ECOFYS

sustainable energy for everyone

# A PEFCR for construction works

Benchmarking the environmental performance
of construction works and products

04-04-2014

**The Product Environmental Footprint method, or PEF method, was initiated by the European Commission to transparently calculate, communicate and benchmark the environmental footprint of all kinds of products such as: food and beverages, mobile phones and building materials. Especially this benchmarking aspect is subject to discussion among the European construction sector.**

**This discussion revolves around the opinion that individual construction products cannot be benchmarked without having a clear understanding of the intended use of that product. The environmental performance of construction products is only meaningful when they are placed in the context of (assembled systems) in construction works. The main question is how to fairly benchmark the environmental performance of construction products.**

**A possible answer to this question is illustrated by the situation in the Netherlands, where a practical method for determining the environmental impact of buildings and infrastructure works is implemented, taking the intended use of the product into account. This method has been set up in close cooperation with the building sector and is based on the recently developed harmonised standards, the EN15804 and EN15978.**

This paper, initiated by the Dutch Ministry of the Interior and Kingdom Relations, shows how PEF Category Rules for building products can be inspired by concepts in the Dutch environmental impact assessment method and the EN15804 and EN15978. The content of this paper may initiate a broad European discussion for harmonising the Environmental declarations for construction products, so that these declarations can act as input for declarations for construction works. An essential part of this harmonisation will be the differentiation of life cycle phases in cradle to gate and gate to grave. An example of these phases is provided in Figure 2.

## EU - Background[1]

In the context of the Communication on the "Strategy for the sustainable competitiveness of the construction sector and its enterprises (Communication COM (2012) 433 final)" five thematic groups have worked out key recommendations for future actions. Thematic group 3 is responsible for the objective of improving resource efficiency, environmental performance and business opportunities. Thematic group 3 sees the need for a voluntary, transparent, EU framework (baseline structure) for the measurement of the sustainability performance of buildings and other construction works

## The need to develop the PEF method

The PEF was developed as a reaction to the proliferation of methods for measuring the environmental performance of products. Considering the area of carbon measurement alone, studies carried out by the Commission identified 62 leading initiatives and methods on product carbon footprinting and 80 on carbon reporting (status in 2010)[2]. Some Member States have been considering voluntary or mandatory policies based on life cycle assessment. In addition, private initiatives were coming up with multi-criteria methods for measuring the life cycle environmental performance of products.

In addition to creating confusion on the market, the proliferation of these methods leads to additional costs for companies trading across borders: they might need to measure their performance according to several, diverging methods. Methods are generally diverging on several issues or leave some methodological choices open for the user. This means that it is not possible to compare the results of measurements which are obtained using different methods (i.e. benchmarking).[3]

The PEF method reduces methodological choices at general life cycle assessment level, taking the full life cycle into account (cradle to grave). Furthermore, at this moment, product category and sector-specific rules are developed with the goal of enabling the comparison of the environmental performance between similar products. In addition, the PEF was designed specifically with the communication of results in mind, both business to business as well as business to consumer.

## The Dutch method for benchmarking of construction works, elements and products

The history of the development of the Dutch method for determining the environmental performance of construction works (Bepalingsmethode Milieuprestatie gebouwen en GWW) shows a similar starting point as the

[1] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL: Strategy for the sustainable competitiveness of the construction sector and its enterprises
[2] Product Carbon Footprinting – a study on methodologies and initiatives, (2010); Company GHG emissions reporting - a study on methods and initiatives (2010)
[3] Questions about the product environmental footprint (PEF) and organisation footprint (OEF) methods. www.ec.europa.eu/environment/eussd/smgp/index.htm

development of the PEF. There were several independent initiatives within the Netherlands to calculate the environmental performance of construction works. However, the results of these calculations were diverse and lacked the possibility for fair and consistent benchmarking. A step by step harmonisation of several independent initiatives, started by the Dutch Ministry of the Interior and Kingdom Relations, resulted in a Dutch data structure for calculating and declaring the environmental performance of construction works.

The Dutch method for determining the environmental performance of construction works consists of harmonised national rules for the calculation of the environmental impacts of construction works, combined with rules for the declaration of the environmental performance of construction products. The environmental performance is defined by including the complete life cycle: cradle to gate based on EN15804; and gate to grave based on EN 15978.

**Benchmarking of construction works, elements and products**

The purpose of the Dutch method is to support architects, principals and even consumers in making choices with respect to the sustainable performance of buildings. The intention of the method is not to prescribe certain materials and construction products, but rather to let users design and create construction works with a minimum environmental impact due to fair and consistent benchmarking of the environmental performance of products, elements or construction works.

The figure below illustrates how the Dutch method – designed for the benchmarking of construction works – also facilitates benchmarking of elements and products. Products can be compared on a product basis as long as the products have the same function in a construction works. The figure below presents as an example roof tiles; comparing the environmental impacts of these products is possible, based on their EPD information in combination with assumptions for the scenarios of the application in elements and/or construction works. The EPDs consist as a minimum of cradle-to-gate information and recycling information if appropriate. Users complete this with the scenario information as far as necessary for obtaining functional equivalence.

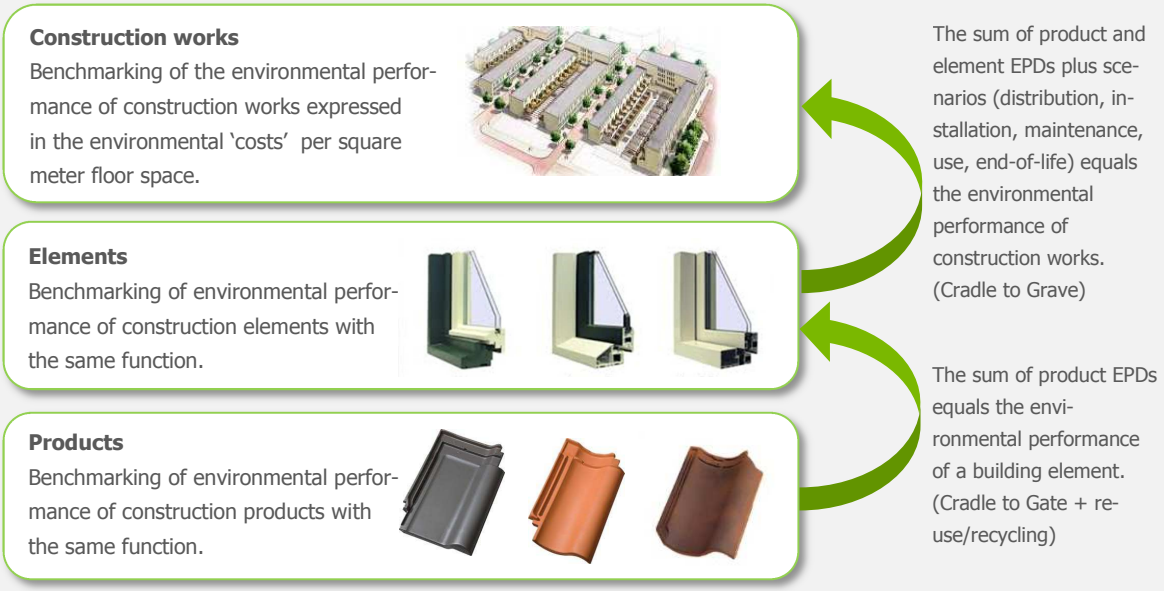


*Figure 1: benchmarking construction products at different levels*

The basis of this Dutch method was the Dutch standard NEN 8006, which has been replaced by the European standards EN15804 and EN15978[4]. Both EU standards are set up to a achieve harmonisation of a core Environmental Product Both EU standards are set up to a achieve harmonisation of a core Environmental Product Declarations (EPD) system to be used in building assessments.

The EN15804 provides the core rules for the production of EPDs for construction products. The EN15978 contains the calculation method for an assessment of the environmental performance of construction works. The reason to set up these two standards originates from the complexity of the construction sector related to multi-useable construction products combined with cultural and local parameters like: construction methodology, transport and intended use.

**Intended use of products**

Comparing EPDs of individual and non-comparable construction products or materials can be arbitrary and potentially misleading. Example**:** the environmental impact during the lifetime of a timber window used in an interior separation wall will be completely different compared to the same window used in a facade. The window used in the facade will need more maintenance and will, probably, have a much shorter lifespan, resulting in higher impacts over the lifetime of the product.

The EN15804 obliges a *cradle to gate* allocation for calculating and declaring the environmental impacts of construction products and materials into an environmental product declaration (EPD). To obtain the complete scope of the environmental impacts over the full life cycle (*cradle to grave*) of all the products used, the sum of the environmental impacts presented by the related EPDs will be calculated – together with specific data for the use stage (heating, cooling etc.) – based on rules described in the EN15978. The combination of the two standards results in the comparable environmental performance of a construction work and its products over its lifetime.

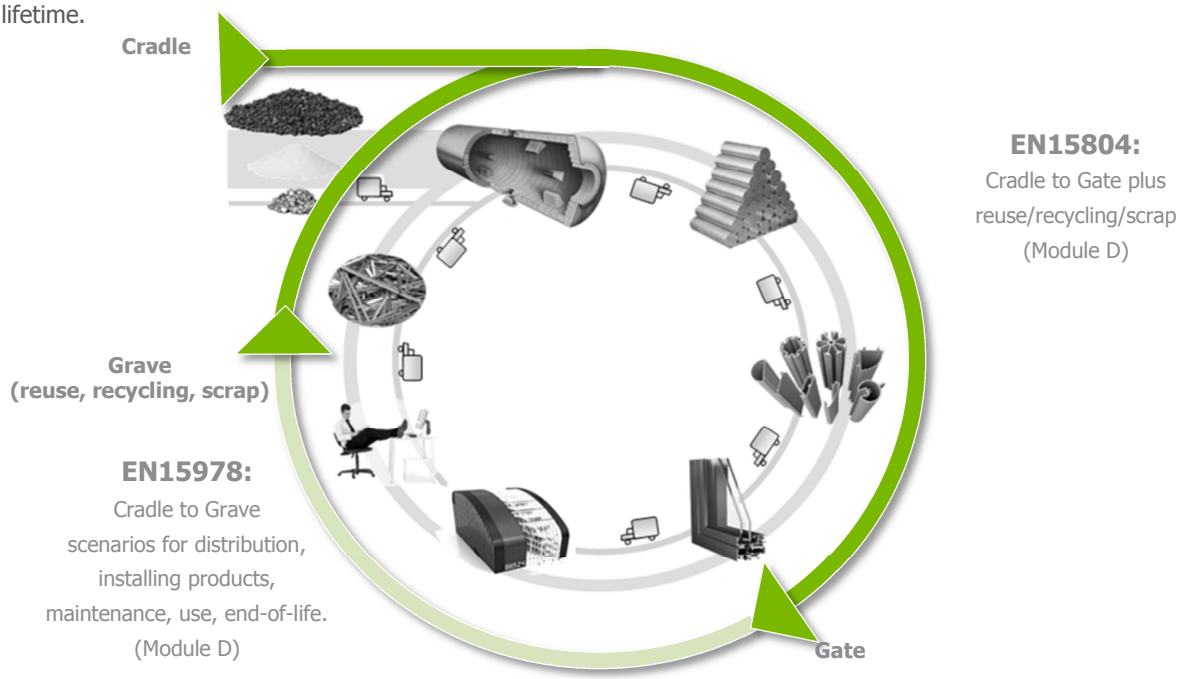


*Figure 2: relationship of the EN15804 and the EN15978*

[4] The Dutch method is currently adapted to the terminology of EN15804 and EN15978, including specific choices such as the inclusion of Module D in the calculations

**The Dutch method and a uniform Dutch EPD database**

The Dutch method for determining the environmental performance of buildings and construction works (Bepalingsmethode Milieuprestatie gebouwen en GWW) is based upon product characteristics and is introduced in the Building Decree 2012 (national building regulations). From January 2013 onwards, it is obligatory to deliver a calculation report of the environmental impact of newly constructed buildings (dwellings and office buildings).

For calculating the environmental impact of buildings, the Dutch method for determining the environmental performance of buildings and construction works (Bepalingsmethode Milieuprestatie gebouwen en GWW) and data from a uniform database for EPDs (Nationale Milieudatabase, NMD) should be used. In this first phase of the legislation, principals are only required to provide information on environmental effects. It is expected that after a certain period of time and collecting data, specific requirements will be implemented.

The uniform database (NMD) contains the environmental performance of many construction products for several different impact categories, like emissions, resource use, ozone depletion, etc. The database is structured by three main pillars:

- Category 1: company specific product data, verified by independent third parties. Relevant for manufacturers and suppliers of construction materials;
- Category 2: branch specific product group data, verified by independent third parties. Relevant for sector associations or cooperation of manufacturers of construction materials;
- Category 3: generic product data, not verified by third parties but with a minimum check by a technical committee of the database.

This structure, consisting of the three categories for product data, leads to a complete range of data for construction products and materials which can be updated or specified by companies or associations. An important advantage is that SME companies are supported by this structure, because they can easily refer to category 2 or 3 data. The expectation is that over time, the database will become more mature due to a shift from category 3 to category 2 and Category 1 product data.

## A European data structure

A valuable and possible starting point in harmonising the environmental declarations for construction products in a way that these declarations can act as input for declarations for construction works, is defining a European data structure. This structure can consist of calculation rules for determining the environmental performance of products (cradle-to-gate), combined with a guideline for taking into consideration cultural and local parameters (cradle-to-grave).Overall, this results in the environmental performance of construction works. Additionally this structure will consist of a clear form for communicating the environmental declaration on product as well on construction works levels. Sharing existing European expertise in benchmarking of construction works and products can be helpful for creating a clear understanding of methods, interpretations, hurdles and solutions.

Afterwards, Member States can prescribe that the EPDs will be used in a national structure for declaring the environmental performance of construction products and works. This national structure may consist of a format

suitable for a database, with the obligation to be used when calculating the environmental performance of construction works.

This two-step approach may result in a European method for determining the environmental performance for construction works, which also allows product and element benchmarking, based on a level playing field. This could be manifested as a specific PEFCR for construction products. The Dutch approach: a building assessment method based on EPDs demonstrates that this can work in the market.

The standards EN15978 and EN15804, both developed specifically for the construction sector during the last 8 years, can serve as a foundation for this. These standards offer guidance for dealing with the complexity of the construction sector related to multi-useable construction products, combined with cultural and local perimeters and have been adopted widely by the EU industry and construction sector.

### Benefits for SME

To make the combination of the two standards practical, a data structure to make data available like the Dutch one (making both specific EPD and generic data available in the same format) is recommendable. A data structure consisting of not only validated company and branch specific information, but also generic product data will make the system easier to work with for SMEs and other stakeholders. The latter can make use of the generic data when specific data cannot be obtained (e.g. for innovative products, for cost reasons, etc.). The keyword should be access of use, without compromising accuracy and integrity. Small and medium-sized enterprises should be able to use the data structure without incurring large costs. In addition, calculating the environmental performance of construction works can more easily be done by using EPDs described accordingly an EU data structure.

EPDs based on an EU structure will prevent unnecessary work for the industry, will assist designers and LCA-professionals in finding the right EPDs easily and will give a continued and centralised overview of relevant EPDs. Member States can additionally provide data for country-specific scenarios (e.g. installation, end-of-life scenarios). As with the other construction product characteristics, it will be up to the Member States to define specific requirements for one or more of the environmental product data, like certain environmental indicators.

### Different steps for declaring the environmental performance of construction works

The table below describes in more detail which parts of the environmental performance declaration of construction products and works can be part of so called harmonised stepping stones (middle column) and which parts can be subsidiarity for Member States (right column). The rows describe, from the top to bottom, the different steps for declaring the environmental performance of construction works, starting with a Life Cycle Assessment at product level, up to an EPD at the level of construction works.

| | EU data structure for the EPD of construction products and works | |
|---|---|---|
| **Description** | **EU harmonised stepping stones (mandatory for Member States):**<br>• Calculating environmental performance products: EPDs<br>• Guidelines<br>• Form for communicating EPDs | **Subsidiarity to Member States:**<br>• National structure<br>• Selection indicators |
| Calculating environmental performance products EPDs (LCA rules for the product category of construction products) | According to EN15804:<br>• Scope and goal definition<br>• Building Life Cycle Information<br>• Impact assessment/indicator calculation<br>• … | - |
| Communication: Environmental Product Declaration | EU Format for communicating EPDs at product level:<br>• Description product<br>• Choices made<br>• Matrix with required environmental indicators (cradle-to-gate) | National structure:<br>• For example the Dutch database, NMD, with three levels of EPDs<br>• Selection of environmental indicators |
| Guidelines for the assessment of environmental performance of construction works | According to EN15978:<br>• Goal and intended use<br>• Scenarios for the Building Life Cycle<br>• Quantifying of the building<br>• … | Defining scenarios:<br>• transport to site<br>• Installation of products<br>• use<br>• maintenance<br>• end-of-life |
| Communication: Environmental Performance of construction works | EU Guideline for communicating environmental Performance of construction works:<br>• Description construction works<br>• Environmental impacts (cradle to grave) | National structure:<br>• Selection of environmental indicators<br>• Further aggregation to single-score indicators for the environmental performance of a building |

*Figure 3: table suggesting mandatory and subsidiarity parts for the EPD of construction products and works.*

### Sharing expertise in benchmarking of construction works and products

During the last year, the Dutch market became more experienced in benchmarking of the environmental performance of construction works by using EPDs of construction products. The construction sector believe that the Dutch method, embedding a method for calculating the environmental impacts of construction works in accordance with harmonised standards is a powerful combination which can act as an example for an EU data structure for the EPD of construction products and works.

This expertise can be of help during the defining a PEFCR for the EU construction sector. Similarities between the current EPD method and PEF methodology can be underlined and differences can be addressed.

As a start, find below the three main differences between the PEF method and the Dutch method/EN15804-EN15978:

1. Impact assessment categories and methodology: The PEF uses the impact assessment methods recommended by the JRC, described in the ILCD Handbook. EN15804 uses the CML Impact assessment methods from the University of Leiden. The PEF uses 14 midpoint categories and the EN15804 uses 7. In addition to these midpoint categories, the EN15804 describes 17 other environmental categories which need to be calculated.
2. Module D: recovery, recycling, reuse of products and material from the EN15804 should be tackled in the whole system from product info to data for scenarios to become aligned with PEF principles.
3. The PEF is intended for benchmarking and B2B and B2C communication, whereas EPDs according to the EN15804 are intended for providing input for building assessments in B2B communication.

Recommended is to develop a route for the harmonisation the differences with the knowledge that these can be harmonised during future revisions of the EN15804 and EN15978. For example, the number of midpoint categories can be revised and implemented during a future revision. May be a working group can be formed and support this route by undertaking preparatory work.

The approaches of PEF and the EU standards EN15804 and EN 15978 can be well aligned in a way that serves both the purpose of building assessment and the purpose of product benchmarking. The Dutch method for determining the environmental performance of construction works shows that this is feasible and can be seen as a good example for defining a PEFCR for the complex and divers construction sector.

For further information, please contact:
Wouter Meindertsma MSc (w.meindertsma@ecofys.com) - Jeroen Scheepmaker MSc (j.scheepmaker@ecofys.com)

## Ecofys

Established in 1984 with the mission of achieving »sustainable energy for everyone«, Ecofys has become the leading expert in renewable energy, energy & carbon efficiency, energy systems & markets as well as energy & climate policies. The unique synergy between those areas of expertise is the key to its success. Ecofys creates smart, effective, practical and sustainable solutions for and with public and corporate clients all over the world. With offices in Belgium, the Netherlands, Germany, the United Kingdom, China and the US, Ecofys employs over 250 experts dedicated to solving energy and climate challenges.

www.ecofys.com

ECOFYS Netherlands B.V.
Kanaalweg 15G
3526 KL Utrecht
T: +31 (0) 30 662-3300
F: +31 (0) 30 662-3301
E: info@ecofys.com
I: www.ecofys.com

ECOFYS Worldwide
ECOFYS Group
Utrecht | The Netherlands
ECOFYS Netherlands
Utrecht | The Netherlands
ECOFYS Germany
Cologne | Berlin | Germany

ECOFYS United Kingdom
London | United Kingdom
ECOFYS Beijing
Beijing | China
ECOFYS US, Inc.
Corvallis | Oregon | USA