referee
real value of energy efficiency

TOOL GUIDANCE - LOCALITIES

Press any chapter to navigate directly to it

REFEREE Tool

- R1. Purpose of the Tool
- R2. Defining Inputs and Outputs
- R3. Policies Eligible for Testing

Guidance

- G1. Introduction
- G2. Step-by-step guide

European context

- E1. European regulation
- E2. European targets

ISINNOVA research innovation sustainability · Mcrit Multicriteria Planning · cambridge econometrics clarity from complexity · EEB European Environmental Bureau · CSD Center for the Study of Democracy · Notre Europe Institut Jacques Delors Thinking Europe · Penser l'Europe · Europa denken · BAUM

R1

Purpose of the Tool

Back to main

Overarching objectives

REFEREE strongly advocates the principle that energy efficiency measures will be key for delivering the European Green Deal.

The project aims to **make energy efficiency more appealing** to policy makers at all levels of governance by

(1) **delivering insightful** and **reliable** information on the **multiple benefits** that energy efficiency measures can provide;

(2) **offering user-friendly tool** to make this information immediately operational for decision makers.

Back to main

Overview on the Policy Assessment tool

- The REFEREE Policy Assessment Tool can simulate policy packages both at the level of Member states and at the level of localities (municipalities, counties, small regions…).

- **This guidance document will help you navigate the tool dedicated to the localities.** *(To know more about the Member State tool, consult the* ***REFEREE national tool Dashboard)***

- REFEREE quantifies **the multiple benefits of energy efficiency policies**, including direct impacts (energy efficiency gains) and indirect impacts (benefits on the environment, citizens' health, public finances, etc.)

Back to main

REFEREE Local Model GUIDANCE

- **REFEREE Website (tool access):** https://refereetool.eu/presentation-referee-tool/

Back to main

How can REFEREE be useful to localities?

- **A fast-changing policy area.** Local administrators usually have fewer tools and resources available to solve issues or adapt their efforts to rapidly changing energy efficiency frameworks.
- **Easy-to-use.** The tool is aimed to assist local policy-makers in making decisions regarding energy efficiency based on more objective information in an easy-to-use policy support system.
- **Non-energy efficiency impacts.** Apart from the usually assessed energy efficiency impacts (consumption, emissions, costs savings), the tool will provide innovative and cross-sectoral insights related to non-energy impacts, like impacts on public budget or citizen income.
- **Useful for SECAP plans.** The tool is intended to help design local SECAP plans (Sustainable Energy and Climate Action Plans). It assists localities in estimating their energy consumption data and identifying areas where impacts are expected to have greater returns. The model provides estimations of data that may be hard to obtain in small localities, allowing an easier execution of such plans.
- **Sensitivity analysis.** The tool will allow for sensitivity analysis of key policies, comparing results from different runs using different policy intensities.

Back to main

R2

Defining Inputs and Outputs

Back to main

How is the tool organized?

Users input

Basic data about the locality

- *Population & expected annual growth*
- *Income per capita*
- *Public budget*
- *Country & climatic area*
- *Initial energy consumption by sector*

Local policies definition

- *Sectors: housing, tertiary, mobility*
- *Policy instrument*
- *Share of the stock that will be affected*
- *Policy intensity*

Energy consumption assessment

Historical record of energy consumption per capita

(from Covenant of Mayors SECAPs)

Energy distribution by sector

(from EU benchmark of energy consumption by sector per country)

The REFEREE local policy assessment tool

Calibrated with CE E3ME

Electricity mix is provided by E3ME country data, acquiring more robust data. Also provide maximum energy efficiency gains, as observed from national-level energy efficiency policies modelled by E3ME.

Simulation engine

Online visualisation module

Local Policy Assessment Report

Policy and reference scenario

Locality profile; Reference energy consumption; Policy intensity by sector and subsector)

Thematic graphs & tables

- *Energy impacts: energy consumption, energy mix, energy cost and cost savings*
- *Non energy impacts: productivity gains, public budget, gross locality income, green house gas emissions by origin*

Exogenous input data

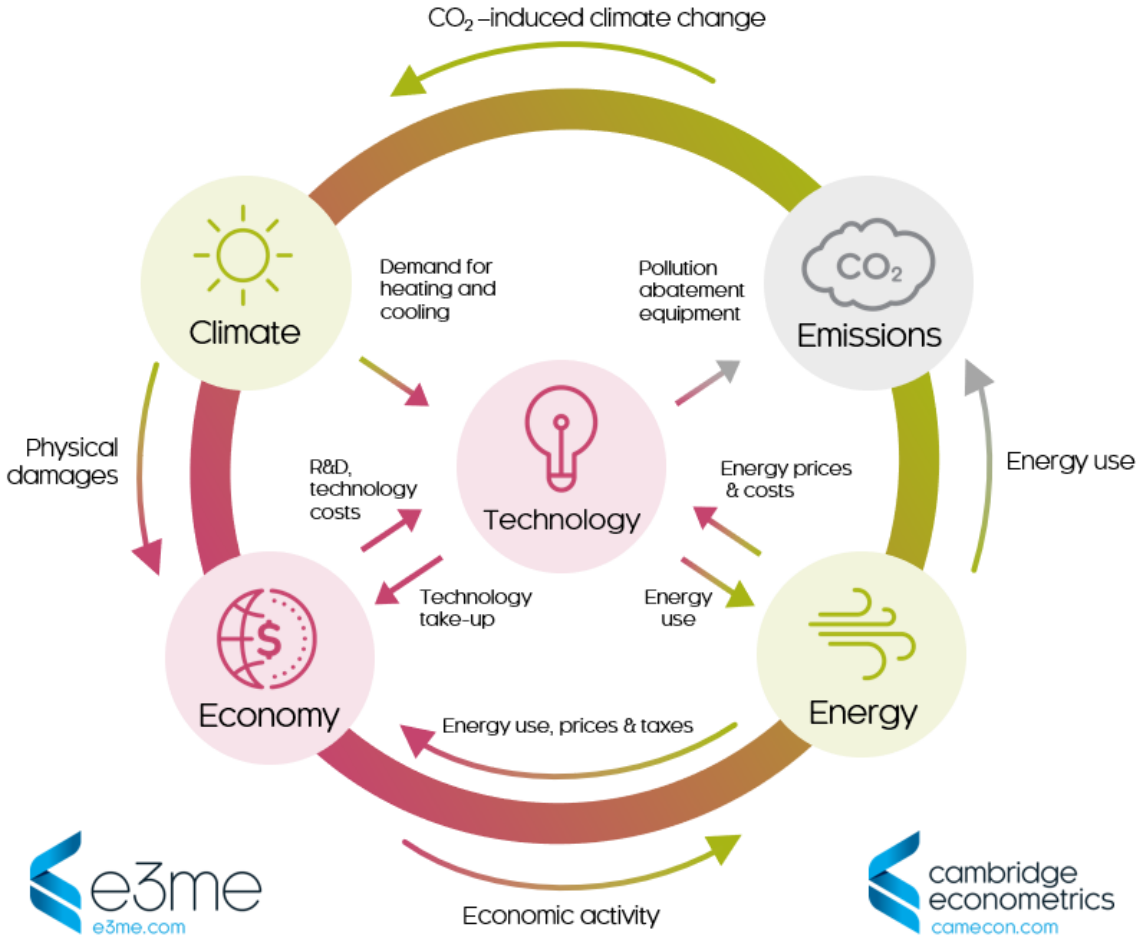
Data processing

Endogenous input/output data

Output data

Back to main

E3ME Engine



The Localities Tool is powered by E3ME Lite model

E3ME

- A global, non-equilibrium macro-econometric model designed to address **major economic and economy-environment policy challenges**.
- Econometric specification provides a strong empirical basis for analysis, allowing to fully assess **short and long-term impacts**.
- Endogenously captures linkages and feedbacks between the world's economies, energy systems, emissions.

E3ME Lite

- **Online version of the E3ME model**, based on parameters for each direct impact from the FTT models that feed into E3ME.
- Parameters are assessed for each model feedback channel and country in EU27 & UK, leading to more than 3k runs.
- Captures **net economic impacts from changes in the energy system** based on estimated parameters from E3ME.

Back to main

Inputs for the local policy tool

Inputs in the REFEREE Local Policy tool required inputs in relation to the profile of locality to be assessed, and on the energy efficiency policies to be tested.

Socioeconomic Profile of locality

- Income per capita
- Population and population growth
- Locality public budget

Policies for Energy Efficiency

- Housing, tertiary and mobility sectors are considered, as well as subsectors such as climatization, water heating, public transport or private transport.
- Policy intensities and targeted stock can be adjusted.

Energy Profile of locality

- Total energy consumption (tool provides for climatic area proxies based on Covenant of Mayors benchmark)

- Local energy consumption abatement by sectors (tool provides for country-based proxies based on Member States reporting to Eurostat)

Internal assumptions (E3ME parameters)

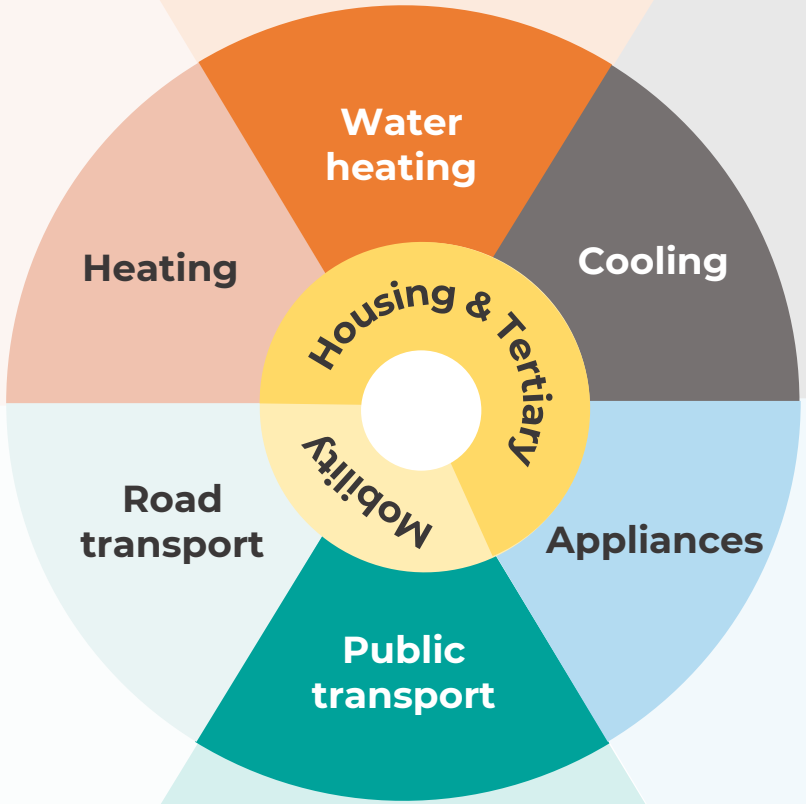
- Historical electricity mix and 2035 projection
- Historical energy costs and 2035 projection
- Housing energy profile by sources
- Tertiary energy profile by sources
- Mobility energy profile by sources

Back to main

Examples of local policy measures

- Water saving equipment
- Consideration of user behaviour
- Thermal water collectors

- Smart heating energy management
- Consideration of user behavior
- More efficient heating technologies
- Energy rehabilitation of buildings



- Smart cooling energy management
- Consideration of user behavior
- More efficient cooling technologies
- Nature-based cooling strategies

- Increase mean vehicle occupation
- Reduce travel rate
- Transfer road users to public transport
- Increased vehicle efficiency

- Fleet renovation
- Better fleet management

- Supporting the renewal of household appliances
- Renewal of building lighting
- Awareness for the rational use of appliances

Back to main

Outputs

Impact areas	Results
Expected energy consumption and energy savings	Energy consumption and energy savings (total & by sector) • Housing: heating, cooling, water heating, appliances • Tertiary: heating, cooling, water heating, appliances • Mobility: public transport, road transport
Cost savings (pre-tax)	Costs and cost savings (total & by sector) • Housing: heating, cooling, water heating, appliances • Tertiary: heating, cooling, water heating, appliances • Mobility: public transport, road transport
	Magnitude of savings contrasted to locality aggregated income (Proxy to locality GDP)
Climate Change	CO2 emission savings (total & by sector) • Housing: heating, cooling, water heating, appliances • Tertiary: heating, cooling, water heating, appliances • Mobility: public transport, road transport
	Contrast with existing policy targets for greenhouse gas emission reduction
Socioeconomic impacts	Increase of available income per capita
	Increase of available local aggregated income
	Locality public budget impacts
Governance (transformation capacity of public policies)	Impact of public policies derived from citizen behaviour
	Impact of public policies derived from cleaner technology (cleaner energy mix)
	Exogenous gains not deriving from local policies (derived from cleaner electricity mix)

Back to main

Outputs. Energy Efficiency Impacts

Outputs in the REFEREE Local Policy tool consider energy consumption, GHG emissions, economic savings, as well as indirect additional impacts:

Total Energy Savings (in MWh)
MWh of the Expected energy consumption and energy savings for different sectors and subsectors.

- **Housing: heating, cooling, water heating, appliances**
- **Tertiary: heating, cooling, water heating, appliances**
- **Mobility: public transport, road transport**

Cost savings (Million euros)
This is, euros saved by changes in energy consumption, in euros (countries with other currencies, will need to make their own transformations if needed). Two main drivers: (1) Total energy consumption (less energy mean less costs); (2) Energy mix (different energy carriers have different costs). Sectors considered, again **Housing, Tertiary and Mobility.**

Climate Change Impacts (in tCO2)
This is CO2 emissions tones saved because of less energy consumed (MWh), and because of cleaner energy mixes. Sectors considered, again **Housing, Tertiary and Mobility.**

Contrast with existing policy targets. Additionally, REFEREE provides for greenhouse gas emission reduction and energy efficiency increases targets currently in force in the EU to be met. The tool allows for contrasting simulation results with targets in force (e.g., 55% total CO2 reduction for 2030 in respect of the reference year (preferably 2005). *(To know more about this, check **Chapter 3 European targets more in deep**.)*

Back to main

Outputs. Non-energy impacts

Outputs in the REFEREE Local Policy tool consider energy consumption, GHG emissions, economic savings, as well as indirect additional impacts:

Increase of available local aggregated income (in %)

- The Model estimates the increase of local available aggregated income of citizens in a locality resulting from considering savings in the overall energy bill in the locality. This result is intended as a proxy to the locality productivity indicator (municipal GDP) indicating a potential increase of the local economy resulting from lower energy costs. This result is presented as the % of the € variation from the initial year (which will be 100%) to the final (100%+X).

Increase of available income per capita (in %)

- The Model estimates the repercussion of economic savings on single families by assessing energy costs savings per person in relation to the estimated income per capita in the locality, between the initial year and the final year of the simulation. The model only considers energy costs pre-tax, therefore there will be an extra income available for families deriving from taxes saved too. This additional savings will depend on the tax levels of each country and/or the locality', which can be of important additional magnitude (up to 100% increase). This result is presented as a % of the € variation from the initial year (which will be 100%) to the final (100%+X).

Locality public budget impacts (in %)

- Model assumes that with increased available income for citizens and businesses in a locality (and increased population), public budgets will be positively impacted too. This indicator is calculated based upon initial public budget declared in the parameters, population growth, available income per capita changes and available local aggregated income variations. This result shows a % of the € variation from the initial year (which will be 100%) to the final (100%+X).

Back to main

Outputs. Non-energy impacts

The REFEREE tool provides hints on the organization of local energy governance and the figure of uprising energy citizenship that capitalizes gains from energy efficiency.

It discusses the origin of energy efficiency gains and climate change benefits, either being facilitated by a more responsible Energy Citizenship that consumes less and cleaner, or because of benefits obtained exogenously from cleaner energy mixes at Member State level driven from an increasing shares in RES (or eventually in the nuclear)

Impact of public policies derived from citizen behavior (less consumption)

- Tones of CO2 that are saved by a reduction of the energy consumption, citizens and businesses that consume less. Local administration can influence on this, by establishing policies affecting citizens, or by implementing initiatives at the level of City Halls and their premises with exemplification capacity.

Impact of public policies derived from cleaner technology (cleaner energy mix)

- Tones of CO2 that are saved by a change on energy carriers (i.e. changing fuel cars by electric cars), so now the locality use cleaner energy. Local administration can influence on this, by establishing policies affecting citizens, or by implementing initiatives at the level of City Halls and their premises with exemplification capacity.

Exogenous gains not deriving from local policies (cleaner electricity mix)

- Tones of CO2 that are saved by a national change on electricity mix. We saw in the recent past that electricity is produced using more renewables and less fossil fuels in most EU countries, with a direct impact on the carbon footprint of consumed MWh. If exogenous gains represent a high % in relation of citizen behaviour and cleaner technology, CO2 reductions will not be due to a good governance in this matter. Local governments cannot influence on this.

Back to main

R3

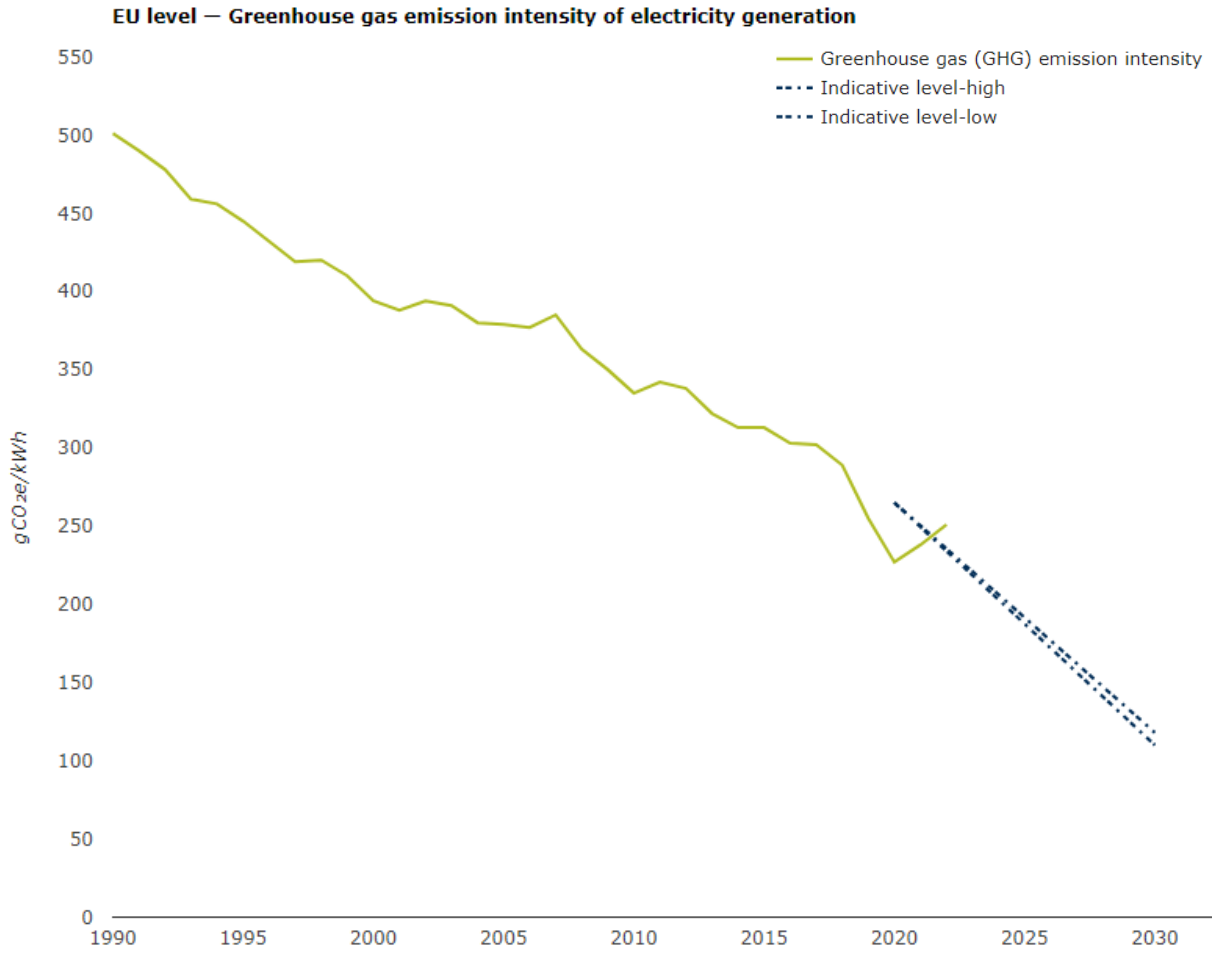
Policies Eligible for Testing

Back to main

Introduction

Energy consumption and, thus, emissions, should decrease thanks to **improvements in the electricity mix**, which is expected to become cleaner over the years. However, policymakers should not become complacent and view this as an advantage. Instead, they should consider combining energy efficiency policies to meet both European and/or local objectives.

Nevertheless, localities all face specific challenges and thus must apply different strategies. A general split can be done between **large and small localities** (population-wise). We can identify general trends for each type that would help fulfil their energy efficiency needs and design adequate policies. While we only provide an overview of the most significant challenges and strategies for localities, the tool aims to assess a wide range of energy efficiency policies.



Back to main

Large localities

Technology used in buildings: Disorderly urban growth and a lack of sustainable urban planning contribute to the expansion of urban areas, increasing the demand for energy and a rapid construction of buildings without paying attention to aspects such as bioclimatic architecture or energy efficiency in general. The electrification of heating and cooling systems in buildings are in line with improvements in energy efficiency. Heat pumps play a significant role in the decarbonization of cities due to their very high energy efficiency, and their versatility in heating residential and commercial buildings, heating water, heating swimming pools, cooling buildings, etc. The REPowerEU plan launched by the European Commission in 2022 envisages **doubling the yearly rate of deployment of heat pumps** and proposes measures to integrate geothermal and solar thermal energy into modernized district and collective heating systems. Education and public awareness of the importance of decarbonization and the individual actions that can be taken are critical to the success of this process.

Mobility energy mix. Some cities still rely heavily on fossil fuels, such as gasoline and diesel, for transportation, as well as for energy generation. This generally comes from the fact that mobility is excessively reliant on the individual car. In addition, the lack of investment in sustainable infrastructures, such as charging stations for electric vehicles and smart energy grids, is an obstacle to decarbonization. Transitioning to electric vehicles (EVs) reduces greenhouse gas emissions associated with fossil fuel vehicles. Cities can promote the electrification of buses, taxis, and municipal fleets, as well as expand charging infrastructure for EVs.

Modal shift and electric micromobility vehicles: In some European cities the public transport is inefficient, forcing some users into private transport. Thus, apart from improving public transport to give users more incentives to use it, new alternatives should be provided. Electric micromobility systems, such as electric bikes and electric scooters, can be an environmentally friendly alternative to short urban trips. They can be self-sustaining and energetically autonomous and be a solution for improving the mobility conditions of low-income communities in large European cities.

Back to main

Small localities

Energy efficiency margins. There is a lot of room to reduce the use of old devices driven by fossil fuels for heating homes, due to the overuse of non-renewable energy sources (e.g., heating oil). Small localities, which often have fewer financial and human resources available, must investigate the lines of subsidies that supralocal entities offer and that they can channel to their citizens to improve energy efficiency (more efficient heating devices or increase in renewables). This will not only lead to a reduction in consumption and, therefore, emissions, but also to significant financial savings for households.

Intensities in renewable energy production. The potential of local renewable energy production systems remains largely untapped due to financial and technical constraints. In less populated areas where the population is sparse, there is often an extensive stretch of land and/or a terrain that lends itself well to the implementation of different renewable energy sources (solar panels in fields that are well exposed to the sun, wind turbines in large open fields, etc.). Taking advantage of this could result in substancial energy, emissions and economic savings.

Local mobility. In many cases, locals find it necessary to rely on private cars, as they often have to travel long distances for work, education, or shopping. Encouraging cooperation between regional bus services and other local or supralocal entities could offer a dependable public transportation alternative, which could help reduce road transport.

G1

Introduction

Back to main

Introduction

The model can only accurately forecast the policy effects if the input factors are based on the best available data. This guidance will introduce the most relevant and influential input factors, so that data can be *assumed sensibly* or, if available, *used correctly*.

The tool has three sections, which are displayed at the top-left corner.

1. **Parameters** → enter details about the locality
2. **Model** → add policies by combining pre-defined policy measures
3. **Results** → see the effects of the policies in the model output

It is possible to freely navigate through the sections, should any data need to be revised in the Parameter or Model sections.

Back to main

Parameters: Locality Data

The model requires some basic parameters to establish the **baseline for modelling** the subsequent **policy effects**. All required information about the locality is inserted in the first section (more detailed guidance in chapter 8, our “step-by-step guide”).

Besides basic information such as **population**, **public budget** and **income per capita**, the user is asked to select the country of the locality. Once all the information is filled in, the tool proposes **realistic but imperfect values** for the **energy consumption** of the **locality** in **each sector**.

If there are **more accurate data** available for the energy consumption of each sector, these **should be used**, but if not, it is possible to copy and paste the proposed values.

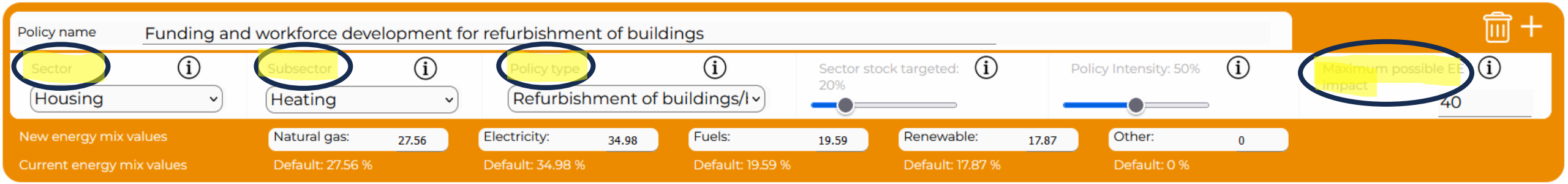
If data on the energy consumption is only available from **historic sources** but not for the initial year of simulation, you can also copy only the tool’s proposals for the **initial year of simulation** (when policies are implemented; most likely the **present year**).

Back to main

Model: Sectors & Policy Types

Once the model has all the necessary data from the locality, the user can move to the second section which is designed to **insert policies**. **Sectors** (Housing, Tertiary, Mobility) are divided into several **subsectors**. In each subsector, there are a variety of policy types to choose from. Policies belonging to the same policy type need to be **combined** and inserted only once. For example, both a **funding scheme** to support home-owners to make their buildings more energy efficient and a **communication strategy** which tries to ensure that these funds are being used by home-owners need to be inserted as a **combined policy package** belonging to the same policy type (e.g. refurbishment).

Each **policy type** produces a **maximum possible energy efficiency impact** for the share of sector stock that is targeted. The value for this is **predefined** based on best available benchmarks for each policy type on the right side of each policy bar. The efficiency impacts of the localities' policy package for any policy type should only be edited if there is more accurate data than the benchmark provided by the tool. In the following slides some examples are provided for a better understanding.



Back to main

Model: Sector Stock Targets

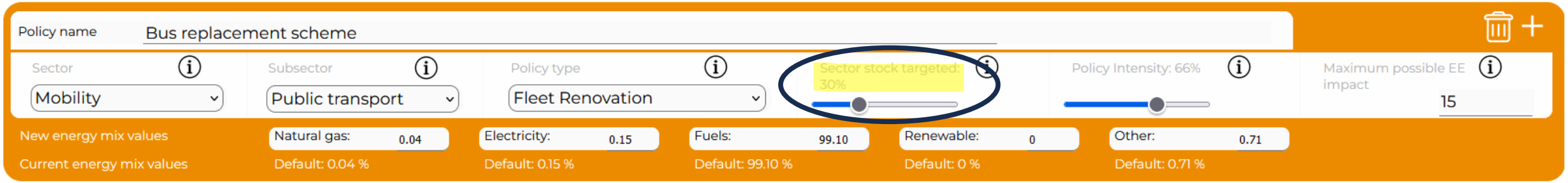
The input factor of “sector stock targeted” defines how much of the **total stock** should be more energy efficient by the **end of the simulation (policy programme).** “Stock” always refers to the total of each subsector.

Example I → Mobility sector

A municipality plans to **replace its current buses** with more efficient ones. This will likely yield a maximum EE improvement of 15% (this is based on internal calculus, but if user has more concrete data the percentage is editable, even though this is not usually recommended since it is complex to obtain). Here, the sector stock refers to the **entire public transport fleet**.

If the municipality **operates 200 buses** and plans to **replace 60** of those, **30%** of the **sector stock** is **targeted**. The tool then assumes that efficiency gains are applied to 30% of the sector stock (public transport fleet).

If data related to the **mileage** of each bus exists, then sector stock should refer to mileage. A replacement of 30% of buses could lead to the policy affecting 45% of the mileage, if new buses run 50% more frequently (30 * 1,5 = 45; where we add to the 30% the 50% of increased mileage multiplying it by 1,5).



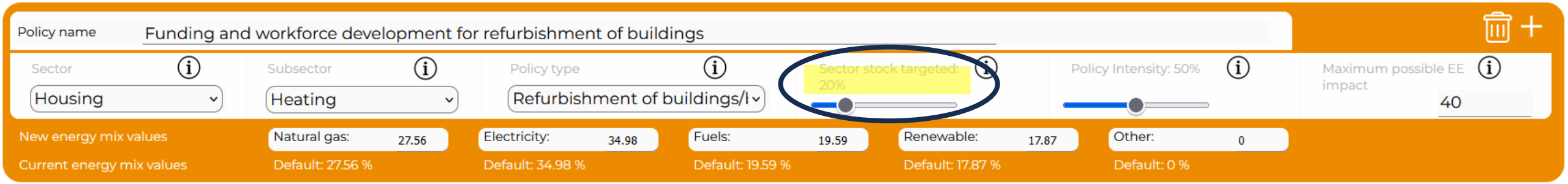
Back to main

Model: Sector Stock Targets

Example II → Housing sector

A municipality plans to increase efforts to **refurbish buildings** for better insulation and **more efficient heating**. This will likely yield a maximum EE improvement of 40%. Here, the sector stock refers to **all buildings within the municipality**.

If there are **4000 buildings** in the municipality and it plans to **refurbish 800** of those, **20%** of the **sector stock** is **targeted**. If data related to the **floor space** of each building is available, then sector stock should refer to the floor space that is refurbished. Floor space is a **more accurate value** for calculating the efficiency gains in heating than buildings, as the **size of buildings vary significantly**. A refurbishment of 20% of all buildings could lead to the policy affecting 40% of the sector, if those 20% renovated make up 40% of the floor space.



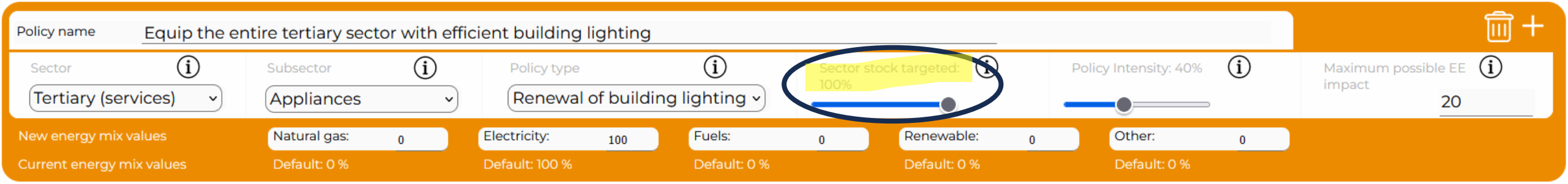
Back to main

Model: Sector Stock Targets

Example III → Tertiary sector

A municipality plans to **equip half of the tertiary sector** with **efficient building lighting**. This will likely yield a maximum EE improvement of 20%. Here, the **sector stock refers to all appliances**, meaning everything that is **plugged** into the electricity network.

When estimating the sector stock target, it is important to consider that besides lights there are many more appliances in the tertiary sector. If **30%** of the electricity by all appliances is **used by lights** and **50%** of lights should be **replaced** with more energy efficient ones, the **sector stock target** will be **15%** (30%*50% = 0,3*0,5 = 0,15 = 15%).

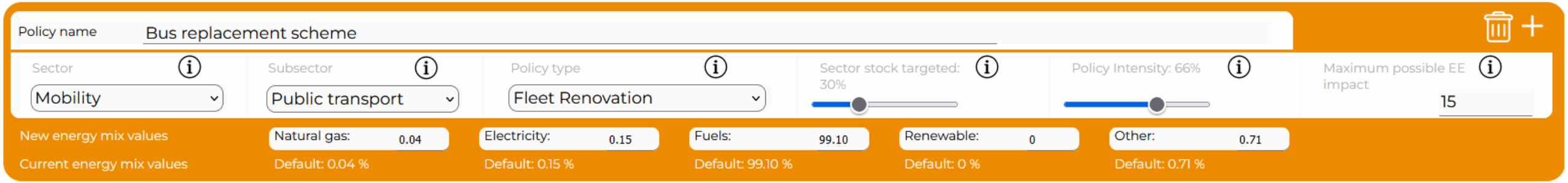


Back to main

Model: Policy Intensity

The input value for **policy intensity** provides a useful way to include an estimation of the **success of the policy** in the calculation of the model. The success is primarily defined by the **available resources** for this policy as well as some external factors. Resources may be available amount of **public funding**, administrative personnel managing and monitoring the policy success, workforce and skills needed to ensure the success within the desired timeframe and accompanying communication campaigns to activate non-municipal actors.

Only if the policy is guaranteed to succeed in both, *targeting the desired sector stock* ***and*** *achieving the maximum possible EE impact*, should the policy intensity be set close to 100%. For example, if 30% of the public transport fleet should be replaced, but the policy package cannot ensure that each new bus will be 15% more efficient, both need to be considered along with the resources put in to achieve the goals when estimating the policy intensity.



G2

Step-by-step guide

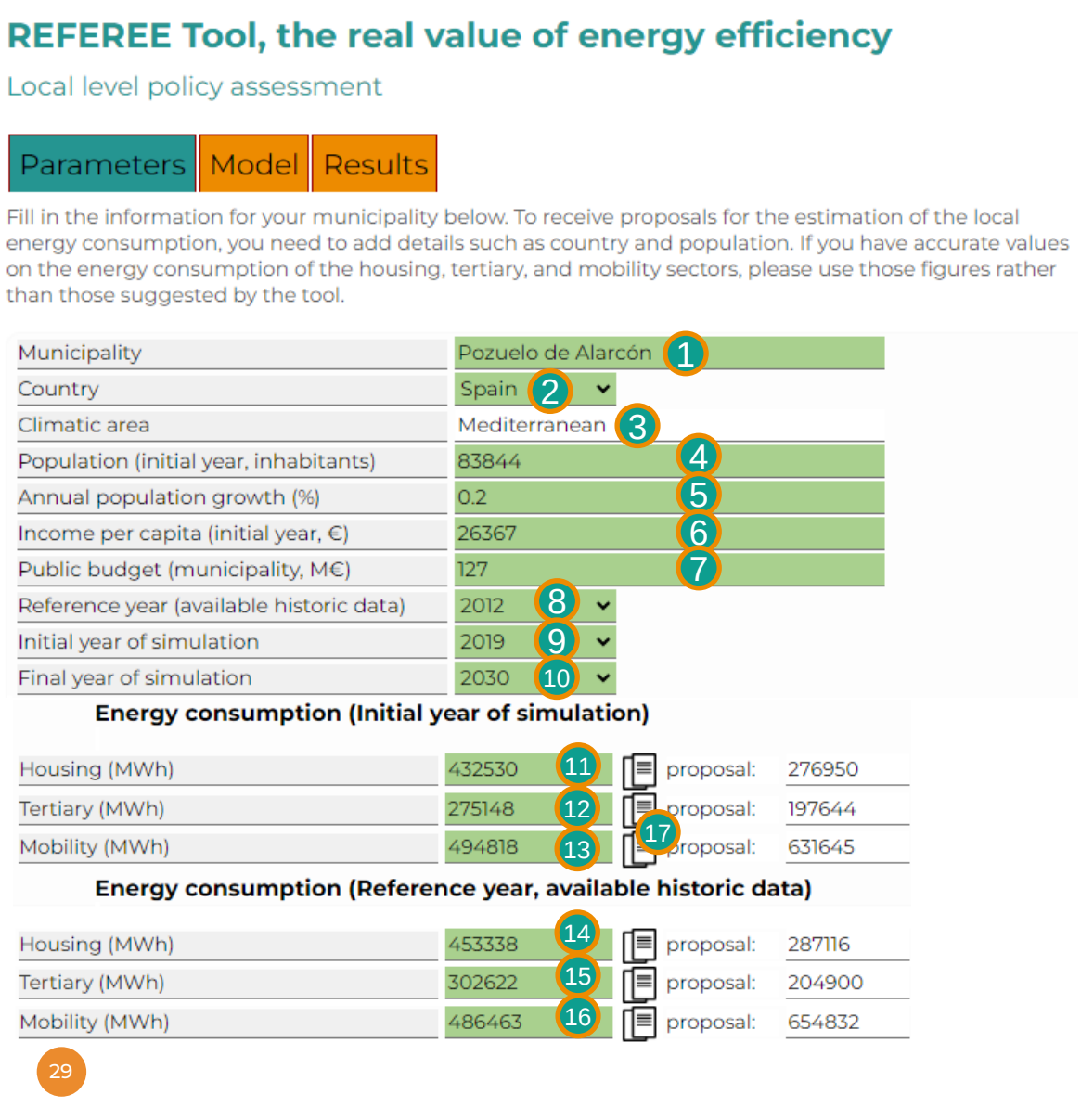
Parameters

Model

Results

Back to main

Parameters section

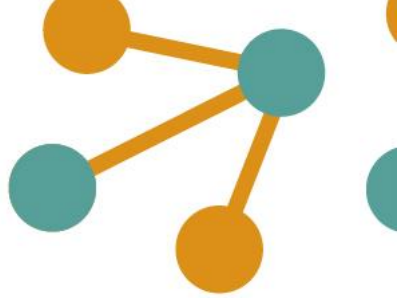


1. Insert the name of the municipality.
2. Select the country of the municipality from the dropdown.
3. This is updated automatically once you select the country.
4. Insert the population of the municipality.
5. Insert the annual population growth in % of the municipality.
6. Insert the income per capita of the municipality.
7. Insert the public budget of the municipality (total €).
8. Select the reference year from the dropdown.
   → This will be the year from which historical data will be used as a reference
9. Select the initial year from the dropdown.
   → This will be the year from which current data will be used as a starting point; must be after the reference year.
10. Select the final year from the dropdown.
    → This will be the year at which estimates will conclude/end, so it will be the ending point for forecasting purposes; must be after the initial year.
11. Insert the energy consumption in MWh of the municipality, for the
12. initial year for each sector – Housing (11), Tertiary (12) and Mobility (13)
13. → If the breakdown of total energy consumption is not available, please refer to our suggestion and adapt it accordingly.
14. Insert the energy consumption in MWh of the municipality, for the
15. reference year for each sector.
16. → If the breakdown of total energy consumption is not available, please refer to the tool proposal and adapt it accordingly.
17. Optional buttons to copy and paste the proposals automatically

Back to main

Model section

0. Brief comment on this section.
1. Type the name of the policy (optional).
2. Choose the municipal **sector** (housing, tertiary, mobility) in which the policy is directed from the dropdown.
3. Choose the municipal **subsector** in which the policy is directed from the dropdown.
   → For housing and tertiary sectors, there are 4 subsectors (heating, cooling, water heating, appliances) and for mobility sector, there are 2 subsectors (public transport and road transport).
4. Choose the policy type that best fits the policy to be implemented from the drop-down.
5. Determine a percentage of stock targeted with the horizontal scrollbar.
   → The stock targeted determines the policy penetration rate in the addressed stock, that is how many items (people, buildings, vehicles...) are going to be affected by the policy.
6. Determine a percentage of policy intensity with the horizontal scrollbar.
   → The policy intensity determines in which level does a policy wants to be implemented, being a 100% the maximum energy efficiency gains from the policy. Shrinking this level reduce its implementation costs.
7. Automatically determines a percentage of the total sector of the expected Energy Efficiency impact by that policy.
   The suggested value can be modified, so it can be adjusted to another value if wanted.
   → For example, if the policy intensity is set at 100%, then the policy will have the full impact.
   → Otherwise, a policy with a policy intensity of a 50% with a 10% expected EE impact, will have an impact of a 5%, for the X% of the stock targeted.



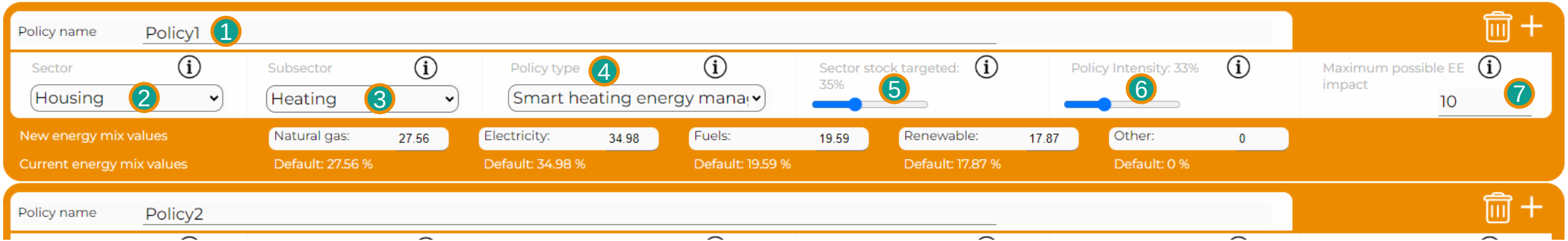
REFEREE Tool, the real value of energy efficiency

Local level policy assessment

Parameters | Model | Results

0

Add up to 34 energy efficiency policies in the housing, tertiary, and mobility sectors. All policies targeting one aspect of a specific subsector need to be aggregated into one input policy. For each policy, state which part of the existing sector stock will be addressed (e.g., affected share of total housing stock or share of mileage by private cars) and how likely the policy is to reach its full EE potential (policy intensity). For each sector and subsector, you may also alter current energy mix. For more details, check the Guidance handbook.



Back to main

Model section

8 Erase this policy.

9 Create a new empty policy.

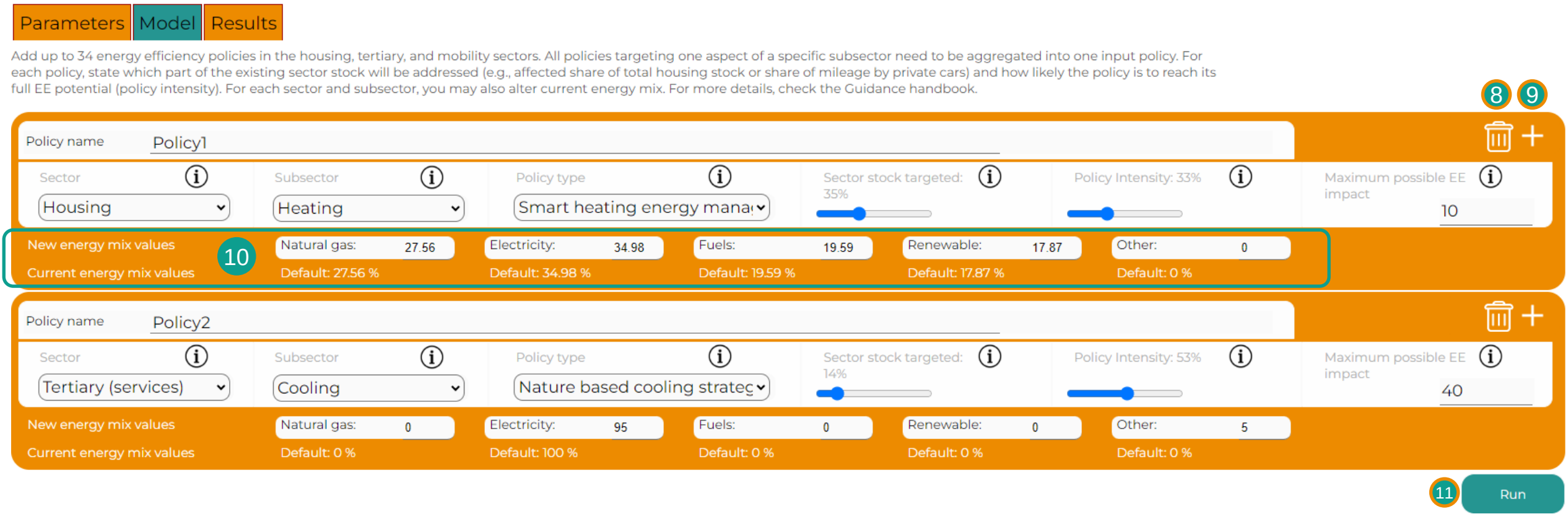
11 Run the model.

10 Adjust the energy carriers for that policy, to stablish the energy mix.

→ Numbers represent the fractioned energy mix percentage, so the **total of them must sum 100%.** Energy carriers allowed by the model are natural gas, electricity, fuels (diesel, gasoline…), renewables (solar, wind, water force, waste…) and other. Model won't run if a policy does not sum 100. It will tell which policy is not complaining with a pop-up advise when trying to run it.

→ For the **same subsector of the same sector, the energy mix must be the same**. If energy mix is changed from one policy, it is instantly updated to all other policies from the same subsector from the same sector.

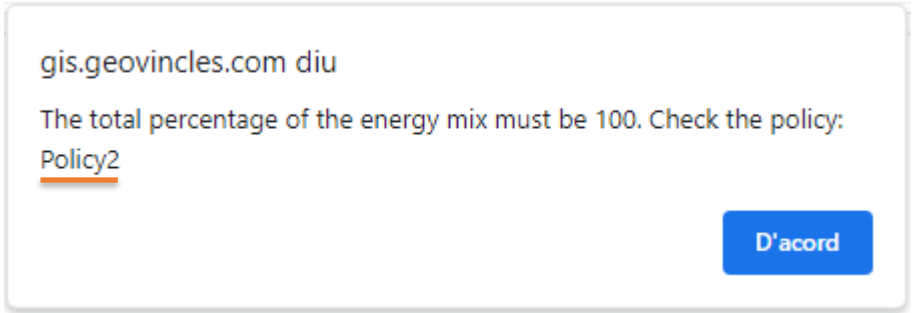
→ Predetermined values are **given/suggested, but they are expected to be changed**. If they are not modified, model will run with the same energy mix from the initial (**default**) and final year (**white boxes**).

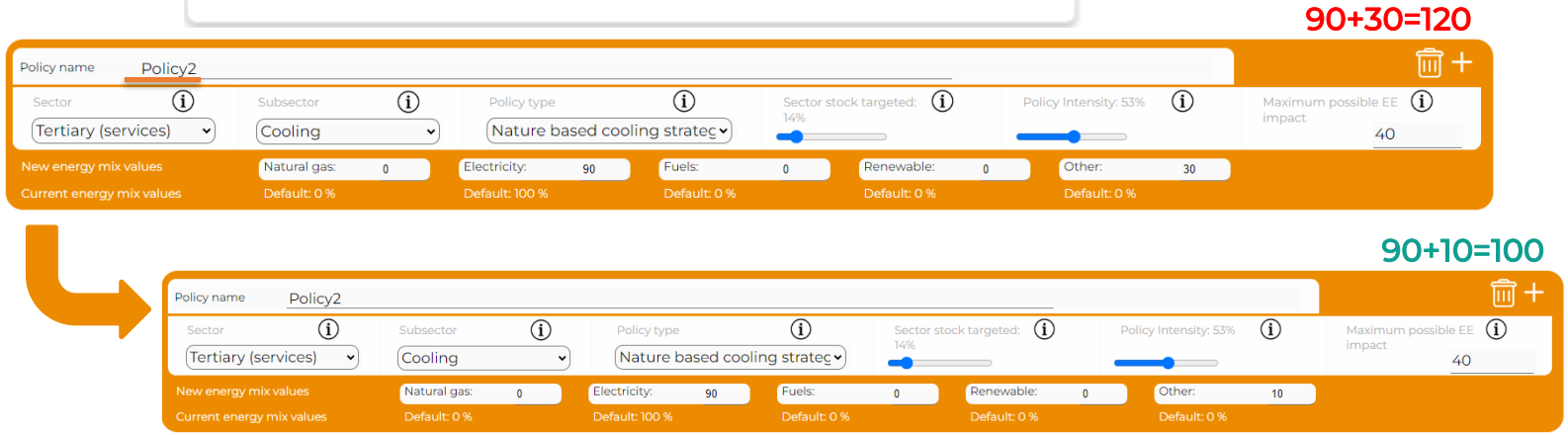


Back to main

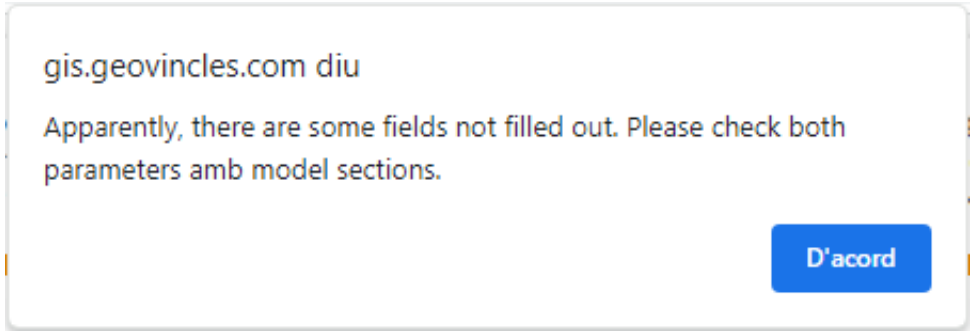
Frequent Errors

1. “Total percentage must be 100”
   Find the policy the pop-up indicates and correct the percentages of the **energy carriers**.





2. “Field/s not filled out”
   Go back to the **parameters section** and check that you did not miss any input. Then, check the **model section** in the same way.



Back to main

Results section

1. Select values to see simple charts in the online interface. There are three dropdowns. The first one, shows different values. The other dropdowns vary in function of the selected variable, according on what is willed to see.
   → For some combination, the third dropdown does not show a value, because the combo does not need it. In any case, user **needs to press the "-" option** to see the graphic, since it is uploaded when the three dropdowns are filled.

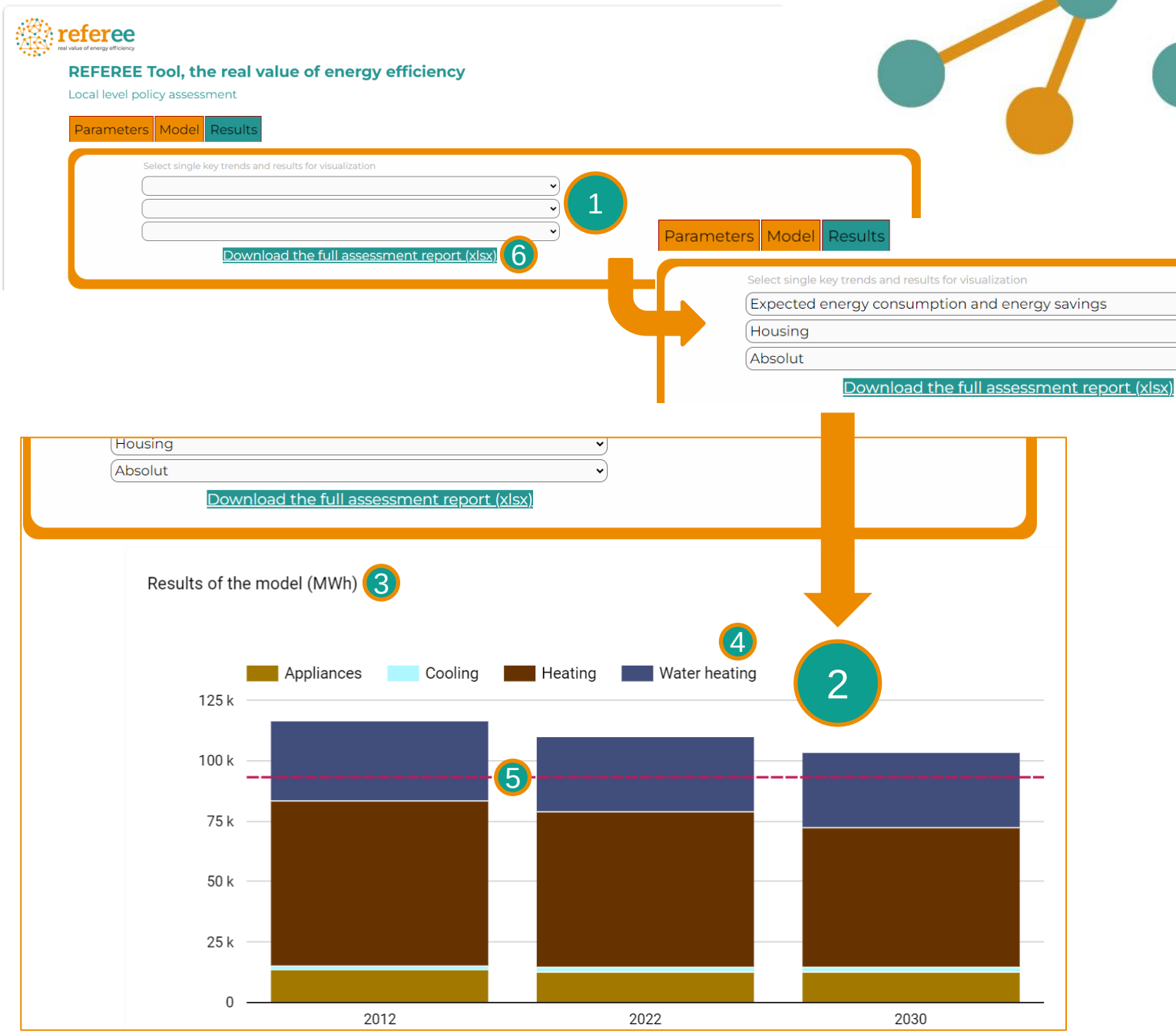
2. Graphic generated in the online interface.
   → In this case, we see a chart of the energy consumption for the heating subsector of the housing sector.
   → Data for the reference, initial and final year are displayed for a quick view comparison.

3. Units of the chart generated.

4. Legend of the chart.

5. Target line to be achieved (based on EU framework).
   → In this example, the 2030 (final year) column, surpass the red target line, meaning that target is not achieved in energy reduction. More efforts should be forecasted to end up below the line.

6. Click to download the Excel file of the model, where results are presented in a more elaborated and structured format.



Back to main

Local Policy Assessment Report

- Once downloaded and opened the Excel File, it will show the Main Page Menu. It allows to navigate through its different pages, which they have a “Go to Main Page button" to return to the beginning.

- Report shows predefined charts.

- Users will have tables with the results of the run, so they have also the option to create their own charts if they wish to.

LOCALITY POLICY SUPPORT SYSTEM TOOL

Scenario Definition

Locality profile

Pathways for the housing sector | Pathways for the tertiary sector | Pathways for mobility

Energy price evolution pre tax European Countries graphs | Energy price evolution pre tax European Countries tables

Thematic graphs and tables

Energy consumption graphs | Energy consumption tables

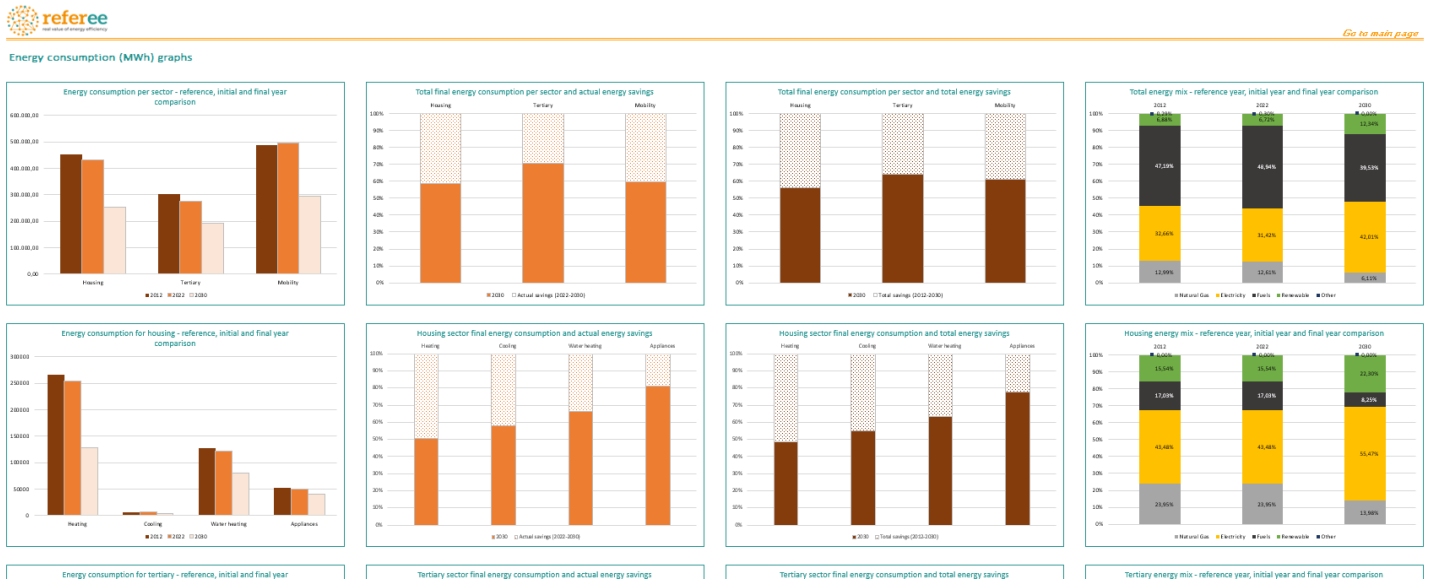
CO2 Emission graphs | CO2 Emission tables

Expected costs from energy graphs | Expected costs from energy tables

Economic outputs graphs | Economic outputs tables

Full result reports

Synthesis policy report | Housing report | Tertiary report | Mobility report



E1

European regulation

Back to main

Background: EC forward-looking

The European Commission developed an innovative framework for policies on energy, transport, environment, and sustainability, defining the way forward in a series of roadmaps, strategies, and initiatives. The most representative initiatives are summarized below:

- The **Roadmap to a Competitive Low-Carbon Economy by 2050 (COM/2011/0112 final)** set sub-targets to achieve an 80% reduction in carbon emissions by 2050, namely 25% by 2020, 40% by 2030 and 60% by 2050. In practice, these objectives implied an increase in the efficiency of the European energy system, i.e., consuming less, and moving to 100% renewable energy production with full development of the electrification potential of each sector.

- **The Roadmap to a Single European Transport Area by 2050 (COM/2011/0144 final)** developed the transport dimension of the Roadmap for a low-carbon economy: 60% reduction in greenhouse gas emissions by 2050 while maintaining or even improving transport performance. The proposals insisted that technology be a key enabler, for example, enabling 40% of sustainable low-carbon fuels in aviation by 2050, reducing 40% of emissions from shipping by 2050 or stopping the use of conventionally fuelled cars in cities by 2050. The consolidation of the Single European Transport Area, plus investments in the completion of missing links and the interconnection of transport networks (€1.5 billion) should promote seamless travel across borders and transport modes, and the transition to more efficient and environmentally friendly modes.

- **The Energy Roadmap 2050 (COM/2011/0885 final)** focused on the strategy focused on power generation infrastructure. The roadmap elaborated a series of forward-looking scenarios that coincided in a sharp long-term drop in oil consumption (20%) and solid fuels (between 10% and 15%), a sharp increase in renewable energy sources (between 40% and 60%), relative stability of natural gas, and various alternatives for reducing the size of nuclear power (between 10 and 15 per cent). Uncertainties in the sector were great, including peak oil; to what extent shale gas in Europe could prove viable; whether and when carbon capture and storage (CCS) would become commercial; what role Member States would seek for nuclear power; or how climate action would evolve around the world.

Back to main

Background: EC forward-looking

- The **2030 Energy Strategy (COM/2014/015 final) set out in 2014 the policy framework for climate and energy for the period from 2020 to 2030**. The post-2020 policy framework set by the Energy Strategy set binding targets including a **40% reduction** in EU national emissions by 2030 compared to 1990, a 27% share of renewable energy sources by 2030 and a higher level of energy savings of around 25% by 2030.

- The **Roadmap to a Resource Efficient Europe by 2050 (COM/2011/0571 final)** set out a vision for 2050 in which the EU economy had grown while respecting resource constraints and planetary boundaries, thus contributing to global economic transformation. The economy would be competitive, inclusive, and provide a high standard of living with a much lower environmental impact. All resources would be managed sustainably, from raw materials to energy, water, air, land, and soil. All climate change milestones would have been reached, while biodiversity and the ecosystem service it supports would have been substantially protected, valued, and restored.

- The **EU Circular Economy Action Plan (COM/2015/614 final)** inherited the approach of the previous resource efficiency map sheet, providing strategies and milestones to increase the levels of recycling and reuse of materials in Europe, in so-called circular loops. The transition to a more circular economy, where the value of products, materials and resources is maintained in the economy for as long as possible, and waste generation is minimised, is an essential contribution to the EU's efforts to develop a sustainable, low-carbon, resource-efficient and competitive economy. The EU action plan for the circular economy focused on the areas of product design, production processes, consumption, waste management and the market for secondary raw materials and water reuse. The action plan set out the priority actions needed to tackle plastics, food waste, critical raw materials, construction and demolition waste, and biomass and bio-based products.

All these initiatives serve to accompany the current binding projects, which make up the regulatory and trend framework of the EU, within the framework of emissions mitigation policies, adaptation to climate change and promotion of sustainable energy and energy efficiency. It is necessary to know which plans, projects or regulatory frameworks are most relevant today.

Back to main

Current framework: relevant EC plans

The **European Green Deal** was adopted in December 2019. This European strategy aims to "transform the EU economy towards a more sustainable future", and responds to the challenges posed by the fight against climate change based on **six main areas of action:** (1) energy efficiency through a transformation of industry and sources to more sustainable ones; (2) transformation towards a circular economy based on recycling and reuse processes of both products and their packaging; (3) efficiency in the construction sector with respect to construction processes and materials; (4) energy efficiency of buildings; (5) mobility aiming for a 90% reduction in emissions; and (6) sustainability in the food sector and a framework for biodiversity protection. With the approval of the European Green Deal, the process of updating the European **Circular Economy Action Plan 2015 begins.**

The European Union agreed in 2021 in **The European Climate Law** to increase the **reduction in emissions to 55% by 2030**, compared to emissions in 1991. In this way, efforts must be intensified to achieve the proposed objective. In addition, Europe has achieved the commitment to become the first climate-neutral continent by 2050 (emissions equal to or less than those eliminated through the planet's natural absorption).

The "**Fit for 55" package (COM 2021/550)** was proposed in 2021 to update the EU regulatory framework to achieve these objectives and realize the EU Green Deal. The proposals cover areas related to climate, land use, energy, transport, etc.

Due to the Russia-Ukraine war and the difficulties and disruptions in the global energy market, in mid-2022 the European Commission implemented the **REPowerEU Plan**. Its main objectives are to (1) save energy; (2) produce clean energy; and (3) diversify its energy supplies. This plan has impacted directives, such as the RED or the EED, increasing their overall level of ambition.

Back to main

Current framework: relevant EC plans

The **Renewables Energy Directive (2009/28/EC)** was revised as part of the Fit for 55 package and the REPowerEU plan, given the need to accelerate the transition to clean energy in the EU. Since the introduction of the RED (2009/28/EC), the share of renewable energy sources in the EU's energy consumption has increased from 12.5% in 2010 to 21.8% in 2021. The revised Directive set a new increased target of 42.5% renewable energy by 2030, aiming for 45%. The directive also lays down common principles and standards for renewable energy support schemes, sustainability criteria for biomass, provisions to facilitate and accelerate permitting, and the right to produce and consume renewable energy and to establish renewable energy communities. It establishes rules to remove barriers, stimulate investments, and drive cost reductions in renewable energy technologies and empowers citizens and businesses to participate in the clean energy transformation.

The **Energy Efficiency Directive (2012/27/EU)** was also revised as part of the Fitfor55 package and further enhanced (Directive **(EU) 2023/1791)** as part of the REPowerEU plan, presented by the Commission in May 2022, which aims to decrease the EU's dependence on fossil fuel imports from Russia. The EU legislation establishes the "energy efficiency first" principle as a fundamental principle of EU energy policy. This means that EU countries must consider energy efficiency in all relevant policies and in all major investment decisions taken in the energy and non-energy sectors.

On top of regulatory progress, the EU also launched **NextGenerationEU,** a historical temporary recovery instrument to address the socio-economic consequences of the covid pandemic and support investment for a cleaner and more resilient future. It thus includes a **minimum of 37% spending on climate investments and 20% on support for the digital transition.** The funds focus on financing initiatives to promote clean energy, sustainable mobility and green vehicles, smart construction and building renovation, digital infrastructure, modernisation of public administration and human capital formation.

E2

European targets

Back to main

More concrete targets

In the previous chapter, some of the main goals relevant for this topic where presented, as a part of the European background and framework. This chapter aims to go deeper on more concrete targets. The plans and strategies established at European level define binding and non-binding policy targets.

The Energy Efficiency Directive (2018/2002) established a headline EU energy efficiency target for 2030 of at least 32,5% (compared to projections of the expected energy use in 2030). The revised EED (2023/1791) establishes a new, and for the first time, **binding, energy efficiency target of reducing final energy consumption by at least 11.7%** compared to projections of the expected energy use for 2030

The Renewable Energy Directive is the legal framework for the development of renewable energy across all sectors of the EU economy, supporting clean energy cooperation across EU countries. It establishes the following targets:

- Reduce emissions intensity of **transport fuels by a 14,5% by 2030**, or ensure a share of **renewable in transport of at least 29%**;
- **Binding annual increase of 1.6% in the use of renewable energy in the industry sector**, with specific targets for hydrogen use from non-biological sources (42% by 2030 and 60% by 2035).
- (Indicative) Energy used in buildings should be **by 2030 of renewable origin in at least 49%**. Increase of the **renewable energy used for heating and cooling to 0.8% annually by 2025 and 1.1% by 2030;**

The European Climate Law (July 2021) establishes the following key targets in relation to GHG emissions:

- **Net zero greenhouse gas emissions by 2050**;
- **At least 55% GHG reduction by 2030** in relation to 1990;
- An **average 1,49% yearly energy saving**s gradually **reaching 1,9%** by the end of **2030**.

Back to main

More info regarding EU targets

The countries of the EU are working individually on new legislation to reach these objectives at national level.

The REFEREE tool provides information whether the targets are accomplished or not, as an addition information provided, so policymakers can be aware if the policies applied are useful to comply the European targets.

To know more on policy targets in force in the EU and at Member State level, access the following brief:

DOWNLOAD PDF

referee
real value of energy efficiency

TOOL GUIDANCE - LOCALITIES

Press any chapter to navigate directly to it

REFEREE Tool

- R1. Purpose of the Tool
- R2. Defining Inputs and Outputs
- R3. Policies Eligible for Testing

Guidance

- G1. Introduction
- G2. Step-by-step guide

European context

- E1. European regulation
- E2. European targets

ISINNOVA research innovation sustainability · Mcrit Multicriteria Planning · cambridge econometrics clarity from complexity · EEB European Environmental Bureau · CSD Center for the Study of Democracy · Notre Europe Institut Jacques Delors Thinking Europe · Penser l'Europe · Europa denken · BAUM