EEEA/2023/01

European environmental economic accounts

Technical Note

Reporting of energy-efficiency measures undertaken for the construction of low energy consumption and passive buildings

Version: June 2023

Contents

Acknowledgements

This note was drafted by Marco Orsini (Institut de Conseil et d'Etudes en Développement Durable asbl) under service contract number 2019.0372. The country information in this note draws on validation reports related to the environmental goods and services (EGSS) data collection, quality reports on EGSS data, and research experience of the author. The note was edited by Maaike Bouwmeester and Isabelle Rémond-Tiedrez. Eurostat thanks EGSS data compilers and participants to the Working Group Monetary Environmental Statistics and Accounts for their country examples and feedback.

1. Background

Regulation (EU) 691/2011 on European environmental economic accounts defines the environmental goods and services sector as the production of goods and services 1) for preventing, reducing and eliminating pollution and any other degradation of the environment or 2) for the purpose of resource management. This definition is operationalised in the indicative compendium included in Regulation (EC) 2015/2174 through a concrete list of environmental goods and services. One item in this list refers to "low energy consumption and passive buildings and energetic refurbishment of existing buildings" to be reported under CReMA 13B (heat/energy saving and management). The operational list of EGSS products provides relevant CPA and CN codes for the items included in the indicative compendium[1].

New energy-efficient buildings represent adapted goods which are defined as "goods that primarily serve a non-environmental purpose but may serve a secondary environmental purpose because they are specifically designed to be more environmentally friendly or more resource efficient than normal products of equivalent use".

The 2016 EGSS handbook suggests that adapted products such as energy-efficient buildings should be identified by their technical characteristics and their actual environmental impacts relative to standard products. To this end, auxiliary product information from environmental labels or energy standards should be taken into consideration. Following this guidance, buildings could be considered as energy-efficient if they received the highest environmental rating in a respective labelling scheme.

[1] For the "low energy consumption and passive buildings and energetic refurbishment of existing buildings" the current operational list makes reference to the following products and entries of the CPA 2008:

16.23.20; 41.00.10; 41.00.20; 43.99.7	Prefabricated wooden buildings; Residential buildings; Non-residential buildings; Assembly and erection works of prefabricated constructions

Country example: Spain

Spain has an energy labelling scheme for buildings called the Certificación Energética de Edificios (CEE). The CEE rates the energy performance of a building on a scale from A (very efficient) to G (not efficient). The rating is based on the building's energy consumption, as well as the energy efficiency of its heating, cooling, ventilation, and lighting systems. This information and the data on the construction sector (collected by the Ministry of Transport, Mobility and Urban Agenda and the Ministry for the Ecological Transition and the Demographic Challenge) are used for calculating the full value of the construction of NZEBs, and the part reported under CReMA 13B.

With regard to construction of low-energy consumption and passive buildings EGSS accounts compilers are asked to estimate:

- the **(full) value of output** (and related employment, GVA and exports) of low-energy consumption and passive buildings construction, to be reported in the core part of the EGSS questionnaire[2];
- the **part of the output** (as well as employment, GVA and exports) that is **related to energy-efficiency measures undertaken for low-energy consumption and passive buildings construction**, to be reported in a new column of the questionnaire as a (CReMA 13B) memo item[3].

In 2020 Eurostat published a Guidance note on the reporting of energetic refurbishment and the construction of new energy efficient buildings in EGSS accounts which defines the construction of low-energy consumption and passive buildings as **the construction of new buildings that are compliant with the European standard for nearly zero-energy buildings (NZEB) according to Directive 2010/31/EU[4] on the energy performance of buildings**. It also lists recommendations for the reporting of the full value of output of the construction of NZEB but includes minimal guidance on

[2] In Cells AQ169 to AQ175 (for Output, GVA and Employment) and cells AQ77 to AQ79 (for Exports) of the Questionnaire

[3] In cells BK169 to BK175 (for Output, GVA and Employment) and cells BK77 to BK79 (for Exports). These cells correspond to NACE F. Should the country have any output (and related employment, GVA and exports) related to low-energy consumption and passive buildings construction to be reported for other NACEs, data on energy-efficiency related measures can be entered in the grey cells of the "memo item" column with a footnote.

[4] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

the reporting of the part of output related to energy-efficiency measures undertaken for their construction, that is:

"*The necessary information on energy-efficiency related costs could be obtained, for example, by establishing dedicated surveys, adapting existing surveys, or consulting research and technical reports or administrative sources. If pertinent information remains unavailable, data compilers may apply a default conversion factor of 0.2, i.e., assuming as a first preliminary and generic estimate that 20% of the construction costs in new energy-efficient buildings are related to energy efficiency*"[5].

This note is therefore an attempt to bridge the gap by providing guidance for compilers who are working towards reporting the CReMA 13B memo item.

[5] Eurostat, Guidance note – Reporting of energetic refurbishment and construction of new energy efficient buildings in EGSS accounts, v. December 2020, p. 15.

2. Estimation options

In this note, we explore three main routes to obtain an estimation of the energy-efficiency measures undertaken for the construction of NZEB, to be reported as CreMA 13B memo item:

(1) through **surveys**,

(2) through **estimation based on the available data on the CReMA 13B output of NACE C – 'Manufacturing' and NACE F 43.2 – 'Electrical, plumbing and other construction installation activities'**,

(3) and through **estimation based on other data** ("conversion factor" hereafter).

Note that Directive 2010/31/EU defines NZEB as buildings that consume nearly zero or a very low amount of energy, which is to be covered to a very significant extent by renewable sources produced on-site or nearby. Nonetheless, the Directive does not define a unique standard of reference for NZEB across the EU, leaving to national authorities some degree of flexibility for the definition of nearly zero-energy buildings. According to D'Agostino et al. (2021)[6] established NZEBs energy performance levels vary from 20 kWh/m^2 per year (Belgium Flanders) to 132 kWh/ m^2 (Estonia) in new residential buildings.

2.1 Construction dedicated surveys & adapting existing surveys

Whenever a dedicated EGSS survey exists that also covers NACE F, one or more questions related to the energy-efficiency measures undertaken for the construction of NZEB could be added to the survey.

These questions should aim at obtaining

- general information on the construction of NZEB such as the number of units, the surface, the (full) cost per m^2 and the energetic characteristics of the NZEB (energetic class/label, consumption per m^2)

[6] Delia D'Agostino, Sofia Tsemekidi Tzeiranaki, Paolo Zangheri, Paolo Bertoldi, Assessing Nearly Zero Energy Buildings (NZEBs) development in Europe, Energy Strategy Reviews, Volume 36, 2021, https://www.sciencedirect.com/science/article/pii/S2211467X21000663 , last accessed: 29/03/2023

- specific information on the costs related to installation of energy efficiency related products such as[7]:
    - installation of thermal insulation inside/outside the buildings including installation of triple-glassed windows and state-of-the art outside doors;
    - installation of heating and cooling systems running on energy from renewable sources such as space heat generators and water heater based on solar thermal collectors, heat pumps for heating and cooling purposes, including apparatus, pipes, and wells for heat exchange and distribution ;
    - installation of radiators, floor heating systems, mechanical ventilation systems, space cooling system (state-of-the-art air-conditioner);
    - installation of (automatic) shading systems for windows to avoid overheating in summer and state-of-the-art lighting systems;
    - installation of auxiliary systems and control electronics for the technologies above
    - installation of smart meters, smart micro-grids, and other electronics for an efficient management of energy supply and demand.

Apart from an EGSS dedicated survey, EGSS compilers can check the possibilities of including/adding new questions to the surveys targeting specifically the construction sector.

For example, the European business statistics regulation (EBS-R) (EC) No 2019/2152 calls for producing a number of indicators on the construction sector. It calls also for quarterly indices on construction costs for new residential buildings to be produced by EU countries' statistical offices.

These indicators and indices are often estimated based on surveys covering the type of buildings (residential/non-residential, single house/apartments, etc.), surfaces, costs, energy performance related information (according to national standards and labelling schemes).

EGSS compilers should check the possibility of accessing their national surveys' results for finding any relevant information and could eventually check the possibility of

[7] A list of items that are relevant for the energy-efficiency measures undertaken for the construction of NZEB can be found at p. 12 of the Guidance document on the reporting of energetic refurbishment and the construction of new energy efficient buildings in EGSS accounts.

adding questions related to the energy-efficiency measures undertaken for the construction of NZEB in those surveys.

Country example: Germany

Germany collects data on the improvement of energy efficiency of buildings through its EGSS Länder based surveys. The surveys allow for collecting data on the energy refurbishment of existing buildings (e.g., measures that result in an improvement in the efficiency class of at least KfW efficiency house standard 115) and the construction of new efficiency houses (e.g., construction of efficiency, passive and plus energy houses with KfW efficiency house standard 55, 40, 40 Plus or better). The surveys asks for the additional costs for measures to improve the energy efficiency of buildings, which are:

- Thermal insulation of the building envelope (e.g. installation or manufacture of windows for thermal insulation with a U-value of less than 1.0 W/m²K, large components such as window frames, fittings, films for coating glass, roller shutters,
- Closing of thermal bridges, large components such as thermal insulation materials for buildings, insulation boards and mats, installation, service and planning)
- Energy-efficient heating technology (e.g. installation or production of condensing boilers, heat pumps, solar thermal and micro-CHP, pellet heating)
- Energy-efficient ventilation and air-conditioning technology (e.g. ventilation systems with heat recovery, automated control systems for monitoring and adjusting the indoor climate)
- Energy-efficient lighting technology (e.g. daylight sensors with dimmers, motion detectors, energy-efficient lighting concepts)
- Other environmental protection services to improve the energy efficiency of buildings that cannot be assigned to the preceding keys (e.g., building automation measures, production of software for controlling electrical systems, including large components, installation, service and planning).

Country example: France

In France the statistical data and studies service (SDES) of the Ministry of ecological transition carries out a monthly statistical survey (EPTB – survey on land and building price) on the price of land and buildings among people who have received authorization to build a detached house. The purpose of the survey is to measure the evolution of land and construction of individual houses' prices. It provides information on the prices but also on characteristics of the land (purchase or not of the land, date, servicing, etc.) and the construction of the house (surface, heating, etc.). It includes also the information on the type of the house with regards to its energy efficiency performance. At the moment the results of this survey are not yet used because the response rate to the question on energy efficient houses does not allow for a sufficient quality of data. France relies instead on the data of a special observatory of energy efficient buildings (BBC observatory) which collects information on certified buildings in France (number of buildings, type of buildings, energy certification, surfaces, ect.). This information is combined with existing official statistics on the building residential sector from the SDES (Residential buildings account) and national accounts figures for the construction sector to estimate the value of production, gross value added and employment of NZEB.

Country example: Ireland

Ireland uses a database of dwelling energy efficiency audits to retrieve data on several characteristics of the low consumption buildings, including new ones. Data can be accessed on-line.

Energy audits' results databases as well as energy certifications databases are valuable source of data on basic data (like the surfaces of NZEB buildings) that can be of help for estimating information on energy-efficiency measures undertaken for the construction of NZEB.

2.2 Estimation based on the value of domestic production of energy-efficiency technologies

As indicated in the Guidance note on reporting of energetic refurbishment and the construction of new energy efficient buildings in EGSS accounts, domestic production of energy-efficiency technologies under NACE C and NACE 43.2 may be a good proxy of the energy efficiency-related share of new construction recorded under NACE 41 – 'Construction of buildings' for large countries.

This is true only in part as a share of energy-efficiency goods under NACE C and NACE 43.2 is used for energy related works of renovation/retrofitting in existing buildings.

To improve on this approximation of the energy efficiency-related share of new construction recorded under NACE 41, the NACE C and NACE 43.2 production can be split using information on surfaces of renovated buildings and new NZEB buildings into renovation/retrofitting of existing buildings and NZEB. The underlying assumption then being that the same quantity per m^2 of goods from NACE C and NACE 43.2 is used both for renovation and NZEB buildings.

Country example: Belgium

In Belgium the national statistical office (STATBEL) provides monthly statistics on the number (and surface) of new buildings and renovations based on the authorizations to build/renovate.

At the EU level the EU Building Database provide a wide range of statistics on the EU countries' building stock as well as on new buildings. Information include buildings stocks characteristics, building shell performance, technical building systems, NZEB, building renovations etc.

This estimation method could be applied also by small countries provided they take into account that they potentially import a non-negligible part of goods used for improving the energy efficiency of buildings. This would imply for small countries to add import of EGSS (at least for CReMA 13B goods under NACE C and 43.2) into their data collection process. A very simple way to calculate these imports would be to rely on EGSS exports statistics of their most important surrounding commercial partners and apply an average share for calculating the exports from the external trade statistics.

A practical example of this estimation method is included at the end of this document.

2.3 Conversion factor

Starting from the full value of NZEB reported (mandatory) for the EGSS, EGSS compilers could use a simple conversion factor to derive the value of output (as well as employment, GVA and exports) related to energy-efficiency measures undertaken for their construction. Compilers should only use a generic conversion factor as a last resort, in case there is no additional information to estimate the share of the energy efficiency measures in the total value.

The current version of the Guidance note on reporting of energetic refurbishment and the construction of new energy efficient buildings in EGSS accounts proposes to countries to use a 20% coefficient. This conversion factor was the consensus outcome of a discussion in the Task Force on Environmental Classifications.

Country example: Greece

Greece estimates the whole amount of energy savings related activities in the construction sector based on the demand side estimation method illustrated in the EGSS practical guide (p.62). They use the national accounts Gross Fixed Capital Formation for buildings (see National Accounts, Table 3, Tables by industry of the ESA2010 transmission program) and a relevant factor that represents the heat and energy part of the those investments . This factor is estimated using mainly data from EU funding operational programs (NSRF) distributed for heat and energy saving purposes for the period 2008 – 2020.

To improve on this generic conversion factor, compilers can try to derive national conversion factors from several possible sources:

***Consulting research and technical reports of the construction sector**:* national construction sector bodies (as well as associations of architects and building sectors engineers) may provide information on the share of construction costs in buildings for implementing energy efficiency measures.

***Estimation based on administrative sources**:* national authorities could monitor the costs of implementing energy efficiency measures for several reasons (for example for calculating the rates of subsidies for the construction/acquiring low energy consumption buildings).

Estimation based on subsidies schemes: whenever a subsidy scheme is in place for the acquisition of low energy consumption building, it could be used for retrieving information on the value of the output (as well as employment, GVA and exports) related to energy-efficiency measures undertaken for their construction. In fact, compilers could make the hypothesis that the subsidy covers for the "extra cost" of the NZEB.

Country example: Austria

Austria compiles data on the energy efficient buildings based on the Austrian subsidy schemes for residential buildings support to the construction of low energy buildings and passive houses. Since 2008, the criteria for housing subsidies have generally been aimed at energy-saving construction and thermal renovation. As only subsidised buildings are taken into account there might be an underestimation because there is no information available on the construction of low energy buildings and passive houses not requesting/accessing housing subsidies. The subsidies for new construction and refurbishment are in EGSS considered as market output for the construction of energy-efficient buildings. The employment related to this output is calculated based on the average output per employee according to the results of the short term business statistics. The gross value added is determined on the basis of the average ratio of output and gross value added according to the structural business statistics. Since housing subsidies are limited to resident units, no exports are calculated for the activities related to efficiency measures in energy-efficient buildings.

NZEB national plans describe how EU countries will increase the number of nearly zero-energy buildings in line with Directive 2010/31/EU on energy performance in buildings. They are available on the EU Commission Energy website. They can be used by EGSS compilers to check which national administration offices are responsible for the follow-up of the Directive 2010/31/EU and then inquiry for the availability of information on NZEB related costs.

Cost optimum studies: Directive 2010/31/EU provisions imply that Member States should evaluate the (extra) costs of NZEB (and renovation). This is done through national studies modelling and estimating (extra) costs of building NZEB (and renovation). These studies are often referred to as "cost optimum" studies. EGSS data compilers should check with their administration offices responsible for the follow-up of the Directive 2010/31/EU the availability of (modelled data) on the costs of NZEB[8].

[8] Integrated reporting on NZEB is requested within the National Energy and Climate Plans reporting obligations. EGSS data compilers should also check with their national authorities dealing with climate governance the availability of NZEB related information.

Example: European Commission

The European Commission publishes on its Energy website the EU countries' 2018 cost-optimal reports. While these reports do not necessarily contain readily available information needed by EGSS compilers, they contain the relevant information on the administrative bodies responsible for Directive 2010/31/EU follow up.

Relevant information on national institutions that could be involved in national follow up and reporting for the Directive 2010/31/EU is available in the references of the policy brief published by BPIE in 2021.

Several EU projects were funded for establishing methodology and tools for these studies. A couple of examples of projects (funded under the EU's research and innovation funding programme Horizon 2020) are:

- Cravezero https://cravezero.eu/
- CoNZEBs https://www.conzebs.eu/ which produces results (related to costs) as those presented in this paper: H Erhorn-Kluttig et al 2019[9].

EGSS data compilers could find that some national based studies were produced under these projects and/or find useful contact information for national experts or institutions working on the costs of NZEB.

[9] H Erhorn-Kluttig et al 2019 IOP Conference Series.: Mater. Sci. Eng. 609 062002: https://iopscience.iop.org/article/10.1088/1757-899X/609/6/062002/pdf

Annex

Below follows an example of the estimation of the energy efficiency measures in construction based on the value of domestic production of energy-efficiency technologies. Please take note that this is an example developed specifically for this technical note and not an example of an estimation method currently in use.

Example based on Belgian data

Belgium reported (in 2022) a total amount of 403 M€ for the production of environmental goods and services for promoting energy efficiency (CReMA 13B) in the manufacturing sector (NACE C) for year 2020 (see the table below).

Table: EGSS, NACE C, CReMA 13B, output and exports, 2020, Belgium

CODE	NACE	OUTPUT	EXPORTS
C10-C12	Manufacture of food products, beverages and tobacco products	0	0
C13-C15	Manufacture of textiles, wearing apparel, leather and related products	34	20
C16-C18	Manufacture of wood and paper products, and printing	15	6
C19	Manufacture of coke and refined petroleum products	3	0
C20	Manufacture of chemicals and chemical products	30	19
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	1	1
C22_C23	Manufacture of rubber and plastic products, and other non-metallic mineral products	39	20
C24_C25	Manufacture of basic metals and fabricated metal products, except machinery and equipment	102	57
C26	Manufacture of computer, electronic and optical products	43	43
C27	Manufacture of electrical equipment	23	9
C28	Manufacture of machinery and equipment n.e.c	22	18
C29_C30	Manufacture of transport equipment	9	7
C31-C33	Manufacture of furniture; other manufacturing; repair and installation of machinery and equipment	83	56
C	Manufacture	403	257
C – excl. C27 and C29_C30	**Manufacture excluding manufacture of electrical equipment and manufacture of transport equipment**	**371**	**241**

Example based on Belgian data - continued

We cannot assume that all these products are for promoting energy efficiency in buildings. In fact some of these products are probably related to energy efficient transport equipment, most efficient domestic appliances and lightning etc.

Based on the EGSS operational list, we assume that products from NACE C27 and C29_30 are not for promoting energy efficiency in buildings. For NACE C29_30 Manufacture of transport equipment this assumption is straightforward. For NACE C27 Manufacture of electrical equipment, since the EGSS operational list includes the manufacturing of lightning and of domestic appliances under CReMA 13B, we assume that most of its products are not related to energy efficiency of buildings (at least with regards to their envelope).

For NACE C26 Manufacture of computer, electronic and optical products, the EGSS operational list indicates only codes 26.51.70 and 26.11.40; thermostats and thermostatic valves as relevant for energy efficiency in buildings. We think these goods should be more important than any energy efficient consumer electronic product that could be included in the data and for simplicity we assume that 100% of its production is relevant for energy efficiency in buildings.

For NACE C28 Manufacture of machinery and equipment n.e.c the EGSS operational list indicates only heat pumps as relevant for CReMA 13B under this NACE and we do not see any other product that could be recorded under CReMA 13B but not being related to energy efficiency in building. We thus assume that 100% of its production is relevant for energy efficiency in buildings.

The total value of output of products related to energy-efficiency measures undertaken in the construction and renovation of buildings is then estimated at 371 M€ in 2020.

Belgium reported also that 257 M€ of products from the NACE C under CReMA 13B are exported. Based on the same assumption as that for output (exclusion of NACEs C27 and C29_30 products), we estimate that export of products related to energy-efficiency measures undertaken in the construction and renovation of buildings was equal to 241 M€.

In order to know the total value of products for promoting energy efficiency for buildings available for national use we need an estimation of the imports of NACE C CReMA 13B products related to energy efficiency in buildings. Based on import and export data in supply and use tables (2019) we know that Belgium is a net exporter of NACE C products, with imports totalling 89% of exports for the NACEs reporting CReMA 13B products related to energy efficiency in buildings (excluding thus NACEs C27 and C29_C30). We thus estimate imports of NACE C CReMA 13B products related to energy-efficiency measures undertaken in the construction and renovation of buildings as 89% of 241 M€ of exports, which gives an amount of 205 M€. The total value of products for promoting energy efficiency in buildings available for national use is therefore the production plus the difference between import and export, that is 335 M€.

Example based on Belgian data - continued

These products are used for both the construction of new buildings and the renovation of existing buildings. In order to calculate the part which goes for the construction of new buildings we use an estimation of the ratio of m2 of new buildings to the total surface of new and renovated buildings, based on the available information on buildings' permits[1)].

For the residential sector, Statbel provides the number and surface of new buildings sector and the number of renovated buildings. Assuming that the unit surface of renovated buildings is larger than for new buildings[2)], we estimate a total amount of surfaces of new and renovated buildings.

For the non-residential sector Statbel provide the number and volume of the new buildings and the number of renovated building. Assuming that the unit volume of renovated buildings is the same than for new buildings and a ratio of 3.5 to transform volume to surface[3)], we estimate the total amount of surface for renovated and new buildings. Combining renovated and new buildings' surfaces together for residential and non-residential buildings we get that the part of new buildings on total construction activity is estimated at 52%.

We assume that the same amount of products for promoting energy efficiency per m2 are used in the construction of new buildings and in the renovation of existing buildings. Thus the value of products for promoting energy efficiency in new buildings available for national use is estimated at 173 M€ (52% of 335 M€).

In order to compare this value with the overall value of new buildings the last step of the estimation consists of adding a mark-up for the installation of these products in buildings. Based on Structural business statistics of Belgium[4)], we know that 1 € of goods and serviced purchased corresponds to 1.26 € of turnover (which approximates output) for NACE F41 (construction of buildings), we estimate the value of the part of the production of new buildings related to energy-efficiency measures at 217 M€.

Depending on the definition of NZEB buildings this value should be further treated for obtaining the part of the output of low energy consumption and passive buildings construction that is related to energy-efficiency measures undertaken for low-energy consumption and passive buildings construction.

For example, assuming that NZEB are only 10% of new buildings (in terms of surface) and assuming NZEB consuming 15% more products for promoting energy efficiency in new buildings than standard buildings, the value of the memo item for Belgium would be 25 M€.

1) Data available at Statbel at: https://statbel.fgov.be/fr/themes/construction-logement/permis-de-batir#figures
2) We calculate that the unit average surface for new buildings is 300 m2 and we assume, based on expert judgment that renovated buildings are 20% larger in surfaces.
3) Both assumptions are based on expert judgements.
4) Data from NBB/Statbel available at:
https://bestat.statbel.fgov.be/bestat/crosstable.xhtml?datasource=1eaf593d-5164-49d3-a60b-3ec11486e305

Example based on Belgian data - continued

The calculation is the following:

- TOT VALUE m2 = STANDARD VALUE m2 * SHARE of TOT SURF. Of STANDARD BUILD + NZEB VALUE * (1- SHARE of TOT SURF. Of STANDARD BUILD)
- NZEB VALUE m2 = STANDARD VALUE m2 * (1 + extra demand NZEB)

When assuming

- SHARE of TOT SURF. Of STANDARD BUILD = 90%
- extra demand NZEB = 15%

This gives:

- 217 M€ / 17.8 Mm2 = STANDARD VALUE m2 * 90% + STANDARD VALUE m2 * 10% * (1 + 15%)

And thus:

- STANDARD VALUE m2 = 217 M€ / 17.8 Mm2 * 1/ (90%+10%* (1+15%))

From which one can calculate STANDARD VALUE and by difference with TOT VALUE finally NZEB VALUE can be calculated.