CommitClimate CO_2 Simulator

SECTOR: TRANSPORT

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Interreg Baltic Sea Region
Co-funded by the European Union
ENERGY TRANSITION
CommitClimate

Goal of the presentation

- What is included in the sector, which sub-sectors
- Calculation rationale
- Technical assumptions
- What can the user change? What cannot the user change? Linkages with other sectors
- List of policy measures
- Policy measures working principle

Transport Sector

- The sector includes CO_2 emissions from consumption of energy consumption in transport activity sectors
- Sub-sector breakdown:
  - Municipal fleet
  - Public transport
  - Private and commercial transport

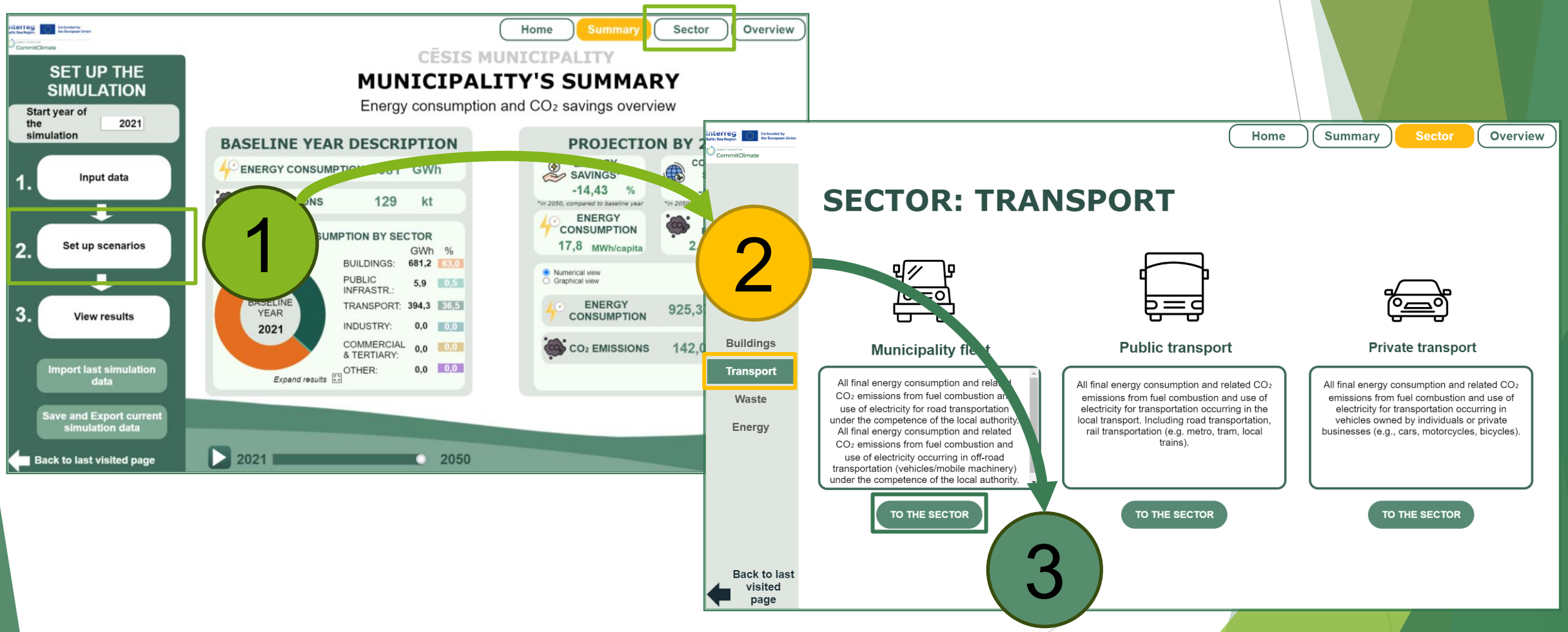
Policy application caution!

- *NB! Please note that emissions are also influenced by developments in the energy sector. As a result, changes in emissions may occur in the policy scenario even if no policies are applied within this sector.*

Adjustments to these outcomes can be made by modifying policies in the local energy production sector.

Approach to calculating emissions in a municipal vehicle fleet

Navigation to the municipal transport sector



Approach to calculating emissions in the municipal vehicle fleet I

- The emissions calculation is based on user-specified data on the number of vehicles in municipal vehicle fleet by fuel type and technical assumptions about fleet usage and characteristics:
  - Average fuel economy
  - Activity (annual mileage)
  - Fuel emission factors

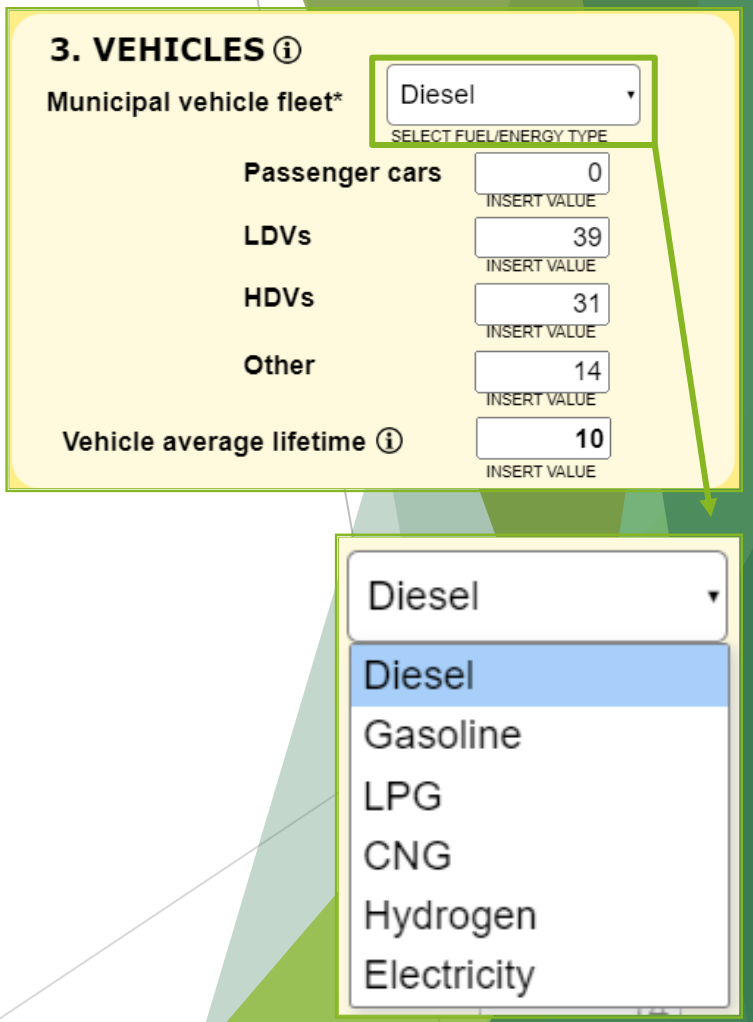
$$E = vehicles \times fuel\ economy \times mileage \times EF$$

where

E	*- CO_2 emissions (tonnes/year)*
Vehicles	*- number of vehicles*
Fuel economy	*- average fuel economy (kWh/100 km/year)*
Mileage	*- average mileage (km/year)*
EF	*- emission factors (tonnes CO_2/MWh)/1000*

Approach to calculating emissions in the municipal vehicle fleet II

- The number of vehicles in the municipal fleet is a mandatory input. The simulator will not generate results if the number of vehicles in the fleet is 0.
- The user can choose to specify different vehicle types:
  - Passenger cars
  - Light duty vehicles (LDVs)
  - Heavy duty vehicles (HDVs)
  - Other vehicles
- The user can choose between different fuel types in each vehicle category:
  - Diesel
  - Gasoline
  - LPG
  - CNG
  - Hydrogen
  - Electricity



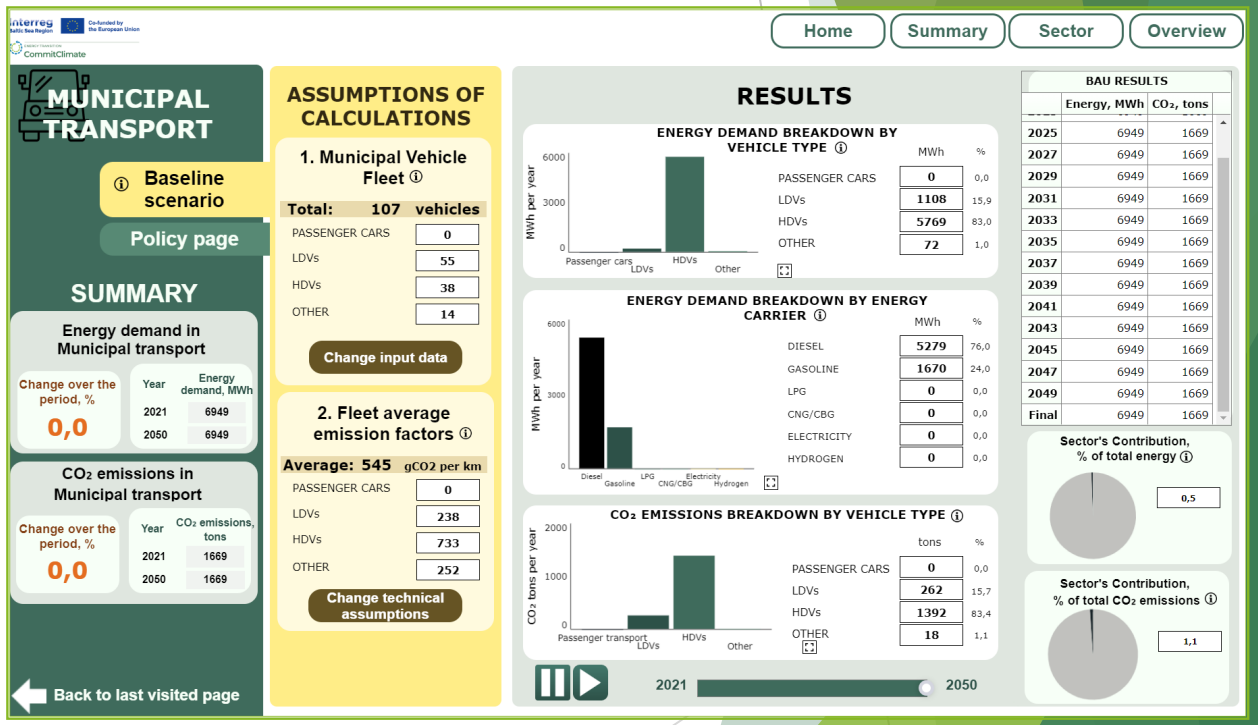
Approach to calculating emissions in the municipal vehicle fleet III

NB!

- The calculation of energy consumption and CO_2 emissions in the baseline scenario is based on built-in technical assumptions about average fuel economy and annual mileage for each vehicle type. The user can change these assumptions in the Municipal Vehicle Fleet Technical Assumptions section
- The simulation assumes that the existing vehicle fleet is renewed at the end of its service life (unless otherwise specified in the Technical Assumptions section)

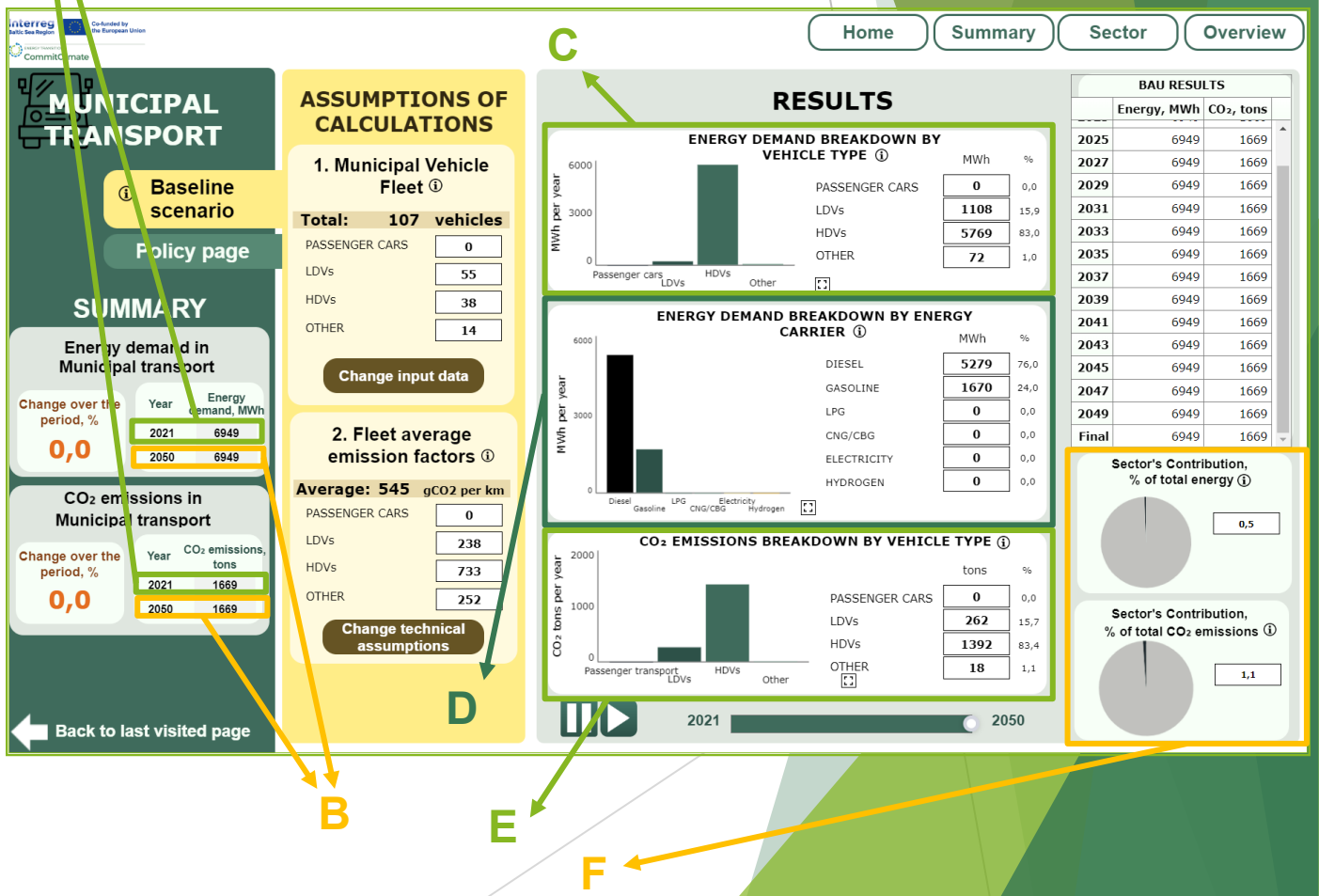
Baseline scenario for energy consumption in the municipal fleet I

- After the user has input data on the size of the municipal fleet and specified technical assumptions (optional), the Simulator can calculate the energy consumption and related CO_2 emissions in the baseline scenario in the municipal fleet sector.
- The baseline scenario describes the continuation of the current situation (baseline year) considering changes in the vehicle stock (if applicable) and gradual efficiency improvements in the future
- The baseline scenario is visible in the first view after opening the sector page (Fig.)



Baseline scenario for energy consumption in the municipal fleet II

- The baseline scenario is visible in the first view after opening the sector page
- In the baseline scenario, it is possible to view the results for:
  - Energy demand and GHG emissions in the Baseline year (A)
  - Energy demand and GHG emissions in 2050 (B)
  - Energy consumption breakdown by energy carrier (C)
  - Energy consumption breakdown by vehicle category (D)
  - GHG emission breakdown by vehicle category (E)
  - Sector's contribution of total energy consumption and GHG emissions in the municipality (F)



Policy measures in the municipal fleet I

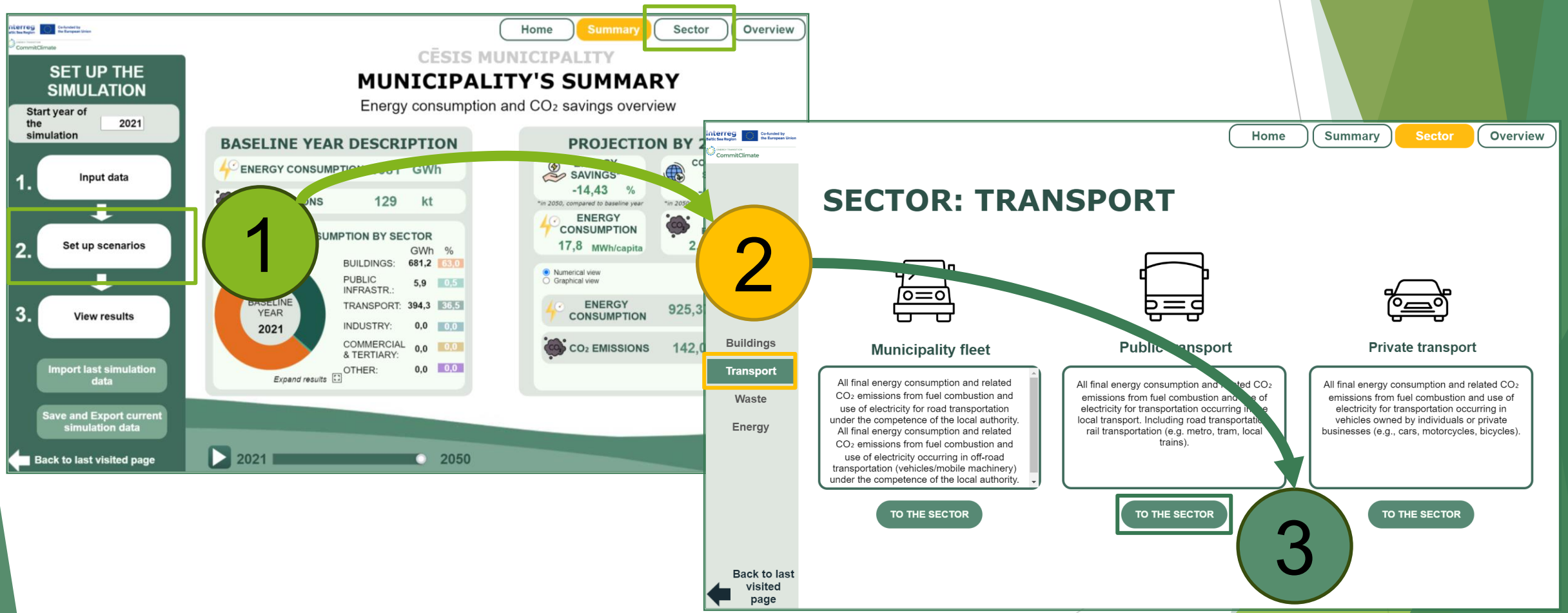
- The user has the opportunity to analyze the impact of various policy measures on energy consumption and CO_2 emissions in the municipal fleet:
  - Passenger car fleet decarbonization
  - Other vehicle fleet (LDVs, HDVs, other) decarbonization
  - Fleet modernization, driver training and awareness rising
  - Fleet management improvement
  - RES usage

Policy measures in the municipal fleet II

- One of the proposed measures in the municipal fleet is car fleet decarbonization. This policy means that the existing fleet will be replaced with low or zero carbon vehicles at the end of their service life.
  - In the Policy Assumptions View, the user can specify which technologies will be used to replace the existing fleet (D, G, LPG, CNG, H2, EVs), and in which year the vehicle replacement policy will be initiated
- The fleet modernization and fleet management improvement policies respectively reduce the average fuel consumption and total fleet mileage by an amount specified by the user
  - The rate at which the fuel economy of vehicles improves and the annual mileage decreases, as well as the year in which these improvements begin, can be specified in the Policy Assumptions View in the Municipal Fleet sector
- The RES usage policy applies to the blending of biofuels into diesel and gasoline. The user has the option to specify the increase in the proportion of biofuels in the municipal fleet. The initial value of the biofuel blending is defined in the Technical Assumptions section

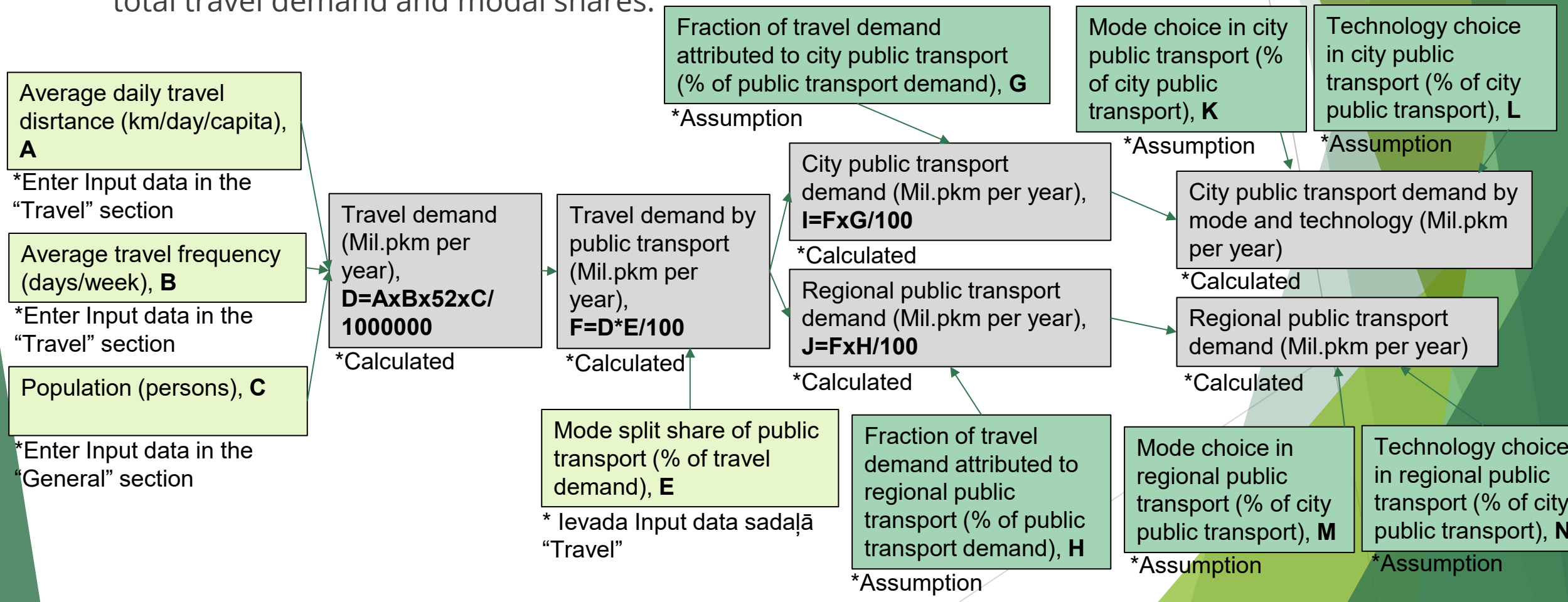
Approach to calculating emissions in public transport

Navigation to the public transport sector



Approach to calculating emissions in public transport I

- The approach to calculating emissions from public transport is based on forecasting total travel demand and modal shares:

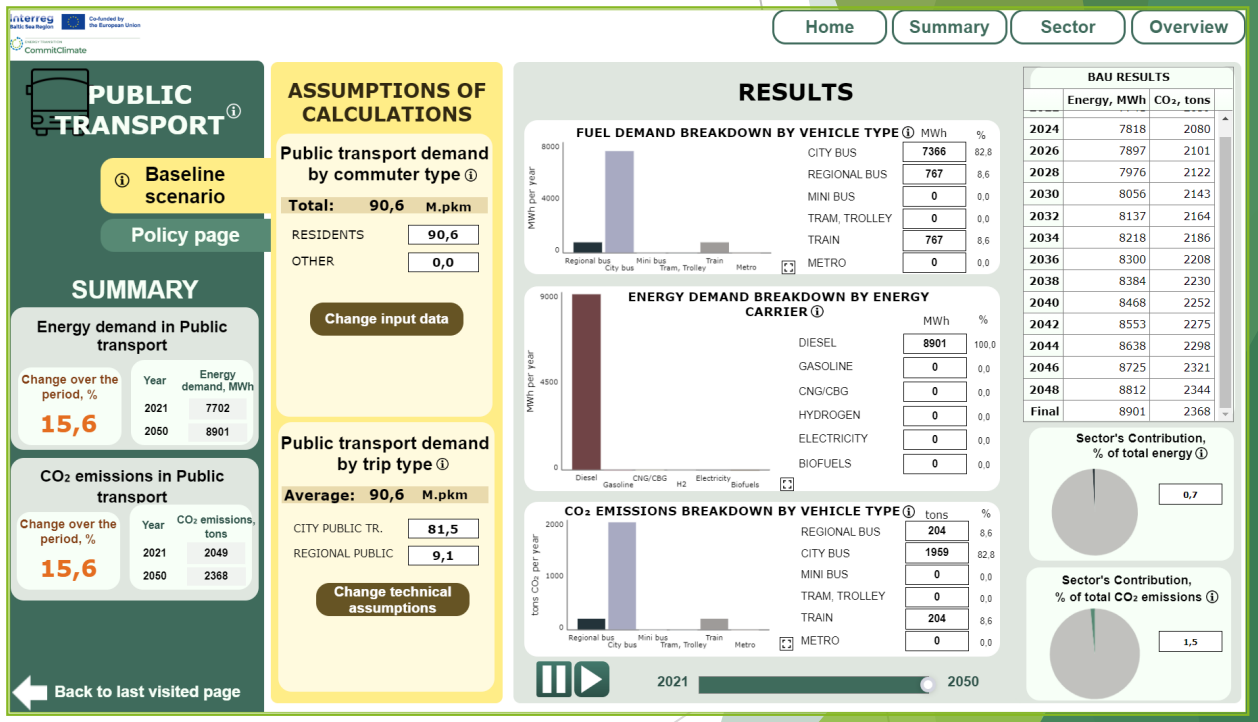


Approach to calculating emissions in public transport II

- User input data:
  - Current and projected daily travel distance of local population and city guests (km/day/capita)
  - Current and projected travel frequency of local population and city guests (km/day/capita)
  - Fraction of public transport in passenger travel (%)
- Technical assumptions that the user can view and change in the Technical assumptions section of the Public transport sector:
  - Fraction of city public transport (%)
  - Fraction of regional public transport (%)
  - City public transport and regional public transport mode choice (%)
  - Average occupancy (%)
  - Technology selection by mode choice (%)
  - Fuel economy (liters/100 km, kg/100 km, kWh/100 km)

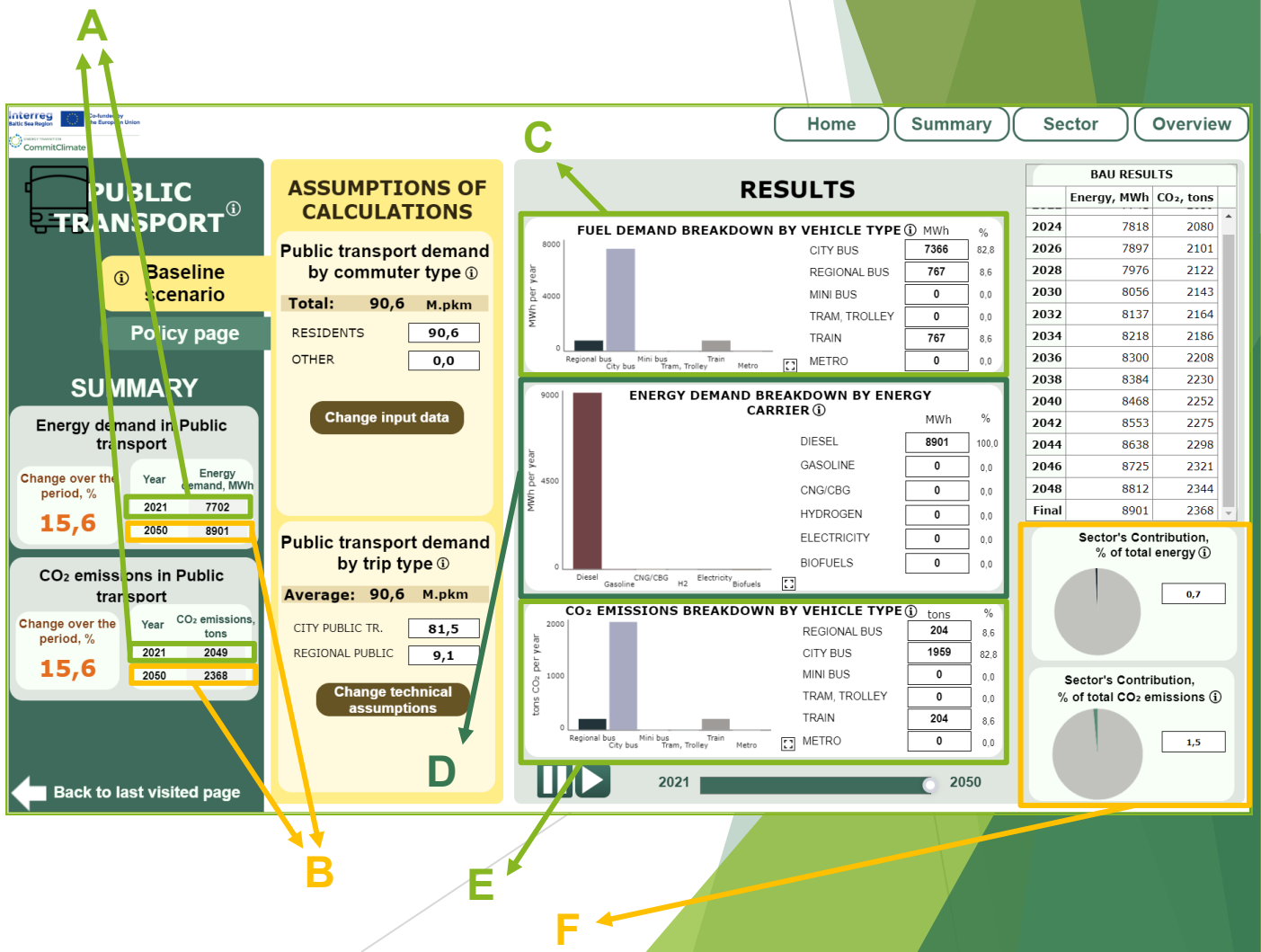
Baseline scenario for energy consumption in public transport I

- After the user has input data about the transport sector and specified technical assumptions (optional), the Simulator can calculate the transport sector's energy consumption and related CO_2 emissions in the baseline scenario
- The baseline scenario describes the continuation of the current situation (in the base year) considering changes in travel demand and gradual improvements in vehicle efficiency in the future
- The baseline scenario is visible in the first view after opening the sector page (Fig.)



Baseline scenario for energy consumption in public transport II

- The baseline scenario is visible in the first view after opening the sector page
- In the baseline scenario, it is possible to view the results for:
  - Energy demand and GHG emissions in the Baseline year (A)
  - Energy demand and GHG emissions in 2050 (B)
  - Energy consumption breakdown by vehicle type (C)
  - Energy consumption breakdown by energy type (D)
  - GHG emission breakdown by vehicle type (E)
  - Sector's contribution of total energy consumption and GHG emissions in the municipality (F)



Policy measures in public transport I

- The user can analyze the impact of various policy measures on energy consumption and CO_2 emissions in public transport:
  - Operational efficiency and route optimization
  - Transition to low and zero carbon fuels
  - Adopting renewable energy in public transport infrastructure
  - Mode shift to public transport

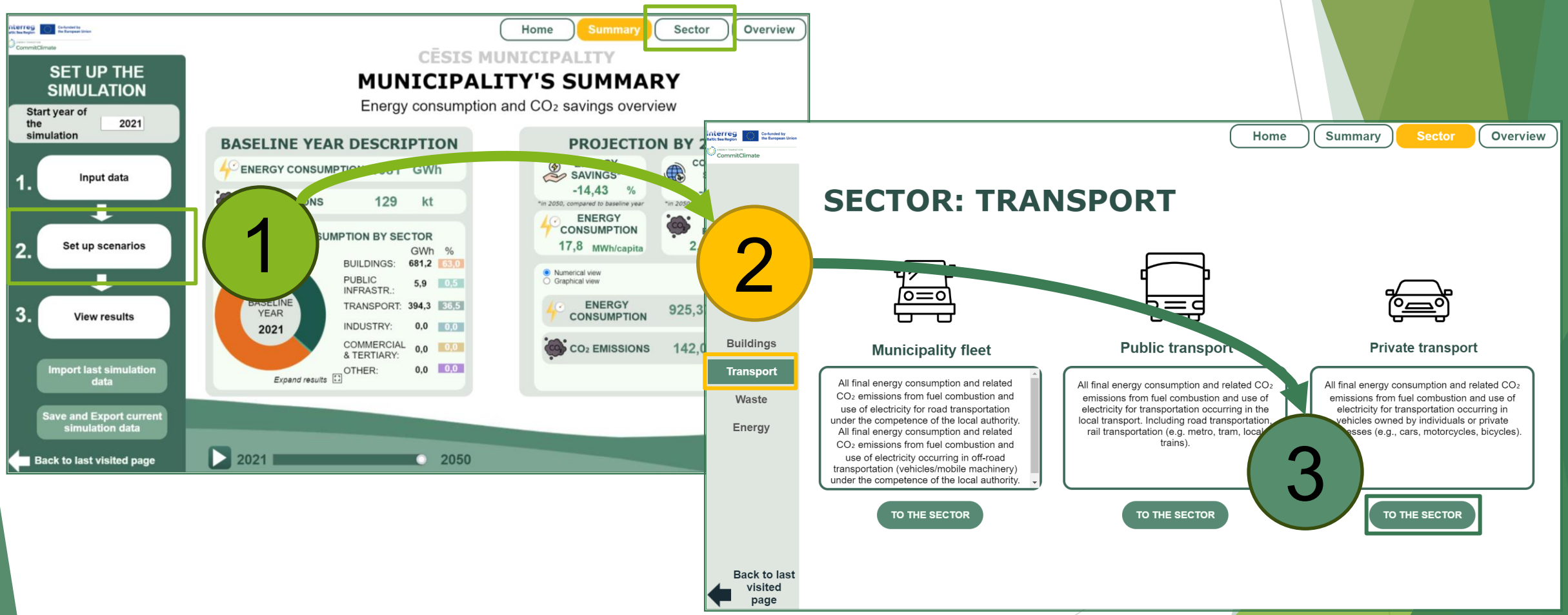
NB! Please note that energy emissions are also influenced by the "Reduction in passenger transport demand" policy, which can be adjusted on the Private Transport Policy page.

Policy measures in public transport II

- 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
- 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.
- The fleet modernization policy defines the annual rate at which energy consumption (MWh/pkm) decreases over the selected period when this policy is applied.
- One of the proposed measures in the public transport fleet is the transition to zero and low carbon technologies. 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
- 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

Approach to calculating emissions in private transport

Navigation to the private transport sector

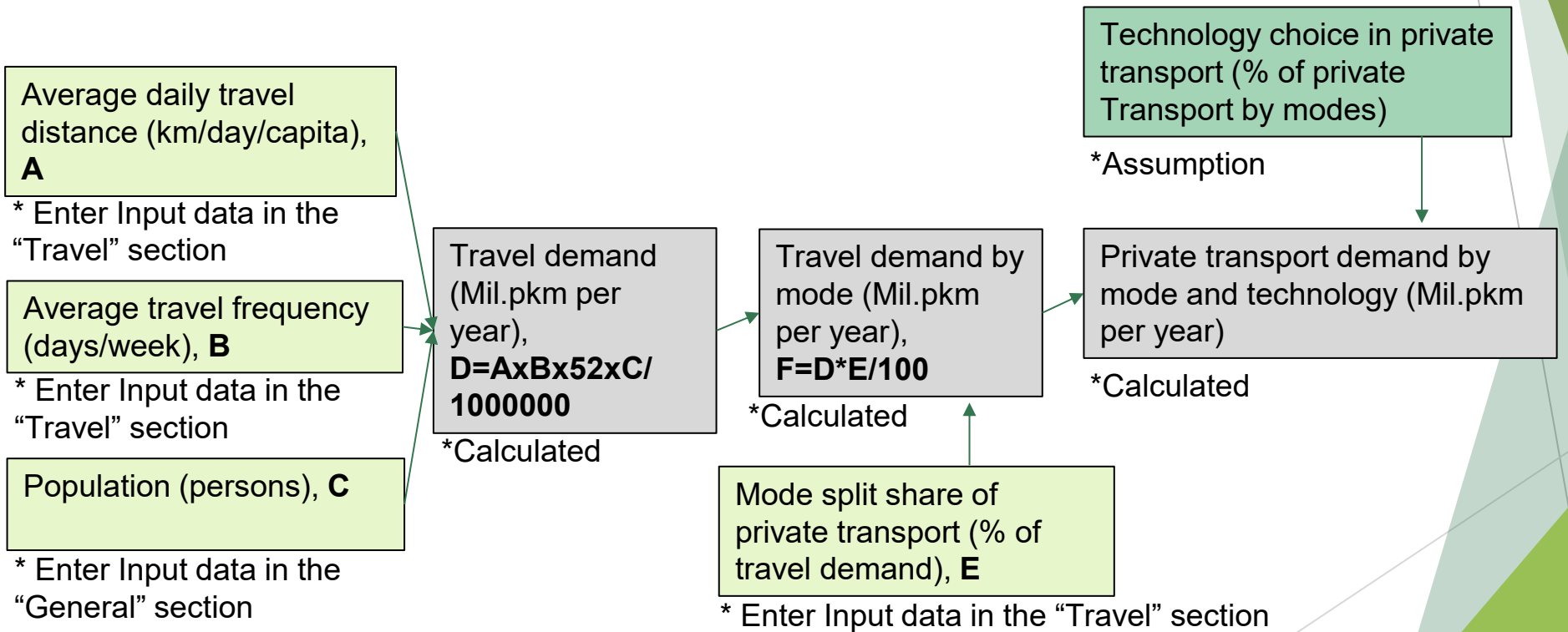


Approach to calculating emissions in private transport

- In the private transport sector, emissions are calculated for:
  - Passenger transport
    - Categories: private cars, two-wheelers, micro-mobility
  - Freight transport
    - Categories: HDVs < 3.5 tons and HDVs > 3.5 tons

Approach to calculating emissions in private transport. *Passenger transport I*

- The approach to calculating emissions for **private passenger transport** is based on forecasting total travel demand and modal shares:



- The private transport modes included are: private car, walking, cycling, two-wheelers, and micro-mobility. Of these, walking and cycling are not included in the energy consumption calculation.

Approach to calculating emissions in private transport. *Passenger transport II*

- User input data:
  - Current and projected daily travel distance of local population and city guests (km/day/capita)
  - Current and projected travel frequency of local population and city guests (km/day/capita)
  - Fraction of private transport modes in passenger travel – private car, two-wheelers, and micro-mobility (%)
- Technical assumptions that the user can view and change in the Private transport sector section Technical assumptions:
  - Annual vehicle mileage (km/year)
  - Average occupancy (persons/vehicle)
  - Vehicle usage in local territory (%)
  - Technology selection (%)
  - Fuel economy (liters/100 km, kg/100 km, kWh/ 100 km)
- Included technologies in private transport
  - Diesel
  - Gasoline
  - LPG
  - CNG/CBG
  - Hydrogen
  - Electricity

Approach to calculating emissions in private transport. *Freight transport I*

- The emissions calculation is based on user-specified data on the number of freight transport vehicles by fuel type and technical assumptions about fleet usage and characteristics:
  - Average fuel economy
  - Activity (annual mileage)
  - Fuel emission factors

$$E = vehicles \times fuel\ economy \times mileage \times EF$$

where

E	*- CO_2 emissions (tonnes/year)*
Vehicles	*- number of vehicles*
Fuel economy	*- average fuel economy (kWh/100 km/year)*
Mileage	*- average mileage (km/year)*
EF	*- emission factors (tonnes CO_2/MWh)/1000*

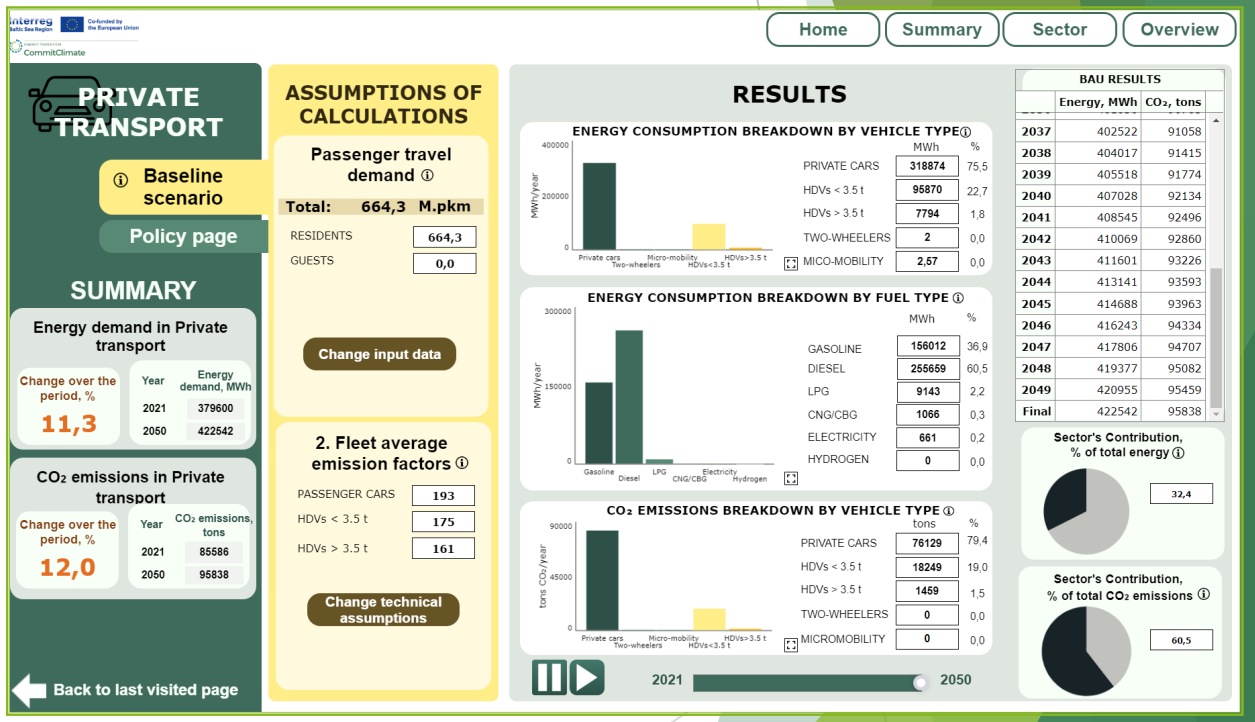
- If the number of registered freight vehicles is not specified in the Input data section "Travel" (or it is equal to 0), freight transport will not be included in the energy consumption.

Approach to calculating emissions in private transport. *Freight transport II*

- User input:
  - Number of registered goods vehicles
- Technical assumptions that the user can view and change in the Private transport sector section Technical assumptions:
  - Fraction of HDVs < 3.5 tons (% of total registered), fraction of HDVs > 3.5 tons (% of total registered)
  - Annual vehicle mileage (km/year)
  - Average occupancy (persons/vehicle)
  - Vehicle usage in local territory (%)
  - Technology selection (%)
  - Fuel economy (liters/100 km, kg/100 km, kWh/ 100 km)
- Included technologies in road goods transport:
  - Diesel
  - Gasoline
  - LPG
  - CNG/CBG
  - Hydrogen
  - Electricity

Baseline scenario for energy consumption in private transport I

- After the user has input data about the transport sector and specified technical assumptions (optional), the Simulator can calculate the transport sector's energy consumption and related CO_2 emissions in the baseline scenario
- The baseline scenario describes the continuation of the current situation (in the base year) considering changes in travel demand and gradual improvements in vehicle efficiency in the future
- The baseline scenario is visible in the first view after opening the sector page (Fig.)



Baseline scenario for energy consumption in private transport II

- The baseline scenario is visible in the first view after opening the sector page (Fig.)
- In the baseline scenario, it is possible to view the results for:
  - Energy demand and GHG emissions in the Baseline year (A)
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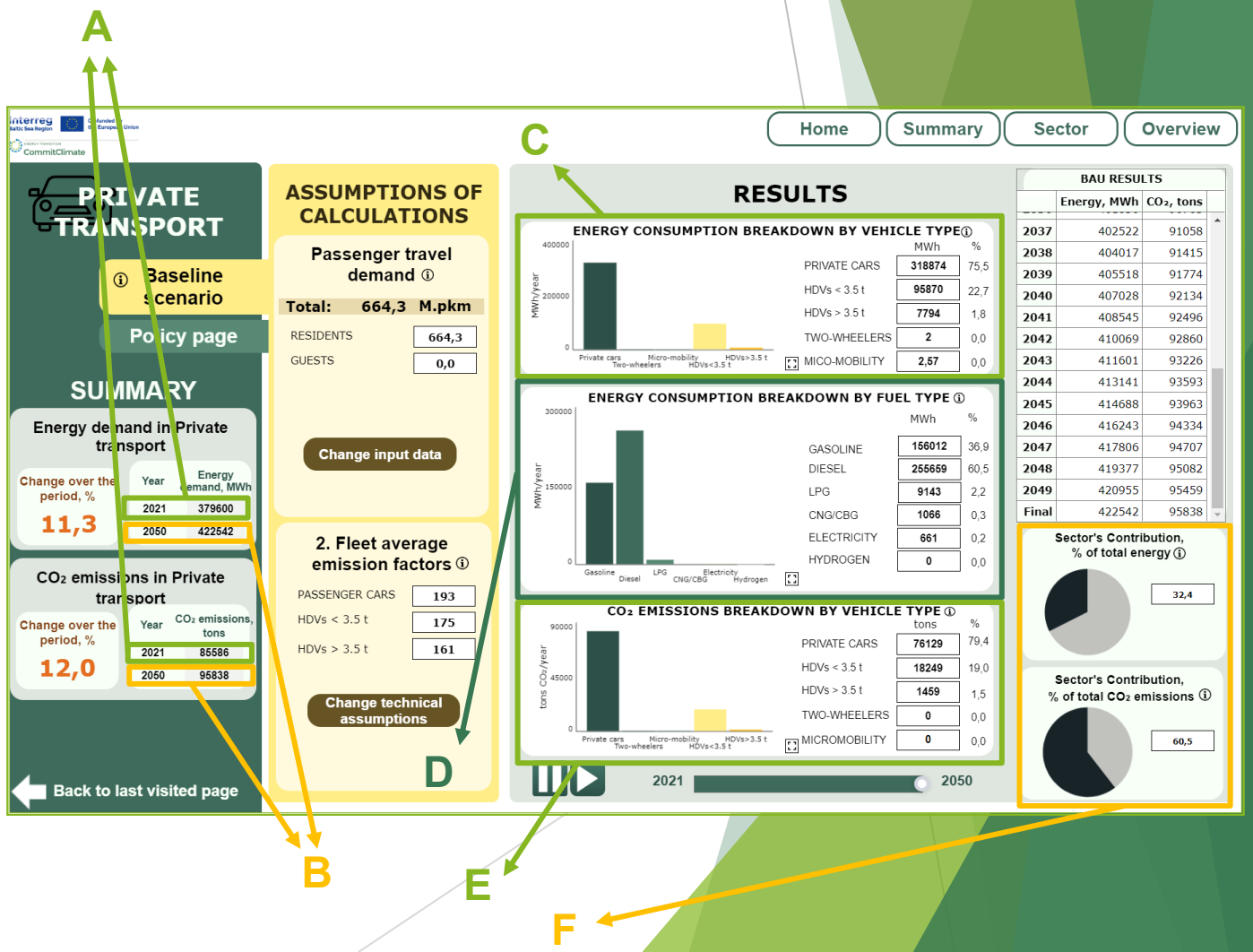
  - Sector's contribution of total energy consumption and GHG emissions in the municipality (F)



Policy measures in private transport I

- The user can analyze the impact of various policy measures on energy consumption and CO_2 emissions in private transport:
  - Reduction in passenger transport demand
  - Modal change in passenger transport
  - Car sharing
  - Transition to zero and low emission technologies in passenger cars and/ or freight transport
  - 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.
  - Reducing demand for freight transport

Apply selected passenger car policies to guest travellers *– This option allows the user to extend the policy parameters defined for passenger car policies 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.

Policy measures in private transport II

- One of the proposed measures in the private transport fleet is the transition to zero and low carbon technologies in passenger car fleet. This policy means that the existing traditional fuel in the fleet is replaced with alternative technologies
  - In the Policy Assumptions View, the user can specify which technologies to use (Diesel, Gasoline, LPG, CNG/CBG, H2, EVs), in which year to start the fuel conversion and by which year to complete it
- The reduction in transport demand policy affects passenger travel demand or freight transport demand in the amount specified by the user
  - The speed at which the daily travel distance and travel frequency decrease, as well as the year in which this decrease begins, can be specified in the Policy Assumptions View in the Private Transport Sector
- The modal change policy allows you to assess the effect on transport emissions of a different mode choice in passenger transport (for example, a higher proportion of cycling or micro-mobility). The user must specify the desired modal split and the period in which it is achieved
- The car sharing policy allows you to assess the effect on transport sector emissions of a higher occupancy rate of private cars.
  - The rate at which average private car occupancy (%/year) changes, as well as the year in which this decline begins, can be specified in the Policy Assumptions View in the Private Transport Sector.

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SECTOR: TRANSPORT

To view information on the emission calculation approach in other sectors, go to the sections “Buildings”, “Waste”, “Energy”

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