MICAT

Multiple Impacts Calculation Tool

POLICY BRIEF

From principle to practice: The role of the MICATool in addressing multiple impacts and implementing the energy efficiency first principle

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Executive Summary

This policy brief explores how the MICATtool, developed by the MICAT project, can be used to support the implementation of the energy efficiency first (EE1st) principle. EE1st is firmly embedded in European Union (EU) strategies and legislation, notably in the recent recast of the Energy Efficiency Directive (EED). Central to the EE1st principle is the idea that energy efficiency solutions, from building insulation to demand-side flexibility, should be systematically prioritised whenever they offer greater value than new energy supply infrastructure such as power plants, electricity grids and hydrogen pipelines. A critical aspect of applying the EE1st principle is to ensure a fair comparison between investments in energy supply infrastructure and energy efficiency alternatives, which involves considering not just direct financial gains and losses as reflected in energy bills but also the broader multiple impacts covering social, environmental, and economic impacts. These impacts are often ignored in quantitative assessments, even though they tend to outweigh the direct energy cost savings.

To effectively address this, the MICATool provides a comprehensive framework for estimating the multiple impacts of energy efficiency. It features methods for physical quantification, monetisation, and aggregation, facilitating effective cost-benefit analysis. This brief explains how the MICATool can meet the legal requirements of the EE1st principle under the EED, specifically focusing on (i) assessing energy efficiency solutions in planning, policy, and major investment decisions, (ii) reporting on the benefits of energy efficiency in national energy and climate plans (NECPs), and (iii) addressing energy poverty issues. This makes the MICATool a key resource for a more holistic and equitable assessment of energy efficiency solutions within the EU energy and climate policy framework.

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Understanding the role of the energy efficiency first principle in EU energy and climate policy

The EE1st principle is a key element of the EU's energy and climate governance. At its core, EE1st suggests that energy efficiency solutions should be considered as the first option when planning and making energy-related decisions. This means that before committing to new energy supply infrastructure – such as power plants, electricity grids, gas and hydrogen pipelines – it is essential to assess whether energy demand can be cost-effectively reduced through energy efficiency measures.

Importantly, energy efficiency solutions within the EE1st principle go beyond traditional end-use measures such as building insulation or efficient industrial processes. These solutions also include efficient energy conversion, such as efficient district heating and cooling systems. Equally important is the aspect of demand-side flexibility, which involves adjusting and managing energy consumption in response to supply conditions, thereby improving the overall efficiency of the energy system. In simple terms, the EE1st principle recognises that a kilowatt-hour of energy saved is equivalent to a kilowatt-hour of energy generated, and that different technological and behavioural solutions exist on both the demand and supply sides of the energy system to meet both consumer energy needs (e.g. thermal comfort) and broader societal objectives (e.g. climate neutrality).

EE1st is prominently featured in the European Commission's strategies, notably the European Green Deal. It is also increasingly embedded in EU legislation, including the Governance Regulation ((EU) 2018/1999)[1] and the Renewable Energy Directive ((EU) 2023/2413) [2]. A recent milestone for the EE1st principle was the adoption of the recast Energy Efficiency Directive ((EU) 2023/1791) (EED) [3]. Article 3 of the EED establishes the EE1st principle as an overarching policy and decision-making principle. In particular, it requires the assessment of energy efficiency solutions in energy-related decisions. It also highlights the promotion of cost-benefit methodologies that allow proper assessment of the 'wider benefits' of energy efficiency.

[1] Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

[2] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652

[3] Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast)

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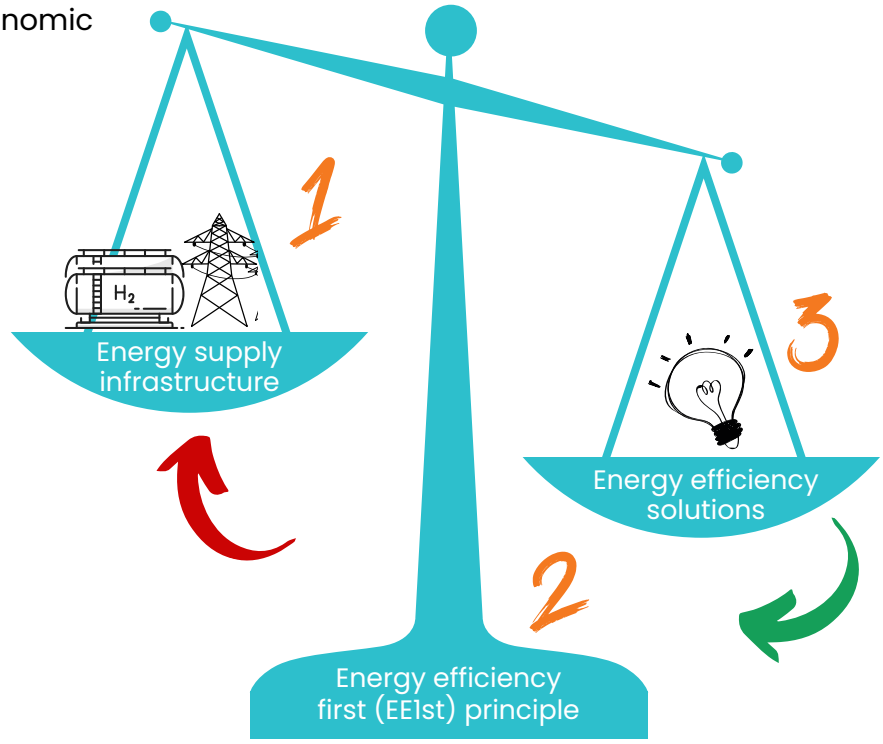
Why multiple impacts are integral to the energy efficiency first principle

The 'wider benefits' referred to in Article 3 of the EED are synonymous with the well-known multiple impacts, representing the wide range of social, environmental and economic effects that result from the investment and operation of energy technologies, including energy efficiency solutions. For example, energy-efficient renovation of buildings not only saves energy, but also improves the health and well-being of building occupants by improving indoor air quality and thermal comfort. At a societal level, it can also stimulate job creation and lead to economic growth [4].

Acknowledging the importance of these multiple impacts, the EE1st principle implies that when assessing the costs and benefits of energy efficiency solutions and comparing them with the default energy supply infrastructure, it is essential to look beyond the direct financial gains or losses reflected in energy bills and to consider the full range of multiple impacts.

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



[4] https://micatool.eu/micat-project-wAssets/docs/publications/reports/MICAT_D2-2_cost_benefit_analysis.pdf

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Previous research has shown that the magnitude of the multiple impacts, when expressed in monetary terms, is often similar to the direct energy cost savings. Therefore, ignoring multiple impacts could undermine the cost-effectiveness of energy efficiency solutions, leading to biased decision making and sub-optimal levels of energy efficiency for both individuals and the economy [5],[6].

To address this need, the MICAT project provides a comprehensive approach to estimating the multiple impacts of energy efficiency. The project has developed a publicly available, easy-to-use and scientifically robust online tool called MICATool [7]. This tool allows for holistic analysis of multiple impacts at European, national and local levels. The MICATool has three main features:

- **Physical quantification:** It measures multiple impacts in physical terms, such as tonnes of air pollution or full-time equivalent jobs, usingimpact factors or functions linked to specific energy efficiency improvement actions, policy measures or aggregate scenarios.
- **Monetisation**: The tool translates physical impacts into monetary terms so that they can be compared and incorporated into cost-benefit analyses. For example, human health impacts are monetised using factors such as the value of a life year (VOLY).
- **Aggregation and cost-benefit analysis:** The tool determines whether overall benefits outweigh costs, carefully accounting for overlaps between different impacts to avoid double counting and overestimation [8].

In this way, the MICATool enables decision-makers to comprehensively assess multiple impacts and understand the true value of energy efficiency. In the context of the EE1st principle, this ensures that energy efficiency, with its economic, environmental, and societal impacts, is valued on an equal footing with energy supply infrastructure.

[5] Thema J, Suerkemper F, Couder J, Mzavanadze N, Chatterjee S, Teubler J et al. The Multiple Benefits of the 2030 EU Energy Efficiency Potential. Energies 2019;12(14):2798. https://doi.org/10.3390/en12142798.
[6] Edenhofer O, Jacobsen JB, Anadon LD, van Aalst M, Cartalis C, Dessai S et al. Towards EU climate neutrality: Progress, policy gaps and opportunities. Assessment Report 2024. Luxembourg: European Scientific Advisory Board on Climate Change (ESABCC); 2024.
[7] https://app.micatool.eu/
[8] To illustrate, building retrofits typically reduce indoor humidity. This in turn has an impact on human health and labour productivity, which ultimately has macroeconomic implications such as GDP growth.

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How the MICATool can address the legal provisions regarding the energy efficiency first principle

Assessing energy efficiency solutions in planning, policy, and major investment decisions

Article 3(1) of the revised EED requires Member States to "ensure that energy efficiency solutions […] are assessed in planning, policy and major investment decisions." Planning decisions are a key responsibility of public authorities, such as the NECPs. Locally, an example is local heating and cooling planning under Article 25 of the EED. Beyond public authorities, Article 27 of the EED requires network operators to consider energy efficiency alternatives to network upgrades in their infrastructure planning.

Policy decisions involve the design and evaluation of energy-related policies by national, regional, and local governments. Complying with EE1st in policy decisions means including multiple impacts in model-based impact assessments and underlying cost-benefit analyses.

For example, building energy performance requirements under the Energy Performance of Buildings Directive ((EU) 2018/844)[9] should take into account the multiple impacts to both individuals and society to capture the true value of building efficiency.

Major investment decisions, defined in the EED as projects exceeding €100 million (and €175 million for transport infrastructure) should also integrate the full value of energy efficiency alternatives, comparing, for example, doubling the number of car lanes versus adding new cycle lanes.

[9] Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency

Reporting on the benefits of energy efficiency in National Energy and Climate Plans

Article 3(5)(d) of the EED 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. The MICATool can assess the multiple impacts of the policies and measures behind the NECPs. With over fifteen indicators covering social, economic, and environmental impacts, the tool facilitates a holistic assessment of proposed measures. This can help policymakers build broader support for their measures and justify public investments.

Addressing energy poverty impacts

Article 3(5)(b) of the EED requires Member States to "address the impact on energy poverty" in applying the EE1st principle. This is addressed by the dedicated indicator "Alleviation of energy poverty" in the MICATool [10]. It compares national energy poverty gaps with expected energy cost savings, taking into account parameters such as subsidy rates and average rent of energy poor households. These analyses can help prioritise public funding for vulnerable beneficiaries, and provide comprehensive technical assistance and information to help vulnerable groups benefit from energy efficiency investments.

Across these three domains – planning, policy, and major investment decisions – the MICATool allows for a comprehensive assessment of energy efficiency solutions in terms of both physical and monetised impacts. These can be specific energy efficiency measures (e.g. residential building retrofits), policy programmes (e.g. grant schemes) or scenarios (e.g. NECPs). Users can easily adjust input data and default values in the tool. Visualisation of the results can be used to communicate results to authorities, stakeholders and the general public, e.g. as part of public consultations.

[10] https://micatool.eu/micat-project-wAssets/docs/publications/factsheets/Social-impact-Alleviation-of-energy-poverty.pdf

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Conclusion

The MICATool can be a key resource for operationalising the EE1st principle. Its ability to quantify, monetise, and visualise the multiple impacts of energy efficiency actions makes it an important tool for informed decision-making and strategic planning in line with the EE1st principle and the EU's overarching energy and climate governance.

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