

# CONSTRUCTION CARBON REGULATIONS IN EUROPE REVIEW & BEST PRACTISES

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## EXECUTIVE SUMMARY

This report is written for everyone working with construction sector carbon regulations. The reader is assumed to have a basic familiarity with life-cycle assessment in construction.

This report is the result of a research in building life-cycle assessment (LCA) regulations and associated LCA databases in Europe. It reports all relevant regulations or regulatory projects identified, and analyses in more detail the existing and expected national regulations in Denmark, Finland, France, Netherlands, Norway, Sweden, and the UK. In case of UK, while the formal process for national regulations is not yet active, the London Plan implements such requirements for a population of 9 million people, making it relevant on a similar scale.

Regulations are analysed both in terms of the regulatory mechanisms and scope, as well as in the technical implementation and the actual LCA methodology. As many of the regulations are paired with a national LCA database to be used for approved assessments, the related databases were also analysed or their key content, processes and characteristics.

This report contains a detailed review of seven construction LCA methods. These are reviewed for their scope, timing, compliance requirement as well as the technical criteria of the used methodologies, including also rules for biogenic carbon, end of life and reused materials.

The report also reviews six LCA databases used to support regulations. The review included such things as top-up factors applied to generic data, size of database, frequency of updates, open access and if it's the sole database allowed for the regulatory application.

Following the analysis, the regulations were scored and benchmarked with each other based on the decarbonization impact they have, as well as the openness of the policy, including alignment with the European standards and openness to construction product data sources.

Based on comparative scoring against identified best practises, all regulations were classified on these dimensions either as transparency drivers, carbon cutters or leaders. The evaluation's leaders, implementing most of best practises in both dimensions, are the upcoming Danish and Finnish regulations and the London Plan.

Similar benchmarking was applied to the databases. The databases that were reviewed are B-EPD, CO2data, INIES, Okobaudat, NMD and Boverket's database. The databases were scored based on the availability and access and the quality and cost (to manufacturers). The leaders, implementing most of best practises in both dimensions, are Okobaudat and INIES.

Every regulation and database analysed advances decarbonisation of the construction industry. Every regulation can also be improved to cut even more carbon at a lower cost.

As every regulation has to be adapted to its local context, no single ideal recipe exists. However, the regulations presented in this report provide a starting point and contrasts for anyone investigating, planning, updating, or creating similar regulations in their local context.

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# 1. INTRODUCTION

## 1.1 PURPOSE OF THIS REPORT

The purpose of this report is to provide an overview of the regulations and policies on construction LCA and embodied carbon in the European market and help all parties preparing or implementing such policies to identify good practises.

## 1.2 THE IMPORTANCE OF REGULATING EMBODIED CARBON

The carbon footprint from energy has been regulated in the construction industry for more than 50 years. As the energy supply decarbonizes and buildings become increasingly energy efficient due to already implemented policies, embodied carbon will become the dominant source of carbon impacts from buildings. For as long as manufacturing of core materials runs on fossil fuels and emissions intensive chemical processes apply, embodied carbon will continue to unabated while both grid- and building level energy systems move to renewables at a rapid pace. For these reasons, building regulators have started updating the regulations to include whole life carbon emissions of construction works in the scope

## 1.3 ACCURACY OF INFORMATION

The development of this report required research into relevant regulations and policies in 32 countries across Europe. All identified regulations and polices were reviewed during the course of year 2022. While every effort was made to identify all relevant policies and their requirements, information in this report cannot be guaranteed to be accurate at the time of reading. Many of the reviewed policies were very recently released while some others are still under consultation which means that changes might occur or have already occurred since they were last reviewed for the purpose of this report. To obtain the latest information and requirements of any of the reviewed regulations it is recommended to download the latest documentation and read them in conjunction with this report. Where available, links to the relevant websites and documentation have been provided in Chapter 2.

## 1.4 AUTHORS

This report has been authored by experts at One Click LCA Ltd. Our mission is to power the makers of a zero-carbon future. One Click LCA provides the world's leading construction LCA software and manufacturing LCA and EPD software, as well as free large scale LCA education for all via One Click LCA Academy.

One Click LCA is used in over 140 countries by leading organisations. One Click LCA employs over 100 experts working on decarbonization of construction and manufacturing industries worldwide. For more information about us, please visit [www.oneclicklca.com](http://www.oneclicklca.com).

## 1.5 SUPPORTERS

This report has been made available thanks to the support of the Netherlands Enterprise Agency and the Finnish Ministry of the Environment. We are grateful for their support. Any omissions or mistakes in this report are those of the authors.

## 2. OVERVIEW OF THE EUROPEAN REGULATIONS

The number of national regulations and voluntary certification schemes incorporating whole-life carbon has been growing rapidly across Europe in the past years.

This review considered policies, regulations and voluntary certification schemes in all European Union countries, Norway, Iceland, Switzerland and the United Kingdom. Also, supranational requirements, like EU Taxonomy and EPBD were included in this study.

The following principles were applied in the study to select policies or tools covered:

- Policies or tools that contribute to lower whole-life carbon emissions
- The policies or tools target buildings specifically
- Policies were incorporated to the scope also when not in vigour, but for voluntary systems they have to be adopted by the industry in their target market
- Policy or tool is meant for broad adoption, as opposed to single organisation

The table below presents all national certification schemes, standing building regulations driving building LCA, building LCA methodologies and current product regulations and existing national databases for all reviewed countries. Countries that do not have any of these currently, or anything in development, are mentioned below this table separately.

Table 1: Overview of European regulations, certifications, standards and guidelines

Country	Voluntary building certifications	Methodology for public buildings	Building regulations	Product regulations	Product databases
Austria	<ul style="list-style-type: none"> <li>• <a href="#">IBO ÖKOPASS</a></li> <li>• <a href="#">Klimaaktiv</a></li> <li>• BREEAM AT</li> <li>• <a href="#">Oekoindex OI3</a></li> <li>• <a href="#">TQB-Bewertung</a></li> </ul>	-	-	-	<a href="#">Baubook</a> (Voluntary)
Belgium	<ul style="list-style-type: none"> <li>• <a href="#">GRO 2020</a></li> <li>• <a href="#">Milieuregulateerde materiaalprestatie van gebouwelementen (MMG)</a></li> </ul>	<a href="#">MMG assessment framework</a>	-	<a href="#">2014-05-22 Arrêté royal fixant les exigences minimales</a> (Royal Decree on environmental messages);  EPD mandatory for env. claims	<a href="#">B-EPD</a> (Regulatory)
Czech Republic	<a href="#">SBToolCZ</a>	-	-	-	-
Denmark	<a href="#">DK-DGNB</a>	<a href="#">Den frivillige bæredygtighedsklasse</a> - methodology	Building regulation to enter in force by 2023	-	<a href="#">EPD Danmark</a> (Voluntary)
Finland	<ul style="list-style-type: none"> <li>• <a href="#">RTS label</a></li> </ul>	<a href="#">Voluntary guideline</a> for	Building regulation to	-	<ul style="list-style-type: none"> <li>• <a href="#">CO2data</a></li> <li>• <a href="#">RTS EPD</a> (Voluntary)</li> </ul>

Country	Voluntary building certifications	Methodology for public buildings	Building regulations	Product regulations	Product databases
	<ul style="list-style-type: none"> <li><a href="#">Zero carbon methodology</a> (in development)</li> </ul>	assessing public buildings	enter in force by 2024		
France	<ul style="list-style-type: none"> <li><a href="#">Bâtiments Bas Carbone</a> (BBCA)</li> <li><a href="#">Haute Qualité Environnementale</a> (HQE)</li> <li><a href="#">Bâtiment à Énergie Positive &amp; Réduction Carbone</a> (E+C-)</li> <li>The regional variants of <a href="#">Effinergie, Quartiers et bâtiments durables</a></li> </ul>	E+C-	<a href="#">RE2020</a>	<a href="#">Arrêté du 9 juillet 2014 modifiant l'arrêté du 23 décembre 2013</a> relatif à la déclaration environnementale des produits de construction (EPD mandatory for environmental claims)	INIES (Regulatory)
Germany	<ul style="list-style-type: none"> <li><a href="#">DGNB</a></li> <li><a href="#">BREEAM DE</a></li> <li><a href="#">Nachhaltiger Wohnungsbau</a></li> </ul>	<a href="#">Bewertungssystem Nachhaltiges Bauen</a> (BNB)	-	-	OKOBAU.DAT
Iceland	-	<a href="#">Roadmap to greener construction 2030</a> (policy for public buildings in development)	-	-	-
Ireland	<a href="#">Home Performance Index</a> (HPI)	-	-	-	IGBC (Voluntary)
Italy	<ul style="list-style-type: none"> <li><a href="#">Casaclima Nature</a></li> <li><a href="#">GBC Home</a></li> <li><a href="#">Protocollo ITACA</a></li> </ul>	<a href="#">Criteria ambientali Minimi</a> (CAM)	-	CAM Green public procurement (Law 221/2015)	EPD Italy (Voluntary)
Netherlands	<ul style="list-style-type: none"> <li><a href="#">BREEAM NL</a></li> <li><a href="#">GPR Gebouw</a></li> </ul>	-	MPG + the building degree	-	<a href="#">NMD</a> (Regulatory)
Norway	<ul style="list-style-type: none"> <li><a href="#">BREEAM NOR</a></li> <li><a href="#">FutureBuilt</a></li> <li><a href="#">Powerhouse</a></li> </ul>	<ul style="list-style-type: none"> <li>Simplified NS 3720:2018</li> <li><a href="#">Statsbygg requirements</a></li> </ul>	TEK17	-	EPD Norge (Voluntary)
Poland	<a href="#">ZIELONY DOM</a>	-	-	-	ITB(Voluntary)
Portugal	<a href="#">LiderA</a>	-	-	-	DAP Habitat (Voluntary)
Romania	<a href="#">Green Homes Romania</a>	-	-	-	-
Spain	<ul style="list-style-type: none"> <li><a href="#">Verde</a></li> <li><a href="#">BREEAM ES</a></li> </ul>	-	-	-	GBCE
Sweden	<ul style="list-style-type: none"> <li><a href="#">Miljöbyggnad</a></li> <li><a href="#">NoIICO2</a></li> <li><a href="#">BREEAM SE</a></li> </ul>	<a href="#">Klimatdeklaration av byggnader</a>	<a href="#">Law (2021:787) on climate</a>	-	<ul style="list-style-type: none"> <li><a href="#">Boverket</a></li> <li>The International</li> </ul>

Country	Voluntary building certifications	Methodology for public buildings	Building regulations	Product regulations	Product databases
			<a href="#">declarations for buildings</a>		EPD System
Switzerland	<ul style="list-style-type: none"> <li>• <a href="#">Minergie</a></li> <li>• <a href="#">SGNI</a> (DGNB-CH)</li> <li>• <a href="#">Standard Nachhaltiges Bauen Schweiz</a> (SNBS)</li> </ul>	<a href="#">SIA merkblatt 2032</a> (Not mandatory standard)	-	-	<a href="#">KBOB</a>
UK	<ul style="list-style-type: none"> <li>• <a href="#">BREEAM UK</a></li> <li>• <a href="#">Home Quality Mark</a></li> <li>• <a href="#">Whole life carbon for the built environment</a> (RICS)</li> <li>• PAS 2050</li> </ul>	-	London Plan (London only)  <a href="#">Part Z</a> (proposed)	-	<a href="#">Built Environment Carbon Database</a> (BECD) in development

The following countries have no current LCA regulations, nor do they have any national LCA methodologies or voluntary schemes in place: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Luxembourg, Malta, Slovakia and Slovenia. Some organisations in these countries do utilise international voluntary certification schemes to assess and reduce the climate impacts of their projects.



## 3. COUNTRY SUMMARIES

### 3.1 AUSTRIA

#### Market overview

Austria is a federal republic. The federal legislative power is predominantly exercised by the lower chamber of the Austrian parliament. Each state has their state parliament for state legislation.

#### National building regulations

Due to the distribution of responsibilities in a federal state, no single building and construction law exists in Austria. However, the harmonization of building regulations implemented in the 2000s resulted in a harmonized federal regulation with functional requirements and guidelines. All nine states base their building codes on [Austrian Institute of Construction Engineering's \(OIB\) guidelines](#) that have been created to harmonize the regulatory framework in Austria. The guidelines only consider energy savings and efficiency, not embodied carbon.

#### Building regulations at sub-national level

Austria is a federal republic that consists of nine states which have some legislative authority in terms of zoning and construction. Whilst all states need to align with the federal functional requirements, they may deviate from Austrian Institute of Construction Engineering's harmonized guidelines as long as a certain level of safety is maintained.

#### Building LCA limit values

No official ones identified. However, Oekoindex OI3 sets limit values for voluntary use and they are used in connection with state-level housing subsidies in some states.

#### Policies for public buildings

Klimaaktiv is an Austrian initiative that is used for some public buildings.

#### Details of the nationally used building LCA methodology

None identified.

#### Policies for public infrastructure

None identified.

#### Construction product requirements

EU's CPR applies directly in Austria. No complementary regulation was identified.

#### Generic data and databases

No national mandatory generic database for construction products were identified. However, Austria's [Baubook](#) works as a voluntary database to disclose environmental data for products.

#### Voluntary certifications

Austria has various voluntary certification schemes, such as [IBO ÖKOPASS](#), [Ökoindex OI3](#), and [ÖGNI's DGNB](#) that are widely used nationally. IBO ÖKOPASS takes both materials and

energy into account, however the emphasis being in quality as a total, not LCA. Ökoindex OI3 on the other hand offers a perspective to examine either material emissions, constructions, or whole buildings, depending on the scope of the project and takes into account Global Warming Potential as one of its reporting categories. Austria's DGNB methodology is similar that of Germany's and has LCA related targets.

Other voluntary certification schemes used in the market are [Klimaaktiv](#), BREEAM AT, and TQB Assessment and LEED.

### **Other developments**

Austria has national plans to become climate neutral by 2040 and has stated in its sustainability agendas to concentrate heavily on renewable energy and energy efficiency.

### **System openness to trade**

The Austrian system can be considered trade neutral to all suppliers, whatever their origin. Both building and building product requirements are based on European standards and no additional mandatory requirements are set.

## 3.2 BELGIUM

### Market overview

Belgium is a constitutional monarchy with a federal parliament governing on the federation level. Belgium is also a federal state, with two types of entities: Communities (Flemish, French and German speaking) and Regions (Flemish, Brussels-Capital, and Walloon region)

As a federal state, communities and regions have legislative power over their internal jurisdictions. This power includes for example housing, zoning and public planning, thus giving regions the possibility to regulate separately from the federal state. No hierarchy of norms exists between the state and regions, and conflicts of jurisdiction are settled by Belgian constitutional court.

### National building regulations

Regions are responsible for spatial development plans, environmental legislation and energy and building code regulations. No building codes regulating the whole life cycle of a building exist.

### Building regulations at sub-national level

No specific building regulation to drive life-cycle emissions in construction sector exists. However, the regions are defining a mutual methodology for assessing building emissions, which is used in public works, called the [MMG assessment framework](#) that is implemented in the TOTEM tool.

### Building LCA limit values

None identified.

### Policies for public buildings

No hard policies for public buildings were identified. However, the MMG methodology and the TOTEM tool is often required to use for all public projects. The Flemish region uses [GRO 2020](#) for its own construction projects.

### Details of the nationally used building LCA methodology

The Milieugerelateerde materiaalprestatie van gebouwelementen (MMG) assessment framework is based on the European CEN/TC 350 standard family and includes 12 main environmental impact categories. The provided generic data, as well as the Belgian EPD database's data can be used for the assessment.

The methodology includes the whole life cycle of the building or element assessment and sets a 60-year service life to the building assessed. The methodology includes the Product stage (A1-A3), construction process stage (A4-A5), Maintenance (B2), Replacements (B4), Operational energy use (B6) and the End-of-life stage (C1-C4). Module D has not yet been implemented but is expected to be added in the future revisions.

### Policies for public infrastructure

None identified.

### Construction product requirements

Belgium has a [Royal Decree](#) on the minimum requirements for environmental labels on construction products. The Royal Decree states that companies making specific

environmental claims on their products to create an NBN EN 15804 compliant EPD and to deposit to the national database B-EPD. As per the decree, certain environmental claims, such as biodegradable, recycled, lower energy consumption, reusable and claims on the origin of timber and agricultural products are exempted from EPD requirement.

### Generic data and databases

To support environmental impact assessments the nationally used tool TOTEM provides generic environmental data that can be used in the assessment. The data is based on the Ecoinvent database and is harmonized to Belgian context.

The TOTEM tool has also included environmental data from the Belgian EPD database called B-EPD. The Belgian EPD program applies to all construction products sold in Belgium or intended to be used in Belgium. The PCR is based on the international standards ISO 14040, ISO 14044, ISO 14025, and the European standard EN 15804:2014+A2:2019.<sup>1</sup>

### Voluntary certifications

Belgium has two substantial voluntary schemes, the GRO 2020 used by the Flemish region and the MMG assessment used by all three regions.

### Other developments

No national LCA methodology or policy yet exists. However, the regions are currently developing the existing MMG framework to create a nationally used way of assessing building emissions.

Belgium also has a circular economy strategy that guides its way to reduce the usage of virgin materials and to lead into more sustainable use of resources. Belgium has also made progress in reducing the usage of fossil fuels and increasing the share of renewable energy.

### System openness to trade

The Belgian system cannot be described as trade neutral. Foreign manufacturers may be considered disadvantaged, due to EPD published in their own jurisdiction not being eligible under the royal decree, and thus cannot be currently used in the nationally used TOTEM tool. The TOTEM tool is currently a de facto monopoly in all three regions, preventing the usage of any other LCA tool. This has the effect of blocking the use of construction products from foreign manufacturers, if they have published EPDs in their own regions, when such EPDs would be available in other tools than TOTEM.

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<sup>1</sup> FPS Health, Food Chain Safety and Environment. (2022). Environmental Product Declarations (EPD). A Concise Guide for Producers in the Construction Sector. [https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth\\_theme\\_file/bepd-guide-en.pdf](https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/bepd-guide-en.pdf)

### 3.3 DENMARK

#### Market overview

Denmark is a constitutional monarchy represented by a national parliament. The kingdom does not have one sole judicial system, but separate systems for Denmark, Greenland and Faroe Islands. The present discussion only concerns Denmark.

#### National building regulations

The Danish Building Act regulates construction nationally. A requirement for all new buildings to calculate a life-cycle assessment from 1<sup>st</sup> of January 2023 onwards is expected to be added into the building code<sup>2</sup>.

#### Building regulations at sub-national level

Where long-term considerations on spatial planning are provided nationally, municipalities conduct the strategic planning for their own territory and prepare detailed plans to steer land use locally. However, the government does have the power to issue planning directives related to areas of importance, such as infrastructure. Overall planning for the Copenhagen metropolitan area is done nationally and the final planning of land use cannot cross the national planning directive.

#### Building LCA limit values

A cross-parliamentary committee has declared that it will introduce limit values into the building act for all new buildings larger than 1 000 m<sup>2</sup> from 2023, and that limit values will be further revised and tightened every second year. The limit values are expected to become mandatory for all new buildings regardless of the size in 2025. The limit values have not yet been published.<sup>3</sup>

#### Policies for public buildings

No official policies or schemes exist for public buildings. However, DGNB Denmark is often used for assessing public buildings nationally. For example, the city of Copenhagen requires a DGNB certification for all buildings with a construction budget above 2.6 million euros.

#### Details of the nationally used building LCA methodology

The national [Sustainability Class](#) methodology is to become mandatory in 2023 for all new buildings. The methodology is aligned with the European EN 15978 standard and is to be performed when applying for a construction permit and upon completion. The assessment scope shall depend on the stage of the project.

The national methodology's scope includes substructures, superstructures, building services and external works. Life-cycle stages included in the assessment depend on the stage of the project. Product stage (A1-A3), Transport (A4), Construction site (A5) Replacements (B4), Operational energy (B6), and Waste treatment and disposal (C3-C4) are to be included in the assessment. The assessing of transport (A4) and construction site (A5) can be omitted from calculations when applying for a building permit. Environmental data used must comply with the EN 15804 standard and be third-party verified. For construction products where no

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<sup>2</sup> Videncenter om Bygningers Klimapåvirkinger. (2022). Klimakrav træder i kraft i bygningsreglementet fra 2023. <https://www.byggeriogklima.dk/klimakrav-i-br/kort-om-kravene/>

<sup>3</sup> Videncenter om Bygningers Klimapåvirkinger. (2022). Tidsplan frem mod klimakravenes ikrafttræden. <https://www.byggeriogklima.dk/klimakrav-i-br/tidsplan/>

representative EPD is found, generic data that is similar with the German database Ökobaudat must be used. The methodology allows currently only EN 15804 +A1 data.

### **Policies for public infrastructure**

None identified.

### **Construction product requirements**

EU's CPR applies directly in Denmark. No complementary regulation was identified.

### **Generic data and databases**

No official national building product database exists. The nationally used Sustainability Class methodology however suggests using the German generic database Ökobaudat when no specific EPD is found.

### **Voluntary certifications**

The most used national voluntary certification scheme is the DK-DGNB, which is a Danish version of the German DGNB. DK-DGNB certificate includes economic, environmental and social aspects into the assessment, including a building LCA. The certification can be achieved for multiple building types, as well as new builds and renovations.

### **Other developments**

The Danish climate act sets national targets for Denmark to reduce its emissions by 70 % in 2030 compared to 1990 and to achieve climate neutrality by 2050. The Act sets obligations on the government to report its actions towards meeting the targets.

### **System openness to trade**

The Danish system is broadly neutral to product manufacturers. Whereas building and building product requirements are based on European standards, the data allowed is for the moment limited to the older version of the standard. Further, software tool LCAbyg is provided a state endorsement, which may lead to manufacturers whose data is not in that software being at a disadvantage for competition on the Danish market.

## 3.4 FINLAND

### Market overview

Finland is a parliamentary republic with its constitution defining the political system. The legislative authority is exercised by the elected parliament that votes on bills presented predominantly by the government. As a non-federal country the legislative power is held at a national level.

### National building regulations

Currently the Land use and construction act regulates construction in Finland. The new zoning and building act was in consultation during 2021 and is currently being modified according to the consultation feedback. The new law is expected to be presented to the parliament in the second half of 2022 and is expected to come into force from first of January 2024.<sup>4</sup>

The new act will present a mandatory climate declaration for all projects when applying for a construction permit. However, in certain cases projects are exempt from this requirement. For example, buildings under 50 m<sup>2</sup>, “free-time” residential buildings, industrial, religious, agricultural production and military buildings and temporary buildings in use for less than two years are not governed by this regulation.

### Building regulations at sub-national level

Finland is divided into municipalities that are governed by the regional councils. The councils are responsible for the municipality’s operative actions. Where municipalities and cities do not have the same legislative power as the government, they can influence construction and its emissions by zoning. Some Finnish cities, like the capital Helsinki, mandates that building carbon footprint is assessed in city owned projects and occasionally require building LCA as part of land sales competitions.

### Building LCA limit values

Finland is expected to introduce mandatory limit values for building carbon footprint as part of the oncoming regulation in 2024. The limit values are expected to exclude underground constructions (soil stabilisation, basements and foundations) and external site constructions. The limit value regulation would not apply to detached houses nor refurbishments.

### Policies for public buildings

Finland has a voluntary policy for assessing public buildings. The set criteria includes life cycle emissions from buildings implemented or bought with public funding, including operational energy, materials and innovations. The policy was set to conform with national climate politics and to anticipate the forthcoming regulation.

Cities and municipalities have also regional agendas and can impose building LCA calculations on city owned buildings. However, this is not regulated by law. Once the new zoning and building act is enacted into law, it will require a climate declaration from all new construction over 50 m<sup>2</sup>, including public buildings.

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<sup>4</sup> Ympäristöministeriö. (2022). Maankäyttö- ja rakennuslain uudistuksen jatkosta linjaus: uusi rakentamislaki sekä alueidenkäytön digitaalisuus eduskuntaan syksyllä. <https://ym.fi/-/maankaytto-ja-rakennuslain-uudistuksen-jatkosta-linjaus-uusi-rakentamislaki-seka-alueidenkayton-digitaalisuus-eduskuntaan-syksylla>



## Details of the nationally used building LCA methodology

The Finnish ministry of environment published a draft methodology in 2021<sup>5</sup> for assessing the climate impacts of buildings. This methodology gives the scope for national assessments. The final updated version of the methodology will be published alongside with the new construction act that mandates its usage.

The climate declaration covers Product manufacturing (A1-A3), Transport to building site (A4), Building site (A5), Product replacements (B4), Operational energy (B6), and the End-of-life (C1-C4). Transport, energy usage on site and fuel consumption and end-of-life impacts can be calculated according to given default values. The methodology prioritizes the use of product specific data, such as EN 15804+A2 compliant EPD data, whenever the project specific product is known. If no manufacturer specific EPDs are found or no specific producer has been chosen, the assessor must use the national database of generic values for building product data. No mandatory calculation tools are stated in the regulation or methodology.

The results are reported both for building site, including underground constructions and external works, and the building itself, including superstructures, finishes, fittings, and building services. The climate declaration measures Global Warming Potential (GWP) as the only environmental impact category and expresses this both as the carbon footprint and the carbon handprint. Results are expressed in kg CO<sub>2</sub>e/m<sup>2</sup>/a. No mandatory verification of results is expected in the regulations.

## Policies for public infrastructure

National public infrastructure policies are under development by the Finnish Transport Infrastructure Agency. This entails the development of national infrastructure database and calculation methodology and practice. No standing policies for public infrastructure were identified.

## Construction product requirements

The Finnish regulation applies EU's Construction Product Regulation, and no complementary regulation exists. However, the climate declaration and national generic values, which include a top-up factor to reflect uncertainty, create an increased demand for product transparency.

## Generic data and databases

To facilitate climate declarations and to incentivize product manufacturers to create Environmental Product Declarations, the Finnish Environmental Ministry has created a national database [co2data.fi](https://co2data.fi) in cooperation with the Finnish Environmental Institute. The database includes generic values for most used construction materials along with default values that can be used for the climate declarations. The database values for building materials include a 20 % top up factor to compensate for the variability of product emissions.

Finland has a local EPD program operator [RTS](https://www.rts.fi) that publishes EPDs. RTS publishes EN 15802 +A1:2012 and EN 15804 +A2 compliant EPDs.

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<sup>5</sup> Ympäristöministeriö. (2021). Rakennuksen vähähiilisyden arviointimenetelmä 2021. Luonnos lausuntokierrosta varten.



## Voluntary certifications

RTS Environmental Classification for building projects (RTS Ympäristöluokitus) is the main voluntary national certification scheme in Finland, measuring building sustainability. The certification scheme's LCA metrics are based on European standards. The certification scheme can be used for different building types and applies for new buildings and refurbishments. International certification schemes, such as BREEAM and LEED are also widely used.

The Finnish Green Building Council is also releasing a Carbon Neutral Building Assessment methodology for voluntary assessments in projects that aim for carbon neutrality. The LCA approach used in the methodology is based on the national methodology. The assessment guidance has not yet been released and is being piloted throughout 2022.<sup>6</sup>

## Other developments

The Finnish government programme states that Finland is to become carbon neutral by 2035. Some cities, such as the capital Helsinki, has set more ambitious goals of becoming carbon neutral by 2030. Cities that have taken a stricter path to emission reductions have created their own roadmaps on how to reduce construction sector emissions and they already demand the carbon footprint assessment in some land sales and land lease contracts, and design competitions.

## System openness to trade

The Finnish system can be considered trade neutral to all suppliers, whatever their origin. Both building and building product requirements are based on European standards. The national building assessment methodology accepts all EN 15804 +A1:2012 and EN 15804 +A2 compliant third-party verified EPDs and thus remains neutral to all parties regardless of their origin.

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<sup>6</sup> Green Building Council Finland. (2022). Hiilineutraali rakennus. Ohje oman toiminnan arviointiin ja hiilineutraaliusväittämän tekemiseen. <https://figbc.fi/wp-content/uploads/sites/4/2022/01/Hiilineutraali-rakennus-ohje-esittely-19.1.2022.pdf>

## 3.5 FRANCE

### Market overview

France is a representative democracy. The legislative power is vested upon the French parliament that consists of the National Assembly and the Senate. The Senate's legislative powers are however limited, and in case of a dispute the National Assembly has the decisive power.

### National building regulations

The energy and environmental performance of buildings is regulated by the French [Decree on energy and environmental performance requirement for building construction](#). The decree places requirements on calculating the building's whole life cycle emissions for all residential, office, and primary or secondary educational buildings that are subject to applying for a building permit from 1<sup>st</sup> of January 2022 onwards. Regulation are being extended to other typologies. No minimum applicable size is identified, and the regulation also includes for example parking zones. The national regulation only applies to continental France and Corsica, and excludes overseas regions and territories.

### Building regulations at sub-national level

France is divided into 18 administrative regions that are located both in Europe in and outside of Europe, as well as overseas collectivities and territories. Regions follow national regulations, however national regulations have regional adaptations for local conditions.

### Building LCA limit values

France has set limit values that decrease over time for each typology. The limit values are divided into two, one for construction materials and site impacts (ICconstruction\_max) and one for life cycle carbon emissions that are related to energy consumption (ICenergie\_max). The limit values depend on various coefficients such as typology, building area, location of the project and usage of data.

### Policies for public buildings

Public buildings must follow the national regulations. Each municipality can however set their own policies to public building governed by the region, as long as the policy does not conflict with national regulations.

### Details of the nationally used building LCA methodology

The RE2020 regulatory calculation method is described in the [Arrêté du 4 août 2021](#) section 4. The methodology follows the EN 15978 standard with some key deviations, including the so-called "dynamic carbon calculation". The dynamic calculation principle applies a coefficient to each year from year 1 to year 50 for the considered calculation period. The coefficient varies from 1 (year 0) to 0.6 (year 50) and aims to account for the fact that the earlier an emission happens the more harm it causes, and to consider the benefits of biogenic carbon temporarily stored in buildings.

The scope of the assessment includes the whole building and its external areas (including systems, combined heat and power, photovoltaics and refrigerant leaks). The methodology covers product manufacturing (A1-A3), Transport to building site (A4), Building site (A5), Product replacements (B4), Operational energy (B6), the End-of-life (C1-C4) and includes also benefits and load beyond the boundary (module D).

The performance indicators (IConstruction and ICénergie) are based on the Global Warming Potential (GWP) indicator. Biogenic carbon indicator is also reported along with the ratio of generic data used, as well as other environmental impact categories such as Ozone Depletion and Acidification. All other EN15804 +A1 indicators are also calculated and reported but not tied to performance indicators.

[Arrêté du 14 décembre 2021](#) defines the data that can be used in the environmental calculations. Data should be third party verified and in line with NF EN 15804 + A1: 2014-04, or XP C08-100-1: 2016-12, or XP C08-100-1 : 2016-12 and EN 50693 : 2019-08, or any equivalent standard and needs to cover cradle to grave impacts including module D. Program operators must sign a convention with the Ministry to be approved for the regulatory calculations.

All assessments must be done with government approved tools and completed assessments must be submitted to an LCA data repository. The overall system itself can be considered complex, beyond the level of complexity required for the regulatory purposes.

### **Policies for public infrastructure**

None identified.

### **Construction product requirements**

The [Arrêté du 9 juillet 2014 modifiant l'arrêté du 23 décembre 2013](#) regulates the creation and publishing of product specific environmental declarations. The act requires manufacturers marketing their products with environmental statements to create an EN 15804 compliant EPD, with a few exceptions. The act includes also building electrical appliances and HVAC -products sold to consumers. All declarations must be published to the national INIES database.

Other construction product requirements follow the European regulation.

### **Generic data and databases**

The French national database for Environmental and Health Declarations (FDES) [Inies](#) publishes NF EN 15804 compliant EPDs. The construction product declarations published must also comply with the national supplement to EN 15804 standard. Declarations for equipment must comply with the NF XP C08-100-1 standard and PCR ed.3 for equipment.

Inies database includes generic data as well as EPDs compliant with the system. The generic environmental data (données environnementales par défaut, DED), is created by the French government. More generic data can be requested by assessors through the [MLab portal](#).

### **Voluntary certifications**

The French market has multiple frequently used voluntary certification schemes, such as the Bâtiment Bas Carbone (BBCA), Haute Qualité Environnementale (HQE) and the Bâtiment à Énergie Positive & Réduction Carbone (E+C-). The E+C- scheme was used nationally to prepare and test methods for the regulation now in force and it is still widely used until all building typologies will be covered by the regulation.

The HQE certification scheme and the BBCA label and their LCA calculation methodologies follow closely the regulatory methodology RE2020 and the E+C- methodologies. However, the BBCA methodology aims to go beyond regulation to promote low carbon construction.

### **Other developments**

The national program operator Inies has defined rules to approve EPD generators (configureurs) which are used by the public to generate on demand verified EPDs for free. This enhances a more efficient creation of EPDs to be used in assessments and increases the amount of data available in European markets.

### **System openness to trade**

The French system cannot be considered trade neutral, due to the restricted data usage in mandatory RE2020 assessment. Currently, only INIES database can be used, which makes the system limited to favour French manufacturers who would publish their data in France for domestic and export markets. The government has issued a system to recognize other EPD programs besides INIES, however no other EPD program has been approved as of now.

## 3.6 GERMANY

### Market overview

Germany is a federal country, functioning as a parliamentary representative democratic republic. The federal legislative power is vested upon the parliament.

### National building regulations

Construction is regulated both nationally and on a state level. The federal government regulates predominantly land use and zoning, where states regulate the buildings themselves. Where a model building code is presented nationally, it offers all states a model to issue their own building regulations.

### Building regulations at sub-national level

As a federal state, Germany comprises of 16 States that have their own constitutions. German States can implement local policies that can exceed the national level of ambition. Currently no national regulation concerning building LCA exists. Where efforts have been made towards more energy efficient designs, no state has created a policy on regulating the whole life cycle of the building at the entire state level.

### Building LCA limit values

None identified.

### Policies for public buildings

The Federal Ministry for Housing, Urban Development and Construction has established the [Bewertungssystem Nachhaltiges Bauen](#) (BNB) sustainable building assessment system to be used for public buildings, such as schools and offices. The assessment system is mandatory for all new federal buildings along with complete refurbishments.

### Details of the nationally used building LCA methodology

The BNB methodology used for federal buildings follows the EN ISO 14040, EN ISO 14044 and the DIN EN 15978 standards. The scope of the assessment includes the whole building, excluding any external constructions. The methodology covers Product manufacturing (A1-A3), Transport to building site (A4), Building site (A5), Product replacements (B4), Operational energy (B6), and the End-of-life (C1-C4).

The results considered include the Global Warming Potential (GWP), as well as other environmental impact categories such as Ozone Depletion and Acidification. As part of the national sustainable construction agenda, the federal government provides an online database that can be used for LCA calculations, as well as the BNB compliant [eLCA -tool](#).

### Policies for public infrastructure

None identified.

### Construction product requirements

The German regulation applies EU's Construction Product Regulation, and no complementary regulation exists.

## Generic data and databases

The German [ÖKOBAUDAT](#) platform is a standardized national environmental database created by the Federal Ministry for Housing, Urban development, and Construction. The database has environmental data on building materials, construction processes, transportation, energy and disposal. All data published in ÖKOBAUDAT is publicly available.

ÖKOBAUDAT is frequently updated and has currently over 1 400 datasets for building products. All data is EN 15804 and BNB -compliant. ÖKOBAUDAT delivers both EN 15804+A1 and EN 15804 +A2 compliant data during the transition period.

## Voluntary certifications

Germany has multiple voluntary certification schemes, from which DGNB and LEED are the most used. Both certification systems can be used for various building types.

DGNB certification scheme was created by the German Sustainable Building Council and today its localized versions are widely used in some neighbouring countries. It is widely used also in Denmark who has its own local version of DGNB.

## Other developments

Germany aims to become climate neutral by 2045 and has already advanced in increasing renewable sources to generate electricity. The German Climate Act imposes the government with requirements to reduce greenhouse gas emissions by 55 % by 2030. Construction wise Germany has committed especially to increasing energy efficiency in the existing building stock and to build more energy efficiently.

## System openness to trade

The German system can be considered neutral and fair to all suppliers, whatever their origin. Both building and building product requirements are based on European standards.

## 3.7 ICELAND

### Market overview

Iceland is a representative democracy and a parliamentary republic. Legislative power is vested upon the national government and parliament. As Iceland is not a part of the European Union, EU regulation does not directly apply in Iceland. However, Iceland is commercially integrated into the Union via the EEA and Schengen agreements.

### National building regulations

Construction in Iceland is regulated by the national construction regulation. The act on Environmental Assessments of Projects and Plans ensures that certain projects must perform an Environmental Assessment of the project. This does not however entail an LCA of the project and no harmonized LCA standards were identified.

The Icelandic Housing and Infrastructure Authority is working on a new harmonized LCA standard and is launching a [sustainability roadmap](#) concerning project LCA calculations in the first quarter of 2022.

### Building regulations at sub-national level

Iceland is divided into regions, constituencies, and municipalities. The municipalities do not have actual regulatory power but can influence zoning and plot sales and lease and can thus influence sustainability on their land.

### Building LCA limit values

Building emission limit values are expected to be implemented eventually into the national regulations. No definitive deadline for introducing limit values is set.

### Policies for public buildings

The national Housing and Infrastructure Authority's roadmap envisions for LCA to become mandatory for public parties in the first phase. Currently no policies for public buildings were identified.

### Details of the nationally used building LCA methodology

No harmonized building LCA standard or methodology was identified. The national Housing and Infrastructure Authority's roadmap will present a unified way for Icelandic industry to assess the emissions coming from construction.

### Policies for public infrastructure

None identified.

### Construction product requirements

In Iceland construction products are regulated through the [act on construction products](#). No regulation on environmental claims and environmental declarations were identified.

### Generic data and databases

As a part of the roadmap, Iceland will inspect need and practicalities of a national database.

### **Voluntary certifications**

No national voluntary certifications were identified. However, international schemes such as BREEAM International and the Norwegian NS 3720 is used in the market.

### **Other developments**

None identified.

### **System openness to trade**

No trade limiting elements have been identified in the high-level plans set out to date.



## 3.8 NETHERLANDS

### Market overview

Netherlands is a constitutional monarchy and a parliamentary democracy. The role of the monarch is primarily representative and ceremonial. The legislative power is vested upon the States General of the Netherlands, which consists of the Senate and the House of Representatives.

### National building regulations

Construction in the Netherlands is regulated by the Dutch Building Decree. According to national regulations, Milieu Prestatie Berekening (MPG) is mandatory for all office buildings over 100 m<sup>2</sup> and all residential buildings.<sup>7</sup>

### Building regulations at sub-national level

Netherlands is divided into 12 provinces that are responsible for translating national guidelines into a regional context. Provinces are further on divided into municipalities, that develop and implement local policies related to spatial planning and the environment.

### Building LCA limit values

The maximum limit values for the LCA results given as shadow prices have been applied to all MPG assessments since 1<sup>st</sup> of January 2018. The initial limit value for all buildings was set to 1.0 €/m<sup>2</sup>/a. The limit value was tightened 1<sup>st</sup> of July 2021 for all residential buildings to 0.8 €/m<sup>2</sup>/year, whilst the value stayed the same for office buildings.

### Policies for public buildings

The regulation on environmental performance of buildings that directs calculations in the Netherlands applies to all residential buildings and all office buildings above 100 m<sup>2</sup>, whether public or private. However, no other public buildings must be assessed.

### Details of the nationally used building LCA methodology

The [Milieu Prestatie Berekening](#) (MPG) is a nationally used methodology for construction projects in Netherlands. MPG indicates the environmental impacts from material usage in buildings and is used for various building types. The MPG methodology is based on a Dutch determination methodology that bases calculations on the European EN 15804 +A2 standard and all data used in the MPG assessment should be EN 15804 +A2 compliant.

The scope of the assessment includes foundations, floors, supporting structures, facades, roofs and buildings installations. It is limited to materials found in the national NMD database. The assessment includes the whole life cycle of the building, excluding operational energy (B6) and water (B7) usage.

The MPG methodology accounts for various environmental indicators as per the Dutch determination methodology and EN 15804 +A2- However, based on a weighting methodology on the environmental categories it assigns the impacts into the shadow price indicator using a monetary multiplier dependent on the environmental indicator, and the main result is given as €/m<sup>2</sup>/a.

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<sup>7</sup>Rijksdienst voor Ondernemend Nederland. (2021). MilieuPrestatie Gebouwen – MPG. <https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/gebouwen/wetten-en-regels/nieuwbouw/milieuprestatie-gebouwen>

## Policies for public infrastructure

As the government has a monopoly on civil engineering works, they can influence heavily the environmental assessments carried out on infrastructure. Rijkswaterstaat commissions most of Dutch infrastructure and applies environmental impact assessment process to all their civil engineering works using their own methodology, which broadly aligns with MPG.

## Construction product requirements

The Netherlands apply EU's Construction Product Regulation.

## Generic data and databases

The [Dutch National Environmental Database](#) (NMD) includes three categories of data: category 1 (product-specific) and 2 (sector average) with third party verified data for specific products or product groups and category 3 for generic government commissioned data for construction products and processes. The NMD differs from other European environmental databases predominantly due to the way environmental data is displayed. As in the MPG assessment, all environmental product data is displayed as the shadow price per given functional unit.

## Voluntary certifications

The most used voluntary scheme in the Netherlands is BREEAM NL. Other voluntary certification tools such as LEED and GPR Gebouw are also used to assess overall sustainability of construction works.

## Other developments

None identified.

## System openness to trade

The Dutch system cannot be considered trade neutral, due to the MPG assessment only allowing use of the national NMD database. This sets a barrier to foreign manufacturers who will need to create separate EPDs to the NMD database in addition to their local or other EPD Program Operator.

## 3.9 NORWAY

### Market overview

Norway is a constitutional monarchy, where the legislative power is vested with the national parliament. The majority of bills are passed to the parliament by the government and new legislation and amendments to old acts can be passed by a majority vote. As a non-federal country the legislative power is held on national level.

### National building regulations

Currently building construction is governed by the Norwegian Building Regulation. The [Norwegian energy and greenhouse gas emission](#) chapters came into force on 1<sup>st</sup> of July 2022, with a one-year transition period after which they will become mandatory.

### Building regulations at sub-national level

Norway is divided into counties and further on into municipalities and both are governed by local authorities and councils. Both, municipality, and county officers have an administrative status and can set policies to govern regional planning and implementation. However, the central government has overriding authority.

The regulatory proposal states that all apartment blocks and commercial buildings shall prepare a greenhouse gas calculation based on the Norwegian NS 3720:2018 methodology. The assessment shall be produced upon completion.

### Building LCA limit values

While Norway had proposed voluntary limit values in a consultation phase, these have been removed after the regulation was officially released on 1<sup>st</sup> of July 2022. It is unknown whether they will be re-introduced again in the future.

### Policies for public buildings

The Norwegian government's building commissioner, property manager and developer Statsbygg has ambitious environmental goals towards its own projects and has included project LCA studies into its functions before the regulation mandating it. Also, bigger cities like Oslo and Bergen have ambitious goals towards carbon reductions and they have been requiring assessments even before the regulation came into force. The municipality of Bergen has also created its own [guide](#) for whole life carbon assessments of buildings.

### Details of the nationally used building LCA methodology

The national building methodology commonly used is the NS 3720, which is based on the EN 15978 standard. The NS 3720:2018 standard and the NS 3720 methodology include the whole life cycle of the building, including operational emissions. The assessment is to be carried out for the entire building, including the building site and foundations.

The regulation solely requires the calculation of Material Production (A1-A3), Transportation impacts(A4), and Material replacements (B4).

The assessment period is set to 60 years and only Global Warming Potential (GWP) is measured. No carbon handprint is considered. No generic database or national database is recommended in case no specific EPD value is found. Methodology is EN 15804 +A1 compliant.

## Policies for public infrastructure

There are three main national infrastructure bodies in Norway: Vegvesen, Nye Veier and Jernbaneverket and all of these have their own systems in place. Whereas no environmental assessment is mandatory under national regulations, voluntary certification schemes and assessments are used. For example, Vegvesen applies [CEEQUAL](#) certification in all its new projects.

## Construction product requirements

No national regulations governing environmental statements were identified. It is worth mentioning though that the new regulation requires all construction materials to be non-hazardous to human health.

## Generic data and databases

No national generic database for construction products and building services exists.

The Norwegian EPD program operator [EPD Norge](#) does publish Norwegian EPDs. EPD Norge is a program operator for type III Environmental Product Declarations (EPDs) as per ISO 14025. The Product Category Rules for European construction products follow the European EN 15804 standard. The EPD program can be used by any manufacturer regardless of the origin and EPDs published by EPD Norge are usable in any national methodologies accepting any EN 15804 compliant EPD data.

## Voluntary certifications

BREEAM NOR and FutureBuilt are the most widely used Norwegian national certification schemes. These schemes are similar and require both embodied and operational energy emissions to be accounted for and reduced.

## Other developments

None identified.

## System openness to trade

The Norwegian system can be considered neutral to all suppliers, whatever their origin. Product data requirements for climate declaration are based on European standards.

## 3.10 SWEDEN

### Market overview

Sweden is a constitutional monarchy, but the role of the monarch is primarily representative and ceremonial, and the legislative power is held by the Swedish national parliament (Riksdag). New legislation and amendments to existing are predominantly presented by the government, which is also responsible for the implementation of decisions taken by the parliament.<sup>8</sup> As a non-federal country the legislative power is held solely at a national level.

### National building regulations

The new national [act on climate declaration](#) for buildings is the predominant legislation governing embodied carbon reductions in the building sector. The legislation entered into force 1<sup>st</sup> of January 2022. The act mandates all newly built buildings over 100 m<sup>2</sup> to submit a climate declaration for occupation permit. Temporary buildings used for less than two years, buildings that do not need a building permit, industrial buildings as well as buildings used for defence or agriculture are exempted from creating a climate declaration. Buildings owned and constructed by private persons for non-commercial purposes do not need to submit a climate declaration. The act only concerns new build buildings and it is not required for renovations and refurbishments to create a climate declaration. The supervisory authorities may impose a penalty in case of incorrect and untrue information.

The new regulations apply only to buildings where a building permit has been applied for on 1<sup>st</sup> of January 2022 or later.

### Building regulations at sub-national level

Sweden is divided into regions and further into municipalities. Both regions and municipalities are governed by local commissions, that have political responsibilities but no substantial legislative power. Swedish cities have notable limitations in terms of being able to set stricter requirements for construction permits than the national regulation sets out.

### Building LCA limit values

Sweden has announced the setting of mandatory limit values for building carbon footprint by 2027 and the possibility of an earlier introduction is currently being investigated.

### Policies for public buildings

The act on climate declarations concerns all new buildings over 100 m<sup>2</sup>, including public buildings.

### Details of the nationally used building LCA methodology

The Swedish national methodology [Klimatdeklaration](#) is used according to the act on climate declaration for buildings. The assessment is done upon completion, and it shall reflect the building at an as-built stage. All declarations completed shall be registered with the National Board of Housing, Building and Planning and submitted to the municipality's building committee.

The climate declaration covers solely upfront carbon, including Product manufacturing (A1-A3), Transport to building site (A4) and Building site (A5). Product manufacturing emissions

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<sup>8</sup> Government Offices of Sweden. How Sweden is governed. <https://www.government.se/how-sweden-is-governed/>

shall be conducted predominantly with real values from manufacturer specific EPDs. If no EPD is found for the product used, national database values may be used for the assessment. Transport to building site (A4), as well as energy consumption at the building site (A5) shall be assessed with generic national database values. Waste at the building site shall be estimated with project specific values or specific climate data provided by the manufacturer.

### Policies for public infrastructure

The Swedish Transport Agency (Trafikverket) has introduced demands for climate declarations in investment projects exceeding 50 million. For other projects the transport agency has set requirements on individual material, such as reinforcement steel and concrete. The calculations must be performed with the agency's own calculation tool.<sup>9</sup>

The voluntary certification scheme CEEQUAL is used for certain projects in Sweden.

### Construction product requirements

The construction product requirements in Sweden are based on the European construction product regulations. No specific requirements concerning building product sustainability were identified. However, the climate declaration and national generic values, which include a top-up factor to reflect uncertainty, aim to create an increased demand for product transparency.

### Generic data and databases

The Swedish National Board of Housing, Building and Planning has created a [national database](#) to serve companies undertaking climate declarations as per the Swedish regulations. The climate database contains generic values for most used building products, energy, and fuels. The database values for building materials include a 25 % top up factor to compensate the heterogeneity of product emissions.

### Voluntary certifications

The most used national voluntary certifications are [Miljöbyggnad](#) and [BREEAM SE](#). BREEAM SE and Miljöbyggnad incorporate various requirements the building needs to fulfil to be certified, as well as different certification levels a project can seek for, depending on the project's ambition and points received. Both certification schemes require LCA calculations to be made. Other international voluntary certification schemes, such as LEED, are also used in various projects nationally.

### Other developments

The Swedish government has mandated the National Board of Housing, Building and Planning to investigate the possibility of expanding the current regulatory framework to consider climate effects of construction more widely.<sup>10</sup>

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<sup>9</sup> Trafikverket. (2022). Klimatkrav. <https://www.trafikverket.se/for-dig-i-branschen/miljo---for-dig-i-branschen/energi-och-klimat/klimatkrav/>

<sup>10</sup> Anderberg, B. (2022). Regeringen vill införa klimatdeklarationer vid ombyggnad och tillbyggnad. [https://www.byggindustrin.se/affarer-och-samhalle/hallbarhet/regeringen-vill-infora-klimatdeklarationer-vid-ombyggnad-och-tillbyggnad/?utm\\_campaign=BYI\\_22\\_03\\_03\\_tors&utm\\_medium=email&utm\\_source=Eloqua&elqTrackId=7C6C6CBBB19A3829BBA10EA960CCD61A&elq=1e9fae063a584343a6eed073253df0c1&elqaid=50670&elqat=1&elqCampaignId=37629](https://www.byggindustrin.se/affarer-och-samhalle/hallbarhet/regeringen-vill-infora-klimatdeklarationer-vid-ombyggnad-och-tillbyggnad/?utm_campaign=BYI_22_03_03_tors&utm_medium=email&utm_source=Eloqua&elqTrackId=7C6C6CBBB19A3829BBA10EA960CCD61A&elq=1e9fae063a584343a6eed073253df0c1&elqaid=50670&elqat=1&elqCampaignId=37629)

### **System openness to trade**

The Swedish system can be considered neutral to all suppliers, whatever their origin.  
Product data requirements for climate declaration are solely based on European standards.

## 3.11 UNITED KINGDOM

### Market overview

The United Kingdom is a constitutional monarchy. Legislative power is invested upon the national parliament, but for a bill to pass into a law, royal assent is required. The UK parliament is composed of the elected House of Commons and the non-elected House of Lords. The role of the latter is to scrutinise and amend bills that have been approved by the House of Commons. It is unable to stop bills from passing into law, but it can delay them.

There are three distinct legal jurisdictions in the United Kingdom: England and Wales, Northern Ireland and Scotland. All the above-mentioned jurisdictions possess certain executive and legislative devolved powers.

### National building regulations

UK's national Building Regulations 2010 do not regulate the whole life cycle emissions of a building. The building regulation does however regulate the minimum energy performance requirements for new buildings in form of a target CO<sub>2</sub> emission rate. The calculated emission rate and the documentation behind the calculation needs to be submitted before the start of the works as well as upon completion.

The construction industry has proposed a new amendment to existing UK Building Regulation, called "[Part Z](#)". Part Z and the Approved Document Z outline the importance of whole life carbon assessment requirements. The proposal introduces both, a mandatory assessment starting from 2023 and the setting of carbon limits to be introduced later on.

### Building regulations at sub-national level

Combined Authorities and the London Assembly can examine executive decisions but are not able to legislate in the same manner as the Scottish and Welsh parliaments and the Northern Ireland Assembly. Sub-national authorities are however able to set requirements for what is built inside their areas. The Greater London Authority's London Plan is a representative example of such a set of requirements.

### Building LCA limit values

Suggested Part Z requirements includes part Z2 on Carbon Intensity. It is intended to avoid over usage of resources and to set a reasonable efficiency standard for upfront carbon in the form of a limit value. This is proposed to apply to all buildings assessed starting from January 2027. No limit value has been defined yet.

### Policies for public buildings

No national hard policies for public buildings were identified. The UK's Industrial Decarbonisation Strategy however outlines the importance of the construction sector in reducing emissions over the coming years to achieve a net zero carbon economy by 2050.

### Details of the nationally used building LCA methodology

The nationally used methodology for building LCA is the RICS Professional Statement "Whole life carbon assessment for the built environment" 2017 edition. Currently it is being revised and is expected to be published in 2022. The RICS PS is in line with the European EN 15978 and EN 15804 standards.

A whole life cycle assessment shall be performed at the design stage and include at a minimum, substructures and superstructures. To provide a complete view of the project's



total emissions, the RICS PS encourages the assessment to account for all components related to the project during all life cycle stages and to perform at least one other assessment after practical completion of the project.

### **Policies for public infrastructure**

UK's National Infrastructure Strategy does set targets for UK infrastructure to achieve Net Zero by 2050 targets. PAS 2080 is widely used in UK to assess and manage carbon emissions in infrastructure projects. Most infrastructure bodies, including Highways England, Network Rail, High Speed Two and others, set their own requirements.

### **Construction product requirements**

No specific requirements concerning building product sustainability were identified.

### **Generic data and databases**

A consortium of organisations operating across UK have started a project to create a consistent way of measuring and reporting life cycle emissions as well as reliable and consistent data to support the assessment and to benchmark projects against. Various parties are thus collaborating in developing the [Built Environment Carbon Database](#) (BECD).

### **Voluntary certifications**

BREEAM UK is the dominant voluntary green building certification in the UK. It includes life-cycle assessment as part of the certifications criteria. The RICS Professional standard is also used as a guideline in the Greater London Authority's assessment methodology.

### **Other developments**

UK has set in its strategies to become net zero carbon by 2050. This has enhanced the creation of national strategies for the construction sector.

### **System openness to trade**

The UK system can be considered trade neutral to all suppliers, whatever their origin.

## 3.12 THE EUROPEAN UNION

### Market overview

The European Union is a political and economic union with 27 independent member states. A mutual standardized system of laws and regulations has been established in all matters where the member states have agreed to act as one. EU laws can be categorized into two: laws that are enforced without separate national implementation (EU regulations) and laws that require national implementation measures to be enforced (EU directives).

### Building regulations

The Energy Performance of Buildings Directive (EPBD) is the cornerstone of the European Union's buildings legislative framework. The EPBD was amended in 2018 as a part of the Clean Energy Package and aimed to set a direction towards decarbonization of the European building stock. In December 2021 the European Commission proposed a revision to the directive to deliver on the 2050 targets on zero emission building stock.<sup>11</sup>

The new proposal aims to tackle the gradual introduction of minimum energy performance standards to enhance renovation of worst performing buildings, to boost energy performance of buildings later on; and a standard for new buildings to calculate life-cycle emissions according to the Level(s) framework.

### Building LCA limit values

None identified.

### Policies for public buildings

No mandatory directive to include sustainability criteria on public buildings is set on a European Union level. The European Public Procurement directive (014/24/EU) sets mandatory requirements for purchasing projects or materials. The key principles of the directive include proportionality and non-discrimination. The directive recommends using performance-based requirements and allows the setting of technical specifications to achieve sustainability objectives and the usage of sustainability labels. However, setting public procurement criteria aimed to limit competition between local and European bidders is illegal. The directive also allows setting a requirement on third party verification to prove equivalence.

Where no separate policy for public buildings exists, the EPBD sets more ambitious goals for public buildings to be achieved earlier. For example, all new built public buildings must be Zero Emission Buildings from 2027, whereas the same applies to all other new buildings from 2030.

### Details of the nationally used building LCA methodology

The European Commission's Level(s) – European framework for sustainable buildings provides a common basis for assessing and reporting on building sustainability. Level(s) framework is based on six macro-objectives addressing key sustainability aspects over the building's life cycle and further on divided into separate core indicators. The first macro-objective "Greenhouse gas emissions along buildings life cycle" considers both the life-cycle

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<sup>11</sup> European Commission. Energy performance of buildings directive. [https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive\\_en](https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en)

emissions from the building as well the use stage energy performance. Level(s) can be applied at various stages of the project.<sup>12</sup>

The indicator 1.2 on Life cycle Global Warming Potential quantifies the greenhouse gas emissions of a building from cradle to grave (A-C), including the benefits and loads beyond the system boundary (D) as defined by EN 15978. The assessment shall include the whole building, including building services and its external areas. Results are expressed in kg CO<sub>2</sub>e per m<sup>2</sup> of useful internal area for a 50-year time frame. Whilst not mandatory, the same methodology can be used to assess other environmental indicators, such as Ozone Depletion and Acidification.<sup>13</sup>

### **Policies for public infrastructure**

None identified.

### **Construction product requirements**

European legislation defines the essential requirements that must be considered for all goods placed on the market. European standardisation bodies have drawn up relevant corresponding technical specifications. European regulations touching construction products include the Public Procurement Directive setting guidance for public procurement and the Construction Products Regulation that sets the basic requirements for construction products, as well as harmonized rules on how performance metrics are expressed across member states.

### **Generic data and databases**

None identified.

### **Other developments**

The European Green Deal sets the path towards a carbon neutral Europe. The European Climate Law integrates the European Green Deal's targets for Europe's economy and society to reduce net greenhouse gas emissions by at least 55 % by 2030 and to become climate-neutral by 2050. The climate law ensures via binding targets that EU institutions and member states take the necessary actions to meet these targets.

Many of the European Union's programmes, institutions, regulations and policies touch decarbonization in the construction industry, including the EU Emissions Trading System (EU ETS), EU Taxonomy and EU Green Public Procurement (GPP) Criteria. The EU ETS can be considered one of the cornerstones on reducing greenhouse gas emissions cost-efficiently. The trading system includes approximately 40 % of EU's greenhouse gas emissions and covers electricity and heat generation and energy-intensive industry sectors, such as steel works and the production of cement, lime and metals.

The EU's Sustainable Finance Taxonomy is one of the most important upcoming regulations in the EU concerning decarbonisation of the construction industry, as it requires financial market participants to provide disclosures aligned with taxonomy by 2025. The disclosure requirements are incorporated through several elements and include for example financial market participants to evaluate the sustainability of their investments that have been aligned with taxonomy. According to taxonomy, all building trade related activities can potentially

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<sup>12</sup> European Commission. Level(s). European framework for sustainable buildings. [https://ec.europa.eu/environment/levels\\_en](https://ec.europa.eu/environment/levels_en)

<sup>13</sup> European Commission. (2021). Level(s) indicator 1.2: Life cycle Global Warming Potential (GWP). User manual: introductory briefing, instructions and guidance (Publication version 1.1).

contribute greatly to climate change mitigation. New building construction, building renovation, individual renovation measures, and building acquisition and ownership are all included in the activities listed in the taxonomy. For non-financial companies, the disclosure must include the proportion of turnover, capital expenditure and operating expenditure aligned with taxonomy and requires new buildings of over 5 000 m<sup>2</sup> to account for whole-life carbon emissions to qualify. However, no limit values have been set yet. The implementation advisory body is expected to introduce embodied carbon thresholds by 2025.<sup>14</sup>

The EU Green Public Criteria sets environmental criteria for public procurement on office building design, construction and management and thus influences sustainability of construction projects. The Green Public Procurement criteria for office buildings is currently under revision.

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<sup>14</sup> EU Technical Expert Group on Sustainable Finance. (2020.) Taxonomy: Final report of the Technical Expert Group on Sustainable Finance.  
[https://ec.europa.eu/info/sites/default/files/business\\_economy\\_euro/banking\\_and\\_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy\\_en.pdf](https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy_en.pdf)

### 3.13 OTHER COUNTRIES

#### Voluntary certification schemes in Europe

In many European countries no public policies or regulations towards building sustainability exists. However, some of these countries do have national voluntary certificates that have been established by sustainability organizations such as Green Building Councils and the local construction sector. The Czech Republic, Ireland, Poland, Portugal, Romania and Spain have national voluntary certification schemes to assess sustainability of construction in local conditions.

The Czech Republic uses the [SBToolCz](#) methodology, which is based on an international framework for assessing sustainability. Ireland has the [Home Performance Index](#), a green home label that is aligned with the Level(s) framework. The Polish [Zielony Dom](#) is a similar certification framework that considers a wide range of sustainability criteria and takes its inspiration from internationally used certification schemes such as BREEAM and LEED and more nationally used ones, such as the Irish Home Performance Index. The Romanian [Green Homes certificate](#) includes a variety of sustainability indicators and is aimed to facilitate the financing of Green Homes. International certification schemes, such as BREEAM International and LEED are also commonly used across European countries. Spain also has domestic Verde certification and BREEAM-ES.

Some of the national certification schemes identified, such as the Portuguese [LiderA](#), do not require an LCA to be conducted and only concentrate on other criteria such as energy efficiency and indoor air quality.

#### Sustainability in public buildings

Some European countries do not have standing legislation to regulate emissions coming from construction in the private sector. However, they might have public procurement policies concerning green procurement. The Italian [Criteria Ambientali Minimi](#) (CAM) sets the minimum criteria for public building procurement. The criteria is set especially to control products used in public construction.

Where in Switzerland the SIA Merkblatt 2032 for calculating the embodied energy is not a mandatory standard, it can be used for public buildings. The Swiss Coordination conference of the construction and real estate bodies of public construction (KBOB) upholds an LCA database for construction product data. KBOB and the KBOB database offer guidelines for life cycle assessments and data usage.

#### Other sustainable construction initiatives

Some countries, such as Estonia, have started to investigate the possibility of national regulation on building emissions. Estonia's government bodies commissioned a study on developing the principles and methodology for carbon footprint of construction works. The [commissioned study](#) was released in April 2022 and produced a national methodology based on European standards and a simplified carbon footprint calculator.

#### Countries with no identified national whole-life carbon reduction initiatives

Other European countries had no identified national programs on whole-life carbon reduction.

## 4. TYPES OF REGULATIONS AND POLICIES

This research identified seven national regulations on embodied and whole life carbon of buildings. These regulations differ in various ways. The most important points of differentiation are presented below.

1. Compliance criteria
2. Timing of the assessment
3. Transparency and openness
4. Decarbonization effectiveness

### 4.1 COMPLIANCE TYPE

A key characteristic of an LCA methodology/policy is the intended use of the LCA results. An LCA methodology will generate the results at any point of time, but how these results are treated will typically depend on the policy requirements. Based on the policies' intent, these are classified under one of the classifications in Table 2.

Table 2: Policy's compliance type classifications

Policy type	Description
Declaration	Policies of this type require the building to be assessed in one or multiple stages during the design process. No limit values are being mandated.
Limit Value	Policies of this type require the building to achieve certain limit values for one or more environmental impact categories..

### 4.2 TIMING OF ASSESSMENT

The timing of the assessment can significantly affect the optimization of environmental impacts and hence the effectiveness of the regulation in regard to environmental impacts reduction. When LCA is applied at early stages, there are more opportunities and incentive to optimise a building's design and reduce its environmental impacts. As the design progresses, more design elements are being fixed making it technically harder or too expensive to apply any change. Based on the timing that the assessment is required by the regulations or policies, these are grouped as per the table below,

Table 3: Assessment timing classifications

Policy type	Description
Single assessment – Planning stage	Regulations and policies of this type require a single assessment sometime during the design stage, more commonly prior to the development's submission for planning approval.
Single assessment – Post construction	Regulations and policies of this type require a single assessment after the construction has been completed.
Multiple assessments	Regulations and policies of this type require more than one assessment throughout the design stage and/or post construction

### 4.3 TRANSPARENCY AND OPENESS OF THE METHODOLOGY

Under this point, the identified regulations are assessed for the complexity of their requirements, the transparency of the methodology that must be followed and the level playing field offered to the market. No pre-set categories have been defined for this topic, however all reviewed regulations were assessed based on the following two criteria:

1. The openness of the methodology to the use of data from various sources
2. The openness of the methodology to the use of any compliant LCA tool

The French RE2020 and the Dutch MPG regulations restrict the use of data to certain databases only, INIES and NMD respectively. All other reviewed regulations are open to any source of data that complies with EN 15804. An implicit manufacturer data access limitation is likely created in the Danish market by the position of the LCAByg software.

Regarding the openness to the use of LCA tools, the French RE2020 and the Dutch MPG have a process of third party validating and approving LCA tools. This guarantees the quality of the results that are generated by the LCA tools. All other reviewed regulations are open to the use of any tool with the LCA practitioner being responsible for identifying and using a suitable tool that will allow compliance with all requirements. However, it is not clear if in all cases a new tool would be facto approved.

### 4.4 IMPACT REDUCTION EFFECTIVENESS

Under this point, the review considers the ability of the regulation or policy to drive down carbon emissions and other environmental impacts. The parameters that were investigated during this process are:

1. Timing of the assessment. When assessments are undertaken earlier in the design process, there are more opportunities and higher chances of carbon emission and other impacts to be addressed.
2. Scope. The broader the scope of the assessment in terms of life cycle stages and building elements, the more opportunities for potential impact reduction.
3. Type of compliance required (declaration or limit value). Assessments of declaration type are considered less capable of pushing the design teams and client to optimise the development's environmental impacts.
4. Acceptable data. This relates to the type and amount of data that are available for use in the assessment. Regulations that require the use of data from single databases limit the amount of available data. Regulations that accept any data that is compliant with the relevant standards allow the design teams and clients to make a more accurate assessment by using manufacturer specific EPDs and at the same time compare products and select the best according to performance.

Based on the findings, the policies were rated on each of the above parameters and finally benchmarked. A detailed description of the benchmarking can be found in Chapter 7.

## 5. REVIEW OF EUROPEAN LCA REGULATIONS

This section reviews the identified LCA regulations. These include policies that are existing and mandatory, existing but not mandatory until some point in the future and policies that are not fully formulated but are expected to be and become a law in the coming years. The countries with such policies are Denmark, Finland, France, Netherlands, Norway, Sweden and the UK.

In addition to these policies, the new London Plan policy on whole life carbon is presented on footnotes below the various tables. Although it is not a national regulation, it is currently the only policy in force in the UK and it affects a big part of the country's population. It can be expected that any similar future policies in the UK will draw lessons from the London Plan.

These policies have been reviewed in detail to allow a comparison of how they address all the various aspects of a building LCA. The parameters cover for example the stage it must be undertaken at, the achievement of any required benchmark, the material scope, life cycle stage scope, how the results must be reported and other technical aspects.

### 5.1 A GENERAL OVERVIEW

Table 4 shows some general non-technical requirements and information of the policies. More specifically it indicates when the regulation came into or is expected to come into force, if it applies to renovation projects, when an assessment must be undertaken, which building types it applies to, the databases that can be used in these assessments, if there is a preference in using EPDs over generic data, what is the compliance type of the policy as described in Chapter 4 and how the policy approves the LCA tools that can be used in the assessments.



Table 4: General non-technical information on policies.

Country	Methodology	In force	Applies to renovations	Timing of assessment	Applicable buildings	Acceptable data	Preference of EPDs	Compliance type	Compliant tools <sup>15</sup>
Denmark	Bygningsreglement	2023	No	Single assessment – Post construction	All	EN 15804 <sup>16</sup>	Yes	Limit value	Open <sup>16</sup>
Finland	Finnish method / RakL	2024 Expected	Yes	Single assessment – Planning Stage (Building permit)	All Buildings requiring an energy declaration	EN 15804+A2, CO2data	Yes	Limit value	Open
France	RE2020	2022	No	Multiple assessments (Building permit & Post construction)	Residential Offices Education	INIES database	Yes	Limit value	Approved tools
Netherlands	MPG	2013	No	Single assessment – Planning Stage (Building permit)	Offices and residential	NMD only	Yes	Limit value	Approved tools
Norway	NS 3720 / TEK 17	2022	Yes	Single assessment – Planning Stage (Building permit)	Residential and commercial buildings	EN 15804	Yes	Declaration	Open
Sweden	Klimatdeklaration av byggnader	2022	No	Single assessment – Post construction	>100 m <sup>2</sup> <sup>17</sup>	EN 15804, Boverket	Yes	Declaration	Open
UK	London Plan / Part Z <sup>18</sup>	In force / Proposed	Yes	Multiple assessments (Prior and post construction)	>1000m <sup>2</sup> Or >10 dwellings	EN 15804 and other standards	Yes	Declaration <sup>19</sup>	Open
EU	Level(s) via EPBD	2027/2030 Proposed	Yes	Multiple assessments (Conceptual / detailed / as-built)	All	EN 15804	Yes	Declaration	Open

<sup>15</sup> Policies classified as open do not approve tools beforehand. They are open to the use of any tool as far as that tool can comply with all of the policy's modelling and reporting requirements. The responsibility in this case falls to the LCA practitioner to ensure that they are using an appropriate tool. Policies marked as "Approved tools" require the use of pre-approved tools and have an approval process in place.

<sup>16</sup> The Danish regulation has preference to EN15804 EPDs. The generic database used is created using OKOBAU-database. The methodology is endorsing LCAByg, but open to other software to be used as well.

<sup>17</sup> Excludes industrial and workshop buildings, temporary buildings(<2years), building that do not require a building permit, outbuildings for agriculture, forestry or other similar industries, buildings related to defence and security, buildings built by specific state developers, and buildings built by individuals.

<sup>18</sup> Part Z is a proposed regulation based on the RICS Guidance on Whole Life Carbon Assessment. The only policy currently in force in the UK is Policy SI 2 of the New London Plan published in 2021, on which Part Z is inspired. This policy requires a whole life carbon assessment for all referable projects. The assessment must be undertaken before planning application and post construction. The methodology is based heavily on the RICS Guidance. It accepts data compliant with EN 15804, ISO 21930 and other standards in an order of preference. The policy is open to any tool that can comply with all its requirements without prior approval. Limit values are not currently enforced.

<sup>19</sup> The proposed Part Z regulations suggests that limit values will apply from 2027 onwards.

## 5.2 ASSESSMENT SCOPE

The reviewed regulations differ also in respect of the scope of the assessment that is required. Some of the regulations require a whole life cycle assessment, while some others have a narrower scope that is only limited to upfront carbon emissions from A1 to A5. Table 5 presents the life cycle module that should be considered in the assessment for each of the reviewed regulations.

Table 5: Life cycle modules included by policy

Country	Methodology	Raw materials	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycle
		A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
		Product Stage			Construction Stage		Use Stage						End of Life Stage				Benefits and Loads beyond the system boundary	
Denmark	Bygningsreglement	█			█		○	○	○	●	○	●	○	○	○	█		●
Finland	Finnish method / RakL	█			█		○	○	○	●	○	●	○	█				●
France	RE2020	█			█		█						█				●	
Netherlands	MPG <sup>20</sup>	█			█		█						○	○	█		●	
Norway	NS 3720 / TEK 17	█			●	○	○	○	○	●	○	○	○	○	○	○	○	○
Sweden	Klimatdeklaration av byggnader	█			█		○	○	○	○	○	○	○	○	○	○	○	○
UK	London Plan / Part Z <sup>21</sup>	█			█		█						█				●	
EU	Level(s)	█			█		█						█				●	

█ Life Cycle Modules are included ● Life Cycle Module included ○ Life Cycle Module not included

<sup>20</sup> A future version of the Swedish method, Klimatdeklaration2027, is expected to have an extended scope and include modules B2, B4, C1-C4 and D.

<sup>21</sup> Similar to RICS PS, the London Plan SI 2 policy requires all modules to be reported. For modules B2 and B3 which are considered challenging to calculate during the design stage, the policy provides some benchmark values per m2 of GIA.

Similar to the life cycle modules, the regulations also differ when it comes to the building elements that should be included in the assessment. Some regulations as in Sweden focus on the parts of the buildings that will typically cause the majority of the impacts while other regulations for example in Finland cover the entire building including the finishes, external works and MEP equipment. Table 6 shows in more detail what parts of the building should be included in the assessment for each regulation.

Table 6: Building parts included in the assessment scope by policy

Country	Methodology	Substructure	Frame	Upper floors	Roof	Stairs	Exterior walls	Interior walls	Doors	Windows	Ceilings	Floor finishes	Wall finishes	External works <sup>22</sup>	Furnishings and appliances <sup>22</sup>	Services <sup>22</sup>
Denmark	Bygningsreglement	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○
Finland	Finnish method / RakL	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
France	RE2020	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●
Netherlands	MPG	●	●	●	●	●	●	●	●	●	●	●	●	○	○	●
Norway	NS 3720 / TEK 17	●	●	●	●	●	●	●	●	●	●	●	●	○	○	●
Sweden	Klimatdeklaration av byggnader <sup>23</sup>	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○
UK	London Plan / Part Z <sup>24</sup>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
EU	Level(s) via EPBD	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

● Building element is included within the scope ○ Building element is not included in the scope

<sup>22</sup> Some items may be excluded in some methodologies.

<sup>23</sup> A future version of the Swedish method, Klimatdeklaration2027, is expected to have an extended scope and include Services and interior finishes as well.

<sup>24</sup> The London Plan SI 2 policy requires all the above building elements to be considered.

### 5.3 TECHNICAL OVERVIEW

This paragraph provides detailed technical aspects of each methodology. These include how the End-of-Life impacts of materials are calculated, how reused materials are being assessed, how biogenic carbon is included and other technical details.

Table 7 on the following page contains generic technical information about each regulation. This information includes the alignment with EN 15978, the standard used for Life Cycle Assessment of Buildings in Europe, the alignment of the acceptable data with EN 15804 which is the European standard for the Environmental Product Declarations of construction products, the calculation period required for the assessment, the scope of the assessment which related to the life cycle modules included in the assessment, whether the future decarbonisation of the electricity grid should be taken into account and finally whether the End of Life scenarios are fixed by the methodology or they can be changed on a project by project basis.

The scope is classified as “Whole life” when all modules are required to be included in the assessment like in the case of France and UK. “Simplified whole life” methods cover the entire life cycle of the buildings excluding some modules that will typically not contribute significantly e.g. B1, B2 and B3.

Table 7: Other technical requirements of policies

Country	Methodology	Methodology alignment	Data alignment	Calculation period (years)	Scope	Future decarbonisation	EoL scenarios
Denmark	Bygningsreglement	Simplified EN 15978	EN 15804	50	Simplified whole life	Operational Energy only	Fixed
Finland	Finnish method / RakL	Simplified EN 15978	EN 15804:2012 +A2:2019	50	Simplified whole life	Operational Energy only	Fixed
France	RE2020	EN 15978 with deviations	EN 15804:2012 +A2:2019	50	Whole life	All impacts discounted	Fixed
Netherlands	MPG	EN 15978 with deviations	EN 15804:2012 +A2:2019	50/75	Simplified whole life	Not applied	Fixed
Norway	NS 3720 / TEK 17	Simplified EN 15978 (via NS 3720)	EN 15804:2012 +A2:2019	60	Upfront + Replacements	Both with energy discounting and without	Not applied
Sweden	Klimatdeklaration av byggnader	Simplified EN 15978	EN 15804:2012 +A2:2019	Not applied	Upfront	Not applied	Not applied
UK	London Plan / Part Z <sup>25</sup>	EN 15978 (via RICS PS)	EN 15804	60	Whole life	Energy and material replacements	Not defined
EU	Level(s) via EPBD	EN 15978	EN 15804+A2 / prEN15941	50	Whole life	Operational energy only	Not defined

<sup>25</sup> The New London Plan Policy SI 2 aligns with EN 15978 and the methodology that this is applied is the RICS PS with a few minor deviations in regard to reporting. The service life is set to 60 years and the scope includes the entire building's life from module A1 to module C4, including module D and pre-construction demolition impacts. The grid decarbonisation is not taken into account. Applicant who wish to take it into account can do so following a discussion of their approach with the GLA. EoL scenarios are not defined.

Table 8 reports on the outputs required by each methodology, including impact categories and normalisation and weighing, the unit the results are reported in and whether there is a limit value and the building types that are applicable for comparison with this limit value.

Table 8: Assessment outputs by policy

Country	Methodology	GWP <sup>26</sup>	ODP <sup>26</sup>	AP <sup>26</sup>	EP <sup>26</sup>	POCP <sup>26</sup>	ADP <sup>26</sup>	PE <sup>26</sup>	Normalisation & weighting	Reference unit	Limit value for reference unit	Applicable buildings for limit value
Denmark	Bygningsreglement	●	●	●	●	●	●	●	No	Impacts/m <sup>2</sup> /y	12	>1000m <sup>2</sup>
Finland	Finnish method / RakL	●	○	○	○	○	○	○	No	kg CO <sub>2</sub> e/n-m <sup>2</sup> /a & kg CO <sub>2</sub> e/site-m <sup>2</sup> /a	Planned in kgCO <sub>2</sub> e/n-m <sup>2</sup> /a	Same as energy regulation
France	RE2020	●	●	●	●	●	●	●	No	kgCO <sub>2</sub> e/m <sup>2</sup>	Varies <sup>27</sup> . 980 for offices, 640 for detached houses	Residential, offices and education
Netherlands	MPG	●	●	●	●	●	●	●	No	€/m <sup>2</sup> /a	<ul style="list-style-type: none"> <li>• 0.8 for residential</li> <li>• 1 for offices</li> </ul>	Office, residential
Norway	NS 3720 / TEK17	●	○	○	○	○	○	○	No	Kg/CO <sub>2</sub> e/m <sup>2</sup> /a	Not applied	Not applied
Sweden	Klimatdeklaration av byggnader	●	○	○	○	○	○	○	No	kgCO <sub>2</sub> e/m <sup>2</sup>	Planned	N/A
UK	London Plan / Part Z <sup>28</sup>	●	○	○	○	○	○	○	No	kgCO <sub>2</sub> e & kgCO <sub>2</sub> e/m <sup>2</sup>	Planned	All assessed
EU	Level(s) <sup>29</sup>	●	○	○	○	○	○	○	No	Kg CO <sub>2</sub> e	Not applied	Not applied



<sup>26</sup> While other impact categories exist, the following ones are covered in this report: Global Warming Potential (GWP), Ozone Depletion Potential (ODP), Acidification Potential (AP), Eutrophication Potential (EP), Abiotic Resource depletion potential (ADP), Primary Energy (PE)

<sup>27</sup> The limit value in the RE2020 methodology depends on the building type, the year of construction, the foundations, the presence of parking, the climate zone and the use of generic data. The methodology is described in full for [residential](#) and [offices and education buildings](#) in these documents

<sup>28</sup> The London Plan only requires GWP to be reported. No normalisation is applied. If the building is not within the range of the expected values, the applicants must explain why.

<sup>29</sup> Level(s), although only requires GWP to be reported, it specifically says that the design team can go a step further (sic) and report on other indicators as well.

Indicator is reported

Indicator is not reported

## 5.4 REUSED MATERIALS, BIOGENIC CARBON AND END OF LIFE

Table 10 shows how the impacts of re-used materials are considered in each methodology. The table reports on this issue for each module that is included in each methodology. Four different ways of considering these impacts were identified and explained at Table 9.

Table 9: Reused material impact approaches

Policy type	Description
Fraction	Modules calculated with this approach are considering a fraction of the impacts of a new material. This is currently only found in the MPG methodology in the Netherlands.
As normal	These modules are calculated in the same way as with a new material. A typical example is the transportation impacts to allow for these to be considered when a reused material is brought from outside the construction site.
No impacts	In these modules, the reused material is considered to have no impacts. Typical example in this case is the A1-A3 impacts.
Not defined	This characterization means that the methodology does not define how these impacts should be calculated.

Table 10: Consideration of reused material impacts by module

Country	Methodology	A1-A3	B4	C1 - C2	C3 - C4	D
Denmark	Bygningsreglement	No impacts	As normal	N/A	As normal	As normal
Finland	Finnish method / RakL	No impacts	As normal	As normal	As normal	As normal
France	RE2020	No impacts	No impacts	No impacts	No impacts	No impacts
Netherlands	MPG	Fraction	As normal	As normal	Fraction	Fraction
Norway	NS 3720 / TEK 17	Not defined	Not defined	N/A	N/A	N/A
Sweden	Klimatdeklaration av byggnader	No impacts	N/A	N/A	N/A	N/A
UK	London Plan / Part Z <sup>30</sup>	Not defined	Not defined	Not defined	Not defined	Not defined

<sup>30</sup> The London Plan SI2 policy, similar to the RICS methodology does not define how the impacts of reused materials are calculated.

Country	Methodology	A1-A3	B4	C1 - C2	C3 - C4	D
EU	Level(s) via EPBD	Not defined	Not defined	Not defined	Not defined	Not defined

Table 11 communicates how biogenic carbon is being treated in each methodology. All methodologies that information was available for, include biogenic carbon when the scope includes the EoL impacts (C1-C4). For methodologies that include biogenic carbon, the table reports on how sequestered carbon is considered. This can be either reported in a separate indicator, subtracted from the A1-A3 impacts or both.

Table 11: Biogenic carbon treatment

Country	Methodology	Biogenic carbon included	Reported separately	Subtracted from A1-A3
Denmark	Bygningsreglement <sup>31</sup>	No reference found	No reference found	No reference found
Finland	Finnish method / RakL	Yes	Yes <sup>32</sup>	No
France	RE2020	Yes	Yes	Yes
Netherlands	MPG	For EN 15804+A2 data only	-	-
Norway	NS 3720 / TEK 17	No <sup>33</sup>	-	-
Sweden	Klimatdeklaration av byggnader	No	-	-
UK	London Plan / Part Z <sup>34</sup>	Yes	Yes	No
EU	Level(s)	Yes	Yes	No

Table 12 presents the various processes that are considered as benefits in module D. This review identified the following processes as contributing to module D benefits in the various methodologies.

- a) Incineration of materials and energy recovery.
- b) Reuse of materials
- c) Recycling of materials

<sup>31</sup> No reference was found on how biogenic carbon is handled in the Danish methodology. The solution is implied in the generic database used. However, this may lead to inconsistencies in case EPDs leverage a different version of the standard, or a national PCR that considers biogenic carbon differently.

<sup>32</sup> Sequestered carbon is reported separately when this is expected to be stored for a period longer than 100 years.

<sup>33</sup> No reference has been found regarding biogenic carbon handling in TEK17. However, according to NS 3720, the biogenic carbon must not be included when EoL emissions data are not available. Provided that currently TEK 17 excludes EoL modules it is assumed that biogenic carbon will not be included.

<sup>34</sup> The London Plan SI2 policy requires biogenic carbon to be reported separately. Biogenic carbon is released back at module C3.

- d) Carbon sequestration
- e) Export of renewable energy to the grid
- f) Carbonation of cementitious materials

Table 12: EoL scenarios and other processes considered as benefits in Module D

Country	Methodology	EoL Scenario applied <sup>35</sup>	Incineration and energy recovery	Reuse	Recycling	Sequestered carbon	Exported energy	Cementitious materials carbonation
Denmark	Bygningsreglement	Fixed	Not defined	●	●	○	●	○
Finland	Finnish method / RakL	Fixed	●	●	●	● <sup>36</sup>	●	●
France	RE2020	Fixed	●	●	●	Reported separately	●	Part of B1
Netherlands	MPG	Fixed	Unknown <sup>37</sup>					
Norway	NS 3720 / TEK 17	Not applied	Module D excluded					
Sweden	Klimatdeklaration av byggnader	Not applied	Module D excluded					
UK	London Plan / Part Z <sup>38</sup>	Not defined	●	●	●	Reported separately	●	○
EU	Level(s)	Not defined	●	●	●	Reported separately	●	○

● Scenario results in benefits at Module D      ○ Scenario not considered at Module D

<sup>35</sup> Methods marked as “Fixed” have fixed EoL scenarios and/or values for each material and will not allow deviations. Methods marked as “Not defined” do not specify the EoL scenario for each material type and will give the flexibility to the design team to change this in the assessment.

<sup>36</sup> Sequestered carbon is reported at Module D when this is expected to be stored for a period longer than 100 years.

<sup>37</sup> EoL impacts are predefined for each material available at the NMD database which is used for the MPG method. No information on the EoL scenario applied in material is available.

<sup>38</sup> The London Plan SI2 policy does not specify the acceptable EoL scenarios and processes that can be considered in module D. Sequestered carbon is reported separately.



## 6. REVIEW OF EUROPEAN LCA DATABASES

This chapter reviews the government-sponsored construction LCA databases in Europe which are in or made for a regulatory use, The databases reviewed are shown at Table 13.

Table 13: Databases considered in the study

Country	Government-sponsored database	Form of government support
Belgium	B-EPD	Established by the government
Finland	CO2data	Established by the government
France	INIES	Regulatory status granted by the government
Germany	ÖKOBAUDAT	Established by the government
Netherlands	NMD	Regulatory status granted by the government
Sweden	Boverket	Established by the government

In addition to the above government sponsored databases, there are several commercial databases across Europe most of which are hosting Environmental Product EPDs. Some of the biggest, by amount of data hosted are shown below in Table 14, however these are not part of this review.

Table 14: Other voluntary private databases

Country	Voluntary private databases
Denmark	EPD Danmark
Finland	RTS
Germany	IBU, iftRosenheim
Ireland	EPD Ireland, EPD Hub
Italy	EPD Italy
Norway	EPD Norge
Poland	ITB
Sweden	The International EPD System
UK	BRE

### 6.1 GOVERNMENT-SPONSORED DATABASES

The databases presented here are all used either in construction product regulation, such as Belgium's B-EPD, or they are mandatory or encouraged to be used in national LCA frameworks. The databases vary considerably in size and function from the more extensive such as NMD and ÖKOBAUDAT to smaller, like the Finnish CO2data and the Swedish Boverket database that only provide generic data on construction products.

With the transition period from the European EN 15804 +A1:2014 standard to EN 15804:2012 +A2:2019 standard, many databases have data assessed with both methodologies. As the EN 15804 +A2 standard became mandatory in July 2022, many of the databases have published new assessment rules for all new data. Databases such as Boverket and CO2data are both still solely EN 15804 +A1 compliant, whereas ÖKOBAUDAT and B-EPD have EN 15804 +A1 compliant data but require all new data to be compliant with the new standards. The NMD and INIES databases deviate from EN15804 by requiring the reporting of additional indicators to the ones required by the European standard. The Dutch MPG requires results based on a weighting of the impact categories to a single environmental impact indicator. This indicator must be reported in all NMD EPDs. This

additional indicator is currently based on EN 15804+A1 until the end of 2023 when the data in the NMD database is set to be based fully on EN 15804+A2.

As per the Belgian legislation, when making certain environmental claims about construction or building system products, the organization shall create an EN 15804 compliant EPD and deposit it to the national B-EPD database. Where the database has EN 15804 +A1 compliant EPDs, for new ones EN 15804 +A2 compliance is required. The database hosts no generic data, only manufacturer specific EPDs. The B-EPD programme is predominantly applicable to building products placed or used in Belgian market. The database is integrated with the national TOTEM tool to be used in national building LCAs.

The Finnish CO2data and the Swedish Boverket databases are both similar in methodology and content and have been developed in a cross-country cooperation. Both databases are based on the EN 15804 +A1 standard and include only generic government commissioned data. Both databases are encouraged to be used by national building LCA methodologies when no specific product is known or no product specific EPD exists.

Similar to Belgian legislation, if organizations operating in the French market make certain environmental claims on their construction or building system products, the claim must be backed up by an NF EN15804/CN compliant EPD deposited to the French database INIES. All EPDs are EN 15804 +A1 and NF EN15804/CN compliant and the local PCR has not yet been revised to match the new EN 15804 +A2 standard. The local PCRs are relatively different to other European EPD publisher's and thus no EPD published in other EPD programs can be easily published in the French database. INIES hosts both generic and market data, both created with the same standards.

The German ÖKOBAUDAT database is encouraged to be used in the German building LCA policy for public buildings. The database hosts both generic and market data, with the same data standard alignments. EN 15804 +A1 and EN 15804 +A2 compliant data are both accepted during the transition period from one standard to another and they are currently disclosed separately in the database. Predominantly ÖKOBAUDAT sources its data from various EPD programme operators. All generic data is commissioned by the Federal Office for Building and Regional Planning.

The Dutch Nationale Milieu Database (NMD) is to be used in national building environmental performance calculations. The database has various types of data, generic, product specific and averaged product group data. All new data follows the EN 15804 +A2 standard, however, the transition period is ongoing, and the database has still a considerable amount of EN 15804 +A1 compliant data.

An overview of the basic parameters of each database studied is shown at Table 15.

Table 15: Basic parameters of the government databases considered in the study

Country	Database	Status in regulation	Amount of data (July 2022)	Generic data included	Generic data alignment	Market data included	Market data alignment	Source of data
Belgium	B-EPD	Mandatory in construction product regulation	112	No	-	Yes	EN 15804 +A2	3 <sup>rd</sup> party verified EPDs
Finland	CO2data	Mandatory in LCA regulation	255	Yes	EN 15804 +A1	No	-	Gov't commissioned
France	Inies	Mandatory in construction product & LCA regulation	6084	Yes	EN 15804 +A1, NF EN15804/CN	Restricted	EN 15804+A1, EN 50693	Gov't commissioned & 3 <sup>rd</sup> party verified EPDs
Germany	ÖKOBAUDAT	N/A	1719	Yes	EN 15804 +A1, EN 15804 +A2	Yes	EN 15804+A1 and EN 15804+A2	Gov't commissioned & 3 <sup>rd</sup> party verified EPDs
Netherlands	NMD	Mandatory in LCA regulation	3181	Yes	EN 15804 +A1, EN 15804 +A2	Restricted	EN 15804+A1, EN 15804+A2	Gov't commissioned & 3 <sup>rd</sup> party verified EPDs
Sweden	Boverket	Mandatory in LCA regulation	208	Yes	EN 15804 +A1	No	-	Gov't commissioned

## 6.2 DATA REQUIREMENTS

The key national databases are different in data inclusivity, methodologies and background data used for the LCA, as well as the scope of data disclosed. The majority of databases include materials, processes and energy LCA data. The exception, with only material data included, is the B-EPD program. As the Swedish building LCA methodology does not mandate the inclusion of operational energy calculations, the Swedish Boverket database only has material and process data included, as does the Dutch NMD.

Many databases assign conservative values for generic data. Conservative values aim predominantly to compensate for heterogeneity in the markets and they usually represent an additional top up factor used for any product's emissions to better represent the market average. In the Finnish CO2data database the top up factor assigned is 20 %, whereas in the Boverket database the factor is 25 % and in NMD the top up factor is set to 30 %. The French INIES and the German ÖKOBAUDAT have a range of top up factors. In INIES, this depends on the methodology of the assessment. Both consider the products separately and the uncertainty in the market when assigning the conservative factor. For ÖKOBAUDAT the factor is set to 10, 20 or 30 % depending on the product group, and in INIES the top up factor is set between a range of 30 – 100 %. The Norwegian regulation requires that generic data is topped up by 25% when used for regulatory compliance; however, a database of generic data is not being provided.

Both CO2data and Boverket database values are formed predominantly as an average of existing EPDs used in the market. As the B-EPD data is to be used in the national TOTEM tool, the background data used for EPD assessments shall be predominantly Ecoinvent data. However, this is not a hard requirement for B-EPD. The Dutch NMD database on the other hand consists predominantly of Ecoinvent data. Other databases do not set requirements on background data and do accept both Gabi and Ecoinvent as background databases.

In the databases the scope of data presented follows predominantly EN standards. For B-EPD and ÖKOBAUDAT the scope of the data is to be disclosed according to EN 15804 +A2. CO2data and Boverket databases disclose mainly only A1-A3 emissions by material. However, CO2data has also other life cycle stages defined either by material type or by construction. Boverket only discloses material manufacturing, as no end of life is considered in the national methodology. INIES discloses both end of life and D-module according to the French NF EN 15804/CN standard.

Results and indicators shown vary between the databases. CO2data and Boverket only disclose the GWP, whereas B-EPD, NMD, ÖKOBAUDAT and INIES disclose all indicators according to relevant EN standards. Both B-EPD and INIES do however disclose additional indicators as well, including for example ecotoxicity. NMD's main indicator is the shadow price used in the national building LCA methodology. For some data NMD discloses other environmental indicators according to EN 15804 +A2.

Table 16 below, provides an overview of the data requirements and coverage of each database.

Table 16: Data requirements and coverage

Country	Database	Data included	Conservative factor	Background database	Service life defined by database	EOL defined	D Module defined	Indicators
Belgium	B-EPD	Materials	-	Any	As per EN 15804 +A2	As per EN 15804 +A2	As per EN 15804 +A2	According to EN 15804 +A2 <sup>39</sup>
Finland	CO2data	Materials, processes, energy	20 %	EN 15804 +A1 compliant EPDs	By material and construction	By material type	As per EPDs used in the calculation	GWP only
France	INIES	Materials, processes, energy	30 – 100 %	Ecoinvent, Gabi	By material	As per NF EN 15804/CN	As per NF EN 15804/CN	According to EN 15804+A1 & NF EN 15804/CN
Germany	OKOBAUDAT	Materials, processes, energy	10 %, 20 % or 30 %	Ecoinvent, Gabi	By material	As per EN 15804 +A2	As per EN 15804 +A2	According to EN 15804+A1, EN 15804+A2
Netherlands	NMD	Materials, processes	30 %	Ecoinvent, NMD process database	By material	By material	By material	Shadow price (€) & indicators according to EN 15804+A2
Sweden	Boverket	Materials, processes	25 %	EN 15804 +A1 compliant EPDs	-	-	-	GWP only

<sup>39</sup> In addition to EN 15804+A2 indicators, B-EPD requires EPDs to also report the potential incidence of disease due to particulate matter (PM), the potential human exposure to ionizing radiation (IRHH), Human Toxicity – cancer effects (HTCE), Human toxicity – non cancer effects, Ecotoxicity, and Land Use Related Impacts.

### 6.3 DATA ACCESSIBILITY AND TRANSPARENCY

Different databases have different principles in terms of accessibility, availability of data and transparency of the background calculations. Deviations from these metrics can lead to significant trade restrictions for parties outside of the national market. This can be done for example through a regulation requiring construction product EPDs to be published in specific databases as in the case of INIES, NMD and B-EPD.

The Finnish CO2data, Swedish Boverket and German ÖKOBAUDAT databases are all easily accessible and free for any party that wants to use the data. Whereas the calculation methodologies differ between the three, all are done transparently and disclosed to anyone who uses the data. As these databases are not the exclusive source of data, no trade restrictions arise in connection with these databases.

The B-EPD and INIES databases are easily accessed by anyone via the online version, and in case of INIES against payment for the digital interface. However, the role of these databases as the exclusive sources of EPDs for regulatory compliance for sustainability marketing is a restriction to free movement of goods within the Single Market.

The NMD database is more restricted in accessibility and transparency. Only validated tools can use NMD data for calculations. Whereas the database is accessible online, not all data is disclosed. For some data only the shadow price indicator per functional unit is disclosed and no environmental indicators are shown. This is intended to protect manufacturer's data. This system is a significant restriction to trade for manufacturers operating outside the Netherlands. The NMD database has been undergoing significant technical evolutions in the last two years. Due to related numerous technical and planning issues, the NMD's validated LCA tool providers are creating an association of instrument holders (Vereniging van instrumenteigenaren), that has highlighted concerns with the NMD system process, technology and maintenance and attempts to help improve the situation.

Table 17: Data accessibility and transparency

Country	Database	Update frequency	Access to data	Transparency of the methodology	Trade restrictions
Belgium	B-EPD	Continuous	Open access	Transparent	Yes
Finland	CO2data	Periodical	Open access	Transparent	No
France	INIES	Continuous	Restricted	Transparent	Yes
Germany	ÖKOBAUDAT	Periodical	Open access	Transparent	No
Netherlands	NMD	Continuous	Restricted	Transparent	Yes
Sweden	Boverket	Periodical	Open access	Transparent	No

From all databases considered, NMD is most restricted in accessibility of data. However, NMD, INIES and ÖKOBAUDAT are the richest in data availability and they all have a large variety of generic and product specific data. B-EPD, CO2data and Boverket are all accessible. However, data is quite scarce in all cases. B-EPD only has product specific EPDs, where CO2data and Boverket only host generic data.

## 7. THE BENCHMARK METHODOLOGY

While several things are important for successful regulatory projects, and regulations always must be adapted to local conditions. The authors' view is that benchmarking regulations can be both possible and useful, if conclusions are used with local applicability in mind.

The building LCA regulations are benchmarked in this study for transparency and openness, and on their decarbonization effectiveness. The criteria for these are explained below.

The LCA databases on the other hand were benchmarked on the availability and access to data, and cost and quality of data. The criteria for these are also explained below.

### 7.1 TRANSPARENCY AND OPENNESS OF THE REGULATIONS

Under this point, the identified regulations are assessed for the complexity of their requirements, the transparency of the methodology that must be followed and the level playing field offered to the market. No pre-set categories have been defined for this topic, however all reviewed regulations were assessed based on the following three criteria.

1. The openness of the methodology to the use of data from various sources
2. The openness of the methodology to the use of any compliant LCA tool
3. The alignment of the methodology with the European Standards.

The French RE2020 and the Dutch MPG regulations restrict the use of data to certain databases only, INIES and NMD respectively. All other reviewed regulations are open to any source of data that complies with EN 15804. An implicit manufacturer data access limitation may be created in the Danish market by the strong linkage to OKOBAUDAT.

Regarding the openness to the use of LCA tools, the French RE2020 and the Dutch MPG have a process of third party validating and approving LCA tools. All other reviewed regulations are open to the use of any tool with the LCA practitioner being responsible for identifying and using a suitable tool that will allow compliance with all requirements.

The parameters considered to affect the policy openness are shown below. The parameters are rated from 1 to 10.

Table 18: Policy openness parameters

Parameter	Condition	Points
Data openness (open for data)	Policies that are restrictive to a single database	1
	Policies that imply the use of a single database	5
	Policies that are open to any qualifying data	10
Tool openness (open for tools)	Policies that prescribe tools to be used	1
	Policies that allow the use of any tool with no validation required	5
	Policies that are open to the use of any tool, as long as the tool is third party validated	10
Standards alignment (common methods)	Policies that apply significantly adjusted method	1
	Policies that apply aligned & adjusted method	5
	Policies that are fully aligned with EN 15804	10



## 7.2 DECARBONIZATION EFFECTIVENESS OF THE REGULATIONS

Under this point, the review looks into the ability of the regulation or policy to drive carbon emissions and other environmental impacts down. The parameters that were investigated during this process are:

1. Timing of the assessment. When assessments are undertaken earlier in the design process, there are more opportunities and higher chances of carbon emissions and other impacts to be addressed.
2. Scope. The broader the scope of the assessment is in terms of life cycle stages and buildings elements the more opportunities for potential impact reduction.
3. Type of compliance required (declaration or limit value). Assessments of declaration type are considered less capable of pushing the design teams and client to optimise the development's environmental impacts.
4. The application of top-up factors on impacts calculated with generic materials.

Based on the findings, the policies were rated on each of the above parameters and finally benchmarked. A detailed description of the benchmarking can be found in Chapter 8.

The parameters considered to affect the decarbonisation impact of a policy are shown below, together with the rating rules for each case. Each parameter is rated from 1 to 10 as per the rules defined in each case and shown in Table 19.

Table 19: Decarbonization impact parameters

Parameter	Condition	Points
Timing of assessment	Post construction	1
	Single assessment during design	5
	Multiple assessments	10
Generic material top up factor	No top up factor	1
	Top up factor at least 20%	5
	Top up factor can exceed 30%	10
Compliance type	Declaration	1
	Limit value	10
Modules included in the building LCA	Upfront carbon assessments	1
	Simplified whole life carbon assessments	5
	Whole life carbon assessments	10
Material scope of assessment	Structure and envelope only	1
	Significant scope of building but not whole building	5
	Whole building (excl. furniture and appliances)	10



### 7.3 AVAILABILITY AND ACCESS TO DATA FOR DATABASES

The parameters considered to affect the availability and access to data are shown below. Each parameter is rated from 1 to 10 as per the rules defined in each case.

Table 20: Availability and access to data parameters

Parameter	Condition	Points
Amount of data	Less than 500 datapoints	1
	501 – 2000 datapoints	5
	More than 2000 datapoints	10
Inclusion of generic datapoints and EPDs	EPDs only	5
	Generic datapoints only	5
	Both generic datapoints and EPDs	10
Access to data	Restricted or partially paid access	1
	Open access	10
Monopoly position (inverted scoring)	Database is a monopoly source of data	1
	Database is one of allowed data sources	10
Digital infrastructure (expert estimate)	Digital infrastructure considered unreliable	1
	Working digital infrastructure with issues	5
	Reliable digital infrastructure in place	10

### 7.4 COST AND QUALITY OF DATA FOR DATABASES

The parameters considered to affect the cost and quality of data are shown below. Similar to availability and access, parameters are rated from 1 to 10.

Table 21: Cost and quality parameters

Parameter	Rating rule	Points
Top-up factor for generic datapoints	No factor is applied	1
	Common factor for all materials	5
	Variation of factor for different material types based on higher uncertainty	10
Generic data production process	All data created from averages of EPDs / no generics	1
	Data partially created from averages of EPDs	5
	All data created from original inventories	10
Update frequency	Periodical update	1
	Continuous update	10
Cross-publishing accepted	No cross-publishing is accepted	1
	Limited cross publishing	5
	If EPDs are published, they can be cross-published to the program	10
Indicators required	Additional to EN15804 indicators are required	1
	Fully aligned with EN15804	10

## 8. REGULATIONS & DATABASES BENCHMARK

Benchmarking dimensions and parameters were given in the previous chapter. Scores are compared to a maximum possible for each dimension. This positions policies to the graphs.

### 8.1 BENCHMARK OF EUROPEAN LCA REGULATIONS

The comparative graph in Figure 1 shows how the policies compare with each other based on transparency and openness and their decarbonization impact.

Regulations that focus on transparency and openness but lack impact are classified as transparency drivers. Regulations that focus on decarbonization with less openness and transparency are classified as carbon cutters, while the ones that perform well in both dimensions are considered the leaders. Every regulation implements some of the best practises, and no regulation implements all of them.

Using this methodology of evaluation, the three methodologies coming out as leaders are the Danish and Finnish regulatory methods and the UK's London Plan / Part Z. These regulations implement a balanced mix of best practises in terms of openness and decarbonization effectiveness. On the other hand, the Dutch and French regulations have the highest decarbonization impact of all studied regulations. Unfortunately, this comes at some cost of openness. These regulations are the carbon cutters of this benchmark.

Finally, the Swedish and Norwegian regulations are the transparency drivers of this ranking. While these policies do not contribute as significantly to decarbonization, they are very open. Detailed scoring of the policies can be found in Annex A.

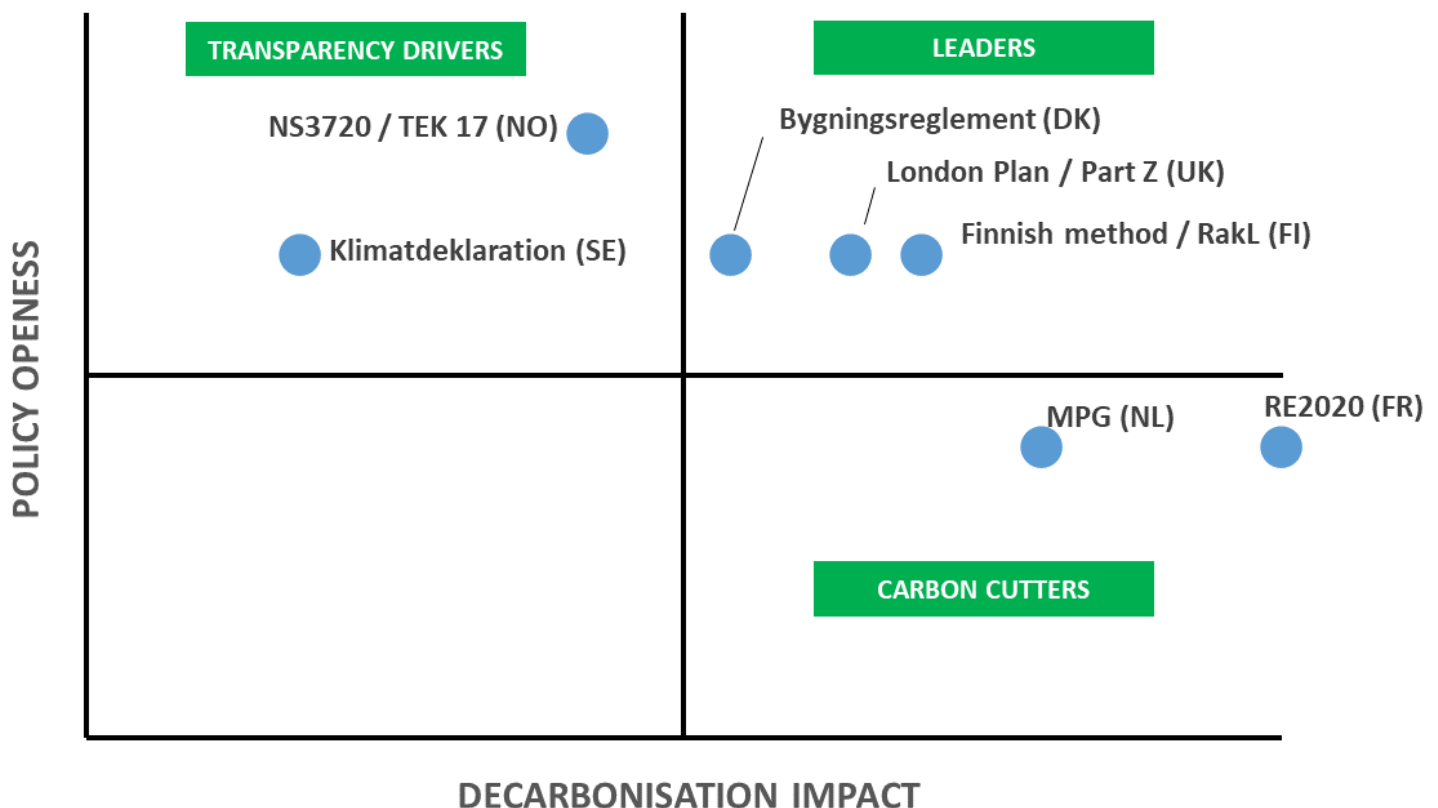


Figure 1: Decarbonization impact vs openness of European construction carbon regulations

## 8.2 BENCHMARK OF EUROPEAN DATABASES

The comparative graph in at Figure 2 shows how the databases compare with each other based cost and quality, and access and availability.

Databases that have high rating on cost and quality but not on availability and access are classified as controllers. Databases doing the opposite, high rating on availability and access but low rating on cost and quality are classified as enablers. Databases managing to do well on both dimensions are considered the leaders.

Using this methodology, the OKOBAU.DAT and INIES databases are the leaders. These databases do well in both consistency of the quality as well as ensuring wide access to data.

The Swedish and Finnish databases have adopted exactly the same practises, and logically end up in the exact same position in the ranking. These two databases are the enablers.

Finally, the Dutch and Belgian databases have also a tight control of the quality of the process, somewhat to the detriment of the availability and access. These databases are the controllers.

Detailed scoring of the databases overall and each parameter can be found in Annex A.

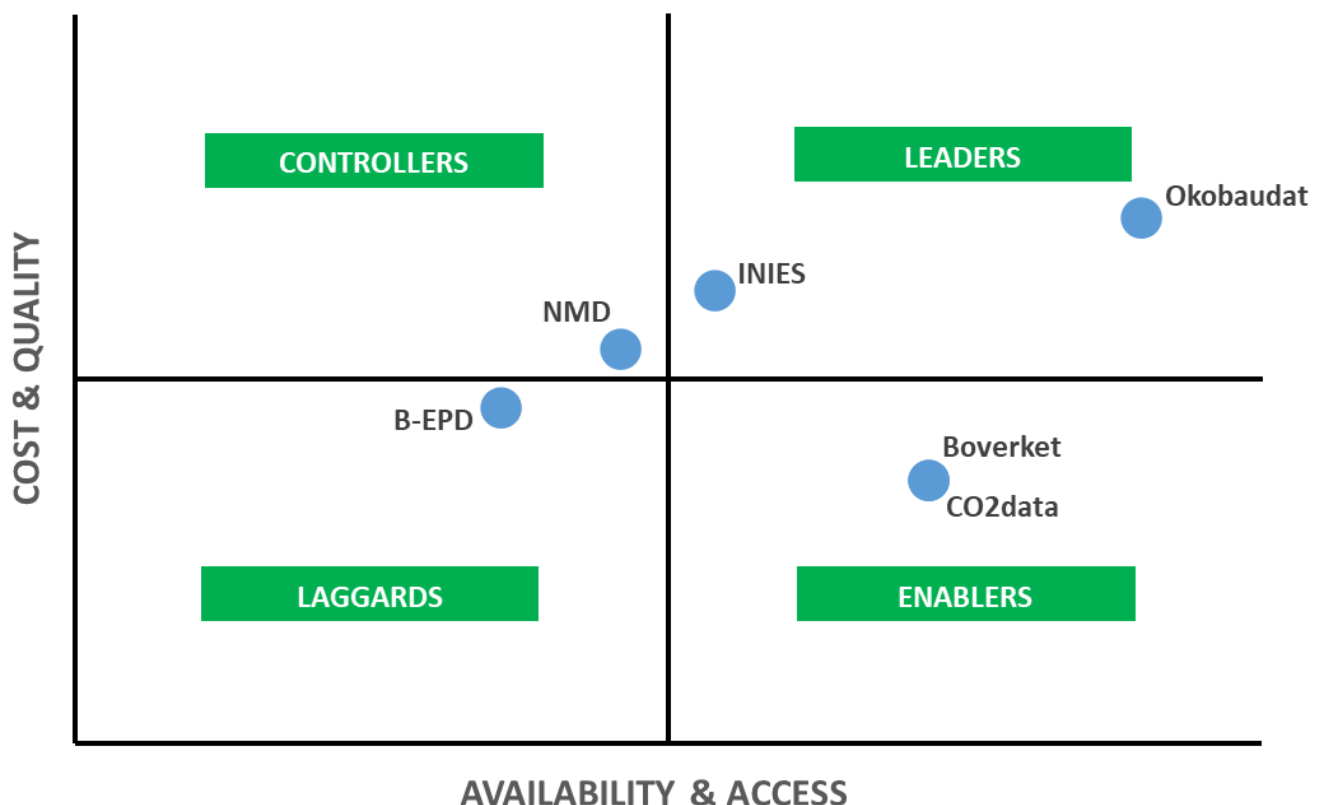


Figure 2: Availability & Access vs Cost & Quality for LCA databases used in European construction regulations

## ANNEX A: POLICY AND DATABASE RATING

The rating of policies in each parameter and each quality reviewed are shown below.

Table 22: Decarbonization impact scoring

	Timing of assessment	Top up factor	Compliance type	Modules included	Material scope	Total points	% Score
Byggningsreglement	1	1	10	5	10	36	54%
Finnish method / RakL	5	5	10	5	10	35	70%
RE2020 (FR)	10	10	10	10	10	50	100%
MPG (NL)	5	10	10	5	10	40	80%
NS 3720 / TEK 17 (NO)	5	5	1	5	5	21	42%
Klimatdeklaration (SE)	1	5	1	1	1	9	18%
London Plan & Part Z (UK)	10	1	1	10	10	32	64%

Table 23: Policy openness scoring

	Data openness	Tool openness	Standards alignment	Total points	% Score
Byggningsreglement	5	5	10	20	67%
Finnish method / RakL	10	5	5	20	67%
RE2020 (FR)	1	10	1	12	40%
MPG (NL)	1	10	1	12	40%
NS 3720 / TEK 17 (NO)	10	5	10	25	83%
Klimatdeklaration (SE)	10	5	5	20	67%
London Plan & Part Z (UK)	10	5	5	20	67%

Table 24: Overall policy scoring

	Decarbonization Impact	Policy Openness
Byggningsreglement	54%	67%
Finnish method / RakL	70%	67%
RE2020 (FR)	100%	40%
MPG (NL)	80%	40%
NS 3720 / TEK 17 (NO)	42%	83%
Klimatdeklaration (SE)	18%	67%
London Plan & Part Z (UK)	64%	67%

The rating of databases in each parameter and each quality reviewed are shown below.

Table 25: Availability and access scoring

	Amount of data	Generics and EPDs	Access to data	Monopoly position	Digital infrastructure (expert estimate)	Total points	% Score
B-EPD	1	5	10	1	1	18	36%
C02data	1	5	10	10	10	36	72%
INIES	10	10	1	1	5	27	54%
Okobaudat	5	10	10	10	10	45	90%
NMD	10	10	1	1	1	23	46%
Boverket	1	5	10	10	10	36	72%

Table 26: Cost and quality scoring

	Conservative factor	Generic data production process	Update frequency	Cross-publishing accepted	Indicators	Total points	% Score
B-EPD	1	1	10	1	10	23	46%
C02data	5	1	1	1	10	18	36%
INIES	10	5	10	5	1	31	62%
Okobaudat	10	10	1	5	10	36	72%
NMD	5	10	10	1	1	27	54%
Boverket	5	1	1	1	10	18	36%

Table 27: Overall database scoring

	Availability & Access	Cost & Quality
B-EPD	36%	46%
C02data	72%	36%
INIES	54%	62%
Okobaudat	90%	72%
NMD	46%	54%
Boverket	72%	36%