

Nordic guide to sustainable materials

WP 1: State-of-the-art

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1. Nordic Guide to Sustainable Materials, WP1

1.1. Background

Under the “Nordic Guide to Sustainable Materials” project, the Green Building Councils in Norway, Sweden, Finland and Iceland have joined forces to tackle three important challenges for the transition to more sustainable materials:

- agreement on a common set of functional criteria for sustainable materials,
- sufficient Environmental Product Declarations for Nordic products to enable manufacturers to get credit from their development of sustainable products and
- simplification of the procurement process for sustainable materials.

The project will also provide practical guidelines for building owners who require the use of sustainable building materials and will be applicable for all types of building and rehabilitation projects.

The Green Building Councils (GBCs) in Finland, Iceland, Sweden and Norway are all partners in the project. Each country’s respective GBC consists of members from across the value chain and these members are invited to join the project. The project consists of five work packages. Work package 1 aims to obtain an overview of regulations in this field and existing commonly used tools and criteria. This state-of-the-art-report summarizes the results and the report comprises important input for our Nordic efforts to identify common functional criteria for sustainable materials.

The Swedish Green Building Council is leading work package 1 and is responsible for this report, but there has been close collaboration between all of the partners in obtaining information from all four countries.

1.2. Definition of construction product

It is imperative to have clear definitions for construction material and construction products, delimitation of systems is also crucial. Generally, in the EU member states, the definition of a construction product is governed by the EU’s Construction Product Council Directive 89/106/EEC, 305/2011/EU. “Any product or kit which is produced and placed on the market for incorporation in a permanent manner in construction works or parts thereof and the performance of which has an effect on the performance of the construction works with respect to the basic requirements for construction works.”

In Sweden, the fixtures of a building are regulated under the Swedish Land and Cadastral Legislation 1970:994.

The Finnish national regulations that supplement this directive are: The Act on Violations Concerning CE Markings (187/2010), the Act on the Type Approval of Certain Construction Products (954/2012), specifies that a construction product means a permanent construction part, structure, or component, product or equipment that is permanently affixed to a construction object and for which essential technical requirements have been defined in the Land Use and Building Act or regulations based thereon, or a component required for the installation of the product referred to above. Construction products also include the components needed to install these products. This act is implemented if a product cannot have a CE -labelling.

In Norway a construction product is defined as follows:

- The product must be built into a construction, in a permanent manner. This is not an absolute requirement: Windows and pipes can be replaced yet still constitute clear examples of construction products.
- Furthermore, the product may impact the fundamental requirements of the building (mechanical resistance and stability, fire safety, hygiene, health and environment, security, and accessibility, noise protection, energy conservation and heat insulation as well as sustainability).

In Iceland, building material is defined in the Icelandic Building regulation (2012/chapter 1.2.1.) and in the Construction Laws 160/2010. Building material is defined as: Construction Product, Product manufactured with the intention that it will be a permanent part of some kind of structure. "There is no other definition on building material. This may e.g. been understood as this: all building parts are building material or product. Fixed or, fast," interiors also.

1.3. Governing legislation that pertain to materials in the construction industry

Construction products are regulated by numerous regulations and directives in the EU, including the Ecodesign Directive (2009/125/EC) and the Waste Framework Directive (2008/98/EC), the REACH Regulation (1907/2006/EC), the CLP Regulation (1272/2008/EC), the Construction Products Regulation (305/2011/EU) as well as numerous directives for specific products. The following table shows the relevant legal requirements as specified by the individual countries.

Table 1. Relevant legal requirements for the respective countries. Information about the respective legal requirements is provided in Appendix 1.

Legal requirements	Sweden	Norway	Finland	Iceland
REACH	x	x	x	x
RoHS	x	x	x	x
The Stockholm Convention, POPs Regulation 850/2004/EC	x	x	x	x
The Ecodesign Directive	x	x	x	x
The Waste Framework Directive	x	x	x	x
The Construction Products Regulation	x	x	x	x ¹
The CLP Regulation	x	x	x	
The product Control Act, 3a requirement to apply the substitution principle		x		
The Biocidal Products Regulation	x	x	x	x ²
The Product regulation	x	x	x	
Swedish environment Generational goal (Swedish legislation)	x			
Swedish Environmental legislation (Swedish legislation)	x			
The Swedish National Board of Housing, Building and Planning's Statute Book (Swedish legislation)	x			
Icelandic Building Regulation nr. 112/2012				x ³
The Norwegian priority list		x		
Rules and requirements for chemical substances in construction material (Norwegian legislation)		x		

¹ Assembly bill presented to the Althingi (Assembly) this fall , 20014

² Proposal under consideration in the Assembly, September 2014

³ In general, the aim of the Ministry of the Environment (which handles matters pertaining to building legislation in Iceland) is to adopt EU law and regulations rather than write special Icelandic rules and regulations.

1.4. Standards

It is possible to certify an entire organisation in line with the ISO 14000 Environmental Management System that, in particular, sets requirements for the verification of legal requirements and also pursues continual improvements of environmental performance. In addition to ISO 14000, it is becoming common practice for companies to apply ISO 26000 Social Responsibility as guidance for their general sustainability efforts. Life cycle assessment (LCA) is managed via ISO 14040 (Principles and Framework) and ISO 14044 (Requirements and Guidelines).

CEN/TC350 standards provide the horizontal EN-standardised methodology and indicators for the sustainability assessment of buildings using a transparent life-cycle approach. This is the main principle in the CEN/TC350 standards, because without a long-term perspective and life-cycle approach it is not appropriate to refer to sustainability.

The assessment methods for the environmental, social and economic performance of buildings given in the CEN/TC350 standards, take into account performance aspects and impacts that can be expressed with quantifiable indicators, which are measured without value judgments and which lead to a clear result for each indicator. This means that, with the performance-based approach, the CEN/TC350 standards are purely technical instruments as this is the basic precondition for trade-barrier-free movement of construction products within the Internal Market and in the global market area. For this reason, these standards do not provide valuation methods and do not set levels, classes or benchmarks for any measure of performance. Valuation methods, levels, classes or benchmarks may be prescribed in the requirements for environmental, social and economic performance in the client's brief, national building regulations, national application standards, building assessment and certification schemes, etc.

The environmental standards for sustainable construction cover the so-called "ecological dimension" of sustainability. The CEN/TC350 standards provide the horizontal methodology and standardised quantitative environmental indicators under the M/350 mandate, where the main standards are:

- EN 15643-2 Sustainability of construction works – Assessment of buildings - Part 2: Framework for the assessment of environmental performance;
- EN 15978; Sustainability of construction works – Assessment of environmental performance of buildings - Calculation method;
- EN 15804 Sustainability of construction works – Environmental product declarations - Core rules for the product category of construction products

EN15804 "Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products" defines how to declare different products in Environmental Product Declarations (EPDs) based on Product Category rules (PCRs). In modules A-C, this system is an attributional LCA. EN 15804 should be applied as the base for declaring environmental aspects in Europe. It should be said that EPDs/PCRs are used worldwide. But, even if they are based on the international EPD standard ISO 14025, they differ from country to country. A new, shared, international standard is on its way through and the European standard will be harmonized in line with this standard.

EN 15804 is the basis for all Norwegian EPDs for building products.

The Swedish PCR document "PCR 2014:02" provides guidance on the assessment of the environmental performance of buildings. A Norwegian standardisation committee is now working with a possible Norwegian standard on greenhouse gas calculation of buildings.

In the Swedish project "Robust LCA," 6 different ways of conducting an LCA are defined, as seen in figure below. In the past, this has been a major hindrance to understanding and using LCAs in declarations.

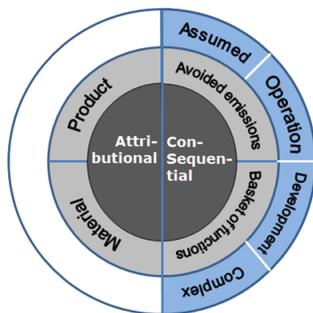


Figure 1. According to Martin Erlandsson et al 2014

Even if we do have European standards, some sets of definitions/factors are still lacking for this declaration to be complete, transparent and neutral for different materials. Therefore it is not 100% possible to validate in practice. Therefore, in a project managed by IVL Swedish Environmental Research Institute, the timber, steel and concrete industries together with the contractor NCC have worked with a shared approach and mutual understanding on how to handle LCAs for building materials in Sweden. From these industries and other LCA experts in Sweden, a total of more than 30 individuals have participated in workshops and discussions, with the results published in detailed as well as informative reports. In the overall report, 19 common recommendations have been given by the participating industries on how to declare materials and products with LCAs.

In Norway, EPD Norway is running courses on how to develop EPDs from LCAs.

With funding from the Finnish Innovation Fund Sitra, the Green Building Council Finland, together with the real estate and construction sector, created eight common building metrics (compatible with CEN / TC 350 family on standards) and one of these metrics is the carbon lifecycle footprint. In the guidance for this metric, the building and construction sector has largely agreed on the recommendations on how to handle typical building materials.

In Iceland, there are no requirements on the use of EPD in building industry for the moment

1.4.1. International EPD System

An environmental declaration is defined, in ISO 14025, as quantified environmental data for a product with pre-set categories of parameters based on the ISO 14040 series of standards, but not excluding additional environmental information. An environmental declaration is created and registered in the framework of a type III environmental declaration programme, such as the International EPD® System.

The contents in the EPD must be in line with the requirements and guidelines in ISO 14020 (Environmental labels and declarations - General principles). The recommendation is that any environmental claims based on the EPD meet the requirements in ISO 14021 (Environmental labels and declarations - Self-declared environmental claims), and national legislation and best available practices in the markets in which it will be used. The international standard ISO 14021 states that only environmental claims that can be supported by up-to-date and documented facts may be used. Vague claims, such as "environmentally friendly" should be avoided. The international EPD system is used by many different industries including some building material producers. The International EPD system applies EN15804, particularly, if this is a prerequisite according to any European market.

There is a European project called the ECO Platform. The objective of the ECO Platform is the development of verified environmental information of construction products, in particular type III declarations (EPDs). The added value of EPDs under the ECO Platform framework is the possibility of using these declarations in all European and international markets.

The ECO Platform is not a program operator, however, its members comprise the different countries' program operators together with LCA practitioners, industrial associations and other stakeholders working together to guarantee a coherent framework for EPDs.

Manufacturers providing ECO Platform EPDs to their customers will be able to optimise their investments avoiding additional fees, work repetition and reducing communication efforts. ECO Platform EPDs are supported by the most important program operators in Europe and their quality and international acceptance is guaranteed. More information can be found at <http://www.eco-platform.org/home.html>

2. Voluntary requirement

A number of voluntary initiatives exist in the construction and property sector that are intended to assess the environmental impact of a building or structure. The following table details the different requirements/systems used to assess the environmental impact of a building/structure.

Table 2. Report covering the voluntary systems currently used to assess a building or structure. Number of certified in (x) Information about the system is provided in Appendix 2.

Voluntary requirements	Sweden	Norway	Finland	Iceland
BREEAM Norway ⁴		x (12 and 112) ⁵		
BREEAM Sweden	x(18)			
BREEAM Intl.	x(40) ⁶		x(15)	x (14)
BREEAM Communities	x(2)	x		x (1)
LEED	x(62)	x (only a few)	x(44)	
CEEQUAL	x	x (starting now)		
The Nordic Ecolabel	x	x	x(0)	
Miljöbyggnad (Sweden)	x(256)			
(PromisE Finland NOT IN USE ANYMORE)			x(1500)	

⁴ Some major developers have requirements for only one or just a few of the 10 categories given in BREEAM Nor.

⁵ Number of buildings certified. 12 buildings are certified while 112 buildings are in the certification process.

⁶ Information: www.breeam.or

3. Different tools to handle material issues in projects

A number of voluntary tools exist in the construction and property sector that are intended to assess the environmental impact of different construction material. The following table details the various tools used to assess the environmental impact.

Table 3. Report covering the tools currently used to assess construction material. Information about the respective tools and the criteria that apply is provided in Appendix 3.

Tools	Sweden	Norway	Finland	Iceland
BASTA (Guidance to Sustainable Construction Materials)	x			
Byggvarubedömningen (Building Material Assessment)	x			
SundaHus	x			
The Nordic Ecolabel (Swan)	x	x	x	x ⁷
Miljöstatus	x			
Klimagassregnskap.no		x		
SINTEF Technical approval		x		

EPD	x	x	x
Eco Product		x	
Emission Classification of Building Materials			x
Classification of Indoor Environment			x

⁷ Mostly used for other consumables

In Sweden, local initiatives also exist at a municipal level that pertain to the construction industry. For example, Stockholm City and the City of Gothenburg have adopted chemical plans that include requirements governing the chemicals used in buildings, etc. Miljöbyggprogram SYD is another example of a local environmental program that the municipalities of Malmö and Lund are working with to drive development toward more sustainable construction.

In Finland, the aim of the non-mandatory Emission Classification of Building Materials is to enhance the development and use of low-emitting building materials – M1 stands for low emissions. This classification does not overrule official building codes or interpretations of them. The Finnish Classification of Indoor Environment is a voluntary system for setting target values for the indoor environment of new construction. In addition, the non-mandatory Finnish building product environmental declaration system is being updated.

In Norway, a 10-year program called FutureBuilt, which is initiating and following pilot projects, requires documentation of carbon emissions attributable to material used in the construction. The projects have to use tools like Klimagassregnskap.no to document this. The BREEAM-NOR certification of buildings gives credits for use of sustainable materials documented by, for example, EPDs, ECOproduct and the Nordic Ecolabel. After using BREEAM-NOR for two years in Norway, the demand for sustainable materials has risen remarkably and producers now have both EPD and indoor-air-emission data for a substantial number of products.

4. Identified obstacles to driving the projects

Some challenges will exist to preparing a shared guide to sustainable materials in the Nordic countries or to establishing a similar way of assessing building materials.

4.1. Information:

One issue concerns the ability to obtain information about the specific building products through a chain of suppliers or directly from the producers. Some producers are not willing to disclose information about the content of their products, often due to secret formulas or patents that are crucial to their business. In Sweden, the market is gradually becoming more understanding and has made much progress with this issue. However, much remains to be done to facilitate the process.

4.2. How to deliver information:

Another issue is the format of the information, what should be digital and in a specific format to be able to automatically import data into different databases or assessment tools. A digital format could make connection to Building Information Modelling (BIM) possible. At the same time, a flexible system is needed that can be adapted to changes in legislation or new requirements for data and standards. BIM is not only impacting transmission formats, it also affects how information is structured and named (concept). This is highly relevant coupled to ISO/DIS 12006-2-2: 2013, which is now coming in an updated format to enable digital management.

4.3. Complex supply chains

Most products have complex supply chains, which means they may contain components deriving from different sub-suppliers, with varying technical and chemical skills and national legal requirements. In combination, these factors can cause difficulties in the information gathering process and, thus, lead to inertia in information gathering and uncertainties regarding the veracity of the information for specific groups of products.

4.4. Awareness and knowledge

Over the last years, awareness and knowledge concerning how materials affect buildings and facilities have increased, in particular from a material-chemical perspective. The construction sector has actively developed systems and structures to improve the ability to track and gather material documentation. However, it remains important to continue increasing awareness and knowledge through all stages involved in the building process.

4.5. Complex tools

It is essential that the tools and means developed to assist the process are widely used throughout the sector. Therefore, to encourage their usage, it is important that these tools are not made too complex.

4.6. Transparent and accepted

The assessment criteria, or the tools, need to be transparent and accepted by the different stakeholders in the building sector if they are to be successful. The criteria should meet the standards of certification schemes, such as, Miljöbyggnad, BREEAM and LEED etc.

4.7. Definition of a product/article:

The definition of an article is another challenge. More and more materials are bought from countries, both in Europe and outside of Europe, where an article is defined as the whole product, while Sweden, together with a few other countries, defines an article as each separable part of the product. This, in combination with the modest understanding and knowledge of REACH and its appendices such as the Candidate List, can make it quite difficult to explain to a supplier what information is requested to be able to declare the chemical composition of a product.

4.8. New legislation and new requirements

Over the last few years, new field-specific legislation has been implemented and is being continuously updated. It is important to distinguish between legislation and voluntary commitments.

4.9. Function is an important part of a product

During the environmental assessment of building materials and their subsequent selection, it is crucial that you take into account the function of the building materials in the building. Otherwise, there is a risk of sub-optimization between the environment and the function. It could also cause sub-optimization between different environmental aspects, for example, energy and substances from a chemical viewpoint. However, it should be kept in mind that construction products are intermediate products for incorporation in a permanent manner in construction works or parts thereof. This means that the environmental performance of construction products only have meaning when they are considered as assembled systems in the construction works. Setting requirements on the environmental performance of products without the proper context could be misleading.

4.10. Costs for developing systems and assessments of products

It is important that the systems under development are cost-efficient both in terms of development and maintenance. It is also of great importance that assessments pertaining to chemical components and product lifecycles are cost optimized, to prevent high product assessment costs inhibiting assessment.

5. Discussion

There is overriding European legislation covering this area. The laws have been implemented but the interpretation among the Nordic countries may vary. In addition, individual countries also have their own legislation in this area. Most of these requirements form a framework and are not specific. With the exception of Norway, no countries currently apply any general requirements stipulating that construction products must disclose the contents of the substances they use. Under the Construction Products Regulation, the member states are able to enact regulations limiting hazardous substances in construction material. However, national chemical requirements that are specifically aimed at construction products are few. In Sweden, there is a bill recommending that keeping a logbook of construction materials should be a requirement, Government Bill 2013/14:39. In Norway, both the building regulations and the Product Control Act “the substitution principle” demand that a user of a product documents any hazardous substances and tries to identify an alternative product without these substances.

A number of voluntary initiatives have been initiated, primarily, in Sweden and Norway, where requirements have been set for the certification of buildings through various private and joint industrial actions, but also for the reporting of the environmental impact of construction products. Sweden has currently made the greatest progress concerning hazardous substances with three established systems (Basta, Byggvarubedömningen (Building Material Assessment) and SundaHus) in the market, whereby construction-related products are assessed based on their environmental properties. The main focus of the assessments lies on the contents (chemical content) and two of the systems (Byggvarubedömningen and SundaHus) also address other environment-related lifecycles. In order to obtain this information, the industry has prepared a joint document, a classification in which information about content and the environmental performance of the product is declared in the *Building Product Declaration, version 3*, where work is in progress to update and develop the document. This work should be taken into account later in this project.

Regarding EPDs, both Norway and Sweden have established program operators that assess a building product’s life cycle according to stipulated requirements under different standards, EPD Norway and International EPD in Sweden.

Norway has made the greatest progress concerning CO² emissions due to materials and many building owners demand documentation of this and also demand emissions below defined limits for specified products.

Many suppliers are currently frustrated at the different requirements stipulated in the Nordic countries, which may result in certain products being recommended in some countries while other countries try to avoid usage. There are no uniform product/article definitions that enable a degree of recognition to be arrived at for a specific product in the individual countries. The supplier of a product is free to name it, which also makes recognition and traceability difficult at various levels of the industry. A common definition for products marketed in the Nordic region, as well as shared criteria, would drive efforts to get more environment-friendly products to the market. This first part of the Nordic Green Guide to Sustainable Material Project shows that the joint legal requirements on the subject are relatively few and pointless but, at the same time, they form a shared platform for the industry. Many positive initiatives exist and these should be addressed in continued efforts. The obstacles that could impede the work have been reported under the section “Identified obstacles to driving the projects”. Most of these are based on the fact that there have not been any previous procedures for the information flow between various supplier chains, and that there has not been any significant demand for the content. One problem is that many products derive from parts of the world where these requirements are still considered insignificant and, in view of the size of the Nordic market, it could be difficult to demand relevant information from these suppliers.

Here, the key issue is that the requirements are placed consistently and are clear, and that the information is easy to use. It is also important that the tools used do not result in major expenses, or that they are so complex that the market does not succeed in financing and addressing the issue.

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