Working sub-group 4: Carbon Footprint criterion

EU Ecolabel (EUEL) for Indoor and Outdoor Paints and Varnishes (P&V)

(June 2024)

Contents

1 Introduction

Incorporating carbon footprinting for paint products is crucial due to their significant impact on environmental sustainability. The carbon footprinting of paint and varnish products is expected to become standard practice because of upcoming requirements in the soon-to-be-recast Construction Products Regulation (CPR) and the recently recast Energy Performance of Buildings Directive (EPBD).

1.1 The relevance of the CPR for paints and varnishes

It was uncertain whether the decorative paints covered by the EU Ecolabel (EUEL) criteria set out in Decision 2014/312/EU are actually covered by the scope of the CPR. However, the following list of product families of relevance to the CPR implies that at least some of the main categories of paints and varnishes are indeed within the scope.

Mandate and product family name	Mandate and product family name
M100. Precast concrete products.	M115. Reinforcing steel.
M101. Doors, windows.	M116. Masonry.
M102. Membranes.	M118. Waste water disposal.
M103. Thermal insulating products.	M119. Floorings.
M104. Structural bearings.	M120. Structural metallic products.
M105. Chimneys.	**M121. Wall and ceiling finishes.**
M106. Gypsum.	M122. Roof coverings.
M107. Geotextiles.	M124. Road construction products.
M108. Curtain walling.	M125. Aggregates.
M109. Fixed fire fighting equipment.	M127. Adhesives.
M110. Sanitary appliances.	M128. Concrete, mortar and grout.
M111. Circulation fixtures.	M129. Space heating appliances.
M112. Structural timber products and ancillaries.	M131. Pipes, tanks not in contact with drinking water.
M113. Wood-based panels.	M135. Glass.
M114. Cement.	

As shown above, “wall and ceiling finishes” technically includes both paints and varnishes. Furthermore, wall and ceiling paints are the most common type of paint in the decorative paints sector. However, it does seem that some products covered by the EUEL are not explicitly covered, such as the floor coatings and anti-corrosion paints.

Working question 1: What is your opinion about the extent of paints and varnishes covered by the CPR?

1.2 The relevance of the EPBD for paints and varnishes

The recently recast EPBD makes a completely new requirement for the “life-cycle Global Warming Potential” of all new buildings to be measured in the EU from 2030 onwards (and from 2028 onwards for some building types). The methodology for doing this is set out in the EN 15978 standard, which splits up the building life cycle into different life cycle modules for the building. Since buildings are essentially composed of many different construction products and construction materials, there is also a parallel standard (EN 15804) that focuses on the analysis of ingoing materials and products but provides the information in such a way that it can slot into EN 15978 calculations at building level.

Although presented in more detail later, the main life cycle modules where paints and varnishes have an impact are:

- modules A1-A3: production of raw materials, their transport to the paint factory and paint production.
- module A4: distribution from the factory to retailer and final consumer.
- module A5: use (and loss) of paints and varnishes during their first application.
- module B2: recoating of painted/varnished surfaces during building maintenance.

Each Member State will have to decide on its own specific rules for EN 15978 calculations and there will no doubt be default, generic values made available for paints and varnishes (either directly in terms of kgCO2/m2 area coated or in terms of kgCO2/L of product and L/m2 of coated area). Due to the considerable variety of paint and varnish products and specific applications and performances, it is highly likely that any generic datasets will be too limited and be poorly accurate. Some frontrunner national methodologies, like in Denmark[1] and Finland, are adding a penalty of 10-30 % depending on the quality of data, to the generic default values for construction products as well, in order to encourage suppliers to provide specific carbon footprints for their own products.

1.3 Other drivers for carbon footprinting of paint and varnish products

Green building certifications are increasingly moving towards carbon footprinting or LCA methods for buildings. This might include calculations according to their own simplified methods or try to encourage the gathering of relevant information for suppliers of construction products and materials. This latter approach includes efforts to award points for using a minimum number of products/materials that are covered by an Environmental Product Declaration (e.g. according to EN 15804) or ecolabels.

For instance, Leadership in Energy and Environmental Design (LEED) certification requires environmental declarations for products to earn points and achieve higher certification levels. The selection of building materials based on their environmental footprint is a key factor in meeting these certification requirements. Additionally, building certification schemes are becoming more ambitious in their sustainability criteria. For example, both DGNB and LEED now require a Life-Cycle Assessment (LCA) of all components in their certification processes. LEED is also set to release a new version of its certification in early 2025, with a major focus on decarbonization.

Working question 2: Have you any experience in certifying your paint as being compliant with specific requirements of green building certification schemes on carbon footprinting or EPDs? Is this a market signal that is well-known in the industry?

The Product Environmental Footprint (PEF) methodology is a potentially relevant driver for setting a standardized approach to the LCA of paint and varnish products. The same basic methodology could be carried out just to report on carbon footprint as well, although this would contradict one of the basic principles of PEF, which is to account for all of the impact categories to ensure that there is no burden-shifting from one impact category to another, just to get a low result in, for example, carbon footprint.

Working question 3: Have you been involved in the PEF Category Rules development and/or revision process for paints? If so, how did it influence your opinion on the value of carbon footprinting for paints (and varnishes)?

[1] Udvikling af dansk generisk LCA-data

2 Carbon footprint methodological options

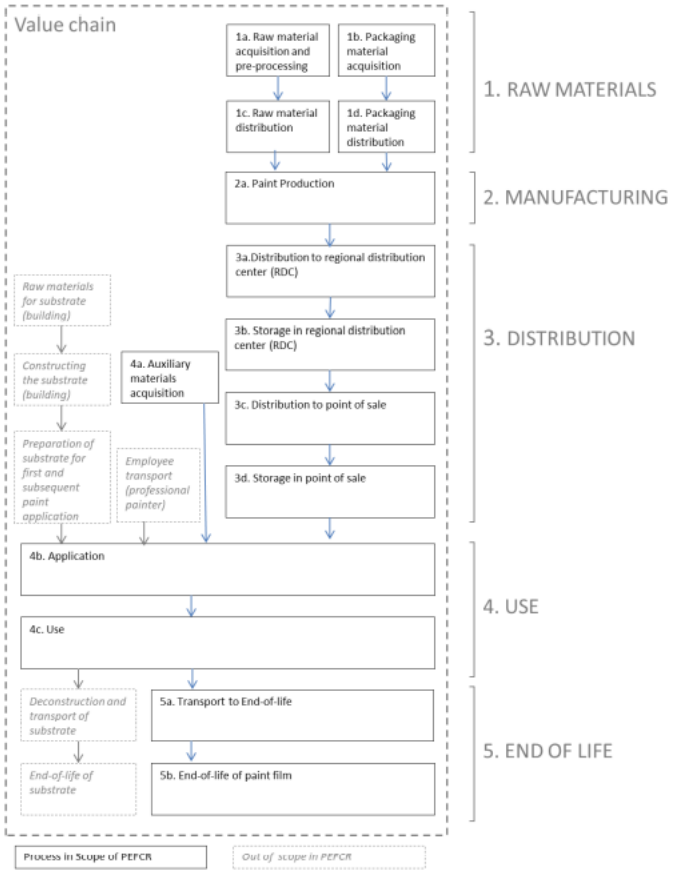
Different methodologies and approaches can assess the same basic data but yield varying results, making it essential to choose a consistent approach. During the 1st AHWG meeting, four approaches were discussed which, in decreasing order of complexity, are:

- the Product Environmental Footprint Category Rules (PEFCR) for paints,
- the Product Environmental Footprint (PEF) general methodology (see Recommendation 2021/2279)
- EN 15804 carbon footprint, cradle-to-grave, and
- EN 15804 carbon footprint, cradle-to-gate.

Each approach offers a unique framework for evaluating environmental impacts, emphasizing the need for a standardized methodology to ensure consistency and comparability of results.

2.1 Product Environmental Footprint (PEF)

The Product Environmental Footprint methodology, introduced by the European Commission in 2013 and updated in 2021 via Commission Recommendation (EU) 2021/2279, allows companies to assess and communicate the environmental performance of goods or services throughout their life cycle in a consistent manner with limited scope for creative interpretation or manipulation. To achieve this, the methodology presents detailed requirements for modelling the environmental impacts of input (material and energy) and output (emissions and waste streams) flows from cradle-to-grave, as presented in the figure below.



Source: Product Environmental Footprint Category Rules - Decorative Paints version 1.0

The scope of the PEF study outlines the system to be evaluated and its technical specifications in detail. The scope definition must align with the study's defined goals and should include:

- Functional unit and reference flow.
- System boundary.
- Impact categories.
- Additional information to be included.
- Assumptions and limitations.

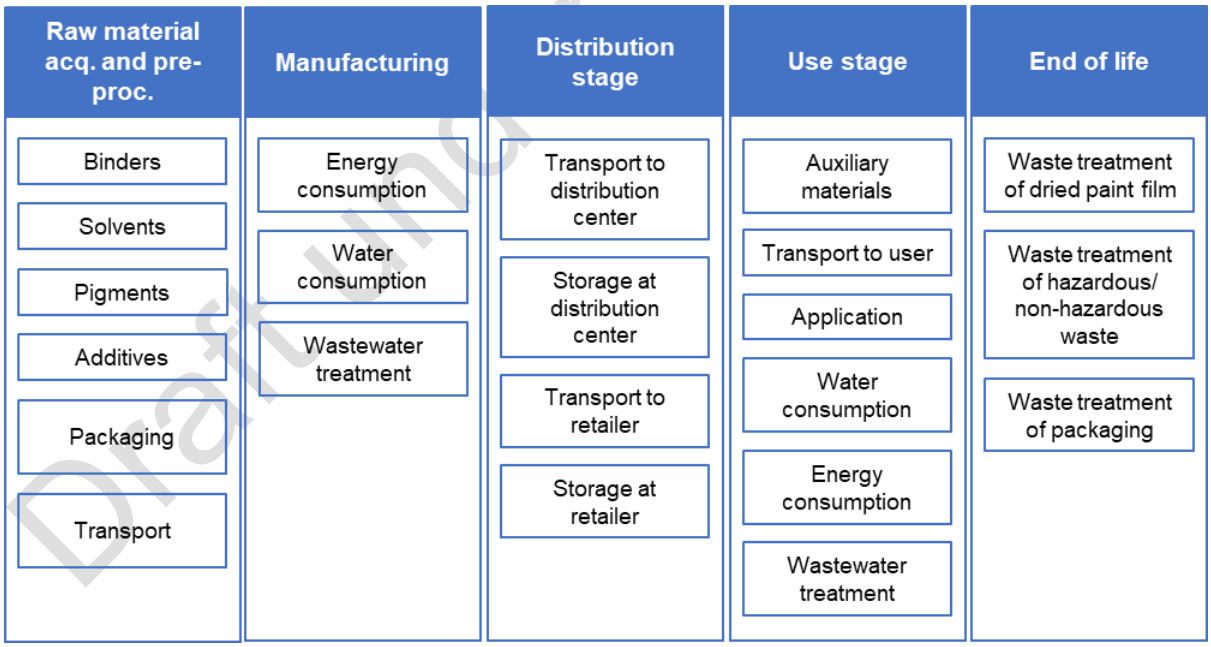
The general rules laid out on the methodology allow for reliable, reproducible, and verifiable PEF studies. However, comparability can only be achieved if the results are based on the same Product Environmental Footprint Category Rules (PEFCR).

2.2 Product Environmental Footprint Category Rules (PEFCR) for paints

The PEF Product Category Rules (PEFCR) are Product Environmental Footprint rules specific to different product groups. The main goal of a PEFCR is to standardise how LCAs of products belonging to the same product group are conducted, based on a set of specific guidelines and rules. Unlike a general PEF study, a study following the PEFCR allows for comparability between products belonging to the same product group.

PEFCRs are developed based on a representative product, which is an average product sold on the market within the EU. This product is considered representative of the category of products under study.

The PEFCR encompasses the cradle-to-grave environmental impacts approach throughout the life cycle of decorative paints. It includes raw material acquisition and pre-processing, production, distribution and storage, usage, and end-of-life stages, covering all processes that distinguish paint value chains as presented in the figure below.



Source: Own elaboration from Preliminary Report, based on PEFCR for Decorative Paints.

The scope of the PEFCR covers paints included in product categories (a) through (d) of the Paints Directive (2004/42/EC of the European Parliament and of the Council of 21 April 2004 on limiting emissions of volatile organic compounds due to the use of organic solvents in decorative paints, varnishes, and vehicle refinishing products, amending Directive 1999/13/EC).

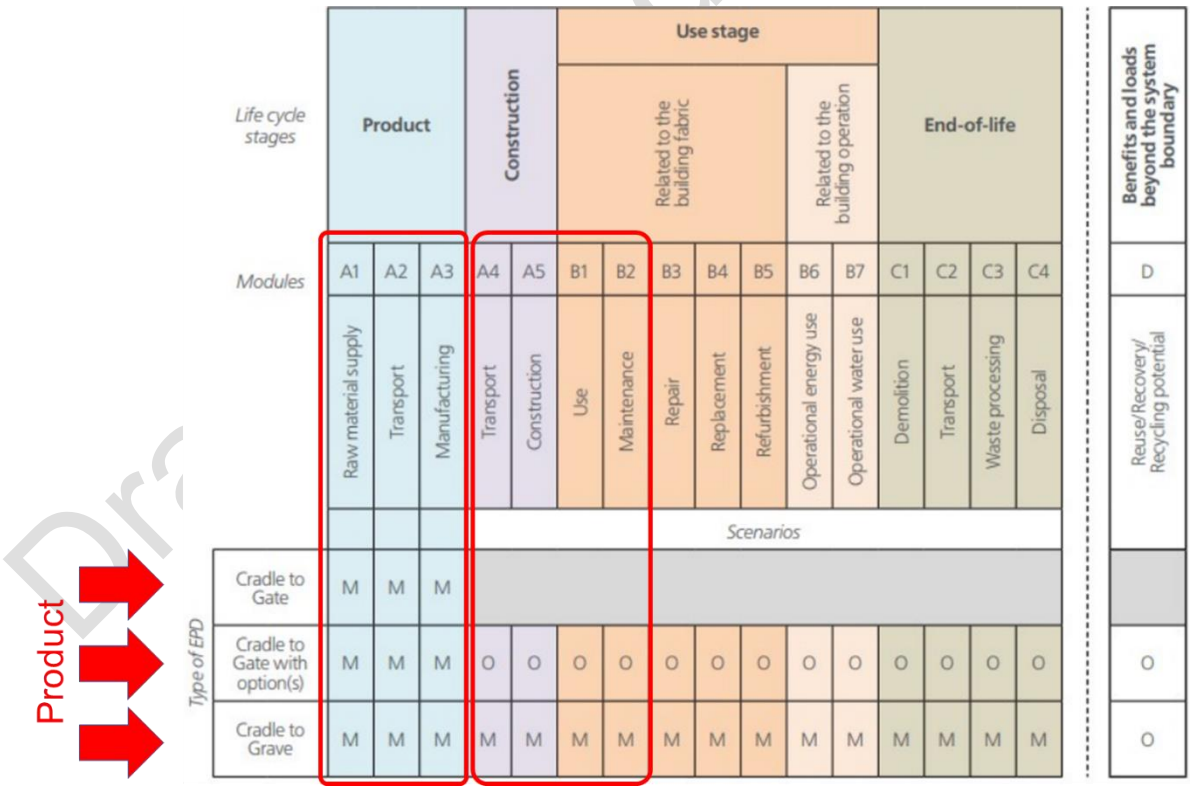
- (a)‘matt coatings for interior walls and ceilings'
- (b) ‘glossy coatings for interior walls and ceilings'
- (c) ‘coatings for exterior walls of mineral substrate'
- (d) ‘interior/exterior trim and cladding paints for wood, metal or plastic'

The PEFCR of Decorative Paints is relevant for the EU Ecolabel of paints and varnishes. This PEFCR provides specific guidelines and rules to be used when conducting a PEF study of decorative paints in scope, including indoor and outdoor wall paint and outdoor wood varnish.

Working question 4: If you have experience with the PEFCR for paints, do you think the method could be easily adapted for varnishes? Either way, please try to explain why.

2.3 EN 15804

The EN 15804 establishes a standardized methodology for creating EPDs, ensuring consistency and comparability of environmental data across different construction products. The standard uses Life Cycle Assessment (LCA) to evaluate the environmental impact of construction products throughout their entire life cycle, from raw material extraction to disposal. This comprehensive approach helps identify the stages with the highest environmental impacts, including the carbon footprint. The EN 15804 standard also mirrors the modular structure of building life-cycle stages (modules A1-A5, B1-B7, C1-C4 and D) so that EPD data is directly compatible with building LCA calculations.



The figure above shows all the building life cycle stage modules, together with their names. At the bottom of the figure, there are three different options for product EPDs (i.e. paints in this case). In all cases, data must be reported for modules A1-A3, because this is information that the paint or varnish producer can obtain and make accurate assumptions about. Module A3 essentially ends at the factory gate.

The other two options for EPDs include additional optional information (O) for life cycle stages beyond the control of the paint or varnish producer, while the final option makes such information mandatory (M). For the sake of paints and varnishes, we consider that the other life cycle stages beyond A3 that are worth potentially considering (from an EPD perspective) are:

- Module A4: national/regional transport scenarios that customers could choose from depending on where the product ends up compared to the factory.
- Module A5: to account for emissions and waste of product during application (could be significant).
- Module B1: use phase could mean impacts due to emissions of VOCs or other contaminants.
- Module B2: The need for recoating after X years. Manufacturers could make an estimate of this for different use environments.

A full cradle-to-grave approach does not seem so realistic for paint and varnish products, since the end-of-life will be determined by the type of substrate it is applied to.

Working question 5: What are your opinions on the cradle-to-gate versus cradle-to-cradle approaches?

3 Comments from AHWG meeting

The AHWG meeting was held on May 7th, and comments from stakeholders were collected until May 22nd. A summary of the comments in an aggregated and anonymised form is as follows:

Lack of supplier data: A significant issue with the proposed criterion is its requirement for the carbon footprint of each ingredient, necessitating detailed data from suppliers, which is impractical. Part of the solution to this is in the development and maintenance of generic datasets. However, some stakeholders then argue that using secondary data will lead to environmental performances similar to non-Ecolabelled products, rendering the carbon footprints redundant.

A balance between using secondary data when primary data is not available and requested primary data to all suppliers is surely a reasonable way forward for tackling this issue.

Lack of clarity: The inclusion of the carbon footprinting criterion lacked clarity on who will conduct the footprint analysis and whether third-party certification is necessary. Stakeholders raised the concern about the added costs and time for companies, particularly smaller ones. The proposed criterion specified a cradle-to-gate or cradle-to-grave methodology, with data being requested for each ingredient, including general transport assumptions and losses. However, stakeholders argue that the criterion is overly complex, time-consuming, and costly. Ambiguity about whether the footprint should be calculated per product or per product family was considered to further complicate the matter.

It would be interesting to know how much a carbon footprint analysis for a paint or varnish product would typically cost and to know how significant the economies of scale are when assessing lots of similar products.

Optional requirement: While some support the idea of measuring carbon footprints, they argue that it should be an optional criterion with adequate support, such as a freely available online calculator. The criterion is also said to be premature and not comprehensive enough, with some stakeholders calling for a harmonized methodology, considering the current state of science and data availability, to ensure accurate and comparable assessments.

Optional criteria have been used before in EU Ecolabel criteria for other product groups and services, although this is normally as part of a broader set of optional criteria, where points are given for meeting any of the optional criteria and a minimum total number of points is required overall.

Other limitations: Additionally, others argue that it should not be limited to carbon footprint, as there are other environmental impact categories as important when assessing paints and varnishes, including toxicity.

Overall, the discussions reveal a significant divide, with many stakeholders opposing the immediate implementation of the new criterion due to practical challenges and high costs, while others see potential benefits if well-supported and harmonized methodologies are developed.

4 Working questions

In this section, we recap on the comments already set out earlier and add some more questions too.

Working question 1: What is your opinion about the extent of paints and varnishes covered by the CPR?
Working question 2: Have you any experience in certifying your paint as being compliant with specific requirements of green building certification schemes on carbon footprinting or EPDs? Is this a market signal that is well-known in the industry?
Working question 3: Have you been involved in the PEF Category Rules development and/or revision process for paints? If so, how did it influence your opinion on the value of carbon footprinting for paints (and varnishes)?
Working question 4: If you have experience with the PEFCR for paints, do you think the method could be easily adapted for varnishes? Either way, please try to explain why.
Working question 5: What are your opinions on the cradle-to-gate versus cradle-to-cradle approaches?
Working question 6: Have you ever been involved with the carbon footprinting of a paint or varnish product? If so, please provide some details, such as cost, main challenges etc.
Working question 7: Are you planning to investigate or look into doing carbon footprinting or LCA of you paint and varnish products? If so, what are the main drivers for that?
Working question 8: What are your main concerns about requiring carbon footprinting for paint and varnish products?

Additional questions can also be raised during the working group based on the ongoing discussions during the meeting.

5 Minutes from WSG4

Viegand Maagøe welcomed all participants and informed them about the meeting being recorded for internal use by JRC and the project team. The following organisations were in attendance:

- AFNOR Certification
- BASF SE
- BOERO BARTOLOMEO SpA
- CATAS SpA
- Chemours
- DG ENV
- Evonik Operations GmbH
- FIPEC
- German Environment Agency
- JRC
- Kerakoll Italy
- Metal Packaging Europe
- Peter Kwasny GmbH
- PPG AC France
- Röhm GmbH
- Sherwin Williams Italy
- The European Environmental Bureau (EEB)
- Titanium Dioxide Manufacturers Association (TDMA)
- Tronox
- Valhi
- Vitex S.A.

The purpose of the meeting was presented and a description of what to discuss and to focus on working questions.

The meeting started with a coherence discussion regarding whether paint and varnish products are covered by CPR. Some stakeholders argued that the terminology regarding the coverage of paints and varnishes is unclear, and they were unsure whether what types of paints are within the scope of the regulation. Nevertheless, it was discussed that wall and ceiling paint products should be included in the group 'wall and ceiling finishes'.

Stakeholders agreed that there is a market pressure for EPDs. Most argued that it is not due to regulation such as CPR but due to building certificate schemes, such as DGNB, LEED and BREEAM, even though these are not mandatory, there is a significant demand in new building projects. In addition, most stakeholders stated that EPDs according to EN 15804 are conducted on their products.

There was a consensus amongst participants that EPDs are costly and time-consuming, as it can take up to one year to get one EPD published. As a result, producers have not obtained EPDs for all their products, but focused on specific family groups or paints for specific markets. In general, most have EPDs only for wall and ceiling paints. Other stakeholders argued that they only do EPDs when PCRs for certain paint categories are available.

When asked about cradle-to-gate and cradle-to-grave LCA approaches, most stakeholders stated that they use cradle-to-gate in LCAs/EPDs. Some argue this is because of the difficulty in assessing the end-of-life of paint products, considering these are sold worldwide and their end-of-life cannot be easily determined. However, focus on cradle-

to-grave LCAs seemed to be employed by others, while many were open to using this approach, and it was argued that cradle-to-grave approach would be preferred if a CO_2 footprint requirement was to be set in the EUEL.

When discussing the use of data in LCAs, there was a consensus remarking that getting supplier specific data is challenging and most must rely on generic data, which many times is not country specific. However, they argued that database generic emission factors may turn the calculations redundant, as all producers rely on the same factors, resulting in EPDs with no value, as the only difference is then the formulation.

One raw material supplier was asked about carbon footprint for their raw materials and stated that there is a demand for ISO 14067 (Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification) and EN 15804 (Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products) from their clients and that many of their products already have Product Carbon Footprints (PCF), which are updated annually.

One of the participants was part of the initial version of PEFCR but are currently not following this methodology. According to stakeholders, PEF is useful when documenting the effect of durability on life cycle impact, but results are not used for general documentation.

Stakeholders agreed that there is a big variation between the carbon footprint of raw material suppliers and databases, sometimes up to 50%. However, they also argued that the methods used differ throughout the supply chain and between suppliers, in terms of LCA stages and databases used, although the EPD standard should streamline the process and avoid these issues.

When discussing the addition of a limit value of CO_2 emissions on the EUEL, stakeholders agreed that that would not make sense unless a correlation to paint performance (e.g. durability) existed. This is because less quality paints would likely have a lower carbon footprint per kg/L than higher quality ones. One of the suggestions presented was to set limit values for specific materials which generally have a high impact on the carbon footprint of the paint product (e.g. binders and pigments – titanium dioxide could have a limit value instead of setting a limit value for paints). However, this approach would not take durability into account.

The project team said that using a functional unit to calculate the CO_2 footprint of these products may be a solution to include the performance which would allow for comparability between paint products. Stakeholders stated that it would be more work on their part to do this but agreed that is important to have it and should be a requirement in the EUEL, similarly to other requirements (e.g. water resistance). Others stated that when setting a limit value, it would be more beneficial to apply the cradle-to-grave approach. There was a consensus that opacity and wet scrub resistance should be used when calculating the carbon footprint. Stain resistance and polishing performance were also suggested as possible parameters to include.

Participants were asked to provide data on the carbon footprint of EU Ecolabelled and non-Ecolabelled paints, in order to make a comparison between the two and figure out if it would be possible to set a limit value in the EUEL.

Some stakeholders raised concerns regarding the impact on the validity of the EUEL when some ingredients in the formulation are changed, i.e., if the EUEL award becomes invalid (or it expires), and the company needs to go through the application process again, if they change supplier for one of the materials. In addition, as the Product Carbon Footprints from the raw material supplier are updated annually, the stakeholders argued that it would be a significant effort to update the values for each ingredient for each of their paints every year.

When asked about focusing on carbon footprint only or including other impact categories as well, stakeholders were in favour of sticking to carbon footprint for now and revising this in the future/next criteria revision.

The project team presented the next steps, timeline of the project and deadlines to provide feedback. Project team thanked participants for their time and comments. Meeting ended.

6 Conclusions

The Working Sub-Group 4 meeting comments followed by the additional comments received, provided insights into stakeholder's views on the implementation of a carbon footprint requirement on the EU Ecolabel, ranging from perceived demand to challenges with complying with such a requirement.

6.1 Insights on current approaches to carbon footprint

Stakeholders have indicated a significant market pressure for Environmental Product Declarations (EPDs) on paint and varnish products. This demand is driven not by regulations like the Construction Products Regulation (CPR), but by green building certification schemes such as LEED and BREEAM. As a result, many paint producers have published EPDs for some of their products in accordance with EN 15804. Developing these environmental declarations is costly and time-consuming, leading some producers to focus on family groups or paints that follow specific (and available) Product Category Rules (PCRs).

There is also a high demand for the Product Carbon Footprint (PCF) of raw materials from suppliers. Although scarcely available among raw material suppliers, those who have them update them annually.

The Product Environmental Footprint (PEF) methodology is not widely used by stakeholders to calculate their carbon footprint. However, stakeholders view the main purpose of PEFCR methodology as documenting durability and some have published cradle-to-grave EPDs based on certain elements of this methodology, including durability of paints. Nevertheless, PEFCR is not applicable to all paint products.

Regarding the scope of LCAs, a cradle-to-gate approach is widely used by paint producers. This preference is due to the difficulty in assessing the end-of-life of these products, as they are sold globally, and end-of-life scenarios vary by location. However, when following a cradle-to-gate approach, paints with lower durability have a lower environmental impact than high quality paints, as refurbishment is not accounted for in the life cycle. As a result, this can lead to greenwashing. Therefore, some producers favour cradle-to-grave over cradle-to-gate LCAs/EPDs, and many agree or at least are open to adopting this approach in the future.

6.2 Challenges with carbon footprint requirement

A key challenge in assessing the carbon footprint of paint products is obtaining supplier-specific data. Producers must often rely on generic data from databases, which can differ significantly from supplier data – sometimes by as much as 50%. This reliance on generic emission factors can make carbon footprint calculations redundant and result in EPDs with limited added value.

One other significant issue is the current method of calculating carbon footprints, which often focuses on paint quantity (e.g., per kg or L) rather than performance (e.g. spreading rate, durability). As a result, there is no consensus on whether a CO_2 emissions limit should be set for the EU Ecolabel for indoor and outdoor paints and varnishes. Stakeholders agree that if such a limit would be established, it must be correlated with performance. However, these limits would need to be established for each product type covered by the EUEL, requiring a benchmark and corresponding data for all paints and varnishes. Additionally, setting a limit for specific problematic raw materials (e.g., binders and pigments) could help reduce the carbon footprint, but it is uncertain how this would impact paint formulations.

Using a functional unit to calculate the CO_2 footprint of paints would include performance and allow comparability between products. Although it requires further effort from producers, stakeholders agree on its importance for Ecolabel criteria. Performance should at least consider opacity and wet scrub resistance, and possibly stain resistance and polishing parameters. Furthermore, expanding the carbon footprint scope to cradle-to-grave should be considered if setting a limit value.

One additional concern is the impact of altering ingredients in the formulation or having to update the PCF of raw materials yearly on the validity of the EUEL, i.e., if the EUEL is rendered invalid and producers must reapply. This is considered a significant effort for the producers, which would require additional resources. However, the current EU Ecolabel requires license holders to demonstrate ongoing compliance to the criteria due to changes in suppliers, formulation, or extension of the product range. The same can be said for EPDs, where changes to the products that

lead to significant changes to environmental impacts require a revision of the EPD. It could also be argued that the carbon footprint, if no changes are made to the paint formulation, should be valid for at least 5 years just as EPDs. It is worth noting that the latest EU Ecolabel product criteria adopted have a period of validity of over six years[2].

Finally, stakeholders argued that the methods used to calculate CO_2 emissions differ between suppliers in terms of LCA stages and databases used. There is a lack of alignment on which LCA methodology to follow worldwide: the EU tends to follow EN 15804 and PEFCR, whereas the US follows ISO 21930 and ACA PCRs. This forces global companies to comply with both, which is once again resource consuming.

Overall, although there are several challenges, stakeholders participating in this WGS meeting supported a carbon footprint requirement as a criterion for the EU Ecolabel. However this depends on the data availability and data provision from stakeholders during the revision period.

6.3 Carbon footprint based on performance

To compare the effect of the carbon footprint of paint products[3] with and without performance considerations, a functional unit must be set.

A functional unit in an LCA study is a *'quantified description of the performance requirements that the product system under study must fulfil*'. In other terms, when conducting an LCA of paints, a functional unit describes the specific function a paint product must fulfil over a given period. To ensure comparability between different paint products, certain performance requirements must be considered, including spreading rate and durability.

An example of a potential functional unit that all paints must fulfil is *"protection and decoration of 1 m^2 of indoor/outdoor substrate for 50 years at 98% opacity"*. In this case, all paints must protect and decorate 1 m^2 of wall with a 98% opacity for 50 years. The amount of paint required to fulfil this functional unit can therefore be calculated based on the following parameters:

- Spreading rate (m^2/L)
- Fraction of paint applied to wall (of the paint taken from the can, how much is actually applied on the wall)
- Paint density (kg/L)
- Maintenance multiplier (based on durability – how many times it requires re-application over the 50 years)

The amount of paint required can therefore be calculated through the equation:

kg of paint = 1 (m^2) / Spreading rate (m^2/L) / Fraction of applied paint (-) × Paint density (kg/L) × Maintenance multiplier

The results obtained will therefore be related to the amount of paint required to protect and decorate 1 m^2 of indoor substrate for 50 years at 98% opacity, and will differ amongst paints, based on their performance.

Based on the material sent by one participant and research conducted by the project team, a comparison was conducted on different types of water-based indoor paints, based on spreading rate, paint density and durability indicated in their EPDs. All EPDs analysed were conducted according to EN 15804:2012+A2:2019. The table below shows the amount of each paint required to fulfil the functional unit, based on the equation above.

	Paint A	Paint B	Paint C	Paint D	Paint E	Paint F	Paint G
Spreading rate [m^2/L]	15,6	15,6	11	8	12	10,26	13,00
Fraction of paint applied [-]	0,89						
Paint density [kg/L]	1,43	1,31	1,47	1,32	1,45	1,47	1,41
Maintenance multiplier [-]	3,33	3,33	5	6,67	3,33	5,00	4,17

[2] https://eur-lex.europa.eu/eli/dec/2023/1809/oj
[3] Refers to both paint and varnish products, although only paint products are mentioned.

Amount of paint required [kg]	**0,343**	**0,315**	**0,529**	**0,632**	**0,348**	**0,803**	**0,508**

Based on this, two graphs were created to compare the carbon footprint when focusing on amount (kg) or functional unit, which accounts for performance. However, it's important to note that the results pertain only to the production stage (A1-A3) collected from the EPDs due to insufficient data regarding the installation and use stages. Therefore, the comparison only accounts for the production phase: extraction of raw materials, transport to manufacturer and production processes, excluding the transport to the customer, application with auxiliary materials and end-of-life.

Error! Reference source not found. shows the results when considering the CO_2 impacts per kg of paint, whereas **Error! Reference source not found.** presents the results when those impacts are linked to performance, providing impacts as CO_2 per functional unit.

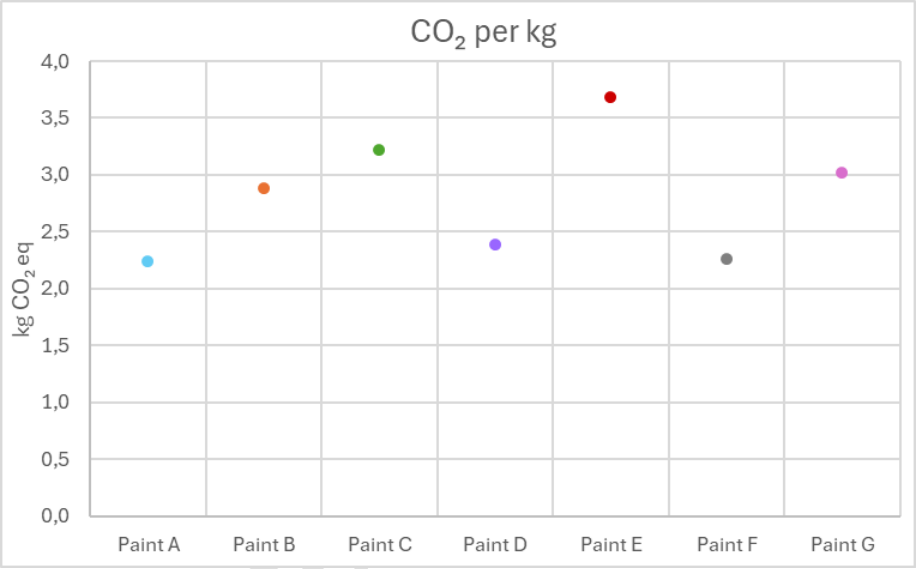


Figure 1 Carbon footprint (A1-A3) per kg of 7 types of interior paints.

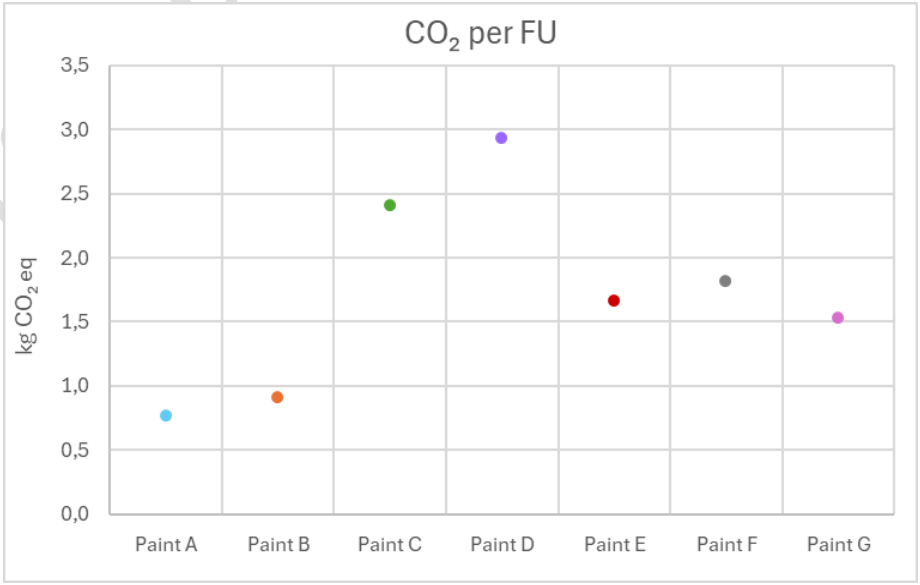


Figure 2 Carbon footprint (A1-A3) per functional unit of 7 types of interior paints.

The figures show that certain paints with low carbon footprint per kg can also have a low impact per functional unit (over 50 years). However, others with lower durability require more frequent re-applications, which leads to higher carbon footprints. This is the case for Paint D, which has one of the lowest footprints per kg but when accounting for performance over 50 years, the lower durability compared to the remaining paints leads to the highest impact per FU. In contrast, Paint E has the highest impact per kg but the fourth lowest per FU, due to its spreading rate and durability.

In conclusion, and as discussed by the participants, if a carbon footprint requirement is to be added to the EU Ecolabel, the performance of paints must be included to avoid greenwashing.