



No|CO₂

A NET ZERO CARBON FUTURE

MANUAL 1.0



SWEDEN
GREEN BUILDING
COUNCIL

INNEHÅLL

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1. GLOSSARY OF TERMS AND ABBREVIATIONS

Term	Explanation of how the term is used in the NoIICO ₂ manual
Baseline	The NoIICO ₂ baseline model is a model of a building type, constructed as a simple box with foundation, with the possibility of setting project specific parameters such as the number of above and below ground floors, to include a basement and parking floors and so on. The building elements and products are typical for the building type and representative of those available for the Swedish market. After the project has specified its project specific parameters, the model calculates the climate impact of the baseline-model and the carbon limit which the project's climate impact must not exceed.
Bioenergy	The energy in biomass is called bioenergy and is solar energy that is chemically stored and bound by photosynthesis. The largest constituents of biomass are cellulose, lignin, starch, and sugar. In nature, biomass is regenerated relatively quickly.
Biogenic carbon	Biogenic carbon emissions are those that originate from biological sources such as plants, trees, and soil. Biogenic carbon emissions relate to the natural carbon cycle where carbon dioxide emissions occur during the combustion, changed land use, or decay of biomass.
Building element	Building elements are the main components of a building (floors, walls, and roofs).
Building services systems	Building services are the systems installed in buildings to make them comfortable, functional, efficient, and safe. For example, energy distribution, HVAC systems, water distribution systems, escalators and lifts, lighting, security- and alarm systems etc.
Building's energy performance	The Primary Energy Factor (PEF) is determining the energy performance of buildings. In Swedish Building Regulations, PEF is referred to as EP _{pet} and depending on its value the building gets an energy classification from A (the most efficient) to G (the least efficient). EP _{pet} is calculated using delivered energy, by applying geographical adjustment factors and weighting factors to the energy delivered to the building.
Building's energy use	Swedish Building Regulation, BBR Section 9:12, defines a building's energy use as the energy delivered to a building (usually called purchased energy) for heating (E_{uppv}), comfort cooling (E_{kyl}), hot water (E_{tv}) and the building's property energy (E_f). If underfloor heating, towel dryer, or other heating device is installed, its energy use is also included. The building's energy use (E_{bea}) is determined according to the following formula: $E_{\text{bea}} = E_{\text{uppv}} + E_{\text{kyl}} + E_{\text{tv}} + E_f$
Carbon dioxide equivalent	A carbon dioxide equivalent or CO ₂ equivalent, abbreviated as CO ₂ -eq is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.
Carbon credit	A carbon credit is a permit that allows the company that holds it to emit a certain amount of carbon dioxide or other greenhouse gases. One credit permits the emission of a mass equal to one ton of carbon dioxide.
Carbon limit	In this manual, a carbon limit value is a climate impact for a certain life cycle stage that the project must not exceed. NoIICO ₂ has one carbon limit for stages A1-A3 and another for the stages A4-A5.
Carbon offsetting	Carbon offsetting is the process of purchasing, and cancelling, carbon emissions credits equivalent to the carbon footprint of an activity, company, product, or service.
Carbon offset cancellation	Carbon offset irredeemably taken out of circulation so that no-one else can claim the benefit of the carbon emissions reduction that they represent.
Climate actions	Collective name within the framework of NoIICO ₂ for approved actions that reduce, avoid, or absorbs greenhouse gases.

Climate change	Climate change includes both the global warming driven by post-industrial human emissions of greenhouse gases, and the resulting large-scale shifts in weather patterns. Human activity has caused climate change according to scientific bodies of national or international standing. The largest driver has been the emission of fossil greenhouse gases. Positive impact on climate change means uptake or reduction of emissions of fossil greenhouse gases, while negative impact means emissions of fossil greenhouse gases.
Climate credit (“Carbon credit”)	Climate compensation purchased through climate credits, corresponding to one tonne of carbon dioxide equivalents.
Climate data	In NollCO ₂ , we use the expression climate data for the CO ₂ intensities for building elements (kgCO ₂ e/kg), energy (kgCO ₂ e/MWh), water use (kgCO ₂ e/m ³) and transportation (kgCO ₂ e/tkm).
Climate impact	In NollCO ₂ , climate impact is the result of a carbon calculation. For example, the climate impact of a construction product’s A1-A3 stage is calculated as the products climate data (kgCO ₂ e/kg) of the stage A1-A3 multiplied with the weight of the product (kg). The carbon footprint of the building’s A1-A3 stage is the sum of the calculation of all products and services climate impact of their A1-A3 stage.
Construction products	Construction products are processed, finished items that are offered for sale and used in the construction of a building, often as a part of a building element.
Expected building service life	The expected building service life is a 50-year span after the building is put into operation, as defined by the Swedish Housing Agency in the proposal regarding a climate declaration for new buildings.
Energy generated off-site	Energy produced outside the property’s boundary but within an outer system limit. For electricity production, NollCO ₂ defines Nord Pool’s electricity market as the outer system limit for electricity produced off-site. For other energy production, NollCO ₂ defines Sweden as the system limit for electricity produced off-site.
Energy generated on-site	Energy produced on the property where the NollCO ₂ building is situated.
Environmental integrity	In NollCO ₂ , the carbon offsetting must have “environmental integrity”, i.e. the environment and society must benefit <i>at least</i> as much as if the buyer had reduced its own emissions by the same amount of CO ₂ e.
EU Level(s)	The European Commission’s voluntary reporting tool for the sustainability performance of buildings.
Ex-ante	Credits which correspond to emissions that are going to be avoided.
Ex-post	Credits which correspond to savings that have already been made.
Fossil fuel-generated greenhouse gases	Fossil fuel-generated greenhouse gas (GHG) emissions are caused by human activities. The energy of fossil fuels is essentially solar energy that is chemically bound, and fossil fuels need millions of years to form anew.
Generic climate data	Climate data that is representative of a certain construction product. Such representative data is usually based on averages for different construction products within one and the same product group. In the manual, generic climate data at the national level denotes generic climate data representative for the Swedish market.
Life cycle stage	According to the standard SS-EN 15978:2011, the life cycle stage of a building comprises a product stage (module A1 – A3), construction process stage (module A4 – A5), use stage (module B1 – B7), and an end of life stage (module C1 – C4).
Module	Part of the life cycle stage according to the standard SS-EN 15978.

National climate database	The database with nationally generic climate data for construction products and building services systems, representative for the Swedish and Finnish markets. The database is free to access and developed by Swedish and Finnish agencies, planned to be released in January 2021. The data in the database must be used when making a climate declaration in accordance with the National Board of Housing, Building and Planning's regulations.
Net zero carbon building	In NollCO ₂ , this refers to a building whose life cycle carbon footprint is reduced and then offset to net zero using NollCO ₂ offset measures.
Non-operational energy demand	According to Swedish Building Regulation, BBR Section 9:12, the non-operational energy use includes electricity or other energy used for the building users' activities in the premises. Examples include the building users' process energy, lighting, computers, copiers, TVs, refrigerators/freezers, machines and other appliances for the business as well as stoves, refrigerators, freezers, dishwashers, washing machines, dryers, and other household appliances.
Operational energy demand	According to Swedish Building Regulation, BBR Section 9:12, operational energy is the energy required to operate the building. This includes energy for heating, cooling, heating hot water and electricity to run the building's technical systems, including fixed lighting in public areas and operating areas. Electricity used in heating cables, pumps, fans, motors, control and monitoring equipment and the like is included in operational energy demand. Electricity for external appliances that supply the building, such as pumps and fans for free cooling, are also included.
Proof of cancellation	Certificate or extract from the registry that attests to the buyer, volume, project name and standard with a timestamp for the climate credit (vintage) and the cancellation.
Renewable electricity	Renewable electricity is electricity produced from renewable energy sources. Electricity produced from renewable energy sources comprises the electricity generation from hydro plants (excluding that produced as a result of pumping storage systems), wind, solar, geothermal and electricity from biomass/wastes. Electricity from biomass/wastes comprises electricity generated from wood/wood wastes and the burning other of solid wastes of a renewable nature (straw, black liquor), municipal solid waste incineration, biogas (incl. landfill, sewage, farm gas) and liquid biofuels.
Renewable energy	Renewable energy is energy collected from renewable energy sources. These include wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.
SS-EN 15804:2012+A1:2013	Swedish standard SS-EN 15804:2012 <i>Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products</i> that define which stages a construction product's life cycle includes and how an environmental product declaration (EPD) for the product should be calculated.
SS-EN 15804:2012+A2:2019	A2:2019 is an update of the Product Category Rules (PCR) which serves as the main implementation of EN 15804 and as a basis for development of sub-PCRs. The update includes requirements on all construction products and materials to declare all the modules A1-A3, C1-C4 and D. It also includes requirements on declaring climate impact, excluding biogenic carbon, in the indicator GWP-GHG. Biogenic carbon content is declared separately from GWP-GHG.
SS-EN 15978:2011	Swedish standard SS-EN 15978:2011 <i>Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method</i> . Define which stages a building's life cycle includes, A-D, and how the environmental impact of the life cycles should be calculated.
Vintage	Indicates when the climate credit was created by the project.

Abbreviation	Reference in NollCO ₂
A_{temp}	Conditioned floor area as defined by Swedish Building Regulations, including all interior floors attics and basements heated above 10°C.
BTA	Total built floor area, including the thickness of the exterior envelope, as defined by Swedish standard, SS 21054:2009, "Area and volume for house buildings - Terminology and measurement rules", including but not limited to living areas and ancillary areas. Open area under carports and similar exterior structures are not included in BTA.
BTA, dark	Below-grade built floor area.
BTA, light	Above-grade built floor area.
BVD	Swedish abbreviation for construction product declaration ("Byggvarudeklaration"). Details comprehensive information on a building product, including proportions of various constituent materials.
BSAB 96	Categorisation of building elements and their components according to the Swedish Construction Service ("Svensk Byggtjänst"). BSAB 96 consists of codes for elements and components and is used by NollCO ₂ to set the system boundary the building and associated carbon calculations.
CO₂e	Carbon dioxide equivalents: a common scale for measuring the climate effects of different gases. Measured as the total units of CO ₂ which would warm the earth as much as a single unit of a gas greenhouse gases (e.g. CH ₄ , N ₂ O).
E_{bea}	Total building energy use (Swedish "Byggnadens energianvändning").
EPD	Environmental Product Declaration.
LCA	Life cycle assessment: a comprehensive environmental assessment of the entire life cycle of a product or service according to impact categories.
LCE	Life Cycle Emission Analysis: an analysis made according to principles for LCA, but only considering climate impact.
PCR	Product category rules: reporting rules for an EPD performed under EN standard 15804:2012 + A2:2019.
tkm	Tonne kilometre: one tkm correspond to the transport of one tonne of goods over one kilometre. Used to factor a vehicle's emissions for the transport component of a building product's climate impact.

2. INTRODUCTION

2.1 About SGBC

Sweden Green Building Council (SGBC) is Sweden's leading member organisation for sustainability in the built environment. SGBC is a non-profit organisation with members from all parts of the construction industry, municipalities and the public sector. The spread of members from the built environment is one of SGBC's greatest strengths.

Through certification, education, and advocacy, SGBC works for societal change that benefits both people and the environment. SGBC is a part of World Green Building Council (WGBC), with representatives in 70 countries on all continents. Read more about what we do at SGBC, including our certification systems, courses, and events at www.sgbc.se (only in Swedish).

2.2 About NollCO₂

NollCO₂ is a certification system for buildings, developed by SGBC and its member companies. The system consists of criteria for reducing climate impact during the design, construction, and operation phases of a building's service life, with additional measures for balancing the remaining climate impact to net zero.

NollCO₂ implements parts of the Swedish standard SS-EN ISO 14021:2017, which prescribes how statements, symbols, evaluation, and verification shall be incorporated into eco-labelling and environmental declarations. In accordance with the standard's requirements, such labels and declarations may not make misleading or inaccurate claims.

The term "climate neutral" in the NollCO₂ system is equated with a net zero climate impact when factoring aspects of the building's construction, operation and end-of-life alongside climate actions, or offsets, to balance the total climate impact to zero. Read more about NollCO₂'s framework at www.sgbc.se (in Swedish).

NollCO₂ is designed according to the following three principles:

- The certification must be easily applicable and cost-effective to encourage broad-level investment by organisations
- The certification must be both ambitious in its climate goals as well as transparent and based on recognized standards and strategies, regulations, guidelines, and best practices.
- The certification must align with SGBC's support system, technologies, and practices.

The NollCO₂ 1.0 Manual is organised into the following sections:

- **Introduction**
- **Certification Process** – certification stages, types of buildings that can be certified, reporting requirements
- **System Boundaries** – boundary conditions, functional units
- **Indicators** – base indicators, climate impact indicators, climate action indicators
- **Appendix** – climate considerations during the construction process

If there are doubts regarding differences in the Swedish version of the NollCO₂ manual 1.0 and the English version, the Swedish NollCO₂ manual 1.0 applies.

2.3 NollCO₂ business value

Certifying a construction project with NollCO₂ means taking a leadership role in the building industry's climate work. NollCO₂ drives development along two main paths:

- NollCO₂ sets requirements for projects to reduce climate impact by using carbon limit values for the product stage A1-A3, and for construction stage A4-A5
- NollCO₂ sets a requirement for reduced climate impact associated with operational energy use by mandating that the building's energy performance shall achieve Energy Class B or better
- NollCO₂ requires the project to balance the outstanding climate impact with climate actions to a net zero climate impact

These measures will encourage contractors and suppliers to take initiative to reduce their individual impacts and will also create new market opportunities to reduce carbon such as building demand for reclaimed and repurposed products. A more energy-efficient NollCO₂ building will cost less to operate over time, and the higher environmental profile of a NollCO₂ certified building is likely to correspond with an increased market value and a higher chance of securing sustainable finance based on requirements in the EU taxonomy or similar sustainability criteria frameworks for investors.

2.4 NollCO₂ trademark

SGBC has the exclusive right to the registered trademark "NollCO₂". Clients developing and/or owning a NollCO₂ certified building have the right to use the NollCO₂ trademark in communications and marketing from the time of registration through to award of certification. Certification may not be used, referred to or otherwise used in marketing in a misleading or otherwise impermissible manner.

3. CERTIFICATION PROCESS

NollCO₂ certification is administered by Sweden Green Building Council. The certification process starts with a registration of the project and a review of the project's administrative data. During the certification process, the documents required by each indicator for preliminary certification, verification and feedback are reviewed.

Interpretations and clarifications are periodically published on www.sgbc.se and are applicable if posted before the project's registration date. Interpretations and clarifications published after the project's registration date may be pursued at the project team's discretion.

Please refer to www.sgbc.se for an updated price list.

3.1 Buildings eligible for certification under NollCO₂

A building is defined according to the Swedish Planning and Building Act (PBL) as a permanent structure for human occupancy consisting of a roof with or without walls which is either permanently placed on a slab-on-grade, crawlspace or basement foundation, or is permanently placed in a specific location on water.

In order for a building to be registered as one building in NollCO₂, the building must: be perceived as one building, have one energy declaration, have uniform building technical conditions, and have a common indoor climate and common technical supply systems. SGBC reserves the right, in the application for registration, to decide whether the building should be registered as one building and thus as one NollCO₂ project.

Occupancies eligible for certification

NollCO₂ can be used for the following occupancies based on available baseline models:

- Office buildings
- Free-standing industrial and retail buildings
- Multi-unit residential buildings
- Elderly care homes
- Detached single family and duplex homes (under exploration for autumn 2020)
- Mixed-use

More occupancies may be added to NollCO₂ as relevant baselines are developed.

NollCO₂ 1.0 can be used for the following building types

- New construction detached
 - New construction detached defined in the Swedish Planning and Building Act, PBL, as the construction of a new building or the relocation of a previously-constructed building to a new location, with the exception of projects defined as a relocation of a previously-constructed building.
 - The building cannot have been in operation for more than five years when applying for preliminary certification.
- New construction, extension
 - New construction, extension as defined in the Swedish Planning and Building Act, PBL, as a change of a building that entails an increase in the building's volume.

- An extension can be certified separately, provided that the energy and water use in the extension can be distinguished via measurement and that the location of the NollCO₂ plaque on the extension clearly shows that it is the extension to which the plaque applies.
- The extension cannot have been in operation for more than five years when applying for preliminary certification.

Check www.sgbc.se for updates on the ongoing development of NollCO₂.

Validity period

NollCO₂ certifications are valid provided that the verification and follow-up reporting requirements are met. Read more about maintaining a NollCO₂ certification at www.sgbc.se.

Buildings with classified information

When certifying a building with classified information, the inspection procedure and documentation management can be adapted accordingly. Please contact SGBC’s certification department to discuss.

3.2 Certification stages

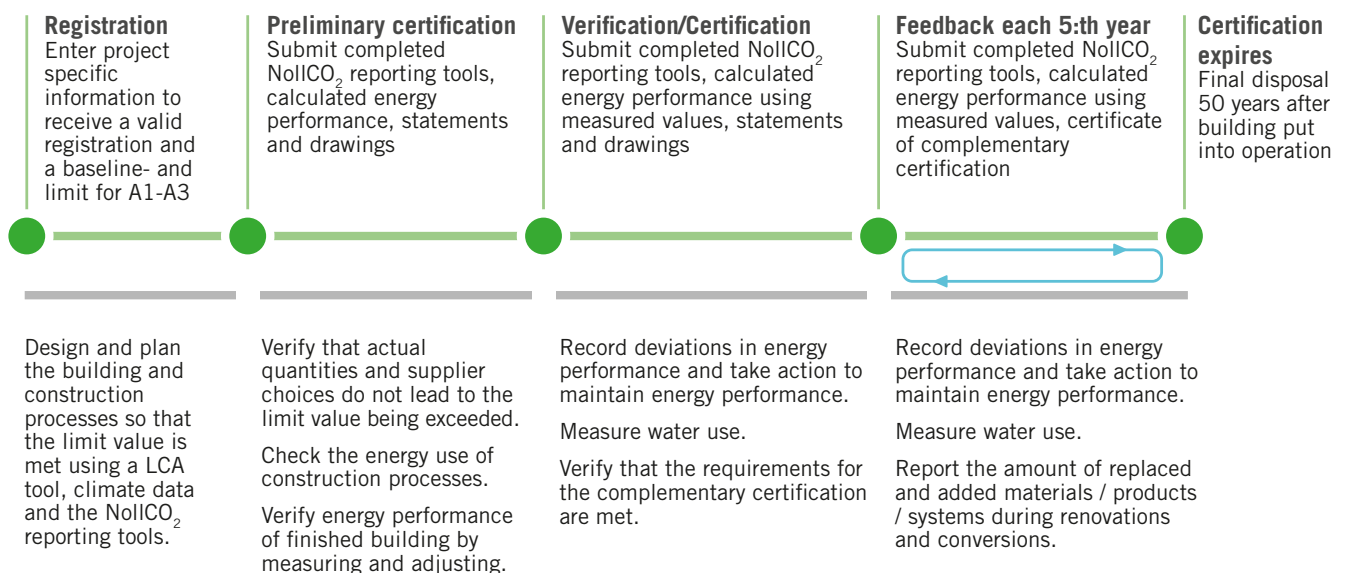


Figure 1 NollCO₂ certification process illustration – please visit www.sgbc.se for details

Registration

A NollCO₂ certification consists of several different stages. Any building that is to be certified with NollCO₂ must first be registered in SGBC’s digital tool: Building Green Online (BGO). At this stage, it is determined which manual version the building will be compared with during inspection. Note that one registration applies to one building. The invoice price for registration includes the cost of calculation of the baseline and limit value and administration costs.

Upon registration, project specific information is submitted, and the project receives a project-specific baseline, A1-A3 limit value and the NollCO₂ reporting tools.

The approved registration is valid for three years. The application for preliminary certification must be made within three years after approved registration.

Preliminary certification

Preliminary certification is achieved when the required reporting is submitted, reviewed and approved. The reporting for preliminary certification is usually done when the design is complete and before construction starts but can also be done after construction starts. The invoice price for preliminary certification and certification/verification, includes costs for review of submitted reporting as well as administration costs.

When the application for preliminary certification is approved, the building receives a preliminary certification and a certificate. A preliminary certification is valid from the date of issue until three years from the date the building is put into operation.

Verification

Verification is achieved when the project has submitted the required reporting which is then reviewed and approved. This verifies that the actual outcome is consistent with the reporting done for the preliminary certification. When verification is approved, the building receives a certification and a plaque to install on the building.

If the submitted application for verification has not been received within three years after the building has been put into operation, the preliminary certificate will be revoked.

Upon approved verification, the building is certified for five years. After these five years, approved follow-up reporting is required for continued certification.

Periodic follow-up reporting

Follow-up reporting implicates that the building maintains the performance from approved verification. In addition, compensation made and conversions of building components are reported. Indicators that are affected by follow-up reporting are stated in the accounting requirement for each indicator. Follow-up reporting is complete when documents are submitted, reviewed, and approved. The follow-up reporting invoice price includes costs for review of submitted reporting and administration costs.

Follow-up reporting is required every five years until 50 years after the building was put into operation, or until the building is decommissioned.

If the follow-up reporting is not approved, the certificate is revoked, and the certificate and plaque are returned to SGBC.

3.3 Reporting documents

NollCO₂ uses the following reporting tools and documentation

"NollCO₂ Klimatpåverkan Certifiering.xlsx"

- Excel tool containing climate data and quantities for construction products and building services systems together with transport data and climate data for transport types. The tool contains several components pre-filled together with climate data from Ökobaudat and EPDs. These are replaced with project data according to the reporting requirements listed in each indicator section

"NollCO₂ Klimatpåverkan Återrapportering.xlsx"

- Excel tool containing information on replacement and reconstruction of materials/products/systems for the follow-up reporting

"NollCO₂ Balansberäkning.xlsx"

- Excel tool containing data on construction, energy and water use, replacement and reconstruction, and climate actions required to calculate the project's balance of climate impact and climate actions

"NollCO₂ Klimatpåverkan rapport.docx"

- Word document that summarises the project's climate impact and reduction strategies

Verification

- Registration certificate and certificate of fulfilment of the complementary certification

Calculations

- Energy calculations of energy use and energy production

Other

- Project's declaration of construction components' compliance with chemical legislation
- Project's declaration of construction components' compliance with the EU timber regulations
- Report of installation date and forecast of renewable electricity production
- Report on the distribution of financing of climate actions
- Reporting document regarding purchased climate credits

3.4 NollCO₂ reporting

Participation in SGBC's NollCO₂ Basics course is mandatory for the individual coordinating documentation and reporting to SGBC on behalf of the NollCO₂ project. For more information on the NollCO₂ basics course, visit www.sgbc.se.

4. SYSTEM BOUNDARIES

4.1 Life cycle

NollCO₂ follows the calculation standard SS-EN 15978:2011 for assessing the climate impact of a building. SS-EN 15978:2011 divides the building's life cycle into life cycle stages and modules. The four stages are:

- A. Production stage, product stage (modules A1-A3) and the construction stage (modules A4-A5)
- B. Use stage (modules B1-B7)
- C. End of life stage (modules C1-C4)
- D. Benefits and loads beyond the system boundary (module D)

NollCO₂ includes climate impact from the building's entire life cycle A-C. Climate impact outside the system boundary (module D) is not included in NollCO₂.

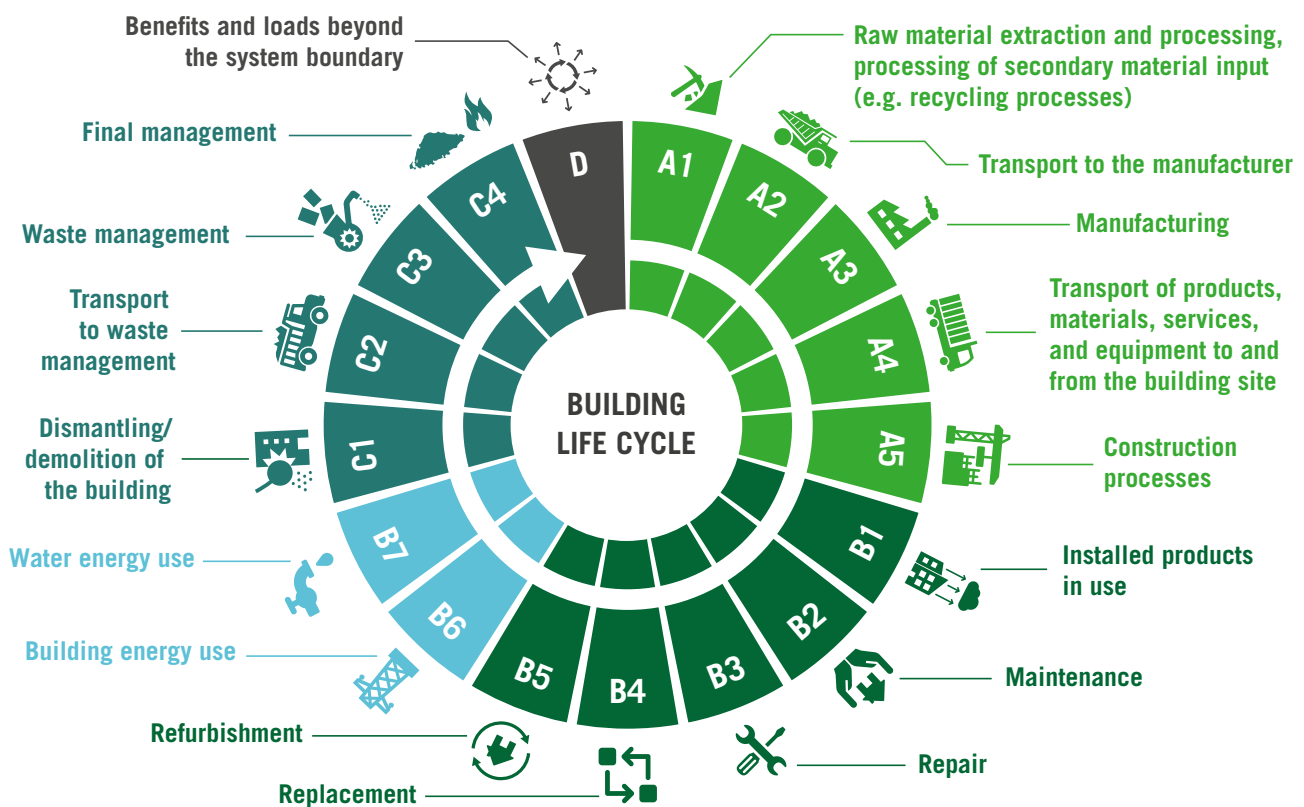


Figure 2 The standard SS EN 15978 describes the life cycle stages and modules A-D for a building

Expected building service life

NollCO₂ uses a 50-year expected building service life in accordance with the Swedish National Board of Housing, Building and Planning's proposal to the Government regarding the climate declaration (Boverket's Report 2020: 13 "Development of rules on climate declaration of buildings"). The 50-year period starts with building occupancy.

4.2 Building

Functional unit kgCO₂e/m² BTA

NollCO₂ uses the functional unit kgCO₂e/m² BTA for reporting climate impact in line with the Swedish National Board of Housing, Building and Planning's proposal on climate declarations.

External physical system boundary

The applicable physical system boundary is defined according to SS-EN 15978:2011 and excludes construction and landscaping work outside the periphery of the building. Balconies and other protruding components of the building are included.

The climate impact of infrastructure for water supply outside the building's periphery is not included in the calculation of the building's climate impact A1-A3 but is included in B7.

All energy-producing units on the property where the building is located, and which generate energy for use in the building, are included in the calculation of B6. This entails the following:

- The life cycle-based climate impact of supplied / purchased energy is reported in B6
- The life cycle-based climate impact of energy production systems that are *permanently installed in the building* is reported in B6
- The life cycle-based climate impact of energy production systems that are *permanently installed on or next to the building* (on-site) is reported in B6
- Where energy production technology is *integrated* in a construction product that is permanently installed in the building but has an additional function aside from energy production, e.g. solar cells in roof tiles or windows, the project estimates the life cycle-based climate impact of the construction products can be attributed to the construction, and reports this in A1-A3. In the same way, the project estimates the life cycle-based climate impact of the construction product that can be attributed to the product's energy production function, and reports this in B6. For example: if the window is provided with a thin film of solar cells with associated electronics, the climate impact of the film and electronics is reported in B6, while the rest of the window's climate impact is reported in A1-A3.

Building elements

Building elements and building service systems that are included in the scope of the NollCO₂ are illustrated in *Figure 3*.

Included building parts in NollCO₂

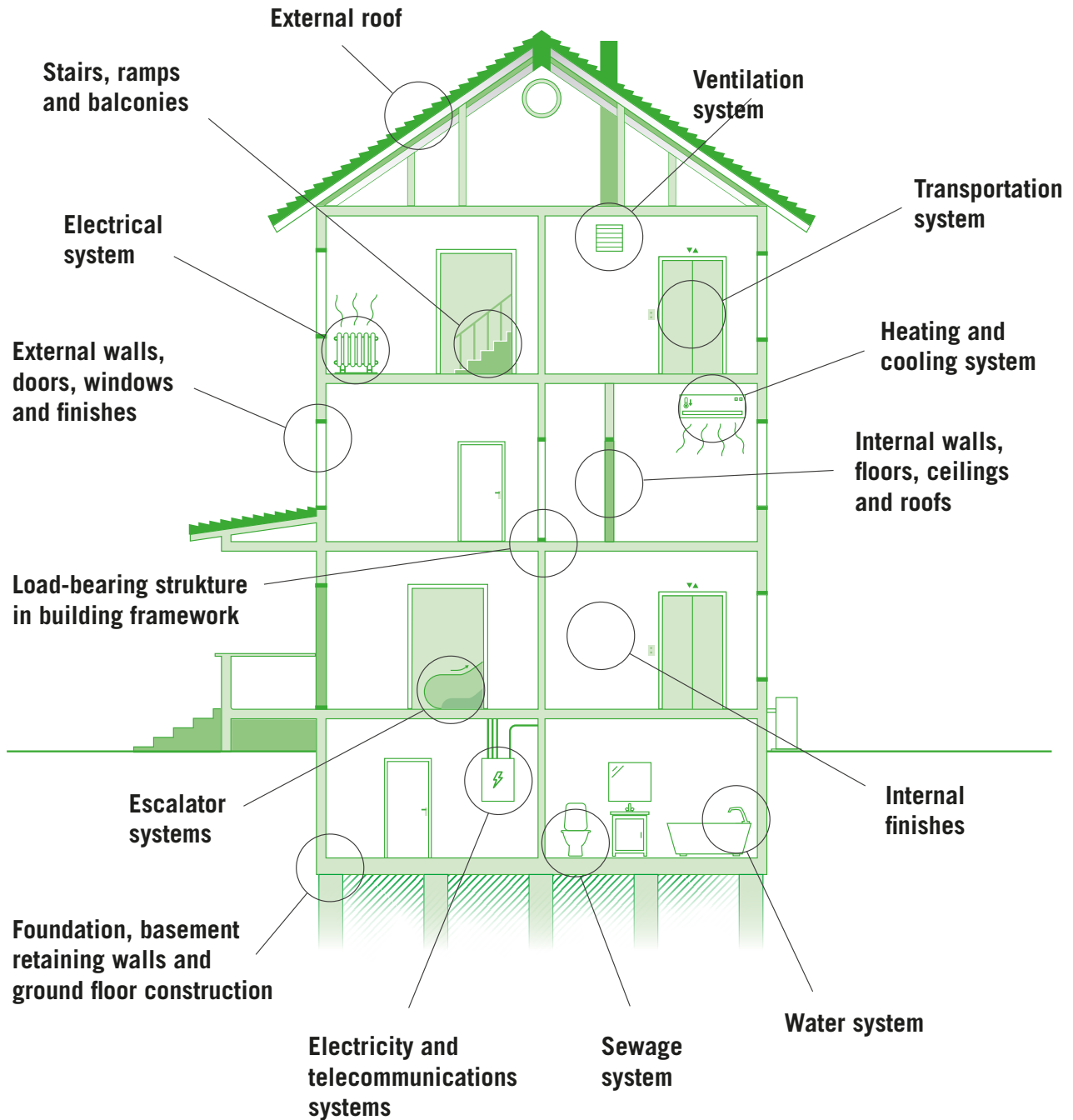


Figure 3 Illustration showing system boundaries for building components included in A1-A3 for calculation according to NollCO₂

NollCO₂ uses Svensk Byggtjänst's BSAB 96 codes for building elements, construction products and building service systems.

Table 1 Building elements, construction products and building service systems that are included and excluded in the NollCO₂ calculations of climate impact A1-A5, B4-B5, and C1-C4 and in the NollCO₂ modelling of baseline.

Building elements and building service systems included in NollCO ₂ calculation	Construction products and building service system components inclusions	Exclusions
<p>BSAB 15 Basic constructions</p>	<p>15.S/11/SB/SC/SE/SF/SG/SH/SJ/SK/SL/ST/SU Basic constructions for houses For example: foundations, piles, pile plinths, pile slabs, pillar sockets, foundation soles, foundation beams, foundation walls, pile decks, and production of crushed rock</p>	<p>15.SZ Other basic constructions for houses</p>
<p>BSAB 27 Bearing structure in the house frame</p>	<p>Above and below ground: 27.A Composite bearing structure in the house frame (can have two main functions at the same time), 27.B Frame interior walls 27.C Frame exterior walls 27.D Pillar frames 27.E Beam frames 27.F Frame floor 27.G Roof and outer joist frames 27.H Supplementary bearing structure in the house frame For example, Horizontal and vertical load-bearing parts, cast and prefabricated inner and outer frame walls, reinforcement, beams, columns, perforated decks, tensile steel, slit plates, press plates, high-profile plates, beam shoes, screws and bolts and other fittings/forging required for steel and wooden frame strength</p>	<p>27.Z Other bearing structures in the house frame</p>
<p>BSAB 41 Climate separation components and extensions in roofs and floor joists</p>	<p>41.A Composite climate-separating components and extensions in roofs and floor joists (can have two main functions at the same time) 41.C Exterior climate screens in roofs and floor joists 41.D Indoor climate screens in roofs and floor joists 41.E Opening extensions in roofs and floor joists 41.F/FB/FC Exterior and interior drainage systems from roofs and floor joists For example, waterproofing moisture barrier, insulation, joists, fittings, and profiles</p>	<p>41.FD/FE/FY Extensions for roofs and floor joists 41.Z Other climate-separating components and extensions in roofs and floor joists Nails, screws, and staples</p>
<p>BSAB 42 Climate separation components and extensions in the outer wall</p>	<p>Above and below ground: 42.A Composite climate-separating components and extensions in the outer wall (can have two main functions at the same time) 42.B Exterior climate screens in outer wall 42.C Interior climate screens in outer wall 42.D Opening additions in outer wall 42.E Exterior wall additions For example, façade cladding, surface layers, fittings, joint materials, sealing strips, windows, doors, sections, and gates</p>	<p>42.Z Other climate-separating components and additions in the outer wall Nails, screws, and staples</p>

<p>BSAB 43 Internal components for room construction</p>	<p>Above and below ground: 43.B Complementary wall structures 43.C Interior walls (other than frame interior walls) and opening additions 43.D Floors and floor openings 43.E Ceilings For example, non-load-bearing walls, subfloors, interior doors and glass sections, interior and suspended ceilings, cast-in-place concrete, joists, fittings, profiles, insulation, putty, plasterboard, other board materials, acoustic boards, joint materials, frames and suspended ceiling structures</p>	<p>43.Z Other components for room construction Nails, screws, and staples</p>
<p>BSAB 44 Internal surface layers</p>	<p>Above and below ground: 44.B Surface layers on floors and stairs 44.C Surface layers on walls 44.D Surface layers on ceiling For example, parquet, wooden floors, plastic carpets, fabric textile carpets, textile tiles, tiles, wallpaper, paint, waterproofing, glue, grout, and putty</p>	<p>44.Z Other inner surface layers Nails, screws, and staples</p>
<p>BSAB 45 House extensions</p>	<p>Above and below ground: 45.BB Balconies 45.BC Walkways 45.BE Entrance stairs 45.CB Internal stairs including stair material, stair cladding, fittings, and railings</p>	<p>45.A Composite house extensions 45.BD Canopy 45.BF Façade ladders 45.BG Windshields 45.BH Ramps 45.Z Other house extensions</p>
<p>BSAB 49 Other components for room construction etc</p>	<p>Above and below ground: 49.B Shaft in house Includes any additional fire discs</p>	
<p>BSAB 52 Water supply</p>	<p>Above and below ground: 52.B Tap water system</p>	
<p>BSAB 53 Wastewater system</p>	<p>Above and below ground: 53.B Sewerage system</p>	<p>53.C Waste collection and vacuuming system 53.D Suction systems for industrial processes 53.E Laundry system</p>
<p>BSAB 54 Fire extinguishing system</p>	<p>Above and below ground: 54.B Water extinguishing system > 54.B/1 Sprinkler system</p>	<p>54.B/2 Water extinguishing system - water mist system 54.B/3 Fire hydrant systems and risers 54.C Foam extinguishing system 54.D Gas extinguishing system</p>

<p>BSAB 55 Cooling system</p>	<p>Above and below ground: 55.B Refrigerant system 55.C Cool media system 55.D Coolant system 55.E Heat transfer system 55.F Recycling system</p>	
<p>BSAB 56 Heating system</p>	<p>Above and below ground: 56.B Hot water system</p>	<p>56.C Steam heating system 56.D Hot oil heating system</p>
<p>BSAB 57 Air handling system</p>	<p>Above and below ground: 57.B General ventilation system 57.C Process ventilation system 57.F Air heating system</p>	<p>57.D Fire gas control system</p>
<p>BSAB 6 Electricity and telecommunications systems</p>	<p>Above and below ground: 61/2 Sewerage system - electrical pipes, cable ladders, electrical ducts, cable culverts 63.B Electricity distribution networks 63.F/FE/FF/FH Lighting and illumination systems 63.H/1/21 Electric heating system</p>	<p>61/1/3/4/5, 63.F/FB/FC/FD/FG/FJ/FK/FL/FM, 63.G Light distribution system 63.H/22/3/4/HB/HG, 64 Telecommunication system</p>
<p>BSAB 7 Transport system</p>	<p>Above and below ground: 71 Lift system 73 Escalator and roller ramp systems</p>	<p>74 Crane system 75 Tube mail systems 76 System with machine-driven gate, gate, door, etc. 78 Other transport systems</p>

In *Table 2* the expected service life values of building elements, construction products and building service systems are listed. Expected service life values are taken from the EU Level(s) project. Read more about EU Level(s) in “NollCO₂ ramverk.pdf” (~NollCO₂ framework) at www.sgbc.se.

Table 2 Expected service life of building elements, construction products and building service systems, from EU Level(s) (translated into BSAB 96 codes).

Building elements, construction products and building service systems	Expected service life
BSAB 15.S Basic constructions for houses BSAB 27 Bearing structure in house frame BSAB 49.B House shaft	60 years
BSAB 43 Internal components for room construction (non-load bearing) BSAB 45 House extensions (non-load-bearing stairs)	30 years
BSAB 41 Climate-separating components and extensions in roofs and floor joists BSAB 42 Climate-separation components and extensions in the outer wall (non-load bearing) BSAB 45 Exterior house additions (balconies, walkways)	30 years (35 years for glass façade elements, 10 years for outer paint layers)
BSAB 44 Internal surface layers	10 years
BSAB 46 Room extensions (permanently installed)	10 years
BSAB 52.B Tap water system	25 years
BSAB 53.B Wastewater system	25 years
BSAB 54.B Water extinguishing system	30 years
BSAB 55 Cooling system	15 years
BSAB 56.B Hot water system	20 years
BSAB 57 Air handling system (air handling unit/AHU) BSAB 57 Air handling system (other)	20 years 30 years
BSAB 61 Sewer system	30 years
BSAB 63 Electric power system (except for BSAB 63. FF/FE/FG/FH)	30 years
BSAB 63.FF/FE/FG/FH Lighting and illumination systems	15 years
BSAB 64 Telecommunication system	15 years
BSAB 71 Lift system BSAB 73 Escalator system and roller ramp system	20 years



5. INDICATORS

BASE



BASE

1 Complementary certification

Purpose

NollCO₂ shall be used in concert with a complementary building-level sustainability certification.

Assessment scope

A NollCO₂ building shall have a complementary building-level sustainability certification.

Criteria**1.1 Complementary building certification**

- The project shall certify the building according to one of the following complementary certifications at the specified minimum level:
 - Miljöbyggnad minimum level Silver
 - BREEAM-SE minimum level Very Good
 - LEED minimum level Gold
 - Nordic Ecolabelling (Svanen) of single-family homes, apartment buildings and buildings for schools and preschools 089.

Method

Occupancy (s) and their respective BTA, above and below ground, in the building are declared upon registration.

Reporting requirements**Preliminary certification**

- | | |
|-----|---|
| 1.1 | Projects report the following: <ul style="list-style-type: none"> • Certificate of registration for one of the complementary certifications in method 1.1 |
|-----|---|

Verification

- | | |
|-----|--|
| 1.1 | Projects report the following: <ul style="list-style-type: none"> • Statement that the complementary certification is targeting the minimum level according to method 1.1 and will provide evidence of full certification with the first reporting period. |
|-----|--|

Follow-up Reporting

- | | |
|-----|---|
| 1.1 | Projects report the following: <ul style="list-style-type: none"> • For the first reporting period (5 years after verification), evidence of achievement of complementary certification is provided. The certificate must show that the minimum level or higher according to method 1.1 has been achieved • Declaration that the complementary certification has not been revoked during the validity of the certification |
|-----|---|

BASE

2 Legal requirements for chemical content, timber, and wood products

Purpose

To ensure that building elements, construction products and building service systems, in addition to having a low climate impact, also meet legal requirements for chemical contents and for legal harvest of timber and wood products.

Assessment scope

Building elements, construction products and building service systems must meet legal requirements for chemical content and legal harvest of timber and wood products according to EU regulations.

Criteria

2.1 Chemical products and goods

- Building elements, construction products and building service systems comply with laws and regulations that apply to chemical products and goods according to the Swedish Chemicals Agency (KEMI)

2.2 Timber and wood products

- Timber and wood products in the project meet the requirements of the EU Timber Regulation

Method

2.1 Chemical products and goods

The Swedish Chemicals Agency's <https://www.kemi.se/lagar-och-regler> describes laws and regulations applicable to chemical products and goods in Sweden.

2.2 Timber and wood products

Timber and wood products must meet the requirements of the EU Timber Regulation; please refer to the Swedish Forest Agency's website <https://www.skogsstyrelsen.se/lag-och-tillsyn/timmerforordningen/> for applicable products. Products with a FLEGT licence and products covered by CITES are exempt from the requirements of the EU Timber Regulation.

Reporting requirements

Preliminary certification

2.1	A written declaration from the project that building elements, construction products and building service systems to be procured comply with laws and regulations that apply to chemical products and goods according to the Swedish Chemicals Agency (KEMI). Any planned exceptions are described in an appendix to the declaration
2.2	A written declaration from the project that the project's planned procurement of timber and wood products will meet the requirements of the EU Timber Regulations

Verification

2.1	A written declaration from the building owner that the building elements, construction products and building service systems procured comply with laws and regulations that apply to chemical products and goods according to the Swedish Chemicals Agency (KEMI). Any exceptions implemented are described in an appendix to the declaration
2.2	A written declaration from the building owner that the timber procured for the building and the wood products procured meet the requirements of the EU Timber Regulations

Follow-up Reporting

2.1	Same as for verification
2.2	Same as for verification

5. INDICATORS

CLIMATE IMPACT OF BUILDINGS



CLIMATE IMPACT OF BUILDINGS

3 Product stages A1-A3

Purpose

To calculate and limit the climate impact associated with the manufacture of building elements, construction products and building service systems used for the construction of the building.

Assessment scope

The climate impact of the products under stage A1-A3 shall be less than the project's limit value for climate impact for A1-A3.

Criteria**3.1 Climate impact of the products stage A1-A3**

- The climate impact of products under stage A1-A3 shall not exceed the project-specific limit value expressed in kgCO₂e/m² BTA as confirmed at project registration

Method**3.1 Climate impact of product stage A1-A3**

Upon registration, SGBC will calculate a baseline and a limit value for the products stage A1-A3. These values are based on the following:

1. Building business type(s) and per business type:
 - Below-grade BTA, called dark BTA
 - Above-grade BTA, called light BTA
 - Number of storeys above ground
 - Number of garage storeys above grade
 - Number of below-grade garage storeys
 - Number of stairwells in the building
2. Thickness of the basement slab or slab-on-grade
3. Proportion of load-bearing inner wall versus outer wall in the below-grade garage floor
4. Thickness of outer wall in the below-grade garage floor

Baseline (kgCO₂e/m² BTA), climate impact of a building type is adjusted according to the information from A1-A3 in the project, and is calculated by SGBC.

The limit value for A1-A3 (kgCO₂e/m² BTA) is calculated as follows:

$$\text{climate impact of dark BTA}_{\text{baseline}} + 0,7 \cdot \text{climate impact of light BTA}_{\text{baseline}}$$

Based on this baseline and limit value, the project can analyse and calculate whether it meets the NollCO₂ certification requirements for A1-A3 before proceeding with a preliminary certification.

The building elements, construction products and building service systems to be included in the calculation of A1-A3 are shown in *Table 1* under **System boundaries > Building**.

The climate impact of each construction product and building service system is factored based on the component's climate data (kgCO₂e/kg) and respective quantity (kg).

When the project has not specified a particular construction product or building service system or where an EPD is unavailable, calculations rely on *generic climate data*.

1. Where possible, the **Swedish National Climate Database** shall be used
 - 1.1 Until the Swedish National Board of Housing, Building and Planning has published its National Climate Database (January 2021), national climate data may be retrieved from the “Construction Sector Environmental Reporting Tool” (“Byggsektorns MiljöBeräkningsverktyg”). Any licence fees for the use of climate data from the “Construction Sector Environmental Reporting Tool” are the responsibility of the project
 - 1.2 National generic climate data from equivalent construction product or building service systems may be used
2. If there is no suitable national climate data, climate data for the corresponding construction product or building service system can be retrieved from:
 - 2.1 Ökobaudat climate database (<https://www.oekobaudat.de/>)
3. If there is no equivalent construction product or building service system in the national climate database nor in Ökobaudat, a simplified LCE analysis can be performed based on:
 - 3.1 Information on constituent material and its quantities from a building product declaration (Byggvarudeklaration, BVD) for an equivalent construction product or building service system
 - 3.2 Climate data for included materials such as 1) national climate data, or if national climate data are missing 2) Ökobaudat’s climate data

For reporting the climate impact of construction products with integrated technology for on-site energy production, the system limits described in the section *System boundaries > Building* shall apply.

If the project **has specified** a certain construction product or building service system and the manufacturer offers an EPD, the project shall use climate data (GWP-GHG) in the EPD provided that

1. The EPD has been produced in accordance with the standard SS-EN 15804: 2012 + A2: 2019 (alternatively for EPDs older than 2019, SS-EN 15804: 2012 + A1: 2013) and PCR 2019:14 Construction products
2. The climate data retrieved from the EPD shall be the climate impact GWP-GHG (without biogenic carbon) defined in PCR 2019:14 Construction products. GWP-GHG is equated with the GWP indicator in EN 15804:2012 + A1: 2013
3. The EPD is valid

If the project reuses construction products and/or building service systems, the climate impact under A1-A3 is the climate impact attributable to the transport of recycled construction products or building service systems from its place of origin to the construction site, and the climate impact of the processes to restore the reused construction product or building service system to usable condition.

- Climate data of the reused construction product or building service system is reported as LCE calculated climate data in NollCO₂'s reporting tool:
 - Climate data for transport according to the Method section in *Indicator 4*
 - Climate data for energy use in restoration processes according to the Method section in *Indicator 6*

The project may use any LCA tool, but for reporting, nationally generic/EPD/LCE climate data together with quantities and information on EPD/LCE and the supplier is specified in SGBC’s reporting tool.

- The project needs to transfer climate data from the national climate database/EPD/Ökobaudat in parallel with the transfer of quantities from the LCA and/or design tools into the SGBC reporting tool

The expected service life values of the construction products and building service systems in the reporting tool are taken from EU Level(s) and should not be revised by the project, see **Table 2**.

Reporting requirements

Preliminary certification

3.1	<p>Reporting tool "NollCO₂ Klimatpåverkan Certifiering.xlsx" with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab "Data A1_C4": <ul style="list-style-type: none"> ◦ The project design's building elements, construction products and building service systems, or their equivalent component in the national climate database or Ökobaudat, and their climate and transport data • In the tab "A1_C4": <ul style="list-style-type: none"> ◦ For each building element, construction product and building service system, selected from the tab "Data A1_C4", given names used in the project and, if decided, the intended supplier ◦ Quantity (tonnes) of the building element, construction product and building service system ◦ Conversion interval and scope for the building element, construction product and building service system • In the tab "Sammanfattning": <ul style="list-style-type: none"> ◦ The project's BGO identification number obtained upon registration ◦ The year in which the building is estimated to be completed ◦ Total light BTA of the building in m² ◦ Total dark BTA of the building in m² ◦ Limit value A1-A3 obtained upon registration
	<p>Report "NollCO₂ Klimatpåverkan rapport.docx" with the following details from the project:</p> <ul style="list-style-type: none"> • Sections "Byggsdelar A1-A3" and "Resultat > Klimatpåverkan sammanställning A1-A3, A4-A5, B1-B5 and C1-C4"
	<p>If LCE has been done:</p> <ul style="list-style-type: none"> • LCE calculation(s) with a report of which building product declaration (BVD) and which climate data has been used for materials included in the BVDs
	<p>The following drawings:</p> <ul style="list-style-type: none"> • Façade drawings for the building's façades • Floor plans drawings for the building's floor plans

Verification

3.1	<p>Reporting tool “NollCO₂ Klimatpåverkan Certifiering.xlsx” with the following project information specified based on the finished building:</p> <ul style="list-style-type: none"> • In the tab “Data A1_C4”: <ul style="list-style-type: none"> ◦ Extension/updating of materials/products/systems and their climate and transport data • In the tab “A1_C4”: <ul style="list-style-type: none"> ◦ Name of material/products/system used in the project and supplier ◦ Quantity (tonnes) of the building material/product/system <ul style="list-style-type: none"> ▪ Upon verification, quantities are sourced from relational documents ◦ Planned conversion intervals and scope for the material/product/system • In the tab “Sammanfattning”: <ul style="list-style-type: none"> ◦ The year the building was completed ◦ Aboveground BTA in m² ◦ Underground BTA in m²
	<p>Report “NollCO₂ Klimatpåverkan rapport.docx” with the following details by the project:</p> <ul style="list-style-type: none"> • Sections “Byggsdelar A1-A3” and “Resultat > Klimatpåverkan sammanställning A1-A3, A4-A5, B1-B5 and C1-C4” for modules A1-A3 based on the outcome of the completed building
	<p>If LCE has been done:</p> <ul style="list-style-type: none"> • LCE calculation(s) with a report of which building product declaration (BVD) and which climate data has been used for materials included in the BVDs
	<p>The following drawings for the completed building:</p> <ul style="list-style-type: none"> • Façade drawings for the building’s façades • Floor plans for the building’s floor plan

Follow-up Reporting

3.1	<p>There is no follow-up reporting required for Indicator 3. Construction products and building service systems that are procured/replaced during the use of the building are reported in Indicator 5</p>
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CLIMATE IMPACT OF BUILDINGS

4 Construction stage A4-A5

Purpose

To calculate and reduce the climate impact of the transport of building elements to the construction site, transport of construction equipment to and from the construction site, and construction processes at the construction site, with the aim of influencing the project's suppliers and contractors to develop transport methods and construction processes with lower climate impact.

Assessment scope

Climate impact of transport of building elements, construction products and building service systems to the construction site, transport of construction equipment to and from the construction site, and construction processes at the construction site.

Criteria**4.1 Climate impact transport A4 and construction processes A5**

- The climate impact of A4-A5 shall not exceed the limit value of 55 kgCO₂e/m² BTA

Method**4.1 Climate impact A4-A5**

In the reporting tool "NollCO₂ Klimatpåverkan Certifiering.docx", the project specifies climate and transport data for:

- A4 Transport
 - A4.1 encompasses transport of building elements, construction products and building service systems from the factory gate to the construction site
 - A4.2 encompasses transport of construction equipment for use on construction site, to and from the construction site
 - Generic transport distance values from the tool "Byggsektorns MiljöBeräkningsverktyg" can be used in A4.1. Any license costs are paid by the project
 - For both A4.1 and A4.2, calculations/ estimations of distance per planned mode of transport between factory gate/ storage location and construction site can be provided instead of actual transportation distances
 - Climate data for transport are to be declared in kgCO₂e/tkm: a product with 1 kgCO₂e/tkm has a climate impact of 1 kgCO₂e per 1,000 kg of shipped product and per km. The following table specifies climate data for different means of transport:

Means of transport	kgCO ₂ e/tkm
Truck with trailer 50-60 tonnes (EU)	0,064
Truck with trailer 34-40 tonnes (EU)	0,071
Truck 20–26 tonnes (EU)	0,13
Truck 7.5–12 tonnes (EU)	0,23
Flights, 785–3,600 km (continental)	1,0

Train, diesel (SW/FI)	0,022
Train, electric (SW/FI energy use. + Swedish electricity mix 2018)	0,00977

Source: NTM - Network for transport measures, Default and benchmark transport data

- If the project wants to report its own climate data for transport
 - Project-specific data for emissions from transport shall be based on actual measurements of energy use and transport distances, including any empty runs / empty returns. The emissions of carbon dioxide equivalents coming from energy use must be reported with full quality assurance and well-to-wheel from a life-cycle perspective. Examples of reporting methods of high scientific quality are SS EN 16258, NTM - Network for transport measures or data from HBEFA.
 - The method and basis for emission data must be reported, including sources, delimitations, and assumptions, unless one of the above accounting methods is used.
- A5 Construction processes
 - A5.1 Waste resulting from installation of and construction processes using materials / products / systems included in A1-A3
 - The climate impact of A5.1 includes generation of waste, transport from the construction site and waste disposal
 - Default values: waste for larger building service systems can be set to 0%. Waste for individually purchased products that are not further processed at the construction site (doors, windows, etc.) can be set at 2%. Waste for construction products that are used in large quantities and that are further processed on site (gypsum boards, wood, pipes, cables, etc.) can be set to 10%. Other waste can be set at 5%.
 - Climate data from “Ökobaudat” (<https://www.oekobaudat.de/>) for waste / final disposal of materials / products / systems may be used
 - If a product’s EPD provides information on C1-C4, these values can be used as climate data for waste handling
 - A5.2 Materials that are only used during the construction process, including production, transport, and waste / final disposal
 - Applicable to products used for the construction and / or assembly of building elements “BSAB 16 bearing structures”, and which are subsequently disposed of as waste
 - Climate data from “Ökobaudat” (<https://www.oekobaudat.de/>) for waste / final disposal of materials / products / systems may be used.
 - If a product’s EPD provides information on C1-C4, these values may be used as climate data for waste handling
 - A5.3 Energy use at the construction site
 - Amount of energy / fuel (MWh or m³) used at the construction site
 - If EPDs are available for planned and / or signed energy contracts, this climate data shall be reported
 - Thermal values (MWh / m³) and mobile emission factors (kgCO₂e / MWh) for fuel use shall reference the Swedish Energy Agency’s figures

- A5.4 Water use at the construction site
 - The volume of water (m³) that is planned for use/ has been used at the construction site is to be reported
 - If EPDs are available for planned and/or signed water delivery contracts, this climate data shall be reported

Reporting requirements

Preliminary certification

4.1	<p>Reporting tool “NollCO₂ Klimatpåverkan Certifiering.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab “Data A1_C4”: <ul style="list-style-type: none"> ◦ Waste that arises from installation or construction processed at the construction site, reported as (%) of amount of building element, construction product or building service system declared in the product stage A1-A3 ◦ Transport distances and climate data for the modes of transport planned to transport the building elements, construction products or building service systems to the construction site from the factory gate. Calculation/estimation of distance per planned mode of transport between factory gate and construction site for delivered building components A1-A3 is accepted ◦ Climate data for waste/final disposal of building elements, construction products or building service systems in module A5. • In the tab “A4.2”: <ul style="list-style-type: none"> ◦ Quantity (tonnes) of construction site accommodations and heavier construction equipment erected on the construction site (cranes, scaffolding, etc.) and transported to and from the construction site ◦ Transport distance (km) per mode of transport for construction sheds and construction equipment • In the tab “Energi och vatten A5.3_4”: <ul style="list-style-type: none"> ◦ Planned energy/fuel use per energy source ◦ Planned water use ◦ EPD identification and its climate data for planned energy and water contracts, if available <p>Reporting tool “NollCO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “Byggproduktion A4-A5>Sammanfattning Klimatpåverkan av transporter A4.1/2 och byggprocesser A5.1/2/3/4” is completed with information from “NollCO₂ Klimatpåverkan Certifiering.xlsx”: <ul style="list-style-type: none"> ◦ From the tab “A1_C4”: <ul style="list-style-type: none"> ▪ The summary per BSAB 96 code for A4.1, A5.1 and A5.2 ◦ From the tab “A4.2”: <ul style="list-style-type: none"> ▪ Climate impact for transport to and from the construction site of construction equipment ◦ From the tab “Sammanfattning”: <ul style="list-style-type: none"> ▪ Summary climate impact “Energi användning byggarbetsplatsen A5.3” ▪ Summary climate impact “Vatten användning byggarbetsplats A5.4” ▪ Summary climate impact “A4-A5 Byggproduktion” • The table under the heading “Strategier för att minska klimatpåverkan av byggproduktion A4-A5” is completed with the project’s planned strategies for reducing climate impact of A4-A5.
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Verification

4.1	<p>Reporting tool “NollCO₂ Klimatpåverkan Certifiering.xlsx” with the following project information specified based on the actual outcome:</p> <ul style="list-style-type: none"> • In the tab “Data A1_C4”: <ul style="list-style-type: none"> ◦ Waste that arose because of installation or construction processed at the construction site, reported as (%) of amount of building element, construction product or building service system declared in the product stage A1-A3 ◦ Transport distances and climate data for the modes of transport used to transport the building elements, construction products or building service systems to the construction site from the factory gate. Calculation/estimation of distance per type of transport used between factory gate and construction site for delivered building parts A1-A3 is accepted ◦ Climate data for waste/final disposal of building elements, construction products or building service systems in module A5.2 • In the tab “A4.2”: <ul style="list-style-type: none"> ◦ Quantity (tonnes) of construction site accommodation and heavier construction equipment erected on the construction site (cranes, scaffolding, etc.) and transported to and from the construction site ◦ Transport distance (km) per mode of transport for construction sheds and construction equipment • In the tab “Energi och vatten A5.3_4”: <ul style="list-style-type: none"> ◦ EPD identification and its climate data for signed energy and water contracts, if available ◦ The <i>measured</i> energy/fuel use of construction production per energy source ◦ <i>Measured</i> water use of construction production
	<p>Reporting tool “NollCO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “Byggproduktion A4-A5>Sammanfattning Klimatpåverkan av transporter A4.1/2 och byggprocesser A5.1/2/3/4” is completed with information from “NollCO₂ Klimatpåverkan Certifiering.xlsx”: <ul style="list-style-type: none"> ◦ From the tab “A1_C4”: <ul style="list-style-type: none"> ▪ The summary per BSAB 96 building element for A4.1, A5.1 and A5.2 ◦ From the tab “A4.2”: <ul style="list-style-type: none"> ▪ Climate impact A4.2 ◦ From the tab “Sammanfattning”: <ul style="list-style-type: none"> ▪ Summary climate impact “Energianvändning byggarbetsplatsen A5.3” ▪ Summary climate impact “Vattenanvändning byggarbetsplats A5.4” ▪ Summary climate impact “A4-A5 Byggproduktion” • The table under the heading “Strategier för att minska klimatpåverkan av byggproduktion A4-A5” is completed with the project’s strategies that have been followed up to certification to reduce the climate impact of A4-A5

Follow-up Reporting

4.1	There is no follow-up reporting for Indicator 4
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CLIMATE IMPACT OF BUILDINGS

5 Use stage B1-B5

Purpose

To increase knowledge and awareness of the climate impact of construction materials used for replacement and refurbishment during the building's use stage.

Assessment scope

Climate impact of refurbishing and replacing building elements, construction products and building service systems.

Criteria**5.1 B4 Replacement**

- Report the climate impact of replacing building elements, construction products and building service systems over the building's 50-year service life

5.2 B5 Refurbishment

- Report the climate impact of refurbishments over the building's 50-year service life

Method

The modules "B1 Installed products in use", "B2 Maintenance" and "B3 Repair", are difficult to forecast and are expected to have a marginal climate impact as compared to modules B4 and B5; as such, B1-B3 have been excluded from the criteria and reporting requirements.

5.1 "B4 Replacement"

- The reporting tool "NollCO₂ Klimatpåverkan Certifiering.xlsx" calculates a forecast for the climate impact B4, referencing:
 - The expected service life of building elements from the EU Level(s) framework, construction products and building service systems; reported quantities in the product stage A1-A3; transport impact A4; and climate data for waste/final disposal for A5.1/2
 - An assumption that building elements, construction products and building service system are replaced with the same amount (weight) as is removed
- The forecast for climate impact B4 is based on the waste processing of the disposed construction product/building service system plus the climate impact of the manufacture, transport, and installation of the new construction product/building service system. Climate data for manufacturing, transport and installation and waste processing are interpolated to zero in 2050, as Sweden and the EU will be climate neutral in 2050
- The follow-up reporting tool "NollCO₂ Klimatpåverkan Återrapportering.xlsx" uses the forecast for B4 from the tool "NollCO₂ Klimatpåverkan Certifiering.xlsx", but allows the project to update the forecast with actual results for what has been replaced and what has been built in.

5.2 "B5 Refurbishment"

- The reporting tool "NollCO₂ Klimatpåverkan Certifiering.xlsx" calculates a forecast for climate impact B5, referencing:
 - Expected refurbishment intervals and extent of refurbishment, reported quantities in the products stage A1-A3, transport impact A4 and climate data for waste processes in A5.1/2
 - The extent of the refurbishment is expressed as a percentage of the construction products/building service system to be replaced, for example 20% of interior partitions will be replaced every five years
 - The assumption that replacement of building elements, construction products and building service systems correspond with as-built conditions

- The forecast for the climate impact of B5 is based on the waste processing of the disposed construction product/building service system plus the climate impact of the manufacture, transport, and installation of the new construction product/building service system. Climate data for manufacturing, transport and installation and waste processing are interpolated to zero in 2050, as Sweden and the EU will be climate neutral in 2050
- The follow-up reporting tool “NollCO₂ Klimatpåverkan Återrapportering.xlsx” uses the forecast for B5 from the tool “NollCO₂ Klimatpåverkan Certifiering.xlsx”, but allows the project to update the forecast with actual results for what has been demolished/ dismantled and what has been built in.

Reporting requirements

Preliminary certification

5.1	<p>Reporting tool “NollCO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “B4 Replacement” based on information from “NollCO₂ Klimatpåverkan Certifiering.xlsx”: <ul style="list-style-type: none"> ◦ From the tab “A1_C4”: <ul style="list-style-type: none"> ▪ The B4 preliminary certification summary, per BSAB 96 building element ◦ From the tab “Sammanfattning”: <ul style="list-style-type: none"> ▪ Summary of ”B4 Ersättning byggdelar” for preliminary certification
5.2	<p>Reporting tool “NollCO₂ Klimatpåverkan Certifiering.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab “A1_C4”: <ul style="list-style-type: none"> ◦ Reconstruction interval (years) for the building element/construction product/building service system ◦ The percentage of the building element/construction product/building service system that is rebuilt at the reconstruction interval
	<p>Reporting tool “NollCO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “Ombyggnad B5” based on information from “NollCO₂ Klimatpåverkan Certifiering.xlsx”: <ul style="list-style-type: none"> ◦ From the tab “A1_C4”: <ul style="list-style-type: none"> ▪ Summary per BSAB 96 building element for B5 for preliminary certification ◦ From the tab “Sammanfattning”: <ul style="list-style-type: none"> ▪ Summary of ”B5 Ombyggnad byggdelar” for preliminary certification

Verification

5.1	<p>Reporting tool “NollCO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “B4 Replacement” based on information from “NollCO₂ Klimatpåverkan Certifiering.xlsx”: <ul style="list-style-type: none"> ◦ From the tab “A1_C4”: <ul style="list-style-type: none"> ▪ Summary per BSAB 96 building element for B4 for verification ◦ From the tab “Sammanfattning”: <ul style="list-style-type: none"> ▪ Summary of ”B4 Ersättning byggdelar” for verification
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5.2	<p>Reporting tool “NoIICO₂ Klimatpåverkan Certifiering.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab “A1_C4”, if updated: <ul style="list-style-type: none"> ◦ Reconstruction interval (years) for the building element/construction product/building service system ◦ The percentage of the building element/construction product/building service system that is rebuilt at the reconstruction interval
	<p>Reporting tool “NoIICO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “Ombyggnad B5” based on information from “NoIICO₂ Klimatpåverkan Certifiering.xlsx”: <ul style="list-style-type: none"> ◦ From the tab “A1_C4”: <ul style="list-style-type: none"> ▪ The B5 certification summary, per BSAB 96 building element ◦ From the tab “Sammanfattning”: <ul style="list-style-type: none"> ▪ Summary of ”B5 Ombyggnad byggdelar” for verification

Follow-up Reporting

5.1 & 5.2	<p>Reporting tool “NoIICO₂ Klimatpåverkan Återrapportering.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • At the first instance of follow-up reporting: <ul style="list-style-type: none"> ◦ In the tab “Data B4_B5_C1_4”, information is retrieved from “NoIICO₂ Klimatpåverkan Certifiering.xlsx” on: <ul style="list-style-type: none"> ▪ The climate, and transport data for the product stage A1-A3 as reported at verification ◦ In the tab “B4_B5_C1_4”, information is retrieved from “NoIICO₂ Klimatpåverkan Certifiering.xlsx” on: <ul style="list-style-type: none"> ▪ The quantities and suppliers for the product stage A1-A3 as reported at verification ▪ Forecast for B4 ▪ Forecast for B5 ◦ In the tab “Sammanfattning”: <ul style="list-style-type: none"> ▪ Project BGO identification number ▪ Year when the building was verified [YYYY] ▪ The building’s BTA ▪ Follow-up reporting year • All upcoming follow-up reporting instances: <ul style="list-style-type: none"> ◦ In the tab “Sammanfattning”: <ul style="list-style-type: none"> ▪ Follow-up reporting year ◦ In the tab “Data B4_5_C1_4”: <ul style="list-style-type: none"> ▪ Climate and transport data for built-in building element/construction product/building service system not previously used in the building
5.1	<p>Reporting tool “NoIICO₂ Klimatpåverkan Återrapportering.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab “B4_5_C1_4”: <ul style="list-style-type: none"> ◦ Amount of demolished/dismantled building element/construction product/building service system for the year(s) in which the replacement took place ◦ Amount of built-in building element/construction product/building service system for the year(s) in which the build-in took place

5.2

Reporting tool “NoIICO₂ Klimatpåverkan Återrapportering.xlsx” with the following project information specified:

- In the tab “B4_5_C1_4”:
 - Quantity of demolished/dismantled building element/construction product/building service system for the year(s) in which the refurbishment took place
 - Built-in building element/construction product/building service system for the year(s) in which the refurbishment took place

CLIMATE IMPACT OF BUILDINGS

6 Building energy use B6

Purpose

To design and construct buildings for low energy use and corresponding low climate impact.

Assessment scope

The building's energy performance and climate impact of energy use.

Criteria**6.1 Building energy use**

- The building's energy performance shall achieve Energy Class B or better (as defined by the Swedish National Board of Housing, Building and Planning (BBR))
- The building's energy performance shall be maintained as verified annually

6.2 Energy production on the property

- Of the energy produced on the property, only that qualifying as renewable (see *method 6.2*) may be used to supply the NollCO₂ building

6.3 Measurement plan

- A measurement plan is developed for the building's energy use and production

6.4 Climate impact of the building's energy use

- The climate impact of the building's energy use is calculated and reported

Method**6.1 Building's energy use**

Calculation for preliminary certification

- The National Board of Housing, Building and Planning's, BBR:s, seven energy classes A-G are based on percentage deviations, positive and negative, from the code-mandated building energy performance. The code-mandated energy performance is specified in the BBR and depend on the type of building, whether it is electrically heated or not, and where in Sweden it is located.
- Energy class B corresponds to a building energy performance (EP_{pet}) 25–50% lower than the code mandated energy performance of the building
- The project building's code mandated energy performance is specified by the BBR version that applies when applying for building permit
- The building's energy performance according to BBR is calculated for energy delivered to a building for heating (E_{uppv}), comfort cooling (E_{kyl}), hot water (E_{tw}) and operational electricity demand (E_p) together with a geographical weighting factor and a factor for the energy provider.
- When designing for the building's energy performance, a margin of safety is recommended to ensure that the building's energy performance requirement will be met in the verification stage
- Calculations shall be performed based on the local climate, normal indoor temperature, normal use of domestic hot water and ventilation
- Tenant energy use (process energy) *is not included* in the building's energy use for the purposes of *Indicator 6*

- The energy use for shared garages shall be distributed according to the A_{temp} of the buildings sharing the garage. In mixed-use buildings, the energy requirements are weighted according to the tenants' respective A_{temp}

Calculation/measurement during verification/follow-up reporting

- The BBR version in effect at the time of building permit shall apply. The BBR requirement for a building's energy use during normal use and a normal year (BEN) shall be applied during the verification stage
- The building's energy use is verified by measuring the building's energy use over a continuous 12-month period, completed no later than 24 months after the building has been put into operation
 - Measurement shall take place according to the measurement plan developed under *method 6.3*
 - To meet the energy performance requirement, it is recommended that first-year operation be used for optimisation and the subsequent year for verification
 - To analyse the building's energy performance and correct for normal usage it may be necessary to account for the number of occupants. New tenants and occupants (proportion of space leased) shall be noted monthly during the verification period. Correspondingly, operating hours and occupancy types should be noted monthly during the verification period
 - The measurement period should reflect intended activities and normal operation
- The energy calculation shall be revised to correspond with the building's measured energy use
- During the reporting period, logged measured data compared with real-time measurements shall be used to identify operational deficiencies
 - If it is determined that the building's energy performance cannot be achieved for the reported year, the cause and planned measures must be documented and reported

6.2 Energy production on the property

- Renewable energy production includes:
 - Solar energy
 - Wind power
 - Bioenergy
 - Geothermal energy
 - Solar thermal energy
 - Free cooling

6.3 Measurement plan

- The building measurement plan includes address information on the building
- The measurement plan shall be structured in accordance with the Sveby programme's "Measurement instructions version 2.0" (10.06.2020)
- The measurement plan shall include information on meters for the following energy types, for calculation of the building's energy use climate impact:
 - Delivered district heating (this includes delivered waste heat from neighbouring properties or other external suppliers)
 - Delivered district cooling
 - Delivered electricity for operational energy use
 - Delivered electricity for tenant (process) electricity use
 - Energy production installed on the property per energy type

- Use of self-produced energy in the building per energy type
- Renewable electricity delivered to the electricity grid by production source (solar power, wind power, etc.)
- The measurement plan shall detail meters installed to cross-reference with billing meters; for example, to distinguish base-building energy from tenant/ household energy
- The measurement plan shall describe the ID, location, type (energy, temperature) and monitoring (manual or automatic) of all meters
- The measurement plan shall state the metering frequency (minimum monthly)
- The measurement plan shall contain a visualisation of how the measurement system is connected
- During commissioning, the measurement plan shall be verified, the function of the meters checked, the reporting of automatically meters to the system's database confirmed, and the manual entering of non-automated meter values in the system's database verified.
- Monthly reports shall show that measured values have been registered, and that data is being collected in the system's database. Monthly reports shall include:
 - Monthly compilation of measured values
 - Energy performance deviations, planned corrective measures, and adjustments implemented to address deficiencies

6.4 Climate impact of the building's energy use B6

- Climate impact is calculated on an annual basis
- If the project **has not signed** an energy contract, or where an EPD is not available, generic climate data are used based on the life cycle climate impact of energy production
 - For energy contracts:
 - Electricity contract 22 kgCO₂e/MWh
 - District heating contract 60 kgCO₂e/MWh
 - District cooling contract 60 kgCO₂e/MWh
 - For renewable energy production financed by the building developer or owner, and where production technology is not an integrated component, the following IPCC 2014 values are used:
 - Solar power 41 kgCO₂e/MWh
 - Wind power 12 kgCO₂e/MWh
 - Bioenergy 40 kgCO₂e/MWh
 - For reporting the climate impact of construction products with integrated technology for energy production, system boundaries for reporting in A1-A3 versus B6 are described in the section *System boundaries > Building*
- If the project has signed an energy contract or has engaged a supplier of waste heat or technology for its own production of renewable energy, the following applies:
 - Where the supplier offers an EPD, the project can use the climate data in that EPD provided that the EPD has been produced in accordance with "Product Category Rules, PCR 2007:08 version 3.0 CPC 171 & 173: Electricity, Steam, and Hot and Cold Water Generation and Distribution", "General Programme Instructions for Environmental Product Declarations, Ver.2.5", ISO 14025 and ISO14044 or later versions thereof

- Where the supplier’s electricity contract is certified Bra Miljöval by the Swedish Society for Nature Conservation:
 - Bra Miljöval Wind 14,8 kgCO₂e/MWh
 - Bra Miljöval Water 8,6 kgCO₂e/MWh
 - Bra Miljöval Solar 30,5 kgCO₂e/MWh
- Waste heat used for building heating is calculated and reported in accordance with its original energy carrier
 - Waste heat from an external supplier, such as a neighbouring property, is reported as externally delivered waste heat according to the amount of energy and climate data for the energy supplier generating the waste heat. Information about these is obtained from the supplier

Reporting requirements

Preliminary certification

6.1	<p>Energy calculation report containing information on:</p> <ul style="list-style-type: none"> • The energy expert (name, employer, contact information, brief CV) who compiled the report on the building’s energy performance • The building’s energy performance and requirements for energy performance for Energy Class B or better for the building type • Calculation of additional airflow must be reported and justified • Used energy calculation program • Input data for energy calculation. This includes the building’s location, internal loads, climate screen, ventilation, heating, comfort cooling, etc. • Calculation results broken down by heating, ventilation air heating, hot water use, HVAC, comfort cooling, property electricity and resulting electricity for operations • Energy use for any garages • Supplied energy from on-site renewable energy sources, for example solar cells or solar collectors • Distribution and regulatory losses as well as safety margin • Review signature of the responsible project manager for: <ul style="list-style-type: none"> ◦ HVAC ◦ Electricity and telecommunications technology ◦ Construction ◦ Architecture ◦ Prefabricated building elements
6.2	<p>Report indicating:</p> <ul style="list-style-type: none"> • Planned renewable electricity production per production type in method 6.2 • Installation date for the renewable energy production that is planned to be installed on the property <ul style="list-style-type: none"> ◦ Installation date for renewable electricity production must not be before the project registration date if the project wants to use the renewable electricity production as a climate action in Indicator 9
6.3	Measurement plan, draft

6.4	<p>Reporting tool “NollCO₂ Balansberäkning.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab ”Nettonoll balans”: <ul style="list-style-type: none"> ◦ Project BGO identification ◦ Completed design, year ◦ Completed building, year ◦ BTA of the building ◦ Limit value climate impact A1-A3, obtained upon approved registration • In the tab ”Användning och energiproduktion” planned values for the years ahead for: <ul style="list-style-type: none"> ◦ Energy delivered to the building ◦ Energy produced on-site ◦ Use of energy in the building ◦ Renewable electricity delivered to the electricity grid ◦ EPD numbers, if EPDs are available for the planned energy contracts/technology suppliers <p>Declaration of intent from energy supplier to produce EPD prior to verification, if supplier-specific climate data is invoked and EPD is missing in preliminary certification</p> <p>Reporting tool “NollCO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “Energianvändning B6” is completed with: <ul style="list-style-type: none"> ◦ Energy use values from the reporting tool “NollCO₂ Balansberäkning.xlsx”, the tab ”Användning och energiproduktion” ◦ Climate impact of energy use from the reporting tool “NollCO₂ Balansberäkning.xlsx”, the tab “Användning och energiproduktion” • The table under the heading “Strategier för att minska klimatpåverkan av energi- och vattenanvändningen B6-B7” is completed with strategies for reducing energy use B6
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Verification

6.1	<p>Reporting on the building's energy performance which contains:</p> <ul style="list-style-type: none"> • The energy expert (name, employer, contact information, brief CV) who compiled the report on the building's energy performance • Achieved energy performance • Achieved energy class - must be Energy Class B or better • The limit for building energy use that would apply to the construction of a new building of the same type specified • Specific energy use • Measured monthly energy use for heating, comfort cooling, domestic hot water, and the building's property electricity <ul style="list-style-type: none"> ◦ Measured values must be reported for the months that have passed since the building's commissioning date • Information about the building's heating system • Heated area, A_{temp}
6.2	<p>Reporting containing:</p> <ul style="list-style-type: none"> • Measured renewable electricity production per production type in method 6.2 divided into produced, used and to the grid delivered electricity. The measures are done monthly • Measured values must be reported for the months that have passed since the renewable electricity production was commissioned • The above can be part of monthly reports from the building's data collection system

6.3	<p>Reporting containing:</p> <ul style="list-style-type: none"> • Measurement plan, established and in use since the building was commissioned • Monthly reports, according to the METHOD section, from the measurement system's data collection system, since the building's commissioning date
6.4	<p>Reporting tool "NollCO₂ Balansberäkning.xlsx" with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab "Nettonoll balans": <ul style="list-style-type: none"> ◦ Project BGO identification ◦ Completed design, year ◦ Completed building, year ◦ BTA of the building ◦ Limit value A1-A3, obtained upon registration • In the tab "Användning och energiproduktion": <ul style="list-style-type: none"> ◦ Information about energy contracts, including EPD number if available for the contract ◦ Information about technology supplier for on/offsite produced renewable energy and EPD number, if available, for the energy production • In the tab "Användning och energiproduktion" measured values for the years elapsed since the building was commissioned and planned values for the years ahead, for <ul style="list-style-type: none"> ◦ Energy delivered to the building ◦ Energy produced on-site ◦ Use of energy in the building ◦ Renewable electricity delivered to the electricity grid
	<p>Reporting tool "NollCO₂ Klimatpåverkan rapport.xlsx" with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading "Energianvändning B6" is completed with: <ul style="list-style-type: none"> ◦ Energy use values from the reporting tool "NollCO₂ Balansberäkning.xlsx", the tab "Användning och energiproduktion" ◦ Climate impact of energy use from the reporting tool "NollCO₂ Balansberäkning.xlsx", the tab "Användning och energiproduktion" • The table under the heading "Strategier för att minska klimatpåverkan av energi- och vattenanvändningen B6-B7" is completed with strategies for reducing energy use B6

Follow-up Reporting

6.1	<p>Reporting on the building's energy performance which contains:</p> <ul style="list-style-type: none"> • Information about the energy expert (name, employer, contact information, brief CV) who compiled the report • Achieved energy class for the years elapsed since the last follow-up reporting /verification • Achieved energy performance for the years elapsed since the last follow-up reporting /verification • Specific energy use for the years elapsed since the last follow-up reporting /verification • Information about the building's heating system • Heated area, A_{temp}
6.2	<p>Reporting containing:</p> <ul style="list-style-type: none"> • Measured renewable electricity production per production type in method 6.2 divided into produced, used and to the grid delivered electricity. The measures are done monthly • Measured values must be reported for the months elapsed since verification/most recent follow-up reporting • The above can be part of monthly reports from the building's collection system

6.3	<p>Reporting containing:</p> <ul style="list-style-type: none"> • Measurement plan, established and used since the building was commissioned • Monthly reports - according to the METHOD section - from the measurement system's collection system since verification/last reporting instance
6.4	<p>Reporting tool "NollCO₂ Balansberäkning.xlsx" with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab "Nettonoll balans": <ul style="list-style-type: none"> ◦ Project BGO identification number ◦ Completed design, year ◦ Completed building, year ◦ BTA ◦ Limit value A1-A3, obtained upon registration • In the tab "Användning och energiproduktion": <ul style="list-style-type: none"> ◦ Information about energy contracts, including EPD number if available for the contract ◦ Information about technology supplier for on/offsite produced renewable energy and EPD number, if available, for the energy production • In the tab "Användning och energiproduktion" measured values for the years elapsed since the building was commissioned and planned values for the years ahead, for <ul style="list-style-type: none"> ◦ Energy delivered to the building ◦ Energy produced on-site ◦ Use of energy in the building ◦ Renewable electricity delivered to the electricity grid
	<p>Reporting tool "NollCO₂ Klimatpåverkan rapport.xlsx" with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading "Energianvändning B6" is completed with: <ul style="list-style-type: none"> ◦ Energy use values from the reporting tool "NollCO₂ Balansberäkning.xlsx", the tab "Användning och energiproduktion" ◦ Climate impact of energy use from the reporting tool "NollCO₂ Balansberäkning.xlsx", the tab "Användning och energiproduktion" • The table under the heading "Strategier för att minska klimatpåverkan av energi- och vattenanvändningen B6-B7" is completed with strategies for reducing energy use B6

CLIMATE IMPACT OF BUILDINGS

7 Water use B7

Purpose

To design, construct and manage buildings for reduced water consumption.

Assessment scope

The building's annual water consumption, reported in cubic metres, and associated climate impact.

Criteria**7.1 Building' annual water use**

- Water consumption shall include the following end uses, reported in cubic metres:
 - Water for heating, cooling, ventilation, and steam processes

7.2 Measurement plan

- When the building is in operation, building's water consumption shall be measurable as per the end uses listed in *Criteria 7.1*

Method**7.1 Building annual water use**

- For estimating water use for preliminary certification, the project may base calculations on previous experience or the responsible engineer's estimation of water use per m² BTA
- For verification and reporting, measurement plans shall be used in accordance with *method 7.2*
- Climate data for the climate impact of water infrastructure outside the building's periphery, expressed in kgCO₂e/m³ of water, is multiplied by the water use and divided by BTA for a climate impact in kgCO₂e/m² BTA
 - Climate data from an EPD shall be used when available, if not, the generic value in the reporting tool is used
- The climate impact of tap water systems in the building shall be reported under *Indicator 3* Building components A1-A3

7.2 Measurement plan

- The measurement plan shall describe the location of the meters and type of monitoring (manual or automatic, including time resolution)
- Any templates or calculation models used where measurement is not possible shall be presented
- The measurement plan includes reporting for end uses listed under *method 7.1*

Reporting requirements**Preliminary certification**

- | | |
|-----|---|
| 7.1 | <p>Reporting tool "NollCO₂ Balansberäkning.xlsx" with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab "Användning och energiproduktion": <ul style="list-style-type: none"> ◦ Supplier and information on possible EPD and its climate data ◦ Standard value/estimated value for annual water use |
|-----|---|

<p>Cont. 7.1</p>	<p>Reporting tool “NollCO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “Vattenanvändning B7” is completed with information on: <ul style="list-style-type: none"> ◦ Water use from the reporting tool “NollCO₂ Balansberäkning.xlsx”, tab “Användning och energiproduktion” ◦ Climate impact of water use from the reporting tool “NollCO₂ Balansberäkning.xlsx”, tab “Användning och energiproduktion” • The table under the heading “Strategier för att minska klimatpåverkan av energi- och vattenanvändningen B6-B7” is completed with strategies for reducing water use B7
<p>7.2</p>	<p>Measurement plan, draft</p>

Verification

<p>7.1</p>	<p>Reporting tool “NollCO₂ Balansberäkning.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab “Användning och energiproduktion”: <ul style="list-style-type: none"> ◦ Supplier and information on possible EPD and its climate data ◦ Measured values for annual water use for the years that have passed since the building was commissioned ◦ Standard value/estimated values for annual water use in the future
	<p>Reporting tool “NollCO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “Vattenanvändning B7” with information on: <ul style="list-style-type: none"> ◦ Water use from the reporting tool “NollCO₂ Balansberäkning.xlsx”, tab “Användning och energiproduktion” ◦ Climate impact of water use from the reporting tool “NollCO₂ Balansberäkning.xlsx”, tab “Användning och energiproduktion” • The table under the heading “Strategier för att minska klimatpåverkan av energi- och vattenanvändningen B6-B7” is completed with strategies for reducing water use B7
<p>7.2</p>	<p>Measurement plan, adopted and in use</p>

Follow-up Reporting

<p>7.1</p>	<p>Reporting tool “NollCO₂ Balansberäkning.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab “Användning och energiproduktion”: <ul style="list-style-type: none"> ◦ Supplier and information on possible EPD and its climate data ◦ Measured values for annual water use for the years that have passed since the building was commissioned ◦ Standard value/estimated values for annual water use in the future
	<p>Reporting tool “NollCO₂ Klimatpåverkan rapport.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • The table under the heading “Vattenanvändning B7” with information on: <ul style="list-style-type: none"> ◦ Water use from the reporting tool “NollCO₂ Balansberäkning.xlsx”, tab “Användning och energiproduktion” ◦ Climate impact of water use from the reporting tool “NollCO₂ Balansberäkning.xlsx”, tab “Användning och energiproduktion” • The table under the heading “Strategier för att minska klimatpåverkan av energi- och vattenanvändningen B6-B7” is completed with strategies for reducing water use B7
<p>7.2</p>	<p>Measurement plan, if updated</p>

CLIMATE IMPACT OF BUILDINGS

8 End-of-life stage C1-C4

Purpose

To increase awareness of the climate impact of buildings at the end of their service life.

Assessment scope

Climate impact from the deconstruction, waste transport, waste processing and disposal of the building when it reaches the end of its service life.

Criteria**8.1 Waste/final disposal of building C1-C4**

- For buildings, projects report the total climate impact of:
 - Dismantling/demolition of the building, C1
 - Transport to waste management facilities, C2
 - Waste management, C3
 - Final management C4

Method**8.1 End-of-life of building C1-C4**

On or before the year of 2045, Sweden has committed to 100 percent renewable electricity, fossil fuel free transports, and zero net emissions of greenhouse gases to the atmosphere. According to the organisation “Avfall Sverige” (~Waste in Sweden), waste processing will also be required to be carbon neutral. Since a NollCO₂ building has a 50-year expected service life, the project will be demolished no earlier than 2070, when end-of-life building processing must be completely fossil fuel free.

- Accordingly, the climate impact of C1-C4 is set to zero in NollCO₂
- The climate impact of waste associated with replacement and refurbishment is addressed under *Indicator 5* “Building use B1-B5”.

The climate impact C1-C4 for the building’s end-of-life is interpolated from current C1-C4 values for the building elements/construction products/building service systems, to a zero value in the year of 2045. Should the building reach its end of life before the year of 2045, interpolated values are to be used.

Reporting requirements**Preliminary certification**

8.1	No requirement. The reporting tool “NollCO ₂ Klimatpåverkan Certifiering.xlsx” calculates C1-C4 based on the information specified in Indicator 3
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Verification

8.1	No requirement. The reporting tool “NollCO ₂ Klimatpåverkan Certifiering.xlsx” calculates C1-C4 based on the information specified in Indicator 3
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Follow-up Reporting

8.1	Reporting tool “NollCO ₂ Klimatpåverkan Återrapportering.xlsx” with the following project information specified: <ul style="list-style-type: none"> • In the tab “Sammanfattning”, the project specifies the building’s expected end of life year
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5. INDICATORS

PROJECT'S CLIMATE
ACTIONS



PROJECT'S CLIMATE ACTIONS

9 Net zero balance

Purpose

To achieve climate-neutral buildings that contribute to Sweden's goal of climate neutrality by the year of 2045.

Assessment scope

The balance between the climate impact of the building's life cycle and use, and the project's climate actions (offsets).

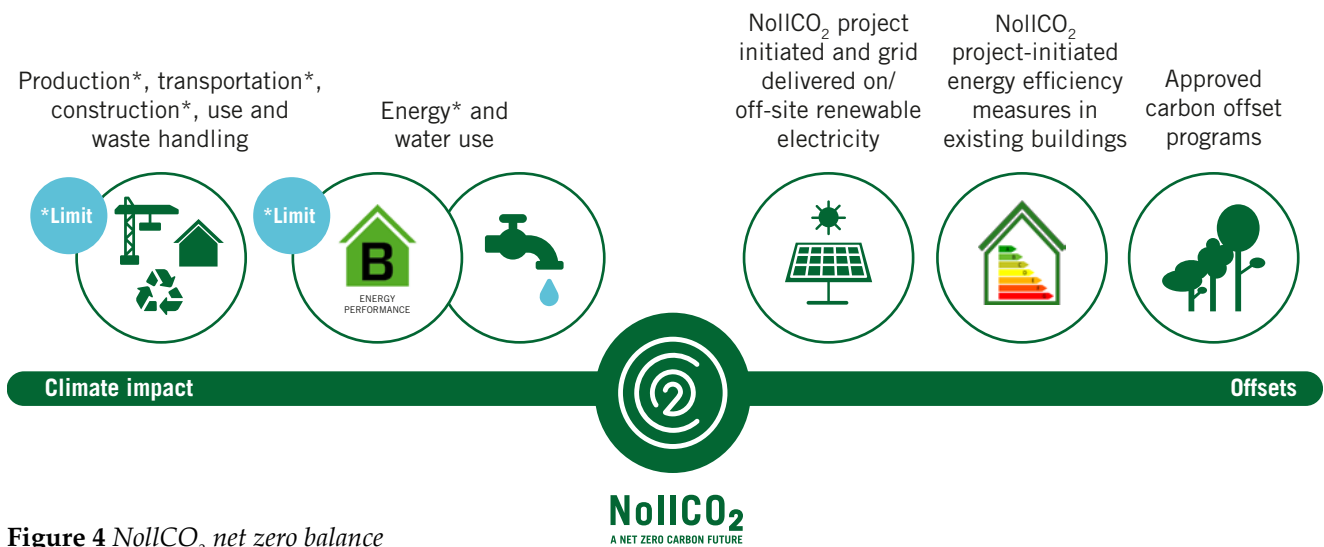


Figure 4 NollCO₂ net zero balance

Criteria

9.1 The climate impact of the building's use is balanced with climate actions to attain an annual net zero balance

- The climate impact of B4-B7 must be balanced with climate actions to an annual net zero balance during the building's 50-year service life, commencing with the building being put into operation

9.2 The climate impact of the building's production stage and end of life stage is balanced with climate actions to a net zero balance not later than the year of 2045

- The climate impact of modules A1-A5 and C1-C4 must be balanced with climate actions to a net zero balance not later than the year of 2045

Method

All calculations are made by the reporting tool "NollCO₂ Balansberäkning.xlsx". A detailed description of the method and criteria for balancing can be found in the document "NollCO₂ Ramverk.pdf" (~NollCO₂ framework) at www.sgbc.se.

The project can use the following climate actions to balance B4-B7 to net zero on an annual basis and A1-A5, C1-C4 to net zero not later than the year of 2045:

- Grid-delivered renewable electricity production, on-site or off-site
 - The boundary for off-site electricity generation is Nord Pool's electricity market: project can, as a climate action, install renewable electricity production in one of the countries physically connected to Sweden's electricity grid and within Nord Pool's electricity market

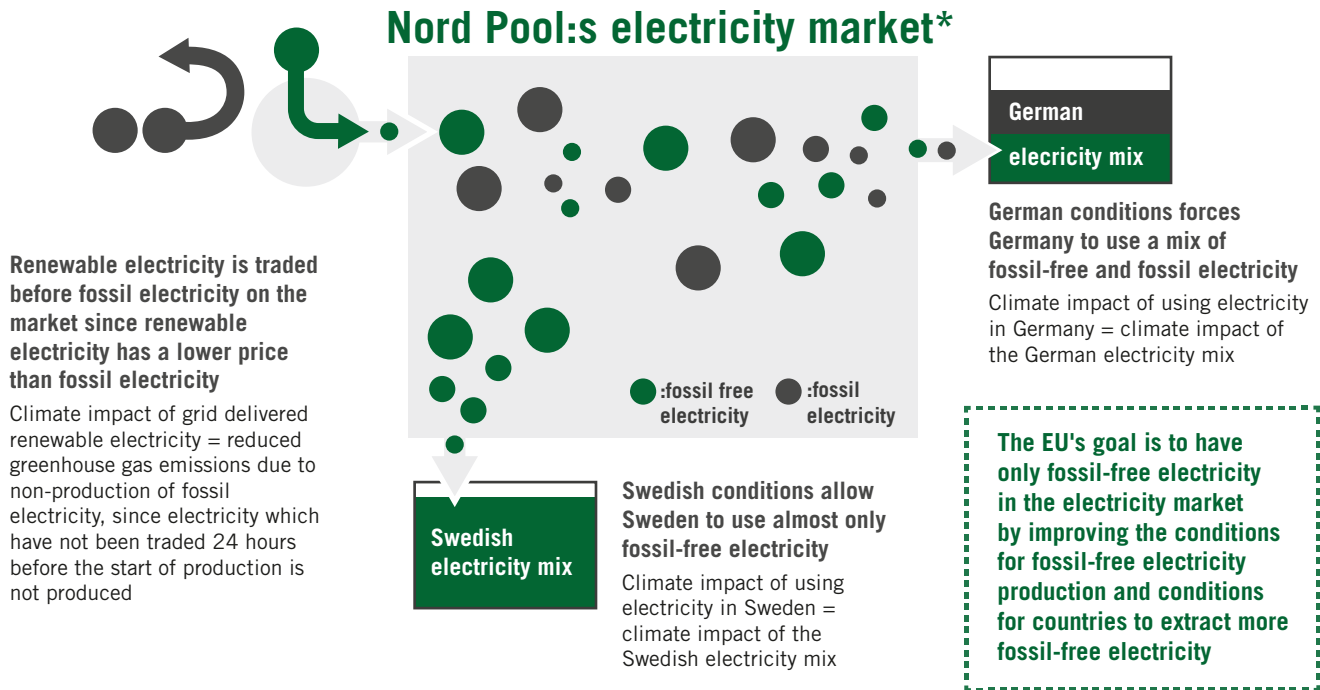
- Energy efficiency measures in existing buildings
 - The existing building in which energy efficiency measures are implemented shall be in the same country as the NollCO₂ project
- Climate compensation as approved by SGBC, according to criteria for environmental integrity (see “NollCO₂ ramverk.pdf” (~NollCO₂ framework) on www.sgbc.se)

The project specifies information about its implemented climate actions in the tool “NollCO₂ Balansberäkning.xlsx”:

- The tool calculates the annual net balance of use B4-B7:
 - B4-B7 are balanced with the project’s climate actions
 - Any annual surplus from the balancing of B4-B7 is transferred to the balancing of A1-A5, C1-C4
 - Any annual surplus from the balancing of A1-A5 and C1-C4 is transferred to next year’s balancing of B4-B7 and so forth
- In the tab “Nettonoll balans”, the tool shows:
 - Climate measures summary
 - The annual climate impact of the use B4-B7 and if annual net zero balance is achieved
 - The climate impact of A1-A5, C1-C4 and if net zero balance is achieved not later than the year of 2045

Installation of renewable electricity

- The project may credit the share (%) of installed renewable electricity on or off-site that corresponds to the share (%) that the building developer or the building owner has financed and where installation took place after the project’s registration date in BGO
 - The share is specified in the tool “NollCO₂ Balansberäkning.xlsx”
- The climate value of grid-delivered renewable electricity production is calculated as the reduction in emissions that occurs when fossil electricity is replaced by the renewable electricity in Nord Pool’s electricity market (see *Figur 5* below)
 - Only the renewable electricity delivered to the grid, and thus the electricity market, has a climate value. The climate value of grid delivered renewable electricity consists of cancelled emissions from fossil-fuelled electricity production since electricity not traded is also not produced and renewable electricity is traded before fossil-fuelled electricity



* In addition to Sweden and Germany, a further 12 northern European countries are connected to Nord Pool's electricity market, see www.nordpoolgroup.com

Figure 5 Nord Pool's electricity market

Energy efficiency in existing buildings

- The climate action for energy efficiency in existing buildings must take place in the same country as the NollCO₂ project. A building is deemed to be existing if it has been in use for at least 5 years
- Energy efficiency measures must improve the existing building's energy performance to Energy Class B or better no later than five years after the NollCO₂ project was verified. For a description of how energy classes are determined, see **Indicator 6**
- The project may credit the share (%) of energy efficiency that corresponds to the share (%) that the NollCO₂ building developer or owner has financed
 - The share is specified in the tool "NollCO₂ Balansberäkning.xlsx"
- The climate value of the reduction in operational electricity is calculated based on the emission reduction that occurs when the electricity market's most expensive electricity production (currently fossil fuel-based electricity) is replaced
- The climate value of energy reductions other than electricity are factored based on the reductions multiplied by the climate data for each specific energy type
- The climate impact of the energy efficiency measures must not exceed 100gCO₂e per reduced kWh and per building (as per the EU taxonomy requirements)
- The project is recommended to check that energy efficiency meets the EU taxonomy's other requirements to increase its chances of sustainable loans for energy efficiency

Climate compensation

- Climate compensation that meets NollCO₂'s criteria for environmental integrity can be done through one of the following programme organisations:

- VERRA, www.verra.org
- Gold Standard, www.goldstandard.org
- Plan Vivo, www.planvivo.org
- The amount of climate compensation purchased is entered in the tool “NollCO₂ Balansberäkning” as a climate action for the year they are purchased
- See “NollCO₂ Ramverk.pdf” (~NollCO₂ framework) on www.sgbc.se for a detailed description of climate compensation in NollCO₂

Reporting requirements

Preliminary certification

9.1 & 9.2	<p>The following is reported on renewable electricity on-site/off-site production used as a climate action in NollCO₂ project:</p> <ul style="list-style-type: none"> • Declaration of the date of installation of the renewable electricity production off site, showing that the installation date is later than the project registration date • Calculation of expected renewable electricity production on and off site on an annual basis during the expected life of the installation (30 years) • Declaration of the NollCO₂ building developer or owner’s share of financing of the installation(s)
	<p>The following is reported when energy efficiency in existing buildings is used as climate action in the NollCO₂ project:</p> <ul style="list-style-type: none"> • Information on the year when the building(s) was/were put into operation, the building’s address, property designation and ownership of the building(s) • Information on what energy efficiency measures are planned in existing building(s) and declaration that the measures are started after the date of the NollCO₂ project registration • Calculation of the climate impact of the energy efficiency measures per building, to be lower than 100gCO₂e per reduced kWh and per building • Reporting on measured annual energy use per building before and after measures broken down into: <ul style="list-style-type: none"> ◦ Delivered electricity ◦ Delivered district heating ◦ Delivered district cooling ◦ Bioenergy used in the building (for example pellet boiler) ◦ Oil boiler energy production used in the building ◦ Gas boiler energy production used in the building
	<p>The following is reported if climate compensation is used as climate action in the NollCO₂ project:</p> <ul style="list-style-type: none"> • No reporting other than that made in the reporting tool “NollCO₂ Balansberäkning.xlsx”

<p>Cont. 9.1 & 9.2</p>	<p>Reporting tool “NollCO₂ Balansberäkning.xlsx” with the following project information specified:</p> <ul style="list-style-type: none"> • In the tab “Nettonoll balans”: <ul style="list-style-type: none"> ◦ Climate impact A1-A3, A4-A5, and C1-C4 for preliminary certification retrieved from the reporting tool “NollCO₂ Klimatpåverkan Certifiering.xlsx” ◦ The climate compensation that is planned to be purchased, reported in the purchase year • In the tab “Användning och energiproduktion”: <ul style="list-style-type: none"> ◦ Planned renewable electricity production off-site with its financing share, planned grid delivered electricity and planned electricity use in the building ◦ Planned renewable electricity production on-site with its financing share, planned grid delivered electricity and planned electricity use in the building ◦ Climate impact B4 and B5 for preliminary certification retrieved from the reporting tool “NollCO₂ Klimatpåverkan Certifiering.xlsx” ◦ NollCO₂ building developer or owner financing share of energy efficiency in existing building #1/#2/#3 • In the tab “EE Byggnad #1”: <ul style="list-style-type: none"> ◦ Information about the existing building where energy efficiency measures are implemented ◦ Information on the building’s energy carriers ◦ Information on annual energy use for heating per energy carrier ◦ Information on annual energy use for comfort cooling per energy carrier ◦ Information on annual energy use for domestic hot water per energy carrier ◦ Information on annual operational electricity use • In the tab “EE Byggnad #2” (if energy efficiency measures are implemented in two buildings): <ul style="list-style-type: none"> ◦ For Building #2, the same information is completed as for Building #1 • In the tab “EE Byggnad #3” (if energy efficiency measures are implemented in three buildings): <ul style="list-style-type: none"> ◦ For Building #3, the same information is completed as for Building #1
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Verification

<p>9.1 & 9.2</p>	<p>The following is reported on renewable electricity on-site/off-site production used as a climate action in NollCO₂ project:</p> <ul style="list-style-type: none"> • Declaration of the date of installation of the renewable electricity production off site, showing that the installation date is later than the project registration date • Updated calculation of renewable electricity production on and off site on an annual basis during the expected life of the installation (30 years) • Declaration of the NollCO₂ building developer or owner’s share of financing of the installation(s) <p>The following is reported when energy efficiency in existing buildings is used as climate action in the NollCO₂ project:</p> <ul style="list-style-type: none"> • Information on the year when the building(s) was/were put into operation, the building’s address, property designation and ownership of the building(s) • Information on what energy efficiency measures have been done in the building(s) and declaration of that the measures were implemented after the date of the NollCO₂ project registration • Calculation of the climate impact of the energy efficiency measures per building, to be lower than 100gCO₂e per reduced kWh and per building • Reporting on measured annual energy use per building before and after measures, broken down into: <ul style="list-style-type: none"> ◦ Delivered electricity ◦ Delivered district heating ◦ Delivered district cooling ◦ Bioenergy used in the building (for example pellet boiler) ◦ Oil boiler energy production used in the building ◦ Gas boiler energy production used in the building
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Cont.
9.1 &
9.2

The following is reported on if **climate compensation** is used as climate action in the NollCO₂ project:

- Name of climate compensation project and certification standard.
- Type of climate compensation project (energy efficiency, tree planting, etc.)
- Proof of cancellation with information
 - Cancellation must be made in the name of the buyer and if possible, the designation of the building
- Climate credit serial number
- Number of tonnes purchased and their compensation object
- Year when the climate credits are issued (vintage)
- Climate compensation credits can only be purchased from projects or project activities that have been started 5 years from the time of purchase. Projects can thus be started over 5 years ago but have expanded with new project activities or have expanded the scope of the project itself to new areas, which are also approved. The climate compensation can either refer to a benefit that has already occurred which is called Ex-Post, or a benefit that occurs in the future which is called Ex-Ante

Reporting tool "NollCO₂ Balansberäkning.xlsx" with the following project information specified:

- In the tab "Nettonoll balans":
 - The climate impact of the verification A1-A3
 - The climate impact of the verification A4-A5
 - The climate impact of the verification C1-C4
 - The climate compensation purchased is reported for the year it was purchased
- In the tab "Användning och energiproduktion":
 - Installed renewable electricity off-site, financing share, quantity delivered to the electricity grid, quantity used in the building
 - Installed renewable electricity on-site, financing share, quantity delivered to the electricity grid, quantity used in the building
 - Climate impact of the verification B4 and B5 retrieved from the reporting tool "NollCO₂ Klimatpåverkan Certifiering.xlsx"
 - NollCO₂ building developer's or owner's financing share of energy efficiency measures in existing building #1/#2/#3
- In the tab "EE Byggnad #1":
 - Information about the existing building where energy efficiency is to be implemented
 - Information about the building's energy carrier
 - Information on annual energy use for the building's heating per energy carrier
 - Information on annual energy use for the building's comfort cooling per energy carrier
 - Information on annual energy use for the building's domestic hot water per energy carrier
 - Information on annual energy use for the building's property energy per energy carrier
- In the tab "EE Byggnad #2" on energy efficiency done in two buildings:
 - For Building #2, the same information is completed as if for Building #1
- In the tab "EE Byggnad #3" on energy efficiency done in three buildings:
 - For Building #3, the same information is completed as if for Building #1

Follow-up Reporting

9.1 & 9.2	<p>The following is reported on whether renewable electricity on-site/off-site production is used as a climate action in the NollCO₂ project:</p> <ul style="list-style-type: none"> • Updated calculation of expected on-site/off-site renewable electricity production on an annual basis during the expected life of the installation (30 years)
	<p>The following is reported on whether energy efficiency in existing building(s) is used as a climate action in the NollCO₂ project:</p> <ul style="list-style-type: none"> • Certificate/report per building where energy efficiency measure(s) have been implemented, and that they were started after the NollCO₂ project registration • Updated calculation of the climate impact of implemented energy efficiency measures per building, which shows that it is less than 100gCO₂e per reduced kWh and building • Updated report of measured annual energy use per building before and measured energy use per building in the years after measures were implemented broken down by: <ul style="list-style-type: none"> ◦ Delivered electricity ◦ District heating ◦ District cooling ◦ Bioenergy used in the building (for example pellet boiler) ◦ Oil boiler energy production used in the building ◦ Gas boiler energy production used in the building
	<p>The following is reported on whether climate compensation has been used as a climate actions in the NollCO₂ project up to the time of reporting:</p> <ul style="list-style-type: none"> • Name of climate compensation project and certification standard. • Type of climate compensation project (energy efficiency, tree planting, etc.) • Proof of cancellation with information <ul style="list-style-type: none"> ◦ Cancellation must be made in the buyer's name and if possible, the building's designation • Climate credit serial number • Number of tonnes purchased and their compensation object • Year when the climate credits are issued (vintage) • Credits purchased may not have been issued later than 5 years from the date on which the purchase was completed. The climate compensation can either refer to a benefit that has already occurred which is called Ex-Post, or a benefit that occurs in the future which is called Ex-Ante

Cont.
9.1 &
9.2

Reporting tool "NollCO₂ Balansberäkning.xlsx" with the following project information specified:

- In the tab "Nettonoll balans":
 - The climate impact of the verification A1-A3
 - The climate impact of the verification A4-A5
 - The climate impact of the verification C1-C4
 - The climate compensation purchased is reported for the year it was purchased
- In the tab "Användning och energiproduktion":
 - Measured renewable electricity production off-site, measured quantity delivered to the electricity grid, measured quantity used in the building for the years since the last follow-up reporting or verification
 - Measured renewable electricity production on-site, measured quantity delivered to the electricity grid, measured quantity used in the building for the years since the last follow-up reporting or verification
 - Climate impact of the follow-up reporting B4 and B5 retrieved from the reporting tool "NollCO₂ Klimatpåverkan Certifiering.xlsx"
 - Share of energy efficiency in existing building #1/#2/#3 which has been financed by the project's client/building owner
- In the tab "EE Byggnad #1":
 - Information about the existing building where energy efficiency has been implemented
 - Information about the building's energy carrier
 - Measured annual energy use for the building's heating per energy carrier for the years since the last follow-up reporting /verification
 - Measured annual energy use for the building's comfort cooling per energy carrier for the years since the last follow-up reporting /verification
 - Measured annual energy use for the building's domestic hot water per energy carrier for the years since the last follow-up reporting /verification
 - Measured annual energy use for the building's operational electricity use for the years since the last follow-up reporting /verification
- In the tab "EE Byggnad #2" (if energy efficiency measures are done in two buildings):
 - For Building #2, the same information is reported as for Building #1
- In the tab "EE Byggnad #3" (if energy efficiency measures are done in three buildings):
 - For Building #3, the same information is reported as for Building #1

6. APPENDIX

A. Climate considerations in the construction process

The assessment of climate impact should be addressed throughout the various stages of the construction process. This appendix briefly lists these stages and the corresponding NollCO₂ project issues to be addressed to optimize the climate impact of building construction.

A.1 Planning and programme stage

Decisions made at an early stage often have the greatest impact on the building's overall performance. Projects planning for a NollCO₂ certification must consider early in project planning how to achieve net zero carbon balance, meet limit carbon values for the life cycle stages A1-A3, A4-A5 and stay below the energy performance limit for B6.

Questions to ask at this stage include:

- If there are existing buildings on the property, is it more climate-friendly to do a complete renovation, or to demolish and rebuild? In case of demolition, can any construction products or building service systems be reused? The climate impact of recycled components, such as recycled bricks, can be a fraction of newly manufactured products
- Are there any projects within the organisation that may serve as a reference for the NollCO₂ project?
- Which complementary certification will the project choose (Miljöbyggnad, BREEAM-SE, LEED or the Nordic Ecolabel/Svanen) and how can that certification be coordinated with NollCO₂?
- What are the owner, designer and builder's priorities? Are there strategies within these organisations for using recycled products, building in wood, etc. and/or are there limit values for climate impact?
- Has the planning guidance specified the orientation and height of the buildings? What are the options for installing solar cells based on prevailing conditions?
- What are the options for energy delivery? Do energy suppliers have to produce EPDs to demonstrate a low climate impact?
- How do the surrounding buildings and climate affect the design of the frame and envelope? Is there a need for extra reinforcement, extra insulation, extra moisture protection, or extra sound insulation? If so, it is possible to manage these requirements with those of NollCO₂?
- How do daylight requirements interface with the energy performance limit? Is it possible to receive daylight without losing energy performance?
- What foundations will the project use? What is the climate impact of the building's foundation?
- Are there suppliers of prefabricated parts and other construction products with low climate impact, or suppliers who can work to reduce their climate impact? Can they be involved early in the design phase? Can product and system suppliers produce EPDs for their products and systems?

A.2 Design stage

In the design stage, the project team specifies construction products and systems. Detailed design includes the comparison of different types of construction products and systems, for example, the choice of concrete type or the choice of wooden frame supplier. At this stage, energy calculations and calculations of thermal comfort are also performed which establish the basis for a preliminary calculation of the climate impact of energy use. Choices of surface treatments made in the design stage can increase or decrease the climate impact, although not as much as the choice of frame and façade material.

Questions asked at this stage are:

- Which products are best suited for the design programme? How do the production and expected service life of the selected products and systems contribute to the climate impact of the building?
- Which building service systems must be specified to meet energy performance requirements? What is the climate impact of the service systems?
- How can the construction and transport processes be optimised to achieve the lowest climate impact?

The design team selecting construction products and systems with low climate impact is dependent on the availability of data and transparency from suppliers and manufacturers. As products and systems are specified, national generic climate data can be replaced with product-specific data in EPDs.

A.3 Contract procurement

Contract procurement involves finding contractors for foundation work, construction, and installation. This is a sensitive stage as the contractor is often free to choose functionally equivalent products and materials, which can change the designed climate impact. Economic preferences tend to drive such choices. What is more, the design team can rarely influence choices made during the construction phase. The building developer and/or owner must play an active role and ensure that no NollCO₂ certification goals are compromised. This can be done through specification of requirements concerning the NollCO₂ certification in the tender documents.

Questions to ask at this stage include:

- What should the project require during the procurement stage? What requirements for limiting the climate impact from the manufacture and recycling of construction products and building service systems can be formulated in a tender document?
- What requirements for limiting the climate impact of transport to and from the construction site and on construction processes can be set in contractor documents?
- How are suppliers of construction products and building service systems evaluated against the requirements for limiting climate impact?

A.4 Construction stage

At this stage, changes in climate impact linked to the choice of construction products and building service systems are less likely to occur as compared to changes related to the design work. Changes such as rebuilding incorrectly built elements or replacing broken products have an increased climate impact. Therefore, supervision of the construction site is crucial. Any material losses, excess materials, excess waste, mistakes, or accidents inevitably lead to greater climate impact than planned.

Other key factors that can affect the climate impact at this stage are a) how construction processes are carried out and b) the choice of construction machinery and its fuel.

An important parameter in this context is the dependence of construction processes' energy use on seasons and climate; cold climate and dark season require greater energy use in the construction processes, which leads to increased climate impact.

Questions asked at this stage are:

- How do the project influence energy use for construction processes through the choice of technology and manufacturing processes (for example on-site processing versus pre-fabrication)?
- How can different types of losses be avoided during transport and processing and installation of the different products and systems on the construction site?
- How can the project keep track of and document the actual installed building materials and service systems in an efficient way? Can the logbook and/or a digital twin be useful?

A.5 Management

At this stage, the building is ready for occupancy and has been put into operation. From this stage, climate impact is linked to operation, maintenance, replacements, and refurbishments. Materials with a longer expected service life have a lower climate impact as their replacement is less frequent. Buildings constructed for flexible use may provide a lower climate impact as these can be more easily adapted to new activities without the need for major refurbishments.

Energy and water use are reduced through ongoing measurement, follow-up, and adjustment of building service systems.

A.6 End of life stage

The end of life stage of a building also has a climate impact. This includes the climate impact of demolition, dismantling and waste management such as incineration or disposal. Note that this stage of a NollCO₂ project's service life will take place in 50 years or more, when the EU and Sweden are targeting climate neutrality. Fossil greenhouse gas emissions from burning of plastic waste may be prohibited in future, for which these must then be balanced with climate actions for climate neutrality. According to the principle "polluter-pays", the building owner may incur fines for any fossil waste that cannot be recycled.

It can therefore be a good idea to think through what fossil materials are built into the building and therefore have to be waste handled in a future climate-neutral EU and Sweden.



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A NET ZERO CARBON FUTURE

