Official Journal
of the European Union

EN
L series

2026/839

16.4.2026

COMMISSION RECOMMENDATION (EU) 2026/839

of 11 March 2026

setting out guidelines for the design of cost-benefit methodologies for the application of the energy efficiency first principle pursuant to Article 3(6) of Directive (EU) 2023/1791 of the European Parliament and of the Council

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 292 thereof,

Whereas:

(1) In its Communication of 28 November 2018 on 'A Clean Planet for all – A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy' ([1]), the Commission stated that energy efficiency is a key area of action, without which the full decarbonisation of the Union's economy cannot be achieved.

(2) The Regulation (EU) 2018/1999 of the European Parliament and of the Council ([2]) on the Governance of the Energy Union and Climate Action defined for the first time the concept of 'energy efficiency first'. The energy efficiency first principle is also at the core of the EU Strategy for Energy System Integration ([3]).

(3) In the Regulation (EU) 2021/1119 of the European Parliament and of the Council ([4]) establishing the framework for achieving climate neutrality ('European Climate Law'), the Union's climate ambition has been raised by setting the net greenhouse gas (GHG) emissions reduction target to at least 55 % below 1990 levels by 2030.

(4) To achieve this objective, in its Communication of 19 October 2020 on 'Commission Work Programme 2021 – A Union of vitality in a world of fragility' ([5]), the Commission adopted a legislative package to reduce GHG emissions by at least 55 % by 2030 (the 'Fit for 55 package'), and to achieve a climate-neutral European Union by 2050. That package covers a range of policy areas including a proposal for a recast of the Energy Efficiency Directive.

(5) Energy efficiency is a cornerstone of Europe's strategy to achieve its ambitious energy transition and decarbonisation goals, and it has been increasingly recognised internationally as an important driver for reducing greenhouse gas emissions. At the same time, energy efficiency delivers powerful dividends for energy security and affordability in Europe.

([1]) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank 'A Clean Planet for all – a European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy', COM(2018) 773 final.

([2]) 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 (OJ L 328, 21.12.2018, p. 1, ELI: http://data.europa.eu/eli/reg/2018/1999/oj).

([3]) Established in the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Powering a climate-neutral economy: An EU Strategy for Energy System Integration', COM(2020) 299 final.

([4]) Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') (OJ L 243, 9.7.2021, p. 1, ELI: http://data.europa.eu/eli/reg/2021/1119/oj).

([5]) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Commission Work Programme 2021 – A Union of vitality in a world of fragility', COM(2020) 690 final.

(6) As highlighted by Mario Draghi in his Report of 9 September 2024 'The future of European competitiveness – A competitiveness strategy for Europe', using energy more efficiently is also vital for the competitiveness of European industries. By cutting energy – and hence operational costs, companies can reinvest in R & D, skills and jobs, and their products can become more attractive on global markets, and therefore boost the Europe's leadership and competitiveness. Moreover, the European energy efficiency sector is a global technology leader, and – as highlighted in the recently adopted Competitiveness Compass ([6]) for the EU – energy-efficient technologies are to a large extent made in Europe, thus providing a competitive edge for the EU economy.

(7) The Action Plan for Affordable Energy ([7]), adopted on 26 February 2025 as part of the Clean Industrial Deal ([8]), includes key actions to reduce energy costs to households and enterprises, and help build a genuine Energy Union that delivers on competitiveness, security, decarbonisation and just transition. The Action Plan is based on four pillars and eight key actions, including a dedicated Action to increase energy efficiency and deliver energy savings, emphasising energy efficiency role as a key contributor for affordable energy, decarbonisation, and industrial competitiveness. To advance energy efficiency, the European Commission will support market actors and financial institutions in fostering a single market for energy efficiency. In addition, as part of the Action aiming at completing a genuine Energy Union, the Commission is working on a new Heating and Cooling Strategy and a Clean Energy Investment Strategy.

(8) On 13 June 2025, the Commission pledged a renewed commitment towards energy efficiency and presented the Energy Efficiency Roadmap, outlining 10 priority areas to guide EU action. One of those key areas focuses on supporting and simplifying implementation. This Commission Recommendation is part of this ongoing effort to support Member States with guidance and tools to ensure effective and aligned implementation.

(9) Commission Recommendation (EU) 2021/1749 ([9]) on Energy Efficiency First provided guidelines to make the principle more operational and examples for its implementation in decision-making in the energy sector and beyond. The recommendation calls for a system approach when applying the energy efficiency first principle and for assessing cost-effectiveness and wider benefits of energy efficiency measures from a societal perspective when making strategic decisions, designing regulatory frameworks, and planning future investment schemes.

(10) Article 3 of Directive (EU) 2023/1791 of the European Parliament and of the Council ([10]) on energy efficiency (recast) ('EED recast') of 13 September 2023 established a structured framework for the implementation, monitoring and reporting of the energy efficiency first principle.

(11) To achieve the desired impact, Article 3 of the EED recast states that the energy efficiency first principle needs to be consistently applied by national, regional, and sectoral decision makers in all relevant scenarios and policy, planning and major investment decisions – large-scale investments with a value of more than EUR 100 000 000 each or EUR 175 000 000 for transport infrastructure projects – affecting energy consumption or supply. The principle needs to be applied in both the energy and non-energy sectors, and it is not limited to the public sector.

([6]) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'A Competitiveness Compass for the EU', COM(2025) 30 final.

([7]) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'Action Plan for Affordable Energy Unlocking the true value of our Energy Union to secure affordable, efficient and clean energy for all Europeans', COM(2025) 79 final.

([8]) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions 'The Clean Industrial Deal: A joint roadmap for competitiveness and decarbonisation', COM(2025) 85 final.

([9]) Commission Recommendation (EU) 2021/1749 of 28 September 2021 on Energy Efficiency First: from principles to practice – Guidelines and examples for its implementation in decision-making in the energy sector and beyond (OJ L 350, 4.10.2021, p. 9, ELI: http://data.europa.eu/eli/reco/2021/1749/oj).

([10]) 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 (OJ L 231, 20.9.2023, p. 1, ELI: http://data.europa.eu/eli/dir/2023/1791/oj).

(12) The EED recast sets conditions for the practical application of the principle, as it requires Member States to promote and, where cost-benefit analyses are required, ensure the application of cost-benefit methodologies that allow a proper assessment of the wider social, environmental and economic benefits of energy efficiency solutions when applying the principle. Moreover, to set enabling conditions for energy efficient solutions and allow for the proper monitoring of the application of the principle, Member States have to identify an entity or entities responsible for its monitoring.

(13) Cost-benefit analyses should be systematically developed and carried out to provide an incentive to apply energy efficiency solutions and measures. These analyses should be based on the most up-to-date information on energy prices and should include scenarios for rising prices of energy produced from fossil fuels, such as due to decreasing Union's emission trading system (EU ETS) allowances pursuant to Directive (EU) 2023/959 of the European Parliament and of the Council ([11]).

(14) To facilitate the transposition and proper implementation of these provisions on the cost-benefit analyses, the EED recast asks the Commission to adopt guidelines providing a common general framework including supervision, the monitoring and reporting procedure, which Member States may use to design the cost-benefit methodologies.

(15) Member States are to bring into force the laws, regulations and administrative provisions transposing Article 3 on energy efficiency first principle by 11 October 2025.

(16) Member States have some margin of discretion to transpose and implement the requirements regarding Article 3 on the energy efficiency first principle in a way that is best suited to their national circumstances. In particular, cost-benefit analyses methodologies may be adapted to national and local circumstances.

(17) The European Citizens' Panel on energy efficiency that took place from February to April 2024 brought together 150 European citizens to discuss how energy is used in the EU and how the energy system may change in the future. The Panel adopted thirteen final recommendations to feed into upcoming EU initiatives, including prioritising actions, which contribute the most to energy independence within the framework of the energy efficiency first principle (Recommendation No 3 – Increase energy independence and efficiency, becoming a global example) ([12]),

HEREBY RECOMMENDS THAT MEMBER STATES:

Follow the guidelines provided in the Annex to this Recommendation when designing cost-benefit methodologies for the application of the energy efficiency first principle and when establishing a framework for the supervision, monitoring and reporting on the application of the energy efficiency first principle. The guidelines provided in the Annex complement Recommendation (EU) 2021/1749 on Energy Efficiency First. This Recommendation does not alter the legal effects of the EED recast and is without prejudice to the binding interpretation of the EED recast as provided by the Court of Justice. It focuses on the provisions relating to the energy efficiency first principle and concerns Article 3 to the EED recast.

Done at Brussels, 11 March 2026.

For the Commission
Dan JØRGENSEN
Member of the Commission

([11]) Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system (OJ L 130, 16.5.2023, p. 134, ELI: http://data.europa.eu/eli/dir/2023/959/oj).

([12]) European Citizens' Panel on energy efficiency, https://citizens.ec.europa.eu/european-citizens-panels/energy-efficiency-panel_en.

ANNEX

1. POLICY CONTEXT AND PURPOSE

Energy efficiency delivers a powerful triple dividend for Europe: for energy security, for affordability and for decarbonisation.

The European Climate Law ([1]) emphasised the need for a higher contribution of energy efficiency and renewable energy for the cost-efficient achievement of a net 55 % GHG emission reduction, and the Draghi report confirmed that for addressing the competitiveness challenges the EU faces, all available technologies and solutions, including energy efficiency must be leveraged ([2]). Energy efficiency is one of the cleanest and most cost-efficient measures to end energy import dependencies and to increase EU security of energy supply ([3]), especially in the context of phasing out Russian energy ([4]).

Energy efficiency supports the rapid deployment of renewable energy, increases system efficiency, contributes to limiting the need for additional power generation capacity and thereby lowering the costs for transmission and distribution, and addresses capacity constraints ([5]).

Structural energy efficiency measures limit the impact of high, volatile energy prices on consumer bills. As such, energy efficiency contributes to reducing energy bills and tackling energy poverty, while also improving living conditions and contributing to a reduction of health costs ([6]).

On the supply side, energy efficiency policies stimulate innovation in technology and business models and address the competitiveness challenges ([7]). On the demand side, energy efficiency increases competitiveness by allowing businesses to produce profitably and spend money saved on their energy bills for increasing productivity.

In this context, the Commission pledged a renewed commitment towards energy efficiency and on 13 June 2025 presented the Energy Efficiency Roadmap ([8]), outlining 10 priority areas to guide EU action. One of those key areas focuses on supporting and simplifying implementation. This Commission Recommendation is part of this ongoing effort to support Member States with guidance and tools to ensure effective and aligned implementation ([9]).

2. LEGAL CONTEXT

The energy efficiency first (EE1st) principle, as defined in Article 2, point (18), of Regulation (EU) 2018/1999 on the governance of the Energy Union and Climate Action, is based on the premise that strategic investments in energy efficiency can reduce demand, thereby reducing the need for, and the costs associated with, additional energy production and infrastructure.

The aim of the EE1st principle is that energy efficiency solutions, including demand-side resources and system flexibility, are considered and assessed as a potentially more cost-efficient alternative to meet a need.

Article 3(5), point (a) of the Energy Efficiency Directive ((EU) 2023/1791) recast (EED recast) requires Member States to promote and, where cost-benefit analyses are required, ensure the application of cost-benefit methodologies that allow a proper assessment of the wider benefits of energy efficiency solutions when applying the EE1st principle.

([1]) Regulation (EU) 2021/1119.

([2]) The future of European competitiveness, Part B | In-depth analysis and recommendations, page 25.

([3]) REPower EU Plan, COM(2022) 230 final.

([4]) Roadmap towards ending Russian energy imports (COM/2025/440).

([5]) The future of European competitiveness, Part B | In-depth analysis and recommendations, page 106.

([6]) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Action Plan for Affordable Energy: Unlocking the true value of our Energy Union to secure affordable, efficient and clean energy for all Europeans, COM(2025) 79 final.

([7]) A Competitiveness Compass for the EU. COM(2025) 30 final.

([8]) New Impetus for Energy Efficiency. Available at: https://energy.ec.europa.eu/topics/energy-efficiency/new-impetus-energy-efficiency_en.

([9]) A Simpler and Faster Europe: Communication on implementation and simplification (European Commission, 2024-2029). Available at: https://commission.europa.eu/document/download/8556fc33-48a3-4a96-94e8-8ecacef1ea18_en?filename=250201_Simplification_Communication_en.pdf.

Article 3(6) requires the Commission to adopt guidelines providing a common general framework including supervision, and the monitoring and reporting procedure, which Member States may use to design these cost-benefit methodologies for the purpose of comparability, while leaving the possibility for Member States to adapt to national and local circumstances.

These guidelines respond to this requirement and are designed to support national, regional, local, and private decision makers when applying the EE1st principle in planning, policy, and major investment decisions in both energy and non-energy sectors.

Pursuant to Article 3(5), point (a), of the EED recast, when applying the energy efficiency first principle, Member States are to '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'.

3. TERMS AND CONCEPTS USED IN THESE GUIDELINES

3.1. Terms defined in the EU legislative framework on energy

'Energy efficiency first' means taking utmost account in energy planning, and in policy and investment decisions, of alternative cost-efficient energy efficiency measures to make energy demand and energy supply more efficient, in particular by means of cost-effective end-use energy savings, demand response initiatives and more efficient conversion, transmission, and distribution of energy, whilst still achieving the objectives of those decisions (Regulation (EU) 2018/1999, Article 2(18)).

'Energy efficiency' means the ratio between the output of performance, services, goods, or energy and the input of energy (Article 2(8) EED recast).

'Energy efficiency improvement' means an increase in energy efficiency as a result of any technological, behavioural or economic changes (Article 2(10) EED recast).

'Energy system' means a system primarily designed to supply energy-services to satisfy the demand of end-use sectors for energy in the forms of heat, fuels, and electricity (Article 2(3) of the EED recast).

'Final energy consumption' or 'FEC' means all energy supplied to industry, to transport, including energy consumption in international aviation, to households, to public and private services, to agriculture, to forestry, to fishing and to other end-use sectors, excluding energy consumption in international maritime bunkers, ambient energy and deliveries to the transformation sector and to the energy sector, and losses due to transmission and distribution as defined in Annex A to Regulation (EC) No 1099/2008 of the European Parliament and of the Council [10] (Article 2(6) EED recast).

3.2. Other key terms and concepts used in these guidelines

'*Cost-benefit analysis*' or '*CBA*' refers to a process that attempts to measure all effects of a decision in monetary units and is used to make a recommendation on the option with the highest net benefit (sometimes also referred to as the most efficient solution) [11].

'*Multi-criteria decision analysis*' or '*MCDA*' refers to a type of analysis, which allows considering a wide range of assessment criteria, all of them shown in their original units of measurement; there is no need to transform them in monetary terms as required by CBA [12].

'*Energy efficiency solutions*' refers to technologies, processes, and practices that reduce or shift the amount of energy required over time to provide the same level of performance, service, or goods. These solutions can include end-use energy savings, demand-side resources and system flexibility, and efficient conversion, transmission, and distribution of energy.

[10] Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics (OJ L 304, 14.11.2008, p. 1, ELI: http://data.europa.eu/eli/reg/2008/1099/oj).

[11] Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023, p. 556. Available at: https://commission.europa.eu/law/law-making-process/planning-and-proposing-law/better-regulation/better-regulation-guidelines-and-toolbox_en.

[12] Ibid, p. 552.

'Energy sectors' refers to sectors which are involved in the production and distribution of energy, such as electricity, gas, heat, etc.

'Non-energy sectors' refers to those areas of the economy that do not primarily deal with the production, transmission, distribution, or sale of energy. While those sectors consume and depend on energy for their operations, their main function is not centred on energy production or supply. Article 3(1) of the EED recast provides a non-exhaustive list of examples of non-energy sectors, which includes buildings, transport, water, information and communications technologies, agriculture, and the financial sector.

According to the Eurostat energy balance methodology ([13]), non-energy sectors could be understood as those involved in final consumption of energy (Eurostat code FC_E). Those sectors comprise the industry sector (FC_IND_E), the transport sector (FC_TRA_E), and other sectors (FC_OTH_E), such as commercial and public services, households, agriculture and forestry, and fishing. Therefore, the indicative list in Article 3(1) could equally be aligned to the Eurostat energy end-use sectors, or to a national grouping of energy end-use sectors.

'Boundary conditions' refers to explicit definition of the boundaries, within which costs and (wider) benefits are (to be) considered in a cost-benefit assessment, e.g., which sectors are to be included, or whether impacts beyond a country border should be included or not, or the length of the assessment period.

'Double counting' refers to a situation where a CBA counts the same costs or benefits twice, for example where there is overlap of benefits between two categories of impact, and both benefits are included in the analysis. Double counting can lead to an under or over-estimation of costs and benefits.

'Direct benefits' refers to benefits or effects arising directly from an energy efficiency measure, such as reduced energy demand (International Energy Agency, 2014).

'Indirect benefits' refers to benefits and/or effects that are triggered as a result of the direct benefits/effects. For example, energy savings are at the heart of many of the indirect benefits such as consumer surplus, improved public health from improved air quality, lower energy prices, resource use, etc. ([14]). The indirect benefit might manifest as increases in spending, employment, or GDP.

'Induced (employment) impact' refers to impacts that arise further down the causal chain as a result of indirect impacts ([15]). Induced employment impacts refer to jobs that are created due to additional spending by direct and indirect workers. For example, in the case of increased building retrofit projects in a city, construction workers carry out the retrofit work (direct jobs) and manufacturers build the necessary materials (indirect jobs). For example, in the areas where construction sites and manufacturing plants are located, new restaurants and childcare facilities might be built, both examples of induced job creation.

'Rebound effect' refers to a situation where improved efficiency is used to access more goods and services rather than to achieve energy demand reduction. As a result, actual energy demand reductions may thus fall short of the estimates made during the policy development phase ([16]).

'Sensitivity analysis' refers to the understanding of how the uncertainty in model results can be attributed to the different sources of uncertainty in the model inputs ([17]). For energy efficiency, sources of inputs subject to a sensitivity analysis should include energy price forecasts, discount rates, and any other variables with a high degree of uncertainty or significant impact on the outcome of the calculations.

'Social discount rate' refers to the rate used to evaluate future societal costs and benefits of public policies. A social discount rate places a present value on costs and benefits that will accrue in the future.

([13]) European Commission, Energy balance guide, Methodology guide for the construction of energy balances & Operational guide for the energy balance builder tool, 2019.
([14]) International Energy Agency (2012), Spreading the net: The multiple benefits of energy efficiency improvements.
([15]) BPIE (2020), Building renovation: a kick-starter for the EU economy. Available at: https://www.renovate-europe.eu/2020/06/10/building-renovation-a-kick-starter-for-the-eu-economy/.
([16]) International Energy Agency (2014), Capturing the Multiple Benefits of Energy Efficiency, p. 38.
([17]) Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023, p. 566.

3.3. Other toolboxes and concepts used in these guidelines and useful for the application of the EE1st principle in the Member States

'Better Regulation Guidelines' or *'BRG'* refers to the principles introduced in the European Commission Staff Working Document of November 2021 and adhered to by the European Commission in the development, formulation, management, and evaluation of both new initiatives and existing legislation ([18]).

'Better Regulation Toolbox' complements the better regulation guidelines and provides guidance, tips and best practices.

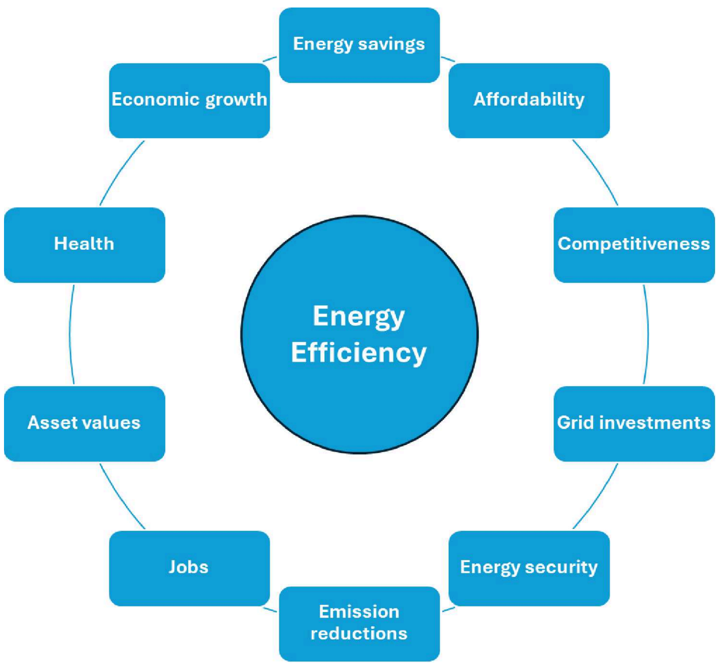
'Energy balance guide' ([19]) is the most complete statistical accounting of energy products and their flow in the economy. The energy balance allows users to see the total amount of energy extracted from the environment, traded, transformed and used by end-users. It serves as an operational guide for the Eurostat's energy balance builder tool and describes how to use this tool.

4. WIDER BENEFITS OF ENERGY EFFICIENCY

Applying the EE1st will allow for unlocking wider benefits. The term 'wider benefits' refers to the social, environmental, and economic outcomes arising from implementing energy efficiency improvements, which go beyond the more straightforward impact of having energy and related-energy cost savings for the intended beneficiary ([20]). Other similar and widely used terms include 'non-energy benefits', 'co-benefits', or 'multiple benefits'. The 2014 IEA report, 'Capturing the Multiple Benefits of Energy Efficiency' ([21]), drew the attention on the matter and provided a comprehensive overview of non-energy aspects that can be (positively) impacted by energy efficiency improvements, as shown in Figure 1 (reflected as well in Tables 1, 2, and 3). This report has been updated in 2025 to expand the analysis on the multiple benefits resulting from energy efficiency ([22]).

Figure 1

Multiple benefits of energy efficiency (adapted from IEA, 2025)



([18]) Commission Staff Working Document, Better Regulation Guidelines, SWD(2021) 305 final.
([19]) Energy balance guide: Methodology guide for the construction of energy balances & Operational guide for the energy balance builder tool, Eurostat, 31 January 2019.
([20]) International Energy Agency (2012), Spreading the net: The multiple benefits of energy efficiency improvements.
([21]) International Energy Agency (2014), Capturing the Multiple Benefits of Energy Efficiency.
([22]) International Energy Agency (2025), Multiple Benefits of Energy Efficiency.

To properly evaluate and identify the wider benefits of energy efficiency, it should be considered where, when and which impacts will materialise. This helps to facilitate a more precise quantification or monetisation of benefits which is needed as input for a comprehensive cost-benefit analysis (CBA). Further details on defining wider benefits can be found in Tables 1, 2, and 3.

Categorising the wider benefits within a systematic framework helps clarifying the interactions between the different categories of benefits, notably regarding the social, environmental and economic benefits.

Social benefits relate to improved health and comfort because of, for example, improved insulation, heating and cooling systems, which may also improve indoor and outdoor air quality. Additionally, decreased fossil fuel consumption reduces power plant and transport emissions, therefore reducing the negative impacts of air pollution on health. Alleviation of energy poverty and reduced noise are also important impacts of the implementation of energy efficiency measures, which are typically associated to the social area.

Environmental benefits refer to wider benefits generally resulting from decreased energy demand and consumption, thereby reducing energy generation. Such wider benefits include reduced greenhouse gas (GHG) emissions and air pollution, and improvements to energy and resource management (water, waste, and land).

Economic benefits relate to non-energy benefits, which affect economic development. They include GDP impacts, employment impacts, increased industrial productivity, public budget improvements, energy security, innovation and competitiveness. For businesses, energy efficiency reduces the amount of energy needed to produce goods or deliver services. Lowering the cost of energy frees up resources for businesses to invest into improving their competitive edge. In addition, employee productivity is largely affected by the physical work environment – specifically, temperature, air quality, and lighting. Energy efficiency measures can positively affect each of these categories as a healthier, more comfortable work environment improves productivity and decreases employee absenteeism ([23]).

This three-pillar approach is the simplest for identifying wider benefits. However, Member States could also consider political, legal and technological benefits (PESTLE approach ([24])).

Timeframes (short-, medium-, and long-term) and scope are important to consider in the context of wider benefits, as some benefits, depending on the beneficiary, stakeholders and hierarchy level in question, take time to manifest, while others are felt more immediately. For example, health benefits can occur at the individual level with almost an immediate effect following a deep energy retrofit of a residential building. However, health benefits may not be felt at the national level within the same timeframe, but rather in the medium- to long-term. Defining the timeframe and the scope is therefore necessary to properly evaluate and aggregate wider benefits related to planning, policy and investment decisions.

4.1. **Examples of wider benefits**

Tables 1, 2 and 3 provide information on various wider benefits of energy efficiency solutions, following a categorisation into social, environmental, and economic benefits. These are non-exhaustive lists. The benefits listed might not all apply in each situation but are useful examples to have in mind when elaborating cost-benefit analyses.

Table 1

Social wider benefits of energy efficiency solutions

Wider Benefit	Description
(Public) Health	Energy efficiency measures can improve indoor climate and reduce indoor and outdoor air pollution, which can lead to improved health (morbidity and mortality) on an individual and public health level ([1]). However, holistic energy efficiency solutions must be considered to avoid adverse effects (e.g., replacement of windows, sometimes resulting in reduced uncontrollable ventilation through leakages, may result in increased dampness, and mould, leading to negative health impacts).

([23]) The Economics of Biophilia, 1st ed., Why designing with nature in mind makes financial sense, 2012.
([24]) F. J. Aguilar, (1967), Scanning the business environment.

Wider Benefit	Description
Indoor (thermal) comfort & well-being	Insulation, heating, and cooling systems impact living and working conditions, which can contribute to health and productivity. Additionally, building conditions, thermal (dis)comfort, and (in)ability to afford energy bills can impact mental well-being [2].
Affordability and energy poverty	Implementing energy efficiency measures can alleviate energy poverty by making energy services more affordable, which also impacts disposable income for individuals and households.
Property and asset values	Energy-efficient buildings can impact market values. For example, market values may increase due to reduced energy costs, compliance with national standards, and improved comfort and health. This, for example, also relates to the rental market and could raise concerns regarding increased rental prices for tenants and thus distributive justice [3].
Noise, visual, and light impacts	Energy-efficient building design and insulation generally reduce noise from external sources and internal systems, and may also improve lighting conditions, thereby improving living, and working conditions. Public transportation and more efficient vehicles can also reduce city and traffic noises. However, some energy efficiency measures could be seen as a disturbance depending on type, location, and perspective.
Productivity	Energy efficiency measures impact air quality, (thermal) comfort, daylight exposure, indoor and outdoor air pollution, which can then impact one's productivity, for example, in the workplace or educational buildings [4]. Productivity can include enhanced cognitive ability, concentration, and performance [5].

(1) International Energy Agency (2025), Multiple Benefits of Energy Efficiency; European Commission: Joint Research Centre, Azzini, I., Listorti, G., Mara, T. and Rosati, R., Uncertainty and sensitivity analysis for policy decision making – An introductory guide, Publications Office, 2020, https://data.europa.eu/doi/10.2760/922129; Mzavanadze, Nora. (2018b). Final report: quantifying energy poverty-related health impacts of energy efficiency, COMBI project D5.4 (final report); Urlaub, S. & Grün, G. (2016). Mould and dampness in European homes and their impact on health.

(2) Ibid.

(3) Suerkemper et al., (2022), Overall quantification and monetisation concept. MICAT – Multiple Impacts Calculation Tool (Deliverable 2.1).

(4) Thema et al., (2016), Widening the Perspective: An Approach to Evaluating the Multiple Benefits of the 2030 EU energy efficiency potential.; European Commission: Joint Research Centre, Azzini, I., Listorti, G., Mara, T. and Rosati, R., Uncertainty and sensitivity analysis for policy decision making – An introductory guide, Publications Office, 2020, https://data.europa.eu/doi/10.2760/922129; Mzavanadze, Nora. (2018b). Final report: quantifying energy poverty-related health impacts of energy efficiency, COMBI project D5.4 (final report).

(5) International Energy Agency (2014), Capturing the Multiple Benefits of Energy Efficiency.

Table 2

Environmental wider benefits of energy efficiency solutions

Wider Benefit	Description
Climate neutrality and greenhouse gas emissions	Energy-efficient solutions decrease demand for energy, energy consumption, and fuel combustion, leading to reduced GHG emissions. GHG emissions and consequently their reduction have impacts on health, ecosystems, and the entire economy [1].
Air quality and air pollutants	Reduced energy consumption decreases air pollution from power plants and industrial processes, which benefits public health and the environment.
Water use (and management of other natural resources)	Energy-efficient technologies and practices can impact water usage, as water is often required for power generation and energy production processes, which affects water stress and competition. Energy efficiency measures also decrease the demand for and thus the extraction of natural resources, which would otherwise be needed to fuel power plants. This, in turn, has impacts on ecosystems and biodiversity [2].

Wider Benefit	Description
Waste	Energy efficiency may lead to a reduction in waste generation in some situations. Less raw material could be required for energy production and more efficient processes could produce less waste by-products. However, energy efficiency measures might also generate new waste in the future and should be accompanied by circularity policies.
Land requirements	By reducing energy demand and energy production, energy efficiency can contribute to reduced demand for land associated with energy production. This may contribute to ecosystem and biodiversity preservation.
Material impacts	Implementing energy efficiency measures can allow for a more efficient use of resources (material, process water, etc.). Additionally, the use of energy-efficient materials plays a role in reducing energy and resource consumption and minimising waste production ([3]).

([1]) Mzavanadze, 2018a; Thema et al., 2016; Ürge-Vorsatz et al., 2015.
([2]) International Energy Agency (2014), Capturing the Multiple Benefits of Energy Efficiency.
([3]) International Energy Agency (2025), Multiple Benefits of Energy Efficiency; JRC, 2020; Wagner et al., 2023.

Table 3

Economic wider benefits of energy efficiency solutions

Wider Benefit	Description
Energy (supply) security	Energy efficiency can reduce a country's dependence on imported energy sources, enhancing national energy security. Depending on country context, impacts on supplier diversity could become relevant ([1]).
Competitive-ness and innovation	Energy efficiency investments can stimulate innovation in technology and business models, helping companies gain a competitive edge in the market. Increasing energy efficiency can thus improve competitiveness at both the firm level and at the country level, by reducing the amount of energy required to produce economic output ([2]).
Economic activity and GDP	Energy efficiency measures can improve health and productivity, as well as disposable income, resulting in increased economic activity and GDP ([3]). Impacts related to the initial installation of measures tend to result in one-off benefits.
Employment impacts	Energy efficiency investments can create direct and indirect local jobs in various sectors (construction, manufacturing, energy services, etc.) ([4]). Induced employment impacts are also possible. However, some of these jobs tend to be temporary (one-off) benefits ([5]). The (lack of) availability of the required skilled labour for energy efficiency implementation is also important.
Disposable income	Assuming energy efficiency measures are cost-effective, disposable income can increase due to decreased energy-related costs ([6]).
Workforce (and student) productivity	Energy-efficient workplaces can lead to better working conditions (for example, with improved indoor air quality) which improves employee productivity and job satisfaction. This can have implications for a company's success, as well as corresponding economic impacts ([7]). The same idea is also applicable to educational buildings and students. It should also be considered how a student's (lack of) productivity can impact their caregiver's productivity (for example, absenteeism, presenteeism, etc.) ([8]).
Public budget	Energy efficiency measures impact the public budget by way of improved public health (e.g., less public health spending), job creation (e.g., changes in income taxes and unemployment benefits), reduced public expenditure on public sector energy consumption and decreased need for investment in supply infrastructure ([9]).

Wider Benefit	Description
Transaction costs	Transaction costs refer to the total cost of making a transaction, which varies in terms of nature and scale depending on the sector or energy efficiency intervention in question. Transaction costs are relevant regarding planning of energy efficiency measures or training skilled labour force and can include monetary values (e.g., commissions or fees) or non-monetary costs (for example, time spent planning, negotiating, or enforcing, inconvenienced time, etc.) ([10]).
Sustainability and circular economy aspects	Energy efficiency measures are essential to reach the climate objectives. When deploying them, certain technologies are themselves more sustainable and circular than others. Such aspects are relevant in the context of the transition to climate neutrality.

([1]) Couder, J. (2015), Literature Review on Energy Efficiency and Energy Security, including Power Reliability and Avoided Capacity Costs. COMBI D7.1 report. Available at: https://combi-project.eu/wp-content/uploads/2015/09/D7.1.pdf.
([2]) International Energy Agency, 2025.
([3]) Copenhagen Economics, 2012; Suerkemper et al., 2022; Thema et al., 2016; Ürge-Vorsatz et al., 2015.
([4]) BPIE, 2020.
([5]) International Energy Agency, 2025; JRC, 2020; Suerkemper et al., 2022.
([6]) International Energy Agency, 2025; Mzavanadze, 2018b; Thema et al., 2016.
([7]) Mzavanadze, 2018b; Thema & Rasch, 2018; Urlaub & Grün, 2016.
([8]) Gehrt et al., 2019.
([9]) Copenhagen Economics, 2012; Thema et al., 2016.
([10]) Ürge-Vorsatz et al., (2015), Literature review on Multiple Impact quantification methodologies, D2.1 report, COMBI project.

When considering those impacts in the CBA, it is important to be aware of potential duplications. Based on the results, there could be the potential to re-evaluate and adapt the list of items or impacts to accurately quantify and monetise them. While the process can be expedited, it is crucial to emphasise that due diligence is required to avoid duplications and ensure the validity of the analysis.

4.2. **Quantification and monetisation of wider benefits**

The concept of evidence-based policy making, which is policymaking grounded in established, robust, tested, and transparent evidence, requires a broad assessment of the costs and benefits of energy-related investments over time, and of the differing impacts on different types of stakeholders. In the narrowest sense, a CBA, when applied to a proposed energy efficiency policy, measures the reduction in consumed energy compared to the counterfactual or baseline scenario, and in some cases also the reduction in emissions. This approach, however, misses the wider potential benefits of energy efficiency ([25]).

Therefore, this section provides a synthesis of wider benefits to consider in the context of CBA. Firstly, it details the potential quantification and monetisation of wider benefits of energy efficiency measures, including identification of appropriate valuation methods, in the context of system elements and impact areas. Then, it further outlines approaches for including and assessing wider benefits beyond the conventional investor perspective into CBA for energy efficiency measures. Examples of quantifying and monetising wider benefits are also presented.

4.2.1. *Considerations for quantifying and monetising wider benefits*

As it currently stands, assessing wider benefits is challenging because the research and evidence on appropriate methodologies for quantifying, but especially monetising, wider benefits is limited. Nonetheless, efforts must be made to do so to support evidence-based, well-informed policy decisions.

The following steps serve to ensure the proper assessment of wider benefits:

(a) Identify the chain of decisions related to the energy efficiency improvement causing wider benefits. For a balanced assessment and to avoid biases, sufficient coverage regarding various sectors, and entities and stage of decision making should be considered.

([25]) International Energy Agency (2014). Capturing the Multiple Benefits of Energy Efficiency, p. 41.

(b) Define the areas of impact the decision in question will affect. Additionally, describe the identified wider benefits qualitatively, including the causal links between them and significant endpoints.

(c) Quantify the wider benefits in physical units. The physical units may vary depending on the impact being evaluated. This initial evaluation provides a basis for comparison between different investment actions.

(d) Monetise the individual benefits (where possible) by assigning a monetary value (in euros or in the national official currency) to impacts with no inherent market price to aggregate the wider benefits. Various valuation methods can be used, including opportunity costs, willingness to pay (WTP) or willingness to accept (WTA), hedonic pricing, direct market valuation, etc. This process is complex and even controversial depending on the wider benefit in question (with respect to monetisation, for example of valuing human life).

(e) Evaluate the wider benefits comprehensively to avoid overlapping and double counting of benefits. An impact pathway mapping approach could be used to trace all benefits, their interactions, and the endpoints to be monetised.

Table 4, Table 5 and Table 6 provide information on common indicators and available quantification and monetisation methods for social, environmental, and economic wider benefits of energy efficiency solutions. Generally, the method of choice is dependent on factors such as time and resources available, as well as the data quality ([26]). In any case, it is best to evaluate and report on wider benefits to any extent possible, even if only rough estimates are available, as opposed to assuming a zero value, as any and all efforts help inform sound policy and investment decisions ([27]).

Additionally, various tools and methodologies for quantifying and monetising wider benefits have been developed in research projects, including COMBI, MICAT ([28]), Odyssee-Mure, and Enefirst, which can be referenced to support this assessment process. Further detailed information on quantification methods and supporting tools for wider benefits can also be found in Recommendation (EU) 2021/1749.

4.2.2. *Methods for quantifying and monetising wider benefits*

Policymakers relying on CBAs need to have access to reliable quantifications of benefits to make informed policy and investment decisions. ([29]) After wider benefits are defined and identified, they then need to be quantified in physical units. This process relies on input data, often from scenario studies and policy impact evaluations. ([30]) Additionally, the physical unit varies depending on the wider benefit being evaluated.

According to the Better Regulation Toolbox, quantification of benefits should start 'from the most objective and robust measures to those that are more speculative and involve more assumptions' ([31]). Quantification indicators can be direct or indirect. For example, medical interventions performed is a direct health indicator, while absences from work/school is an indirect health indicator. A sensitivity analysis could also be conducted to clarify the range of values and to identify the parameters the analysis is most sensitive to.

([26]) International Energy Agency (2014), Capturing the Multiple Benefits of Energy Efficiency, p. 137.
([27]) Ibid, p. 189.
([28]) The MICATool enables policymakers and practitioners to conduct simplified analyses for energy efficiency improvements, to compare and assess the relevance of the multiple impacts and to strengthen reporting and monitoring. MICAT allows the user to select a policy action in a specific sector, a timeframe and geographic region, and then quantifies the impacts of these actions using a variety of social, economic and ecological indicators. Input data can be tailored to suit the specific situation of the user (i.e. dwelling stock and renovation rate). The tool can also monetise these impacts and will conduct a simple cost-benefit analysis, with tailorable variables on energy price sensitivity, investment sensitivity and discount rate.
([29]) Thema, J. et al. (2019), The Multiple Benefits of the 2030 EU Energy Efficiency Potential.
([30]) Suerkemper, F. et al. (2022), Overall quantification and monetisation concept. MICAT – Multiple Impacts Calculation Tool (Deliverable 2.1).
([31]) Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023, p. 286.

Quantification should then be complemented by monetisation, if possible. To aggregate benefits with varying physical units, the units must be converted to a monetary value (in euros or in the national official currency). This allows for an accurate comparison between the impacts and the possibility to integrate the wider benefits into a CBA. Unfortunately, there is a lack of robust methods to sufficiently monetise many wider benefits. Additionally, monetising wider benefits involves a wide bandwidth of uncertainty with different methods yielding different results. This uncertainty is then inherited into a CBA and thus, underpins the need to include a sensitivity analysis in a CBA to examine how changes in parameters affect the results and to ensure transparency. As examples, tool #65 (Uncertainty and sensitivity analysis) in the Better Regulation Toolbox ([32]) and a 2020 JRC report ([33]) provide details on how to perform uncertainty and sensitivity analyses.

As monetisation could be controversial due to ethical complexities involved, such as valuing human life and health (suffering), it should be conducted carefully using robust methods. Moreover, prior to performing a CBA, overlapping and double counting of wider benefits should also be accounted for.

The standard approach to monetising a wider benefit uses the market price of a good (direct market valuation), if available. Alternatively, in cases where the market price is unavailable (likely as a result of a non-existent market, for example, health, ecosystems, etc.), the value of a good can be measured via a proxy value (for example, avoided costs) or using a non-market valuation method, such as WTP or WTA. This information can be derived through studies including revealed preference technique, stated preference technique, and/or experiments. However, such studies may require substantial resources. Alternatively, it might be possible to adopt values from different studies (for example, using benefits transfer), but otherwise the principle of proportionality applies: is the effort worth the impact? For more information and details, please refer to MICAT ([34]) and various COMBI project reports ([35]).

Table 4, Table 5 and Table 6 below provide information on common indicators, as well as quantification and monetisation methods available for various wider benefits of energy efficiency solutions. The methods presented are based on up-to-date research and findings from projects, including, but not limited to, COMBI, MICAT, Odyssee-Mure, and Enefirst. Please note, the wider benefits mentioned are a non-exhaustive list and might not apply to all situations.

Table 4

Quantification and monetisation methods of social wider benefits of energy efficiency solutions

Wider Benefit	Quantification and monetisation methods
(Public) Health ([1])	Quantified in terms of overall morbidity or mortality, as evidenced by interventions performed, doctor visits, and hospitalisation, and indirectly via days off from work/school and by risk factors (for example, thermal conditions and noise) ([2]). Market value approaches to monetise health use (avoided) costs of treatment, hospitalisation, medication, etc. and indirect costs related to loss of productivity (disability-adjusted life years, DALY) as proxies. Health can also be monetised in terms of savings or estimated economic value related to number of avoided cases of premature deaths/illnesses, because of energy efficiency improvements. Non-market value approaches include surveys estimating the value of a statistical life (VSL), value of a life year (VOLY), or WTP surveys.

([32]) Ibid, p. 566.
([33]) Azzini, I., Listorti, G., Mara, T. and Rosati, R., Uncertainty and Sensitivity Analysis for policy decision making, EUR 30432 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-24752-4, doi:10.2760/922129, JRC122132.
([34]) Suerkemper, F. et al. (2022). Overall quantification and monetisation concept. MICAT – Multiple Impacts Calculation Tool (De-liverable 2.1).
([35]) Ürge-Vorsatz, D. et al. (2015). Literature review on Multiple Impact quantification methodologies, D2.1 report, COMBI project.

Wider Benefit	Quantification and monetisation methods
Indoor (thermal) comfort and well-being	Survey-based measurements of comfort to measure life satisfaction (for example, indoor temperature as a proxy for comfort); monetised through health cost savings (WTP/WTA methods) or productivity gains (revealed preference method).
Energy poverty	Savings on energy bills, reflected in disposable income of households (direct market valuation).
Property and asset values	Change in property/market value before and after improvement; monetised using real estate market data (hedonic pricing method).
Noise, visual, and light impacts	Noise reduction quantified in decibels; monetised using property value impacts (hedonic pricing method) or health cost savings (WTP/WTA methods).
Productivity	Quantified using active days (including absenteeism and presenteeism), workforce performance, earning ability as indicators; monetised by ability to earn per hour or active work/school day before and after energy efficiency measure ([3]).

([1]) More information on assessing health impacts can be found in the Better Regulation Toolbox, Tool #32 (Health Impacts).
([2]) Mzavanadze, Nora. (2018b). Final report: quantifying energy poverty-related health impacts of energy efficiency, COMBI project D5.4 (final report).
([3]) Thema, J. et al. (2019). The Multiple Benefits of the 2030 EU Energy Efficiency Potential.
Thema, J. et al. (2016). Widening the Perspective: An Approach to Evaluating the Multiple Benefits of the 2030 EU energy efficiency potential.

Table 5

Quantification and monetisation methods of environmental wider benefits of energy efficiency solutions

Wider Benefit	Quantification and monetisation methods
Climate neutrality and GHG emissions	Quantified in tonnes of CO_2-equivalent reduced (i.e., avoided direct emission from fuel combustion) compared to the defined baseline scenario (see section 6.1); monetised using carbon pricing (direct market valuation) and social cost of carbon ([1]). More information on monetising CO_2 can be found in 2nd ENTSO-E Guideline for Cost-Benefit Analysis of Grid Development Projects (2018) ([2]).
Air quality and air pollutants	Quantified in reductions of pollutants from fuel combustion, transportation, and other economic activities compared to the defined baseline scenario; monetised via health impact costs (damage cost avoided method).
Water use (and management of other natural resources)	Water (or other resource) savings quantified in volume compared to the defined baseline scenario; monetised using water pricing (direct market valuation). Monetising resources possible using embodied costs based on market prices for processed raw materials and linked to raw material demand (for metals and fossil fuels), or indirect material costs monetised via future cost estimates ([3]).
Waste	Waste reduction quantified in weight/volume compared to the defined baseline scenario; monetised using waste disposal or recycling costs (avoided cost method).
Land requirements	Land savings quantified in area compared to the defined baseline scenario; monetised using land value (direct market valuation) or ecosystem service valuations (WTP method).

Wider Benefit	Quantification and monetisation methods
Material impacts	Quantified in terms of amount (weight/volume) of material/resources saved (4) compared to the defined baseline scenario. Various proxy values such as avoided waste production and resource consumption are relevant. Monetised via avoided expenses or reduced expenses before and after energy efficiency measure (or over its lifecycle).

(1) Wagner, F. et al. (2023). Environmental Impacts D2.5 Empirical basis of Environmental Impacts. Quantification/monetisation methodology and derived impact factors. MICAT Project.
(2) ENTSO-E (2018). 2nd ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects. Available at: https://eepublicdownloads.entsoe.eu/clean-documents/tyndp-documents/Cost%20Benefit%20Analysis/2018-10-11-tyndp-cba-20.pdf.
(3) Suerkemper, F. et al. (2022). Overall quantification and monetisation concept. MICAT – Multiple Impacts Calculation Tool (De-liverable 2.1).
(4) Teubler, J. & Hackspeil, S. (2023). Empirical Basis of Environmental Impacts Savings on material resources. MICAT Project.

Table 6

Quantification and monetisation methods of economic wider benefits of energy efficiency solutions

Wider Benefit	Quantification and monetisation methods
Economic activity and GDP	Increased employment or gross value added per employee as key indicators to calculate GDP/year, can be segregated by sector and linked to energy efficiency (1). Other macroeconomic indicators, such as investments and consumption, can be used to quantify (2). Input-output analyses used to assess impacts on GDP *ex-post* and computable general equilibrium models are used for *ex-ante* assessments, and fiscal multiplier analysis (3).
Employment impacts	Quantified in number of jobs created (direct, indirect, and induced; by sector and country); monetised using wage data (direct market valuation) of jobs created. Input-output analyses used to assess impacts on GDP *ex-post* and computable general equilibrium models are used for *ex-ante* assessments, and fiscal multiplier analysis (4). See also Tool #30 in the Better Regulation Toolbox.
Disposable income	Monetised via reduction in energy bills before and after energy efficiency measure (5). This calculation can be adjusted to include other factors that affect the disposable income like, for example, the carbon pricing from the ETS2.
Workforce (and student) productivity	Difficult to directly quantify or monetise, but potential indicators include productivity gains quantified using performance metrics; monetised using wage or output data (revealed preference method).
Public budget	Use of input-output analyses, fiscal multiplier analysis, and budgetary semi-elastics with relevant indicators related to energy savings, public spending on health, social welfare services, etc. (6).
Energy (supply) security	Energy savings quantified in energy units; monetised using energy price forecasts (direct market valuation). Other possible monetisation methods include impact on integration of renewables (demand-response potentials by country in MW/%) and avoided investments in grid and capacity expansion due to lower energy demand. Import dependency and aggregated energy security (supplier diversity) are also important indicators, but monetisation is not yet possible.
Innovation and competitiveness	Difficult to directly quantify or monetise, but potential indicators include patents filed, new products launched, foreign trade statistics, or changes in market share.

Wider Benefit	Quantification and monetisation methods
Transaction costs	Non-monetary transaction costs can be quantified in terms of time spent on getting 'X' done. Whether transaction costs can be monetised and appropriate methods depend on the transaction costs identified. For example, non-monetary transactions costs (for example, cost of negotiating or enforcing) could be monetised using the value of time needed to spend on getting 'X' done. Monetary transactions costs are reported in monetised values already (for example, commissions or fees paid).

(1) Azzini, I., Listorti, G., Mara, T. and Rosati, R., Uncertainty and Sensitivity Analysis for policy decision making, EUR 30432 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-24752-4, doi:10.2760/922129, JRC122132.

(2) Suerkemper, F. et al. (2022). Overall quantification and monetisation concept. MICAT – Multiple Impacts Calculation Tool (De-liverable 2.1).

(3) Ibid.

(4) Ibid.

(5) International Energy Agency (2012). Spreading the net: The multiple benefits of energy efficiency improvements.

(6) Ürge-Vorsatz, D. et al. (2015). Literature review on Multiple Impact quantification methodologies, D2.1 report, COMBI project.

While energy efficiency offers numerous benefits, it is essential for the methodology to address not only the evaluation of these benefits but also the potential trade-offs and societal costs. This requires a thorough assessment of impacts throughout the entire project life cycle. In terms of environmental benefits and costs, the cost-benefit analysis should utilise on the Environmental Footprint and Life Cycle Assessment methodologies [36] and assess the impact of the envisaged measure on the 16 impact categories identified in the methodology. To facilitate this, those methodologies provide a range of indicators to document the effects of specific measures on environmental factors (e.g., on climate change, on ozone depletion, on acidification etc.).

4.2.3. *Overlapping and double counting of wider benefits*

There are numerous interrelations of wider benefits, occurring across multiple impact areas. Therefore, when aggregating wider benefits, a comprehensive evaluation is necessary to identify overlaps and avoid double counting of benefits. Without a proper consideration, an over- or underestimation of energy efficiency solutions is likely to occur. In cases where a benefit is to be omitted from a CBA, to avoid overlap with another benefit, for example, the benefit can still be considered as part of a MCDA.

For example, overlaps occur between valuations of morbidity and mortality effects and productivity impacts; as improved health generally also improves one's productivity, productivity benefits are often already captured within health benefits. In such a case, the inclusion of health and productivity benefits in a CBA leads to double counting and would result in an overestimation of energy efficiency benefits. Overlaps could also occur between health impacts and air quality, for example, if both impacts were quantified/monetised using emission reductions as a factor.

The construction of an impact pathway map is used to illustrate all relevant wider benefits in a given case by helping to identify the cause and effects of energy efficiency measures with defined starting and end points. This approach enables a proper evaluation of the interactions and potential overlaps of wider benefits. The scales (individual, regional/local, national, supranational) of each wider benefit should be defined within the impact pathway map to precisely disentangle the effects of one impact from another and therefore, avoid double counting.

The wider and more encompassing the evaluation scope is, the higher the possibility for overlaps of wider benefits. Therefore, it is important to identify and account for overlaps to ensure a proper and comprehensive evaluation of wider benefits.

A first step is to list all social, environmental, or economic benefits which are simple aggregates of micro level impacts and are supposed to be included in the CBA.

(36) Life Cycle Assessment & the EF methods: Comprehensive coverage of impacts, https://green-forum.ec.europa.eu/green-business/environmental-footprint-methods/life-cycle-assessment-ef-methods_en.

Second, identify each single economic benefit at the regional or local level and/or the national level, respectively, which is included in the CBA and determine the components of these benefits, for example which figures or variables are used to quantify this benefit.

Third, check whether these components are related to or derived from the environmental, social, economic benefits based at the micro-level. This could be done by answering the following question: do any of the components of the respective economic benefits rely in any way on the micro-level aggregates? For example, the reduced energy expenditures of households affected by energy poverty as an aggregate of the micro level might be accounted for in a macroeconomic model through the variable ‘available income’ or ‘demand for other products’, pushing total consumption and hence economic growth.

Fourth, if there is any link, the respective ‘micro-level based’ benefit should not be added to the other benefits.

Fifth, any benefit which has been identified as a wider benefit but could not be aggregated and included in the ‘wider’ CBA, nevertheless represents a wider benefit and might be displayed as such separately.

4.2.4. *Examples of monetised wider benefits*

This section presents two examples of managing quantification and monetisation of various wider benefits. Further information on valuation techniques for monetising wider benefits to be used in CBA were developed by COMBI ([37]) and MICAT ([38]).

Example 1: Air pollution

This example follows the methods and findings based on the COMBI Final Report ([39]).

Impact: avoided emissions of air pollutants (sulphur dioxide, nitrogen oxides, volatile organic compounds, particulate matter with diameter of less than 10 µm and more than 2,5 µm).

Definition: quantities of air pollution emissions that would have been emitted into the environment unless energy efficiency improvement actions had been taken.

Units: tons.

Quantification Approach:

Total annual primary pollutant emissions by Member State for the baseline (2015) and two scenarios in 2030:

— Sulphur dioxide emissions 25 % smaller in 2030 than in 2015; more ambitious policy could deliver another 7 % reduction in annual air emissions.

— Respective estimates for nitrogen oxides are 37 % and 5 %; estimates for volatile organic compounds are 18 % and 3 %; estimates for PM_{10} are 19 % and 4 %; estimates for $PM_{2,5}$ are 30 % and 4 %.

In 2015, 285 000 premature deaths were attributable to $PM_{2,5}$ and 21 000 attributable to ground level ozone in EU-28. In 2030, the estimates suggest 219 000 premature deaths attributable to $PM_{2,5}$ and 17 000 attributable to ground level ozone.

Life expectancy loss to the surviving population due to $PM_{2,5}$ exposure in 2015 was around 6 million years of life lost (YOLLs) for EU-28; in 2030 with business-as-usual, this decreases to 4,6 million YOLLs. COMBI energy efficiency scenario estimates 4,4 million YOLLs by 2030.

([37]) Ürge-Vorsatz, D. et al. (2015), Literature review on Multiple Impact quantification methodologies, D2.1 report, COMBI project.
([38]) Suerkemper, F. et al. (2022), Overall quantification and monetisation concept. MICAT – Multiple Impacts Calculation Tool (De-liverable 2.1).
([39]) Mzavanadze, Nora. (2018a), Quantifying air pollution impacts of energy efficiency COMBI D3.4 Final report.

Monetisation Approach:

Proposed to monetise only human health impacts, as they come in standardised units that are easier to match with economic value estimates.

Avoided premature mortality due to $PM_{2,5}$ exposure: it can match the economic value of the life expectancy lost with the average life expectancy lost for $PM_{2,5}$ in 2015.

Avoided premature mortality due to ground level ozone exposure: average life expectancy lost per person is not known in the case of ground level ozone exposure, so it is assumed that the number of people affected would have lived at least one additional year; therefore, a full value of value of a life year (VOLY) attributed.

Avoided life expectancy loss to the surviving population due to $PM_{2,5}$ exposure: YOLLs can be monetised via VOLYs as 1 YOLL = 1 VOLY

The avoided premature mortality due to exposure to $PM_{2,5}$ in 2030 for EU-28 is 460 million EUR; 46 million EUR for exposure to ground level ozone; and 26 million EUR for life expectancy loss to the surviving population.

Example 2: Macroeconomic impacts

This example follows the methods and findings based on COMBI Final Report ([40]).

Macroeconomic impacts are divided into short-term (business cycle) and structural (long-term) impacts.

Short-term macroeconomic impacts refer to impacts as a result of the fluctuating business cycle.

Energy efficiency investments increase activity and short-term GDP compared to not doing an investment, which, in turn, impact employment, GDP, and public finances in the short-term.

— In 2018, energy efficiency investments were about EUR 89 billion in total, bringing an economic stimulus of about EUR 135 billion. This corresponds to 0,9 % of the EU GDP.

— The impact on employment amounts to more than 550 000 person years in the EU in 2018 and public revenue increases equate to almost EUR 20 billion (assuming investments are financed through private sources).

Long-term macroeconomic impacts refer to impacts irrelevant within the context of the business cycle. For example, fuel prices and structural changes to the economy and competitiveness are relevant.

— Fuel costs are significant in relation to EU production costs in various sectors (agriculture, industry, transportation, power, heating). More efficient sectors will be less susceptible to changes in fuel prices. Large energy efficiency investments can also reduce local energy prices.

— Energy efficiency improvements can be seen as an investment in an asset that can reduce costs into the future, which can have an effect on structural changes in the economy. Sectors where energy efficiency improvements are more cost-effective will see increases in their competitiveness.

5. APPLICATION OF EE1ST COST BENEFIT ANALYSIS

5.1. Preparing the application of the principle

To contribute to a cost-efficient decarbonisation and unlock wider benefits, the EE1st principle needs to be applied in cost-benefit analyses before implementing a measure across all sectors.

([40]) Naess-Schmidt, H. S., Hansen, M. B. W., Wilke, S., Lumby, B. M. (2018), Macro-economy impacts of energy efficiency COMBI D6.4 Final report.

In many cases, a decision on measures consists of a (i) planning; (ii) policy, and (iii) major investment decision. The EE1st principle should be considered at all three decision levels, in accordance with Article 3(1) of the EED recast, when the relevant thresholds of more than EUR 100 000 000 each or EUR 175 000 000 for transport infrastructure projects are reached. This does not mean that a decision always follows all three levels of analysis. Some decisions occur only at the planning level, others at the policy or investment level.

As a starting point, Member States should interpret Article 3(1), which provides general criteria, including the thresholds above which the principle has to be applied, and a qualitative or quantitative definition of the 'impact on energy consumption', which would be used to determine to what extent the EE1st principle needs to be applied. These criteria could then be used at the approval stage by the respective public bodies and become part of the official guidelines for evaluating planning, policy and investment decisions.

It should be recalled that, in accordance with the Commission Recommendation (EU) 2024/2143 ([41]) setting out guidelines for the interpretation of Article 3 of Directive (EU) 2023/1791 the thresholds included in Article 3(1) apply to major investment decisions. For planning and policy decisions, relevant stakeholders should assess whether a given decision could result in investment decisions that exceed the thresholds of Article 3(1) and whether they impact energy consumption. If the reply is positive to both questions, then the principle should be applied.

5.2. **The process of identifying alternative energy-efficient solutions**

In a situation where the initial project under consideration is not energy-efficient, the first important step in applying the EE1st principle should be the identification of possible energy-efficient alternatives, which could deliver the same objective as the initial option and should be considered at equal terms. These could include demand-side resources and system flexibility.

It should be noted that while identifying alternatives, other headline objectives and obligations could be considered and simplify the process. For example, an alternative that offers limited improvements in energy efficiency and prolongs fossil fuel use and their related greenhouse gas emissions should be avoided.

When a measure goes beyond the planning level, the exercise of looking for energy efficiency solutions and applying a CBA should be repeated at the policy level or major investment decision level, since each level might change the scope and could allow for other alternative energy efficiency solutions.

The following table gives examples of how alternative energy efficiency solutions could be identified at the three different levels and covers the energy sector and for the non-energy sector.

Table 7

Examples of processes to identify energy efficiency solutions

	Example in district heating A city intends to expand its district heating system.	**Example in transport** A city intends to expand a ring road.
Planning	Guiding questions for finding energy-efficient solutions could be: — Is the urban plan optimised for climate conditions? — Are the planned buildings zero-emission buildings? — Could local energy production be promoted? — Is a 'heat pump only' design feasible?	Guiding questions for finding energy-efficient solutions could be: — Is the urban plan optimised for sustainable urban mobility? — Is the expansion of the public transport system adequate? — Should investment be made in a new tram/train line instead of broader roads?

([41]) Commission Recommendation (EU) 2024/2143 of 29 July 2024 setting out guidelines for the interpretation of Article 3 of Directive (EU) 2023/1791 of the European Parliament and of the Council as regards the energy efficiency first principle (OJ L, 2024/2143, 9.8.2024, ELI: http://data.europa.eu/eli/reco/2024/2143/oj).

	Example in district heating A city intends to expand its district heating system.	**Example in transport** A city intends to expand a ring road.
Policy	Examples of possible energy-efficient solutions: — A subsidy scheme for decarbonised heating solutions accompanied/preceded by energy renovations. — An energy saving obligation scheme that favours energy renovations over heating system upgrades.	Examples of possible energy-efficient solutions: — A sustainable urban mobility plan that favours soft mobility instead of car use. — Construction of cycling infrastructure instead of new car parking spaces.
Major investment decision	Guiding questions to identify possible energy-efficient solutions: — What fuel will be used (in case of a new unit)? — What water temperature will the system use? — Are there any sources of waste heat around? — …	Guiding questions to identify possible energy-efficient solutions: — Can road surface alternatives which help reduce fuel consumption be used? — …

6. STEPS OF COST-BENEFIT METHODOLOGIES

Once an adequate number of solutions have been identified as potential alternatives, the decision should be made after applying cost-benefit methodologies in a cost benefit-analysis.

This section provides guidance on the technical aspects of the steps that could be taken during a cost-benefit analysis.

Table 8

Seven steps of cost-benefit analysis

Step 1	Establish a baseline scenario
Step 2	Establish a timeframe for energy savings and establishing the social discount rate
Step 3	Identify the impact and monetisation of costs and benefits
Step 4	Select a mathematical aggregation rule
Step 5	Clearly and transparently present the comparison of policy options and alternative measures, ranked in order of merit
Step 6	Check robustness of results
Step 7	Take into account the distributional and cumulative impacts of the proposed policy

For CBAs used when applying the EE1st principle, the crucial stage is step 3, i.e., the identification of impact and monetisation of costs and benefits from a societal perspective. Analysing costs and benefits properly is a key element of the principle. While applying the principle, a societal perspective to assessing the impacts of various alternatives is taken when analysing cost-effectiveness and wider benefits of energy saved.

6.1. **Step 1: Establishing a baseline scenario**

It is recommended to establish a baseline scenario and compare it with the initial measure. In many cases, a static baseline can be used. A static baseline relies on the past as a predictor of future outcomes. A static baseline entails estimating the energy use of the initial measure envisaged and the costs and investments needed to deliver the objective of the planning, policy or investment. This can be achieved through, for example, estimating the energy used before the implementation of the policy ([42]).

In some cases, it may be more appropriate to use a dynamic rather than static baseline for the comparison of alternatives ([43]). A dynamic baseline scenario is defined as the 'business as usual' future scenario that includes driving forces, which may impact the implementation of the initially envisaged measure ([44]). Driving forces can be for example, climate change or socioeconomic developments and new policy and legislative developments, which evolve over time.

Example for dynamic baseline scenario: 'Policy action for curbing CO_2 emissions from road transport'

In case the CO_2 emissions from road transport should be curbed in absolute terms by improving the fuel efficiency of cars through restrictions on the fleet consumption.

If it is assumed that the total mileage (number of vehicles times kilometres driven) of cars remains largely constant, then a 10 % improvement of fuel efficiency should reduce emissions by approximately 10 % in the course of time as more efficient cars are put into service. If, on the other hand, total mileage is assumed to increase by 20 % over time, e.g. due to an increased number of vehicles on the road, then a 10 % fuel efficiency improvement will not reduce emissions as required and additional measures may be needed ([45]).

Calculating the baseline should consider the principle of proportionate analysis, which implies balancing the expected wider benefits against the time and resources required by the decision maker to develop an accurate baseline ([46]).

6.2. **Step 2: Establishing a timeframe for energy savings and establishing the social discount rate**

In the second step, it is recommended to monitor (potential) energy savings and wider benefits of energy efficiency decisions over a period of time. The length of the monitoring period can vary depending on the type of project and on the decision stage within the policymaking cycle. In this context, it is important to consider the expected short-, medium- and long-term impacts of the intervention, as some impacts (for example, the cost to implement the measure) will show effects more quickly than others (for example, the long-term health benefits). In addition, an appropriate social discount rate needs to be selected ([47]). The choice of a social discount rate can have a significant impact on the results of the CBA ([48]).

([42]) International Energy Agency (2014), Capturing the Multiple Benefits of Energy Efficiency, p. 190.

([43]) Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023, Tool #60.

([44]) Macias Moy, D., Bisselink, B., Dutiel, O., Ferreira Cordeiro, N., Garcia Gorriz, E., Grizzetti, B., Hanke, G., Miladinova-Marinova, S., Parn, O., Piroddi, C., Pistocchi, A., Polimene, L., Ruiz Orejon Sanchez Pastor, L., Serpetti, N., Stips, A., Trichakis, I., Udias Moinelo, A. and Vigiak, O., Outline of the dynamic baseline for the MSFD Impact Assessment analysis in the context of the Blue2 Modelling Framework initiative, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/747000, JRC134027.

([45]) Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023, Tool #60.

([46]) COMMISSION STAFF WORKING DOCUMENT SWD(2021) 305 final, Better Regulation Guidelines, Brussels, 3.11.2021, p. 33.

([47]) Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023, Tool #64.

([48]) Hermelink, A.H. & de Jager, D. (2015), Evaluating our future: The crucial role of discount rates in European Commission energy system modelling.

The use of a sensitivity analysis can enhance transparency of the selected rate and the impact of a change of a social discount rate on the economic attractiveness of different degrees of energy efficiency improvements and of their alternatives.

Based on the two steps, it is possible to undertake a limited-scope CBA assessment of gross energy savings, cost savings and GHG emissions reduced, all of which are relatively easy to monetise, either directly or indirectly.

6.3. **Step 3: Identification of impacts and monetisation of costs and benefits**

6.3.1. *Identification of impacts and monetisation*

To extend the CBA and have better granularity, a CBA should take into account various wider benefits of the decision under consideration. Identifying the relevant wider benefits is key for a thorough understanding of the full impacts of a specific planning, policy, or investment decision.

The CBA should take into consideration where primary decisions take place or secondary decisions are triggered respectively across the individual, local or regional, national and supranational hierarchical levels. The CBA should also focus on the areas of Figure 1 to identify where the most significant benefits of those decisions are likely to occur. This identification process of the wider benefits could be ad hoc (specific process for each decision) or could be based on a standardised approach of which impacts have been recognised as significant for each sector.

An important element in the monetisation of costs and benefits is the energy price assumption. This assumption should include the carbon cost over the calculation period by taking the annual greenhouse gas emissions multiplied by the expected prices per tonne of CO_2 equivalent of greenhouse gas. It is recommended to use the ETS1 or ETS2 carbon prices trajectory.

In case benefits can only be estimated, it is recommended to use, for example, conservative values or rough estimates for monetary values rather than assuming any impacts ([49]). Overall, considered assumptions should be transparent.

After monetisation, and before applying the next steps of the CBA, it is possible to consider simpler methods to compare the alternatives, like the Cost-Effectiveness Analysis ([50]). This is applicable, in case only one or two wider benefits have been considered, thus making the comparison of the alternatives a straightforward exercise.

In cases where monetisation of impacts is not possible, Multi-Criteria Decision Analysis (MCDA) should be used to evaluate wider benefits alongside a CBA, as both qualitative and quantitative information is important for decision-makers when making planning, policy and investments decisions.

6.3.2. *Alternative approach (MCDA)*

In case of conflicting criteria and to lower the level of potential uncertainty within the CBA, it is recommended to conduct a sensitivity analysis of the results of the CBA including a range of estimated monetary values for these impacts (see step 6).

In some cases, it could be unreasonable or too difficult to determine or estimate the total impact of alternative solutions. For such cases, it is recommended to apply a MCDA, defined in section 3.2, which is a complementary tool for informed decision making and assessing the wider benefits ([51]).

Together, the use of MCDA and CBA capture comprehensively the full range of costs and benefits of wider benefits of energy efficiency.

([49]) International Energy Agency (2014), Capturing the Multiple Benefits of Energy Efficiency, p. 189.
([50]) Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023, p. 520.
([51]) Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023. MCDAs are particularly appropriate in cases of complex interactions where diverse quantified impacts are measured in various units, such as wider benefits.

6.4. **Wider benefits to include within the CBA**

If robust methods are available to properly monetise a wider benefit, they should be included within a CBA (assuming overlaps have been accounted for). However, the practical decision of whether to include wider benefits within a CBA, and which impacts to include depends on a few variables. Firstly, Member States should decide which benefits to include in a CBA based on the availability and quality of data. Additionally, the principle of proportionality can be relevant. The resources and effort required to monetise a benefit should be justified by its relative importance and impact.

In the context of a specific policy, some wider benefits may influence the order of merit more than others. It should also be noted that, while some wider benefits can be, in principle, monetised, the method available may not be robust enough to ensure that preferences of individuals to pay for a certain good or to accept compensation to give up a good are coherent with long-term sustainability requirements. Therefore, some non-market valuation methods, such as willingness to pay (WTP) or willingness to accept (WTA), should be used with caution if included in a CBA ([52]).

Unavailability and insufficient quality of data, inability to monetise benefits, the need to avoid double counting require the identification of the most likely or appropriate wider benefit, which could be included in a CBA.

Examples of challenges in identifying the right set of wider benefits:

Health benefits, reduced GHG emissions, and increased economic activity and GDP are usually monetised. Robust monetisation methods are available, and these benefits often have a very high cost-benefit ratio. However, these benefits have multiple related and indirect effects and therefore, already encompass various other wider benefits. For example, employment impacts are used as a key indicator to monetise GDP impacts. As such, employment impacts should not be monetised independently to avoid double counting. However, in this example, although the monetised impacts of employment are already captured, qualitative and quantitative impacts (e.g., in a MCDA) can still be important to evaluate.

To proceed, stakeholders that implement the principle could identify the most significant wider benefits (e.g. three to five) of a decision under consideration and properly assess those in the CBA.

The following tables provide suggestions for the most significant wider benefits in various energy and non-energy sectors which Member States could consider in CBAs.

Table 9

Wider benefits of energy efficiency in the energy system

Energy System	Wider benefit of energy efficiency
Electricity **Gas** **Heat**	1. More affordable energy prices (for any produced energy) 2. Reduced greenhouse gas emissions 3. Improved air quality 4. Increased energy security 5. Reduced land use by the energy generation and transmission sector 6. Avoided investment in additional capacity

([52]) Ürge-Vorsatz, D., Kelemen, A., Gupta, M., Chatterjee, S., Egyed, M., Reith, A. (2015), Literature review on Multiple Impact quantification methodologies, D2.1 report, COMBI project. Available at: https://combi-project.eu/wp-content/uploads/2015/09/D2.1_LR-methodologies.pdf.

Table 10

Wider benefits of energy efficiency in non-energy sectors

Non-energy sector	Wider benefit of energy efficiency
Buildings	1. Alleviation of energy poverty 2. Impacts on health 3. Reduced greenhouse gas emissions 4. Improved air quality 5. Job creation 6. Increased property value
Transport	1. Reduced greenhouse gas emissions 2. Improved air quality 3. Improved energy security 4. Reduced land use by the transport sector
Water	1. Decreased water usage
ICT	1. Reduced greenhouse gas emissions
Agriculture	1. Reduced greenhouse gas emissions 2. Land use and biodiversity
Financial Sectors	1. Increase in economic activity 2. Avoided investments in additional capacity 3. Job creation 4. Increased financial innovation and competitiveness

Table 11 provides an example for a decision-making process on whether to include certain wider benefits into a CBA or MCDA. The table is neither comprehensive, nor prescriptive. Various types of wider benefits of the project implementation have been identified, but not all had been finally included in the CBA. MCDA can be used for wider benefits that cannot be included in a CBA because they are difficult to quantify and monetise.

Table 11

Inclusion of wider benefits in a CBA

Impact areas	Wider benefit	Include in CBA?
Social	Health (morbidity)	Yes
Social	Health (mortality)	Yes
Social	Health (comfort and well-being)	No, because of the lack of proper monetisation methods
Social	Property and asset values	No, because it overlaps with GDP
Social	Light and noise improvements	No, because of the lack of proper monetisation methods
Social	Productivity	Yes, but with caution to avoid overlaps with health

Impact areas	Wider benefit	Include in CBA?
Environmental	Reduced GHG emissions	Yes
Environmental	Reduced air pollution	No, because it overlaps with health
Environmental	Material impacts	No, because of the high effort to monetise for relatively low impact value
Economic	GDP impacts	Yes
Economic	Employment impacts	No, because it overlaps with GDP
Economic	Disposable income	Yes
Economic	Public budget	No, because it overlaps with GDP
Economic	Energy security	No, because of insufficient data

Once the selection has been concluded, where possible, the monetised values should be integrated into a CBA. Potential costs and trade-offs should also be included in the analysis. Where it is not possible to monetise the possible negative impacts, they should at least be quantified. When they cannot be quantified, they should at least be included in the Multi-Criteria Decision Analysis.

The inclusion of these wider benefits has a substantial impact on the result of a CBA of energy efficiency, with a strong tendency to greatly increasing the cost-effectiveness, and therefore the likelihood of an energy efficiency approach being selected as the preferred policy option. Ultimately, the inclusion of wider benefits in CBA and MCDA underpins the significant effects of energy efficiency and could lead to better policy decisions.

6.5. **Step 4: Selecting a mathematical aggregation rule**

The next step serves as a method to calculate the value of costs and benefits of competing alternatives.

The most common financial key performance indicators (KPIs) are net present value (NPV) or benefit-cost ratio (BCR) ([53]). Selecting the NPV indicator is better suited to assess the attractiveness of an option in absolute terms, while the BCR will provide the attractiveness of an option regardless of the scale of options considered.

As shown in the following example, applying NPV or BCR may result in a different order of preference of different decision alternatives. While the NPV provides the absolute difference between discounted benefits (net present benefit, NPB) and costs (net present cost, NPC), the BCR is the ratio of the same numbers: discounted benefits divided by discounted costs.

Example: Applying Net Present Value / Cost-benefit ratio

Example Alternative 1:

$$NPV_{1\text{ vs BAU}} = NPB_{1\text{ vs BAU}} - NPC_{1\text{ vs BAU}} = 1\,000 - 500 = 500 > 0$$

$$BCR_{1\text{ vs BAU}} = NPB_{1\text{ vs BAU}} / NPC_{1\text{ vs BAU}} = 1\,000 / 500 = 2 > 1$$

Example Alternative 2:

$$NPV_{2\text{ vs BAU}} = NPB_{2\text{ vs BAU}} - NPC_{2\text{ vs BAU}} = 700 - 300 = 400 > 0$$

$$BCR_{2\text{ vs BAU}} = NPB_{2\text{ vs BAU}} / NPC_{2\text{ vs BAU}} = 700 / 300 = 2{,}3 > 1$$

([53]) Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023, p. 557.

The results of these calculations are presented in Table 12 below.

Table 12

Selecting a mathematical aggregation rule: NPV vs. BCR for two alternatives

	Alternative 1	Alternative 2
$NPB_{x\ vs\ BAU}$	1 000	700
$NPC_{x\ vs\ BAU}$	500	300
NPV total	500	400
BCR total	2	2,3

Alternative 1 is more advantageous than alternative 2 when applying NPV, yet less advantageous when applying BCR.

Alternative 1 is more expensive than alternative 2 (500 vs. 300 of additional investment (+ 67 %) compared to BAU) but also yields more benefit (1 000 vs. 700 (+ 43 %)). The additional investment of 300 only yields additional benefit of 100. If 1 000 can be made available, alternative 1 should be chosen if in case of choosing alternative 2, there is no additional investment of 300 which yields more additional benefit than 100.

The example shows that it is useful to calculate both KPIs and then decide based on available financial resources and investment options ([54]).

6.6. Step 5: Clearly and transparently present the comparison of policy options and alternative measures, ranked in order of merit

In most cases, it is useful to rank the various alternatives. This ranking should be based on the results of the mathematical aggregation, considering any relevant qualitative information on non-monetised benefits, and the differing impacts on the range of stakeholders affected ([55]). The alternatives should also be checked against the initial objective to be achieved.

6.7. Step 6: Check robustness of results

Member States could indicate methodologies, specifications and good practices to assess the robustness, and the transparency of the process, e.g., ensure that alternatives were examined or that double counting was assessed. In that case, stakeholders implementing the EE1st principle should use these methodologies, specifications and good practices to produce results of the needed quality.

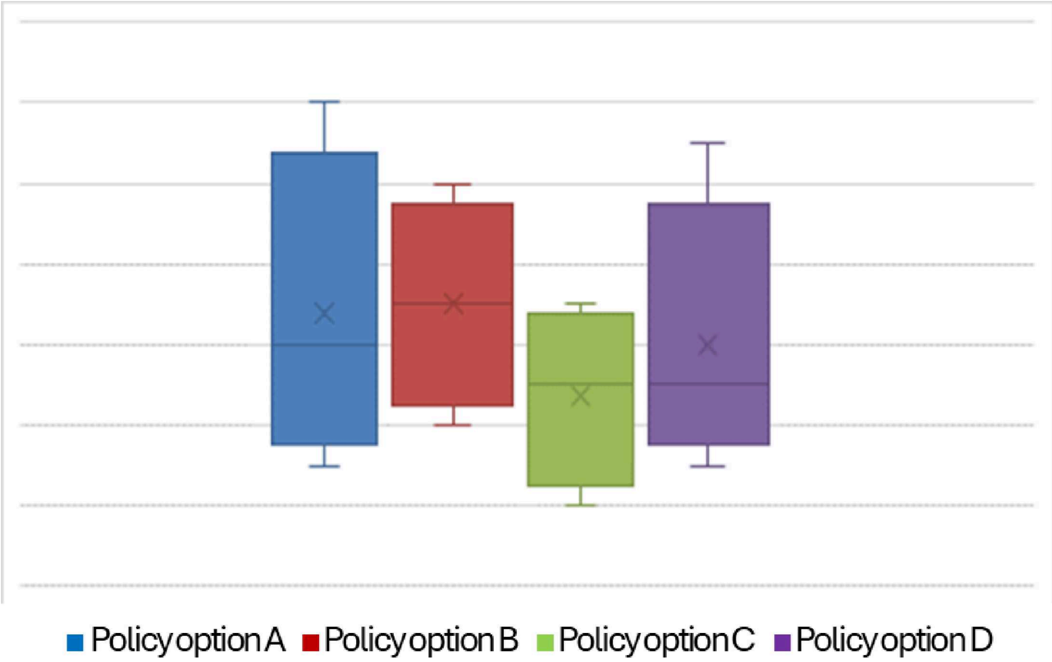
In this context and aiming at the proper implementation of the EE1st principle, Member States could foresee that the competent authorities will assess the quality of the results submitted by stakeholders, in a systematic or ad-hoc manner.

One way to test the robustness of the monetised information is to apply a sensitivity analysis. This can be done by adjusting the most uncertain, yet most influential aspects of the input data for the mathematical aggregation model, which for energy efficiency are often the future energy prices used, and the social discount rate selected. By using a low-high range of input data for future energy prices and for the social discount rate, each policy option will then have a spread of impact results, which provides an 'error' margin. While policy option A may seem the most attractive option after step 5, the lower end of the spread of possible impacts could be lower than for policy option B, which has a smaller spread overall, thereby making policy option B a more sensible choice (see Figure 2).

([54]) Furthermore, a sensitivity analysis regarding the selected discount rate is recommended (see step 2).
([55]) Better Regulation Toolbox which complements the Better Regulation Guidelines presented in SWD(2021) 305 final, July 2023, p 557.

Figure 2

Visual representation to test the robustness of policy options



As part of this exercise, it is equally important to be able to justify any decisions made with regard to the influence of non-monetised impact information and stakeholders' views on the ranking of results.

6.8. **Step 7: Take into account the distributional and cumulative impacts of the proposed policy**

Distributional impacts include the differing impact of the policy on the various Member States, to different stakeholders (for example, SMEs), or to different cohorts of society (for example whether the policy option disproportionately affects more vulnerable or lower-income groups). Some policy options may benefit or negatively affect some stakeholders more than others, and any unintended consequences such as these need to be taken into consideration. Accounting for cumulative impacts means that the impact on future generations should be considered in a proportionate way, and the modelled impact on future generations is greatly affected by the selection of the social discount rate (see step 2 above).

7. **MONITORING AND REPORTING**

Article 3 of the EED recast includes various requirements relevant for monitoring and reporting on the application of the EE1st principle, particularly highlighting its relevance to a broad range of sectors and major investment decisions, including the energy sector, buildings, transport, water, ICT, agriculture, and the financial sector. Therefore, monitoring and reporting requirements are to be applied for decisions across the economy, as further confirmed by Article 3(1), which lists the sectors of application, and Article 3(4), which requires Member States to assign competent authorities to monitor its application. Article 3(5), points (c)-(d), further require Member States to identify specific entities to oversee the monitoring of the principle's application and its corresponding regulatory framework.

Member States are also responsible for assessing the application and benefits of the EE1st principle within their energy systems, particularly concerning energy consumption, and providing a catalogue of measures implemented to remove regulatory or non-regulatory barriers, thus facilitating the adoption of the EE1st principle and demand-side solutions.

7.1. **Monitoring the application of the EE1st and communicating the results achieved**

Article 3(4) requires Member States to ‘monitor the application of the energy efficiency first principle, including, where appropriate, sector integration and cross-sectoral impacts, where policy, planning and investment decisions are subject to approval and monitoring requirements’. Member States are to identify competent authorities to carry out the monitoring duties. Monitoring is required for decisions which are already subject to existing approval and monitoring requirements. This ensures that the burden to Member States is reduced, as it applies only to occurrences where monitoring procedures are already in place.

Monitoring the application of EE1st could be integrated into wider monitoring processes at different levels. The authorities in charge of monitoring the application of the EE1st principle do not have to be the same authorities in charge of approval and monitoring for other aspects of the decision-making process. However, there are obvious advantages in adding the monitoring of EE1st to existing monitoring activities.

Similarly, reporting of EE1st can be defined as a dedicated process or as part of a wider reporting process:

(a) New processes, or as part of existing reporting processes on energy efficiency: depending on how Member States currently collect information on energy efficiency and climate action, reporting on EE1st could be included within the current data gathering activities, or the body in charge of the monitoring can develop dedicated processes.

(b) Part of wider reporting processes: Member States could require that the annual report of all public bodies (or of all public bodies that meet a certain set of requirements) includes a dedicated section on the application of EE1st. Ideally, stakeholders that implemented the EE1st can enter the required information into pre-defined templates, so that aggregation at national level is straightforward. To make use of existing processes covering the private sector, Member States could also require that private entities report on how the EE1st principle was applied as part of existing permitting processes, such as those under the Industrial Emissions Directive.

A key question for Member States is how major investment decisions of publicly owned or regulated entities and energy market stakeholders should be monitored. Article 3(4) suggests that reporting is to be done only as part of decisions which are already monitored. In the case of planning and investment decisions taken by entities not under the full control of a public body (independent entities, regulated entities, market stakeholders), this would suggest that the public body in charge of approving the decision may be also the one required to report.

An important clarification is that the limits set by Article 3 do not prevent Member States from choosing lower thresholds for the application of the EE1st principle and the reporting requirements.

Article 3, paragraph 4 requires that where applicable, sector integration and cross-sectoral impacts should be monitored for planning, policy and investment decisions which are already subject to approval and monitoring requirements.

The interconnectedness of energy systems with other sectors necessitates monitoring how the EE1st principle enhance system integration and creates cross-sectoral benefits. This includes examining how energy efficiency can support grid stability, reduce reliance on energy imports, and contribute to the circular economy.

The timing for measuring these KPIs should align with the decision-making processes, implementation schedules, and strategic review periods of the planning, policy, or major investment decision concerned.

7.2. **Data collection processes (from public bodies and market stakeholders)**

Member States should set up data collections processes and systems that ensure information is made available timely and coherently. It is highly recommendable to establish digital platforms, which lower the administrative burden for stakeholders and public bodies. Member States should endeavour to exploit processes, which ensure that one and the same data is collected only once, but relevant authorities are provided access to the database.

Based on the information to be reported, Member States should put in place a system that gives them the necessary evidence for this reporting. The evidence could be provided either by the collection of the relevant information directly (for example, a list of all major decisions as reported by the different stakeholders) or by using other information already collected and available (for example, a list of all investments above the threshold of Article 3 based on an analysis of budgetary approvals at ministerial level).

Besides data on the application of EE1st to planning, policy and investment decisions, Member States should collect by other means (for example, dedicated research) actions put in place to remove barriers to the application of the EE1st principle. Such a data collection exercise should be coordinated with other work planned to update the NECPs, to minimise data collection efforts and to ensure that the impacts of other policies (for example, energy efficiency policies in general) can be considered when reporting on barriers to EE1st.

7.3. **Reporting on EE1st principle**

Pursuant to Article 3(5), point (d) of the EED recast, Member States are to report, as part of their national energy and climate progress reports (NECPRs), 'how the energy efficiency first principle was taken into account in the national and, where applicable, regional and local planning, policy and major investment decisions related to the national and regional energy systems'. Section 5 of the Annex to Recommendation (EU) 2024/2143 provides some guidance on the reporting requirements.

Article 3(5), point (d), indicates the data which Member States are expected to report:

(a) Assessment of the application and benefits of the EE1st principle in energy systems.

(b) Actions taken to remove regulatory and non-regulatory barriers to the implementation of EE1st principle.

These two elements should be considered as the minimum, and Member States can report more information on how they have embedded the EE1st principle in their decision-making processes.

7.3.1. *Reporting of the application and benefits of EE1st*

Reporting on the application of the EE1st principle needs to include planning, policy and investment decisions which have been affected by the application of the EE1st principle and aim at the benefits that Member States expect to be realised.

For each decision, Member States could:

(a) Report whether one or several specific EE1st options were designed and chosen (yes/no).

(b) Present a quantification of total benefits, with the value for the wider benefits indicated separately for the solutions (in EUR).

(c) Present a quantification of total energy use in solutions (in GWh). This should include the lifetime energy use of the solutions.

(d) Include a commentary covering:

    (1) Details to what extent the solution still includes energy efficiency considerations (qualitative indicator/description) when the solution alternative to an EE1st option was chosen.

    (2) Considerations concerning demand response and flexibility for both solutions.

    (3) Any other explanation, for example concerning the uncertainty in the estimation of benefits, or whether the inclusion of wider benefits changed the choice of the preferred option.

The same information could be used to report to the European Commission. For example, Member States could require that all significant decisions, for which a formal approval is necessary, must clearly indicate in their Impact Assessment or in a similar pre-approval assessment, the following:

(a) Specify among the considered options, which one(s) were an application of the EE1st principle (option(s) where energy efficiency was given priority).

(b) Present the costs and benefits of EE1st options and of at least another main option (either the option that was chosen, or the second-best option if an EE1st option was chosen).

(c) Require that the Impact Assessment report presents separately the direct benefits, and the wider benefits of the options defined at the previous point.

7.3.2. *Reporting on actions taken to remove regulatory and non-regulatory barriers*

Article 3(5), point (d), sub-point (ii), requires Member States to report 'a list of actions taken to remove any unnecessary regulatory or non-regulatory barriers to the implementation of the energy efficiency first principle and of demand-side solutions, including through the identification of national legislation and measures that are contrary to the energy efficiency first principle'.

This suggests that Member States' reports should cover the following:

(a) Actions tackling unnecessary regulatory barriers to the implementation of EE1st principle and demand-side solutions

(b) Actions tackling non-regulatory barriers to the implementation of the EE1st and demand-side solutions

(c) List of national legislation and measures identified as contrary to the EE1st principle.

The first step to ensure a proper implementation of the EE1st principle is thus to review existing policies and assess if they are in line with the principle, or at least do not inhibit its implementation ([56]). Introducing EE1st as an overarching principle is not sufficient to secure its execution: its implementation needs to be carefully planned, and adjustments to decision-making, governance structures and investment frameworks need to be introduced across all areas, including building policies, the power sector, climate action, governance systems, policy targets, etc. Most often, implementing EE1st does not mean adopting new policies, but firstly necessitates ensuring that the existing policies and regulations are in line with the EE1st principle.

Such actions can include general actions, such as guidelines, methodologies and process requirements to ensure that the EE1st principle can be applied to relevant planning, policy and major investment decisions. These could be general or aimed at specific sectors or decision-making bodies.

([56]) ENEFIRST, 2022, How to operationalise Energy Efficiency First (EE1st) in the EU? Key recommendations to Member States. Deliverable D5.3 of the ENEFIRST project, funded by the H2020 programme, D.5.3_ENEFIRST_recommendations_FINAL.pdf.