ODYSSEE-MURE

Webinar Series Energy Efficiency Academy 2025-2027



ODYSSEE-MURE and the multiple impacts of energy efficiency

03 November 2026

15:00 - 16:00 CET

Fraunhofer ISI

Meet the speaker **Niklas Reinfandt**

SEED MICAT coordinator, Fraunhofer ISI

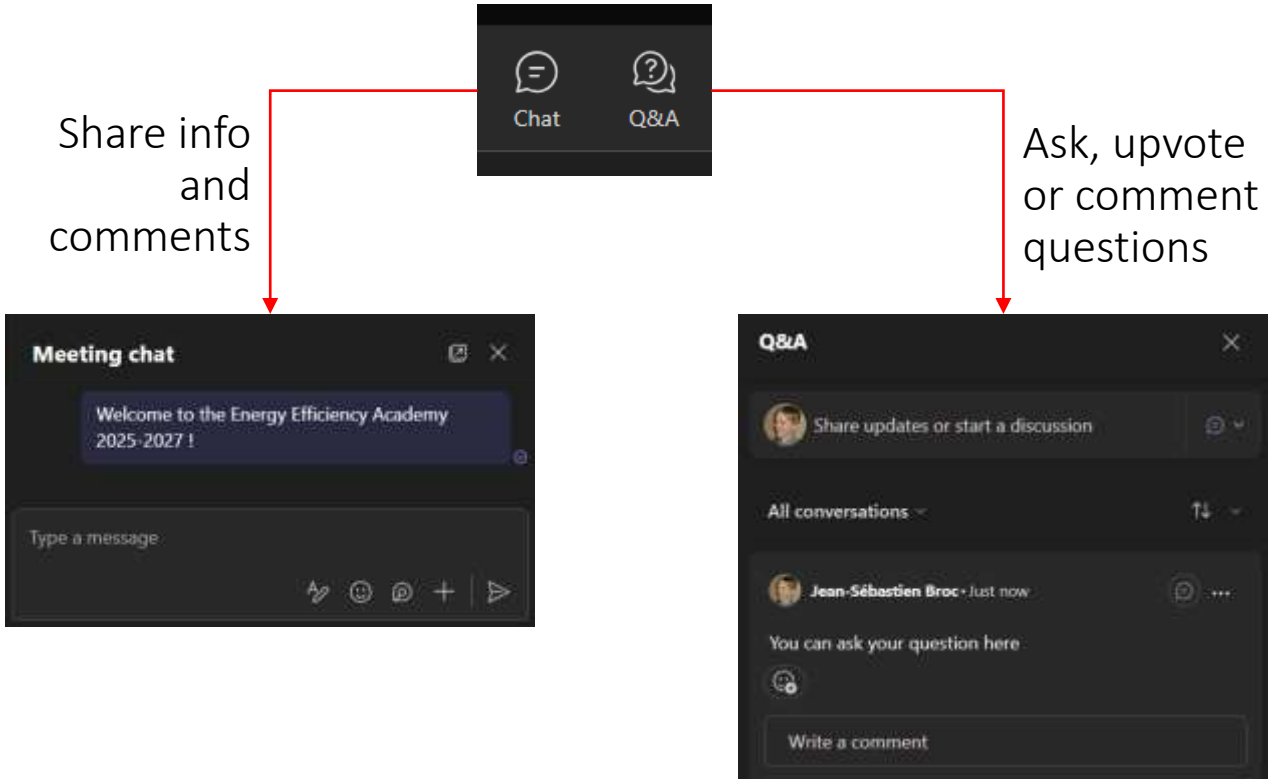
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Webinar series hosted by: IEECP Institute for European Energy and Climate Policy — Energy and Climate Academy

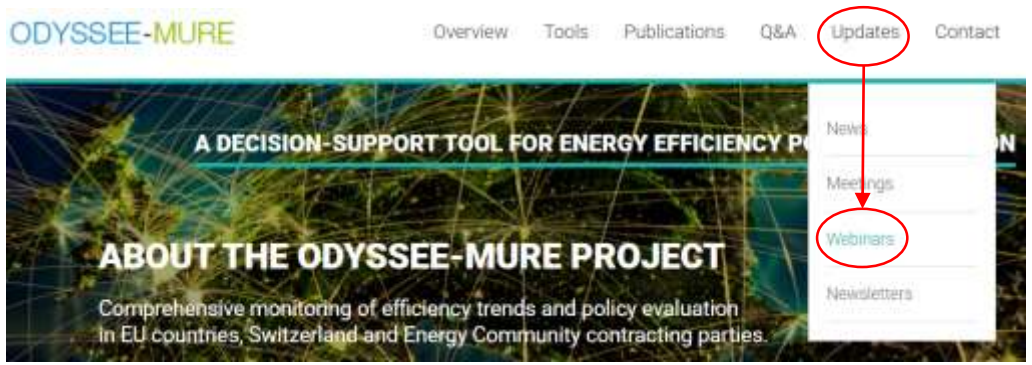
In partnership with: ECEEE, EnR

Practical info

- Mics and cameras are set off for participants
- Use the Q&A panel to ask your questions

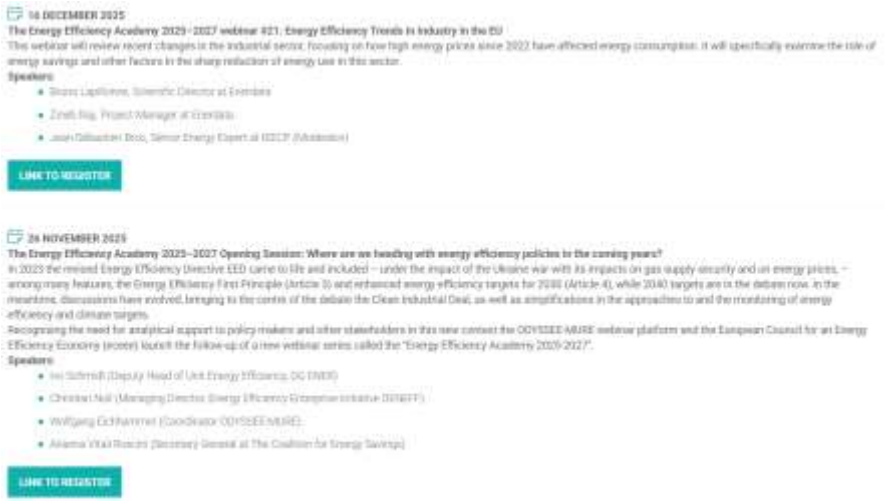


Info on webinars

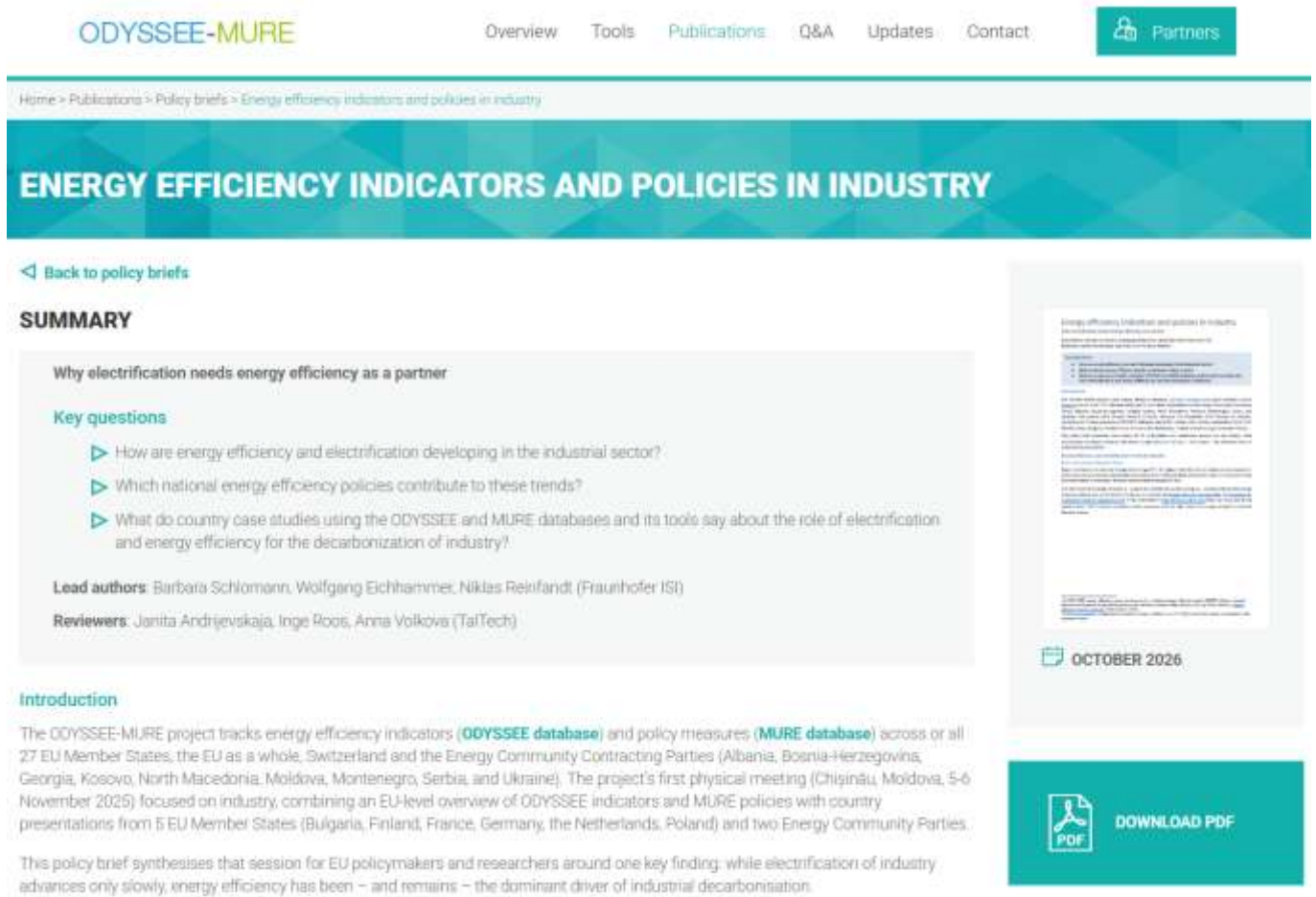


All at once:

- Information about next webinars (dates, registration links, …)
- Proceedings of previous webinars (recordings, presentation files)



ODYSSEE-MURE updates (1)



New policy brief about indicators and policies in **industry**

More briefs coming about energy poverty and decarbonizing industry

ODYSSEE-MURE updates (2)

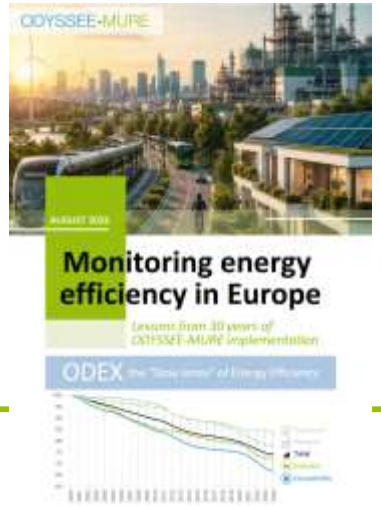
New videos available !

- New series of tutorials



- New podcasts related to the 30-year brochure





ODYSSEE-MURE updates (3)



ODYSSEE-MURE workshop in Dublin on 7-8 October

Hosted by seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Including exchanges with the ENR network

Presentation files soon available on the website

Odyssee

Estimates about 2025 data now available in the ODYSSEE data and tools

MUREII

Update of MURE is on-going

New scoreboard by early 2027

ODYSSEE-MURE: coming soon !

- Next in the Energy Efficiency Academy: mini-series of webinars on **transport**
- 30-year brochure, policy briefs and more…

➔ Stay tuned with the **newsletter**:

https://www.odyssee-mure.eu/events/newsletter/

In the upcoming newsletter: an online survey to know more about your use of ODYSSEE-MURE and what support you would like

And follow ODYSSEE-MURE on **LinkedIn**!

https://www.linkedin.com/company/odyssee-mure

Upcoming events of sister projects and beyond

Tue.
10 Nov.
11.00 CET

Assessment of **Energy Savings in Public Bodies:** the Croatian experience

Tue.
17 Nov.
10.00 CET

Plugging Energy Efficiency First in **national energy planning**

ENERGY EVALUATION EUROPE CONFERENCE 2027
6 OCT - 8 OCT 2027
TALLINN, ESTONIA



TAL TECH

Call for Abstracts open

Deadline: Friday 4 December

ODYSSEE-MURE

Thank you!

Partners:



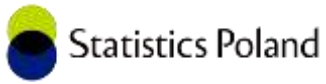




















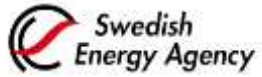











































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ODYSSEE-MURE

ODYSSEE MURE and the MICATool
The multiple impacts of energy efficiency

The Energy Efficiency Academy 2025-2027
Webinar #26

Niklas Reinfandt, Fraunhofer ISI

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Agenda

SEED MICAT
Support Energy Efficiency Deployment with the Multiple Impacts CAlculation Tool

ODYSSEE-MURE

01 Introduction and background

02 MICATool: methodological framework

03 MICATool: use cases

04 German case studies

05 ODYSSEE-MURE integration

06 Guidance and resources

01

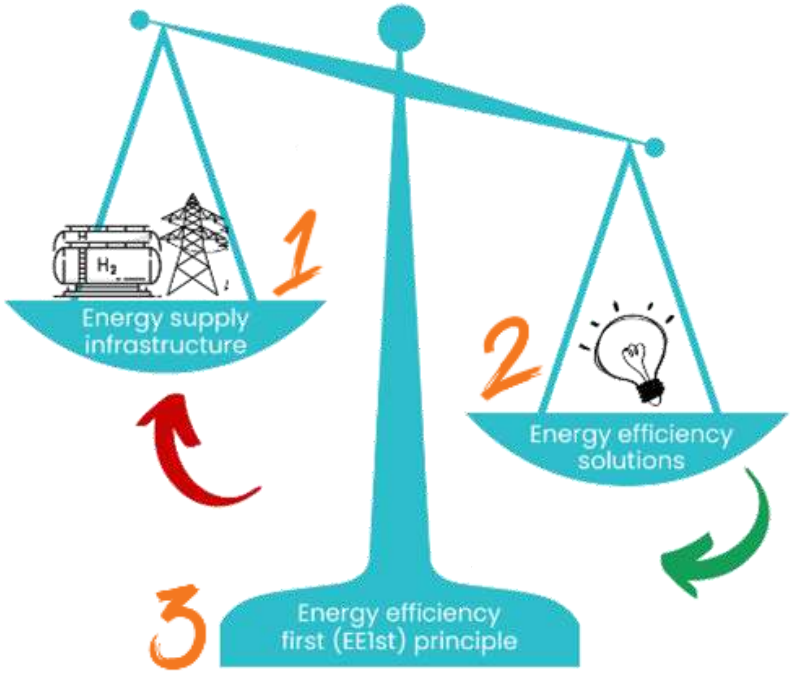
Introduction and background

What are multiple impacts?

- also known as multiple benefits, co-benefits, ancillary benefits, non-energy benefits
- accompany energy efficiency projects and provide additional arguments to implement energy efficiency measures, but are rarely reported



Based on IEA (2014)



1. Ignoring multiple impacts undermines the cost-effectiveness of energy efficiency solutions
2. Assessment of multiple impacts, shifting the economic balance in favour of energy efficiency
3. The EE1st principle calls for a fair comparison of energy supply and energy efficiency in energy related decisions

Link to the Energy Efficiency Directive

MB are strongly linked to the **Energy Efficiency First (EE1st) principle** (Article 3 in **Directive EU 2023/1791 ("EED")**)

- Article 3(1) requires Member States to "**ensure that energy efficiency solutions** […] **are assessed in planning, policy and major investment decisions**" (exceeding €100 million or €175 million for transport infrastructure)

- Article 3(5a):

" **In applying the energy efficiency first principle**, Member States shall promote and, where cost-benefit analyses are required, ensure the application of, and make publicly available, **cost-benefit methodologies that allow proper assessment of the wider benefits of energy efficiency solutions** where appropriate, taking into account the entire life cycle and long-term perspective, system and cost efficiency, security of supply and quantification from the societal, health, economic and climate neutrality perspectives, sustainability and circular economy principles in transition to climate neutrality."

Link to the Energy Efficiency Directive

- Article 3(5b) requires Member States to "**address the impact on energy poverty**" in applying the EE1st principle

- Article 3(5d) provides for Member States to report on how the **EE1st** principle has been **integrated into their NECP progress reports**, including "an assessment of the application and benefits" of the principle.

How to translate all these aspects into practice?

→ more info in the guidance note (Recommendation EU 2024/2143)

Recommendation EU 2024/2143

How to ensure a proper assessment?

- Identify relevant multiple impacts
- Quantify them (in physical units)
- Monetise them
- Avoid double counting (no overlaps)

Recommendation EU 2024/2143, page 13:
"Publicly owned or regulated entities may be directly requested by national authorities to implement the EE1st principle in their operations based on societal CBA. (…)"

Based on this, perform a CBA, which could include:

- **technical analysis** (i.e. identify potential EE alternatives)
- **financial analysis** (from the perspective of the investor)
- **economic analysis** (from the perspective of the society as a whole, i.e. considering the wider benefits of EE1st "societal CBA" with the monetisation of environmental, health, and other societal impacts)

Private entities

- Regulated entities (TSOs and DSOs as set in art. 27, EED)
- Public entities (if required by MS)

Multiple impacts in policy assessment

SEED MICAT supports public authorities at EU, national, regional and local levels in applying Energy Efficiency First.

01

Operationalise EE1st

Compare energy supply and efficiency measures on a broader evidence base

02

Quantify & monetise MIs

Translate effects such as health, emissions, jobs and energy security into indicators and € values

03

Support reporting

Provide relevant indicators for policy-related reporting and cost-benefit analysis

Designed for low data requirements

- Country-, sector- and technology-specific defaults
- Custom inputs where better data are available



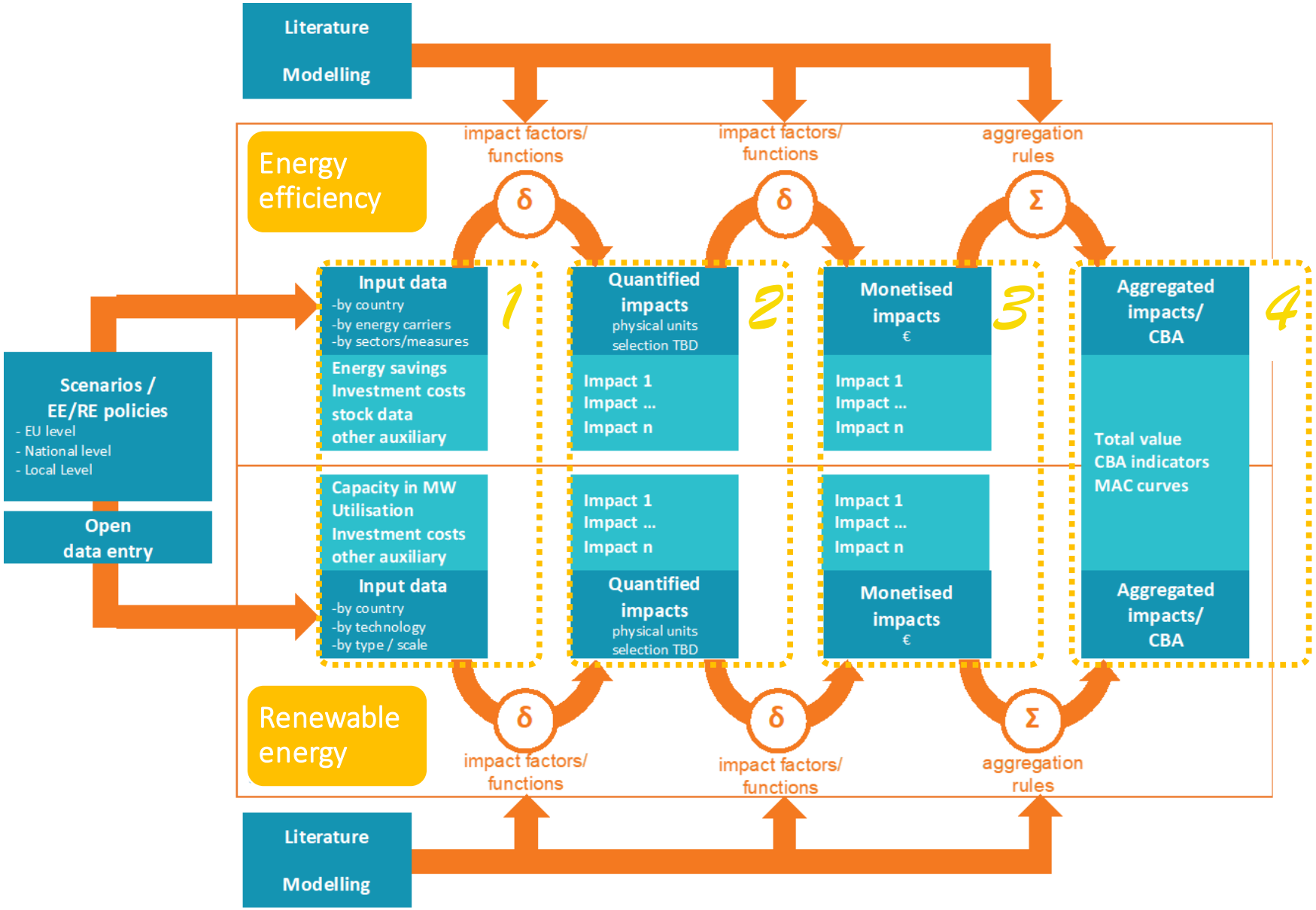
EU and Member States

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02 MICATool

Methodological framework

Quantification framework of MICAT



2 quantification modules:

- Energy efficiency
- Renewable energy

Work flow:

1. Inputs: Required input data and optional parameters
2. Outputs: Quantification of physical impacts
3. Outputs: Monetisation of impacts
4. Outputs: Combination of non-overlapping aggregated impacts (CBA)

Validation:

- Modelling
- Literature

Outputs: physical impacts, monetary values and CBA

The tool produces decision-oriented results in three layers

1 Quantify

Physical indicators for health, air pollution, energy security, jobs, GDP and more

2 Monetise

Apply factors such as societal cost of carbon, value of statistical life or value of a work day

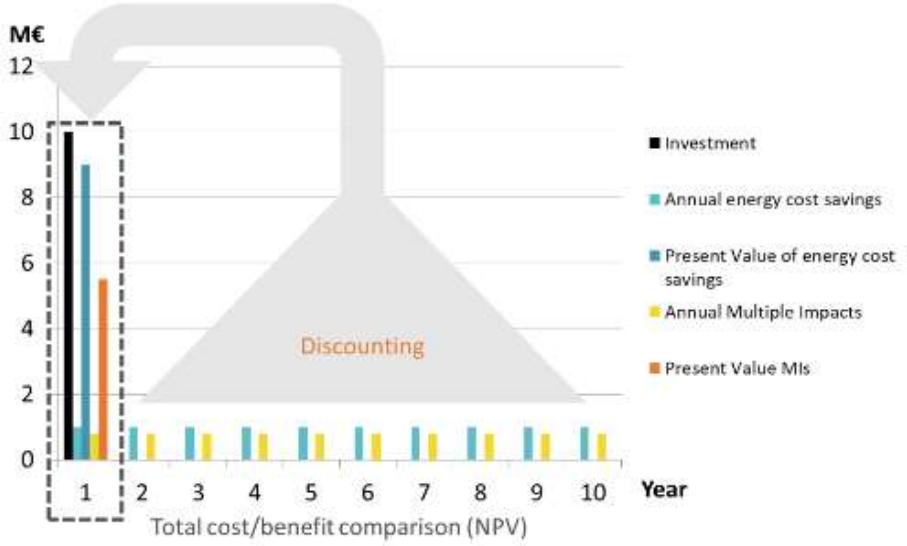
3 Aggregate / CBA

Aggregate only non-overlapping benefits. GDP and public budget effects remain outside the conservative CBA. Test sensitivities.









CBA indicators

- NPV
- Annuity
- levelised costs of saved energy or GHG emissions

Impact quantification

Overall aim: Applicability for a broad target group and coverage of a wide range of use-cases (e.g., customised scenarios and policy measures)

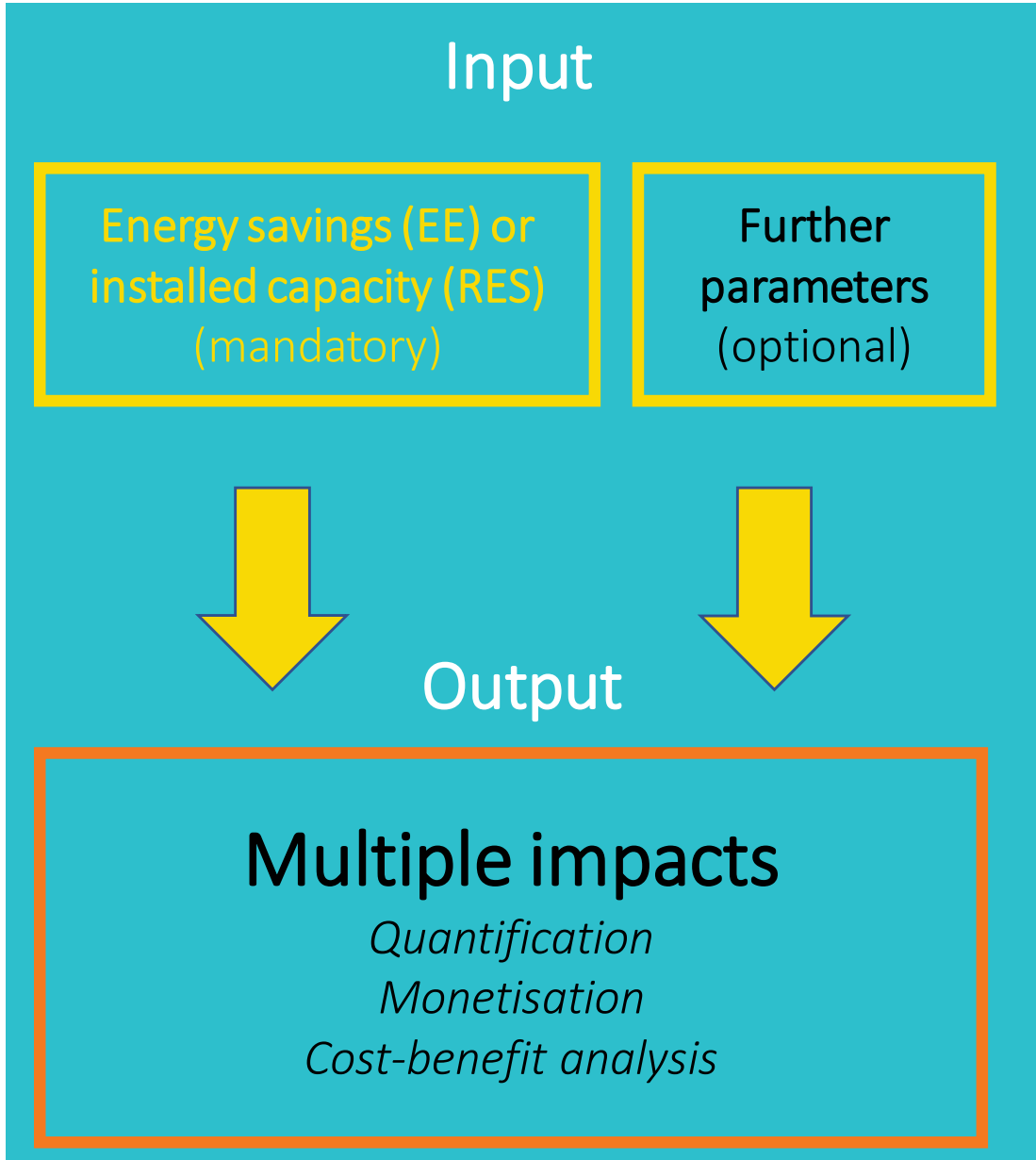
MICAT approach:

- Impact quantification based on **factors or functional relationships linked to energy savings (EE) or installed capacity (RES)**
- Input/modification of further **optional parameters** (e.g., investments, energy prices, fuel split) possible to **increase accuracy** of results

✓ Facilitate assessment & reporting of MI at EU, national and local levels

✓ Support target groups (e.g., public authorities in MS) with limited capacities in their assessment and reporting of MI

✗ Replace detailed modelling of MI and impact assessments of policy measures



MICATool input data

- **MICATool runs with mandatory activity data, then precision can be improved as users adjust global and measure-specific parameters**

Mandatory

minimum to calculate

- ✓ Annual energy savings per sector and improvement action (EE)
- ✓ Installed capacity for renewable energy measures (RES)



Highest priority

improves result quality quickly

- ✓ Investment costs per improvement action
- ✓ Affected fuels and fuel split assumptions

Further adjustable

customises context and sensitivity

- ✓ Lifetime, subsidy rate and fuel switch parameters
- ✓ Sectoral energy mix, energy prices, generation mix
- ✓ Monetisation factors and residential parameters

Default values keep the workflow usable; custom inputs allow users to reflect local measures, fuel mixes and prices

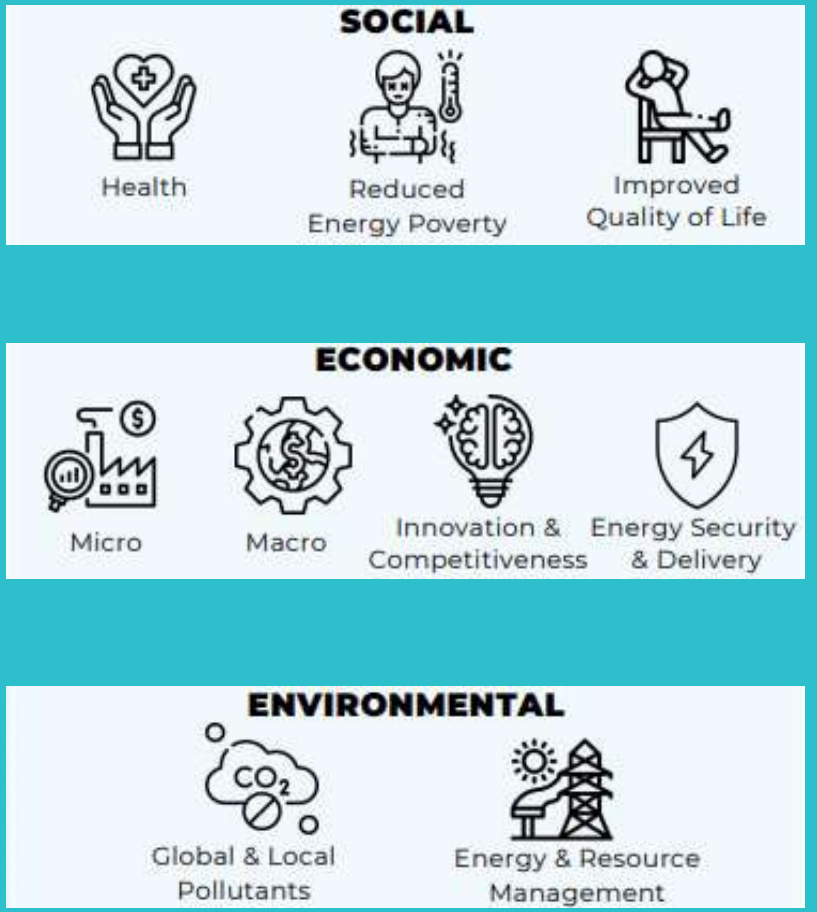
Impact monetisation

Monetisation of impacts:

- Conversion of MI into monetary values (€): to compare their magnitude, for aggregation and integration into CBA
- Monetary value of MI: often higher than energy cost savings → MI can significantly change the results of a CBA
- Aim: gain a more complete overview of the real value of energy efficiency

MICAT approach:

- Applying **monetisation factors** to physical values, e.g. societal costs of carbon, Value of Statistical Life (VSL), value of a work day
- Provision of **default values** for monetisation factors in the tool; modification by tool users possible



Impact aggregation and cost-benefit analysis

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Impact aggregation:

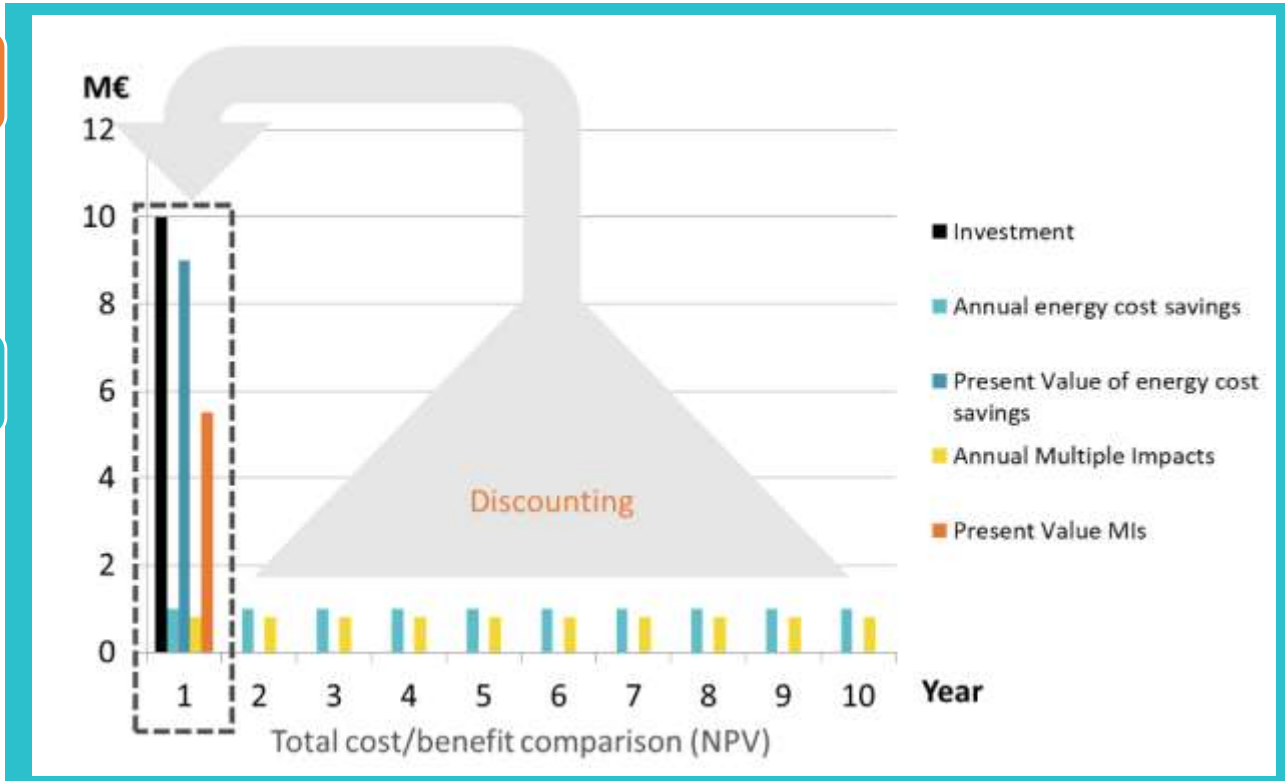
- Monetary impacts only aggregated and included in the CBA, when there is **no risk of double-counting** (conservative approach)
- Some monetary impacts: not aggregated due to double-counting, i.e. only presented in the monetary tool mode (e.g., GDP, public budget)

Included impacts in the CBA mode:

- Energy cost savings
- GHG emission reductions
- Impact on RES targets
- Avoided investments in additional energy supply capacity
- Additional work days due to reduced air pollution
- Reduced mortality due to reduced air pollution
- Reduced mortality due to improved indoor climate
- Avoided asthma cases due to improved indoor climate

Sensitivity analysis by adjustment of

- Discount rates
- Energy prices
- Investments
- Monetisation factors and lifetimes (via optional parameters)



CBA indicators in the MICATool:

- Net present value (NPV)
- Benefit-cost ratio / cost-benefit ratio
- Annuity
- Levelised costs of saved energy (€/kWh) / GHG emissions (€/tCO2)

03 MICATool

Use cases

What are the use cases?

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Governance level

EU



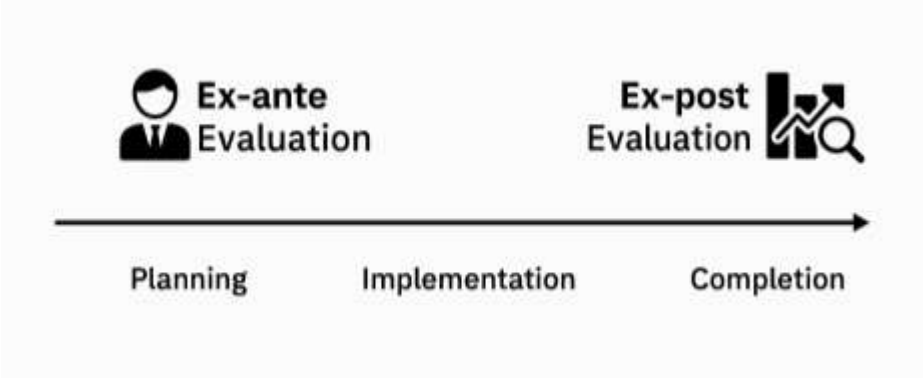
National



Local



Evaluation perspective



Evaluation subject

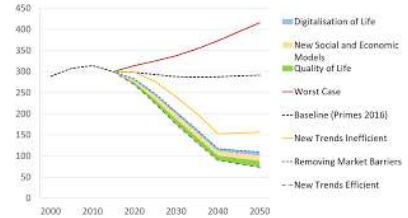
Policies / Programs



Actions



Scenarios



Exemplary use cases

	Policy challenge	Possible information needs	What the tool can provide
	**Use case: Extended evaluation of a concluded program** To support evidence based policy making and / or for reporting purposes, energy efficiency policy and program evaluations have become a more common excercise. Multiple impacts are however (yet) rarely part of standardised evaluation approaches.	What impacts beyond the evaluated ones have been achieved through the program? How does the program assessment change when broadening the evaluation scope?	Quantified and visualised impacts from the reported energy savings Comprehensive assessment of the program from a cost-benefit perspective
	**Use case: Support the NECP reporting under EU regulation** Art. 8, 2 (g) of the EU Governance Regulation stipulates that „Member States shall describe in their integrated NECPs their assessment, at national and, where applicable, regional level, the macroeconomic and, to the extent feasible, the health, environmental, skills and social impact of the planned policies and measures […]“	What are the multiple impacts of the planned policies and actions? What is the level of these impacts?	Information on the multiple impacts of energy efficiency improvement actions in different sectors Quantified and visualised impacts from the reported energy savings

04 MICATool

German case studies

Case Studies

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Selection and application of MICATool to 3 German energy efficiency programmes

1. Broad sectoral coverage

The picture can't be displayed.

- **Household sector:** Federal funding program for energy efficient buildings **(BEG)**

The picture can't be displayed.

- **Transport sector:** The Directive to promote the sale of electric-powered vehicles **(Environmental bonus)**

The picture can't be displayed.

- **Industrial sector:** Federal funding for energy and resource efficiency in industry **(EEW)**

2. Data availability: rigorous ex-post evaluation reports







3. Policy relevance: high visibility for major national policy instruments

Case Studies

Description

•Household sector: Federal funding program for energy efficient buildings (BEG)

- **What?** to support the **energy-efficient refurbishment** of residential and non-residential buildings and the use of **renewable energies to generate heat**.
- **How?** Investment **grants** and soft **loans**
- **Data? Evaluation report**, focussing on the analysis for residential buildings **(2021-2023)**.

➢ Case study focuses on building envelope and heating measures in residential buildings (~95% of all funded projects)

•Transport sector: The Directive to promote the sale of electric-powered vehicles (Environmental bonus)

- **What?** Incentive programme for **EV adoption**
- **How? Government subsidies** (€10.2 bn) and **manufacturer rebates** (€5.3 bn).
- **Data? Evaluation report (2016-2023)**.

➢ Case study focuses on the uptake and impact of BEV (1.4 mil new registrations = 64% of total)

•Industrial sector: Federal funding for energy and resource efficiency in industry (EEW)

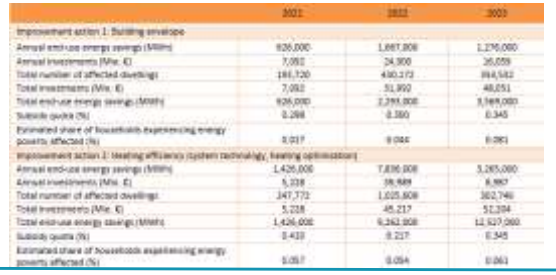
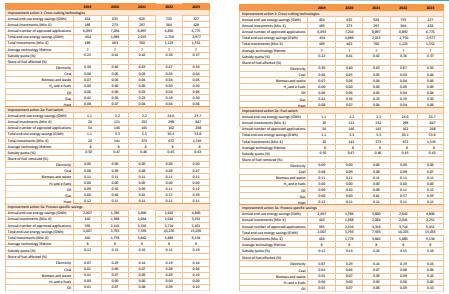
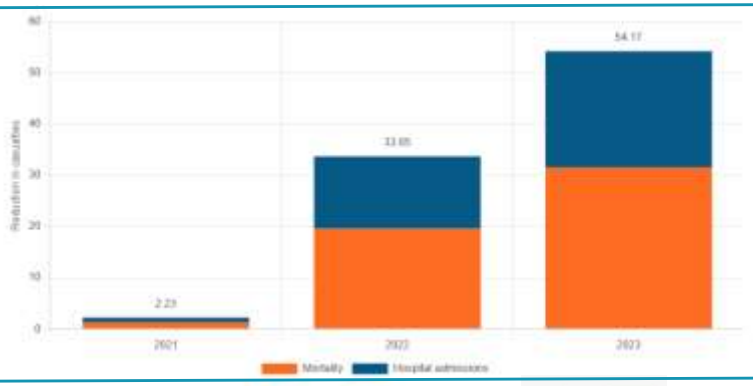
- **What?** to support **industrial and commercial** companies to increase **energy and resource efficiency** and save **GHG emissions** across **6 modules** targeting **cross-cutting technologies, fuel switching and process-specific savings**
- **How? Grants** and **loan** mechanisms
- **Data? Evaluation report (2019-2023)**.

➢ Case study focuses mainly on total programme but in part only Module 4 of the EEW (improvement action 3a = process-specific savings = 72% investments, 76% energy savings)

Methodology – specific to DE case

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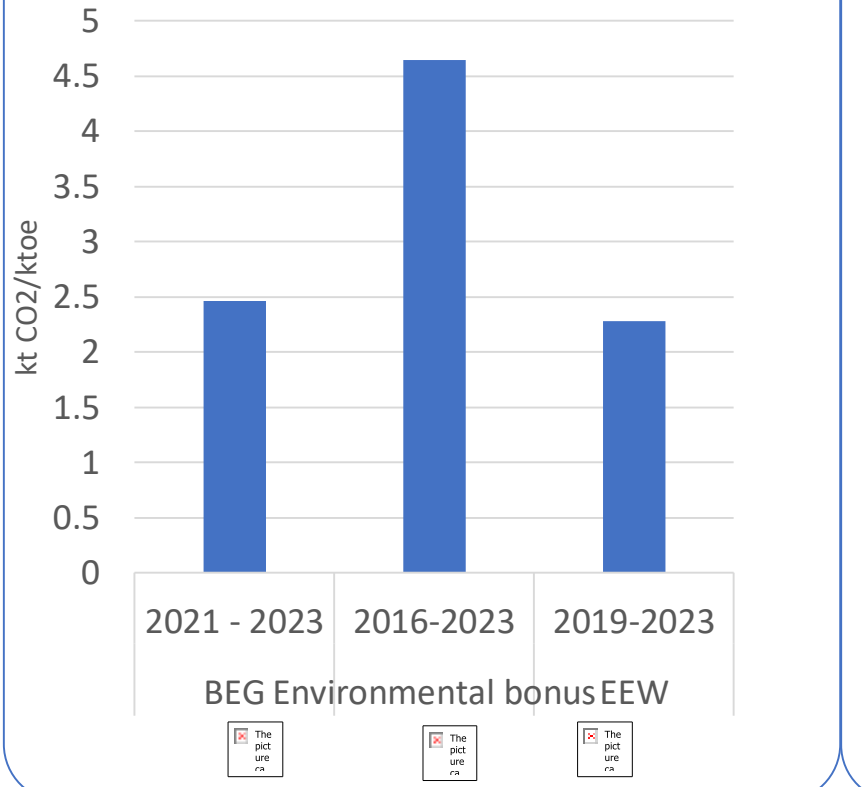
	1. Extract evaluation data	2. Refine default parameters	3. Calculate and export impacts
Case study 1: BEG		• Households affected by energy poverty • Fuels saved or consumed after heating replacement	  
Case study 2: Env. Bonus		• **Share of fuel removed** (→ oil 100%) • **Share of fuel installed** (→ electricity 100%)	
Case study 3: EEW		• Combine six modules into three categories: • Cross-cutting technologies • Fuel switching • Process-specific savings • Adjust affected fuels	 

- Investment costs, energy savings, technical lifetimes, subsidy quota

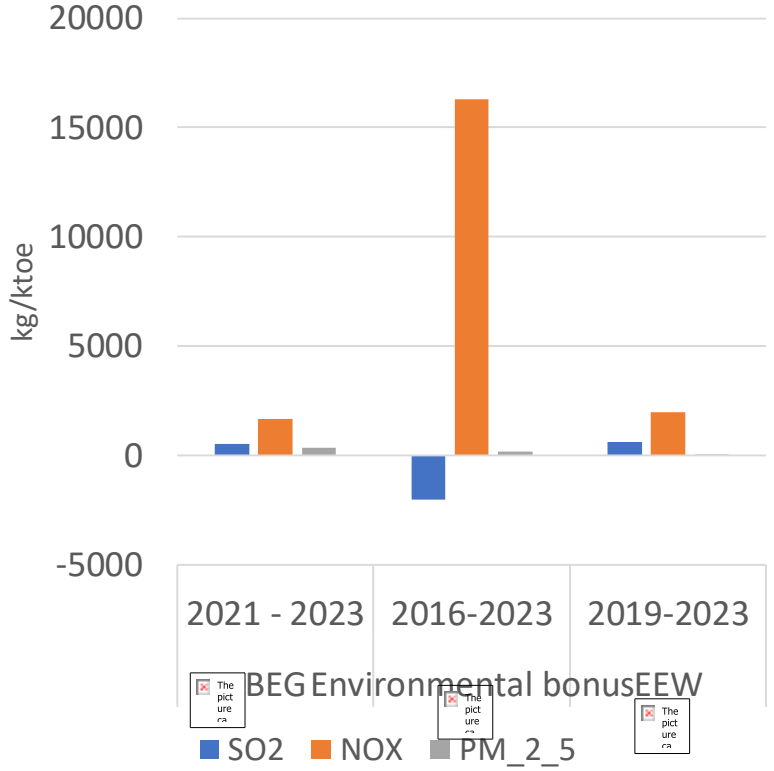
Environmental impacts

Specific impacts per unit of energy saved or investment

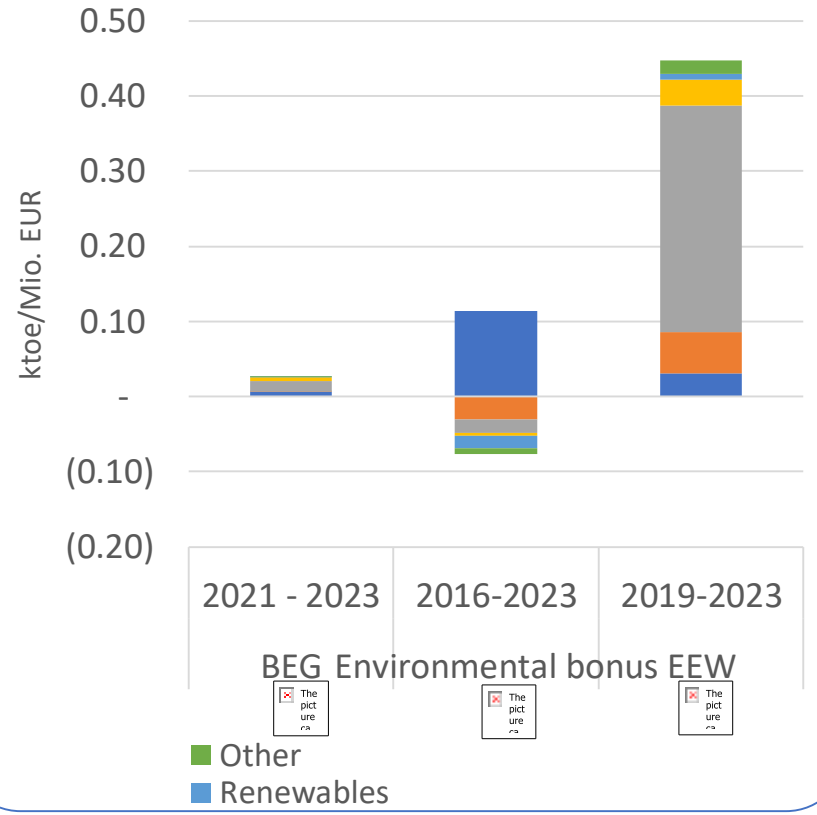
…CO_2 emissions per unit of primary energy saved



…air pollution per unit of primary energy saved



…primary energy saved per million EUR



- Environmental bonus saves the most CO_2 and NOx in the Transport sector (oil → electricity) – but increase SOx emissions and primary energy (elec supply)
- BEG reduces heat demand (mainly gas and oil – higher emission factor!)
- EEW unlocks greatest efficiency measures in primary energy → high savings at comparatively low cost

Social impacts

Indicator coverage across the three programmes

Health impacts

Improvement of living standards

	Unit	BEG	Environmental bonus	EEW
		2021 - 2023	2016-2023	2019-2023
Avoided health effects linked to reduced air pollution				
Mortality	*Reduction in casualties (#)*	√	√	√
Hospital admissions		√	√	√
Avoided lost working days due to air pollution				
Avoided absences	*days*	√	√	√
Reduction in disability adjusted life years				
Avoided asthma cases	*years*	√	X	X
Estimated number of people lifted out of energy poverty				
M/2 (half median energy expenditure)	*people*	√	X	X
2M (twice median energy expenditure)	*people*	√	X	X
Reduction in excess cold weather mortality				
Reduction in casualties	*Reduction in casualties (#)*	√	X	X

Social impacts

Total programme impacts and evaluation periods

Health impacts

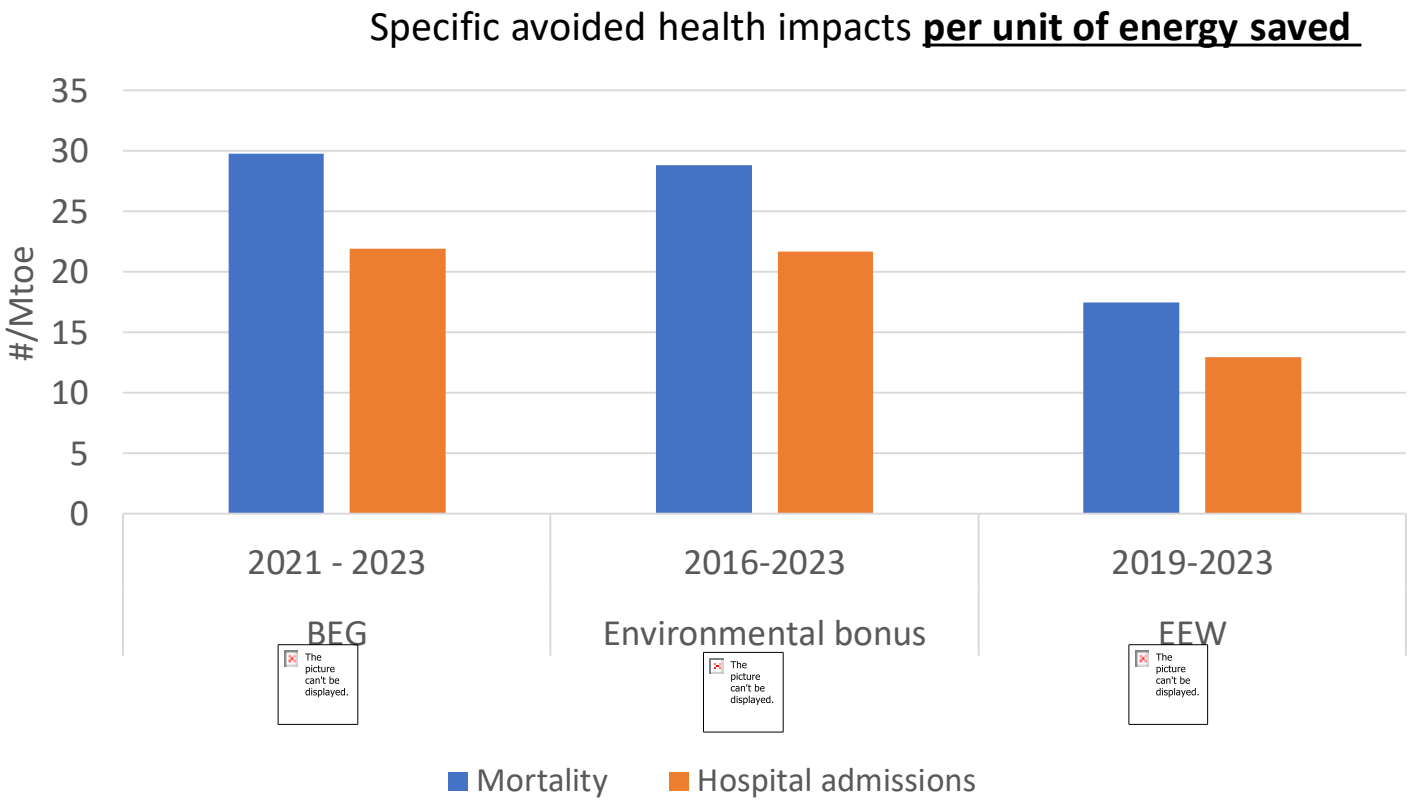
Improvement of living standards

	Unit	BEG	Environmental bonus	EEW
		2021 - 2023	2016-2023	2019-2023
Avoided health effects linked to reduced air pollution				
Mortality	*Reduction in casualties (#)*	**78**	**52**	**99**
Hospital admissions		**58**	**39**	**74**
Avoided lost working days due to air pollution				
Avoided absences	*days*	**27,010**	**18,892**	**35,048**
Reduction in disability adjusted life years				
Avoided asthma cases	*years*	**118**	**X**	**X**
Estimated number of people lifted out of energy poverty (in 2023)				
M/2 (half median energy expenditure)	*people*	**91,993**	**X**	**X**
2M (twice median energy expenditure)	*people*	**131,101**	**X**	**X**
Reduction in excess cold weather mortality				
Reduction in casualties	*Reduction in casualties (#)*	**184**	**X**	**X**
Least impact → **Greatest impact**				
Programme duration (years)		**3**	**8**	**5**

Health impacts

Specific avoided health impacts per unit of energy saved

- **Calculate specific impact → per € invested or per unit of energy saved**

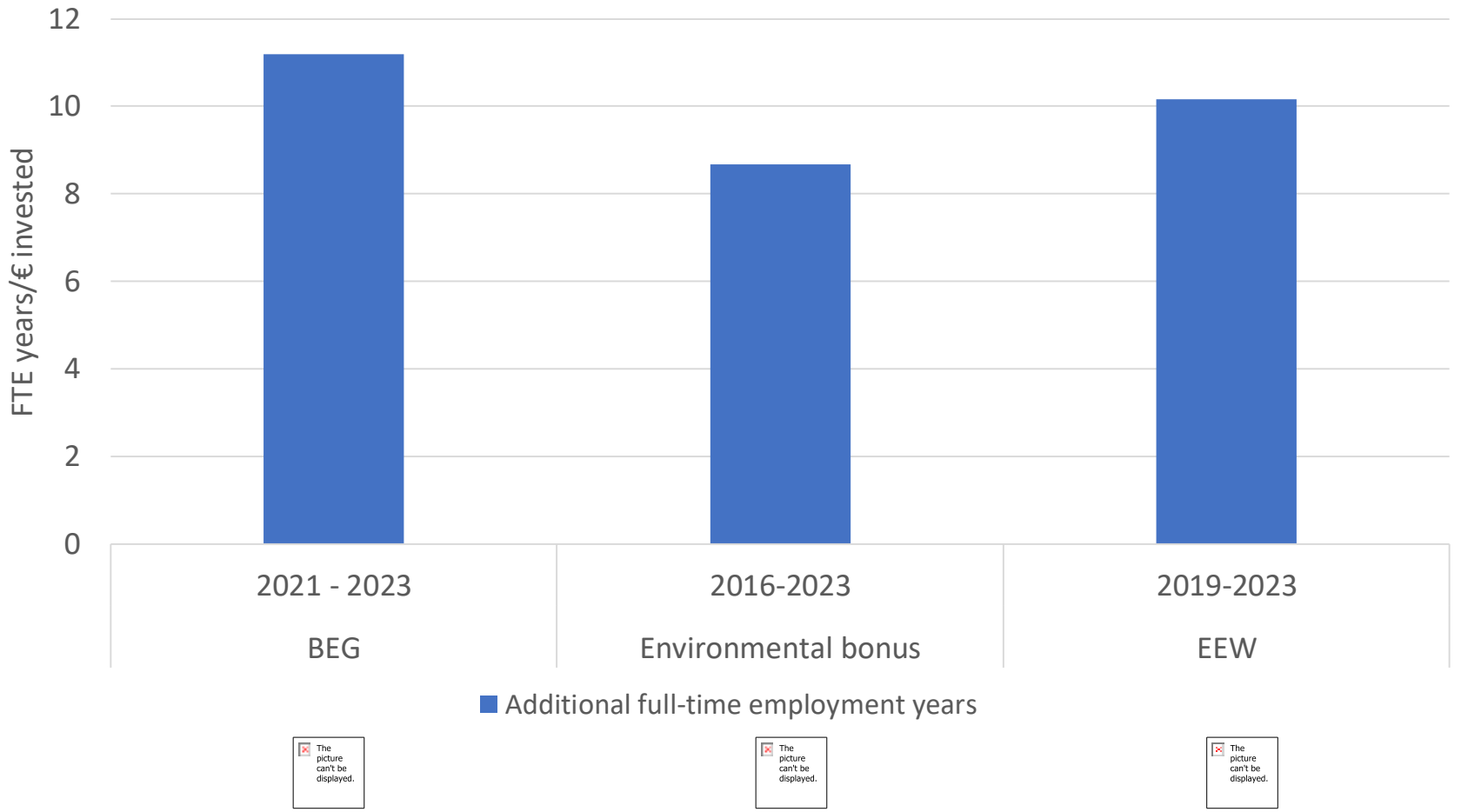


- **BEG and the Environmental Bonus**
  - strongest avoided health impacts per unit of energy saved → **reduced mortality and hospital admissions**
  - Due to greatest reductions in air pollutants (less oil, less gas)
- **The Environmental Bonus reduces CO_2 and NOx by shifting from oil to electricity**
  - under current power mix leads to increased SOx emissions
  - …but SOx emissions will decrease as electricity supply becomes more decarbonised

Employment effects

Additional full-time employment years per investment

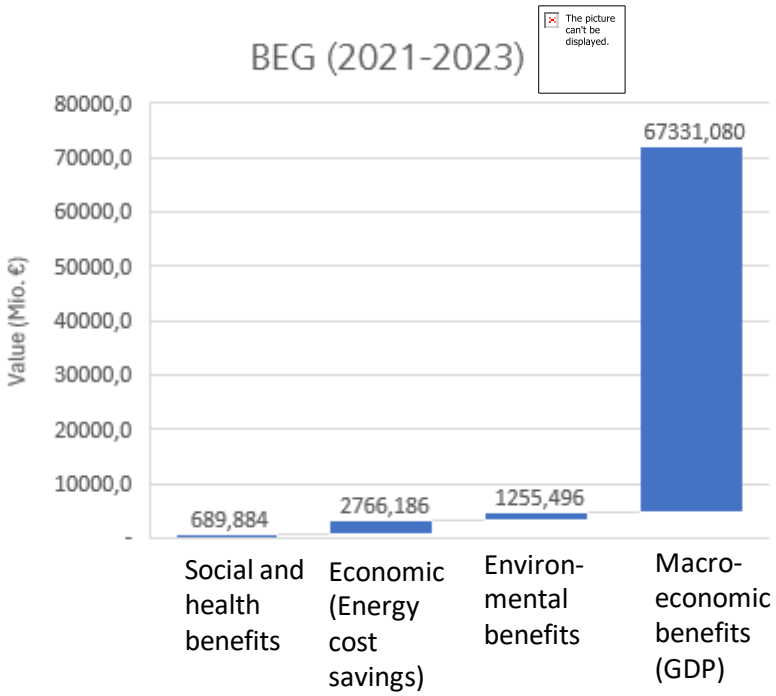
- Specific impact on **employment per EUR invested**

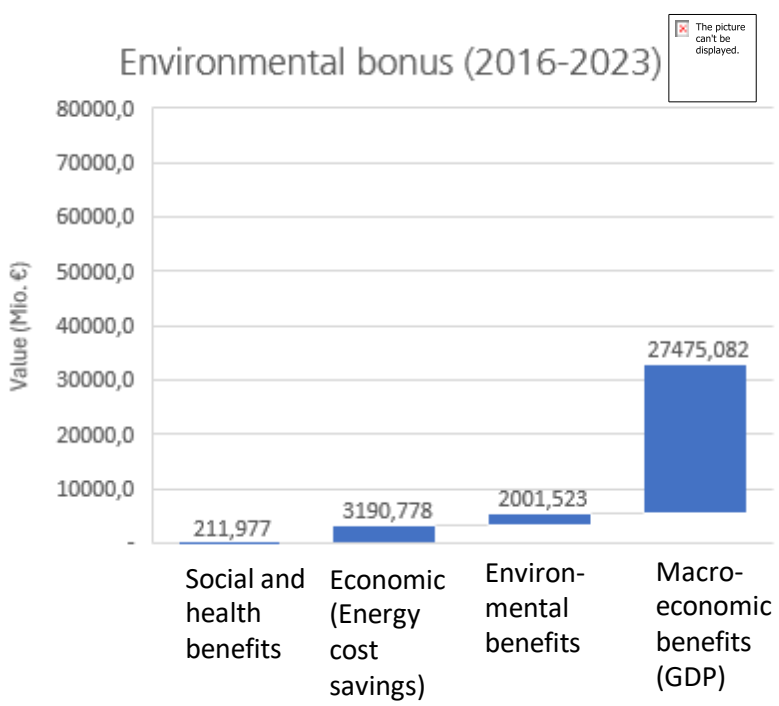


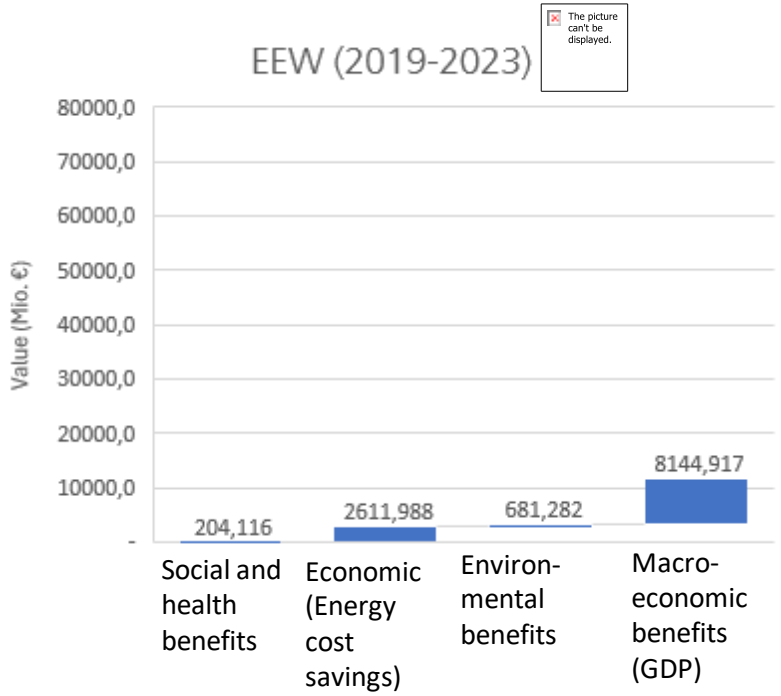
- BEG and EEW show strongest economic stimulus per Euro spent (construction, industrial output)

Monetised benefits

Benefit categories across the three programmes

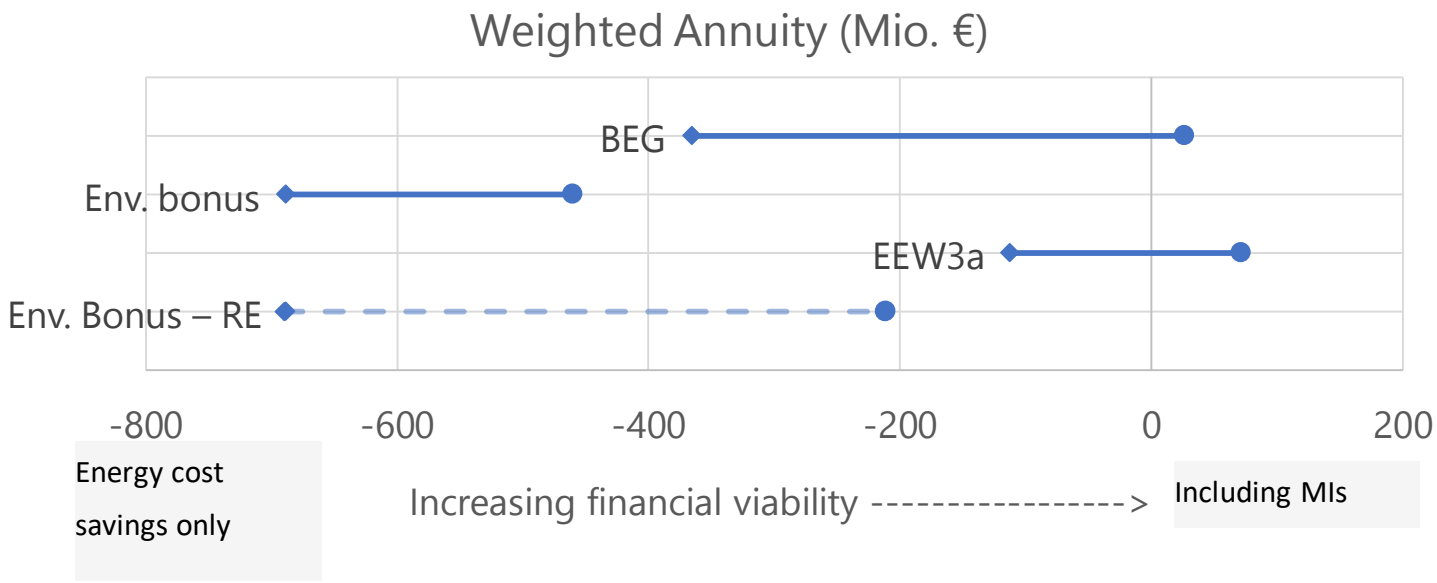






- Monetisation of key benefits
- Impact on GDP main driver – but GDP is once-off, whereas other measures accrue annually and continually (e.g. energy cost savings)

Cost-benefit analysis



- Weighted annuity: annual balance of costs and benefits over the lifetime
- Including multiple impacts improves the assessment of BEG and EEW 3a.
- The Environmental Bonus improves further with a decarbonised electricity supply.

05

ODYSSEE-MURE integration

MICATool and ODYSSEE MURE

Policy module

- Import reported energy savings from MURE and ODYSSEE to assess their multiple impacts in the MICATool. This provides a starting point when no own data are available.



MURE

Direct API import of quantified energy efficiency measures for assessment in the MICATool.

ODYSSEE

Top-down savings by country, year and sector are integrated in the tool (no API is currently available).

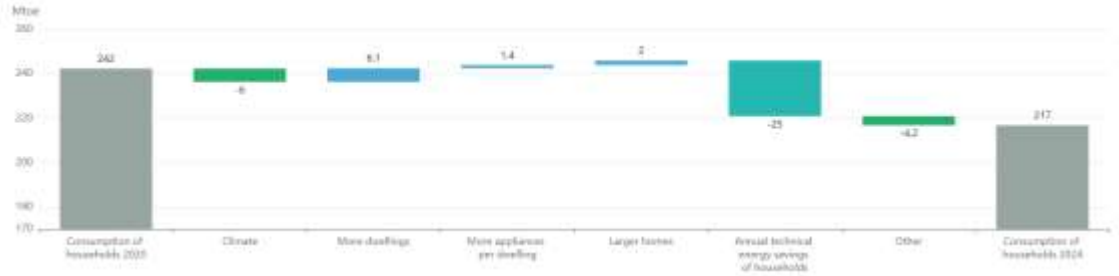
ODYSSEE energy efficiency savings, 2020–2024

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ODYSSEE-MURE

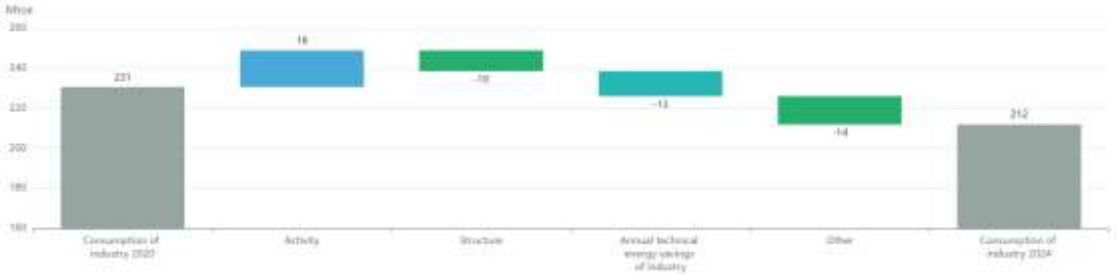
Households

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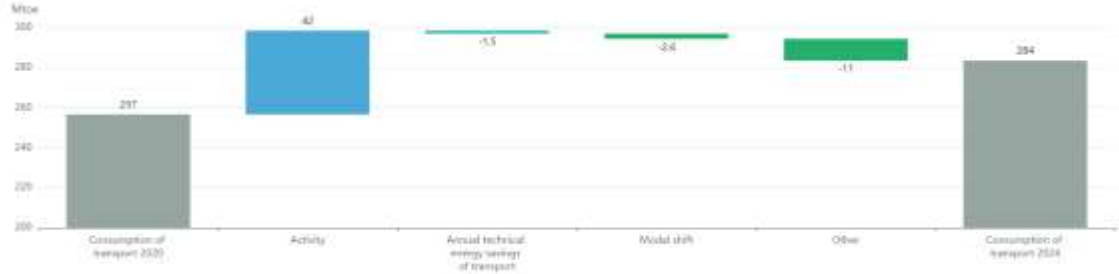
Industry

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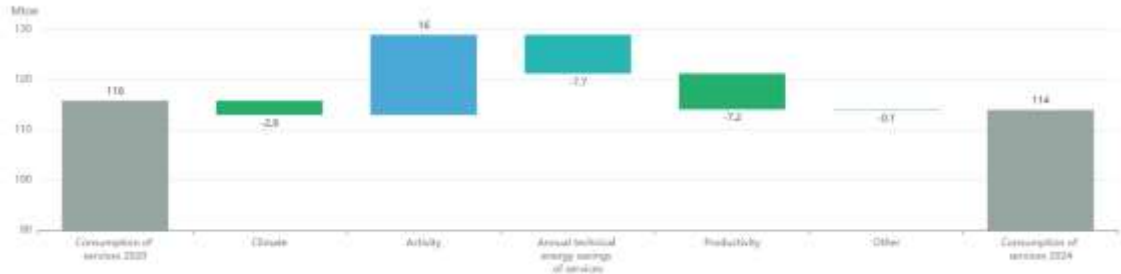
Transport

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Services

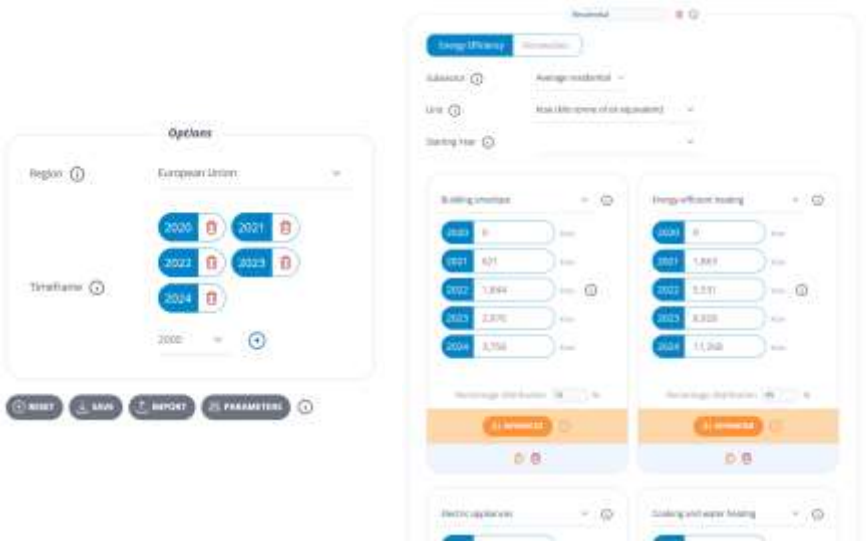
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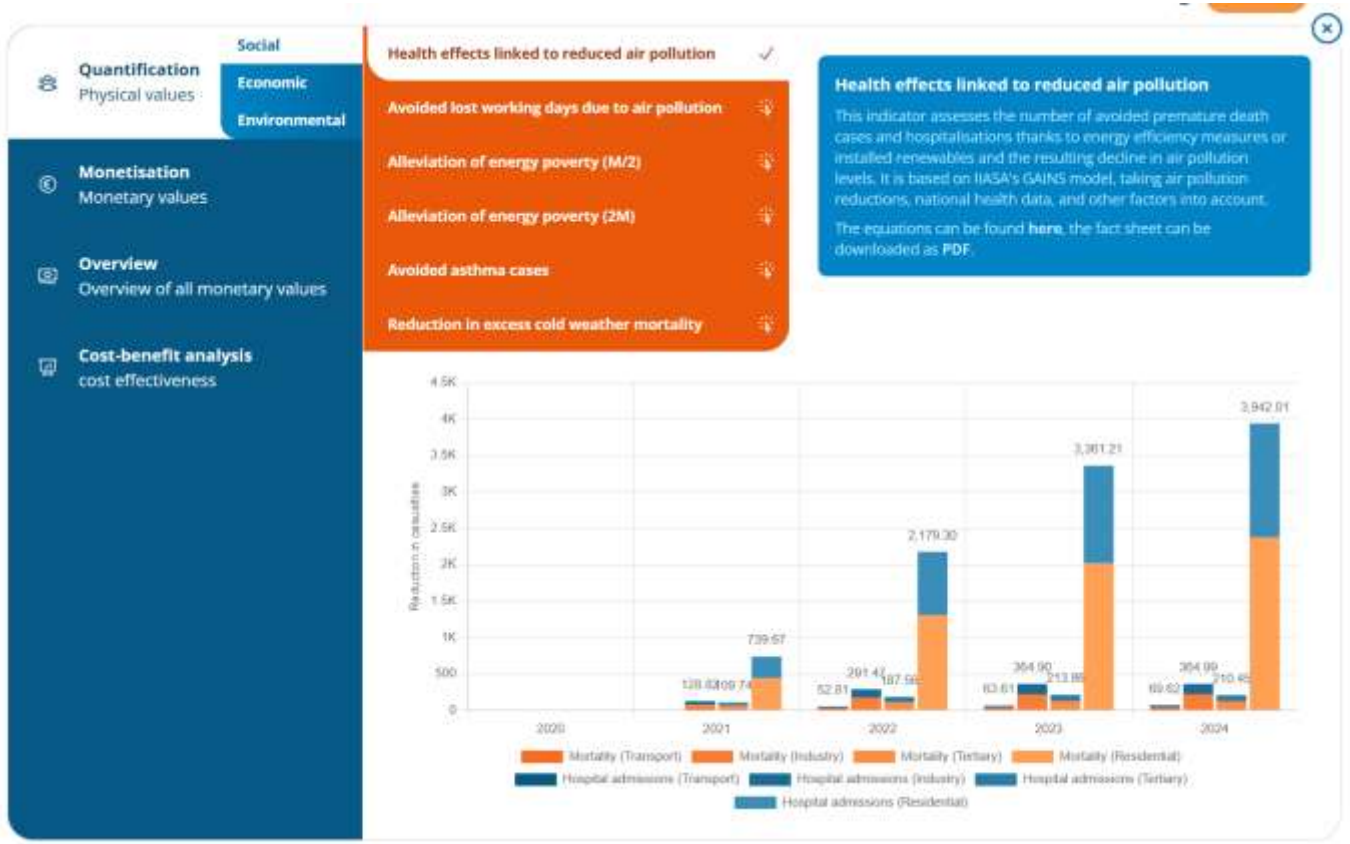
ODYSSEE savings: MICATool analysis

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ODYSSEE-MURE





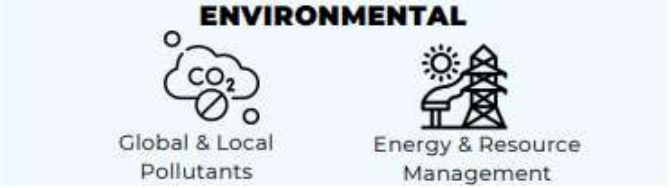


ODYSSEE results: social impacts



Indicator	Households	Industry	Services	Transport
Reduced mortality	5 936	691	429	118
Reduced hospital admissions	3 978	459	292	72
Avoided lost working days	1,67 Mio.	204 148	131 280	31 804
People lifted out of energy poverty (2M)	7 Mio.	n.a.	n.a.	n.a.

ODYSSEE results: environmental impacts



Indicator	Households	Industry	Services	Transport
Reduced SO2 [kt]	96,3	51,9	24,2	0,13
Reduced NOx [kt]	134,3	84,8	37,4	27,0
Reduced PM 2.5 [kt]	146,7	3,8	3,9	0,62
Reduced CO2 [kt]	150 709	76 802	48 184	10 824

ODYSSEE results: economic impacts

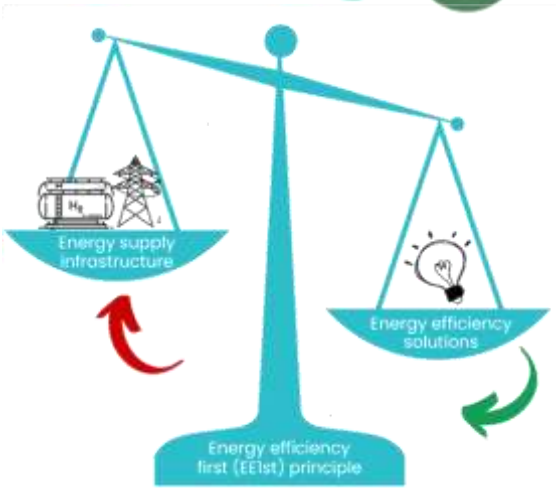


Indicator	Households	Industry	Services	Transport
Impact on GDP [Mio. €]	207 144	57 151	48 992	8 133
Additional full time employment years	3,8 Mio.	1,02 Mio.	0,91 Mio.	0,16 Mio
Reduction of import dependence (gas, in % points)	0,59	0,31	0,18	-

Summary – Key Messages

- Energy efficiency delivers significant impacts beyond energy savings.
- Monetisation can change the cost-benefit assessment and support Energy Efficiency First decisions.
- ODYSSEE-MURE and the MICATool provide a starting point for this broader assessment.





06 MICATool

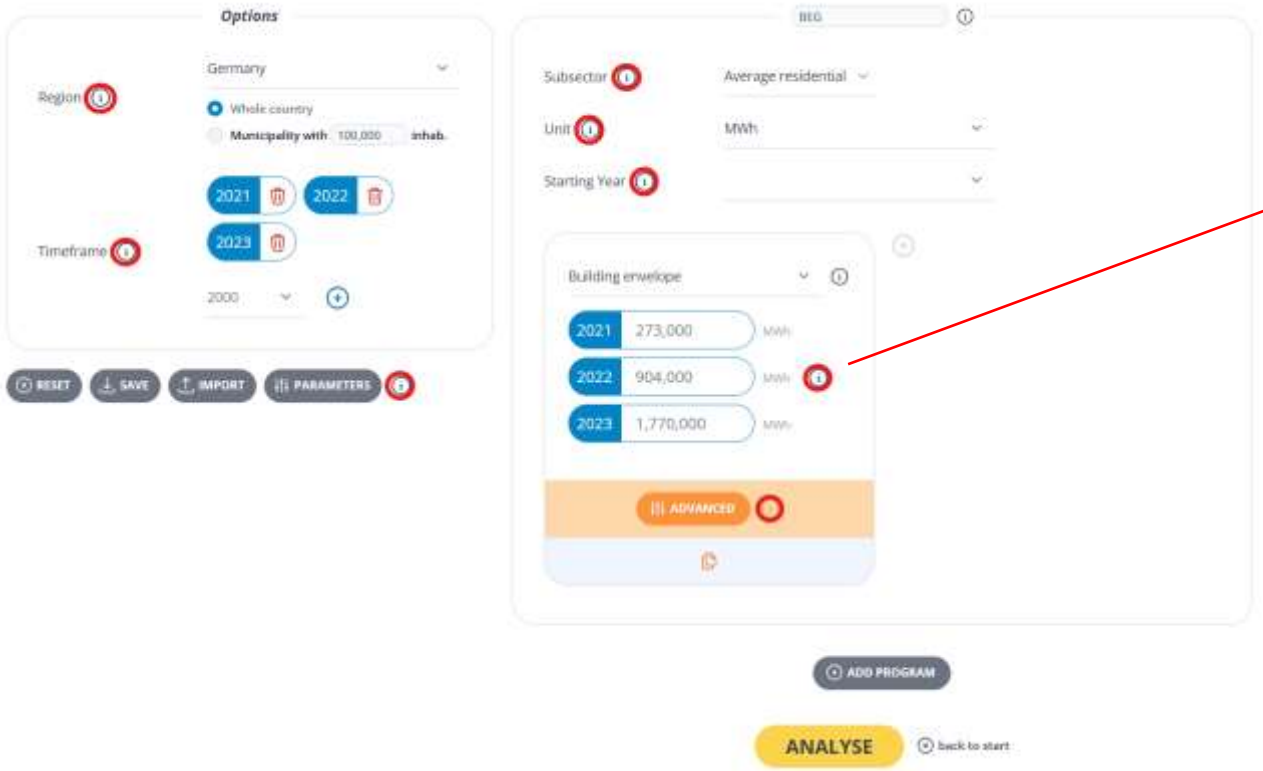
Guidance and resources

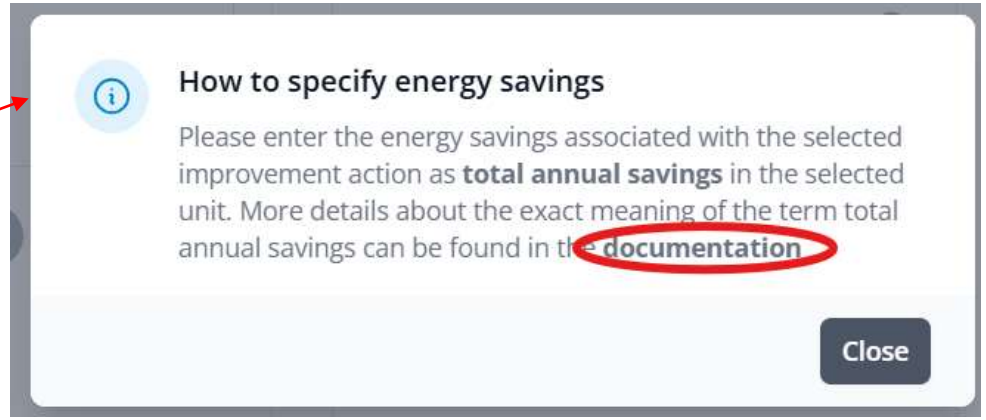
MICATool

[MICAT - Multiple Impacts Calculation Tool (micatool.eu)]

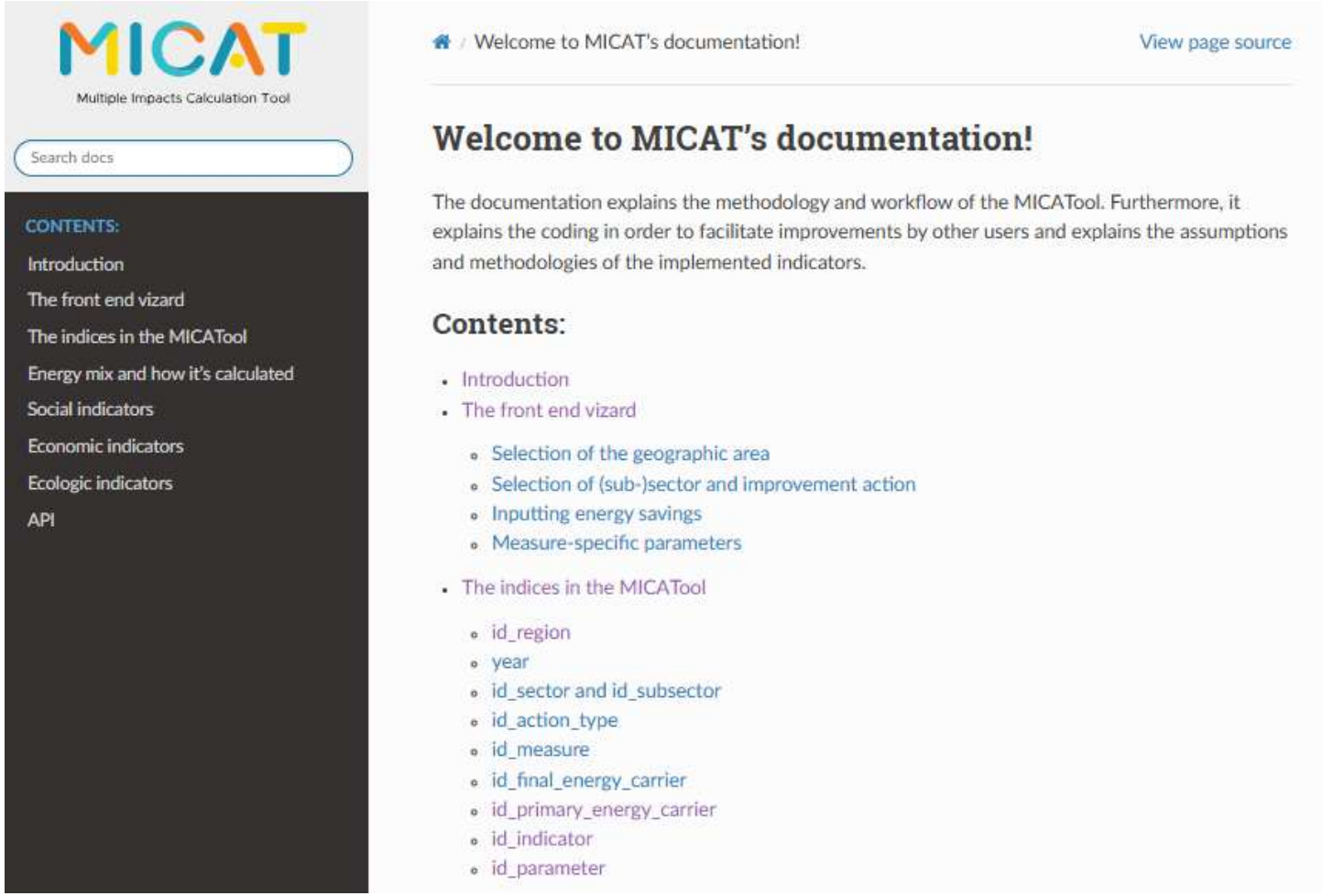


User guidance: contextual help





User guidance: tool documentation



MICAT
Multiple Impacts Calculation Tool

Search docs

CONTENTS:

- Introduction
- The front end vizard
- The indices in the MICATool
- Energy mix and how it's calculated
- Social indicators
- Economic indicators
- Ecologic indicators
- API

Welcome to MICAT's documentation! View page source

Welcome to MICAT's documentation!

The documentation explains the methodology and workflow of the MICATool. Furthermore, it explains the coding in order to facilitate improvements by other users and explains the assumptions and methodologies of the implemented indicators.

Contents:

- Introduction
- The front end vizard
  - Selection of the geographic area
  - Selection of (sub-)sector and improvement action
  - Inputting energy savings
  - Measure-specific parameters
- The indices in the MICATool
  - id_region
  - year
  - id_sector and id_subsector
  - id_action_type
  - id_measure
  - id_final_energy_carrier
  - id_primary_energy_carrier
  - id_indicator
  - id_parameter

Guidance and learning resources

- **Factsheets**
  - Background, methodology and data sources for each indicator. Linked directly in the tool.

- **Methodology paper**
  - A comprehensive multiple impacts framework to assess decarbonisation measures. Detailed explanation of the framework.

- **Training material**
  - Step-by-step guidance through tool inputs and results.

SEED MICAT

Support Energy Efficiency Deployment with the Multiple Impacts CAlculation Tool

THANK YOU!

micatool.eu

MICAT – Multiple Impacts Calculation Tool

@MICAT_EU

ODYSSEE-MURE

Thank you!

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Partners:

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