MICAT

Multiple Impacts Calculation Tool

Empirical Basis of Economic Impacts Energy Intensity

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101000132.

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Executive summary

Energy intensity is an indicator describing the energy necessary for an economy to produce a unit of GDP. It is thus quantified as the ratio between energy consumption and GDP:

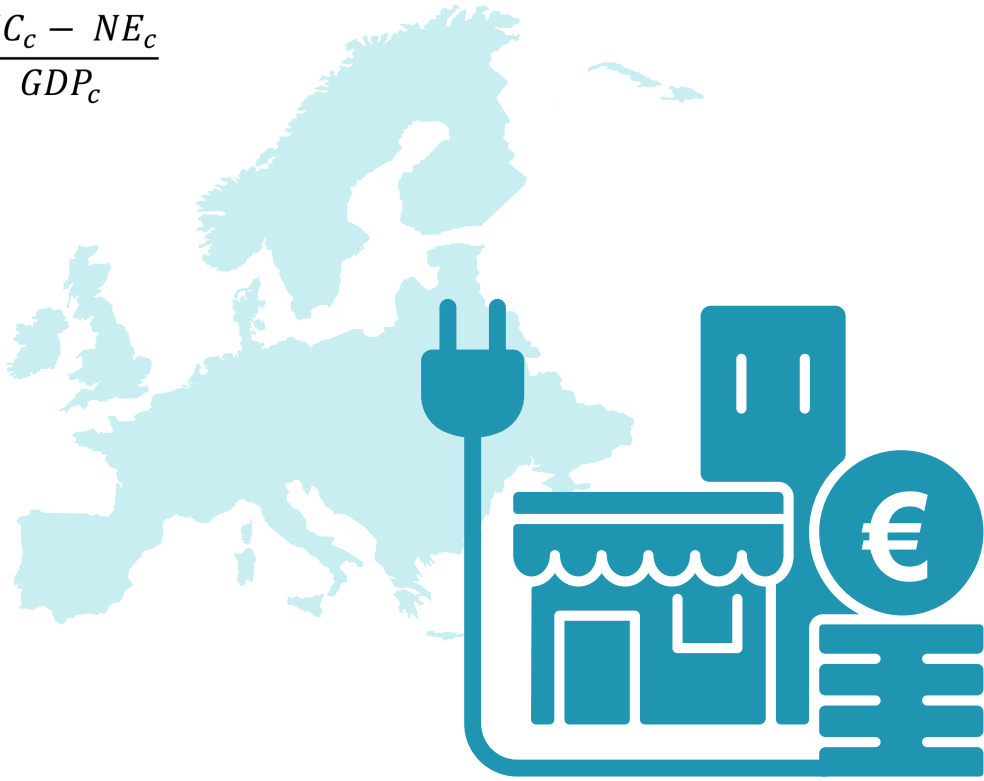
$$EI_c = \frac{GIC_c - NE_c}{GDP_c}$$

Taking into account energy savings, the resulting impact relationship is the following:

$$\Delta EI_c = \frac{GIC_c - NE_c - \Delta E_c}{GDP_c + \Delta GDP_c} - \frac{GIC_c - NE_c}{GDP_c}$$

Despite the fact that this indicator is mainly a key performance indicator for an economy, it is relevant to assess the exposure to energy price and availability volatilities. Yet, it can generally merely be assessed on the European and national level, since the required data is predominantly gathered on these governance levels.

The methodology for quantification is clearly defined and does not pose any challenges. Similarly, the required data is overwhelmingly available from Eurostat and PRIMES. However, a monetisation is not recommended, due to the significant risk of double counting. An aggregation would also not be fruitful.



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Scope of MI Indicator

Definition

The energy intensity describes the average amount of energy necessary to generate a unit of GDP. Thereby, it allows to assess the efficiency of an economy with regard to its energy use. Less energy intensive economies or sectors tend to be more resilient to price volatilities, as a smaller portion of expenses is linked to energy costs.

Relevance on EU, national and/or local level

Given the prevalent import dependency of fossil fuels in the EU, an increased resilience towards energy price increases as engendered by a reduced energy intensity is of major importance. This is the case on a European as well as on a national level. However, energy intensity can hardly be calculated on the local level, as GDP is generally not disaggregated to municipalities.

Impact pathway figure

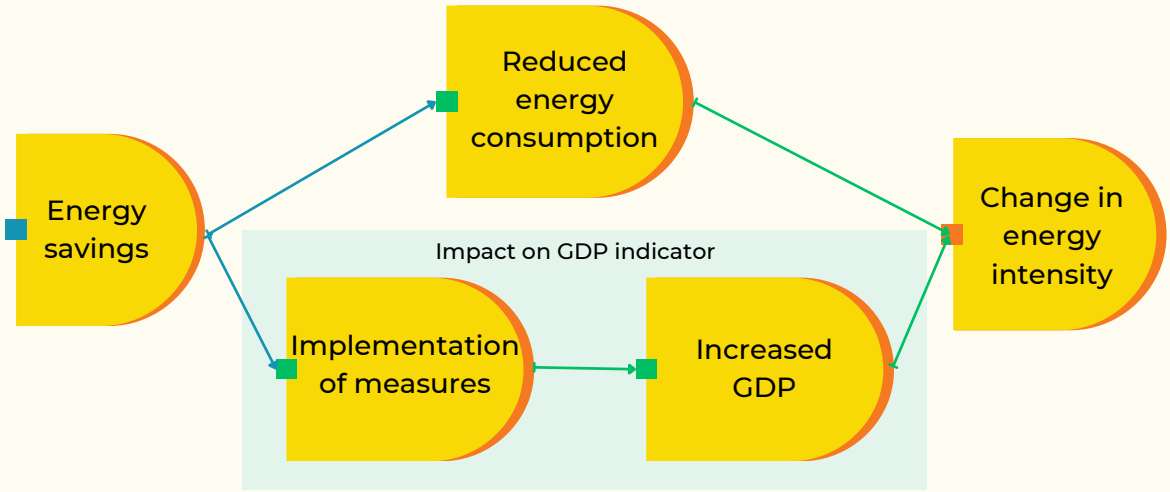

Figure 1: Impact pathway for the energy intensity indicator

Overlaps with other MI Indicators and potential risk of double counting

Since energy intensity is calculated building on the results of the MI Impact on the GDP, a certain overlap between both indicators exists. Moreover, the main benefit resulting from a reduced exposure to energy price volatilities should rather be monetised within the MI import dependency, although a monetisation in itself is quite challenging (see MI import dependency). Thus, to avoid double counting, this indicator should not be monetised.

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Quantification method

Description

To quantify countries' energy intensity EI_c, their energy consumption (difference between gross inland consumption GIC_c and final consumption for non-energy uses NE_c) is divided by their gross domestic product GDP_c:

$$EI_c = \frac{GIC_c - NE_c}{GDP_c}$$

In order to assess the impact of energy efficiency measures, the status quo is compared with a counterfactual scenario without energy savings.

Methodological challenges

The quantification of this indicator is straightforward. Thus, no methodological challenges have emerged.

Data requirements

In order to calculate this indicator, gross inland consumption, non-energy uses, the results from the indicator Impact on the GDP, and the energy savings are necessary. The former two datasets can generally be gathered from Eurostat and PRIMES.

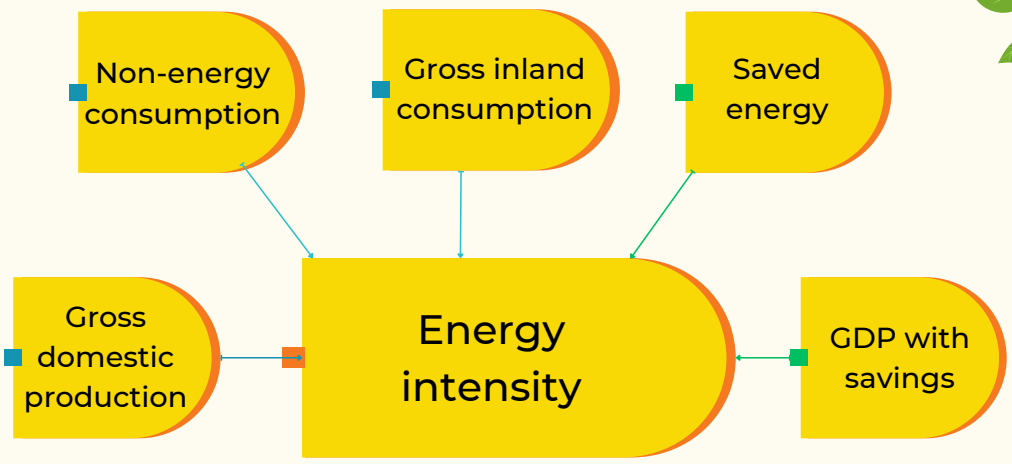

Figure 2: Quantification of the energy intensity indicator

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Impact factor/functional relationship

To calculate the impact of energy savings on a nation's energy intensity, the actual energy intensity is subtracted from a scenario including the energy savings ΔE_c . For the latter, the savings are deducted from the energy consumption and the result from the indictor 'Impact on GDP' is added to the actual GDP:

$$\Delta EI_c = \frac{GIC_c - NE_c - \Delta E_c}{GDP_c + \Delta GDP_c} - \frac{GIC_c - NE_c}{GDP_c}$$

Monetisation

Since energy intensity is more of a key performance indicator of an economy regarding energy efficiency, no direct benefits can be derived from it. Moreover, there is a considerable risk of double counting. Thus, no monetisation is recommended.

Aggregation

Since this impact is more an indicator for an economy than a direct benefit, it should not be aggregated.

Conclusion

Despite the fact that this indicator is mainly a key performance indicator for an economy, it is relevant to assess the exposure to energy price and availability volatilities. Yet, it can generally merely be assessed on the European and national level, since the required data is predominantly gathered on these governance levels. The methodology for quantification is clearly defined and does not pose any challenges. Similarly, the required data is overwhelmingly available from Eurostat and PRIMES. However, a monetisation is not recommended, due to the significant risk of double counting. An aggregation would also not be fruitful.

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MICAT's partners:

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