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D4.2 – Online REFEREE system

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REFEREE: Real Value of Energy Efficiency
Results from the scoping analysis

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2.0	08/02/2024	Isaac Farradellas, Harold Del Castillo, Oriol Biosca, Efrain Larrea, Rafa Rodrigo, Andreu Ulied, Marta Carbonés, Camila Álvarez, Guillem Méndez, Ramon Català	Draft Final

Partners

Partner	Short name	Principal Investigator
MCRIT	MCRIT	Mr Oriol Biosca

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1 Approach

1.1 About REFEREE

REFEREE is a European-funded Horizon 2020 project that started in October 2020 and will run until June 2024.

To deliver the European Green Deal, which sets out the roadmap making Europe the first climate-neutral continent by 2050, we need to accelerate our efforts to improve the energy efficiency of our buildings, transport, and industry. In this context, REFEREE aims to analyze and quantify the direct and indirect non-energy impacts of energy efficiency investments and develop an easy-to-use tool to support policy makers at the national, regional, and local level helping households, businesses, financing institutions, policy makers and other relevant stakeholders to evaluate the multiple impacts of their energy efficiency choices.

At Member State level, simulations and quantifications are provided by a set of technoeconomic and macro-econometric models that allow for a comprehensive and unified modelling of the dynamics of energy efficiency policy impact propagation.

At local level the results are provided by a modelling engine built within the REFEREE project and calibrated with E3ME runs at the Member State level and taking into account as framework conditions the national electricity mix provided by E3ME model.

To maximize the impact of the REFEREE policy support tool, stakeholders have been involved from the inception of the project, through concrete opportunities for its co-development, pilot studies, and focused dissemination and communication actions.

1.2 Objectives and activities carried out.

This report is about the REFEREE online tool, made available online in January 2024.

The report presents the components of the policy support system and its main functionalities.

The online interface will allow users at member state level, as well as local practitioners, and other stakeholders to run the model within a user-friendly environment, requiring no modelling expertise. Both models provide results related to the traditional EE and emissions impacts as well as non-EE impacts

(socioeconomic, emissions costs, technologies penetration), in a harmonized framework.

This report is structured in three sections:

1. The organization of the Policy Support System, which is structured into two dimensions: the first addressed to the EU Member States, named European tool, and the other to the local authorities, named localities tool.
2. An overview of the European tool
3. An overview of the Localities tool.

Two final annexes show the list of all the indicators that are provided by both tools.

The approach of the **European online tool** is to create and implement policies at Member State and European level testing different scenarios and observing differences on evolution of different variables by comparing the policy scenario with the selected base scenario.

The approach of the **Localities online tool** is to create and implement policies at municipality level and for different sectors (residential, tertiary and mobility) to improve their energy consumption patterns, and reduce indirect impacts of energy consumption, such as the Greenhouse Gases (GHG).

Both tools provide their analytical results both directly in the online interface, and throughout downloadable policy assessment reports in MsEXCEL format.

There is an offline version of the REFEREE Localities tool that allows refining and postprocessing results of the online tool. For more information about it, there is the Deliverable 4.1 that presents in detail the offline version.

1.3 Access to the REFEREE Policy Support System

The online tool is available at https://refereetool.eu/presentation-referee-tool/.

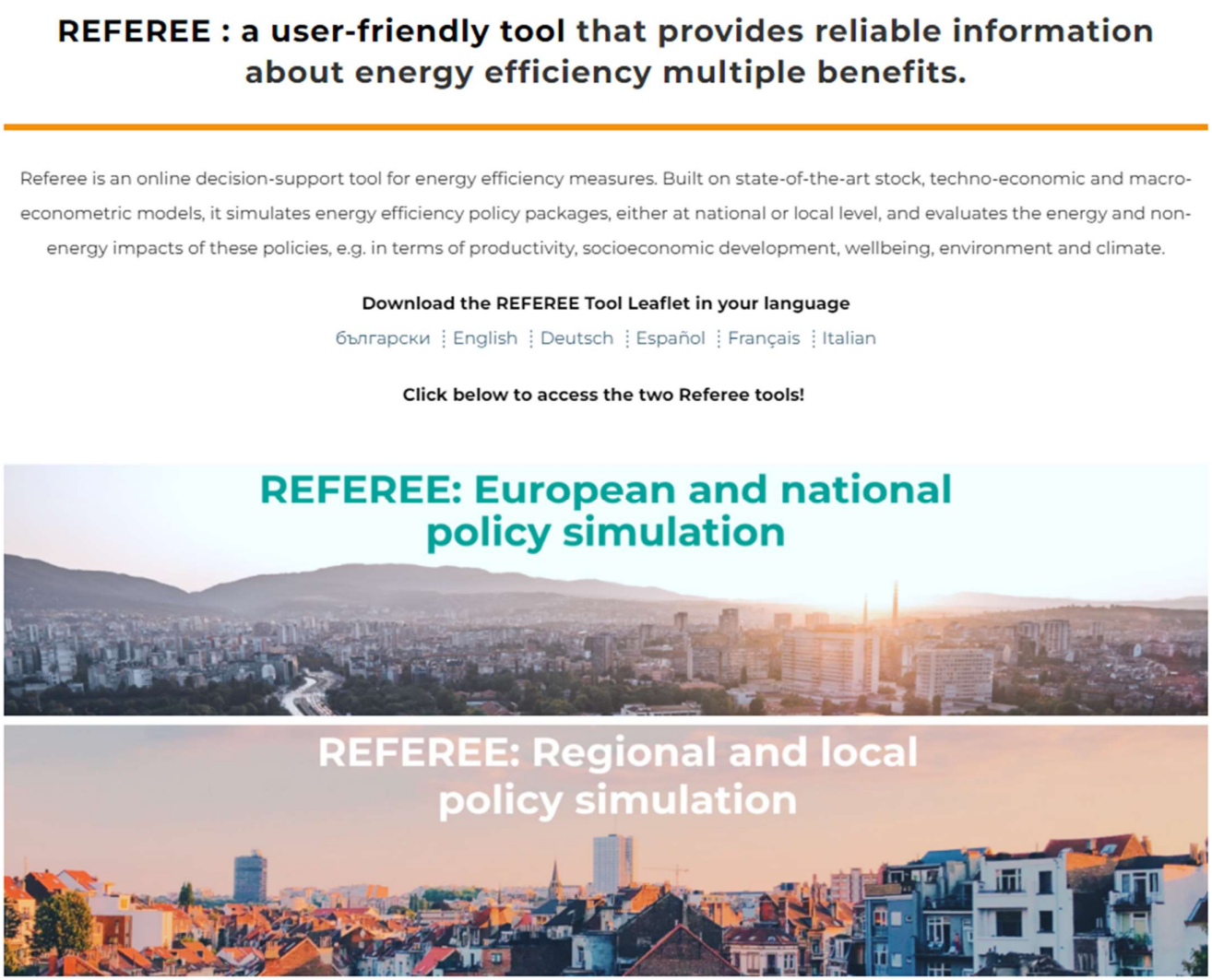


Figure 1. REFEREE Landing page for accessing to the online tool.

2 Overview of the Model at Member State level – The European Tool

2.1 Brief introduction to the model

The REFEREE European Tool is an online tool that provides support for decision making on energy efficiency measures in the EU. It does so by calculating energy and non-energy impacts of different energy efficiency measures applied at EU or national level.

The tool allows selecting one or several predefined EE policies targeting different aspects of energy production and consumption for various economic sectors. The user can select the years of application of each policy, the intensity of the policy and the geographic scope.

An underlying set of models runs in the background, computes the impacts of the defined policies and provide the results to the online interface. These results can be observed online and/or downloaded in data sheet format to conduct a more thorough analysis.

2.2 Overview of the user interface

This chapter describes the way the REFEREE online system displays the different screens and interfaces of the European tool as well as the way these are structures to get a better understanding on how the tool works, and what are the results that can be obtained.

The following sections are discussed:

3.1 Policy input section. The purpose of this section is both to provide input on the type of policy to test for a given country and then to run the model.

3.2 Results section. In results there is the option to generate graphs for different variables. It provides a quick view of the model results, but it is highly recommended to download the policy assessment report, where graphs and tables are provided in a more detailed way.

3.3 Downloadable policy assessment report. In results section, there is the option to download a more detailed policy assessment report in an Excel file.

2.3 Policy input section

Note for the reader: the points A to C outlined below refer to Figure 3 at page 11.

A) Naming the Scenario. In the policy input section, we will define the policy to be implemented. A **name** for the policy package is to be defined, as well as names for each policy to be considered. If no name is established, a default name is set by the system.

B) Definition of a reference baseline scenario. The model compares differences between the policy scenario defined by the user and a reference one. The user can choose from one of the following four reference scenarios made available by the tool:

- **Reference 1:** A basic fossil fuel price world. This scenario is aligned with EU Reference scenario 2020 (Primes).
- **Reference 2:** A low fossil fuel price world. This scenario builds on Reference 1 but considers additionally several measures coming from EPBD, Fit for 55 and RePowerEU.
- **Reference 3:** A higher fossil fuel price world. This scenario builds on Reference 2 by adding the expected ETS (Emission Trading System) cost, introduced to transport and household heating (45€/tonCO2).
- **Reference 4:** The highest fossil fuel price world. This scenario builds on Reference 3 but allowing the user to choose among four different carbon price levels, according to a possible dynamic of the ETS costs in the future. It starts from 45€ per ton of CO2 and ends to 100, 150, 200, 250 or 300 €/TCO2.

For a comprehensive description of the policies included in each scenario please consult the interactive dashboard Guidance Manual of the European tool, available from the REFEREE website landing page or from the online model console.

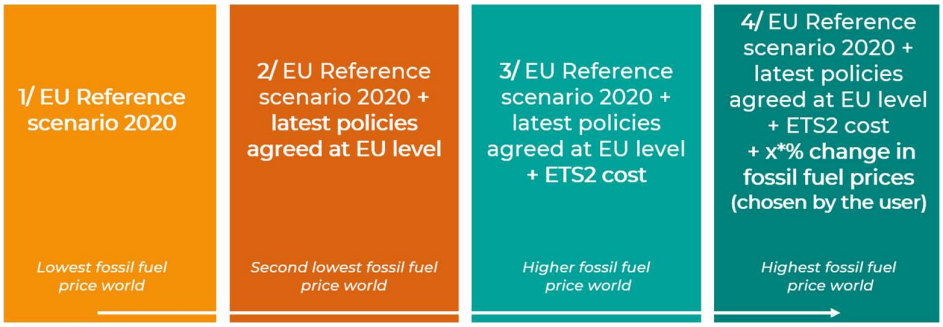


Figure 2: Available reference scenarios to compare against the model run.

C) Definition of the policy instrument to be implemented. Three typologies of policies are available: regulation, subsidy, and tax. The options available in each policy vary upon tools, methods, or mechanisms to achieve specific policy goals or objectives. Specific energy carriers being targeted by the policy and model are also selected. Policies apply to a specific country, and initial and final year of implementation of the policy need to be defined too. In each scenario, several policies can be considered simultaneously. Each policy is defined in an "object-oriented" policy console. More consoles can be added to define new policies clicking on the "**+**" **button** in the top-right corner of the policy console, or clicking on the **copy button** to start from a cloned policy box defined previously.

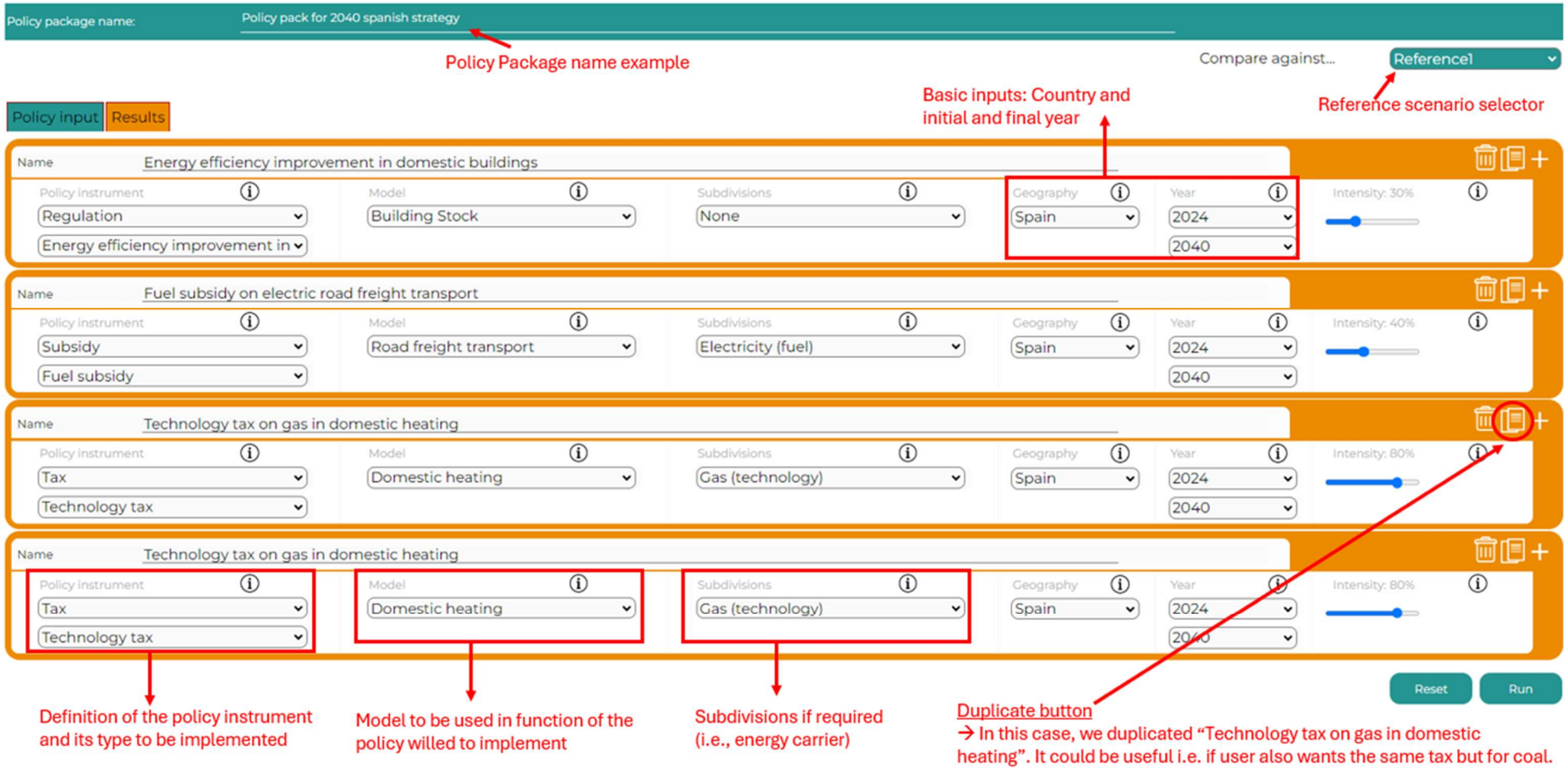


Figure 3: Online interface of the Model at Member State level, with detailed explanations.

D) Running the model. Once the **run** button is pressed, the tool opens the results section with a message in red saying "**please wait while the results are processed**". This is because it takes some time (about 10 minutes) to run the model and perform the calculations. Even if the tool switches automatically to the results section, there is the option to turn back to policy input sections and, for instance, check the inputs provided. Thus, it is possible to navigate through both sections freely. In case it is needed, there is the option to **reset the settings** of a run and to start again from the beginning.

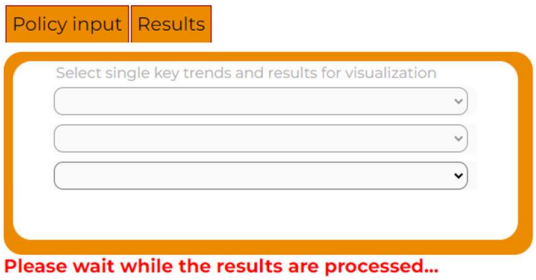


Figure 4: Online interface for EU and country level policy assessment – Results section (wait time).

E) Guidance. There's a guidance **Manual** document to facilitate the use of the interface at the Member State level, so that clicking the corresponding button will display an interactive dashboard.

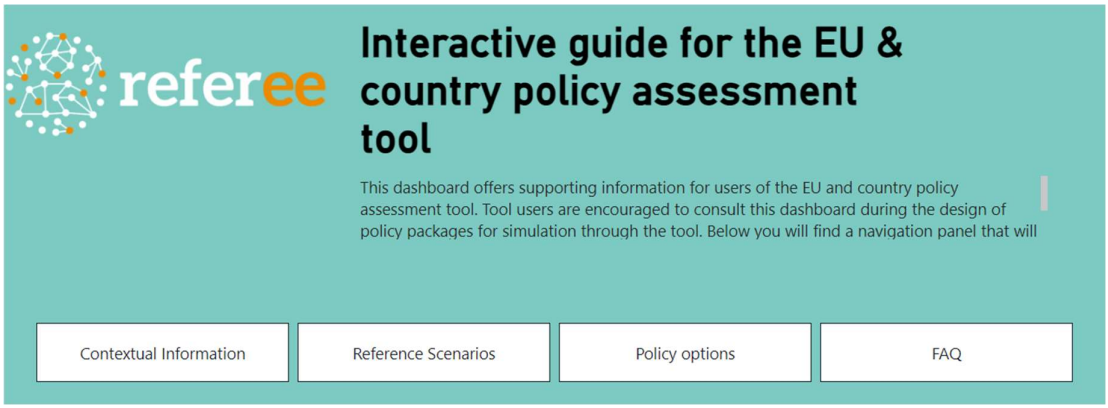


Figure 5: Online Guidance Manual for EU and country level policy assessment.

2.4 Results section (outputs)

Once the tool stops processing, the red message will disappear.

Results can be consulted online through a set of nested dropdowns menus or can be download in a full assessment report (in MsEXCEL format).

In the set of dropdown menus, three nested levels are shown where the user needs to select:

1) Family of results to be consulted in the first tab of the dropdown. Available outputs: i) Air quality and wellbeing ii) Environment and Climate Change, iii) Industrial productivity, iv) Socioeconomic development.
2) Specific variables to be displayed are shown subsequently in the second tab of the dropdown. The third tab indicates different levels of disaggregation. A full description of all available variables and combinations is displayed in Annex 1.

With this combination, a unique graphic is displayed with the requested analytical results of the run.

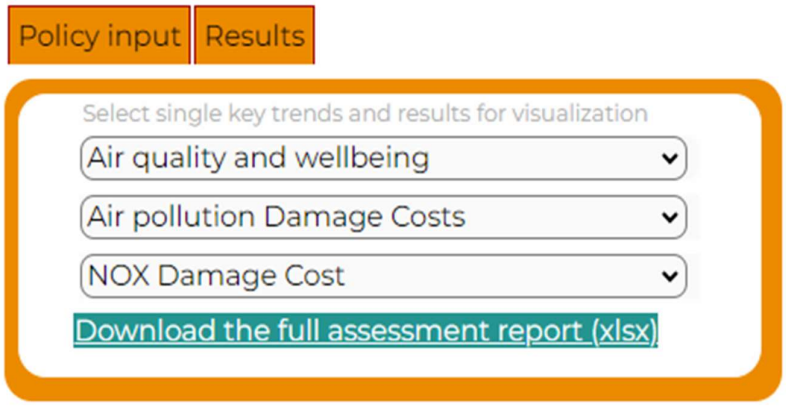


Figure 6: Online interface for EU and country level policy assessment – Results section (labels).

Once the three labels are selected, a chart will be shown automatically below the labels square.

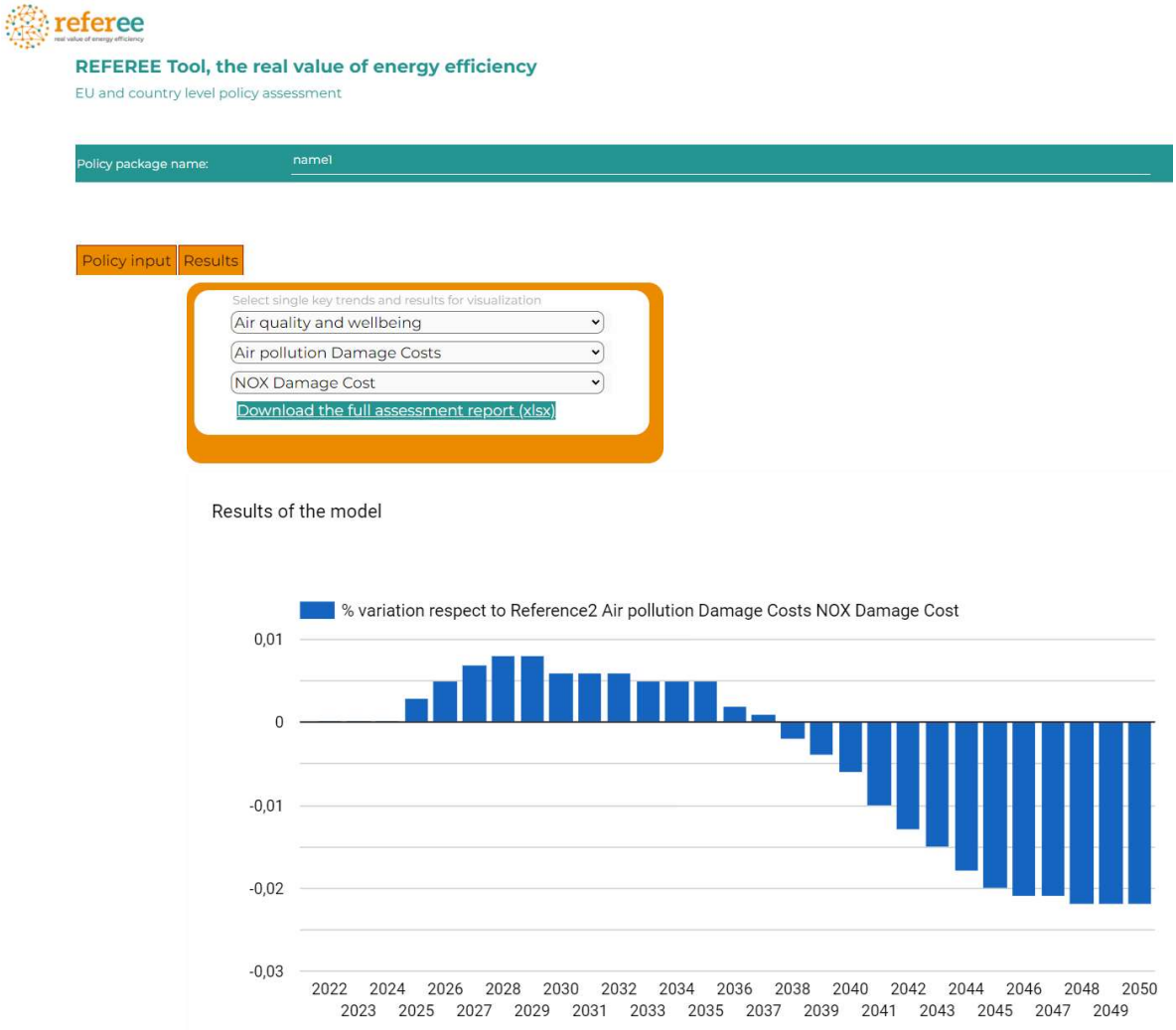


Figure 7: Online interface for EU and country level policy assessment – Results section (chart example).

2.5 Downloadable policy assessment report

By clicking on the "download the full assessment report" button in the results section, a MsEXCEL file will be downloaded.

The file opens with a cover index that gives access to the different tables and graphs included in the report.

The name of the policy package is shown, as it is the specific reference scenario from which data is being compared to.

There is the complete freedom to navigate through the results freely, pressing on any variable.

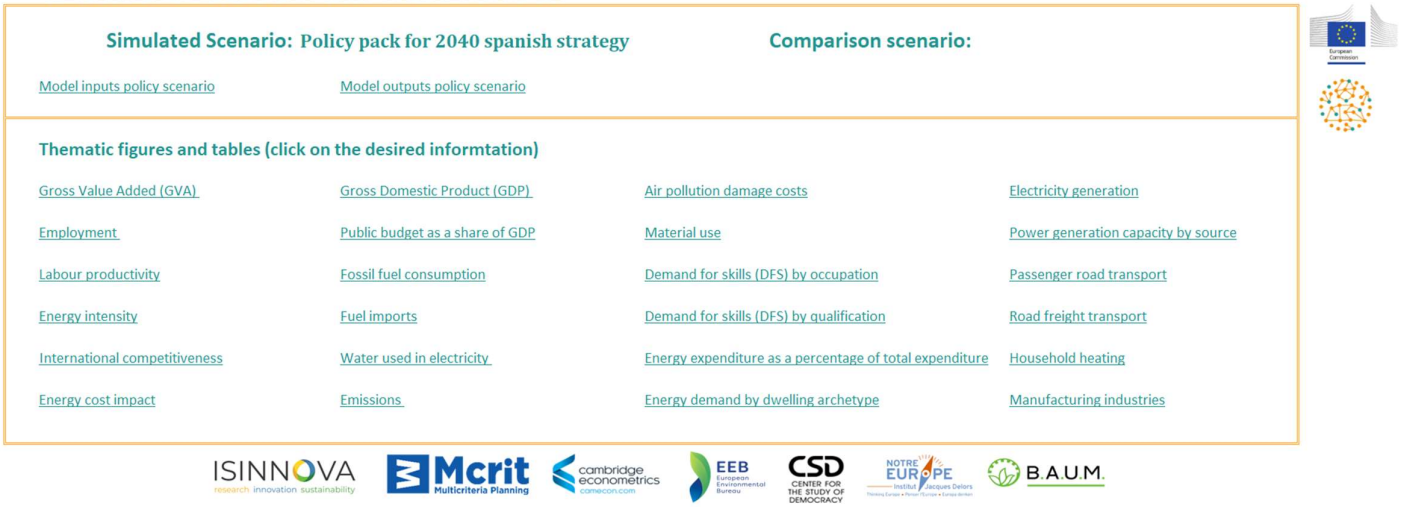


Figure 8. Downloadable results from the online global tool – Cover.

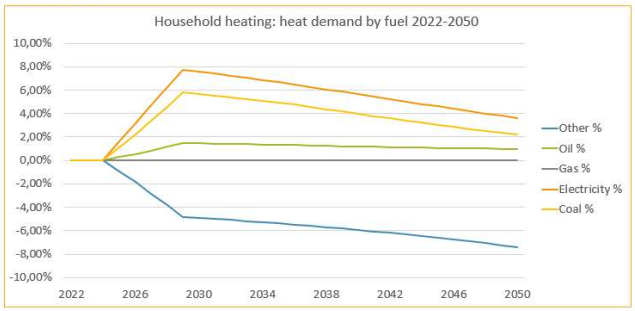
In total, there are 24 results included:

- Gross Value Added (GVA)
- Employment
- Labour Productivity
- Energy Intensity
- International competitiveness
- Gross Domestic Product (GDP)
- Public budget as share of GDP
- Fossil Fuel Consumption
- Fuel imports
- Water used in electricity generation
- Energy Cost Impact
- Emissions
- Air pollution Damage Costs
- Material Use
- Demand for skills by occupation
- Demand for skills by qualification
- Energy expenditure as a percentage of total expenditure
- Energy demand by dwelling archetype
- Electricity generation
- Power generation capacity by source
- Passenger road transport: fleet share by technology & fuel demand by fuel
- Road freight transport: fleet share by technology & fuel demand by fuel
- Household heating: by fuel & by technology
- Manufacturing industries: heating demand by fuel

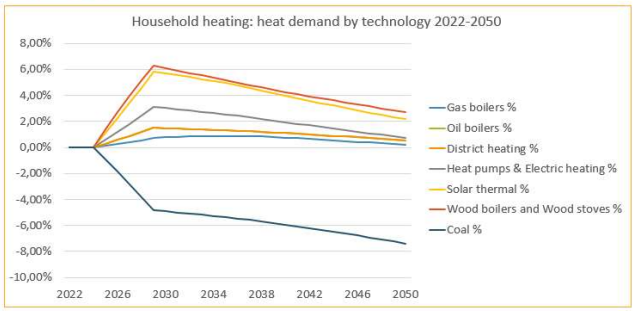
By pressing on one of the indicators shown above, the tool opens a page containing the numerical data, shown by charts and tables, of the indicator itself. These data are editable and manageable by the user (see Fig. 9)

Household heating graphs name1

Heat demand by fuel



Heat demand by technology



Household heating tables name1

Heat demand by fuel

Pillar	Indicator	Level of Di	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Environme	Household	Other	%	0,00%	0,00%	0,00%	-0,32%	-1,86%	-2,83%	-3,83%	-4,84%	-4,32%	-5,00%	-5,03%	-5,15%	-5,27%	-5,37%	-5,47%	-5,58%	-5,69%	-5,81%	-5,93%	-6,06%	-6,19%
Environme	Household	Oil	%	0,00%	0,00%	0,00%	0,27%	0,56%	0,85%	1,16%	1,48%	1,46%	1,43%	1,41%	1,39%	1,36%	1,33%	1,31%	1,28%	1,25%	1,22%	1,19%	1,16%	1,13%
Environme	Household	Gas	%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Environme	Household	Electricity	%	0,00%	0,00%	0,00%	1,58%	3,17%	4,74%	6,26%	7,72%	7,58%	7,41%	7,24%	7,06%	6,87%	6,67%	6,47%	6,27%	6,06%	5,86%	5,65%	5,44%	5,23%
Environme	Household	Coal	%	0,00%	0,00%	0,00%	1,11%	2,24%	3,41%	4,60%	5,80%	5,66%	5,55%	5,41%	5,26%	5,10%	4,93%	4,75%	4,57%	4,38%	4,18%	3,98%	3,78%	3,58%

Figure 9: Downloadable results from the online global tool – Output display example.

3 Overview of the model at local level, the Localities Tool

The Localities Tool is an online model that provides support for decision making on energy efficiency measures at local level. It does so by calculating energy and non-energy impacts of different energy efficiency measures.

The following sections are discussed:

3.1 Parameters. In this section to use the tool the municipality is required to provide basic inputs concerning its population and its main energy consumption figures by sector (see paragraph 3.1).

3.2 Model. As for the European Tool, the purpose of this section is both to provide input on the type of policy to test for the interested municipality and then to run the model.

3.3 Results. In results there is the option to generate graphs for different variables. It provides a quick view of the model results.

3.4 Downloadable policy assessment report. In results section, there is the option to download a more detailed policy assessment report in a MsESXCEL file, where graphs and tables can be found and can be manageable.

Apart from the brief explanation of the different sections provided here, in the Model section it is possible to open a guidance document to facilitate the usability of the interface, so that clicking the corresponding button will display an interactive presentation with more detailed information.

3.1 Parameters section (municipality inputs)

Municipality information. Some basic inputs need to be provided: municipality name; country of the municipality; population; annual population growth; income per capita (in euros)[1]; public budget of the municipality (million EUR); the reference year for calculation of targets; the initial year of the simulation; and the final year of the simulation (see Fig. 10).

Energy consumption. It must be provided for the initial year and the reference year. Data should cover all three areas of housing, services, and mobility. To the

[1] For the countries that do not use EUR, it is needed to do the conversion previously in EUR.

right of the input field, the button allows importing "proposed" default values by the system, as described next.

Proposals *(defaults).* If data for energy consumption is not available in some case, the tool provides a proposal for each cell of energy consumption for both years, based on a variety of SECAP plans from CoM and EU benchmark. Default values are determined based on the country, the population, and the annual population growth, so proposals will only display when these are provided. There is a button to copy them, but also user can select and copy the proposed estimated data.

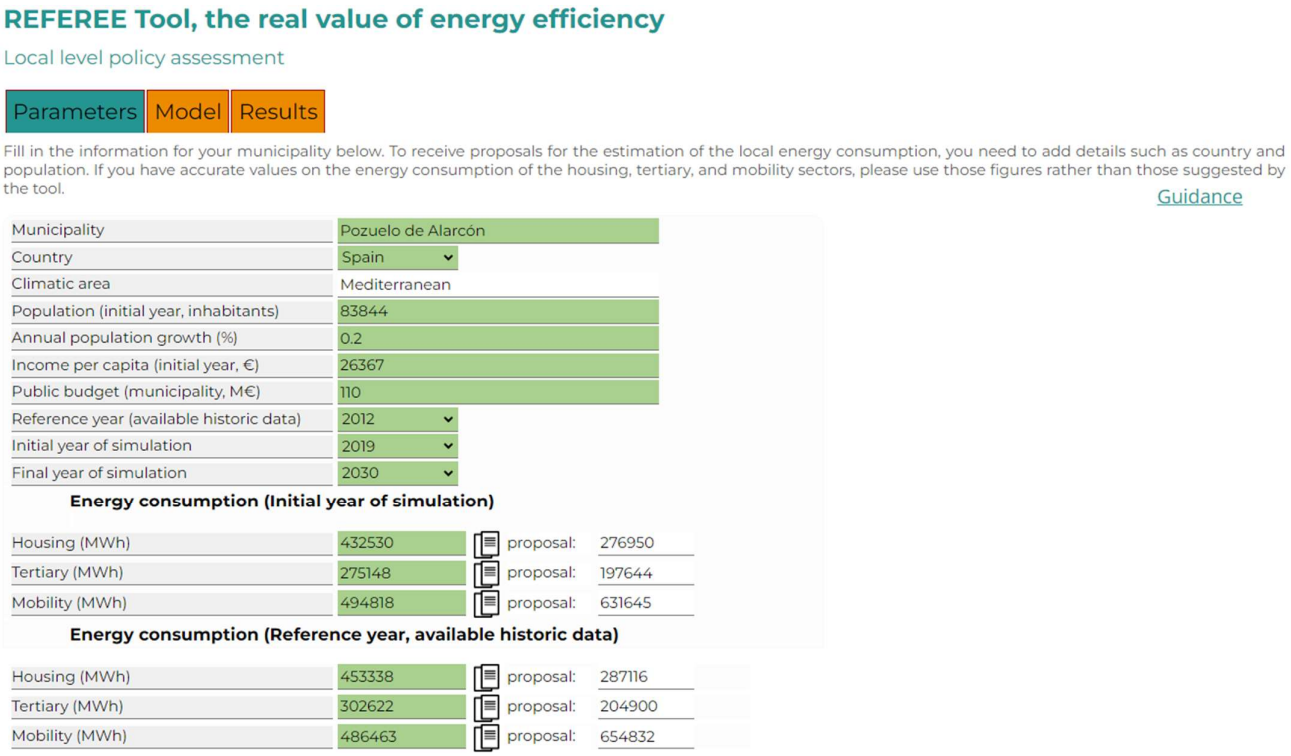


Figure 10. Online interface for local level policy assessment – Parameters section.

3.2 Model section (policy inputs)

In the model section (see Fig. 12), like the *policy input* section of the European Tool, the main point is to define the policies to be implemented. Policy mixes in the localities tool are usually more detailed than in the European Tool, so expect more policies to be tested, given the nature of local energy efficiency policy

sets. At the local level, the tool can support a maximum set (package) of 34 policies.

Naming the policy. In the policy console, user can type a name for the policy or leave the default name (Policy X).

Policy sector. A policy for the locality can be applied in three activity sectors: housing, tertiary, and mobility.

Subsector. The housing and tertiary sectors are further structured in 4 subsectors: heating, cooling, water heating, appliances while the mobility sector is structured in 2 subsectors: public transport and road (private) transport.

Policy type. Here the user can choose between various measures based on the selected subsector and select the one that is the most appropriate for the policy to be implemented.

Sector stock targeted. The stock involved by the policy, that is how many items (people, buildings, vehicles...) are going to be affected.

- ✓ E.g., if an energy efficiency (EE) policy aimed at supporting building rehabilitation can target as much as 5% of the total housing stock in a specific municipality, the slider should point out 5.

Policy intensity. The level of efficiency expected by the policy to be implemented. A 100% represents the maximum EE gains from the policy. Shrinking this level reduce its implementation costs (e.g., the costs of the accompanying measures), but also the EE gains. This provides political realism, depending on the capacities of the city council to undertake a specific policy.

- ✓ E.g., if an EE policy aims at changing energy behavior of users in office buildings, and maximum EE impact derived from this policy is established at 40% energy savings of the subsector, then when policy intensity is set at 33%, it implies on succeeding at altering behavior of 1 out of 3 users, and therefore, energy savings at targeted buildings will result in 33% of 40%, which are a 13,2% energy savings from the subsector.

Maximum possible EE impact. It is related to the maximum impact that a policy can have in energy efficiency (with a 100% policy intensity), and this depends on the technology specification or behavioral estimates. Standard values are proposed for each policy type, and only when better or more detailed information is available for the locality, this parameter should be adjusted.

- ✓ E.g., if the maximum EE impact is 10%, but only a 30 % of policy intensity is set, the final expected EE impact will be 3% energy savings in that subsector for the given sector.

Energy carriers. They need to be adjusted for each policy. The 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.

- ✓ An example is provided in the following figure. It shows how a 100% energy mix driven by electricity, is switched implementing more renewables, but the percentage sums 105, not 100. This means that the reduction in electricity or the increase in renewable energy is wrong, thus, a pop-up advise is shown when trying to run the model, saying, in this case, that "policy1" must be checked.

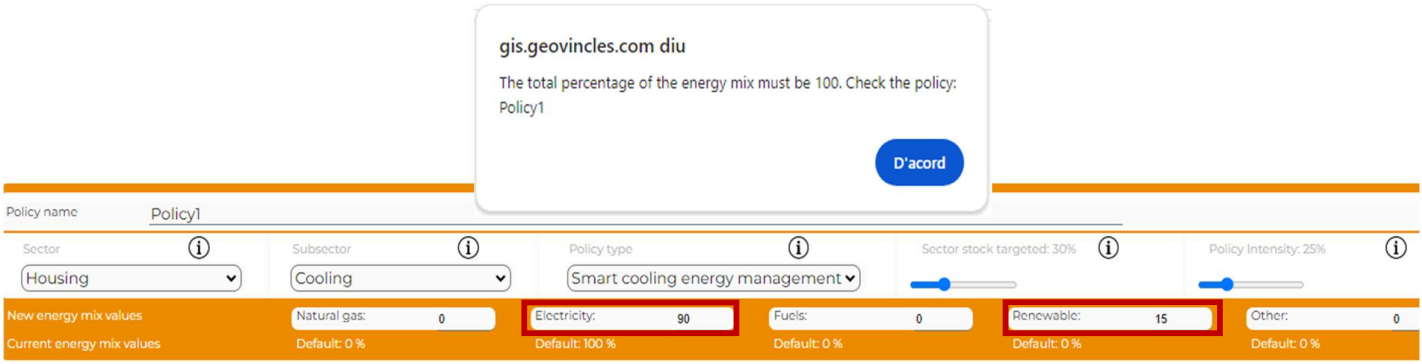


Figure 11. Online interface for local level policy assessment – Parameters section.

- ✓ 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 and final year.

Running the model. Just by pressing the button "Run", when policies are described in their corresponding consoles. Again, more explanation and visuals are provided in the guidance for the local tool, that is available in the same interface by clicking the "Guidance" button.

The next figure presents the model section with all its functions identified and with a simple set of policies, that are described below it.

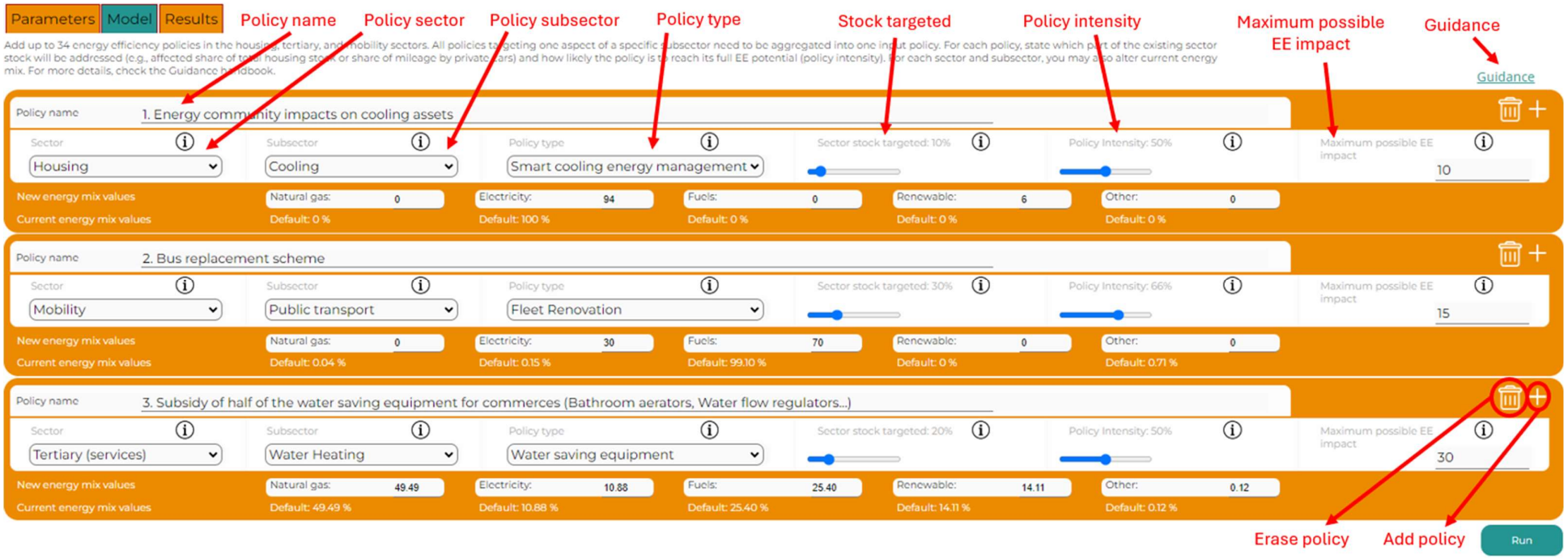


Figure 12. Online interface for local level policy assessment – Model section (simplified with few policies).

This figure shows an example with the selection of three policies. In the first one the government is promoting an energy community, **increasing the share in renewable energy into a 6% of the total energy mix** and reducing the electricity of the same amount of share in cooling assets from the housing sector.

For the second, the municipality plans to replace its current buses with more efficient ones, yielding a **maximum EE improvement** of 15%. 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). More information is provided in the guidance in case that data refers to mileage. Also, if the new buses are electric, then the mix is adjusted expecting the new energy mix of the public transport being a **30% electric and the other 70% with fuels**.

Finally, the town hall is paying the 20% of its shops and businesses (**sector stock**) new more efficient water equipment, but only for the half of all the water equipment from each commerce (**policy intensity** at 50%), implying less costs for the town hall, but also reducing the possible gains, from a 30% (**Maximum possible Energy Efficiency impact**) to a 15% (30*0,5), and this will provide a **3% of energy savings from the cooling subsector of the tertiary sector** (15%*0,2 since only 20% are targeted).

Once the run button is pressed, the tool will display a message in red saying "**please wait while the results are processed**" below the last policy box. It takes normally around 10 to 30 seconds to run the data and make the calculations. When it ends, it delivers the user automatically to the results section. However, there is the option to turn back to other sections and, for instance, check the inputs provided. Thus, it is possible to navigate through the three sections freely.

3.3 Results section (outputs)

Once the tool stops processing, the red message will disappear.

Results can be consulted online through a set of nested dropdowns menus or can be download in a full assessment report (in MsEXCEL format).

In the set of dropdown menus, three nested levels are shown where the user needs to select:

1) Impact area in the first tab of the dropdown. Available outputs: i) Expected energy consumption and energy savings ii) Costs from energy, iii) Climate change, iv) Socioeconomic impacts, v) Governance (transformation capacity of public policies).
2) Specific variables to be displayed are shown subsequently in the second tab of the dropdown. The third tab is to choose whether data is willed to be observed as absolute or relative. A full description of all available variables and combinations is displayed in Annex 2.

With this combination, a unique graphic is displayed with the requested analytical results of the run.

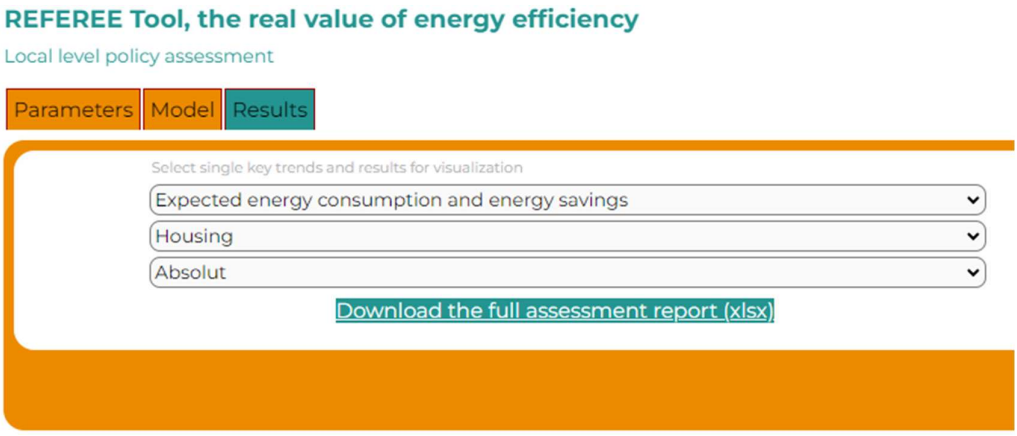


Figure 13. Online interface for local level policy assessment – Results section (labels).

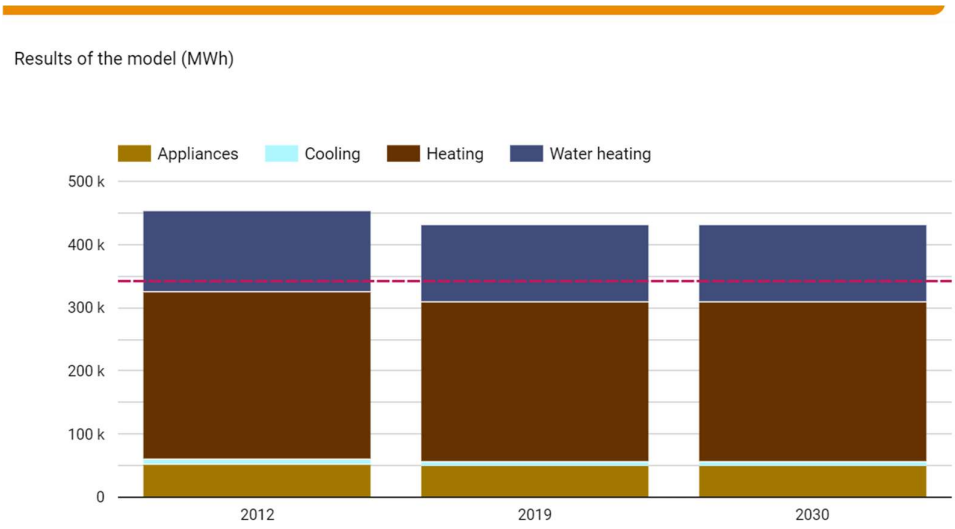


Figure 14. Online interface for local level policy assessment – Results section (chart example).

As in the European Tool, the full set of available indicators is included in an annex at the end of this document (Annex2).

3.4 Downloadable policy assessment report

By clicking on the "download the full assessment report" button in the results section, a MsEXCEL file will start downloading. Wait until the download is complete and open the file. The first thing that is displayed is a **cover** with the different tables and graphs for the different variables' hyperlinks, as it happened in the European Tool.

Also like the European Tool, there is the complete freedom to navigate through the results freely, pressing on any variable and choosing to see **graphs or tables**.

Apart from the graphs and tables, there are also reports for each sector with data related on energy consumption, emissions, or costs. Also, there is a **synthesis report** that allows to see additional and concrete data, for instance, if energy consumption or emission targets are achieved. Moreover, there is a page for the **locality profile** that sums up all the inputs provided related to municipal information (name, years, population, energy consumption…).

Finally, there are pages for each sector profiles that allow each to see the concrete impact of each policy in a more detailed way. This is all explained in the deliverable 4.1 regarding the **offline tool**, which show the same type of results and pages. The only thing that changes is the way the inputs are provided.

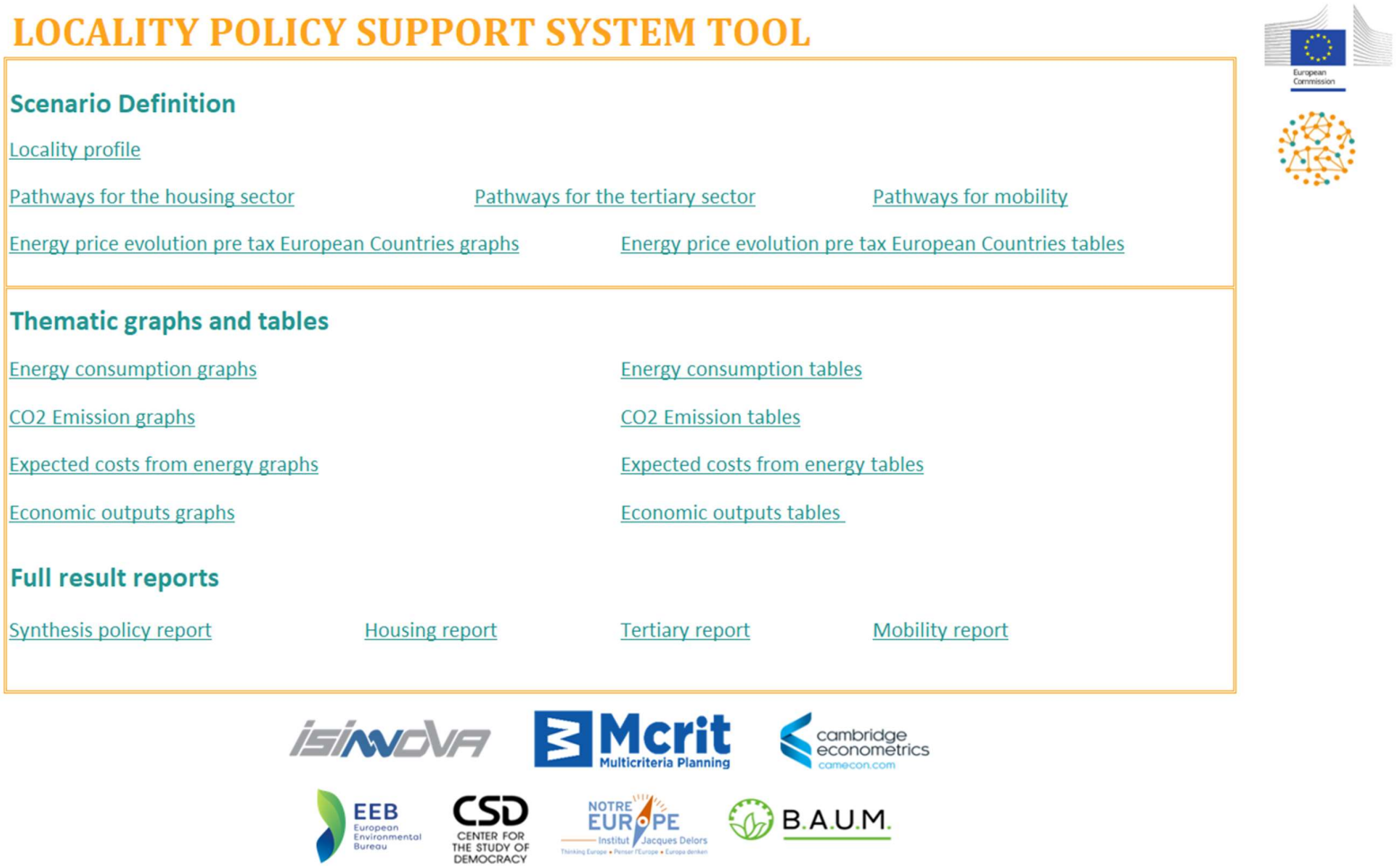
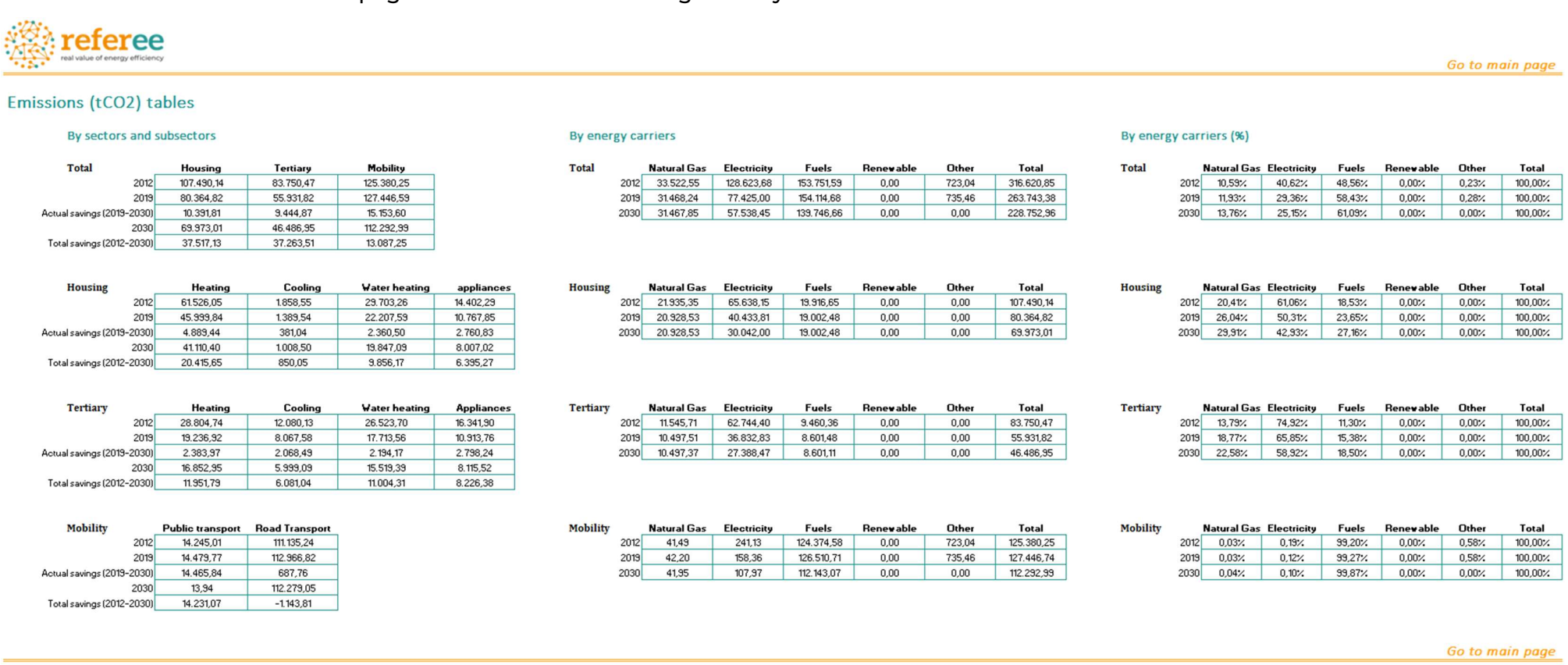


Figure 15. Downloadable results from the online local tool – Cover.

For example, pressing on “CO2 Emission graphs”, more graphs are shown than the ones on the online interface.

Figure 16. Downloadable results from the online local tool – Graphs examples.

Apart from that, the Excel file allows to directly see the data in the tables. For instance, pressing “Emission tables” would deliver to the data used. These pages are editable and manageable by the user.



Emissions (tCO2) tables

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By sectors and subsectors

Total	Housing	Tertiary	Mobility
2012	107.490,14	83.750,47	125.380,25
2019	80.364,82	55.931,82	127.446,59
Actual savings (2019-2030)	10.391,81	9.444,87	15.153,60
2030	69.973,01	46.486,95	112.292,99
Total savings (2012-2030)	37.517,13	37.263,51	13.087,25

Housing	Heating	Cooling	Water heating	appliances
2012	61.526,05	1.858,55	29.703,26	14.402,29
2019	45.993,84	1.389,54	22.207,59	10.767,85
Actual savings (2019-2030)	4.889,44	381,04	2.360,50	2.760,83
2030	41.110,40	1.008,50	19.847,09	8.007,02
Total savings (2012-2030)	20.415,65	850,05	9.856,17	6.395,27

Tertiary	Heating	Cooling	Water heating	Appliances
2012	28.804,74	12.080,13	26.523,70	16.341,90
2019	19.236,92	8.067,58	17.713,56	10.913,76
Actual savings (2019-2030)	2.383,97	2.068,49	2.194,17	2.798,24
2030	16.852,95	5.999,09	15.519,39	8.115,52
Total savings (2012-2030)	11.951,79	6.081,04	11.004,31	8.226,38

Mobility	Public transport	Road Transport
2012	14.245,01	111.135,24
2019	14.479,77	112.966,82
Actual savings (2019-2030)	14.465,84	687,76
2030	13,94	112.279,05
Total savings (2012-2030)	14.231,07	-1.143,81

By energy carriers

Total	Natural Gas	Electricity	Fuels	Renewable	Other	Total
2012	33.522,55	128.623,68	153.751,59	0,00	723,04	316.620,85
2019	31.468,24	77.425,00	154.114,68	0,00	735,46	263.743,38
2030	31.467,85	57.538,45	139.746,66	0,00	0,00	228.752,96

Housing	Natural Gas	Electricity	Fuels	Renewable	Other	Total
2012	21.935,35	65.638,15	19.916,65	0,00	0,00	107.490,14
2019	20.928,53	40.433,81	19.002,48	0,00	0,00	80.364,82
2030	20.928,53	30.042,00	19.002,48	0,00	0,00	69.973,01

Tertiary	Natural Gas	Electricity	Fuels	Renewable	Other	Total
2012	11.545,71	62.744,40	9.460,36	0,00	0,00	83.750,47
2019	10.497,51	36.832,83	8.601,48	0,00	0,00	55.931,82
2030	10.497,37	27.388,47	8.601,11	0,00	0,00	46.486,95

Mobility	Natural Gas	Electricity	Fuels	Renewable	Other	Total
2012	41,49	241,13	124.374,58	0,00	723,04	125.380,25
2019	42,20	158,36	126.510,71	0,00	735,46	127.446,74
2030	41,95	107,97	112.143,07	0,00	0,00	112.292,99

By energy carriers (%)

Total	Natural Gas	Electricity	Fuels	Renewable	Other	Total
2012	10,59%	40,62%	48,56%	0,00%	0,23%	100,00%
2019	11,93%	29,36%	58,43%	0,00%	0,28%	100,00%
2030	13,76%	25,15%	61,09%	0,00%	0,00%	100,00%

Housing	Natural Gas	Electricity	Fuels	Renewable	Other	Total
2012	20,41%	61,06%	18,53%	0,00%	0,00%	100,00%
2019	26,04%	50,31%	23,65%	0,00%	0,00%	100,00%
2030	29,91%	42,93%	27,16%	0,00%	0,00%	100,00%

Tertiary	Natural Gas	Electricity	Fuels	Renewable	Other	Total
2012	13,79%	74,92%	11,30%	0,00%	0,00%	100,00%
2019	18,77%	65,85%	15,38%	0,00%	0,00%	100,00%
2030	22,58%	58,92%	18,50%	0,00%	0,00%	100,00%

Mobility	Natural Gas	Electricity	Fuels	Renewable	Other	Total
2012	0,03%	0,19%	99,20%	0,00%	0,58%	100,00%
2019	0,03%	0,12%	99,27%	0,00%	0,58%	100,00%
2030	0,04%	0,10%	99,87%	0,00%	0,00%	100,00%

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Figure 17. Downloadable results from the online local tool – Tables examples.

Annex1: Indicator combination for the results of the European Tool.

Air quality and wellbeing	Air pollution Damage Costs	NOX Damage Cost
		PM Damage Cost
		SO2 Damage Cost
		VOC Damage Cost
Environment & Climate	Air pollution & Emissions	CH4 Emissions
		CO2 Emissions
		NOX Emissions
		PM2.5 Emissions
		SO2 Emissions
		VOC Emissions
	Electricity generation	Biofuel
		Coal
		Gas
		Nuclear
		Oil
		Renewables
	Fossil Fuel Consumption	Coal
		Gas
		Oil
	Fuel imports	Coal
		Manufactured fuels
		Oil and Gas
	Household heating: heat demand by fuel	Coal
		Electricity
		Gas
		Oil
		Other
	Household heating: heat demand by technology	Coal
		District heating
		Gas boilers
		Heat pumps & Electric heating
		Oil boilers
		Solar thermal
		Wood boilers and Wood stoves
	Manufacturing industries: heating demand by fuel	Biofuel
		Coal
		Electricity
		Gas

		Heat
		Oil
	Material Use	Biomass
		Fossil energy materials/carriers
		Metal ores (gross ores)
		Non-metallic minerals
	Passenger road transport: fleet share by technology	Electric Vehicles
		Hybrid Vehicles
		ICE Vehicles
	Passenger road transport: fuel demand by fuel	Coal
		Electricity
		Gas
		Oil
		Other
	Power generation capacity by source	Biofuel
		Coal
		Gas
		Hydro
		Nuclear
		Oil
		Other
		Solar
		Wind
	Road freight transport: fleet share by technology	Electric Vehicles
		Hybrid Vehicles
		ICE Vehicles
	Road freight transport: fuel demand by fuel	Coal
		Electricity
		Gas
		Oil
		Other
	Water used in electricity generation	Biofuel
		Coal
		Gas
		Nuclear
		Oil
		Renewables
Industrial Productivity	Energy Cost Impact	Total
	Energy Intensity	Total
	Gross Value Added	Agriculture
		Construction
		Manufacturing

		Mining and extraction
		Services
		Total
		Utilities
	International competitiveness	Total
	Labour Productivity	Agriculture
		Construction
		Manufacturing
		Mining and extraction
		Services
		Utilities
Socioeconomic Development	Demand for skills by occupation	Clerical Support Workers
		Craft and Related Trades Workers
		Elementary Occupations
		Managers
		Plant and Machine Operators, and Assemblers
		Professionals
		Service and Sales Workers
		Skilled Agricultural, Forestry and Fishery Workers
		Technicians and Associate Profes-sionals
	Demand for skills by qualification	High
		Low
		Medium
	Employment	Agriculture
		Construction
		Manufacturing
		Mining and extraction
		Services
		Total
		Utilities
	GDP	Total
	Public budget as share of GDP	Total
	Share of energy consumption_Q1	Electricity
		Gas
		Liquid fuels
		Other fuels
	Share of energy consumption_Q2	Electricity
		Gas
		Liquid fuels
		Other fuels

	Share of energy consumption_Q3	Electricity
		Gas
		Liquid fuels
		Other fuels
	Share of energy consumption_Q4	Electricity
		Gas
		Liquid fuels
		Other fuels
	Share of energy consumption_Q5	Electricity
		Gas
		Liquid fuels
		Other fuels
	Share of total space heat demand	Apartments, 27 to 47 years old
		Apartments, less than 27 years old
		Apartments, more than 47 years old
		Multi family home, 27 to 47 years old
		Multi family home, less than 27 years old
		Multi family home, more than 47 years old
		Single family home, 27 to 47 years old
		Single family home, less than 27 years old
		Single family home, more than 47 years old

Annex2: Indicator combination for the results of the Localities Tool

Impact area	Impact area disaggregation	Absolut-Relative
Expected energy consumption and energy savings	For all sectors	Absolut
		Relative
	Housing	Absolut
		Relative
	Tertiary	Absolut
		Relative
	Mobility	Absolut
		Relative
	By carriers	Absolut
		Relative
	Energy savings	Total
		Housing
		Tertiary
		Mobility
Costs from energy	For all sectors	Absolut
		Relative
	Housing	Absolut
		Relative
	Tertiary	Absolut
		Relative
	Mobility	Absolut
		Relative
	By carriers	Absolut
		Relative
Climate change	tCO2 emitted for all sectors	Absolut
		Relative
	tCO2 emitted in housing sector	Absolut
		Relative
	tCO2 emitted in tertiary sector	Absolut
		Relative
	tCO2 emitted in mobility sector	Absolut
		Relative
	tCO2 emitted by energy carriers	Absolut
		Relative
	Emissions savings	Total
		Housing
		Tertiary

		Mobility
Socioeconomic impacts	Increase of available income per capita	-
	Increase of available local aggregated income	-
	Municipal public budget impacts	-
Governance (transformation capacity of public policies)	tCO2 savings by origin	Absolut
		Relative