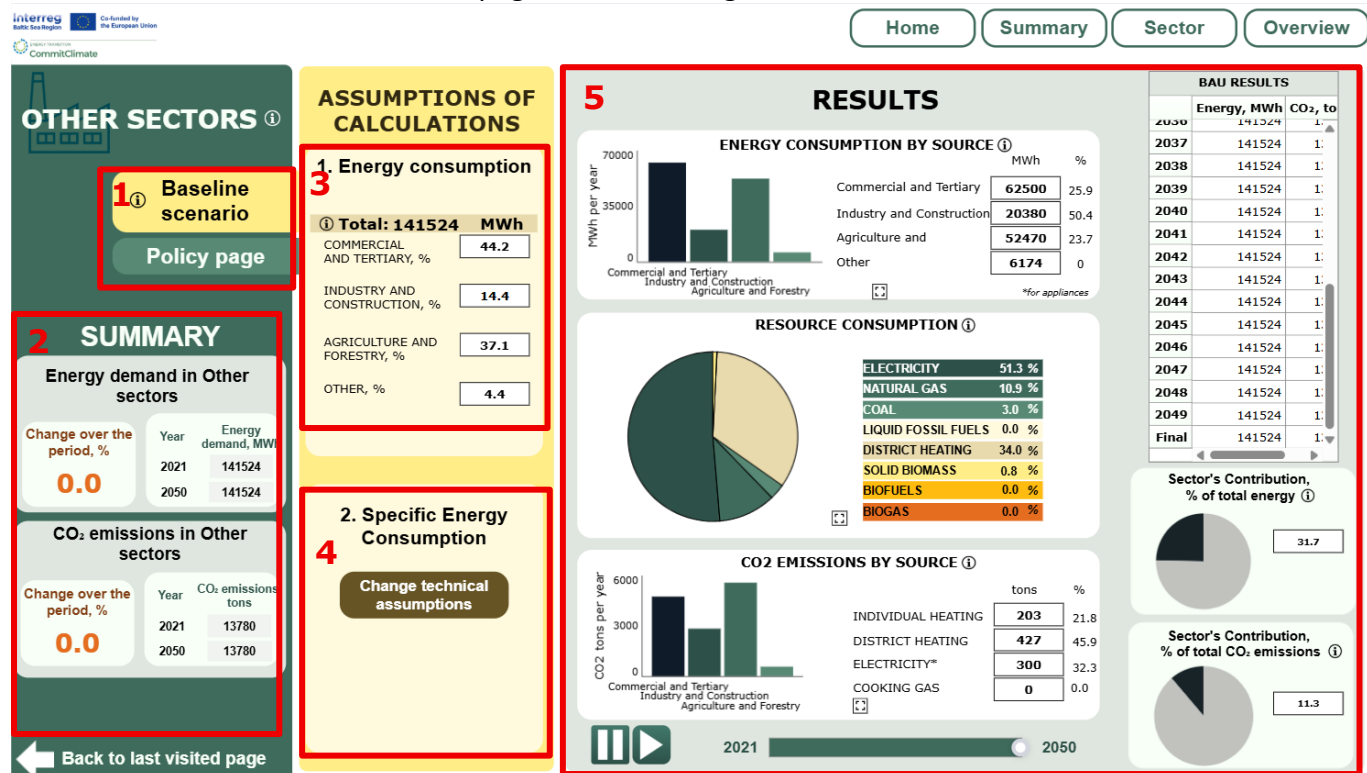


Fig.22. Other sectors page (baseline scenario)

The *Other Sectors* baseline scenario page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Baseline Scenario* and the *Policy page*.

Sub-sector summary (2)

Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in other sectors for the baseline year and for 2050.

It also shows the percentage (%) change in energy demand and emissions resulting from changes in activity levels (e.g., economic development or sector growth). Positive values indicate an increase, while negative values indicate a decrease.

Energy consumption (3)

Displays total energy consumption (MWh/year) in other sectors in 2050, along with its percentage (%) breakdown by sector.

These values are calculated based on input data defined in the *Other Sectors Technical Assumptions* page (Chapter 11.2.). To modify these assumptions, the user can access this page by selecting the “**Change technical assumptions**” button.

Specific energy consumption (4)

Provides access to the underlying assumptions related to energy consumption in each sector. This section allows the user to review and adjust sector-specific energy use parameters.

NB! If the user does not make any changes to the technical parameters, built-in default values are used for calculations. Default values most often reflect national averages or are based on expert assumptions.

Results (5)

This section includes three graphs:

- The first graph shows energy consumption (MWh/year) by sector, presented as both absolute values and shares (%) of total energy consumption.
- The second graph shows the distribution of energy consumption by energy source (electricity, natural gas, coal, liquid fossil fuels, district heating, solid biomass, biofuels, biogas), expressed as percentages.
- The third graph shows CO₂ emissions (tCO₂/year) by sector, presented as both absolute values and shares (%) of total emissions.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050.

Below the table, two pie charts illustrate the sub-sector's contribution to total municipal energy consumption and CO₂ emissions (%).

11.2. Technical assumptions

The other sectors technical assumptions page is shown in Fig.23.

OTHER SECTORS

TECHNICAL ASSUMPTIONS

1 Sector: Commercial and Tertiary

2 Energy consumption by type, MWh/year

TOTAL: 114139 MWh /year

3 Projected change in energy consumption

4 RES energy generation

5 Energy demand in Other sectors by type

6 Energy demand in Other sectors by energy carrier

Year	Electricity	Natural gas	Coal	Liquid fossil fuel
2038	14588	920	0	0
2039	14749	920	0	0
2040	14911	920	0	0
2041	15075	920	0	0
2042	15241	920	0	0
2043	15408	920	0	0
2044	15577	920	0	0
2045	15748	920	0	0
2046	15920	920	0	0
2047	16095	920	0	0
2048	16270	920	0	0
2049	16448	920	0	0
Final	16628	920	0	0

Fig.23. Other sectors page (technical assumptions)

The *Other Sectors Technical Assumptions* page consists of the following sections:

Sector (1)

The user selects a sector (Commercial and Tertiary, Industry and Construction, Agriculture and Forestry, Other) from the drop-down menu. All inputs and results on this page correspond to the selected sector.

Energy consumption (2)

The user defines energy consumption (MWh/year) for each energy source (electricity, natural gas, coal, liquid fossil fuels, district heating, solid biomass, biofuels, biogas) in the selected sector.

The total energy consumption is automatically calculated and displayed in the upper-right corner of this section. This step must be repeated for each sector.

Projected change (3)

If changes in energy consumption are expected over time, the user can specify the annual rate of change (%/year) for the selected sector. Positive values indicate an increase, while negative values indicate a decrease. The user must also specify the period (start year and end year) during which this change in energy consumption is expected to occur for the selected sector.

By selecting the button “Use RES to cover the projected energy demand increase”, an additional input field appears, allowing the user to define what share of the increased energy demand will be covered by renewable energy sources (RES). This share is then assigned an emission factor of 0 tCO₂/MWh. If this option is not selected, the increase in energy demand is distributed according to the initial fuel mix defined in the baseline assumptions, and the corresponding emission factors are applied accordingly.

If these changes are assumed to result from energy efficiency policies, they should instead be reflected in the *Policy* page (Chapter 11.4.).

RES energy generation (4)

If renewable energy sources are used in other sectors, the user can specify either:

- installed capacity (kW), or
- generated energy (MWh/year),

for technologies such as solar photovoltaics, solar collectors, and wind turbines. These values are subtracted from the total sector energy consumption in the baseline scenario.

Results (5)

This section includes two graphs:

- The first graph (left side) shows energy demand (MWh/year) in other sectors, broken down by energy carrier (district heating, electricity, biomass, natural gas, other fossil fuels). The user can switch between sectors by selecting the corresponding tab.
- The second graph shows the percentage (%) distribution of energy consumption by energy source for the selected sector. The displayed sector can be changed using the drop-down menu in the upper-right corner of the graph.

Energy demand graph (6) – On the left side of the page energy demand in other sectors divided by energy carrier is available. User can switch between sectors by choosing corresponding tab on top of the table.

After defining all technical assumptions, the user can return to the *Baseline Scenario* page by selecting “**Back to last visited page**” in the lower-left corner and proceed to the *Policy* page (Chapter 11.3.).

11.3. Policies

The *Other Sectors Policy Page* is shown in Fig.24.

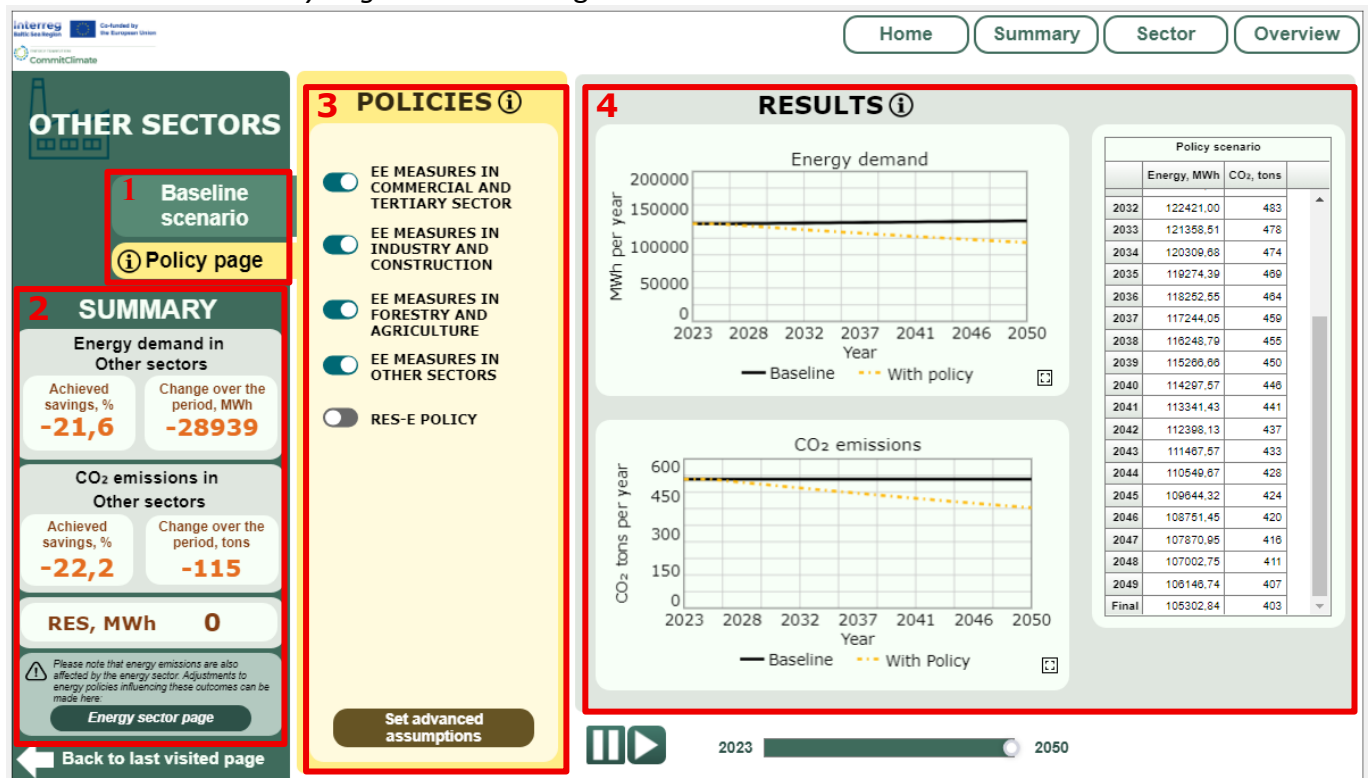


Fig.24. Other sectors page (policies)

Other sectors – policy page

This page consists of the following sections:

1) Navigation buttons – Used to switch between the *Policy* page and the *Baseline Scenario*.

2) Sub-sector summary – Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in other sectors for the baseline year and for 2050 under the policy scenario.

It also shows the percentage (%) change in energy demand and emissions. Positive values indicate an increase, while negative values indicate a decrease. If applicable, the amount of energy produced from renewable sources (MWh/year) is shown below.

3) Policies – This section contains a list of policies applicable to the other sectors. Policies can be enabled or disabled using toggle buttons (a policy is active when the switch is green).

The available policies include:

- Energy efficiency measures in the Commercial and Tertiary sector
- Energy efficiency measures in Industry and Construction
- Energy efficiency measures in Agriculture and Forestry
- Energy efficiency measures in Other sectors
- RES-E policy

Each policy includes default values for implementation speed and implementation period (start and end years).

To modify these parameters, the user must access the *Policy Assumptions* page (Chapter 11.4.) by selecting the **“Set advanced assumptions”** button.

4) Results – This section includes two graphs:

- The first graph shows energy demand (MWh/year) in other sectors from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted yellow line).
- The second graph shows CO₂ emissions (tCO₂/year) over the same period, also comparing baseline and policy scenarios.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050 under the policy scenario.

11.4. Policy assumptions

The other sectors policy assumptions page is shown in Fig.25

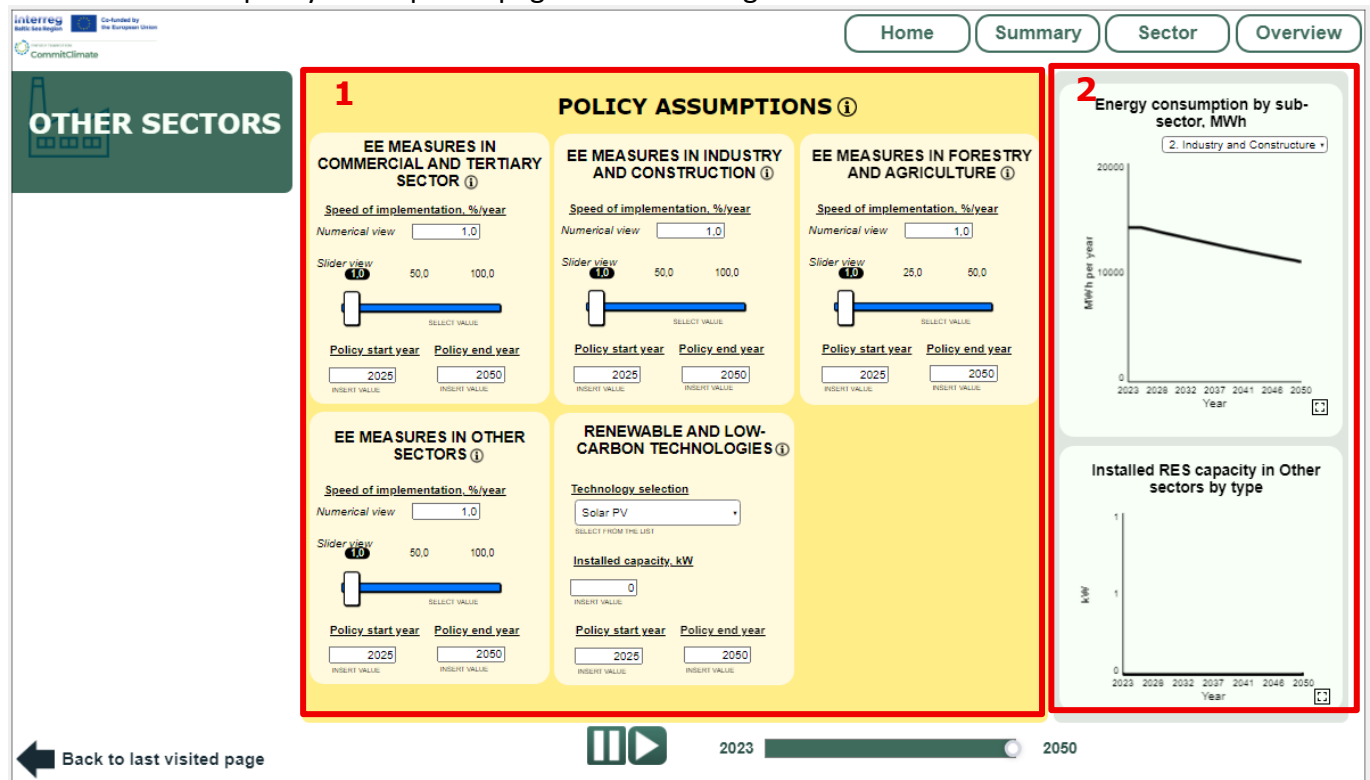


Fig.25. Other sectors page (policy assumptions)

Policy assumptions (1)

Across all sectors, **energy efficiency (EE) measures** are assumed to reduce energy demand in the respective sector.

On this page, the user can adjust:

- **policy implementation speed (%/year)**, either by using the slider or by entering the value manually in the numerical input field, and
- **policy implementation period (start and end years)** using the numerical inputs below the sliders.

Results (2)

On the right-hand side of the page, two graphs are displayed:

- The first graph shows energy consumption (MWh) by sub-sector. The user can switch between sectors using the drop-down menu.
- The second graph shows total installed renewable energy capacity (kW) in other sectors, broken down by energy type.

12. Municipality fleet

12.1. Baseline scenario

The municipality vehicle fleet baseline scenario page is shown in Fig.26.

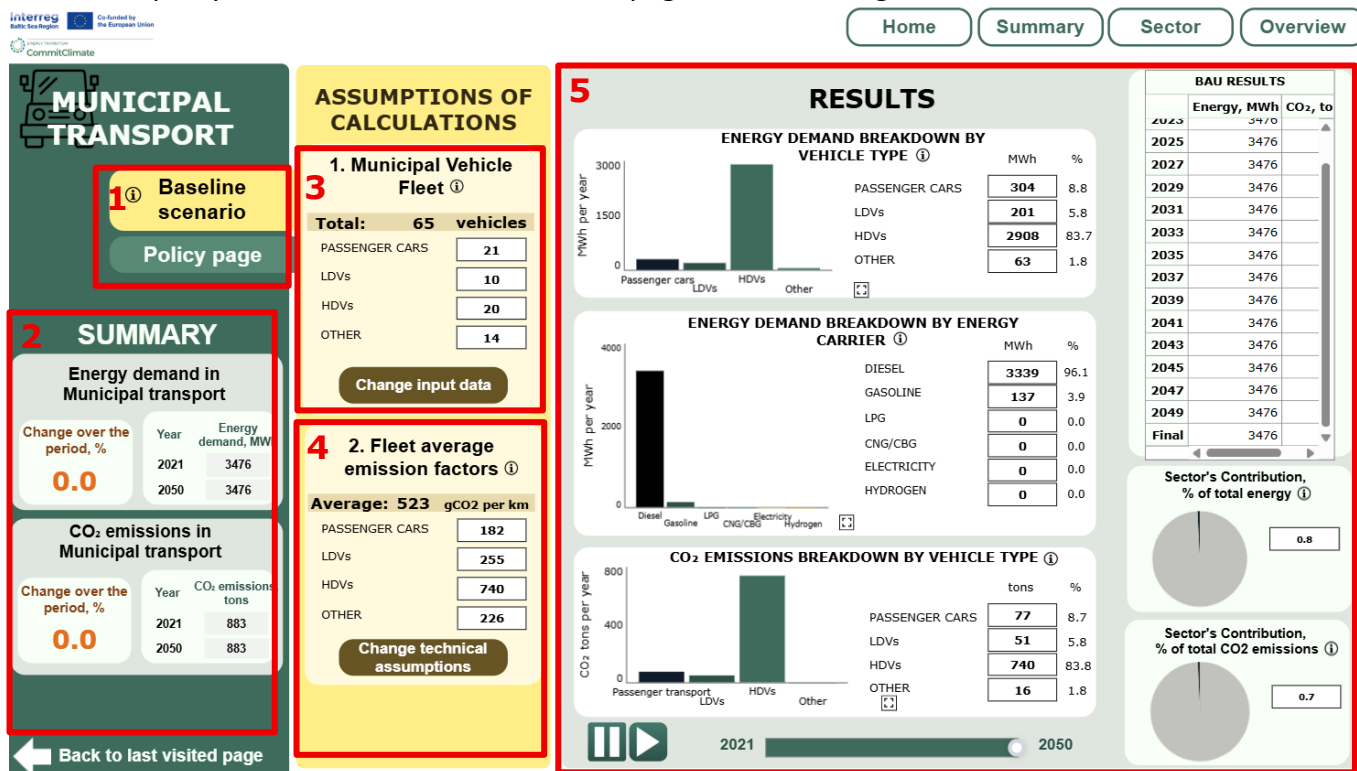


Fig.26. Municipality fleet page (baseline)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Baseline Scenario* and the *Policy* page.

Sub-sector summary (2)

Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in the municipal vehicle fleet for the baseline year and for 2050.

It also shows the percentage (%) change in energy demand and emissions resulting from changes in fleet composition, activity levels, or technology mix. Positive values indicate an increase, while negative values indicate a decrease.

Municipal vehicle fleet (3)

Displays the total number of vehicles in the municipal fleet, along with a breakdown by vehicle type (passenger cars, light-duty vehicles, heavy-duty vehicles, other).

To modify these values, the user must update the *Input Data* page (Chapter 6.1.), accessible via the **“Change input data”** button.

NB! If the user does not make any changes to the technical parameters, built-in default values are used for calculations. Default values most often reflect national averages or are based on expert assumptions.

Fleet average emission factors (4)

To modify these values, the user must update the *Technical Assumptions* page (Chapter 12.2.), accessible via the **“Change technical assumptions”** button.

Results (5)

This section includes three graphs:

- The first graph shows energy demand (MWh/year) by vehicle type, presented as both absolute values and shares (%) of total energy demand.
- The second graph shows energy demand (MWh/year) by energy carrier (diesel, gasoline, LPG, CNG/CBG, electricity, hydrogen), presented as both absolute values and shares (%).
- The third graph shows CO₂ emissions (tCO₂/year) by vehicle type, presented as both absolute values and shares (%) of total emissions in the municipal transport sector.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050.

Below the table, two pie charts illustrate the sub-sector's contribution to total municipal energy consumption and CO₂ emissions (%).

12.2. Technical assumptions

The municipal vehicle fleet technical assumptions page is shown in Fig.27.

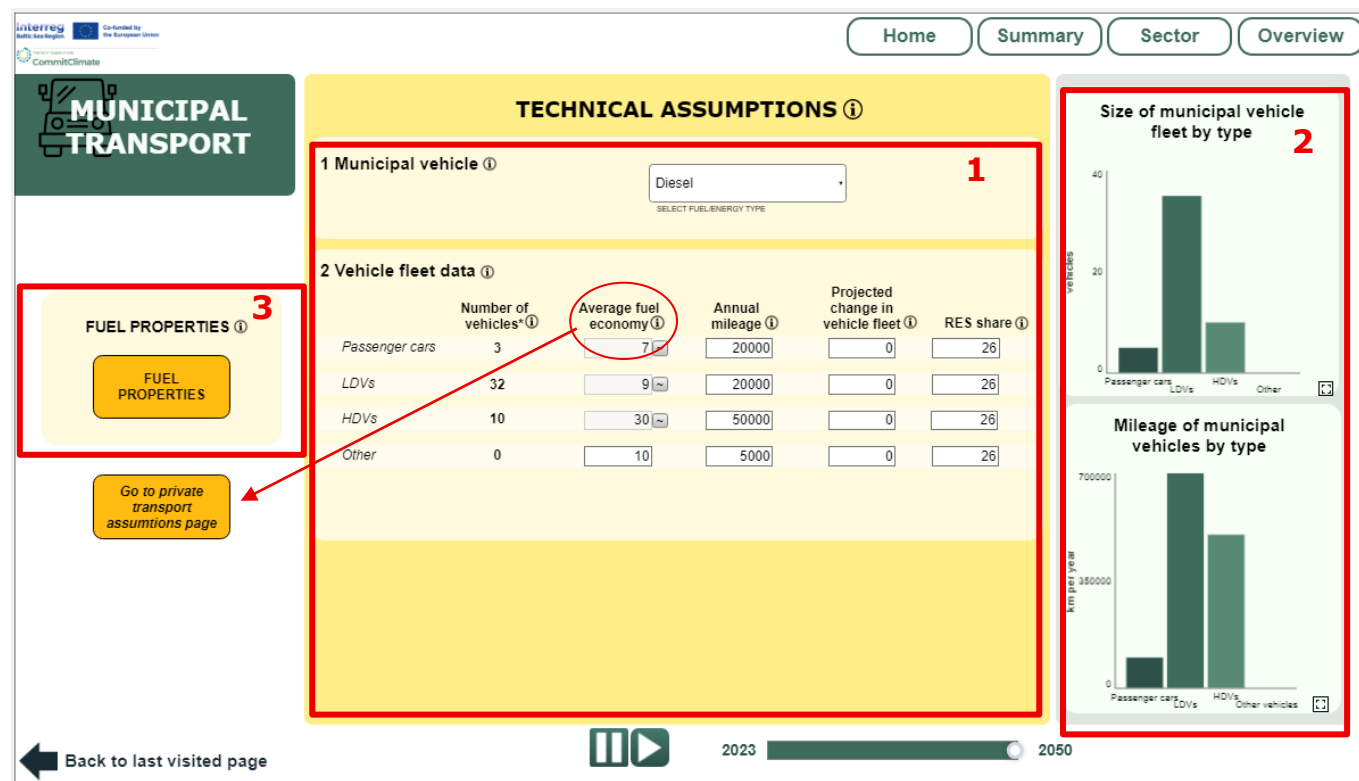


Fig.27. Municipality fleet page (technical assumptions)

Municipal vehicle (1)

The user selects a fuel/energy type (diesel, gasoline, LPG, CNG/CBG, electricity, hydrogen) from the drop-down menu. All parameters displayed on the page correspond to the selected fuel type.

Vehicle fleet data (2)

This section allows the user to define key parameters for vehicles using the selected fuel/energy type. It includes:

- Number of vehicles – Displays the number of municipal vehicles using the selected fuel type, based on data provided in the General Input Data section.
- Average fuel economy (l/100 km, kg/100 km, kWh/100 km) – The user can define the average energy consumption for each vehicle type.
- Annual mileage (km/year) – The user can define the average annual mileage for each vehicle type.
- Projected change in vehicle fleet (%/year) – The user can specify expected changes (increase or decrease) in the number of vehicles for each type over time.
- RES share (%) – Represents the share of renewable energy in the fuel mix. Default values correspond to national requirements but can be adjusted if needed.

These steps must be repeated for each fuel/energy type. If certain parameters are unknown, default values can be used.

Note: If no changes are made, some values may be marked with a specific icon indicating that they are inherited from the Private Transport assumptions (e.g., average fuel economy). If the same assumptions apply to both municipal and private transport, they can be defined only in the Private Transport section to avoid duplication.

Note: If changes made in the Private Transport section are not reflected, the user should select the “Reset value” option (see Chapter 1.2).

For easier navigation, a “Go to private transport assumptions page” button is available on the left-hand side of the page.

Results (3)

This section includes two graphs:

- The first graph shows the size of the municipal vehicle fleet by vehicle type.
- The second graph shows average annual mileage (km/year) by vehicle type.

Fuel properties (4)

Selecting this option opens a separate page (Fig. 28), where fuel-specific parameters used across the transport sector can be adjusted.

The screenshot displays the 'FUEL PROPERTIES' page within the CommitClimate interface. On the left, a dark green sidebar contains the text 'TRANSPORT FUEL'. The main content area has a yellow header 'FUEL PROPERTIES' and a table with three columns: 'Emission factor, tCO₂/MWh', 'Energy density, MWh/t', and 'Fuel density, kg/l'. The table lists various fuels with their respective values. Some values are in input fields, and some are marked with a tilde (~) indicating they are inherited. At the bottom left, there is a 'Back to last visited page' button with a left-pointing arrow. At the top right, there are navigation buttons: 'Home', 'Summary', 'Sector', and 'Overview'.

	Emission factor, tCO ₂ /MWh	Energy density, MWh/t	Fuel density, kg/l
Diesel	0,266	12,0	0,847
Biodiesel	0,002	9,3	0,890 ~
Gasoline	0,256	11,8	0,750
Biogasoline	0,002	8,0	0,794 ~
CNG	0,202	13,3	
CBG	0,001	13,3	
Hydrogen	0,203	33,3	
Biohydrogen	0,000	33,3	
Biofuel	0,000	9,2	0,890
LPG	0,000	12,9	0,520
RES electricity	0,000		

Fig. 28. Fuel properties page

On this page, the user can define:

- emission factors (tCO₂/MWh),
- energy density (MWh/t), and
- fuel density (kg/l),

for each fuel type (diesel, biodiesel, gasoline, biogasoline, CNG, CBG, hydrogen, biohydrogen, biofuels).

Note: Fuel properties apply to all transport sub-sectors within the simulator.

After defining all technical assumptions, the user can return to the *Baseline Scenario* page by selecting **“Back to last visited page”** in the lower-left corner and proceed to the *Policy* page (Chapter 12.3.).

12.3. Policies

The municipal vehicle fleet policy scenario page is shown in Fig.29.

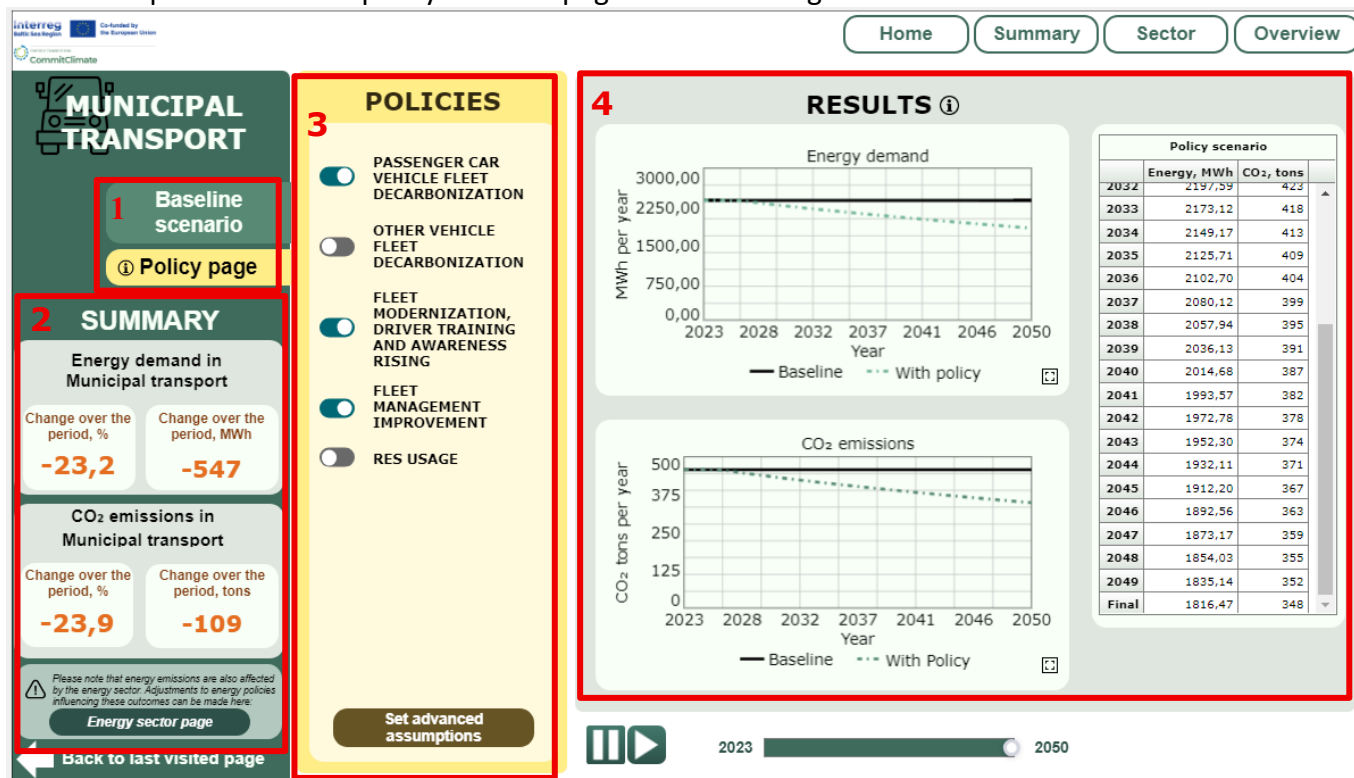


Fig.29. Municipality fleet page (policies)

This page consists of the following sections:

Navigation buttons (1) – Used to switch between the *Policy* page and the *Baseline Scenario*.

Sub-sector summary (2) – Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in the municipal vehicle fleet for the baseline year and for 2050 under the policy scenario.

It also shows the percentage (%) change in energy demand and emissions. Positive values indicate an increase, while negative values indicate a decrease.

Note: Transport-related energy consumption and emissions are also influenced by the energy sector. Decarbonization of electricity and heat supply can lead to a reduction in CO₂ emissions even if no building-specific policies are applied.

Policies (3) – This section contains a list of policies applicable to the municipal transport fleet. Policies can be enabled or disabled using toggle buttons (a policy is active when the switch is green).

The available policies include:

- Passenger car fleet decarbonization
- Other vehicle fleet decarbonization
- Fleet modernization, driver training, and awareness raising

- Fleet management improvement
- Renewable energy (RES) use

Each policy includes default values for implementation speed and implementation period (start and end years).

To modify these parameters, the user must access the *Policy Assumptions* page (Chapter 12.4.) by selecting the **“Set advanced assumptions”** button.

Results (4) – This section includes two graphs:

- The first graph shows energy demand (MWh/year) in municipal vehicles from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted teal line).
- The second graph shows CO₂ emissions (tCO₂/year) over the same period, also comparing baseline and policy scenarios.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050 under the policy scenario.

12.4. Policy assumptions

The municipal transport policy assumptions page is shown in Fig. 30.

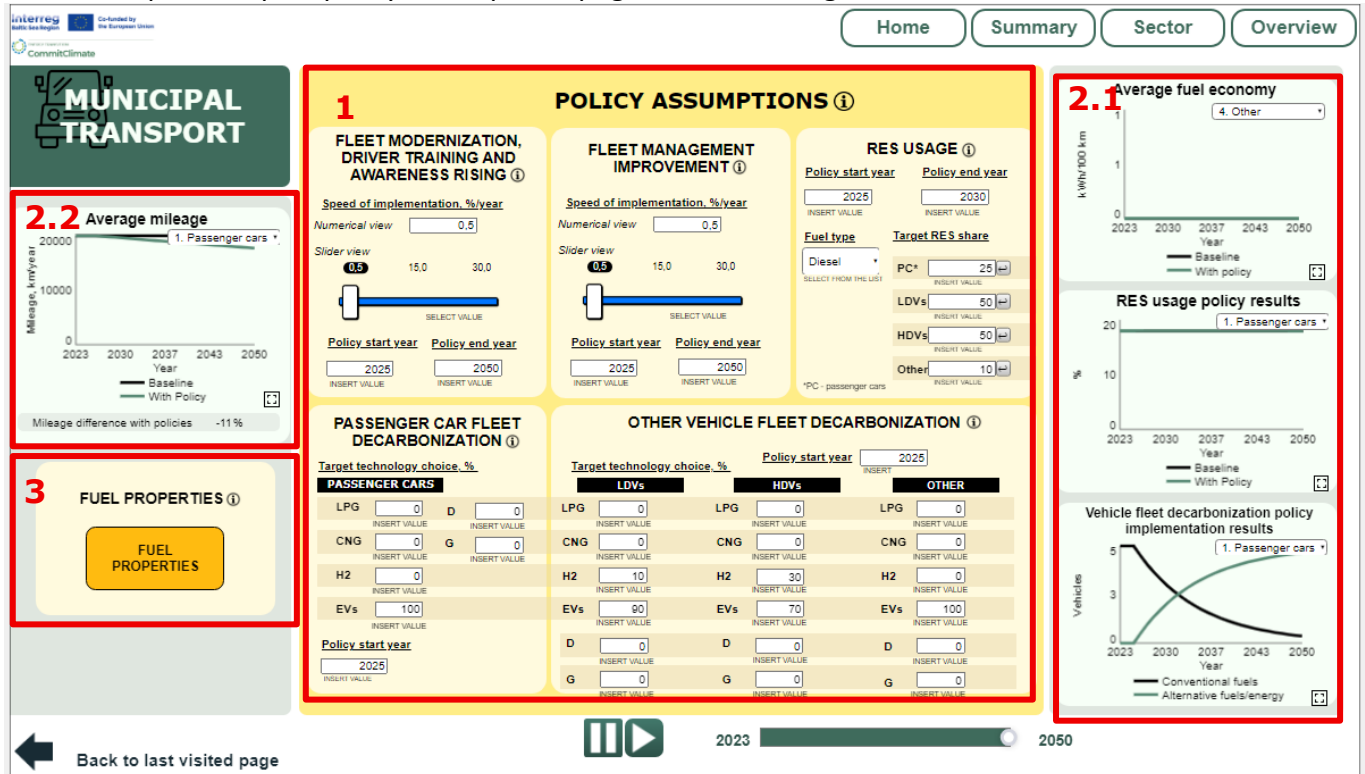


Fig.30. Municipality fleet page (policy assumptions)

On this page, the user can adjust policy parameters for the municipal vehicle fleet:

Policy assumptions (1):

1) Fleet modernization and management policies – The user defines:

- **implementation speed (%/year)**, either by using the slider or entering the value manually, and
- **implementation period (start and end years)** using the numerical inputs below the sliders.

2) RES usage policy – The user selects a fuel type and defines:

- target RES share (%) for each vehicle type, and
- implementation period (start and end years).

3) Fleet decarbonization policies – The user defines:

- target shares (%) of low- and zero-emission fuels (LPG, CNG, hydrogen, electricity) for each vehicle type, and
- policy implementations start year.

Results (2):

(2.1.) On the **right-hand side** of the page, three graphs are displayed:

- The first graph shows average fuel economy (kWh/100 km).
- The second graph shows RES usage (%).
- The third graph shows fleet decarbonization progress (%).

(2.2) On the **left-hand side** of the page, a graph displays average annual mileage (km/year) for each vehicle type from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (teal line).

The displayed vehicle type can be changed using the drop-down menu in the upper-right corner of the graph.

Fuel properties (3):

Below the graph, the **“Fuel properties”** button provides access to the *Fuel Properties* page, where parameters such as emission factors and energy density can be adjusted (Chapter 12.2.).

All graphs display results over time from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (teal line). The displayed vehicle type can be changed using the drop-down menu in the upper-right corner of each graph.

After adjusting the policies, the user can return to the *Policy Scenario* page by selecting **“Back to last visited page”** to evaluate the impact of the changes.

13. Public transport

13.1. Baseline scenario

The public transport baseline scenario page is shown in Fig.31.

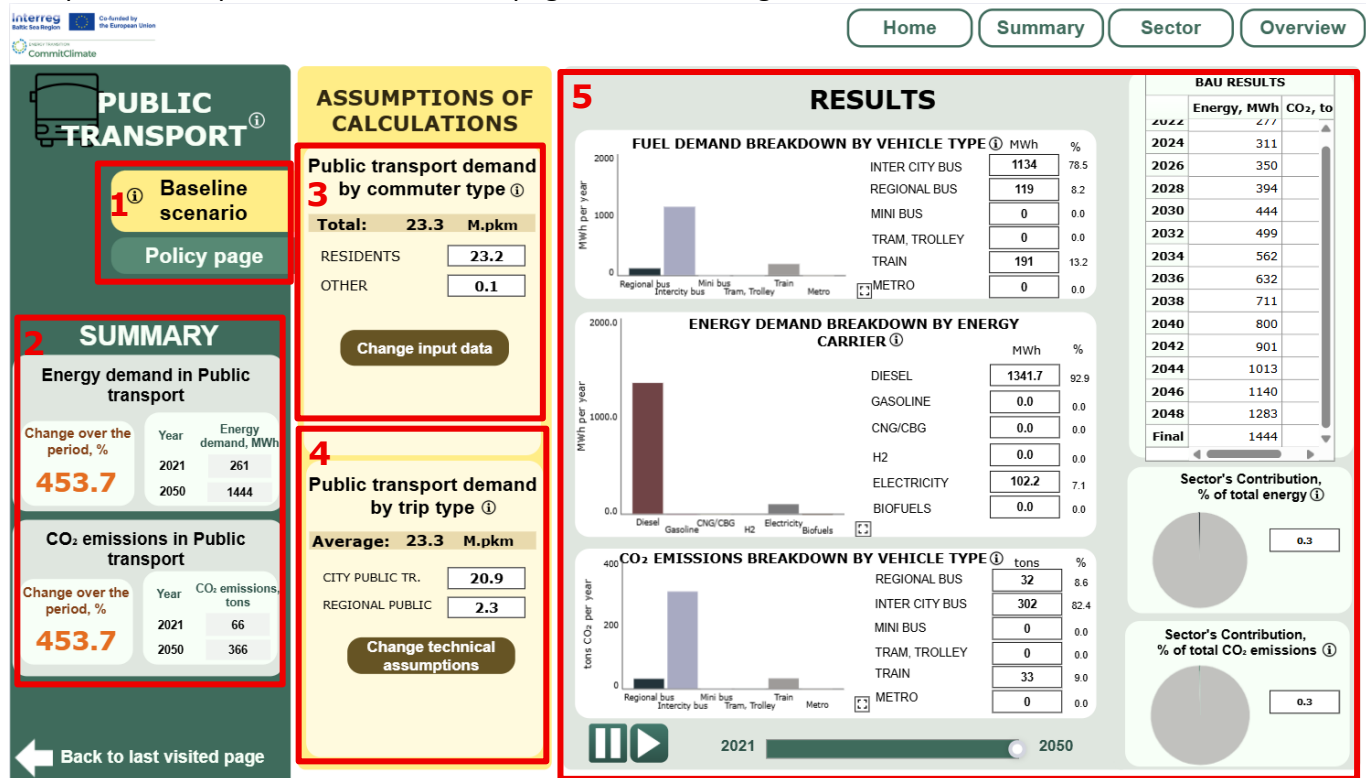


Fig.31. Public transport page (baseline)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Baseline Scenario* and the *Policy* page.

Sub-sector summary (2)

Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in the public transport sector for the baseline year and for 2050.

It also shows the percentage (%) change in energy demand and emissions resulting from changes in transport demand (e.g., population dynamics and travel patterns). Positive values indicate an increase, while negative values indicate a decrease.

Public transport demand by commuter type (3)

Displays total passenger travel demand (million pkm/year) in public transport, along with a breakdown by commuter type (municipality residents and other commuters).

These values are calculated based on data provided in the *Travel Input Data* page (Chapter 6.1 and 6.3.), accessible via the **“Change input data”** button.

Public transport demand by trip type (4)

Displays total passenger travel demand (million pkm/year) in public transport, along with a breakdown by trip type (inner-city trips and regional trips).

To modify these values, the user must update the *Technical Assumptions* page (Chapter 13.2.), accessible via the **“Change technical assumptions”** button.

NB! If the user does not make any changes to the technical parameters, built-in default values are used for calculations. Default values most often reflect national averages or are based on expert assumptions.

Results (5)

This section includes three graphs:

- The first graph shows energy demand (MWh/year) by vehicle type (intercity bus, regional bus, minibuss, tram/trolley, train, metro), presented as both absolute values and shares (%) of total energy demand.
- The second graph shows energy demand (MWh/year) by energy carrier (diesel, gasoline, LPG, CNG/CBG, electricity, hydrogen), presented as both absolute values and shares (%).
- The third graph shows CO₂ emissions (tCO₂/year) by vehicle type, presented as both absolute values and shares (%) of total emissions in public transport.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050.

Below the table, two pie charts illustrate the sub-sector's contribution to total municipal energy consumption and CO₂ emissions (%).

13.2. Technical assumptions

The public transport technical assumptions page is shown in Fig.32.

1 PUBLIC TRANSPORT

2 FUEL PROPERTIES

1 TECHNICAL ASSUMPTIONS

RESIDENTS

1 A City vs Regional public transport (residents), %

City: 70 Regional: 30

2 A City public transport mode choice (residents), %

Bus: 100 Mini bus: 0 Tram, trolley: 0 Metro: 0

3 A Regional public transport mode choice (residents), %

Regional Bus: 50 Train: 50

4 Technical Assumptions about Public transport vehicle fleet

Regional bus

Occupancy, %: 50

OTHER COMMUTERS

1 B City vs Regional public transport (other commuters), %

City: 70 Regional: 30

2 B City public transport mode choice (other commuters), %

Bus: 100 Mini bus: 0 Tram, trolley: 0 Metro: 0

3 B Regional public transport mode choice (residents), %

Regional Bus: 50 Train: 50

Technology, %	Fuel economy	RES share, %
Diesel: 40	40	26
Biofuel: 35	40	100
CNG/CBG: 10	20	90
Electricity: 15	200	98
H2: 0	5	0

Back to last visited page

2023 2050

Fig.32. Public transport page (technical assumptions)

This page consists of the following sections:

Technical assumptions (1)

- 1) City vs regional transport** – The user defines the shares (%) of city and regional trips for both municipality residents and other commuters.
- 2) City public transport mode choice**– The user specifies the distribution of travel demand (%) for residents and other commuters across different public transport modes used in city trips (bus, minibus, tram/trolley, metro).

Values can be entered either manually or using a pie chart interface, which can be enabled via the “Use allocation input” option.

The total share must equal 100%; otherwise, the simulator will not function correctly.

- 3) Regional public transport mode choice** – The user specifies the distribution of travel demand (%) for residents and other commuters across public transport modes used in regional trips (regional bus, train).
- 4) Technical assumptions** – The user selects a public transport vehicle type from the drop-down menu and defines:
 - average occupancy (%),
 - fuel mix (%) for each fuel type,

- fuel economy (litters/100 km (liquid fuel), kg/100 km (CNG/CBG, H2), kWh/100 km (electricity)), and
- RES share (%) for each fuel type.

These steps must be repeated for each vehicle type. If certain parameters are unknown, default values may be used.

Fuel properties (2)

Selecting this option opens the *Fuel Properties* page (Chapter 11.3), where the user can adjust parameters such as emission factors and energy density for each fuel type used in the simulator.

After defining all technical assumptions, the user can return to the *Baseline Scenario* page by selecting **“Back to last visited page”** in the lower-left corner and proceed to the *Policy* page (Chapter 13.3.).

13.3. Policies

The public transport policy page is shown in Fig.33.

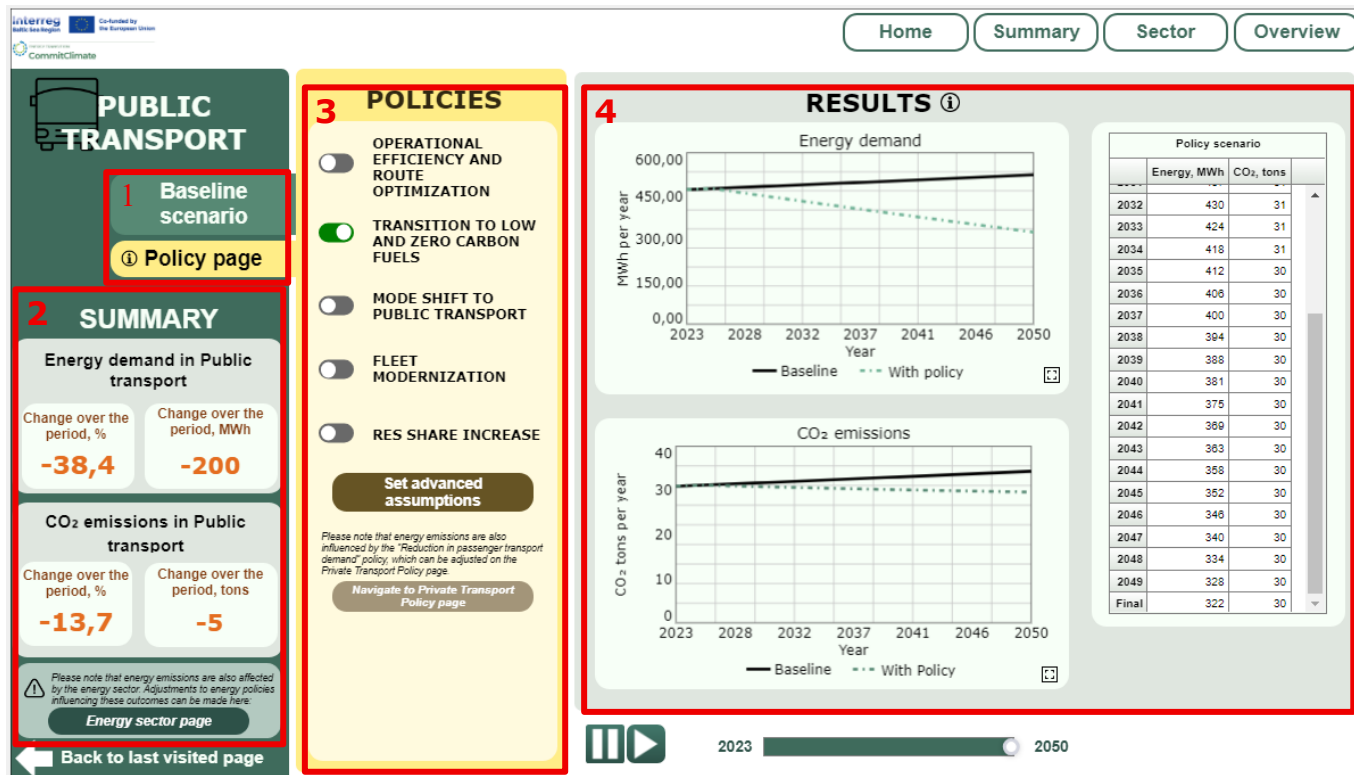


Fig.33. Public transport page (policies)

This page consists of the following sections:

Navigation buttons (1) – Used to switch between the *Policy* page and the *Baseline Scenario*.

Sub-sector summary (2) – Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in public transport for the baseline year and for 2050 under the policy scenario.

It also shows the percentage (%) change in energy demand and emissions. Positive values indicate an increase, while negative values indicate a decrease.

Note: Transport-related energy consumption and emissions are also influenced by the energy sector. Decarbonization of electricity and heat supply can lead to a reduction in CO₂ emissions even if no building-specific policies are applied.

Policies (3) – This section contains a list of policies applicable to the public transport sector. Policies can be enabled or disabled using toggle buttons (a policy is active when the switch is green).

The available policies include:

- Operational efficiency and route optimization
- Transition to low- and zero-carbon fuels
- Mode shift to public transport

- Fleet modernization
- Increase in RES share

Each policy includes default values for implementation speed and implementation period (start and end years).

To modify these parameters, the user must access the *Policy Assumptions* page (Chapter 13.4.) by selecting the **“Set advanced assumptions”** button.

Note: Public transport energy demand and emissions are also influenced by the “Reduction in passenger transport demand” policy available in the *Private Transport Policy* page.

When this policy is enabled, a notification is displayed on this page, along with a navigation button that redirects the user directly to the *Private Transport Policy* page, where the policy can be enabled/disabled and its assumptions adjusted.

Results (4) – This section includes two graphs:

- The first graph shows energy demand (MWh/year) in public transport from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted teal line).
- The second graph shows CO₂ emissions (tCO₂/year) over the same period, also comparing baseline and policy scenarios.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050 under the policy scenario.

13.4. Policy assumptions

The public transport policy assumptions page is shown in Fig. 34.

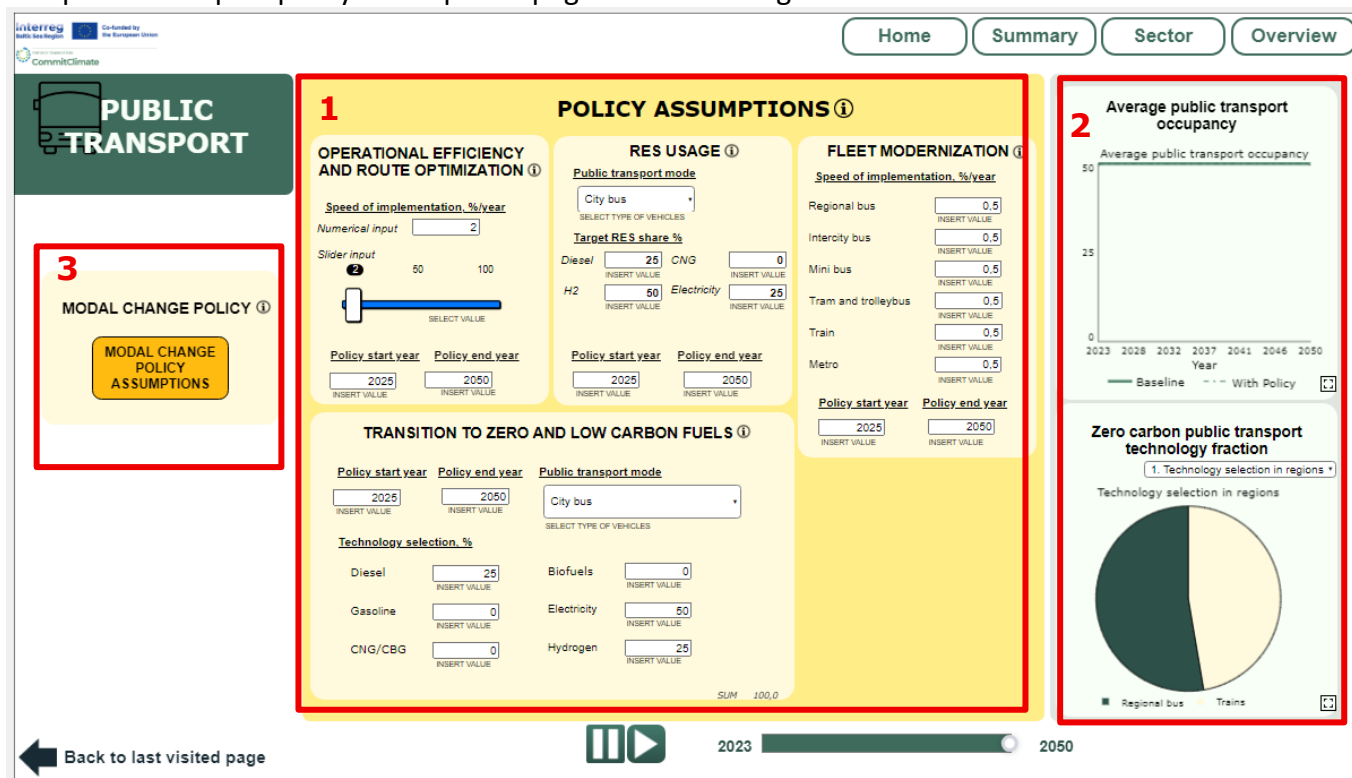


Fig.34. Public transport page (policy assumptions)

On this page, the user can adjust policy parameters for the public transport sector.

Policy assumptions (1):

1) Operational efficiency policy – The user defines:

- implementation speed (%/year), using either the slider or manual input, and
- implementation period (start and end years).

The operational efficiency and route optimization policy affects the public transport occupancy rate specified by the user. The speed at which vehicle occupancy improves, as well as the year in which these improvements begin, can be specified in the Policy Assumptions View in the Public Transport sector

2) RES usage policy – The user selects a vehicle type and defines:

- target RES share (%) for each low- and zero-carbon fuel type, and
- implementation period (start and end years).

The RES usage policy applies to RES electricity production in public transport infrastructure (for example, integrated with electric charging). The user can specify the target share and the period in which it is achieved.

3) Fleet modernization policy – The user defines:

- implementation speed (%/year) for each vehicle type, and

- implementation period (start and end years).

The fleet modernization policy defines the annual rate at which energy consumption (MWh/pkm) decreases over the selected period when this policy is applied.

4) Transition to low- and zero-carbon fuels policy – The user selects a vehicle type and defines:

- fuel share (%) for each fuel type, and
- implementation period (start and end years).

This policy means that the existing traditional fuel in the fleet is replaced by alternative fuels. In the Policy Assumptions View, the user can specify which of the alternative fuels to use (CNG, H2, biofuels EVs), in which year to start the fuel conversion and at what speed the fuel replacement occurs.

Results (2):

On the **left-hand side** of the page, two graphs are displayed:

- The first graph shows average occupancy (%) in public transport from the baseline year until 2050, comparing the baseline scenario (solid line) and the policy scenario (dotted line).
- The second graph displays selected indicators over time, including:
 - share of zero-carbon public transport (%),
 - transport mode distribution in regions (%),
 - transport mode distribution in cities (%), and
 - number of vehicles by fuel type (e.g., city buses, minibuses, regional buses, trains).

The displayed parameter can be changed using the drop-down menu in the upper-right corner of the graph.

Modal shift policy assumptions (3):

On the **right-hand side** of the page, the “**Modal shift policy assumptions**” button provides access to a separate page (Fig. 35). The mode shift policy allows you to assess the effect of the transition from private transport use to public transport. User can specify transition rate (%/year) and year in which policy is initiated.

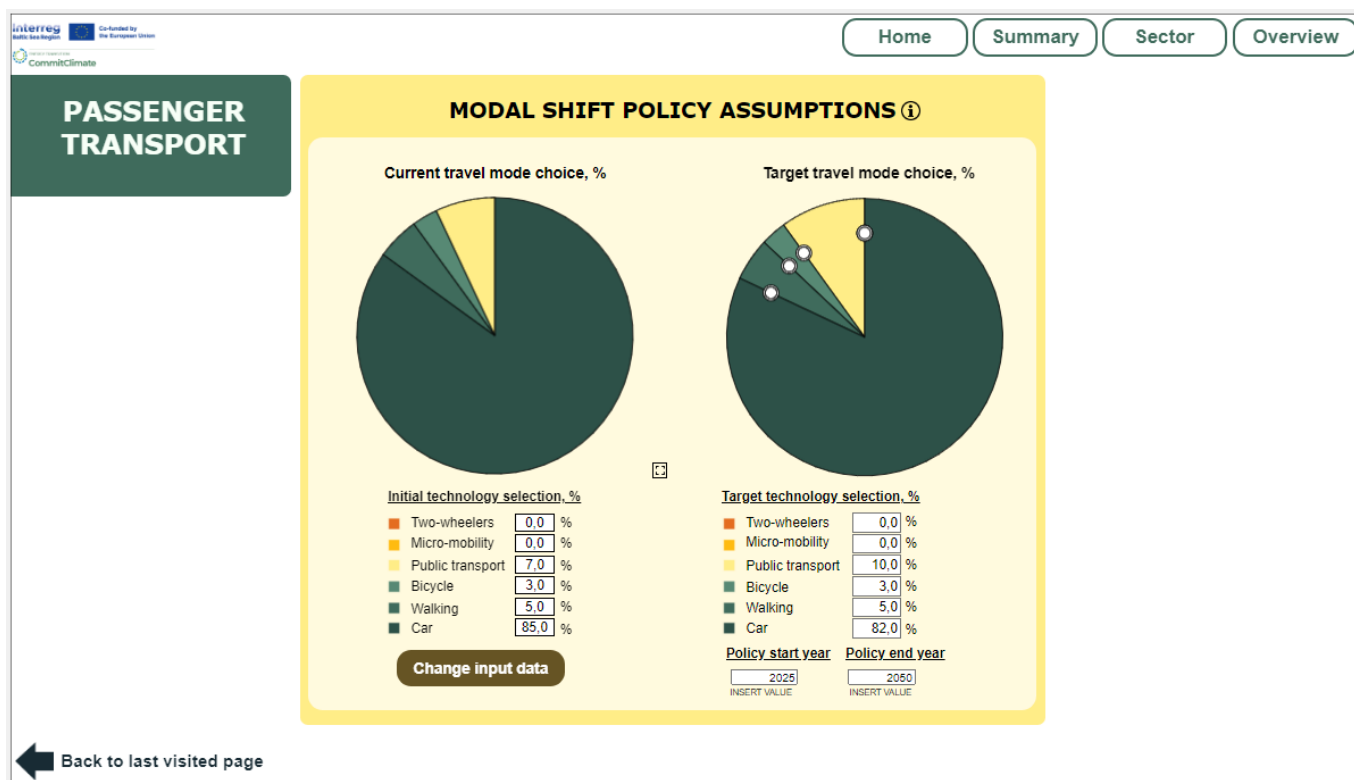


Fig. 35. Modal shift policy page

This page is used to adjust assumptions for the modal shift policy and includes two pie charts:

- The first pie chart shows the current travel mode distribution (%) in the baseline year. These values are calculated based on data provided in the *Travel Input Data* page (Chapter 6.3.), accessible via the **“Change input data”** button.
- The second pie chart allows the user to define the target travel mode distribution (%). Values can also be entered manually using the numerical inputs below the chart.

After defining the target distribution, the user must specify the policy implementation period (start and end years).

The total share must equal 100%; otherwise, the simulator will not function correctly.

After adjusting the policies, the user can return to the *Policy Scenario* page by selecting **“Back to last visited page”** to evaluate the impact of the changes.

14. Private transport

14.1. Baseline scenario

The private transport baseline scenario page is shown in Fig.36.

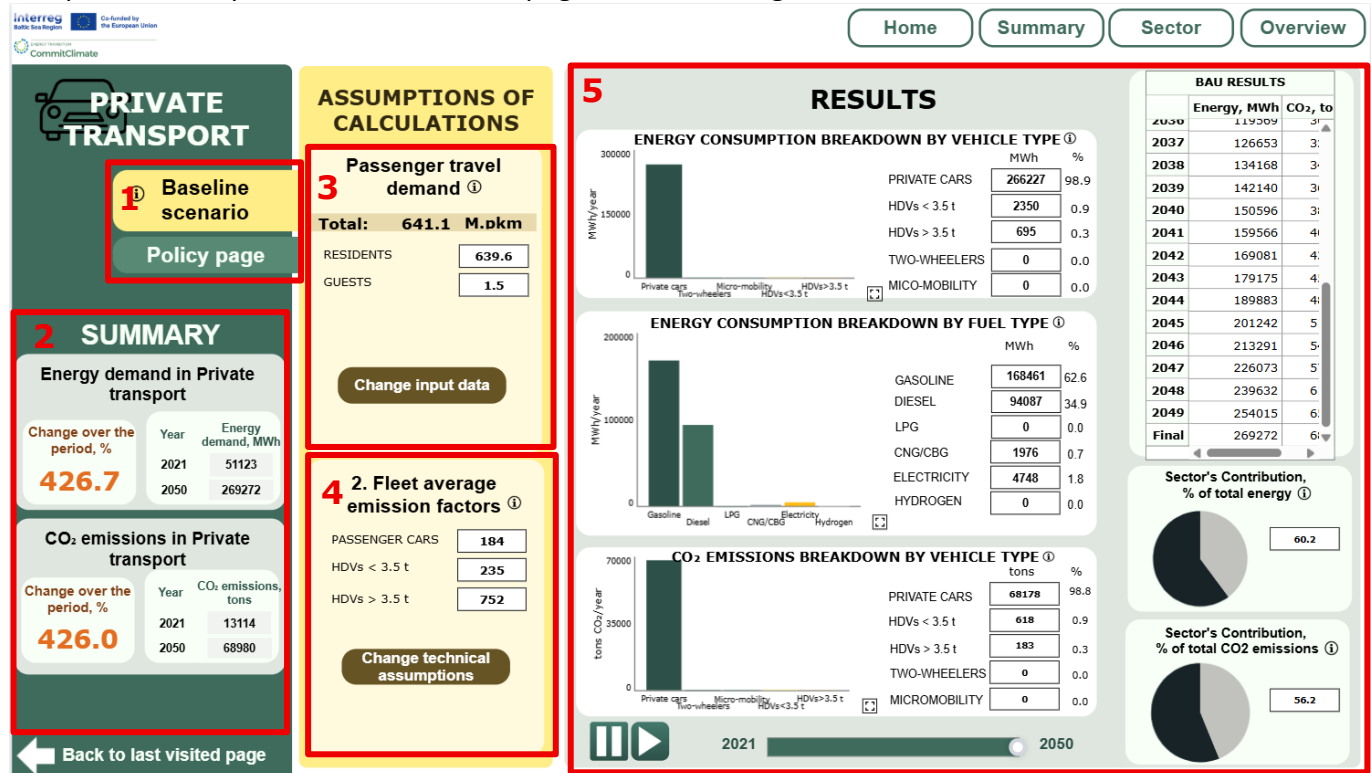


Fig.36. Private transport page (baseline)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Baseline Scenario* and the *Policy* page.

Sub-sector summary (2)

Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in the private transport sector for the baseline year and for 2050.

It also shows the percentage (%) change in energy demand and emissions resulting from changes in transport demand (e.g., population dynamics and travel behaviour). Positive values indicate an increase, while negative values indicate a decrease.

Passenger travel demand (3)

Displays total passenger travel demand (million pkm/year) in private transport, along with a breakdown by commuter type (municipality residents and municipality guests).

These values are calculated based on data provided in the *Travel Input Data* page (Chapter 6.1. and 6.3), accessible via the “**Change input data**” button.

Fleet average emission factors (4)

Displays average emission factors (gCO₂/km) for each private vehicle type (passenger cars, light-duty vehicles under 3.5 tons, and heavy-duty vehicles over 3.5 tons).

To modify these values, the user must update the *Technical Assumptions* page (Chapter 13.2.), accessible via the “**Change technical assumptions**” button.

NB! If the user does not make any changes to the technical parameters, built-in default values are used for calculations. Default values most often reflect national averages or are based on expert assumptions.

Results (5)

This section includes three graphs:

- The first graph shows energy consumption (MWh/year) by vehicle type (private cars, HDVs < 3.5 t, HDVs > 3.5 t, two-wheelers, micro-mobility), presented as both absolute values and shares (%) of total energy consumption.
- The second graph shows energy consumption (MWh/year) by fuel type (diesel, gasoline, LPG, CNG/CBG, electricity, hydrogen), presented as both absolute values and shares (%).
- The third graph shows CO₂ emissions (tCO₂/year) by vehicle type, presented as both absolute values and shares (%) of total emissions in private transport.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050.

Below the table, two pie charts illustrate the sub-sector’s contribution to total municipal energy consumption and CO₂ emissions (%).

14.2. Technical assumptions

The private transport technical assumptions page is shown in Fig.37.

PRIVATE TRANSPORT

1 TECHNICAL ASSUMPTIONS

1 Select type of vehicle:

2 Vehicle data

Technology selection	Fuel consumption	RES share
Diesel: 95.0	30	26
Gasoline: 0.0	32	6
LPG: 0.0	35	0
CNG/CBG: 4.0	30	90
Electricity: 1.0	175	
Hydrogen: 0.0	10	0

2 Private vehicle fleet

Private cars (local), Private cars (guests), HDVs < 3.5 t (total), HDVs > 3.5 t (total)

RESIDENTS

3 A Vehicle use (residents)

Annual mileage: 40000, Occupancy: 50.00, Use in local territory: 100

4 A Goods transport and projection (local companies)

Share HDVs < 3.5 t: 90, Share HDVs > 3.5 t: 10, Demand projection: 0.0

OTHER COMMUTERS

3 B Vehicle use (guests)

Annual mileage: 40000, Occupancy: 50.00, Use in local territory: 70

4 B Goods transport and projection (other companies)

Share HDVs < 3.5 t: 25, Share HDVs > 3.5 t: 75, Demand projection: 0.0

Back to last visited page | 2023 | 2050

Fig.37. Private transport page (technical assumptions)

This page consists of the following sections:

Technical assumptions (1)

1) Vehicle type – The user selects a vehicle type (private cars, HDVs < 3.5 t, HDVs > 3.5 t, two-wheelers, micro-mobility) from the drop-down menu. All inputs on the page correspond to the selected vehicle type.

2) Vehicle data – The user defines:

- fuel shares (%) for each fuel type (diesel, gasoline, LPG, CNG/CBG, electricity, hydrogen),
- fuel consumption (l/100 km, kg/100 km, kWh/100 km), and
- RES share (%) for each fuel type.

The total fuel share must equal 100%; otherwise, the simulator will not function correctly.

3) Vehicle use – The user defines:

- annual mileage (km/year),
- occupancy,
 - For passenger transport - refers to the average number of passengers per vehicle for passenger transport.
 - For goods transport- Refers to the percentage of the maximum vehicle capacity in tonnes for goods transport.

- share (%) of passenger kilometres (pkm) travelled within the municipality by residents and municipality guests.

These steps must be repeated for each vehicle type. If certain parameters (e.g., mileage or RES share) are unknown, default values may be used.

4) Goods transport and projection – The user defines:

- the shares (%) of HDVs under 3.5 t and HDVs over 3.5 t, and
- demand projections (%/year) for heavy-duty vehicles operating within the municipality, including both locally registered vehicles and those registered outside the municipality.

Private vehicle fleet (2)

This section includes a graph showing the number of vehicles by type (local passenger cars, guest passenger cars, HDVs < 3.5 t, HDVs > 3.5 t) operating within the municipality.

This graph can be used to validate the consistency of input assumptions related to travel behaviour and vehicle activity. The user can adjust parameters such as occupancy and annual mileage to better align the estimated number of vehicles with the actual number of registered vehicles in the municipality.

Fuel properties (3)

Selecting this option opens the *Fuel Properties* page (Chapter 12.2.), where the user can adjust parameters such as emission factors and energy density for each fuel type used in the simulator.

Fuel efficiency policy (4)

If changes in fuel efficiency are expected in the baseline scenario, the user can define the improvement rate (%/year) for passenger cars and heavy-duty vehicles.

After defining all technical assumptions, the user can return to the *Baseline Scenario* page by selecting “**Back to last visited page**” in the lower-left corner and proceed to the *Policy* page (Chapter 14.3.).

14.3. Policies

The private transport policy page is shown in Fig.38.



Fig.38. Private transport page (policies)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Policy* page and the *Baseline Scenario*.

Sub-sector summary (2)

Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in private transport for the baseline year and for 2050 under the policy scenario.

It also shows the percentage (%) change in energy demand and emissions. Positive values indicate an increase, while negative values indicate a decrease.

Note: Transport-related energy consumption and emissions are also influenced by the energy sector. Decarbonization of electricity and heat supply can lead to a reduction in CO₂ emissions even if no building-specific policies are applied.

Policies (3)

This section contains a list of policies applicable to the private transport sector. Policies can be enabled or disabled using toggle buttons (a policy is active when the switch is green).

The available policies include:

- 3.1. Reduction in passenger transport demand
- 3.2. Modal shift in passenger transport
- 3.3. Car sharing
- 3.4. Transition to low- and zero-emission technologies in passenger transport
- 3.5. Transition to low- and zero-emission technologies in road freight vehicles
- 3.6. Increase in RES share (private cars)
- 3.7. Increase in RES share (freight vehicles)
- 3.8. Reduction in freight transport demand

Each policy includes default values for implementation speed and implementation period (start and end years).

Apply selected passenger car policies to guest travellers – This option allows the user to extend the policy parameters defined in policies 3.1–3.6 to guest travellers.

If this option is enabled, the selected passenger car policies are applied to both municipality residents and guest travellers. If it is not enabled, these policies are applied only to local residents.

To modify these parameters, the user must access the *Policy Assumptions* page (Chapter 14.4.) by selecting the **“Set advanced assumptions”** button.

Results (4) – This section includes two graphs:

- The first graph shows either energy demand (MWh/year) or CO₂ emissions (tCO₂/year) in private transport from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted teal line). The displayed indicator can be changed using the drop-down menu in the upper-right corner of the graph.
- The second graph shows energy demand (MWh/year) by fuel type, presented as both absolute values and shares (%) of total energy demand in private transport.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050 under the policy scenario.

14.4. Policy assumptions

The public transport policy assumptions page is shown in Fig. 39.

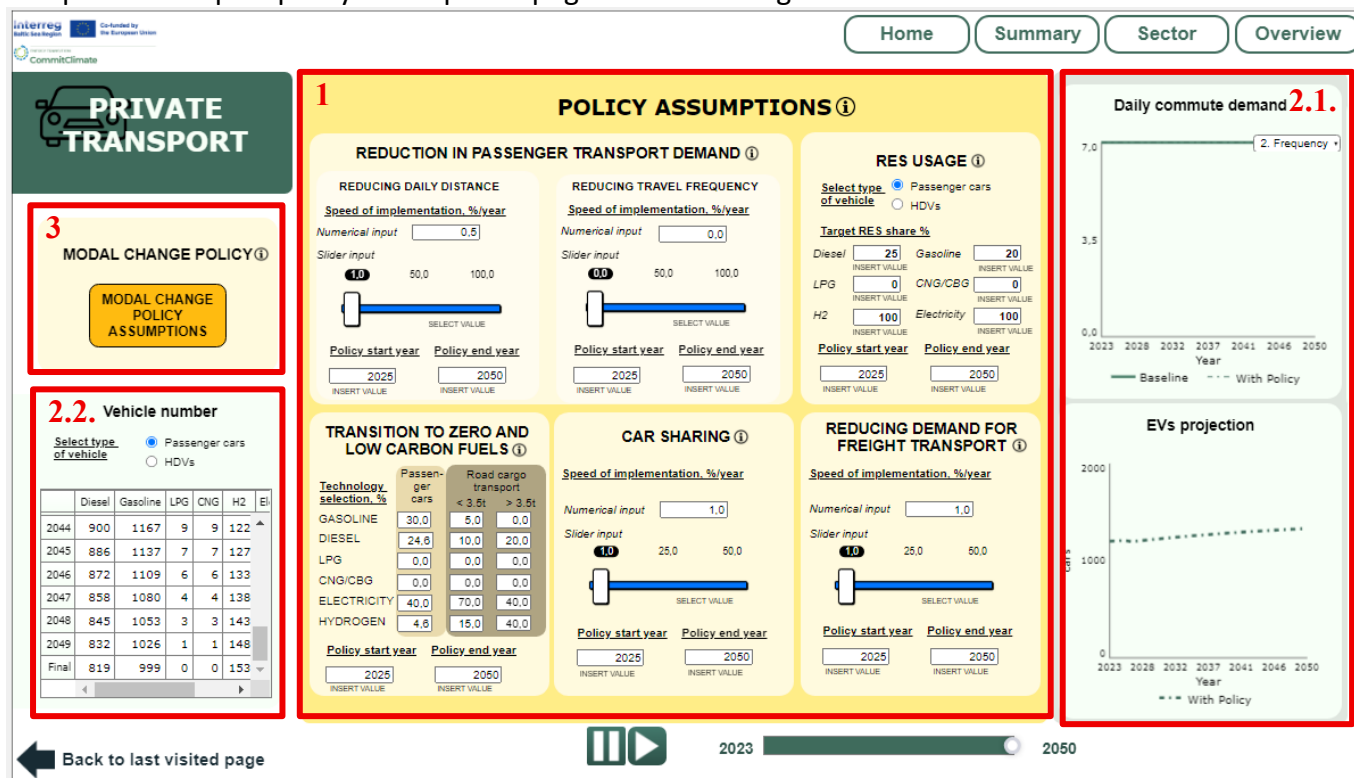


Fig.39. Private transport page (policy assumptions)

On this page, the user can adjust policy parameters for the public transport sector.

Policy assumptions (1):

- For **private/freight transport reduction and car sharing policies**, the user can adjust policy **implementation speed** (%/year) either by using the slider or typing in the value manually in the numerical input field. Policy implementations **start and end year** can be changed by using the numerical inputs below the sliders.

For passenger transport demand it is possible to modify change in the daily distance and travel frequency.

Note: The policy “Reduction in passenger transport demand” also influences the demand for public transport.

- For the **RES usage** policy, the user must select a vehicle type using the buttons and enter the **target RES shares** (%) for each fuel type, as well as policy implementation start and end year.
- For the **transition to zero and low carbon fuels** policy the user must select a vehicle type and enter the **target fuel shares** (%) for each vehicle type to be reached by the policy implementation end year.

Results (2):

On the right side (2.1.) of the page are two graphs, with the first one depicting either the **daily travel distance** (km/day) or **travel frequency** (days/week) for private transport in the baseline scenario (solid line) and policy scenario (dotted line) from the baseline year until 2050; the displayed parameters can be changed by using the drop-down menu in the upper right corner of the graph.

The second graph shows the **projected number of electric vehicles** in the municipality from the baseline year until 2050 in the baseline scenario (solid line) and policy scenario (dotted line).

On the left side (2.2.) there is a table depicting the **yearly number of passenger or freight vehicles** for each fuel type in the policy scenario from the baseline year until 2050; the vehicles type shown can be changed by using the buttons above the graph.

Modal change policy (3):

On the right side of the page is the **modal change policy assumptions** button, which takes the user to a separate page (Chapter 13.4.), where they can adjust the **target travel mode shares** (%) which must be reached until the policy implementation end year.

15. Waste management

15.1. Baseline scenario

The waste management sector baseline scenario page is shown in Fig.40.

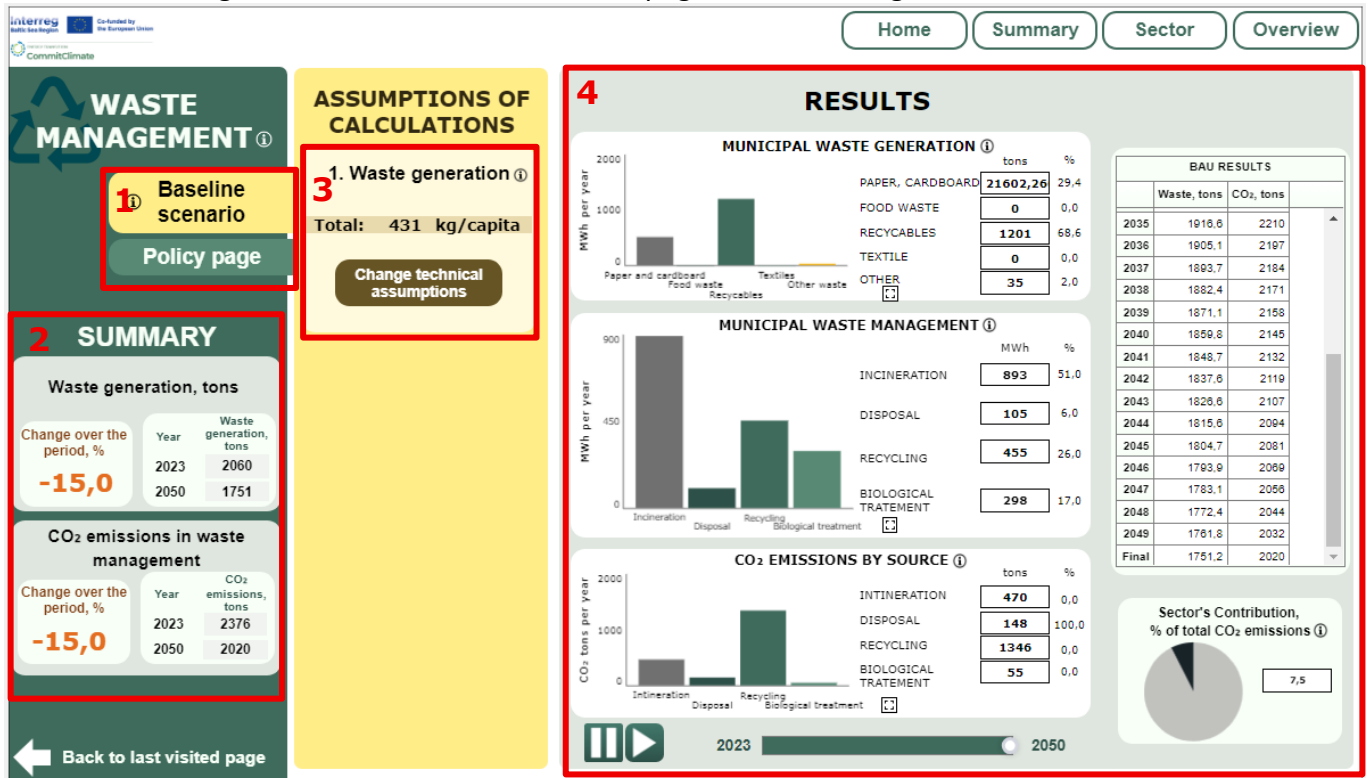


Fig.40. Waste management page (baseline)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Baseline Scenario* and the *Policy* page.

Sub-sector summary (2)

Displays total waste generation (t/year) from municipality residents and CO₂ emissions (tCO₂/year) in the waste management sector for the baseline year and for 2050.

It also shows the percentage (%) change in waste generation and emissions. Positive values indicate an increase, while negative values indicate a decrease.

Waste generation (3)

Displays average per capita waste generation (kg/year/capita) in the municipality.

To modify this value, the user must update the *Technical Assumptions* page (Fig. HJ), accessible via the “Change technical assumptions” button.

NB! If the user does not make any changes to the technical parameters, built-in default values are used for calculations. Default values most often reflect national averages or are based on expert assumptions.

Results (4)

This section includes three graphs:

- The first graph shows waste generation (t/year) by waste type (paper/cardboard, food waste, recyclables, textiles, other), presented as both absolute values and shares (%) of total waste generated.
- The second graph shows energy consumption (MWh/year) by waste treatment method (incineration, disposal, recycling, biological treatment), presented as both absolute values and shares (%).
- The third graph shows CO₂ emissions (tCO₂/year) by waste treatment method, presented as both absolute values and shares (%) of total emissions in the waste management sector.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050.

Below the table, two pie charts illustrate the sub-sector's contribution to total municipal energy consumption and CO₂ emissions (%).

15.2. Technical assumptions

The waste management technical assumptions page is shown in Fig.41.

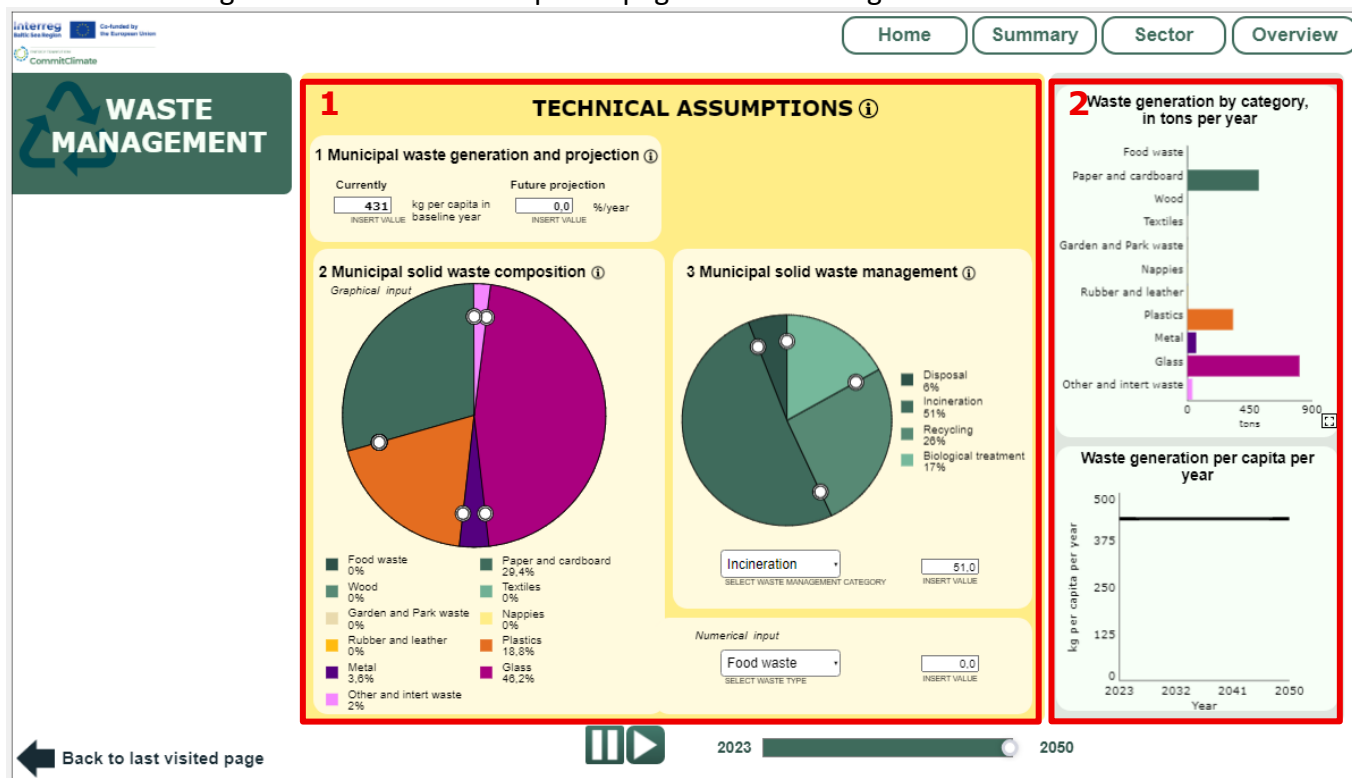


Fig.41. Waste management page (technical assumptions)

This page consists of the following sections:

Technical assumptions (1)

- 1) Municipal waste generation and projection. The user defines:
 - average per capita waste generation (kg/year/capita) in the baseline year, and
 - projected change in waste generation (%/year), if applicable.

Positive values indicate an increase, while negative values indicate a decrease in waste generation over time.

- 2) Municipal solid waste composition

The user specifies the shares (%) of each waste type (food waste, wood, garden and park waste, rubber and leather, metal, paper and cardboard, textiles, nappies, plastics, glass, other, inert waste) in total generated waste. Values can be entered either using a graphical input or by selecting a waste type from the drop-down menu and entering its share manually.

The total share must equal 100%; otherwise, the simulator will not function correctly.

- 3) Municipal solid waste management

The user specifies the shares (%) of each waste treatment method (disposal, incineration, recycling, biological treatment) used in the municipality.

Values can be entered either using a graphical input or by selecting a treatment method from the drop-down menu and entering its share manually.

Results (2)

This section includes two graphs displayed on the right-hand side of the page:

- The first graph shows annual waste generation (t/year) by waste type.
- The second graph shows changes in per capita waste generation (kg/year/capita) from the baseline year until 2050, based on the projections defined in the first section.

After defining all technical assumptions, the user can return to the *Baseline Scenario* page by selecting **“Back to last visited page”** in the lower-left corner and proceed to the *Policy* page (Fig. GH).

15.3. Policies

The waste management policy page is shown in Fig.42.

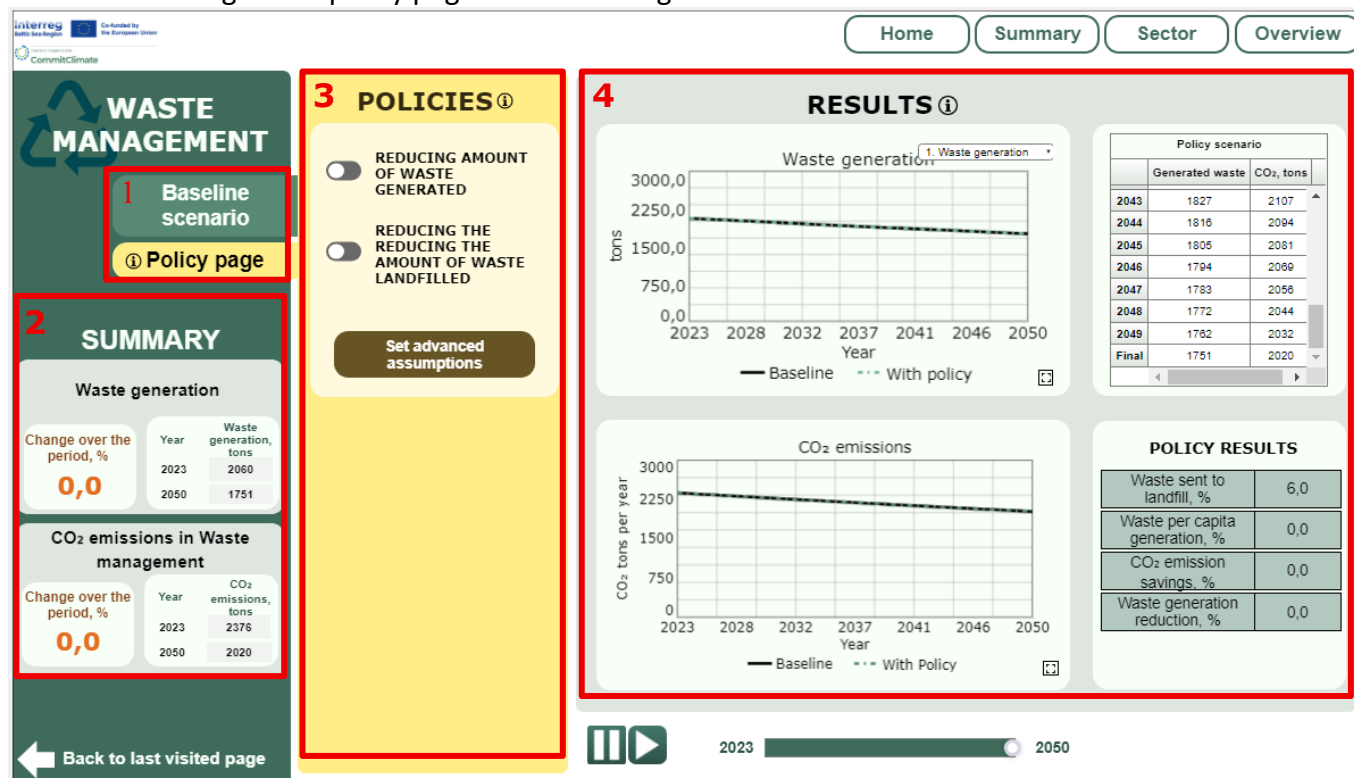


Fig.42. Waste management page (policies)

This page consists of the following sections:

Navigation buttons (1) – Used to switch between the *Policy* page and the *Baseline Scenario*.

Sub-sector summary (2) – Displays waste generation per capita (kg/year/capita) and CO₂ emissions (tCO₂/year) in the waste management sector for the baseline year and for 2050 under the policy scenario. It also shows the percentage (%) change in waste generation and emissions. Positive values indicate an increase, while negative values indicate a decrease.

Policies (3) – This section contains a list of policies applicable to the waste management sector. Policies can be enabled or disabled using toggle buttons (a policy is active when the switch is green).

The available policies include:

- Reduction of waste generation
- Reduction of landfilled waste

Each policy includes default values for implementation speed and implementation period (start and end years).

To modify these parameters, the user must access the *Policy Assumptions* page (Chapter 15.4.) by selecting the “Set advanced assumptions” button.

Results (4) – This section includes multiple visualizations:

- The first graph shows either:
 - energy demand (MWh/year), or
 - the distribution of waste treatment methods (%),

from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted teal line). The displayed parameter can be changed using the drop-down menu in the upper-right corner of the graph.

- The second graph shows CO₂ emissions (tCO₂/year) from waste treatment processes over time, comparing baseline and policy scenarios.

To the right of the graphs, a table presents annual values for waste generation (t/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050 under the policy scenario.

Below the table, the *Policy results* section presents key indicators, including:

- share of waste sent to landfill (% of total waste generated),
- change in waste generation per capita (% compared to the baseline scenario),
- CO₂ emission reduction (% compared to the baseline scenario), and
- total waste reduction (% compared to the baseline scenario).

15.4. Policy assumptions

The public transport policy assumptions page is shown in Fig. 43.

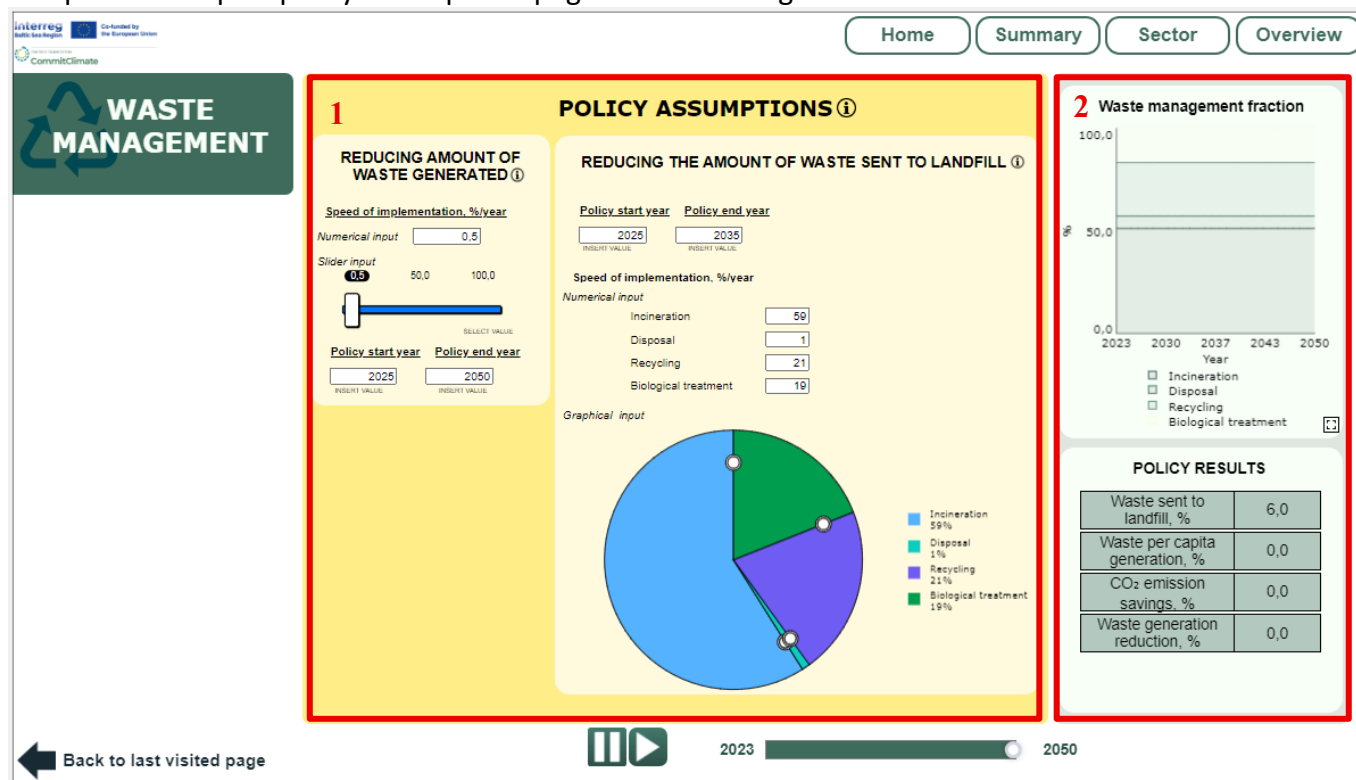


Fig.43. Waste management page (policy assumptions)

On this page, the user can adjust policy parameters for the waste management sector:

Policy assumptions (1)

1) Waste generation reduction policy – The user defines:

- **implementation speed (%/year)**, using either the slider or manual input, and
- **implementation period (start and end years)** using the numerical inputs below the sliders.

2) Waste disposal reduction policy – The user defines:

- shares (%) of each waste treatment method (e.g., disposal, recycling, incineration, biological treatment), using either graphical input or numerical fields, and
- **implementation period (start and end years)**.

Results (2)

On the **right-hand side** of the page, a graph shows changes in the shares (%) of waste treatment methods in the municipality from the baseline year until 2050.

Below the graph, the *Policy results* section presents key indicators, including:

- share of waste sent to landfill (% of total waste generated),
- change in waste generation per capita (% compared to the baseline scenario),
- CO₂ emission reduction (% compared to the baseline scenario), and
- total waste reduction (% compared to the baseline scenario).

16. Local energy production

16.1. Baseline scenario

The local energy production sector baseline scenario page is shown in Fig.44.

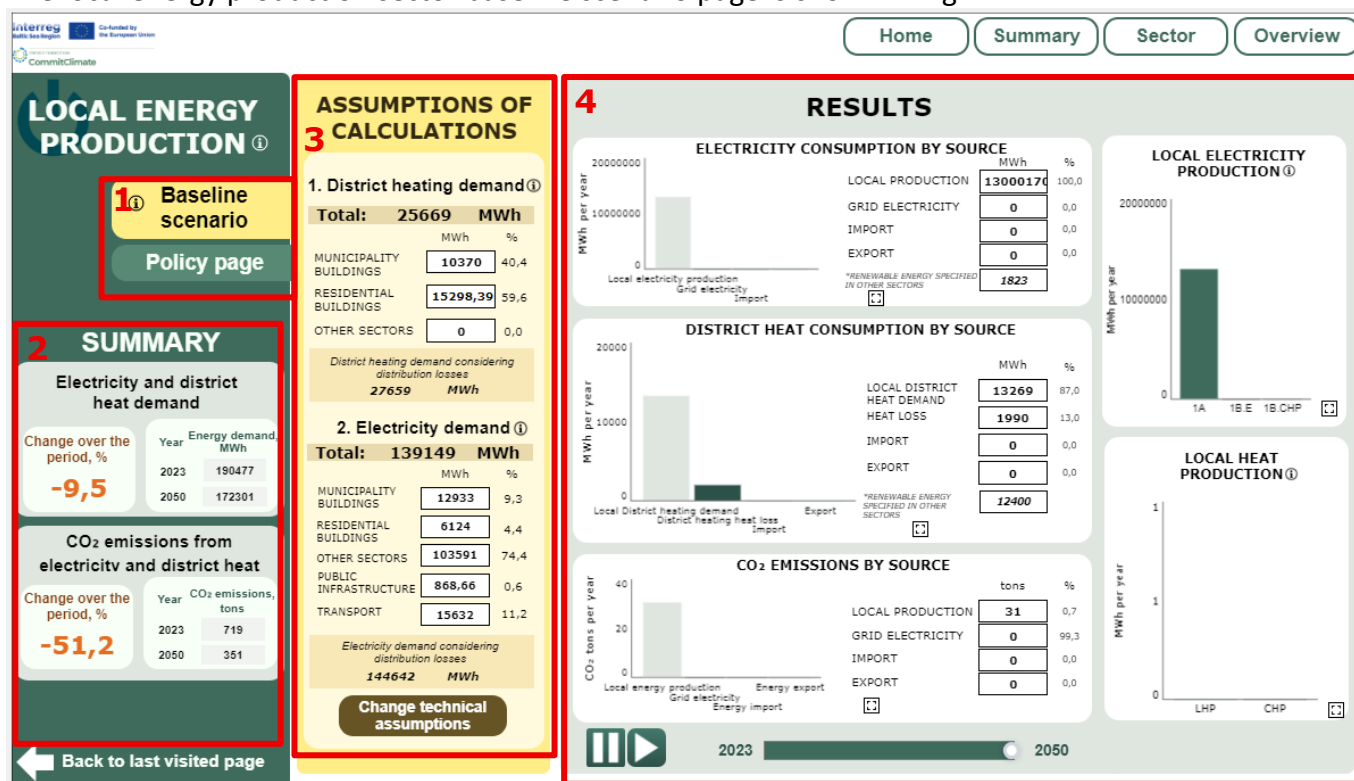


Fig.44. Local energy production page (baseline)

This page consists of the following sections:

Navigation buttons (1)

Used to switch between the *Baseline Scenario* and the *Policy page*.

Sub-sector summary (2)

Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in the local energy production sector for the baseline year and for 2050.

It also shows the percentage (%) change in energy demand and emissions resulting from changes in energy demand across sectors (e.g., buildings, transport, and public infrastructure). Positive values indicate an increase, while negative values indicate a decrease.

District heating demand (3)

Displays total district heating demand (MWh/year), along with a breakdown by building sub-sector (municipal buildings, residential buildings, other sectors).

Electricity demand (4)

Displays total electricity demand (MWh/year), along with a breakdown by sub-sector (municipal buildings, residential buildings, other sectors, public infrastructure, transport).

To modify these values, the user must update the *Technical Assumptions* page (Chapter 16.2.), accessible via the “**Change technical assumptions**” button.

NB! If the user does not make any changes to the technical parameters, built-in default values are used for calculations. Default values most often reflect national averages or are based on expert assumptions.

Results (5)

This section includes multiple visualizations:

- The first graph shows electricity consumption (MWh/year) by source (local electricity, grid electricity, imported energy, exported energy), presented as both absolute values and shares (%) of total electricity consumption.
- The second graph shows heat consumption (MWh/year) by source (local district heating demand, heat losses, imported energy, exported energy), presented as both absolute values and shares (%).
- The third graph shows CO₂ emissions (tCO₂/year) by source (individual heating, district heating, electricity, cooking gas), presented as both absolute values and shares (%) of total emissions in the municipality's energy sector.
- On the right-hand side, two additional graphs show:
 - local electricity production (MWh/year),
 - **1A – Renewable energy production**, including wind energy, hydropower, photovoltaic energy, geothermal energy, and other renewable sources. The share of these sources can be adjusted in the *Technical Assumptions* (Chapter 16.2., Section 1.A).
 - **1B.E – Electricity generation in local power plants (< 20 MW)**, based on energy carriers defined in *Technical Assumptions* (Chapter 16.2., Section 1.B).
 - **1B.CHP – Electricity production from combined heat and power (CHP) plants**, based on energy carriers defined in *Technical Assumptions* (Chapter 16.2., Section 1.B).
 - local heat production (MWh/year),
 - **LHP – Local heat production in heat production facilities (< 20 MW)**, based on energy carriers defined in *Technical Assumptions* (Chapter 16.2., Section 1.B).
 - **CHP – Local heat production from combined heat and power (CHP) plants**, based on energy carriers defined in *Technical Assumptions* (Chapter 16.2., Section 1.B).

from the baseline year until 2050.

16.2. Technical assumptions

The local energy production technical assumptions page is shown in Fig.45.

1 TECHNICAL ASSUMPTIONS ①

1A Local/distributed electricity production (renewable only) ①

Wind Electricity production, MWh

1B Local energy production energy carrier input ①

Natural gas Energy carrier input, MWh

1B.1 Local energy production in CHPs

1B.2 Local heat production in heat-only units under 20 MW

1B.3 Local electricity production in electricity-only units under 20 MW

2 Efficiency parameters, % ①

Natural gas Boiler house-s CHP Power generation

85 85 50

3 Default emission factors

District heating Emission factors, CO₂/MWh

Natural gas

4 Distribution losses, %

District heat distribution losses Grid losses

5 Energy import/export ①

HEAT

Import (CHP) Import (BH) Export (CHP) Export (BH)

ELECTRICITY

Import (CHP) Import (PP) Export (CHP) Export (PP)

6 Purchase of certified green electricity ①

6.1 Purchases guarantees of origins 6.2 Growth rate

Energy carrier input data summary

	CHP	Boiler house	Electricity-only
NATURAL GAS	0	0	0
LIQUID GAS	0	0	0
HEATING OIL	0	0	0
LIGNITE	0	0	0
COAL	0	0	0
WASTE	0	0	0
PLANT OIL	0	0	0
OTHER BIOMASS	0	0	0
BIOGAS	0	0	0
OTHER RENEWABLES	0	0	0
OTHER	0	0	0
SUM	0	0	0

2 Local distributed electricity production from RES

20000000
10000000
0

Wind Hydroelectric Geothermal

WIND	0
HYDRO	13000000
SOLAR PV	170
GEOTHERMAL	0
OTHER	0

3 Show energy balance ☒

Heat ①

Defined demand Difference

Defined supply

Electricity ①

Defined demand Difference

Defined supply

Fig.45. Local energy production page (technical assumptions)

The *Local Energy Production Technical Assumptions* page consists of the following sections:

Technical assumptions (1)

1) Local/distributed electricity production – If renewable energy sources (wind, hydropower, photovoltaics, geothermal energy, other) are used for electricity production in the municipality, the user can define the amount of electricity generated (MWh/year) for each source.

2) Local energy production (LEP) energy carrier input – The user defines energy production (MWh/year) by fuel type for:

- combined heat and power plants (CHPs),
- heat-only plants (< 20 MW), and
- electricity-only plants (< 20 MW).

Available fuel types include natural gas, liquid gas, heating oil, lignite, coal, waste, plant oil, biomass, biogas, other renewables, and other fossil fuels.

This step must be repeated for each fuel/energy source.

3) Efficiency parameters – The user defines average energy production efficiencies (%) for:

- boiler houses,
- CHP plants, and

- power plants.

4) Emission factors – The user defines emission factors (tCO₂/MWh) for:

- energy types (district heating, grid electricity, imported heat from boiler houses, imported heat from CHPs, imported electricity, imported electricity from CHPs), and
- fuel types (natural gas, liquid gas, heating oil, lignite, coal, waste, plant oil, biomass, biogas, other renewables, other fossil fuels).

If specific values are unavailable, default emission factors based on national or European Union averages can be used.

5) Energy import/export – The user defines imported and exported energy flows (MWh/year) by selecting an energy production source (boiler house, CHP, power plant) and entering the corresponding amounts of heat and electricity.

This step must be repeated for each energy production source.

6) Purchase of certified green electricity – If the municipality purchases certified green electricity, the user can define:

- the amount of electricity purchased (MWh/year), and
- the projected change (%/year), if applicable.

Positive values indicate an increase, while negative values indicate a decrease over time.

7) RES energy – This section includes a graph showing total renewable energy production (MWh/year) in the municipality in the baseline year.

Results (2)

- **RES energy graph** – The graph shows total renewable energy production (MWh/year) in the municipality in the baseline year, based on the inputs defined in Sections 1 and 2.

Energy balance (optional view) – This section becomes visible when the user selects “Show energy balance” and provides a consistency check between energy demand and supply.

- **Heat balance**
 - *Defined demand* represents the total heat demand calculated based on inputs from other sectors (e.g., buildings).
 - *Defined supply* represents the net heat available from local production, imports, and exports, based on inputs provided in Sections 2 and 5.

The **difference** indicates whether supply meets demand:

- If the value is **positive**, supply exceeds demand, and the excess heat is not included in emissions calculations.
- If the value is **negative**, demand exceeds supply, and the remaining heat demand is covered using default emission factors defined in Section 4. This additional heat is included in emissions calculations.

- **Electricity balance**

- *Electricity demand* represents total demand calculated across all sectors.
- *Defined supply* represents the net electricity available from local production, imports, and exports, based on inputs provided in Sections 1, 2, and 5.

The **difference** indicates whether supply meets demand:

- If the value is **positive**, supply exceeds demand, and the excess electricity is not included in emissions calculations.
- If the value is **negative**, demand exceeds supply, and the remaining electricity demand is covered by grid electricity using default emission factors defined in Section 4. This electricity is included in emissions calculations.

After defining all technical assumptions, the user can return to the *Baseline Scenario* page by selecting **“Back to last visited page”** in the lower-left corner and proceed to the *Policy* page (Chapter 16.3.).

16.3. Policies

The local energy production policy page is shown in Fig.46.

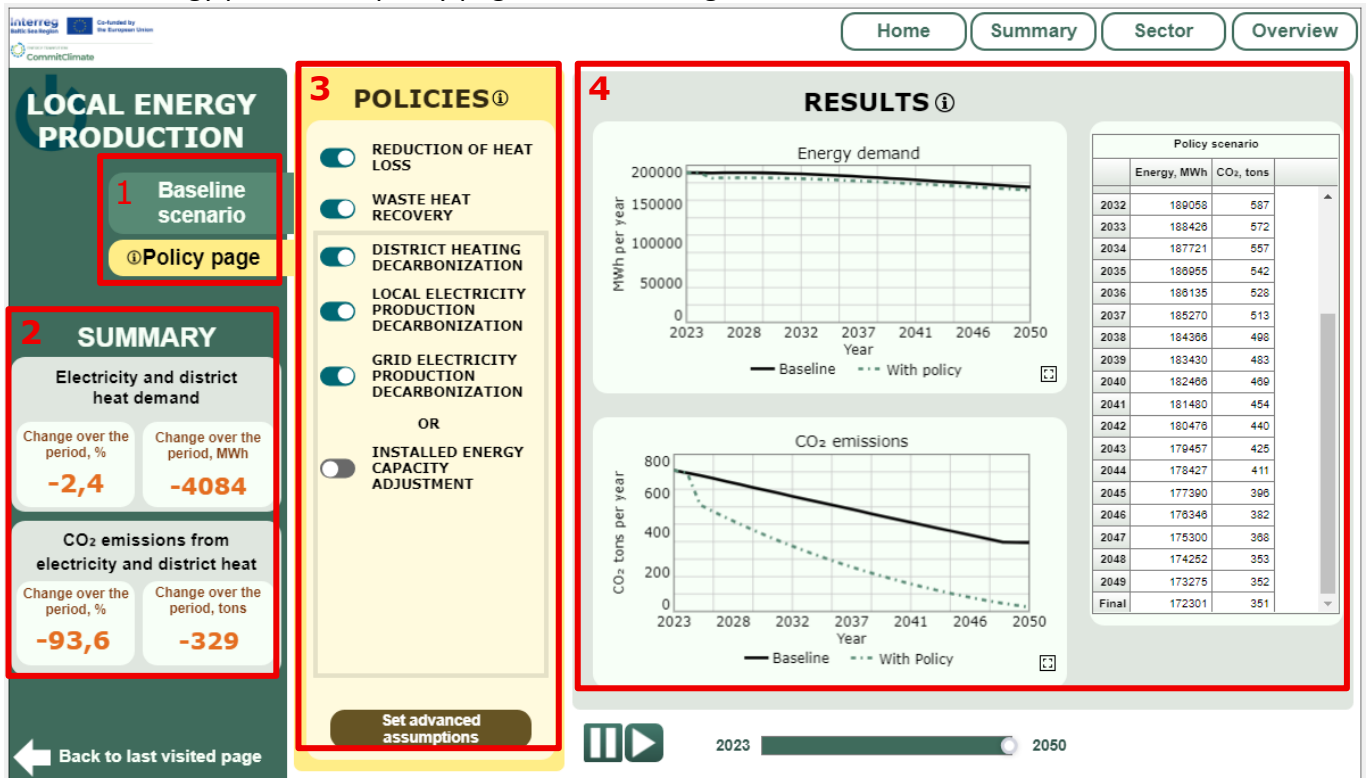


Fig.46. Local energy production page (policies)

This page consists of the following sections:

Navigation buttons (1) – Used to switch between the *Policy* page and the *Baseline Scenario*.

Sub-sector summary (2) – Displays energy demand (MWh/year) and CO₂ emissions (tCO₂/year) in the local energy production sector for the baseline year and for 2050 under the policy scenario.

It also shows the percentage (%) change in energy demand and emissions. Positive values indicate an increase, while negative values indicate a decrease.

Policies (3) – This section contains a list of policies applicable to the local energy production sector. Policies can be enabled or disabled using toggle buttons (a policy is active when the switch is green).

The available policies include:

- District heating decarbonization
- Reduction of heat losses
- Waste heat recovery
- Local electricity production decarbonization
- Grid electricity production decarbonization

Each policy includes default values for implementation speed and implementation period (start and end years).

To modify these parameters, the user must access the *Policy Assumptions* page (Fig. OP) by selecting the **“Set advanced assumptions”** button.

Results (4) – This section includes two graphs:

- The first graph shows energy demand (MWh/year) in local energy production from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted teal line).
- The second graph shows CO₂ emissions (tCO₂/year) over the same period, also comparing baseline and policy scenarios.

To the right of the graphs, a table presents annual values for energy consumption (MWh/year) and CO₂ emissions (tCO₂/year) from the baseline year until 2050 under the policy scenario.

Note!

The “Installed Energy Capacity Adjustment” policy represents a more detailed approach to modelling energy system changes. Therefore, it cannot be used simultaneously with the simplified decarbonization policies.

When selecting policies, the user must choose either:

- *the “Installed Energy Capacity Adjustment” policy, or*
- *the simplified decarbonization policies:*
 - *District heating decarbonization*
 - *Local electricity production decarbonization*
 - *Grid electricity production decarbonization*

These policy options are mutually exclusive and cannot be applied at the same time.

16.4. Policy assumptions

The local energy production policy assumptions page is shown in Fig. 47

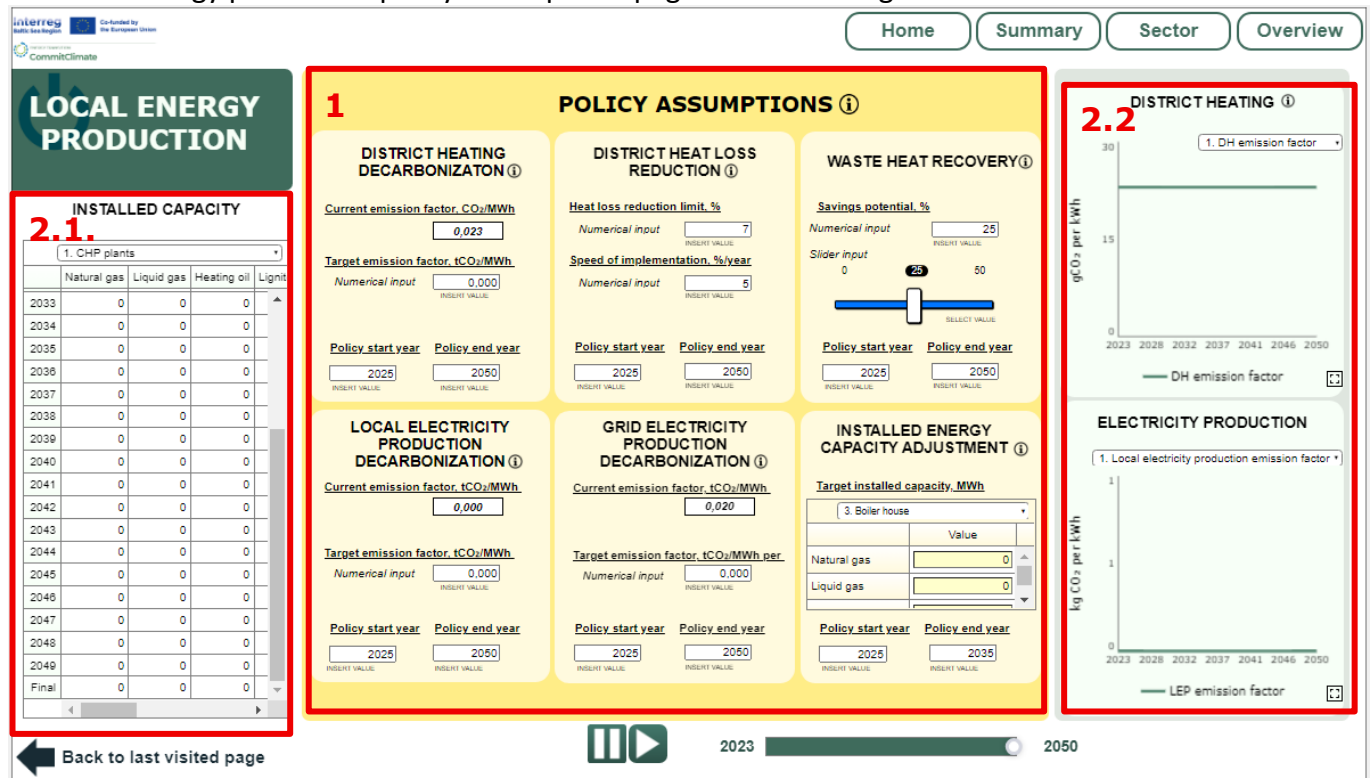


Fig.47. Local energy production page (policy assumptions)

Policy assumptions (1)

This section allows the user to define policy parameters affecting the local energy production sector.

1) District heating decarbonization

- This policy represents a gradual reduction of the greenhouse gas emission factor of district heating by shifting to low-carbon and renewable heat sources.
- The current emission factor is displayed as an informational value, while the target emission factor is defined by the user (tCO₂/MWh). When the policy is active, the emission factor decreases linearly from the current value to the target value over the selected implementation period, reducing CO₂ emissions associated with district heating supply.

2) District heat loss reduction

- This policy represents improvements in district heating networks that reduce heat distribution losses over time.
- A minimum achievable heat loss level is defined, as losses cannot be reduced to zero. When the policy is active, heat losses decrease annually at the user-defined implementation speed (%/year) until the limit is reached. Reduced losses decrease total heat production needs and associated emissions.

3) Waste heat recovery

- This policy represents the use of recovered waste heat to meet part of the district heating demand.
- The user defines the share (%) of heat demand covered by waste heat. When active, this share replaces conventional heat production, reducing energy demand and emissions, while distribution losses remain unchanged.

4) Local electricity production decarbonization

- This policy represents a gradual reduction in the emission factor of locally produced electricity through the deployment of renewable and low-carbon technologies.
- The user defines a target emission factor (tCO₂/MWh), and when the policy is active, it decreases linearly over time, reducing emissions from locally generated electricity.

5) Grid electricity production decarbonization

- This policy represents the gradual decarbonization of grid electricity due to changes in the national or regional energy mix.
- The user defines a target emission factor (tCO₂/MWh), and the grid emission factor decreases linearly over the selected period, reducing emissions from all grid-supplied electricity.

6) Installed energy capacity adjustment

- This policy allows the user to define changes in installed energy capacity over time.
- The user specifies target capacity values and the implementation period. When the policy is active, baseline capacities are gradually replaced with the defined target values.

Important:

- This policy applies to all capacity values shown in the section.
- The user must define values for all technologies, including those that should remain unchanged.
- If no value is provided, default assumptions are applied, which may lead to unintended reductions in installed capacity.
- Multiple capacity tables are available and can be accessed via the drop-down menu.

Note!

The “Installed Energy Capacity Adjustment” policy represents a more detailed approach to modelling energy system changes. Therefore, it cannot be used simultaneously with the simplified decarbonization policies.

When selecting policies, the user must choose either:

- *the “Installed Energy Capacity Adjustment” policy, or*
- *the simplified decarbonization policies:*
 - *District heating decarbonization*
 - *Local electricity production decarbonization*
 - *Grid electricity production decarbonization*

These policy options are mutually exclusive and cannot be applied at the same time.

Results (2)

On the left-hand side of the page (2.1.), policy impacts are visualized:

- **Installed capacity.** This section shows changes in installed capacity over time for:
 - CHP plants
 - Electricity-only plants
 - Boiler houses

On the right-hand side of the page (2.2.), policy impacts are visualized:

- **District heating indicators** – Displays:
 - emission factor (tCO₂/MWh),
 - distribution losses (%), and
 - heat demand (MWh).
- **Electricity indicators** – Displays:
 - local electricity emission factor, and
 - grid electricity emission factor.

17. Overview

After the user has gone through every sector and adjusted technical and policy assumptions to their liking, they can proceed to the simulation overview page (see Fig.48.) by clicking the “Overview” button in the navigation bar at the top of the page.

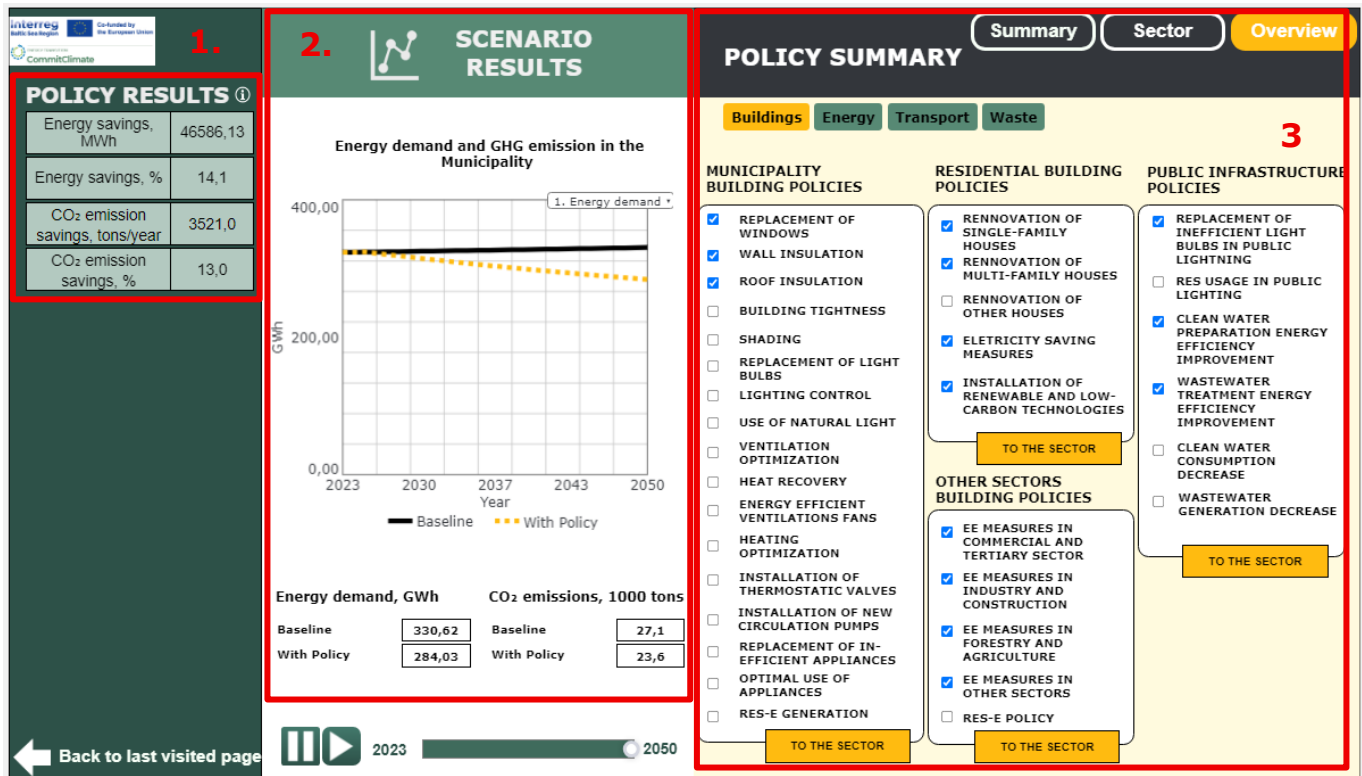


Fig.48. Simulation overview page

This page consists of the following sections:

Policy results (1)

Displays achieved energy savings (MWh/year) and CO₂ emission reductions (tCO₂/year), both in absolute values and as percentages (%) compared to the baseline year. These values reflect the combined impact of all implemented policies in the municipality.

NB! On the Overview page, the baseline scenario for 2050 (without additional policies) is compared with the 2050 results after policies are applied. This highlights the direct impact of the selected policies in 2050. If you want to see the overall change between the base year and 2050, please refer to the Summary page, where 2050 results with policies are compared to the base year.

Scenario results (2) – This section contains a graph showing either:

- energy demand (GWh/year), or
- CO₂ emissions (ktCO₂/year),

from the baseline year until 2050, comparing the baseline scenario (solid black line) and the policy scenario (dotted yellow line). The displayed parameter can be changed using the drop-down menu in the upper-right corner of the graph.

Additionally, the user can select a **CO₂ target (ktCO₂/year)** from the drop-down menu. This adds a trendline based on the emission reduction goal defined in the *General Input Data* page (see Chapter 6.1). This allows the user to assess how closely the policy scenario aligns with the selected target.

Below the graph, display fields show energy demand (GWh/year) and CO₂ emissions (ktCO₂/year) in 2050 for both the baseline and policy scenarios.

Policy summary (3) – This section provides an overview of all policies within the selected sector (Buildings, Energy, Transport, Waste), grouped by sub-sector.

Policies that are active in the current scenario are marked with a checkmark. The user can enable or disable policies using the checkboxes and immediately observe their impact on the results.

The sector can be changed using the navigation bar located at the top-left corner of this section. This section is intended for quick scenario adjustments. For detailed parameter changes, the user must navigate to the corresponding sub-sector page by selecting the **“TO THE SECTOR”** buttons.

After reviewing the results, the user can return to the *Municipality Summary* page (see Chapter 5) by selecting the **“Summary”** button in the navigation bar at the top of the page. There, the user can review baseline indicators, sectoral energy consumption, projections to 2050, and save or export simulation data.