DRAFT REPORT

Nordic Innovation

# Process for BIM-based material inventory for normative climate declarations (Draft version: 2023-12-08)

# Contents

## Preface

This report is a part of the Nordic Sustainable Construction programme initiated by the Nordic Ministers of Construction and Housing and funded by Nordic Innovation. The programme contributes to the Nordic Vision 2030 by supporting the Nordics in becoming the leading region in sustainable and competitive construction and housing with minimised environmental and climate impact.

The programme supports the green transition of the Nordic construction sector by creating and sharing new knowledge, initiating debates in the sector, creating networks, workshops and best practice cases, and facilitating Nordic harmonisation of regulation for buildings' climate impact.

The programme runs from 2021-2024 and consists of the following focus areas:

Work package 1 – Nordic Harmonisation of Life Cycle Assessment

Work package 2 – Circular Business Models and Procurement

Work package 3 – Sustainable Construction Materials and Architecture

Work package 4 – Emission-free Construction Sites

Work package 5 – Programme Secretariat and Capacity-Building Activities for Increased Reuse of Construction Materials

An important part of the programme is to facilitate the digitalisation of building LCA and climate declarations within the Nordic countries. It is in this context the present report has been developed. The report is one of the draft deliverables of task 3 in Work Package 1, led by the Finnish Ministry of Environment.

The work has been carried out by VTT, Granlund, and the Nordic partners: Sberesearch, Rangi Maja OÜ, Bengt Dahlgren Stockholm AB, Gravicon DK and Asplan Viak AS.

Nordic Sustainable Construction

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# Summary

Building information models (BIM) are generated in most large building projects and utilized in many aspects of construction. Life cycle analysis of buildings is largely conducted based on quantities, that are in some ways described already in the models. However, the models are currently not utilized in building life cycle analysis (LCA) to the extent that they might be. The data required by the LCA analyst might be missing from the model or recorded in non-standard ways; features may be absent, and some features modelled multiple times. In addition, often the discussion between BIM modelers and LCA analysts is lacking.

This draft report aims at providing instructions both to the architects and structural engineers, who create the BIM models, and to the LCA analysts that extract information from the models. Such conventions are established that enable reliable material take-off from the model for LCA purposes, but that require as small changes as possible to the BIM modelers' workflow. Locations for data in the models are recommended, so the LCA analyst will receive material quantity information from the model, as designed by the architects and engineers, with reliable outcomes.

The level of detail in different stages of construction projects is recognized, and best practices for amending that information are recommended.

This draft report contains a generic process description of the BIM to LCA process. The document will be later updated with:

- Detailed instructions for BIM-based material inventory, including specification for the level of information needed for modeled building components
- Guidance for transferring data from BIM tools to LCA tools
- Guidance for iterative design & analysis workflow between BIM and LCA tools
- Practical examples with example BIM models

# Overview

A building information model (BIM) typically contains geometries and additional information on the employed building products. In the course of a construction project, different design fields produce BIM models: there may be an architectural model, structural model, and an HVAC model, depending on the design stage. All these models contain quantity information that can be employed in building life cycle assessment (LCA). Figure 1 depicts different stages of data flow that are required to convert BIM data to usable LCA results.

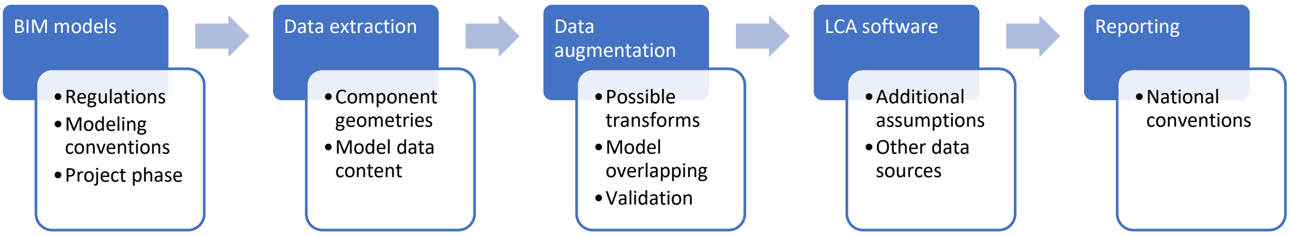


Figure 1. Steps from BIM to LCA

The BIM contents are not designed originally with LCA in mind, and thus in the current state of modeling, there are many issues with regards to data usability. These are related to for example reliability in quantity take-off, specification of data in property sets, object labeling and model coordination. This work aims to establish guidelines for how BIM models can be utilized more usefully in LCA calculations. This is done with the intent on supporting existing BIM modelling conventions, and specifying minimum requirements for additional information, from an LCA point of view. Minimum additional information content in the models is specified, as well as other documentation conventions that support data retrieval from supplementing sources. Best practices are established on how the BIM information can be amended and overlapping between BIM models handled.

Figure 2 establishes the steps that would be required to transform the current status towards automated BIM-based LCA. The more steps are taken, also increasing demands arise on data quality, availability and the amount of modelling work, among others. This proposed process aims to take the first step in Figure 2: to enable reliable material take-offs for LCA purposes, and to establish conventions on data processing. Further automation is left for the future.

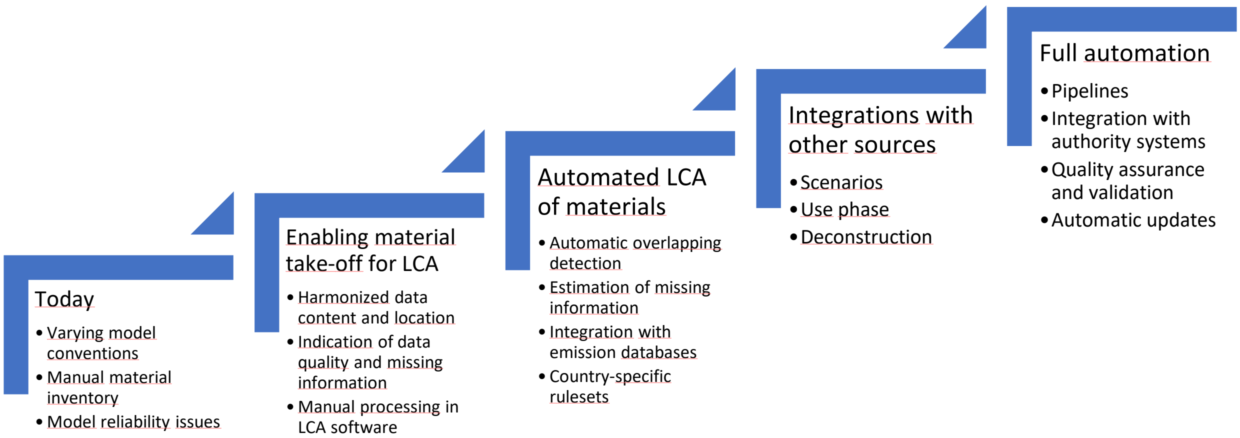


Figure 2. Steps towards automated LCA from BIM

A BIM-based calculation of embodied emissions as part of the life cycle assessment (LCA) of a building requires that material information (description: type and material), quantities (measures) and position in the building (component type, national building part labeling) are modelled correctly in the building information model (BIM). Defined entities and properties should be disclosed in the BIM description document for easy access to background information regarding the model. Regardless of the differences in assessment methods (e.g., building parts to be included) between the Nordic countries, the basic requirements and principles for modelling are the same. A comparison of scopes included in assessment methods in Nordic countries are displayed in Figure 3.

The national assessment methods regulate system boundaries and level of detail in the reporting on building life cycle assessments. The scope of the assessment methods varies between each country. The intention of this BIM to LCA process description is to enable better data flow from the models to LCA calculation, regardless of the data content and handling of the actual LCA calculation. Figure 3 displays the scope of the assessment methods for reporting as well as calculation. The national building part labeling is required to be provided as information in a suitable information field. Reporting with the national building part labeling enables e.g., the assessment of impacts on the use of different materials in building parts.

The quality assurance can be divided into the validation of the usability of information in the BIM and validation of the results of the assessment. Quality assurance follows the requirements for calculation and reporting. The BIM is prepared in line with the BIM requirements and information is precise, correct, and informative. Defined entities and properties are disclosed in the BIM description document for easy access to information regarding the model. Availability of information supports the quality assurance and validation of correctness and analysis on uncertainties in LCA which impacts especially assessments made during an early phase of the project.

It is noted that there is variation in building part labeling at the national level. The proposed classification and naming conventions for BIM are in this document specified according to IFC entities, which have been identified as a basis for data harmonization. The national classifications can be implemented at project level in addition to the IFC entities specified in this document.

The system boundary for building life cycle information is set in the International Standard ISO 21930 and European Standard EN 15804/15978, which set out a common life-cycle model for building and construction works. The system boundary is common for all assessment methods, although national assessment methods differ in which life cycle stages are included in the assessment. ISO 16739-1 is the set standard for Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries.

| Included building parts | | Denmark<br>BRsB | Estonia<br>Proposed draft method for climate declaration (2021) | Finland<br>Climate declaration | Iceland<br>Climate declaration proposal (under development) | Norway<br>TEK17 | Sweden<br>Climate declaration (2022) | Sweden<br>Limit values 2025 Climate declaration 2027 (Boverket's proposal) | Europe<br>LEVEL(s) |
|---|---|---|---|---|---|---|---|---|---|
| Site preparation | | - | - | Soil stabilization and site reinforcement elements | - | - | - | Reported separately from 2027 | ? |
| Substructure | Foundations | x | x | x | x | x | x | x | x |
| | Piling | x | x | x | x | x | - | Reported separately from 2027 | ? |
| | Basement walls | x | x | x | x | x | x | x | x |
| | Ground floor structure | x | x | x | x | x | x | x | x |
| Superstructure (external elements) | Frame (columns and beams) | x | x | x | x | x | x | x | x |
| | External walls, facade | x | x | x | x | x | x | x | x |
| | External doors, windows | x | x | x | x | x | x | x | x |
| | Balconies | x | x | x | x | - | x | x | x |
| | Roof structures | x | x | x | x | x | x | x | x |
| Superstructure (internal elements) | Internal walls, load- and non-load bearing | x | x | x | x | x | x | x | x |
| | Floor slabs | x | x | x | x | x | x | x | x |
| | Internal doors | x | x | x | x | x | x | x | x |
| | Stairs and ramps | x | x | x | x | - | x | x | x |
| Internal finishes | Wall and ceiling interior finishes and coverings | x | x | x | x | x | - | x | x |
| | Flooring materials | x | x | x | x | x | - | x | x |
| | Suspended ceilings | x | x | x | x | x | x | x | x |
| Building services | Lifts and escalators | x | x | x | x | - | - | x | x |
| | Electricity system | - | - | x | x | - | - | x | x |
| | HVAC systems | x | x | x | x | - | - | x | x |
| | Renewable energy systems | x | x | x | x | - | Only building integrated solar panels | All panels in 2025 | x |
| | Water system | x | x | x | x | - | - | x | x |
| | Sewage system | x | - | x | x | - | - | x | x |
| | Other systems (e.g., firefighting) | - | - | x | x | - | - | x | x |
| External works | | Only if included in the area definition | - | only external structures on yard | - | - | - | - | x |
| Furnishing | Fixed furniture | - | - | x | - | - | - | only for building types in Group 1 | x |
| | User furniture | - | - | - | - | - | - | - | - |
| Floor area | Heated net floor area | - | x | x | - | - | - | - | - |
| | Gross floor area | - | - | - | x | x | x | x | x |
| | Reference area, heated gross floor area | x | - | - | - | - | - | - | - |

Limit value scope

Limit value scope (proposal)

Climate declaration scope

Source: Nordic Sustainable Construction, 2023

Figure 3. Coverage of national assessment methods.

## Scope and purpose of this work

This instruction describes the process extracting quantity data from building information modelling (BIM) to the calculation and reporting on emissions of materials in life cycle assessment (LCA). The aim is to suggest improvements in BIM models, to better support, optimize and unify life cycle assessments across the Nordic countries, as well as to unify and streamline the LCA calculation process itself. The work focuses on the method that enables the calculation of embodied emissions; the operational emissions are not extracted from the BIM models and are thus not in the scope of the report.

## Possible pathways from BIM to LCA

There are two major pathways for calculating life cycle effects of building components from BIM models (Figure 4). Domain-specific carbon calculation plugins have been developed for various design software, such as e.g., Tekla Structures, Autodesk Revit and ArchiCAD. These types of tools are useful as they can give planners or designers instant feedback about GHG emissions, for example when comparing alternative design solutions. Complete LCA for an entire building requires data beyond what is available in any single design software. Therefore, quantity take-off from BIM and import to an LCA tool is preferable for required normative calculations. This document focuses on the latter pathway.

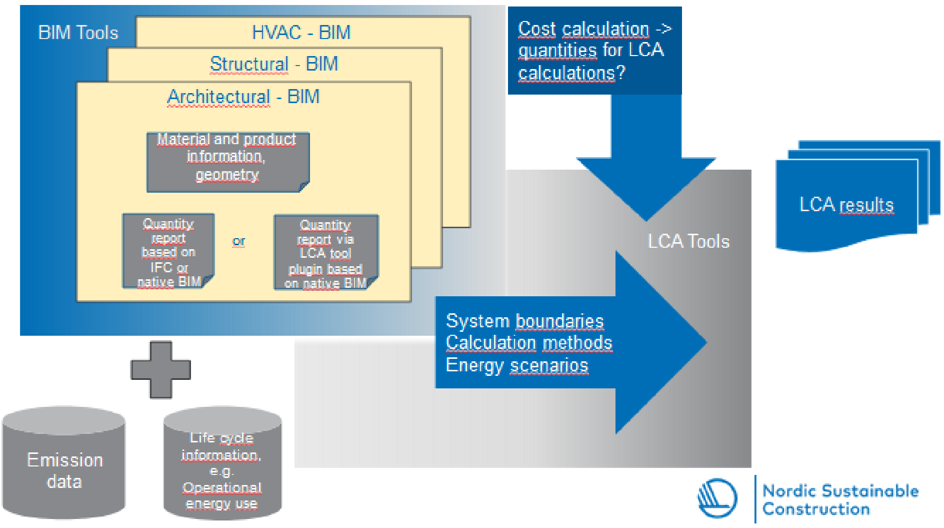


Figure 4. Data sources, processing, and pathways from data to LCA results

# LCA requirements and data availability in different project phases

All Nordic countries have either effective or planned legislation concerning mandatory carbon footprint calculations for certain building types. Limit values are also implemented or planned to be implemented in all countries. Voluntary carbon footprint calculations are made for various reasons, such as requirements stemming from environmental certification schemes like LEED or BREEAM, or corporate strategies and roadmaps for sustainability. Depending on the purpose, LCA calculations can be performed at different stages in the design and construction process. The procedure for calculation remains the same throughout different stages, but the available BIM models and the included data differs.

In this document, the LCA that is required by legislation is referred to as normative LCA. It is useful to note, that although legislation specifies a point at which the normative calculation must be done, this will likely not be the first time the calculation is made. Especially where limit values are in place, a preliminary calculation must be done early in the project to ensure compliance with the legislated limit when the time comes. In this way LCA calculations resemble cost estimates: to stay within budget, regular check-ins are needed to ensure the project stays on target.

There are some national differences as to when the normative LCA is calculated. These are presented in Figure 5. In Estonia and Finland, the draft legislations require normative LCA calculations to be reported along with the building permit, while in Sweden, Norway, and Denmark the carbon footprint calculation is based on as-built information and submitted before the building inspection clears the building for use.

This difference in timing means that the data available from designers to be used in the normative LCA differs. The earlier in the construction process the calculation is required, the sparser and more inaccurate the information available is and hence the more assumptions required from the LCA specialist. At the building permit phase, typically only the architectural BIM model is available, with other disciplines either providing some data in other formats (structural engineering) or providing little or no data (HVAC engineering, electrical engineering). At the building permit stage, specific building products are mostly not yet defined, thus, product and material data are mainly based on generic data from national databases. Information is typically also not available regarding interior finishings and materials. Once the building is completed, the situation is different. All design disciplines have completed their BIM models, all materials are specified in some document (though not necessarily in BIM format) and all used products are known. The documentation conventions on installed products might still vary.

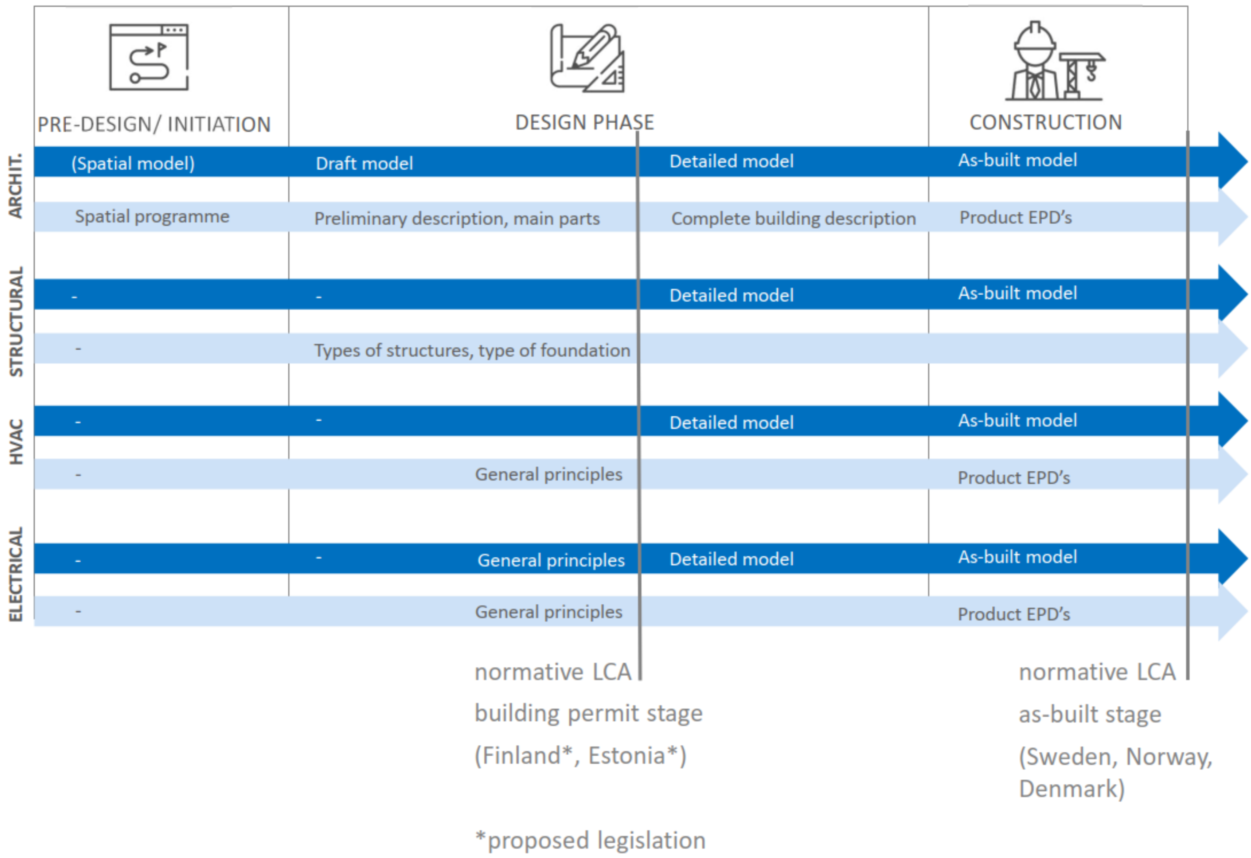


Figure 5. Stages of design and construction vs. normative LCA calculation in various Nordic countries

# Requirements for BIM modelling

This description focuses mainly on assessment of carbon hand- and footprint during the life cycle of a new construction project, not projects focused on renovating the existing building stock, as these are not included in the LCA related legislation in the Nordic countries for the time being. It is important to note that due to the nature of LCA calculations of renovation projects, the requirements for BIM differ slightly in these types of projects.

BIM modelling should be done according to EN ISO 19650 standard for building information modelling. Countries may have more specific national standards or guidelines based on this standard (e.g., "RAVA3" under development in Finland, "Tillämpningsanvisningar BIM" being developed in Sweden, "SIMBA" for public buildings in Norway and DS/EN ISO 19650 in Denmark). A European standard, CEN/TC 442, is also currently being developed. The EN ISO 19650 standard includes conventions for aspects such as project information requirements and how to manage and store model data.

## General requirements for BIM

The information required for LCA is like the information that is needed for cost calculations. It is important that building elements are modelled correctly using the correct tools, so that the quantity units are generated correctly in the design model and consequently also exported correctly into the IFC-model. For BIM to be most useful in LCA calculation, general requirements for BIM modelling are:

- **High quality modelling** - According to national best practices
- **Precise** - The contents of the model are accurate, and the model is created using the correct tools in the BIM software.
- **Descriptive and informative** – The contents of the model consider the needs of the end-users of the BIM.
    - A description file is provided along with the BIM model specifying which information fields contain relevant data and for what purposes the model is intended. Software may generate unintended information, which may not be accurate and thus it is relevant to specify which fields are intended to be used.
- **Correct naming and categorizing** - According to national standards or best practices (or project-specific naming, in which case the naming conventions must remain the same throughout the entire project)
    - All building elements are given descriptive type names which are also used in other documents. For example, all wall elements with the same structure have a same wall type identifier defined in the BIM, which is also found in the structural plans. This enables the retrieval of information from sources outside of the BIM models.
    - When the manufacturer and product names of installed products are known (mostly in the case of as-built models), these are disclosed in the BIM, to support the mapping of product-specific environmental product declarations (EPD). Alternatively, a mapping of product type names in the model, to the installed products is provided externally.
    - If installed products are not specified, materials are named in a harmonized way throughout the models, utilizing established classifications where possible. The materials are either recorded in the model or referenced externally with the type name in the BIM model.

### BIM description file

The contents and modelling principles of the BIM are documented and described in a separate document according to the national best practices and the description file should disclose for example which information fields are generated in the information model. This is important, as software may generate additional fields automatically, the information in which may not be accurate.

The same document is also used as a tool for communicating information about the completeness of the model by indicating for example any assumptions made by the designer or any yet unmodelled elements. This is relevant particularly for modelling done in the earlier stages of the design process. Information that is added as a draft (structure type, material, etc.) and is subject to change should also be clearly indicated in the building information model description.

## Required data in BIM model information take-off

Quantities and properties within BIM models are extracted through information takeoff features in BIM or IFC software. Below are listed data that required at minimum, to perform LCA. The quantity take-off units are further discussed later in Table 1.

LCA programs may support direct IFC input currently, and in such cases these features may be employed. It is however to be noticed that the programs' handling of preferred units may differ from the ones presented in this document. Here, we present how to first extract information from the models and then import them into the LCA software. This way, if manual verification or conversion of quantities is required, they can be performed before importing the quantities to the LCA program. Manual selection of the structures may also be necessary, if the building classification required by the normative LCA is not readily available in the BIM model, or the modeled content differs from the LCA system boundary.

High-quality, precise, descriptive, and informative data in the information takeoff increases the efficiency and accuracy of the process both during the export from IFC software and the import of information to LCA software.

**Building element**

Building element classification, according to the national best practices. The building element type is used to categorize emissions according to the building element. Categorization according to the building element is crucial for a component-level LCA assessment.

**Component type (class)**

Crucial for the import of data to LCA software. Component types are e.g., slab, column or beam.

Displays by which tool in the modelling software the component has been generated and enables a level of checking that information is correct in the model.

**Type (Reference)**

Building element reference according to national best practice and depending on what has been agreed on in the project. The reference is descriptive information about the element, which corresponds with naming in other design documents. E.g., structure type of ground floor slab.

**Quantity information**

**Volume**

Crucial for building elements for which the preferred unit is volume (m3)

**Area**

Crucial for building elements for which the preferred unit is area (m2).

**Number of pieces**

Crucial for building elements for which the preferred unit is number of units (unit).

**Material**

Material information used to describe used material in the structure. Displays the material used in the component, e.g., wood, concrete, or steel.

Displays the thickness of material layers in structure (when available).

**Total thickness**

The total thickness of a structure is crucial especially for components of the structural frame.

## Managing the overlapping between BIM models

The following table describes the model, from which the material and quantity information is preferred to be derived. The range of building elements included in each national assessment method varies and thus not all categories presented below are necessarily included in the national assessment method for all countries. The building information model is recommended to include the building element classification according to the national best practices.

Architectural and structural BIM models are the main sources of information for life cycle assessments. The availability of information depends on the phase of the project. Supplementary information may be included from other BIM models and documentation. When all required information is not available, assumptions and estimates are typically required to supplement information. The recommended source of information for calculation in building permit and as-built phases are presented below as well as building parts which typically require assumptions. Information on building parts that are not available in any BIM model (e.g., internal finishes and number of elevators) is required to be supplemented from other design documents.

## Table 1. Data sources and IFC properties to be employed

| Group | Included building parts | IfcEntity (according to RAVA3pro) | **Propertyset (bolded)** and Properties (according to RAVA3pro) | IFC Object Name / Reference (according to RAVA3pro) | Recommended Quantity Unit (Depending on the available BIM model) *Typical unit for mapping in LCA tools* | Data source (building permit) | Data source (As-Built) |
|---|---|---|---|---|---|---|---|
| Site preparation | | | | | | ? | |
| Substructure | Foundations | (Struct) IfcObject? | | | cubic meters | Structural estimate | Structural BIM |
| Substructure | Piling | (Struct) IfcObject? | | | Meters | Structural estimate | Structural BIM |
| Substructure | Basement walls | IfcWall | **Pset_WallCommon**<br>IsExternal<br>LoadBearing<br>FireRating<br>Compartmentation<br>AcousticRating | Structure type (code) as per national best practice | square meters | Architectural BIM | Structural BIM |
| Substructure | Ground floor structure | IfcSlab | **Pset_SlabCommon**<br>IsExternal<br>LoadBearing<br>AcousticRating | Structure type (code) as per national best practice | square meters | Architectural BIM | Architectural BIM |
| Superstructure (external elements) | Frame (columns and beams) | IfcBeam or IfcColumn | **Pset_ColumnCommon**<br>IsExternal<br>LoadBearing<br>FireRating<br>Compartmentation<br>AcousticRating | | kilograms (steel structure), cubic meters (concrete, wood) | Architectural BIM | Architectural BIM/ Structural BIM |
| Superstructure (external elements) | External walls, facade | IfcWall | **Pset_WallCommon**<br>IsExternal<br>LoadBearing<br>FireRating<br>Compartmentation<br>AcousticRating | Structure type (code) per national best practice | square meters | Architectural BIM | Architectural BIM |
| Superstructure (external elements) | External doors, windows | IfcDoor or IfcWindow | **Pset_DoorCommon**<br>IsExternal<br>FireRating<br>Compartmentation<br>AcousticRating,<br>HandicapAccessible | Type code | square meters | Architectural BIM | Architectural BIM |
| Superstructure (external elements) | Balconies | IfcSlab | **Pset_SlabCommon**<br>IsExternal | | square meters | Architectural BIM | Architectural BIM |
| Superstructure (external elements) | Roof structures | IfcRoof / IfcSlab | **Pset_RoofCommon / Pset_SlabCommon**<br>IsExternal<br>FireRating<br>Compartmentation | Structure type (code) per national best practice | square meters | Architectural BIM | Architectural BIM/ Structural BIM |
| Superstructure (internal elements) | Internal walls, load- and non-load bearing | IfcWall or IfcCurtainWall | **Pset_WallCommon**<br>IsExternal<br>LoadBearing<br>FireRating<br>Compartmentation<br>AcousticRating | Structure type (code) per national best practice | square meters | Architectural BIM | Architectural BIM |
| Superstructure (internal elements) | Floor slabs | IfcSlab | **Pset_SlabCommon**<br>IsExternal<br>LoadBearing<br>AcousticRating<br>Compartmentation | Structure type (code) per national best practice | square meters / cubic meters | Architectural BIM | Architectural BIM/ Structural BIM |
| Superstructure (internal elements) | Internal doors | IfcDoor | **Pset_DoorCommon**<br>IsExternal<br>FireRating<br>Compartmentation<br>AcousticRating<br>HandicapAccessible | Type code | square meters | Architectural BIM | Architectural BIM |
| Superstructure (internal elements) | Stairs and ramps | IfcStair | **Pset_StairCommon**<br>IsExternal | | cubic meters (Railings not included in modelling) | Architectural BIM | Architectural BIM |
| Internal finishes | Wall and ceiling interior finishes and coverings | IfcSpace | **Pset_SpaceOccupancyRequirements**<br>OccupancyType<br>OccupancyNumber<br>HandicapAccessible | | square meters | Architectural estimate | Architectural BIM |
| Internal finishes | Flooring materials | IfcSpace | **Pset_SpaceOccupancyRequirements**<br>OccupancyType<br>OccupancyNumber<br>HandicapAccessible | | square meters | Architectural estimate | Architectural BIM |
| Internal finishes | Suspended ceilings | IfcSpace | **Pset_SpaceOccupancyRequirements**<br>OccupancyType<br>OccupancyNumber<br>HandicapAccessible | | square meters | Architectural estimate | Architectural BIM |
| Internal finishes | Railings | IfcObject | | | length / volume / weight (kilograms) | Architectural estimate | Architectural BIM |
| Building services | Lifts and escalators<br>Electricity system<br>HVAC systems<br>Renewable energy systems<br>Water system<br>Sewage system<br>Other systems (e.g., firefighting) | As per building services requirements | | | Solar panels: Square meters | Building services BIM | |
| External works | | | | | | Architectural estimate | Architectural BIM |
| Furnishing | Fixed furniture | | | | number of pieces (Contractors may use meters as a unit for furnishins such as kitchens) | Architectural estimate | Architectural BIM |
| Furnishing | User furniture | | | | | ? | ? |
| Floor area | Heated net floor area | | | | | Architectural BIM | Architectural BIM |
| Floor area | Gross floor area | | | | | Architectural BIM | Architectural BIM |
| Floor area | Reference area, heated gross floor area | | | | | Architectural BIM | Architectural BIM |

The availability of information depends on the stage of the modelling. LCAs often require making estimates on material and amounts if no designs are yet available or quantity take-off from the model cannot be performed. This is especially typical for early phase assessments. Draft information may be added to the BIM to support the early phase LCA. However, such information should be clearly labelled as draft, to notify the LCA specialist that the information is subject to change. Information regarding readiness is recommended to be disclosed in the BIM description document or location in the model from where it is easily identifiable by the life cycle assessor.

Building elements and components that may be included or excluded in the BIM (such as car parks, often included in BIM but not necessarily included in LCA) are agreed on separately in the project and included or excluded elements are documented in the building information model description. Inclusion or exclusion of building elements may vary depending on the local best practice and building area specification used. The inclusion of building parts that are relevant to the defined assessment method is ensured through quality assurance of the calculation.

# Supplementing BIM data from external sources

## Sources for supplementary data

BIM data is typically supplemented using external sources when information is not available in the BIM. Typical sources for supplementing information are:

- Structural design documents with information on e.g.:
    - Mass of steel rebar
    - Material details, e.g., Ready-mix concrete C30/37.
- Architectural design documents with information on e.g.:
    - Surface/room descriptions
        - Surface materials
    - Paved and green areas and site constructions according to ground plan/site layout.
    - Brick and mortar mass, calculated separately depending on the size and type of bricks.
    - Mass of steel profiles in internal walls
    - Box units (Assessment is challenging due to lack of available EPDs for box units)
    - The number of elevators and escalators, building height does not currently impact the quantity of equipment (e.g. a 3-floor and a 10-floor elevator produce the same calculation outcome)
- Building services (when not included in the nationally predefined values):
    - Building services are included in the Finnish assessment methodology, Sweden and Norway leave out all technical equipment and Denmark leaves most plumbing-related parts out from the calculations.
    - Large-size technical equipment, such as hospital equipment, is supplemented from other design documents.
- Energy reports, depending on the heating/cooling source of the building (geothermal) and electricity source (e.g., solar panels).
- Areas → Aim to include these in the model
    - Heated net area from energy reports (Finland, Estonia)
    - Gross floor area from building description (Sweden, Norway)

- Reference area (embodied part), heated gross floor area (operational part) (Denmark)

## Material assumptions

When calculations require making assumptions about materials, the employed assumptions should be documented. Assumptions should be based on the best available knowledge and expertise, and be based on e.g., benchmark-data or generic manufacturer estimates. LCA tools provide usable generic material assumptions which may be used in calculations when detailed information is not available.

## LCA documentation

Life cycle assessment reporting is done according to the national LCA reporting requirements or another applicable standard. The reporting requirement also applies to disclosing employed source data, scope, assumptions, and what environmental product declarations (EPDs) are utilized. The main assumptions should also be provided transparently to the client together with the LCA results.

It is recommended that the LCA expert keeps track of the employed data sources and supplementing information in such a manner that enables revising of calculation in a straightforward way. For example, if LCA calculations are first performed in an early design stage and the models are updated, the analyst can revise the sources of previous data and compare differences.

Two BIM models can be compared using, for example, Solibri software, and differences e.g., geometry and properties can be identified. The building information model description document enables also comparison of models and identification of changes and differences.

# About this Publication

## Process for BIM-based material inventory for normative climate declarations


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**Nordic co-operation**

Nordic co-operation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland and Åland.

Nordic co-operation has firm traditions in politics, economics and culture and plays an important role in European and international forums. The Nordic community strives for a strong Nordic Region in a strong Europe.

Nordic co-operation promotes regional interests and values in a global world. The values shared by the Nordic countries help make the region one of the most innovative and competitive in the world.

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