Nordic Council
of Ministers

Nordic Swan Ecolabel and Product Environmental Footprint

Focus on Product
Environmental Information

Nordic Swan Ecolabel and Product Environmental Footprint

Focus on Product Environmental Information

Johanna Suikkanen, Ari Nissinen and Marianne Wesnæs

Nordic Swan Ecolabel and Product Environmental Footprint

Focus on Product Environmental Information

Johanna Suikkanen, Ari Nissinen and Marianne Wesnæs

ISBN 978-92-893-6260-3 (PDF)

ISBN 978-92-893-6261-0 (EPUB)

<http://dx.doi.org/10.6027/TN2019-544>

TemaNord 2019:544

ISSN 0908-6692

Standard: PDF/UA-1

ISO 14289-1

© Nordic Council of Ministers 2019

This publication was funded by the Nordic Council of Ministers. However, the content does not necessarily reflect the Nordic Council of Ministers' views, opinions, attitudes or recommendations

Cover photo: Luis Villasmil, Unsplash.com

Disclaimer

This publication was funded by the Nordic Council of Ministers. However, the content does not necessarily reflect the Nordic Council of Ministers' views, opinions, attitudes or recommendations.

Rights and permissions

This work is made available under the Creative Commons Attribution 4.0 International license (CC BY 4.0)
<https://creativecommons.org/licenses/by/4.0>.

Translations: If you translate this work, please include the following disclaimer: *This translation was not produced by the Nordic Council of Ministers and should not be construed as official. The Nordic Council of Ministers cannot be held responsible for the translation or any errors in it.*

Adaptations: If you adapt this work, please include the following disclaimer along with the attribution: *This is an adaptation of an original work by the Nordic Council of Ministers. Responsibility for the views and opinions expressed in the adaptation rests solely with its author(s). The views and opinions in this adaptation have not been approved by the Nordic Council of Ministers.*

Third-party content: The Nordic Council of Ministers does not necessarily own every single part of this work. The Nordic Council of Ministers cannot, therefore, guarantee that the reuse of third-party content does not infringe the copyright of the third party. If you wish to reuse any third-party content, you bear the risks associated with any such rights violations. You are responsible for determining whether there is a need to obtain permission for the use of third-party content, and if so, for obtaining the relevant permission from the copyright holder. Examples of third-party content may include, but are not limited to, tables, figures or images.

Photo rights (further permission required for reuse):

Any queries regarding rights and licences should be addressed to:

Nordic Council of Ministers/Publication Unit
Ved Stranden 18
DK-1061 Copenhagen
Denmark
pub@norden.org

Nordic co-operation

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

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

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

The Nordic Council of Ministers

Nordens Hus
Ved Stranden 18
DK-1061 Copenhagen
pub@norden.org

Download and order Nordic publications from www.norden.org/nordpub

Contents

Figures and Tables.....	7
List of Figures	7
List of Tables	7
Definitions.....	9
List of abbreviations	13
Foreword.....	15
Summary	17
1. Introduction	19
1.1 Background	19
1.2 Objectives.....	20
1.3 Methods and materials	21
2. Basic Information on the Swan and PEF schemes.....	25
2.1 The Nordic Swan Ecolabelling scheme	25
2.2 Nordic Swan Ecolabel product environmental criteria	28
2.3 Participating in the Nordic Swan Ecolabelling scheme	33
2.4 Product Environmental Footprint.....	34
2.5 Product Environmental Footprint Category Rules (PEFCRs).....	36
2.6 Participating in the PEF scheme	43
3. Comparison of the Nordic Swan Ecolabel and the PEF	47
3.1 Introduction.....	47
3.2 Goals and objectives	47
3.3 Overall methodological approach	49
3.4 Definition of product categories.....	50
3.5 Functional units and alternative approaches.....	56
3.6 Significant environmental aspects.....	65
3.7 Data quality and verification	87
3.8 Establishing credibility and verification	95
4. Discussion	99
4.1 Introduction.....	99
4.2 Hypothetical future situation	100
4.3 Opportunities and challenges.....	101
4.4 How the PEF could be used by the Nordic Swan Ecolabel	103
5. Conclusions and Recommendations	105
Sammanfattning	109
References	111
Annex I: Workshop Questions.....	117
Annex II: Workshop Report	119
Workshop Report of the Nordic workshop on Product Environmental Footprint and the Nordic Swan Ecolabel – Focus on product environmental information.....	119

Figures and Tables

List of Figures

Figure 1	Report development
Figure 2	Organisation chart for the Nordic Swan Ecolabel
Figure 3	Project flow for criteria development for the Nordic Swan Ecolabel
Figure 4	Steps to be followed for the development of PEFCRs
Figure 5	Phases of a Product Environmental Footprint study
Figure 6	Metal content of batteries
Figure 7	Bill of materials of a representative product T-shirts
Figure 8	A hypothetical situation where a better-than average – PEF value is a prerequisite for ecolabel applicants

List of Tables

Table 1	Basis for comparing Swan and PEF
Table 2	Swan Ecolabel criteria documents and PEF category rules with similar product groups
Table 3	MECO chart
Table 4	Data detail in the MECO analysis according to the MECO Guide
Table 5	Comparison of objectives
Table 6	Relation to ISO Standards
Table 7	Product category definitions – Rechargeable batteries
Table 8	Product category definitions – Paper products
Table 9	Product category definitions – Textiles, hides/skin and leather
Table 10	Product categories definitions – Indoor and outdoor paint
Table 11	Functional units – and other units used as the basis for the environmental assessments and comparisons – Textiles, hides/skin and leather
Table 12	Functional units – and other units used as the basis for the environmental assessments and comparisons – Paint
Table 13	Functional units – and other units used as the basis for environmental assessments and comparisons – Paper products
Table 14	Functional units – and other units used as the basis for environmental assessments and comparisons – Rechargeable batteries
Table 15	Endurance in cycles for cylindrical cells dimensionally interchangeable with primary batteries
Table 16	Toxicity-related impact categories during the pilot and transition phases, adapted from the PEFCR Guidance document, Page 47
Table 17	Significant identified environmental aspects included in the PEFCR and the Nordic Swan Ecolabel for rechargeable batteries (the four sub-categories are merged)
Table 18	Significant identified environmental aspects included in the PEFCR and the Nordic Swan Ecolabel for paint (the sub-categories are merged)
Table 19	Identified significant environmental aspects included in the PEFCR and the Nordic Swan Ecolabel. PEFCR: T-shirts. Nordic Swan: Textiles
Table 20	Significant identified environmental aspects included in the PEFCR and the Nordic Swan Ecolabel for intermediate paper products
Table 21	Required company-specific data for paint
Table 22	Required company-specific data for textiles/T-shirts
Table 23	Required company-specific data for rechargeable batteries
Table 24	Establishing credibility

Definitions

- *Business to business (B2B)*: Describes transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer (European Commission, 2017).
- *Business to consumers (B2C)*: Describes transactions between business and consumers, such as between retailers and consumers. According to International Organization for Standardization 14025:2006, a consumer is defined as an individual member of the public who purchases or uses goods, property or services for private purposes (EC, 2017).
- *Comparative assertion*: An environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function (ISO, 2006c).
- *CPA/NACE code*: Statistical Classification of Products by Activity/ Nomenclature Générale des Activités Economiques dans les Communautés Européennes (EC 2013, page 17).
- *Data quality*: Characteristics of data that relate to its ability to satisfy stated requirements (ISO, 2006c).
- *(Environmental) impact category indicator*: A quantifiable representation of an impact category (ISO, 2006c).
- *Environmental label/environmental declaration*: A claim which indicates the environmental aspects of a product or service. Note: an environmental label or declaration may take the form of a statement, symbol or graphic on a product or package label, in product literature, in technical bulletins, in advertising or in publicity materials, amongst other things (ISO, 2000).
- *Environmental aspect*: An element of an organisation's activities, products or services which can interact with the environment (ISO, 2000).
- *Elementary flow*: Material or energy entering the system being studied that has been drawn from the environment without previous human transformation, or material or energy leaving the system being studied that is released into the environment without subsequent human transformation (ISO, 2006c).
- *Environmental impact*: A change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services (ISO, 2000).
- *Final product*: Something that is bought and used as it is, without requesting any further significant processing (e.g. drinks, paints, apparel, etc.) (EC, 2017, page 28).

- *Functional unit*: The quantified performance of a product system for use as a reference unit (ISO, 2006c).
- *Impact category*: A class representing environmental issues of concern to which a life cycle inventory analysis may be assigned (ISO, 2006c).
- *Impact category indicator*: A quantifiable representation of an impact category (ISO, 2006c).
- *Intermediate product*: A product that requires further processing before it is saleable to the final consumer (EC, 2017).
- *Life cycle*: Consecutive and interlinked stages of a product system from raw material acquisition or generation of natural resources to the final disposal, where product includes any goods or service (ISO, 2000).
- *Life cycle assessment*: The compilation and evaluation of the inputs, outputs and potential environmental impacts of a product system throughout its life cycle (ISO, 2006c).
- *Life cycle consideration*: The consideration of the entire life cycle of a product or service to identify relevant characteristics and significance of environmental claims. It does not necessarily mean a life cycle assessment (ISO, 2000).
- *Life cycle inventory analysis*: A phase of a life cycle assessment involving the compilation and quantification of inputs and outputs for a product group throughout its life cycle (ISO, 2006b).
- *Life cycle impact assessment*: The phase of a life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product (ISO, 2006b).
- *Life cycle perspective*: A term used in *MEKA Vejledning for Nordisk Miljømærkning*. Refer to *life cycle consideration*.
- *Materials, energy, chemicals and other (MECO)*: The life cycle assessment approach used by the Nordic Swan.
- *Process*: A set of interrelated or interacting activities that transform inputs to outputs (ISO, 2006b).
- *Product*: Any good or service (ISO, 2006c).
- *Product category*: A group of products which have equivalent functions (ISO, 2018).
- *Product environmental criteria*: Environmental requirements that the product must meet in order to be awarded an environmental label Type I (ISO, 2018).
- *Product environmental footprint category rules (PEFCRs)*: Product category-specific, life-cycle-based rules that complement the general methodological guidance for PEF studies by providing further specifications at the level of a specific product category. PEFCRs help to shift the focus of a PEF study towards those aspects and parameters which matter the most, and hence contribute to increased relevance, reproducibility and consistency of the results by reducing

- costs versus a study based on the comprehensive requirements of the PEF guide (EC, 2017).
- *Product environmental footprint (PEF) profile*: The quantified results of a PEF study. This includes the quantification of the impacts for the various impact categories and the additional environmental information considered necessary to be reported (EC, 2017, page 19).
- *Environmental footprint study/EF study*: Term used to identify the totality of actions needed to calculate the EF results. It includes modelling, data collection, and the analysis of the results (EC, 2017, page 17).
- *Product flow*: Products entering from or leaving to another product system (ISO, 2006b).
- *Product system*: The collection of unit processes with elementary and product flows, performing one or more defined functions, and which models the life cycle of a product (ISO, 2006c).
- *Reference flow*: A measure of the outputs from processes in a given product system required to fulfil the function expressed by the functional unit (ISO, 2006c).
- *Relevance, potential and steerability (RPS)*: A tool used by Nordic Swan.
- *Representative product (model)*: A “representative product” may or may not be a real product that one can buy on the EU market. Especially when the market is made up of different technologies, the “representative product” can be a virtual (non-existing) product derived from the average EU sales-weighted characteristics of all technologies around. A PEFCR may include more than one representative product if appropriate (EC, 2017).
- *Scope*: Defines the product system (among other things) to be studied in an LCA study, including its functions, functional unit, system boundary, as well as aspects related to data, methodology, limitations, etc. (ISO, 2006c).
- *System boundary*: A set of criteria specifying which unit processes are part of a product system (ISO, 2006c).

List of abbreviations

B2B	Business to business
B2C	Business to consumer
BAT	Best available technology
CPA	(Statistical) Classification of Products by Activity
DQR	Data quality rating
EC	European Commission
ECHA	European Chemicals Agency
EPD	Environmental Product Declaration
ILCD	International reference life cycle data system
ISO	International Organization for Standardization
JRC	Joint Research Centre
LCA	Life Cycle Assessment
MECO	Materials, energy, chemicals, other
OEF	Organisation Environmental Footprint
OEFSR	Organisation Environmental Footprint Sector Rules
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
REACH	Registration, Evaluation and Authorisation of Chemicals
RPS	Relevance, Potential, Steerability
Swan	Nordic Swan Ecolabel

Foreword

In support of a single market for green products on the European market the European Commission launched the Product Environmental Footprint (PEF) initiative. The objective of the initiative was to develop and test a common measure for depicting the environmental performance of products with a view to improving the comparability of product environmental information, among other objectives. The PEF methodology was tested by industry during a pilot phase and by the end of the pilot project in 2018, Product Environmental Footprint category rules (PEFCRs) were finalised for a total of 17 product groups. Alongside the PEF pilot, the Organisational Environmental Footprint methodology was pilot tested for 2 sectors.

The Nordic Council of Ministers (NCM) decided to fund the “Nordic Swan, Circular Economy and Product Environmental Footprint” project in 2016 as one of the projects during Finland’s presidency of the council. The eventual role of PEF as an additional product policy tool in the European market could bring about changes in the use of existing tools, including ecolabels. This Nordic project has been following the developments of the PEF project from the Nordic perspective throughout the years. Its task has been to assess the synergies and differences in the collection, processing and use of environmental information in the PEF and the Nordic Swan Ecolabel. The objective has been to identify synergies that could strengthen the use of both methodologies. The project has compared the environmental and other sustainability aspects that are considered by the PEF and the Swan initiatives and identified whether their use would eventually lead to any conflicting results. Within the scope of the project, the Finnish Environment Institute (SYKE) has also looked into the implications of PEF eventually operating alongside Swan and other product policy measures in the Nordic market.

This TemaNord report is a result of a process that has involved a number of experts from the ecolabelling and the LCA communities. It is based on a working paper on the same topic that was published in the Nordic Working Paper series in June 2017 which aimed to encourage discussion based on the draft documents available at that time. We are grateful for the expert input from Karin Bergbom and Elisabeth Magnus (Nordic Ecolabel), the reviewers of the working paper, *i.e.* Thomas Rydberg (IVL, Sweden) and Catharina Hohenthal (VTT, Finland), as well as those who voluntarily provided in-depth comments (Kim Christiansen and Preben Kristensen). We would like to also thank the participants who provided input during a workshop SYKE organised in May 2017. Søren Mørch Andersen, Bjørn-Erik Lønn and Birgitta Stefánsdóttir made important comments to the very last draft of the report. We are also grateful for the members of the three Nordic reference groups for their positive attitude and constructive comments throughout the whole project period, from the very planning phase to the executing and finalising of the project. These groups are: 1) the HKP-group (the Nordic

Working Group for Sustainable Consumption and Production) and its successor NCE (Nordic Circular Economy Group); 2) the NEF-group (Nordic Environmental Footprint Group); and 3) the Nordic expert group for eco-labelling, under HKP.

We hope that the results presented in this report regarding the different methodological approaches to producing environmental information contribute to the future development of the product policy field. Type 1 eco-labels and the possible forthcoming PEF scheme could have fruitful cooperation regarding the environmental information basis of products. Cooperation is essential for finding synergies regarding communication of environmental information and in order to maintain the trust of consumers in product environmental information. This report offers concrete examples of similarities and differences and synergies, which we hope can spark further discussion and cooperation.

Helsinki, September 2019

The authors

Summary

In 2013 the European Commission published the “Commission Recommendation, 2013/179/EU on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations”. The recommendation provides a common and consistent set of rules for using life cycle analysis in calculating environmental performance of products. Currently, the Nordic Swan Ecolabel is one well-established way of communicating environmental preferability of products to consumers in the Nordic Countries.

The Nordic Council of Ministers (NCM) decided to fund a project “Nordic Swan, Circular Economy and Product Environmental Footprint” in 2016 as one of the projects of Finland’s Presidency. Its task has been to assess the synergies and differences in the collection, processing and use of environmental information in the PEF and the Nordic Swan Ecolabel. The objective has been to try identifying synergies that could strengthen the use of both methodologies. This report is a result of a process that has involved experts in ecolabelling and LCA. It is based on a Working Paper on the same topic that was published in the Nordic Working Paper series in June 2017 which aimed to encourage discussion based on the draft documents available at that time.

The purpose of this report is to compare the Nordic Swan Ecolabel and the Product Environmental Footprint with a focus on environmental information. The report describes the Nordic Swan Ecolabel’s and the PEF’s approach to setting product group specific requirements. The report compares the methods used by the Nordic Swan Ecolabel and the PEF to identify the product-group-specific relevant environmental aspects and analyses the implications of the differences. The analysis is based on the currently valid Swan Criteria and pilot phase final PEF Category Rules (PEFCRs) for the following methodological aspects: the Product category definitions; Functional units; Significant environmental aspects and life cycle stages; as well as data quality and verification requirements. The following product groups are used as case studies to illustrate the differences: rechargeable batteries, T-shirts/textiles, paints and intermediate paper products.

The report concludes that there are methodological differences in the way the product groups are defined and product comparisons are made. The definition of product categories differs between the two schemes, making it difficult to compare product groups across the two schemes or to use one as an input to the other. PEF defines product categories on the products that are capable of fulfilling the same function whereas the category definition in Swan may be broader. PEF is always carried out on the basis of a functional unit. In Swan it is possible that a functional unit is used if a MECO assessment is performed.

The Nordic Swan Ecolabel criteria requirements and their explanations in the background documents were compared with the “most relevant environmental impacts, life cycle stages and processes” identified in the PEF Category rules for the same product groups. The four product-group specific case studies showed that in these product groups there was only a limited overlap in the significant environmental aspects or life cycle stages as a result of 1) differing focus of the analysis (included environmental aspects/categories); 2) a differing level of quantification used in the analysis; 3) the steerability approach of the Swan and 4) potentially the exclusion of the toxicity categories by PEF.

The product-group-specific comparison also showed that there is only a limited overlap in terms of the type of data that is required by the schemes, meaning that companies cannot easily use data used for one scheme for the other. If PEF becomes integrated in policy instruments, it will be relevant to understand to which extent the differing data requirements would significantly increase the workload of companies and in what ways the EC and the Nordic Ecolabel could reduce that workload.

The product-group specific criteria can be used to identify important issues that should be included as “additional environmental information” in PEFCRs.

The opportunities for the Swan relate to the use of PEF information (in particular PEFCRs) for the “Relevance” and “Potential” of the RPS assessment, keeping in mind that the two systems can lead to different most significant environmental impacts, especially when the product group definition, scope and functional unit differ. Additionally the PEF may point to processes that are not currently considered “steerable” by the Swan’s assessment.

This report suggests three alternatives for the Nordic Swan which may be seen as a possible progression over time. The Nordic Swan could: 1) use PEF information, such as PEFCRs, in identifying life cycle “hotspots” for criteria setting, 2) actively participate in producing PEF information, for example by developing PEF studies or participating in processes to develop new PEFCRs, and use this information in criteria setting, and 3) integrating PEF into the ecolabel criteria set and requiring PEF information from companies to show fulfilling of the criteria. In addition to the broader perspective the report proposes recommendations for both schemes in terms of co-operation and required further work, related to the differences in methodological approaches, to avoid very different results in what will be considered as an environmentally sound product.

1. Introduction

This chapter introduces the report background, purpose and objectives. It describes the materials and methods used for producing this report. In addition, it covers the list of product groups for which Nordic Swan Ecolabel criteria and PEFCRs exist and identifies which ones have been used for this comparative study.

1.1 Background

Generally, improved product policy instruments and environmental knowledge about products and services are needed to reduce greenhouse gas emissions and other environmental impacts of consumption¹. Two types of consumer-oriented environmental data have evolved over years, namely criteria for environmentally sound products, developed mainly in Type 1 ecolabel systems, and life cycle assessment (LCA) and related environmental product declarations.

The Swan, introduced already in 1989, is a Type 1 Ecolabel (ISO 14024:2018) and an information tool and brand on the Nordic market. Its objective is to encourage the demand for and supply of products that cause less stress to the environment. It aims to “be recognised as the most effective voluntary consumer policy tool for the environment” and “for businesses the most attractive and credible way to use the environment as a competitive tool” (Nordic Swan Vision, 2015).² The Swan has its own methodology for defining what can be considered a “best performing” product within a product group. It sets criteria and provides clear-cut information to consumers and purchasers to aid green purchase decisions. It is very well known among Nordic consumers: Approximately 91% of them are familiar with the label and a quarter always/often looks for products that have a Swan ecolabel.³ For example, in Denmark 95% of consumers know the Swan and 63% look for it when buying goods.⁴

In 2013, the EC published a Product Environmental Footprint Guide (PEF Guide) and launched the PEF pilot phase to test a harmonised European set of methodological requirements for quantifying the environmental footprint over the life cycle of a product.⁵ The project has developed and tested a set of pilot phase product environmental footprint category rules (PEFCRs) and guidance (PEFCR guidance). At the end of the pilot project, PEFCRs have been produced for 17 products groups. In addition, guidance on organisational environmental footprint category rules have been

¹ NCM 2012, EC 2013b, Nissinen et al. 2015.

² NCM, 2015.

³ YouGov, 2015.

⁴ Nordic Ecolabelling, 2019f.

⁵ European Commission, 2016a, p. 14.

published online and organisational environmental footprint category rules (OEFSRs) have been developed for 2 organisational sectors. The PEFCR Guidance version 6.3. was published at the end of the pilot project.

The pilot projects tested the process for developing product- and sector-specific rules. In addition, they tested different approaches to verification and communication.⁶ At the time of writing this report, the PEF pilot phase has ended. During the transition phase (2019–2021) the European Commission is continuing the methodological development and is analysing the pilot project results with the aim of proposing policy measures on the future use of PEF to the new Commission. Therefore, at the time of writing this report, there is no decision about the potential future use of PEF in communication to consumers. It may be possible that a dedicated PEF label will be introduced in the future, but other ways of communicating the results or integrating PEF into existing policy tools are also still under consideration.

There could be important implications on the use and market position of the Nordic Ecolabel. For this reason, it was viewed as important in this project to identify synergies and opportunities as well as challenges regarding the two methodological approaches – the PEF and the Swan.

1.2 Objectives

This report was prepared under the project “Nordic Swan, Circular Economy and Product Environmental Footprint” (2016–2019), funded by the Nordic Council of Ministers. This report addresses the one of the project’s objectives, i.e. to identify the implications of the Product Environmental Footprint (PEF) initiative on the Nordic Swan Ecolabel and outline possible synergies between the two systems. The report builds on a Nordic working paper titled “Nordic Swan Ecolabel and Product Environmental Footprint” that was published in June 2017 (NA2017:910) based on the draft PEF documents available at that time. The analysis in this report has been carried out based on the finalised documents available at the end of the pilot phase.

This report is a comparative study of environmental information offered by the PEF and the Nordic Swan Ecolabel schemes. It addresses the following questions:

- What are the similarities and differences in the use of the environmental information and what are the implications for PEF and Swan?
- What are the synergies and the opportunities for cooperation regarding environmental information produced by the two systems?

⁶ EC 2019a, website on EF pilots.

The report describes the goals, methodological approaches, as well as outputs, and communication in relation to PEF and Swan (Chapter 2). It gives a comparison of environmental information through product group specific examples (Chapter 3). The product groups were chosen because for those product groups a PEFCR and Swan criteria document exist, making a comparison possible. The discussion aims to provide a basis for understanding the potential implications of the PEF on the Swan, and on the other hand, how the two may complement each other in the Nordic market (Chapter 4). Other analyses produced in this project address 1) comparison between the organisation environmental footprint and Swan (Salo, H. *et al.*, 2019), 2) the Nordic Swan and the circular economy (Suikkanen and Nissinen, 2017) 3) the use of eco-design tools in the textile and IT sector in Nordic countries (Salo, H. *et al.*, 2019), and 4) the product environmental information used in product policy instruments (Nissinen, A. *et al.* 2019).

It should be emphasized, that this report is a picture of the status at the time of writing this report (May 2019), and that the documents, and thereby conclusions of this comparison, will change in the upcoming years. The Nordic Swan Ecolabel criteria and background documents periodically undergo revision and the PEFCR guidance and method will undergo revision and development during the transition phase, which has just started.⁷

1.3 Methods and materials

This section explains the method for developing this report, the framework used for the analysis and the materials (documents) used for the review. Figure 1 below summarises the process (2016–2019) which included a document review, the preparation of a draft working paper, an expert workshop and further document review.

Figure 1: Report development

The report is mainly based on a document review. In addition to the inputs obtained during the workshop discussions, the original working paper (NA2017:910) was complemented and updated with additional comments received from experts. The comments were addressed in this version of the report, provided that the suggested inputs were in line with the scope of the analysis. Table 1 provides a basis for comparing

⁷ EC, 2017, p. 1.

the PEF and the Swan schemes, indicating also the key documents from both schemes used for the document review.

Table 1: Basis for comparing Swan and PEF

	The Nordic Swan Ecolabel	The PEF
Sets the goals, principles and processes	Goals and Principles for the Nordic Ecolabel, Environmental Philosophy, ISO14024:2018	Commission Recommendation 2013/179/EU
Describes the methodological approach to the development of product group specific requirements	RPS Guide and MECO Guide, ISO 14024:2018	PEF Guide (Annex II of 2013/179/EU) PEFCR Guidance
Provides the product group specific requirements	Criteria Document	PEFCR
Product-group specific result	Application for an ecolabel	Verified PEF report
Use of product-group specific result	Swan Ecolabel	In-house uses and external comparative assertions ⁸

The comparison of the core methodological aspects is based on examples from the Nordic Swan criteria (including the background documents) and the PEFCRs. The product categories for the case studies were selected because they are product groups which are covered by the Nordic Swan Ecolabel Scheme, and in addition, are amongst the product groups for which there are final PEFCRs (based on the list of 17 Final PEFCRs⁹) (see Table 2 below). It should be highlighted, that none of the PEFCR product groups fully overlap with the product categories in the Swan scheme.

⁸ External comparative assertions are only possible when the PEF study is done in accordance with a PEFCR.

⁹ EC, 2019e.

Table 2: Swan Ecolabel criteria documents and PEF category rules with similar product groups

The Nordic Swan Ecolabel	The PEF
Rechargeable batteries and portable chargers ¹	High specific energy rechargeable batteries for mobile applications ²
Sub categories under "Paper Products": ³ <ul style="list-style-type: none"> – Basic paper module – Paper chemicals module – Copy and printing paper – Tissue paper – Grease-proof paper – Printing companies, printed matter, envelopes and other converted paper products – Disposables for food (under this come, e.g., coffee and tea filters and take-away packaging, such as coffee cups, pizza boxes, containers and paper for the packaging of food; and disposable tableware)⁴ 	Intermediate Paper Products ⁵
Textiles, hides/skin and leather ⁶	T-shirts ⁷ Leather ⁸
Computers ⁹	IT equipment (storage) ¹⁰
Indoor paints and varnishes ¹¹ Chemical building products (outdoor paint and varnishes) ¹²	Decorative paints ¹³
Laundry detergents and stain removers ¹⁴ Laundry detergents for professional use ¹⁵	Household heavy duty liquid laundry detergents (HDLLD) for machine wash ¹⁶

Source: ¹ Nordic Ecolabelling, 2018a, and Nordic Ecolabelling, 2018b.

² EC, 2018a.

³ Nordic Ecolabelling, 2011, 2017c, 2017d, 2017e, 2017f, 2017g, 2017h, 2017i, 2018j, 2018r-2018u.

⁴ Nordic Ecolabelling, 2018v.

⁵ EC, 2018e.

⁶ Nordic Ecolabelling, 2018k and Nordic Ecolabelling, 2018m.

⁷ EC, 2019d.

⁸ EC, 2018c.

⁹ Nordic Ecolabelling, 2015b and Nordic Ecolabelling, 2015c.

¹⁰ EC, 2018b.

¹¹ Nordic Ecolabelling, 2018h and Nordic Ecolabelling, 2018j.

¹² Nordic Ecolabelling, 2018p and Nordic Ecolabelling, 2018q.

¹³ EC, 2018d.

¹⁴ Nordic Ecolabelling, 2018e and Nordic Ecolabelling, 2018f.

¹⁵ Nordic Ecolabelling, 2018e and Nordic Ecolabelling, 2019c.

¹⁶ EC, 2019c.

2. Basic Information on the Swan and PEF schemes

In this chapter, the Nordic Swan Ecolabelling Scheme and the Product Environmental Footprint (PEF) scheme are described. The description includes the policy background, goals and objectives of the schemes, the process and the methodology for setting criteria or defining PEFCR rules, participating in each scheme from a company's perspective as well as the communication of the results.

2.1 The Nordic Swan Ecolabelling scheme

2.1.1 Introduction

The Swan is a Type 1 environmental labelling programme according to ISO 14024:2018. It is a voluntary, multiple-criteria-based programme. It awards a license to an organisation, authorising the use of an environmental label on a product, indicating overall environmental preferability within a particular product category based on life cycle considerations. According to ISO 14024:2018, the objectives of Type 1 labels are: to identify products that are determined to be environmentally preferable within a particular product category, and to encourage the demand for and supply of those products that cause less stress on the environment, thereby contributing to a reduction in the environmental impacts associated with products. Type 1 labels consider the whole life cycle (including the extraction of resources, manufacturing, distribution, use and disposal) to limit the risk that environmental impacts are transferred among life cycle stages.¹⁰

The Swan is a tool that aims to steer the market towards greener products and is well-known among Nordic consumers. Approximately 91% of them are familiar with the label and a quarter always/often looks for products that have a Swan ecolabel.¹¹ For example, in Denmark 95% of consumers know the Swan and 63% look for it when buying goods.¹² Consumer choices, including purchaser choices, for ecolabelled products are expected to create market pressure on producers, leading to the development of products and services with better environmental performance.¹³ Nordic Swan Ecolabelling is a member of the Global Ecolabeling Network (GEN) for ecolabels.

¹⁰ ISO 14024:2018.

¹¹ YouGov, 2015.

¹² Nordic Ecolabelling, 2019f.

¹³ Nordic Ecolabelling, 2017c.

2.1.2 Policy background and guiding documents

The Nordic Council of Ministers made the decision to establish an official Nordic Ecolabel on 6 November 1989.¹⁴ Today, it continues to be an important instrument for achieving the Nordic countries' goals for sustainable consumption and production, as determined in the Nordic Environmental Action Plan and the Nordic Strategy for Sustainable Development.¹⁵ The goals and principles for the Nordic Swan Ecolabel, adopted by the Nordic Council of Ministers for the Environment on 22 October 2014, direct the ecolabel's work.

The Nordic Ecolabelling Scheme is endorsed and partly funded by all the Nordic governments and is administered through a Nordic Swan Ecolabelling organisation and national ecolabelling organisations of each of the five Nordic countries. A common Nordic board adapts the overall environmental strategy and regulations. It also approves the selection of new product groups and establishes the criteria for the specific product groups.¹⁶

Figure 2: Organisation chart for the Nordic Swan Ecolabel

Source: Nordic Swan Ecolabel.

¹⁴ NCM, 2014b.

¹⁵ NCM, 2012; NCM, 2014b.

¹⁶ NCM, 2014a; NCM, 2014b.

The main documents guiding the Nordic Ecolabel are:

- Environmental Philosophy (2000): This document defines the general principles and process for selecting the product groups, defining criteria, including life-cycle-perspective-based assessment and the relevance, potential and steerability (RPS);¹⁷
- RPS-Guidance (2013): This is an updated description of the RPS as a tool to assess and prioritise environmental aspects to achieve maximum environmental benefit;¹⁸
- MECO-Guidance (2013): This document describes a three-step process for assessing environmental aspects in the life cycle of a product;¹⁹
- Goals and Principles for the Nordic Swan Ecolabel (2014): This document provides the overarching guidelines for the Nordic ecolabelling organization including strategic objectives and thematic priorities in terms of environmental impacts;²⁰
- Rules for Nordic Ecolabelling Board (2014): This document describes the roles and responsibilities of the Nordic Ecolabelling Board;²¹
- Fee Regulation (2016): This document specifies the fees for applications and licenses.²²

2.1.3 *Goals and objectives*

The Nordic Ecolabel aims to reduce the environmental impact of consumption by means of voluntary ecolabelling (§1). Its objectives (§2) are to help consumers, companies and other organisations to purchase in an environmentally conscious manner and to encourage the development of products and services that have less of an impact on the environment than similar products on the market. It targets the reduction of all types of environmental impacts resulting from the choice of raw materials, use of hazardous chemicals, use of energy and resources, emissions to all kinds of recipients, health aspects, noise and waste treatment.²³

The Swan is a tool which aims to create a demand for greener products on the Nordic market by defining the criteria for such products and offering a straightforward communication mechanism to indicate better environmental performance to consumers. It sets product environmental criteria selectively to differentiate environmentally preferable products from other products in the category.²⁴ The requirements for a product's environmental performance are periodically strengthened, creating a push for enhancing product features towards better environmental performance. To identify the

¹⁷ Nordic Ecolabelling, 2000.

¹⁸ Nordic Ecolabelling, 2013a.

¹⁹ Nordic Ecolabelling, 2013b.

²⁰ NCM, 2014b.

²¹ NCM, 2014a.

²² Nordic Ecolabelling, 2016a.

²³ NCM, 2014b.

²⁴ ISO 14024:2018.

most environmentally sound products on the Nordic Market, the criteria are defined at a level where, at the time of adoption, only a maximum of one third of products available on the Nordic Market meet the criteria.²⁵

For consumers and purchasers (in public organisations and companies) the ecolabel provides guidance for choosing more sustainable products. The ecolabel acts as a proof of better environmental performance to consumers, who therefore do not need to obtain detailed or complex information on products' and services' performance.²⁶ It is expected that consumers, through their choices, also create market pressure that pushes producers and service providers to develop products that are more sustainable.²⁷

2.2 Nordic Swan Ecolabel product environmental criteria

2.2.1 Criteria documents

Criteria documents describe the specific requirements for each product group.²⁸ Product environmental criteria are environmental requirements that the product must fulfil in order to be awarded an environmental label, according to ISO 14024:2018. Their role is to differentiate environmentally preferable products from others in a product category. All products that meet the criteria are eligible to use the label.²⁹ Currently, the Nordic Ecolabel has published criteria documents for over 60 product groups (including services). The Nordic Ecolabel Criteria Document sets out the requirements that a license applicant needs to achieve in order to be granted a license to use an ecolabel. Each criteria document includes the following sections:

- *Product group definition* and potential exclusions, i.e. products that cannot receive an ecolabel under any circumstances;
- *Environmental, quality and regulatory requirements*. The following are indicative examples from one product group of how requirements may be formulated:³⁰
 - Computers and displays must be designed in such a way that disassembly is possible (Computers, requirement 06);
 - Plastic parts heavier than 25 g must not be painted or metallised (Computers, requirement 09);
 - When cardboard boxes are used, they must be made of at least 50% post-consumer recycled material (Computers, requirement 017).

²⁵ NCM, 2014b.

²⁶ Nordic Ecolabelling & Husbanken, 2016, p. 9.

²⁷ Nordic Ecolabelling, 2000.

²⁸ NCM, 2014b, §6.1.

²⁹ ISO 14024:2018

³⁰ Nordic Ecolabelling, 2015b

- *A description of verification procedures* as well as appendices with forms that the applicant must fill in;
- *New future criteria*: this section provides ideas about new criteria forthcoming at the next criteria revision stage.

The criteria documents are developed on the basis of background documents, which contain background facts, details and explanations of the criteria for each product group. The criteria and background documents are publicly available.

2.2.2 Process for setting product environmental criteria

The Nordic Ecolabel sets the criteria according to the processes and principles defined in ISO 14024:2018 and the general principles of the "Goals and Principles for the Nordic Ecolabel" (22 October 2014).³¹ The product groups are chosen on the basis of:

- potential environmental benefits
- consumers' and purchasers' need for guidance with regard to environmentally sound products.

Potential license-holders, different stakeholders and internal working processes suggest new product groups. Criteria are developed in a process headed by the Nordic Swan Ecolabel, taking into consideration the general principles.

Figure 3 summarises the Nordic Ecolabel criteria development process.

Figure 3: Project flow for criteria development for the Nordic Swan Ecolabel

Source: Nordic Swan Ecolabel.

³¹ NCM, 2014b.

The multi-stakeholder process includes expert group input (e.g. concerning energy, nanotechnology etc.) and assessment, a broad public consultation and approval of the criteria by the Nordic Ecolabelling Board.

The criteria are developed by experts from Nordic ecolabelling organisations. Studies (feasibility studies, light RPS studies and pre-studies) support the definition of the criteria. Stakeholders, including industry and NGOs, are consulted during the process. When a draft is finalised there is an open consultation process, and all incoming comments are considered and the response to the comments are made publicly available.³² The Nordic Ecolabelling Board approves the proposed criteria and carries out judgement on potential grey zones.³³ A similar process is applied to revisions of criteria, which take place approximately every 4–5 years.³⁴ Where justified and approved by the Nordic Ecolabelling Board, the criteria may be changed during the validity period.³⁵

2.2.3 *Methodological approach for assessing product environmental performance*

Criteria are set through a process referred to as “RPS”. This is an analytical tool used to prioritize environmental challenges and to clarify where the ecolabel can make a difference.³⁶ Below is an explanation of RPS:

- *Relevance* (R) identifies the extent of the environmental problem for the product group;
- *Potential* (P) determines what can be done about the problem;
- *Steerability* (S) identifies how well the Nordic Swan Ecolabel can influence the problem.³⁷

In order for the Swan to adopt a requirement, all three of these factors must be positive, *i.e.*, the environmental challenge must be relevant for the product group, there must be some potential to influence the problem and the Nordic Ecolabel must be seen to have an influence on the challenge. The RPS assessment hence necessitates a prioritization of environmental parameters so that the focus of the criteria requirements is on those that result in the maximum environmental benefit (within the environmental aspects that can be affected by a Type 1 label, *i.e.* steerability).

The Swan has adopted a method called “MECO”, which stands for *Materials, Energy, Chemicals and Other*, to assess the most significant environmental impacts in the life cycle of a particular product, *i.e.* to assess the relevance (the R in RPS). It is worth

³² Nordic Ecolabelling, 2000, p.20.

³³ K. Bergbom, personal communication, 12 December 2016.

³⁴ Nordic Ecolabelling & Husbanken, 2016, p.9.

³⁵ E. Magnus, personal communication, 31 January 2017.

³⁶ NCM, 2014b.

³⁷ Nordic Ecolabelling, 2015a.

noting that the MECO provides one of various tools to assess relevant environmental aspects, but it is not a compulsory method to follow.

If a MECO assessment is carried out, it is performed by the Swan project leader in charge of the criteria development process, and potentially supported by the Swan's LCA Task Force. The MECO assessment is a mix of qualitative and quantitative assessment, and relies on readily available LCA studies, and other sources such as reports on the best available techniques (BATs), environmental product declarations (EPDs), research reports etc.³⁸

The MECO analysis consists of a three-step process for determining the most relevant environmental impacts from a life cycle perspective:

1. The purpose of the MECO analysis is defined, including whether qualitative or quantitative or both approaches will be used. The step also includes definition of the *functional units* and the *reference flow* required to meet the functional unit, as well as a description of the system boundaries;
2. Data is collected on all the significant environmental aspects in the product's life cycle, based on readily available life cycle information and other qualitative inputs;
3. The data is formulated row by row in the MECO chart which is shown in Table 3.

Table 3: MECO chart

	Raw materials	Production	Use	End of Life	Transport
Materials					
Energy					
Chemicals and Emissions					
Other					

The analysis categorizes environmental impacts by at least four main underlying causes:

- *Material*: The materials needed to produce, use and maintain the product (in kg);
- *Energy*: The energy used during the product's life cycle, including the use of energy during the supply of materials, indicated as energy uses (kWh or MJ) and energy sources (renewable/non-renewable). This includes own production and purchased energy;

³⁸ Nordic Ecolabelling, 2013b, p.3, 8.

- **Chemicals:** Chemicals added to the products or used in the production processes or use stage according to their environmental hazard level on the basis of European chemical regulations³⁹ or other lists for chemicals of concern.⁴⁰ This includes emissions from all life cycle phases;
- **Other:** Environmental impacts that do not fit into the other categories are described in this category. Examples include biodiversity, land use, quality, ethical issues or special conditions regarding noise or odours that are not included in the other sections.

The chart gives an overview and there may be sub-charts for individual environmental aspects. The calculations in the MECO chart are based on the reference flows corresponding to the selected functional unit.⁴¹ Table 4 shows the likely quantification of different aspects during the MECO process.

Table 4: Data detail in the MECO analysis according to the MECO Guide*

Environmental parameter	Required level of detail
Materials (resources)	Where the product has a high resource consumption, the data for the most important materials must be quantified. Also qualitative aspects are considered.
Energy	It is often relevant to quantify energy.
Chemicals	A qualitative assessment is often relevant for chemicals. It is relevant to quantify emissions of greenhouse gases.
Other	Often a qualitative description.

Source: * Nordic Ecolabelling, 2013b, p. 10.

Readily available LCAs and other studies provide guidance for determining the most relevant life cycle stages and environmental impact categories. The information helps ensure that the criteria address environmental impacts that are relevant to the product group. The information is used by the Nordic Ecolabelling organisation to identify the best ways to influence the processes with the highest potential for environmental gains.⁴² It also helps to ensure that criteria do not induce burden shifts between different environmental aspects.⁴³ A more detailed LCA may follow the MECO analysis.⁴⁴

Qualitative expert judgments complement the quantitative data in particular for social and ethical issues, not currently assessed by a traditional LCA.⁴⁵ An interpretation

³⁹ EC Regulation No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), and Regulation (EC) No 1272/2008 on the classification, labelling and packaging of substances and mixtures (CLP Regulation).

⁴⁰ For example: Listen Over Uønskede Stoffer (LOUS) (Denmark), Kemikalieinspektionen (KEMI) laget en guide (PRIO) for risikohåndtering av utpekte farlige stoffer (Sweden), Prioritetslisten (Norway) Other lists from different standards, NGO's, SinList (Substitute it Now!), as well as publications of new emerging chemicals etc.

⁴¹ Nordic Ecolabelling, 2013b, p. 4–14.

⁴² Nordic Ecolabelling, 2000, p.17; Nordic Ecolabelling, 2013b.

⁴³ Nordic Ecolabelling, 2013b, p.3.

⁴⁴ Nordic Ecolabelling, 2013b, p. 5.

⁴⁵ Nordic Ecolabelling, 2000, p.20.

of the data in the MECO chart indicates where in the life cycle the resource burden and energy use are the largest, and therefore relevant for the product group. It also pinpoints chemicals of concern that are relevant to address in the criteria. It is also possible to evaluate the potential for improvements, by comparing with another product.⁴⁶

The document "Goals and Principles for the Nordic Ecolabel" (§6.2) identifies the following environmental aspects: raw materials, the use of hazardous chemicals, use of energy and resources, emissions to all kinds of recipients, health aspects, noise and waste treatment associated with production, transport and final disposal, as well as lifespan, reparability, reuse and recycling.⁴⁷ In addition to these environmental aspects, other issues may be included, for instance the International Union for Conservation of Nature (IUCN) red list of threatened species or chemicals restriction lists to identify relevant issues.

In terms of resource use, the process assesses the necessity to set requirements for the use of renewable and/or recycled materials, etc.⁴⁸ In addition, despite being an environmental label, the Swan includes social aspects of sustainable development.⁴⁹

2.3 Participating in the Nordic Swan Ecolabelling scheme

2.3.1 *Applying for an ecolabel*

An applicant has to meet the requirements specified in the ecolabel criteria and may need to make changes in their production process or the product, in order to meet all requirements. An applicant is furthermore required to provide documentation proof, based on its product and value chain, to support its application. The Swan national organisation checks that the requirements are met through onsite audits.⁵⁰

The criteria are set for processes that manufacturers or the suppliers can influence and therefore it is expected that the applicants use primary data (i.e. data specific for the production by the applicant). The Swan label requires supply-chain-specific-data from the license applicants and means of verification. Only in certain defined and exceptional cases, may secondary data be used if supply chain specific data is not available. Only in exceptional cases, may secondary data be used as part of the documentation, for example, by using a calculation method commonly used in the industry.⁵¹

⁴⁶ Nordic Ecolabelling, 2013b, p. 19.

⁴⁷ NCM, 2014b, p. 3.

⁴⁸ Nordic Ecolabelling; Husbanken, 2016, p.9.

⁴⁹ Nordic Ecolabelling, 2000, p.17.

⁵⁰ Nordic Ecolabelling, 2017a.

⁵¹ E. Magnus, personal communication, 12 December 2016.

2.3.2 *Communication of environmental performance*

The published Criteria Documents and Background Documents are publicly available on the Nordic Ecolabelling website. The names of ecolabelled products and license-holders (companies) are furthermore on the Nordic Ecolabel website. The license-holders may use the Nordic Swan label on their product and in their marketing material. To verify compliance, the Swan authority carries out annual inspections and tests of Swan-labelled products on the market.⁵²

2.4 Product Environmental Footprint

2.4.1 *Introduction*

The European Commission commenced the PEF initiative as a response to the confusing range of choices of methods and initiatives available for companies wishing to market a green product and the confusing range of green claims and labels presented to consumers.⁵³ The PEF method has been developed by the European Commission aiming to develop a common measure of environmental impacts for products.

The PEF is a method for calculating the environmental impacts of a product over its life cycle. It does not by itself make any reference to the environmental preferability of a product. Based on existing approaches, it aims to improve the comparability and reproducibility of results.⁵⁴ The PEF takes into consideration environmental assessment guidelines and standards such as BP X30323, ISO14040-14044, the Greenhouse Gas Protocol (WRI/WBCSD), the ILCD Handbook, PAS2050 and the Ecological Footprint methodology. However, the PEF does not claim to follow all these standards, but have set their own requirements, based on selected parts from existing standards.⁵⁵

The following sections introduce the PEF, including its background, goals and the methods used to determine the environmental preference of products.

2.4.2 *Policy background and guiding documents*

The policy background to the PEF initiative is in the follow up of the “Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan” (Council of the European Union, 2008).⁵⁶ The action plan recommended that the EC starts “working as soon as possible on common voluntary methodologies facilitating the future establishment of carbon audits for organisations and the calculation of the carbon footprint of products”. The subsequent Council Conclusions on Sustainable Materials Management (2010), Communication on Single Market Act (2011) and the

⁵² Nordic Ecolabelling, 2019e.

⁵³ EC, 2019a.

⁵⁴ EC, 2017, p. 22.

⁵⁵ EC, 2017, p. 23–24.

⁵⁶ Council of the European Union, 2008; EC, 2019b.

Resource Efficiency Roadmap (2012) all suggested the development of a common methodology to assess the environmental impacts of products. Further detail may be found on the Website on the Single Market for Green Products.⁵⁷

The communication from the Commission to the European Parliament and the Council (COM [2013] 196 final, April 2013) launches the PEF and OEF methodologies and their piloting, as well as principles for communicating environmental performance (transparency, reliability, completeness, comparability and clarity).⁵⁸ The Commission Recommendation 2013/179/EU on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations is the main policy document. It promotes the use of PEF by member states in policies, and by the private sector in communicating life cycle environmental performance.⁵⁹ The pilot phase ended at the end of 2018 leading to a transition phase until 2021. It is expected that then policy decisions will be taken on the future use of the PEF.

The first/initial guiding document is the “PEF Guide”, published as Annex II of the Commission Recommendation 2013/179/EU (referred to in the footnotes as EC, 2013b). It provides general guidance on PEF and technical guidance on how to conduct a PEF study and prepare a PEFCR.

The “PEF Guide” is complemented with the PEFCR Guidance document, which further instructs the development of PEFCRs and is periodically updated. Where the requirements of the PEFCR are more specific than those of the PEF Guide (2013), the specific requirements in the PEFCRs must be followed. The *Environmental Footprint pilot phase PEFCR Guidance Document – Guidance for the development of Product Environmental Footprint Category Rules (PEFCRs)* was updated and finalised as version 6.3 in December 2017 (the document is marked with “Version 6.3 – May 2018”). This version has been used in the present report.

Further suggestions for changing the methodology of the PEF Guide have been published as a JRC technical report (2019). The JRC report states that it is a “working document” that “does not modify recommendation 2013/279/EU”.⁶⁰

2.4.3 Goals and objectives

The goal of the PEF is to produce information to seek to reduce the environmental impacts of goods and services.⁶¹ The PEF aims to:

- provide a harmonised method for calculating environmental footprint of products within the same category, enabling comparisons and setting principles for communicating environmental performance;⁶²

⁵⁷ EC, 2019a, EC2019b.

⁵⁸ EC, 2019b.

⁵⁹ EC, 2013b.

⁶⁰ Zampori, L. and Pant, R., 2019.

⁶¹ EC, 2013b.

⁶² EC, 2013a

- improve the availability of clear, reliable and comparable information on the environmental performance of products and organisations to all relevant stakeholders, including players throughout the entire supply chain.⁶³

It is expected that PEF studies will support internal functions, B2B and B2C communications and benchmarking applications.⁶⁴

In addition, the PEF Guide establishes the following principles for Product Environmental Footprint studies:

1. Relevance
2. Completeness
3. Consistency
4. Accuracy
5. Transparency.⁶⁵

2.5 Product Environmental Footprint Category Rules (PEFCRs)

2.5.1 PEFCRs

The PEFCR Guidance document (2017) gives instructions on how to develop product-specific category rules. A PEFCR provides guidance for calculating a product's potential life cycle impacts. These are technical documents that are used by LCA (and other related) practitioners to conduct a PEF study for that particular product group. A PEFCR helps focus the PEF study on the aspects that are most relevant for the product group in question. The required content of the PEFCR is described in the PEFCR Guidance⁶⁶ document. The current version 6.3 (Annex B – PEFCR Template) indicates that each PEFCR must include: introductory information, general information about the PEFCR (technical secretariat, consultations and stakeholders, review information etc.), as well as:

- Scope: product classification, representative product (s), functional units and reference flows, system boundaries and a full list of the 16 impact categories to be used to calculate the PEF profile;
- The most relevant impact categories, life cycle stages and processes, stated and summarised in a table;

⁶³ EC, 2013a, p7.

⁶⁴ EC, 2013b.

⁶⁵ EC, 2013a, p.13.

⁶⁶ EC, 2017.

- A life cycle inventory, including a list of mandatory company-specific data, list of company-specific processes and elementary flow requirements, as well as data gaps and data quality requirements;
- A data needs matrix, to evaluate which data is needed, depending on the level of influence the company has on the process;
- Life cycle stages, for each stage the technical requirements and assumptions must be provided, including all processes taking place in that stage including raw material acquisition and pre-processing, manufacturing, distribution, the use stage and end of life (where applicable);
- PEF results, including the benchmark results for each representative product, a PEF profile, guidance for the applicant on how to calculate the PEF profile and what information to include in the PEF report, as well as additional technical information and additional environmental information;
- Verification requirements, i.e. standard requirements specified in the most recent version of the PEFCR Guidance document;
- References.⁶⁷

The PEFCRs are developed on the basis of the representative product and the screening study carried out for that representative product.

2.5.2 *Process for setting PEFCRs*

The documents associated with the development of the PEFCRs are:

- *The PEF Guide (2013), published as an annex of Recommendation 2013/179/EU, specifies the requirements for developing PEFCRs;*⁶⁸
- *The PEFCR Guidance document (2017) provides instructions on how to develop PEFCRs.*⁶⁹ Parts of the PEFCR Guidance (2017) document overlap with the PEF Guide, however it is specified, that the PEFCR Guidance (2017) document overrules the PEF Guide (2013) for rules that have been changed during the development in the pilot phase;⁷⁰
- *PEF screening report* is based on a screening carried out for a representative product within a product group. This forms the basis for the draft PEFCRs, mentioned below. The PEF screening is necessary because it helps to focus data collection activities and data quality priorities for the PEFCR supporting study, and it is used in an iterative approach with communication and feedback from the Technical Secretariat to all the participating stakeholders. The detailed screening

⁶⁷ EC, 2017, p.164–207.

⁶⁸ EC, 2013b – Annex II.

⁶⁹ EC, 2017.

⁷⁰ EC, 2017, p. 23

report is considered confidential. The results of the screening should be subject to a sensitivity analysis and be also part of the PEFCR review process;⁷¹

- A *draft PEFCR* is developed for each product group during the pilot process. The draft PEFCRs lead to the final PEFCR mentioned below;
- A *PEFCR supporting study* is a PEF study carried out on a real existing product on the basis of a draft PEFCR. It is used to confirm the decisions taken in the draft PEFCR before the final PEFCR is released. The PEFCR supporting studies are carried out during the pilot phase, in accordance with the newest version of the PEF Guide, PEFCR Guidance document and the draft PEFCR. The PEFCR supporting studies are used to test the pertinence and the ability to implement the draft PEFCR including, but not limited to, the identified most relevant environmental impacts, issues related to data collection and quality verification requirements. The PEFCR supporting studies result in a confidential report as well as a second report describing the main outcomes of the PEFCR supporting study without disclosing confidential information;⁷²
- A *final PEFCR* specifies the life-cycle-based rules for a product group to complement the general PEF Guidance document (Recommendation 2013/179/EU). In the pilot phase 17 PEFCRs were developed. During the transition phase further PEFCRs may be developed in accordance with the PEFCR Guidance (2017).

During the PEF pilot phase (2013–2018), the below described process for developing product- and sector-specific rules was tested. The PEFCR process of identifying the most relevant impact categories and processes includes a variety of items, amongst these a PEF screening (a preliminary study carried out on the representative product), information based on a combination of information from a variety of (other) existing environmental product declaration (EPD) programs (if there are any relevant product categories) and existing LCAs for the product group, if available. The results are tested by conducting PEFCR supporting studies (PEF studies performed based on a draft PEFCR), and these lead to the identification of the most relevant impact categories. Figure 4 presents the process for preparing a PEFCR, according to PEFCR Guidance (2017) document.

⁷¹ EC, 2017, p. 35–38.

⁷² EC, 2017, p. 37–38.

Figure 4: Steps to be followed for the development of PEFCRs

Source: PEFCR Guidance vs 6.3, p.32.

Figure 4 above is from the currently valid PEFCR Guidance (2017) document. It mentions “performance classes”. According to the PEFCR (2017) the PEFCRs can include a proposal for performance classes.⁷³ However, the same guidance mentions that during the pilot phase no classes of performance will be included.⁷⁴ This indicates that at the time of writing this report there is no conclusive guidance on performance classes.

The respective Technical Secretariats (TS) for the different pilots coordinated the process, which is expected to be open and transparent. A virtual consultation, fully held online, was included and is a prerequisite for the Steering committee to approve the PEFCR. This included major competitors/their representatives covering at least 75% of the EU market and industry stakeholders covered at least 51% of the EU market (both in terms of yearly turnover of production). SMEs, and consumer and environmental associations participated in the process of piloting and testing the PEFCRs.⁷⁵ To ensure consistency with the PEFCR Guidance document (2017), a third-party review panel, consisting of at least one LCA expert, one NGO representative and one industry representative, reviewed the draft PEFCRs. The purpose was to ensure that the PEFCR is consistent with the PEFCR Guidance document (2017).

⁷³ EC, 2017, p. 221.

⁷⁴ EC, 2017, p. 144.

⁷⁵ EC, 2017, p. 31.

2.5.3 *Methodological approach for assessing Product Environmental Footprint*

The PEF is a life cycle assessment (LCA) based method to quantify the environmental impact of products, which allows for the identification of environmental “hotspots” for the product.⁷⁶ It is a “method for modelling the environmental impacts of the flows of material/energy and resulting emissions and waste streams associated with a product from a supply chain perspective (from the extraction of raw materials, through use to final waste management)”.⁷⁷ The method is established so as to ensure the comparability of results.⁷⁸

A PEF study is performed in relation to a functional unit, which describes the functions and duration of the product, and the reference flow which is the amount of product needed in order to provide the defined functions. The functional unit/reference flow and the system boundaries for the product system are defined in the PEFCR. In the absence of a PEFCR, the functional unit is defined in order to perform the study⁷⁹. A resource use and emissions profile is modelled from a compilation of all the material/energy resource inputs/outputs and emissions into the air, water and soil for the product supply chain⁸⁰.

The PEF Guide defines 16 default environmental impact categories and assessment methods that need to be used in preparing a PEF study:

- Climate change
- Ozone depletion
- Human toxicity-cancer effects
- Human toxicity-non cancer effects
- Acidification
- Particulate matter
- Freshwater ecotoxicity
- Ionising radiation (human health)
- Photochemical ozone formation (human health)
- Eutrophication (terrestrial)
- Eutrophication (freshwater)
- Eutrophication (marine)
- Land use
- Water use

⁷⁶ According to ISO 14040:2006 Life Cycle Assessment compiles and evaluates inputs, outputs and the potential environmental impacts of a product system throughout its life cycle.

⁷⁷ EC, 2013b – Annex II, p. 11.

⁷⁸ *Ibid.*, p. 14.

⁷⁹ *Ibid.*, p.19–20.

⁸⁰ *Ibid.*, p. 25.

- Resource use (minerals and metals)
- Resource use (fossil).⁸¹

An environmental footprint impact assessment associates environmental impact categories with the model in the *resource use and emissions profile*. This groups and aggregates the inventoried data into the respective contributions for each EF impact category.⁸² Environmental footprint flows are classified and then characterised (both obligatory), to determine the magnitude of the contribution of each input/output within the EF impact category⁸³ and the results are normalised and weighted.⁸⁴ At the end of the process it is possible to identify the environmental hotspots related to the product. The helpdesk at the EC's Joint Research Centre, together with partners, have produced supporting guidance on modelling, e.g., for agriculture, construction, packaging, transport and end-of-life.

At the centre of the process is the identification of most relevant impact categories, life cycle stages, processes, and elementary flows.⁸⁵ In PEF, "most relevant impact categories" refers to those that cumulatively contribute to at least 80% of the total, overall environmental impact.⁸⁶ The most relevant processes contribute to at least 80% to any of the most relevant impact categories identified.⁸⁷ In identifying the most relevant life cycle stages, and impact categories a representative "virtual" or real product is used. A virtual product is calculated on the average sales-weighted characteristics of all existing technologies/materials covered by the scope of the PEFCR or a weighted average based on mass (tons) or product units (pieces). The process requires a bill of material, a flow diagram, and assumptions regarding transport, and the use and end of life scenarios.⁸⁸

The identification of "the most relevant" impact categories, life cycle stages and processes in the PEFCR are used for identifying where high data quality is needed. This means that even though the most relevant impact categories are identified in the PEFCR, companies who calculate a PEF profile for their own product, have to include values for *all* impact categories (including toxicity)⁸⁹ – not only the significant environmental aspects:

⁸¹ EC, 2017, p. 47–49.

⁸² EC, 2013b (PEF Guide), p.21.

⁸³ EC 2013b, p.48.

⁸⁴ EC, 2017, p. 50, Zampori & Pant (2019), p. 75.

⁸⁵ EC, 2017, p. 22–23.

⁸⁶ EC, 2017, p. 50

⁸⁷ EC, 2017, p. 51.

⁸⁸ EC, 2017, p. 45–46.

⁸⁹ EC, 2017, section B.7.2.

“The applicant shall calculate the PEF profile of its product in compliance with all requirements included in this PEFCR. The following information shall be included in the PEF report:

- A full life cycle inventory;
- characterised results in absolute values, for all impact categories (including toxicity; as a table);
- normalised and weighted results in absolute values, for all impact categories (including toxicity; as a table);
- an aggregated single score as an absolute value.”

In a PEFCR, the identification of the most relevant impact categories must be based on the normalised and weighted results of the representative product(s). Furthermore, for PEFCRs covering final products, the benchmark must be provided in the PEFCR both as characterised, normalised and weighted results for each of the EF impact categories and as a single score based on the weighting factors provided.

The three toxicity-related categories are temporarily excluded from the identification of the most relevant impact categories, life cycle stages, processes and elementary flows. The EC and ECHA are currently jointly working on developing new characterisation factors based on REACH data and therefore the inclusion of the toxicity categories will be reconsidered once the work is completed, after the transition phase.⁹⁰ If a PEF study is carried out in compliance with a PEFCR, the results related to the three toxicity impact categories cannot be used for communication.⁹¹ They are only included in the inventory analysis and their characterised results are reported.

It is compulsory that the model addresses all the impact categories. It is possible to include “Additional Environmental Information” in a PEFCR.⁹² This includes information related to, for example, renewable energy, fuels, secondary materials, product responsibility indicators, IUCN red species list, toxicity etc. depending on the product group.⁹³

In a PEF study for B2C purposes, a minimum of three of the most relevant impact categories must be identified. For PEFs targeting B2B communication, the number is decided during the process. For intermediate products all environmental impact categories are considered.⁹⁴

In the pilot phase, the PEFCRs did not include information on classes of performance.⁹⁵ This may change in the future, however. The “Suggestions for updating the Product Environmental Footprint (PEF) method” (Zampori and Pant [2019]) provides an example of a way to develop classes of performance for 5 categories (A–E) using the representative product and theoretical best product and theoretical worst product. The classes are identified for a single overall score of all 16 impact categories.⁹⁶

⁹⁰ EC, 2017, p. 47

⁹¹ EC, 2017, p. 47.

⁹² EC, 2013b.

⁹³ EC, 2013b, p. 24.

⁹⁴ EC, 2017, p. 50.

⁹⁵ EC, 2017, p. 144.

⁹⁶ Zampori and Pant, 2019, p. 181.

2.6 Participating in the PEF scheme

2.6.1 Conducting a PEF study

The process for conducting a PEF study is described in the PEF Guide, and for product-group specific use it is found in the PEFCRs. This includes defining the goals and scope (including the functional unit and reference flow), creating a *resource use and emission profile*, and conducting an environmental footprint impact assessment, as well as interpretation and reporting.⁹⁷ Figure 5 describes the process for conducting a PEF study, as per the PEF Guide (EC, 2013 b, p. 15).

Figure 5: Phases of a Product Environmental Footprint study

Source: EC, 2013b, p.15.

The scope for the analysis is defined for a measure expressed as a functional unit in terms of NACE/CPA codes. A function-based approach, according to ISO 14025:2006 (a group of products fulfilling equivalent functions), allows comparisons between products. Where a PEFCR exists, it defines a list of mandatory company-specific data, referring to the activity data and (unit) processes for which company-specific data must be collected.

Data quality is calculated as a “Data Quality Rating” (DQR) using a formula, including a semi-quantitative assessment of the quality criteria of a dataset based on technological representativeness, geographical representativeness, time-related representativeness, and precision. The data quality must be considered as the quality

⁹⁷ EC, 2013b.

of the dataset is documented.⁹⁸ In addition to this, the PEFCR Guidance document (2017) requires that the PEFCR define a list of mandatory, company-specific data. This refers to the activity data and (unit) processes for which the company-specific data must be collected. This list defines the minimum requirements to be fulfilled by companies that apply the PEFCR. The purpose is to prevent a company from carrying out a PEF study and communicating the results without access to the relevant company-specific data and by only applying default data and datasets.⁹⁹ The requirements for the DQR score in relation to the company-specific data are outlined in the PEFCR Guidance (2017).¹⁰⁰

2.6.2 *Communication of Product Environmental Footprint performance*

The results of a PEF study are reported in a PEF report, for which a template is provided in the guiding documents.¹⁰¹ The way in which the report can be communicated depends on the target group and objective of the communication. Communication of an environmental profile (PEF study) is currently recommended only when there is a valid PEFCR.¹⁰² A PEF study intended for external communication must be critically reviewed before publishing.^{103,104} The PEFCR Guidance document (2017) has extended requirements to the review process, the reviewers (e.g. years of experience and number of LCAs and reviews), and provides detailed, specific requirements on which parts of the EF study must be verified. A verification report is prepared and a detailed list of the content of this report is specified in the PEFCR Guidance (2017) document.¹⁰⁵

In addition to using the PEF results as a way to substantiate information about environmental performance for company internal and external uses, the PEF may in the future be used more widely in B2B and B2C applications. At the time of writing this report the EC has not disclosed proposals on policy options, including communication uses. It is expected that information on potential policy priorities and related future directions of the PEF will be available once the new European Commission is in place at the end of 2019. It is possible that the PEF will be built into existing labelling schemes or become its own label.

Reporting and communication approaches were tested as part of the PEF pilot phase. Options included publicly available or non-public reports, declarations, labels, etc. The final report of the results of the communication approaches study performed

⁹⁸ EC, 2017, pp. 16–17 and 130–135.

⁹⁹ EC, 2017, pp. 135.

¹⁰⁰ EC, 2017, pp. 135–144.

¹⁰¹ EC 2013b; Zampori, L. and Pant, R., 2019, Annex E.

¹⁰² EC, 2017, p. 151.

¹⁰³ EC, 2017, pp. 145–154.

¹⁰⁴ EC, 2013b, p.55: "The type of review conducted should be informed by the goals and intended applications of the PEF study. Unless otherwise specified in relevant policy instruments, any study intended for external communication must be critically reviewed by at least one independent and qualified external reviewer (or review team). A PEF study to support a comparative assertion intended to be disclosed to the public should be based on relevant PEFCRs and critically reviewed by an independent panel of three qualified external reviewers. Any PEF study intended for internal communication claiming to be in line with the PEF Guide must be critically reviewed by at least one independent and qualified external reviewer (or review team)."

¹⁰⁵ EC, 2017, pp. 145–154.

by Lupiáñez-Villanueva *et al.* (2018) indicated that consumers prefer simple (with max 3 impact categories) and third-party certified information. It claims that information should also not be complex for B2B purposes, because non-experts are involved in purchasing. According to this particular study, consumers would prefer a PEF label with an A–E range over the EU Ecolabel.¹⁰⁶

In earlier versions of the PEFCR Guidance document, a 5-class benchmark system (A–E) was proposed for development during the pilot phase. In this system the representative product would correspond to class C. The proposal has already been taken out of the PEFCR Guidance (V. 6.1) document.¹⁰⁷ The PEFCR Guidance document v. 6.3 states instead: “Within the pilot phase, the PEFCRs shall not include information on classes of performance.” An eventual performance-class-based benchmark system would allow the differentiation of products based on environmental performance results, and to communicate the relative environmental performance accordingly.

¹⁰⁶ Lupiáñez-Villanueva *et al.*, 2018, pp. 166–168.

¹⁰⁷ EC (2017) has not mentioned communication. In addition, there is a reference to classes of performance on p. 110, saying “this may be added at a later stage”.

3. Comparison of the Nordic Swan Ecolabel and the PEF

This chapter consists of a comparison of different aspects of the Nordic Swan Ecolabel and the PEF. The product groups compared are paints, textiles/T-shirts, rechargeable batteries and intermediate paper. The chapter shows that there are differences in the way in which product categories are defined, in the use of functional units, as well as in the environmental aspects that are identified to be significant. The chapter concludes by explaining the similarities and differences in the data quality and verification requirements.

3.1 Introduction

This chapter compares the methodology used in the Swan and the PEF with the purpose of identifying similarities and differences regarding:

- the overall goals and objectives of the two schemes
- product category definitions in the Swan criteria and the PEFCRs
- functional units used in the Swan criteria and the PEFCRs
- significant environmental aspects and life cycle stages identified in the Swan criteria and the PEFCRs
- data quality
- establishing credibility through verification.

The following sub-chapters explain the similarities and differences through extracts taken from the documents of each of the schemes. At the end of each sub-chapter, the similarities and differences are summarised presenting also some implications.

3.2 Goals and objectives

The overall goal of both schemes is *to reduce the environmental impact of consumption*, i.e. the impacts from products and services by finding the products with the least environmental impact. Both schemes have the objective of *including the environmental impacts from the life cycle of products* and promoting the development of products with reduced environmental impacts.

Table 5: Comparison of objectives

	The Nordic Swan Ecolabel scheme	The PEF initiative
Overall objective	According to ISO, the objective of Type 1 labels are to encourage the demand for and supply of those products that cause less stress on the environment, to contribute to a reduction in the environmental impacts associated with products. ¹	The Communication from the Commission to the European Parliament and the Council on Building the Single Market for Green Products (9.4.2013): states "The objective of these actions is to allow and facilitate, in the medium term, a higher uptake of green products and of greener practices by companies in the EU market by contributing to the removal of potential barriers to the free circulation of green products in the Single Market." ²
Aim to consider environmental impacts over the life cycle of products	The Goals and Principles of the Nordic Ecolabel (§ 2) state, "The Nordic Ecolabel takes into account the environmental impact of goods and services during their entire life cycle, from raw materials to waste products". ³	The Product Environmental Footprint (PEF) is a life cycle assessment (LCA) based method to quantify the relevant environmental impacts of products (goods or services). ⁴
Help consumers find products with the least environmental impact	The Nordic Ecolabel helps consumers, companies and other organisations to purchase in an environmentally conscious manner". (Goals and Principles, § 2) ⁵	There are barriers for both producers and consumers to supply and purchase these products, many of them stemming from the ambiguity of what constitutes truly a 'green' product and a 'green' organisation. This Commission initiative is a step towards removing this ambiguity by improving the way how environmental performance of products and organisations is measured and communicated." (EC Communication, 2013) ⁶
Promoting the development of products with reduced environmental impacts	"It also encourages the development of products and services that have less of an impact on the environment and climate than similar products on the market." (Goals and Principles, § 2) ⁷	"The objective of these actions is to allow and facilitate, in the medium term, a higher uptake of green products and of greener practices by companies in the EU market by contributing to the removal of potential barriers to the free circulation of green products in the Single Market." ⁸

Source: ¹ISO 14024:2018.

²EC, 2013a, p.2.

³NCM, 2014b, p. 1, under § 2 Objectives.

⁴EC 2017, p.22.

⁵NCM, 2014b, p. 1, under § 2 Objectives.

⁶EC, 2013a, p. 2.

⁷NCM, 2014b, p. 1, under § 2 Objectives.

⁸EC, 2013a, p.2

With regard to the relation to ISO standards, the two systems are different. As can be seen, the overall goal of the Swan is in line with ISO14024 for Type 1 ecolabelling. The Swan system follows the ISO standard for Type 1 Ecolabelling,¹⁰⁸ but the PEF follows no standard directly. Based on an analysis carried out by JRC in 2010, the Commission came to the conclusion that existing life cycle-based standards do not provide sufficient

¹⁰⁸ Goals and Principles (2014), article 3. It should be mentioned, that the ISO 14024 Standard has been updated in 2018 (ISO 14024:1999 was replaced by ISO 14024:2018). Accordingly, criteria documents released before 2018 will be in accordance with the ISO 14024:1999 standard, not the updated ISO 14024:2018 standard.

specificity to ensure that the same assumptions, measurements and calculations are made to support the comparability of environmental claims between products delivering the same function.¹⁰⁹ Hence, while elements from other standards have been taken into account, the PEF(CR) sets up unique rules, that are different from any ISO standards.

Table 6: Relation to ISO Standards

The Nordic Swan Ecolabel scheme	The PEF initiative
"The label is used in accordance with ISO 14024 for Type 1 ecolabelling." (Goals and Principles § 3) ¹	"Rules analogous to PEFCRs exist in standards for other types of life-cycle-based product claims, such as ISO 14025:2006 (Type III environmental declarations). PEFCRs were named differently in order to prevent confusion with other analogous rules and uniquely identify rules under the PEF Guide." ²

Note: ¹ NCM, 2014b, p. 1, under §3 Operations and activity.

² EC, 2017, pp. 22–23.

3.3 Overall methodological approach

From a methodological perspective, both schemes are based on a life cycle approach; however, the use of LCA is different:

- The PEF is an LCA method for quantifying environmental impacts of products which, like LCA generally, can be used by various organisations for different purposes. The PEF builds on existing approaches and international standards, with the aim of setting the basis for better reproducibility and comparability of the results. To a great extent, the PEF method has been developed on the basis of the International Reference Life Cycle Data System (ILCD) Handbook. However, other methods have also been taken into account¹¹⁰. The PEF is quantitative and is based on pre-defined, relevant environmental impact categories. The PEF method is detailed, comprehensive and will be relatively time consuming to use;
- In setting criteria, the Nordic Ecolabelling makes use of the MECO method (a "light weight LCA method", which is a mix of qualitative and quantitative data), combined with results from readily available LCAs. The LCA studies are generally not carried out by the Nordic Ecolabelling organisation and for this reason they may have varying backgrounds and are of varying quality. The assessment of the relevance, potential and steerability of the various environmental aspects leads to the setting of criteria. The Swan assessment is supported by expert judgments and non-quantifiable information.

The methodological differences are described in detail in the following sub-chapters.

¹⁰⁹ EC, 2017, pp. 22–23.

¹¹⁰ BP X30323; ISO 14044; ISO 14067; Greenhouse Gas Protocol (WRI/WBCSD); PAS2050 and the Ecological Footprint methodology.

3.4 Definition of product categories

Defining the product categories is a challenge for both schemes. Ideally, the products included in a product category should have the same function, i.e. deliver the same service. However, there is a dilemma. If the product categories are very broad, it will be possible to cover a wide range of products; however, the covered products might not deliver exactly the same services. On the other hand, if the product categories are narrow, it will require a large number of PEFCRs or Swan Criteria Documents to cover the enormous number of products used in Europe or the Nordic Countries. Products may also have multiple functions. In order to solve this problem, both the PEFCRs and the Swan can include “sub-categories” under a category. Swan also states requirements for materials that are used in various products within a category when the materials are the same. Furthermore, PEFCRs can be developed for “intermediate products”.

A function-based approach, where one PEFCR addresses products that are capable of fulfilling the same function, is used in the PEF to allow for meaningful comparisons between products. The product categories are defined in accordance with the CPA/NACE codes and in line with ISO14025:2006 (i.e. a group of products that can fulfil equivalent functions).¹¹¹ The Swan criteria product groups are not defined based only strictly on the function they fulfil. The examples in Table 7, Table 8, Table 9 and Table 10 show how product categories are defined for a number of products under both schemes. However, there are other product groups where a function-based approach is found which are not part of this comparison. For intermediate products, a material-based or declared-unit-based approach is used, as is shown in Table 7.¹¹²

The Swan background document for the most recent update of the “Rechargeable batteries and portable chargers” recognises the existence of the PEFCR “High Specific Energy Rechargeable Batteries for Mobile Applications”. The Nordic Swan Ecolabel criteria were finalised on 15 June 2018, and the PEFCR were completed in February 2018. However, the Swan background document does not indicate whether the PEFCR was used in the update of the criteria document.

¹¹¹ EC, 2017, p. 28; ISO, 2006a.

¹¹² EC, 2017, p. 28.

Table 7: Product category definitions – Rechargeable batteries

The Nordic Swan Ecolabel	The PEF
<p>Rechargeable batteries and portable chargers</p> <p><i>Portable rechargeable batteries</i> Portable batteries that are rechargeable in accordance with the definition provided in the European Union's Battery Directive, 2006/66/EC. Rechargeable batteries sold together with, or as accessories/parts for, electrical appliances, e.g. cordless power tools, can also be awarded the Nordic Swan Ecolabel (only the batteries). However, the battery must be designed to be replaced and charged in a separate charger. Rechargeable batteries sold in combination packs with external battery chargers are also eligible for a Nordic Swan Ecolabel.</p> <p><i>Portable chargers</i> A portable charger or "portable power bank" is defined as any portable energy-storage device containing secondary batteries with charging circuitry, and which is used to charge portable consumer electronic devices via DC output. Portable chargers with built-in solar panels can also be awarded with the Nordic Swan Ecolabel.</p>	<p>High specific energy rechargeable batteries for mobile applications The system consists of the rechargeable battery and the charger in the case of ICT, and cordless power tool applications, since it is considered to be part of the system. On the contrary, in the case of electric vehicles, charging stations are considered to be part of the infrastructure and not part of the battery. The scope of this PEFCR is wide and it has been necessary to identify sub-categories based on different applications.</p> <p>This PEFCR is applicable for rechargeable single cells or/and batteries used in the following equipment or vehicles:</p> <ul style="list-style-type: none"> – E-mobility (e.g., e-bikes, ELV, PHEV, cars, bus/trucks) – excluding charging unit; – Information & Communication Technologies (e.g., tablets and phones, computers, cameras, games) – incl. charging unit; – Cordless power tools (e.g., drills, electric screwdrivers) incl. charging unit. <p>The following technologies and chemistries are considered:</p> <ul style="list-style-type: none"> – Battery technology: Li-Ion and NiMH; – Battery chemistry for Li-ion technology includes: LCO (LiCoO₂), NMC (LiNi_xMn_yCo_zO₂), LiMn (LiMnO₂), LFP (LiFePO₄).
<p>Excluded products/applications</p> <ul style="list-style-type: none"> – Non-rechargeable batteries;¹ – Car batteries and industrial batteries; – Batteries that are built into or form a permanent part of electronic products and where replacement of the batteries is not possible. Portable chargers (portable power banks) are exempt from this requirement; – Batteries that are built into or form a permanent part of electronic products and where the entire product is placed in a charger; – Chargers sold for rechargeable batteries alone; – Products with AC input; – Products with jump starter functions; – Higher-capacity power packs intended for charging high-power industrial devices; – Uninterruptible Power Supply (UPS) systems. 	<p>Excluded products/applications</p> <ul style="list-style-type: none"> – Non-rechargeable batteries; – Stationary power stations, back-up power systems (for train, aircrafts, UPS, etc.); – Starting-lighting-ignition (SLI) batteries and start stop hybrid batteries; – Batteries with different expected quality and/or additional function (e.g. the batteries used in applications such as forklifts, golf-carts, wheelchairs).

Note: ¹ Separate Nordic Swan Ecolabel criteria exist for Non-rechargeable batteries, named "primary batteries" (Nordic Ecolabelling, 2018c and 2018d).

Source: Nordic Ecolabelling, 2018d
EC, 2018a

Table 8: Product category definitions – Paper products

The Nordic Swan Ecolabel	The PEF
<p>Various sub-product categories related to paper products</p> <p>This product category is divided into sub-categories:</p> <p>The Paper Basic Module contains general requirements concerning forestry management, emissions, energy use and waste disposal in relation to pulp and paper production</p> <p>The Paper Chemicals Module contains general requirements in regard to the uses of chemicals in the manufacture of pulp and paper.¹</p> <p>In addition:</p> <ul style="list-style-type: none"> – Copy and printing paper; – Tissue paper (e.g. for example, toilet paper, kitchen towels, paper towels and paper handkerchiefs); – Grease-proof paper (e.g. baking paper and food paper, interlay paper, baking tray liner, sandwich paper and other grease-proof paper used for food wrapping, various types of “high density paper” (e.g. for tracing); – Printing companies, printed matter, envelopes and other converted paper products; – Disposables for food (this includes e.g. coffee and tea filters and take-away packaging such as coffee cups, pizza boxes, containers and paper for the packaging of food; and disposable tableware). 	<p>Intermediate paper products</p> <p>An intermediate paper product is a manufactured product (material) that is used as an input for producing paper products for different end-use applications. Intermediate paper products are used in communication (newsprint and other graphic papers), packaging, sanitary and hygiene (tissue), and speciality end-use applications. The term “intermediate” is used to differentiate between “paper materials” and a “paper product”; where the latter refers to final products such as envelopes, corrugated packaging or kitchen towels. Such final products are not included in this product category.</p> <p>This product category is divided into three sub-categories:</p> <ul style="list-style-type: none"> – Graphic papers (including newsprint); – Packaging papers; – Tissue. <p><i>Intermediate paper and paperboard products for the following applications:</i></p> <ul style="list-style-type: none"> – Newsprint, and other uncoated paper or paperboard for graphic purposes; – Toilet or facial tissue stock, towel or napkin stock, cellulose wadding and webs of cellulose fibres; – Containerboard; – Uncoated paper; – Uncoated paperboard (other than that used for writing, printing or other graphic purposes); – Processed paper and paperboard.
<p>Excluded products/applications</p> <p>Each of the above-mentioned product categories specified the included and excluded products. This is too extensive to include in this report.</p>	<p>Excluded products/applications</p> <ul style="list-style-type: none"> – Handmade paper and paperboard; – Filter paper and paperboard; felt paper; – Cigarette paper not cut to size or in the form of booklets or tubes; – Paper, paperboard, cellulose wadding and webs of cellulose fibres, coated, impregnated, covered, surface coloured or printed, in rolls or sheets.

Note: ¹ Nordic Ecolabelling of Paper Products – Basic Module Version 2.2. 11 June 2011–30 June 2019.

Source: EC, 2018e and Nordic Ecolabelling, 2017c.

Table 9: Product category definitions – Textiles, hides/skin and leather

The Nordic Swan Ecolabel	The PEF
<p>Textiles, hides/skin and leather</p> <p>These criteria include products made from textile fibres, hides/skins and leather, and a combination of these.</p> <p>The term “Textiles, hides/skins and leather” refers to:</p> <ul style="list-style-type: none"> – Apparel and accessories, for example trousers, shirts, jackets, underwear, handkerchiefs, scarves, bags and purses; – Furnishing fabrics, i.e. textiles produced for use and interior decoration in the home (including cars/boats), such as towels, bedding, curtains, tablecloths, rugs, cushions, duvets and upholstery; – Fibres, yarn and fabric, including durable non-woven fabric, which are to be used in textiles for clothing and accessories or in furnishing fabrics as mentioned above. “Durable non-woven” refers to products that can be reused and washed; – Hide and leather products, such as jackets, trousers or bags, and hide/skin and leather as raw materials for clothing or home furnishings, (cars/boats), from the following species of animal: sheep, goat, ox, horse, pig, elk, deer and reindeer; – Both products for private and public use can carry the Nordic Swan Ecolabel. The textiles can be made from new fibres and/or recycled fibres. 	<p>T-shirts and Leather</p> <p><i>In PEF, there are two different product categories corresponding to the Nordic Swan Ecolabel product category:</i></p> <ul style="list-style-type: none"> – T-shirts; – Leather. <p><i>The T-shirts product category covers the following products:</i></p> <ul style="list-style-type: none"> – T-shirts used for sport activities; – Singlets and other vests; – T-shirts with long and short sleeves; – Sleeveless T-shirts; – Polo shirts; – Un-printed and printed T-shirts; – T-shirts with or without accessories (buttons, zips, straps...); – T-shirts with or without specific treatment (moisture transfer...). <p>Five sub-categories are considered in this product category, that is, one for each size category:</p> <ul style="list-style-type: none"> – Men T-shirts; – Women T-shirts; – Children (2 to 7 years old) T-shirts; – Children (8 to 14 years old) T-shirts; – Babies T-shirts. <p><i>The Leather product category includes:</i></p> <p>Finished leathers produced from raw hides and skins of bovine, ovine and caprine animals, which have been raised mainly for the production of milk, meat or wool, and slaughtered mainly for human consumption purposes, notably meat production.</p> <p>The product categories included apply to finished leathers manufactured from adult bovine hides, calf, ovine and caprine skins. These are the predominant industrial products of tanneries, representing more than 99% of global finished leather production. Downstream end users (leather article manufacturers) buy leather as an external input processing material.</p>
<p>Excluded products/applications</p> <p>The following products and materials cannot be ecolabelled in accordance with the criteria for textiles, hides/skins and leather:</p> <ul style="list-style-type: none"> – Mineral fibres, glass fibre, metal fibre, carbon fibre and other inorganic fibres; – Products or materials that are treated with flame retardants. This also applies to flame retardants that are integrated in the product or material; – Wall coverings, such as textile wallpapers; – Advertising materials, banners, or roll-ups; – Disposable products. “Disposable products” refers to products that cannot be washed/cleaned or reused; – Products containing electronic components; – Products containing perfume or other fragrances. 	<p>Excluded products/applications</p> <p><i>The T-shirts product category excludes:</i></p> <ul style="list-style-type: none"> – Shirts because they have a full-length opening (from top to bottom) at the front; – Singlets and other vests not knitted or crocheted (e.g. blouses, tunics), due to their process of production (not knitted fabric); – Pullovers, due to their higher gauge and surface density; – T-shirts which cannot be washed (the care label does not recommend any type of washing). <p><i>The Leather product category excludes:</i></p> <p>All leathers produced from hides or skins of animals other than those slaughtered for human consumption, as well as any synthetic substitute material to leather.</p>

Source: Nordic Ecolabelling, 2018m and EC, 2018c.

Table 10: Product category definitions – Indoor and outdoor paint

The Nordic Swan Ecolabel	The PEF
<p>Indoor paint and varnishes and Chemical building products <i>As the PEFCR covers indoor and outdoor paint, the corresponding product categories in the Nordic Swan Ecolabel are:</i></p> <ul style="list-style-type: none"> – Indoor paint and varnishes; – Chemical building products. <p><i>Indoor paint and varnishes</i> The product category of indoor paints and varnishes comprise: Floor coatings and floor paints; paint products which are tinted by distributors at the request of consumer (non-professional) or professional decorators, tinting systems, decorative paints in liquid or paste formulas which may have been pre-conditioned, tinted or prepared by the manufacturer to meet consumer's needs, including wood paints, wood and decking stains, masonry coatings and metal finishes primers and undercoats of such product systems as defined in Annex I to Directive 2004/42/CE for indoor usage.</p> <p><i>Chemical building products</i> The product group covers the following products for manual and machine application:</p> <ul style="list-style-type: none"> – Adhesives; – Sealants; – Fillers/screed (including primers to these); – Outdoor paints and varnishes (including primers for these); – Paints and varnishes for industrial application. 	<p>Decorative paints The PEFCR covers paints that are included in product categories (a) through (d) of the Paints Directive: 2004/42/EC:</p> <ul style="list-style-type: none"> – Matt coatings for interior walls and ceilings; – Glossy coatings for interior walls and ceilings; – Coatings for exterior walls of mineral substrate; – Interior/exterior trim and cladding paints for wood, metal or plastic. <p>The CPA (Classification Product by Activity) codes for the products included in this PEFCR are:</p> <p>C – Manufactured products: C20.3 – Paints, varnishes and similar coatings, printing ink and mastics; C20.3.0 – Paints, varnishes and similar coatings, printing ink and mastics; F – Constructions and construction works: F43.3.4 – Painting and glazing works.</p>
<p>Excluded products/applications <i>The Nordic Swan "Indoor paint and varnishes"</i> The product category "Indoor paint and varnishes" does not comprise the following products: Anti-fouling coatings, preservation products for wood impregnation, coatings for particular industrial and professional uses, including heavy-duty coatings, powder coatings, UV curable paint systems, paints primarily intended for vehicles, products for which the primary function is not to form a film over the substrate, e.g. oils and waxes, fillers as defined by EN ISO 4618 and road-marking paints. The product group does not include anti-rust paints, products for exterior usage or products for industrial applications. Exterior products are covered by the Nordic Ecolabelling criteria for chemical building products.</p> <p><i>Excluded products/applications, The Nordic Swan – "Chemical building products"</i> Adhesives refer to products such as wood adhesive, grab adhesive, tile adhesive, wallpaper paste and the like. The product group does not include adhesives for industrial use for purposes such as furniture production or panelling. Solid building products such as insulation materials and plastic products, pure concrete, etc. cannot be Nordic Ecolabelled under these criteria. Industrial paints and varnishes refers here to paints that are used and manufactured for industrial applications such as painting furniture/panels for indoor and outdoor usage. Criteria already exist for the Nordic Ecolabelling of indoor paints and varnishes, and thus these cannot be ecolabelled under the criteria for "Chemical building products".</p>	<p>Excluded products/applications There is no list of excluded products/applications.</p>

Source: EC, 2018d. Nordic Ecolabelling, 2018g, Nordic Ecolabelling, 2018h.

3.4.1 Conclusions regarding product category definitions

When comparing the product categories in the PEFCRs and the product categories in the Swan criteria, it can be seen that:

- For some areas, the product categories in the PEFCRs are rather similar to the product categories defined in the Nordic Swan Ecolabel, e.g. paint;
- The level of detail can vary significantly within product areas, which seem similar. The two schemes might define a very broad scope versus a narrow scope (e.g. "Textiles, hides/skin and leather" in the Nordic Swan Ecolabel vs. "T-shirts" in the PEFCR). A narrow scope is not necessarily better or worse than a broad scope;
- In some of the examples, a Swan product group is defined for an "intermediate" product. There is a PEFCR category for "intermediate" paper whereas the Swan specified various sub-categories for paper in addition to the "intermediate product" in the basic module and chemicals module for paper;
- In some cases, products are included in one of the schemes, and excluded in the other. An example of this is the product category "Rechargeable batteries". In the PEFCR,¹¹³ rechargeable batteries in phones are included, whereas the Nordic Swan Ecolabelling has chosen to exclude rechargeable batteries placed within electronic products. In such products, the entire product is placed in a charger, e.g. mobile telephones. The motivation for this decision is that the Swan does not impose further requirements on the electrical appliances into which the battery is built, and it would therefore not be possible to ensure that the overall product is environmentally friendly.¹¹⁴ The argument makes sense as it would be confusing for consumers, or even misleading, if the packaging for a mobile phone carried the Swan, if this only covers the battery, not the entire mobile phone;
- The reasons for exclusions differ between the two schemes. The PEF excludes products from the product group definitions on the basis of the function of the product category, whereas the Swan may exclude products on the basis of ethical or environmental reasons. For example, in the case of textiles and T-shirts:
 - In the PEF, shirts and pullovers are excluded from the PEFCR product category scope because they are covered by other CPA codes;¹¹⁵
 - In the Swan categories, textiles that have been treated with flame retardants are excluded from the product group specific criteria due to the associated environmental and health concerns.¹¹⁶
 -

¹¹³ EC, 2018a.

¹¹⁴ Nordic Ecolabelling, 2018a; Nordic Ecolabelling, 2018b

¹¹⁵ EC, 2019d, p. 20.

¹¹⁶ Nordic Ecolabelling 2018k, p. 32.

3.4.2 Implications regarding product category definitions

Some implications concerning the differences in the definitions of the product categories for the users of the PEFCRs and the Nordic Swan Ecolabel are listed below:

- It might be difficult to obtain the same recommendations regarding environmental impacts *when the product categories are defined significantly differently by the two schemes*. If it is not the same products that are included, the two schemes might obtain different results, or even declare different products to “have less environmental impact compared to the average product”;
- Some specific products (e.g. batteries for mobile phones) are only covered by one of the schemes, although there is an overall product categories in both schemes, where it might have been included;
- In addition, the Swan excludes some materials/products on the basis of environmental and health reasons, despite them fulfilling the same function. This implies that products that have been excluded for ethical, health, environmental or other reasons could still get better than benchmark PEF value, leading to possibly contradictory results;
- The current differences in product group alignment make it difficult to compare the environmental information in both schemes. If producers invest time in following one of the schemes, they might not be able to gain the benefit of the work in the other scheme.

3.5 Functional units and alternative approaches

In order to distinguish between products with high environmental impacts and products with relatively smaller environmental impacts, it is necessary to set up a framework for a comparison, and the basis for this comparison is essential for the outcome of the comparison. In LCA, the basis for the comparison is the *functional unit*, which ensures that the compared products provide the same service. Defining the functional unit precisely is fundamental when comparing alternative products with the same function (service) side-by-side. It is, however, not always easy to define the functional unit and products can have more than one function.

The approaches in the PEF and Swan towards the functional units are described through examples in this section. In summary:

- The PEF method, as per the PEF Guide and PEFCR Guidance document, requires a functional unit and provides recommendations for how to define it. It is defined by considering the following aspects:¹¹⁷
 - What? (The functions/services provided);

¹¹⁷ EC, 2013b, p. 20.

- How much? (The extent of the function or service);
- How well? (The expected level of quality);
- How long? (The duration/life-time of the product).

The Swan also operates with a functional unit (if possible), when performing a MECO assessment as part of the preparation for the criteria documents for a product category. The criteria can be but are not necessarily related to a functional unit.

3.5.1 Textiles, hides/skin and leather

The case study illustrates some of the challenges in defining a “functional unit”.

The basis for the comparisons in the categories for textiles and leather in the PEFCRs and in the Nordic Swan Ecolabel documents are shown in Table 11 below, in particular as it concerns the quality of the product.

Table 11: Functional units – and other units used as the basis for the environmental assessments and comparisons – Textiles, hides/skin and leather

The Nordic Swan Ecolabel	The PEF
<p>Textiles, hides/skin and leather No functional unit defined.</p> <p>For some processes, e.g. washing and dyeing, emissions are calculated per kg of fibre or textiles.¹</p>	<p>T-shirts The functional unit: “To wear a clean T-shirt until it becomes dirty 52 times”. Reference flow: “the amount of product needed to fulfil the defined function and shall be 1 single T-shirt. All quantitative input and output data collected in the study shall be calculated in relation to this reference flow.”²</p> <p>Leather For leather, a functional unit has not been defined, as it is regarded as an intermediate product in PEF terms. Instead, a <i>Declared Unit</i> (DU) is defined: a square meter (m²) of finished leather, measured according to ISO 11646 standard 115 or EN ISO 19076.³ Furthermore, it is stated: “Leather is an intermediate product and has no expiry date. Its life span depends on its final use but considering that the use phase is beyond the system boundaries of this PEFCR, the “how long?” specification cannot be defined.”</p>

Note: ¹ E.g. in relation to chemicals, decisions are independent of the amount.

² EC, 2019d, pp. 20–21.

³ EC, 2018c, pp. 6–7.

For the PEF product category “T-shirts”, the functional unit is defined as “To wear a clean T-shirt until it becomes dirty 52 times”. In addition to this, it is stated: “The reference flow is the amount of product needed to fulfil the defined function and shall be 1 single T-shirt.”

The PEFCR assumes an identical lifespan for all T-shirts. The PEFCR for T-shirts states: “The life span is an important parameter when the environmental impacts of products are studied in a life cycle assessment” and: “For any T-shirt, a comparison or comparative assertion can be made against the benchmark (corresponding representative product), or between T-shirts belonging to the same representative

product. However, there is a limitation: the PEFCR assumes an identical life span for all items.”¹¹⁸ The argument for leaving out the quality/lifetime of a T-shirt is: “and no method has been defined yet to quantify the life span of textile items and T-shirts in particular” ... and... “In the absence of a method allowing to quantify it, it is not possible to introduce a variable life span in the PEFCR.” The PEFCR concludes: “During the revision of the PEFCR (after the expiry date), it will be necessary to check whether a method allowing the quantification of the lifetime exists. Should this be the case, a variable lifetime might be used in the PEFCR.”¹¹⁹

The Swan has not defined a functional unit, as the criteria document for this product category is very broad and is more on a material and process level, rather than on a product-specific level. However, the Swan has included product-specific requirements regarding the quality of textiles. There are criteria for dimension changes during washing and drying and colour fastness due to washing, for example:

- “Dimension changes during washing and drying shall not exceed” ... ($\pm 2\%$ for curtains... etc., specifying $\pm \%$ for various textiles) and “The tests shall be performed in accordance with EN ISO 6330, ISO 5077, or the equivalent. The following testing procedure shall be followed: Wash three times at the temperature that is stated on the product, followed by drying in a tumble dryer unless another process is stated on the product”;¹²⁰
- “The colour fastness to washing shall be at least level 3–4 for colour changes and at least level 3–4 for discoloration. The tests shall be performed in accordance with ISO 105 Co6 (a single wash at the temperature that is stated on the product) or the equivalent”.¹²¹

Defining a functional unit for textiles is difficult due to various factors; e.g. the category is broad, and thereby covers a range of products, making it difficult to find a common function. Even within a sub-category (e.g. T-shirts) the definition of a functional unit is complicated as the quality is difficult to measure, and as “quality” covers more than the dimensional changes and colour fastness (e.g. a sweater may suffer from lint or pilling after washing). In addition to this, the lifetimes of textiles are complicated due to changes in fashion; the styles of the textiles are decisive for how many years the consumers use the clothes.

The example of the T-shirts case shows that the functional unit, as defined by the PEF in the current version of the PEFCR, does not take the “quality” into account (which is actually a must when defining the functional unit). This means that if a consumer buys a low-quality T-shirt, this might be discarded after 5–6 times in the washing machine because the colours have faded, or the T-shirt is out of shape. Accordingly, in order to fulfil the service “to wear a clean T-shirt until it has become dirty 52 times” the

¹¹⁸ EC, 2019d, pp. 20–21.

¹¹⁹ EC, 2019d, pp. 20–21.

¹²⁰ Nordic Ecolabelling, 2018m, pp. 29–30.

¹²¹ Nordic Ecolabelling, 2018m, pp. 29–30.

consumer would have to buy around 10 T-shirts. If consumers bought a high-quality T-shirt, they might only have to buy 1 T-shirt. The significance towards the environmental impacts is large; for the production stages, but also for the disposal of T-shirts.

The textile case is an example of how the approach is applied by the Swan Ecolabel for managing a difficult task, simply by setting requirements for the maximum dimensional changes during washing and drying and the colour fastness when washing. Products that cannot fulfil these requirements, cannot obtain a Swan Ecolabel, while products that do meet the requirements would be of improved quality and are expected to have a lower environmental impact as a result.

3.5.2 Paints

The functional units used in the product categories covering “paint” are shown in Table 12.

Table 12: Functional units – and other units used as the basis for the environmental assessments and comparisons – Paint

The Nordic Swan Ecolabel	The PEF
<p>Chemical building products (Outdoor paint and varnishes)³ Functional unit is not defined but it is explained in the background document. The background document states : “It is difficult to specify a meaningful functional unit, since these products are designed to be applied to substrates with very different properties, e.g. wood, concrete, brick, stone, blocks, plasterboard or coarse wall surfaces. It is therefore neither meaningful nor appropriate to use x litres of product/m² as a functional unit. The functional unit should instead be content/litre, without water. <i>However, with regard to emissions and quality, the functional unit of m² can and should be used.</i>”⁴ “The requirement level [for the content of TiO₂] has been calculated based on 38 g TiO₂/m² with 98% opacity on a standard reference surface (in the same way as for indoor paints) that has been used in the EU Ecolabel criteria for outdoor paints. This has been done since Nordic Ecolabelling <i>does not consider the functional unit m² to be relevant for outdoor paints and varnishes since the painted substrates varies so much</i> and therefore affects the amount of paint needed, i.e. TiO₂/m² will not be a fair way of setting such a requirement.”⁵</p> <p>Indoor paints and varnishes⁴ Functional unit not defined.</p>	<p>Decorative paints² <i>The functional unit (FU)</i> is to protect and decorate 1 m² of substrate for 50 years at a specified quality level (minimum 98% opacity). The reference flow is the amount of product needed to fulfil the defined function and is measured in kg of paint. All quantitative input and output data collected in the study must be calculated in relation to this reference flow. <i>The reference flow</i> is calculated with this formula: kg of paint = 1 (m²) / Coverage (m²/L) / applied paint (-) * Paint density (kg/L) * Maintenance multiplier The number of expected maintenance cycles over the reference lifetime of the building (50 years). Based on product-specific test data. How to test the durability and maintenance multiplier is clearly defined in Annex 4 in accordance with EN and ISO standards in the area.</p>

Source: ¹ Nordic Ecolabelling, 2018h, and Nordic Ecolabelling, 2018j.

² EC, 2018d.

³ Nordic Ecolabelling, 2018p and Nordic Ecolabelling, 2018q.

⁴ Nordic Ecolabelling, 2018p and Nordic Ecolabelling, 2018q, p. 81.

⁵ Nordic Ecolabelling, 2018p and Nordic Ecolabelling, 2018q, p. 36.

In the PEF “decorative paints” category, the functional unit for paint is defined as per the requirements of the PEF. A “maintenance multiplier” is defined and an annex is included with a description of how to calculate this. Coverage, durability and maintenance are included, and the quality level is specified (minimum 98% opacity).

Furthermore, considerations regarding the wet scrub resistance are included in the “maintenance multiplier”. The coverage is calculated based on the spreading rate and represents the amount of paint needed to secure a layer thickness that ensures adequate coverage. The spreading rate is determined as at least 98% opacity for the white reference colour RAL 9010.

There is no functional unit *per se* defined in the outdoor paints background document of the Swan, but an explanation is included regarding the function of chemical building products and an explanation of why it is not meaningful to use a functional unit.

- “Primary: Treating a surface so that it has the required properties (e.g. adhesion, smoothness, water repellence, attractiveness...);
- Secondary: It must function/remain effective for many years (maybe 10–30 years depending on the subgroup). The secondary function has a considerable effect on the environmental impact of the products in that an increased useful life (with an inherent increase in quality) results in a lower environmental impact. This is due to the savings gained from not having to extract new raw materials and produce new products, and the effect relates to the entire life cycle.”¹²²

No functional unit is defined for indoor paints. However, the coverage in l/m² must be disclosed on packaging and the spreading rate is also defined as l/m² (depending on paint type and opacity).¹²³ The background document for indoor paints and varnishes stresses the importance of long shelf life and quality. Shelf life is seen as important because indoor paints are:

- often in stores for a long time before being sold
- kept at a consumer’s house for a long time before being used.¹²⁴

The quality of the product is considered important because:

- “different products have different lifespans, i.e. how soon a surface needs to be repainted due to damages, scratches or other types of wear.”¹²⁵
- “an increased lifespan for these products directly results in raw material and production savings.”¹²⁶

Accordingly, the Swan has included considerations regarding the functional unit, quality and shelf life, but has not been able to define a useful functional unit.

¹²² Nordic Ecolabelling, 2018p; Nordic Ecolabelling, 2018q, p. 35 and 81.

¹²³ Nordic Ecolabelling, 2018h, Requirement O17.

¹²⁴ Nordic Ecolabelling, 2018g, p. 6.

¹²⁵ Nordic Ecolabelling, 2018g, p. 6.

¹²⁶ Nordic Ecolabelling, 2018g, p. 6.

Instead of using a functional unit, the requirements for the Swan ecolabelled paints have a “qualitative” approach to setting requirements, which allows the inclusion of health and quality aspects e.g.:

- Some chemical substances are prohibited, e.g. “The product must not contain ingoing substances that are classified according to CLP Regulation (No) 1272/2008 (e.g. carcinogenic, and mutagenic substances);
- There are restrictions on the maximum amounts allowed in the paint (e.g. there is a limit value of maximum 9.0% of environmentally hazardous substances for indoor paints, which have to be calculated by a specific formula; or the concentration limit for isothiazolinones is 500 ppm (0.0500% w/w);
- Quality requirement: White paints and light-coloured paints are required to have a spreading rate of at least 8 m² per litre of product (other paint types have other required spreading rates);
- Quality requirement: “Only Wet Scrub Resistance class 1 and 2 ecolabelled paints may claim wet scrub resistance on the label or other marketing documentation.”

The example of paints indicates why using a functional unit is relevant. When the restrictions on some chemical substances are based on w/w%, it means, that in practice, the “functional unit” is weight, with regard to this requirement. If paint A contains 10% of chemical X, it cannot obtain the Nordic Swan Ecolabel, but paint B, that contains 8% can, although the durability of paint A could be twice as high as paint B, and thereby reducing the total consumption of chemical X, seen over 50 years. Not using a functional unit, but rather kg, might cause misleading results. Furthermore, the expected time period included has implications: A shorter assumed time period would mean that paint is used more often and some of the environmental impacts relevant only in the first years of a painted wall (evaporation of toxic substances) become more important.

3.5.3 Paper and paper products

For intermediate paper and paper products, the Swan and the PEFCR base their calculations on the same unit: one tonne of pulp or one tonne of paper. Neither of them defines the “functional unit” in relation to the final use of the paper. The PEFCR is not for a final product category but is considered an “intermediate product” that can fulfil multiple functions, and therefore a declared unit is used, according to the PEF methodology.¹²⁷

Accordingly, the two schemes use the same approach for the product category *intermediate paper and paper products* (Table 13).

¹²⁷ EC, 2017, p. 28.

Table 13: Functional units – and other units used as the basis for environmental assessments and comparisons – Paper products

The Nordic Swan Ecolabel	The PEF
No functional unit is defined. However, some of the requirements are calculated per one tonne of pulp or one tonne of paper.	One tonne (1,000 kg) of saleable [graphics, packaging papers or tissue] paper at the paper mill's gate.

3.5.4 Rechargeable batteries and portable chargers

The functional units for rechargeable batteries and portable chargers are described in Table 14.

Table 14: Functional units – and other units used as the basis for environmental assessments and comparisons – Rechargeable batteries

The Nordic Swan Ecolabel	The PEF
<p>Rechargeable batteries and portable chargers</p> <p>A functional unit is not defined. The function is defined in the background document as: "To store energy and provide a portable source of power to charge drained electronic devices."¹</p>	<p>High specific energy rechargeable batteries for mobile applications</p> <p>The functional unit (FU) for rechargeable batteries is defined as 1 kWh (kilowatt-hour) of the total energy provided over the service life by the battery system (measured in kWh). Description of service: The function of the high specific energy rechargeable batteries used in mobile applications is to supply an electrical current at a desired voltage range. The rechargeable battery provides the main storage of energy for mobile applications.</p> <ul style="list-style-type: none"> – <i>What?</i> Electrical energy, measured in Wh or kWh (current and voltage during a unit of time); – <i>How much?</i> 1 kWh of the total energy delivered over the service life (number of Wh, obtained from the number of cycles multiplied by the amount of delivered energy over each cycle); – <i>How well?</i> The maximum specific energy (measured in Wh/kg). Specific product standards and technical properties of high specific energy rechargeable batteries PEF must be declared according to the PEF documentation; – <i>How long?</i> The amount of cumulative energy delivered over service life of high specific energy rechargeable batteries (number of Wh, obtained from the number of cycles multiplied by the amount of delivered energy over each cycle). The time required to deliver this total energy is not a significant parameter of the service. <p><i>The reference flow</i> is the amount of product needed to fulfil the defined function and is measured in <i>kg of battery per kWh of the total energy required by the application over its service life</i>.</p> <p>Calculation: $Qua = E_{dc} \times N_c \times Acc$</p> <p>Example: E_{dc} = Energy delivered per cycle = 0,045 kWh/cycle N_c = Number of cycles = 400 cycles Acc = Average capacity per cycle 80% Qua = Quantity of functional unit = 14,4 kWh over service life per battery.</p>

Source: ¹Nordic Ecolabelling, 2018b, p. 16.

For Rechargeable batteries, the Swan has not included a functional unit, which works, as long as the requirements are “restrictions”, such as:

- “The plastic may not be chlorinated plastic.”
- “Cadmium and lead must not be actively added to the plastic in the casing.”
- “Chloro-paraffins must not be actively added to the plastic in the casing.”
- “The following flame retardants must not be added to the plastic in the casing...”

For other requirements, the lack of relating the requirements to a functional unit might lead to an “unfair comparison”, because the lifetime of the battery is not included.

An example is requirement number O2:

Figure 6: Metal content of batteries

Metal content of batteries

The metal content of the battery may not exceed the following limits:

Metal	Content
Mercury	< 0.1 ppm
Cadmium	< 5.0 ppm
Lead	< 5.0 ppm

Note: Nordic Ecolabelling, 2018a, requirement O2

If battery A contains 4.8 ppm Cadmium (and has a lifetime of 180 cycles), it can be awarded a Swan Ecolabel.

Battery B, however, contains 5.1 ppm Cadmium, and has a lifetime of 300 cycles, it cannot be awarded a Swan Ecolabel, although the consumption of Cadmium per cycle is less than for battery A

The example is simplified, as we do not know if the increased amount of Cadmium leads to extended lifetime. The simplified example is included in order to illustrate that including lifetime and a functional unit for comparison are important.

For most of the criteria for batteries, the lack of defining a functional unit is not a problem due to the way the requirements are set.

Moreover, the Swan partly compensates for the lack of functional units by setting strict requirements on the endurance of the batteries in requirement O9 Electrical testing, by defining a minimum “Endurance in cycles”. If the requirements regarding the “Endurance in cycles” sets a limit only including “top performance batteries” it will solve the problem mentioned in the example above.

Table 15: Endurance in cycles for cylindrical cells dimensionally interchangeable with primary batteries

Type of cell	Stated capacity	Total number of cycles
LR 03 AAA	< 800 mAh	≥ 350
LR 03 AAA	≥ 800 mAh	≥ 175
LR 06 AA	< 2,100 mAh	≥ 350
LR 06 AA	≥ 2,100 mAh	≥ 175
LR 14 C		≥ 350
LR 20 D		≥ 350

Note: Source Nordic Ecolabelling, 2018b, requirement O9

3.5.5 Conclusions regarding functional units

The PEFCRs, with the exception of intermediate products, define a functional unit as a basis for analysis. The Swan product groups analysed here, do not define a functional unit, for the most part. For broad product groups, such as “textiles, hides, skins and leather” one functional unit may not cover it sufficiently. There is less difference in the approaches for intermediate products; given the narrower product and life cycle scope.

The Swan background documents in some cases describe the function of the product and explain why it is not meaningful to use a functional unit approach. For example, the Swan criteria for chemical building products explained that it is only meaningful to define a functional unit (per m²) for setting criteria related to emissions and quality. The challenges related to defining the functional unit is partly related to the discussion on the scope of product category, i.e. how broad or narrow the scope of the product category is.

The Swan has solved the problem by setting requirements that are restrictions or requirements of certain characteristics of the material or product. This approach is not directly applicable to the PEFCRs, as they can only include other aspects under “additional environmental information”.

3.5.6 Implications regarding functional units

The implications of the differing approaches concerning functional unit are at least two-fold. Firstly, as the functional unit defines the basis for the comparison, any differing results in terms of the environmental impacts highlighted by the two schemes may relate to the functional unit and this should be among the first items to be checked for possible reasons. Using different functional units may give different results.

Secondly, the case studies showed a potential difference in the approach to “quality”. Quality is considered in a functional unit by answering the question “how well?”. The example of the T-shirts case shows that the functional unit, as defined by the PEF in the current version of the PEFCR, does not take the “quality” into account (which is actually a must when defining the functional unit). The Swan places concrete criteria for enhancing quality.

There may be opportunities for collaboration and alignment both ways when it comes to the functional unit. It might not be possible to use the specifications of the

Swan in the definition of the functional unit for T-shirts, but it could be used as guidance for setting requirements to factors that have large environmental impacts. At the current stage (right after the finalisation of the pilot), the PEFCR for textiles includes benchmark values for all the environmental impacts for average products, but there are not specifications regarding quality, and the authors point out that it is difficult to define the "lifetime" for textiles. Maybe, in the future, the updated PEFCR for textiles could include the semi-quantitative approach to quality aspects from the Swan for determining products above or below average quality. This would require either cooperation between the experts from the Swan and PEF, or that PEFCR includes aspects from the Swan background document when developing the next version of the PEFCR for textiles. The example for paint shows, that maybe the Nordic Swan Ecolabel could benefit from using parts of the PEFCR (by taking the functional unit into account – if needed, defined per "substrate" e.g. wood).

3.6 Significant environmental aspects

3.6.1 Approach for identifying significant environmental aspects

Both of the two schemes address multiple environmental aspects. For each product category, both schemes identify the most significant environmental aspects.

The Nordic Swan Ecolabel identifies "the most important environmental issues", based on a combination of the RPS (relevance, potential and steerability) in combination with information from a qualitative/quantitative mix MECO assessment and available LCAs for products related to the product category. The Swan's goals and principles (2014) define environmental aspects but are more flexible about the analysis, taking into consideration non-quantifiable environmental issues, emerging environmental issues and quality and social issues as well as other relevant issues. The development of criteria includes: "choice of raw materials, use of hazardous chemicals, use of energy and resources, emissions to all kind of recipients, health aspects, noise and waste treatment associated with production, transport and final disposal, the product's lifespan and whether it can be repaired, the extent to which it can be reused and recycled, as well as environmental principles, such as the precautionary and substitution principle".¹²⁸

PEF operates with "midpoint indicators", which are indicators for the *potential* risks to human health, natural environment and natural resources, which are the areas we are aiming to protect. The PEFCRs define which "most relevant impact categories" (accounting for at least 80% of the overall product environmental impact) need to be addressed by the user. According to the PEFCR Guidance document (2017), the most important impact categories are selected from 16 predefined impact categories (13 when toxicity related impact categories are excluded), accounting for at least 80% of

¹²⁸ NCM, 2014b, p. 3.

the environmental impacts from the entire life cycle of the representative product.¹²⁹ The assessment of identifying the most important impact categories must be based on the normalised and weighted results of the representative product(s). At least three relevant impact categories must be considered. The Technical Secretariats are in a position to include requirements for “additional environmental information” on those aspects that are currently not quantifiable, such as toxicity or biodiversity.¹³⁰ The impact categories included in the PEFCR Guidance document (2017) are:

- Climate change
- Ozone depletion
- Particulate matter
- Ionising radiation, human health
- Photochemical ozone formation, human health
- Acidification
- Eutrophication, terrestrial
- Eutrophication, freshwater
- Eutrophication, marine
- Land use
- Water use
- Resource use, minerals and metals
- Resource use, fossil.

There are three toxicity-related impact categories that are currently are being further developed:

- Human toxicity, cancer
- Human toxicity, non-cancer
- Ecotoxicity, freshwater.

One of the main current differences in the environmental aspects is the approach to chemicals-related issues. The Nordic Swan criteria include a significant number of requirements linked to reducing the hazards related to chemicals.

According to the PEFCR Guidance document (2017), the three toxicity-related impact categories are temporarily excluded from the procedure to identify the most relevant impact categories, life cycle stages, processes and elementary flows.¹³¹ This

¹²⁹ EC, 2017, p. 50.

¹³⁰ EC, 2017, p. 88, section “2.12 Biodiversity” and p. 206, section “B.7.4 Additional environmental information” and section “B.7.5 Other impact results”.

¹³¹ EC, 2017. The PEFCR Guidance document (2017) p. 47.” “The three toxicity-related impact categories are temporarily excluded from the procedure to identify the most relevant impact categories, life cycle stages, processes and elementary

decision is reconsidered after the finalisation of work done on developing new characterisation factors based on REACH data.¹³²

Table 16: Toxicity-related impact categories during the pilot and transition phases, adapted from the PEFCR Guidance document, p. 47

How is toxicity included?	How is toxicity excluded?
Characterised results for the three toxicity impact categories are calculated.	Toxicity impact categories are excluded from the procedure to identify the most relevant impact categories, life cycle stages, processes and elementary flows.
Results of the characterisation are included in the PEF report	Characterised results are not presented in the benchmark values Toxicity impact categories are not used for any communication purposes

3.6.2 Comparison of case studies

The comparison here focuses on:

- “The most relevant impact categories and life cycle stages” (and processes) identified in selected case studies for the PEFCRs.

compared to:

- “The most important and included environmental issues (“hotspots”)” from the Nordic Swan Ecolabel, expressed as criteria and requirements. It is important to note that there may be “hotspots” that the Swan considers important that are not included in the criteria. In this comparison we focus on those aspects that are included in the criteria documents.

The case studies include the following product categories:

- Rechargeable Batteries
- Paint
- Textiles
- Intermediate Paper.

flows. This decision will be reconsidered at the end of the transition phase (2020), after the finalisation of the ongoing work done in collaboration between the Commission and ECHA agency in Helsinki on developing new CF based with REACH data.”

¹³² EC, 2017, p. 47.

3.6.3 Significant environmental aspects related to rechargeable batteries

The Nordic Swan Ecolabel criteria for *Rechargeable Batteries and Portable Chargers* were updated in June 2018. The PEFCR on *High Specific Energy Rechargeable Batteries for Mobile Applications* was published in February 2018. The PEFCR is mentioned in the background documents for the Nordic Swan Ecolabel criteria, however, as there are only a few months from the publication of the PEFCR and the Nordic Swan Ecolabel criteria, it is not clear to which degree it has been possible for the Nordic Ecolabelling to include the results from the PEFCR in the Swan ecolabel criteria.

The most relevant impact categories identified in the PEFCR for rechargeable batteries are:

- Climate change
- Resource use, fossils¹³³
- Resource use minerals and metals
- Particulate matter.¹³⁴

In addition to these, the most relevant impact categories for the sub-category Ni-MH batteries also include:

- Acidification.

In Table 17, the significant environmental aspects, life cycle stages and processes identified by the two schemes are compared using:

- Rechargeable Batteries – all the mentioned aspects are from page 42–46 in European Commission (EC) (2018a). PEFCR – Product Environmental Footprint Category Rules for High Specific Energy Rechargeable Batteries for Mobile Applications;
- Nordic Ecolabelling (2018a). Nordic Ecolabelling for Rechargeable batteries and portable chargers. Version 5.0, 15 June 2018–30 June 2023. *Criteria document*.

¹³³ In the PEFCR for High Specific Energy Rechargeable Batteries for Mobile Applications, this category is called "Resource use, energy carriers". The PEFCR Guidance document (2017) v. 6.3, the impact category is called "Resource use, fossil fuels".

¹³⁴ In the PEFCR for High Specific Energy Rechargeable Batteries for Mobile Applications, this category is called "respiratory inorganics". In the PEFCR Guidance document (2017) v. 6.3, the impact category is called "Particulate matter".

Table 17: Significant identified environmental aspects included in the PEFCR and the Nordic Swan Ecolabel for rechargeable batteries (the four sub-categories are merged)*

	Raw material acquisition	Production of main product	Product distribution	Use stage	End-of-Life
PEF	Climate change				
	Charger**	Electricity		Electricity	Cobalt Ferronickel Aluminium
	Safety management unit**				
	LiCoO				
	Nickel				
	Lithium				
	Nickel				
	Manganese				
	Cobalt Oxide				
	Rare earth concentrate				
	Methylpyrrolidone production				
	Aluminium				
	Thermal management unit**				
Swan				Quality of the battery charger ³	
PEF	Resource use, fossils²				
	Charger**	Electricity		Electricity	Cobalt Ferronickel Aluminium
	Safety management unit**				
	LiCoO				
	Nickel				
	Lithium				
	Manganese				
	Cobalt Oxide				
	Rare earth concentrate				
	Methylpyrrolidone production				
	Aluminium				
	Thermal management unit**				
Swan				Quality of the battery charger ³	
PEF	Resource use, minerals and metals				
	Charger**				Copper Cobalt Ferronickel
	Safety management unit**				
	Copper				
	LiCoO				
	Nickel				
	Lithium				
	Manganese				
	Cobalt Oxide				
	Metal content (Mercury, Cadmium and Lead) ⁴				Recyclable design of the portable charger ⁵
	Critical raw materials ⁶				
Swan					

	Raw material acquisition	Production of main product	Product distribution	Use stage	End-of-Life
	Particulate matter⁷				
PEF	Charger ** Safety management unit* LiCoO Nickel Lithium Manganese Cobalt Oxide LiNiMnCoO ₂ Copper Rare earth concentrate Methylpyrrolidone production LiMn	Electricity		Electricity	Nickel Cobalt Ferronickel
Swan				Quality of the battery charger ⁸	
	Acidification⁹				
PEF	Nickel Charger*				Nickel
Swan					
	Toxicity				
PEF					
Swan				Plastic and metal in the casing ¹⁰	
	Corporate social responsibility				
PEF					
Swan	Sourcing of "conflict-free" minerals ¹¹				
	Working conditions				
PEF					
Swan	Working conditions ¹²				
	Safety				
PEF					
Swan				Battery safety and Portable charger safety (fire, overheating etc.) ¹³	

Note: Blocks marked in italics and blue mean that this part is covered by both schemes, at least to some extent.

* In the PEFCR, rechargeable batteries are divided into sub-categories of battery types. The overall conclusions regarding the most significant environmental aspects are based on all sub-categories.

** When "charger", "safety management unit" or "thermal management unit" is stated it means processes in the life cycle of these. No details are stated.

Source: ¹ Requirement 013 in the Nordic Swan Ecolabel: Quality of the battery charger. Amongst other requirements: the charger must automatically stop charging when the battery is fully charged. This saves energy (i.e. electricity).

² In the PEFCR for High Specific Energy Rechargeable Batteries for Mobile Applications, this category is called "Resource use, energy carriers". In the PEFCR Guidance document (2017) v. 6.3, the impact category is called "Resource use, fossils".

³ Requirement 013 in the Nordic Swan Ecolabel: Quality of the battery charger. Amongst other requirements: the charger must automatically stop charging when the battery is fully charged. This saves energy (i.e. electricity).

⁴ Requirement 02 in the Nordic Swan Ecolabel: Restrictions on the metal content of batteries. Maximum limits for metal content of batteries – mercury (< 0.1 ppm), cadmium (< 5.0 ppm), and lead (< 5.0 ppm). (Which is significantly stricter than the EU's Battery Directive 2006/66/EC (permits mercury < 5 ppm and cadmium < 20 ppm). In addition, requirements regarding test methods. Background for requirement 02: Toxicity.

⁵ Requirement 15 in the Nordic Swan Ecolabel: Recyclable design of the portable charger. Design for recycling.

⁶ Requirement 06 in the Nordic Swan Ecolabel: Sourcing of critical raw materials. Background: The licensee must have a policy for the use of raw materials included in the EU's list of critical raw materials (i.e. to phase out the use of critical raw materials, recycling initiatives and minimize the use of critical raw materials in the future. On the list is, amongst others, are cobalt and rare earth elements.

⁷ In the PEFCR for High Specific Energy Rechargeable Batteries for Mobile Applications, this category is called "respiratory inorganics". In the PEFCR Guidance document (2017) v. 6.3, the impact category is called "Particulate matter".

⁸ Requirement 013 in the Nordic Swan Ecolabel: Quality of the battery charger. Amongst other requirements: the charger must automatically stop charging when the battery is fully charged. This saves energy (i.e. electricity).

⁹ For PEF: only for the sub-category "NiMH battery".

¹⁰ Requirement 03 in the Nordic Swan Ecolabel: Requirements applicable to plastic and metal in the casing of the battery charger and in the outer casing/container that encircles the batteries/cells in the portable charger. Requirements are related to substances that may have impact on the user. Toxicity.

¹¹ Requirement 05 in the Nordic Swan Ecolabel: The licensee must have a public conflict minerals policy and support the responsible sourcing of tin, tantalum, tungsten, gold, cobalt and their ores from conflict-affected and high-risk areas. Background for requirement: cobalt is primarily used in Lithium-ion and NiMH-batteries in the cathode chemistries and in battery cans (nickel cobalt plated steel).

¹² Requirement 07 in the Nordic Swan Ecolabel: Working conditions.

¹³ Requirement 011 and 012 in the Nordic Swan Ecolabel: Battery Safety and Portable Charger Safety.

As can be seen in Table 17, the most relevant environmental aspects identified by the PEFCR are to some extent different to the relevant aspects covered by the Nordic Swan Ecolabel criteria. The overlapping environmental aspects are marked in italics. The differences are caused by the different approaches to identifying which environmental aspects to focus on.

In addition, the Nordic Swan Ecolabel has introduced a new requirement: "O10 Charged battery: The battery must be fully charged when it leaves the production site." The background to the requirement is that one of the reasons for the consumer's purchase of primary batteries is that they are ready for use right away. This requirement ensures that consumers have the same experience when purchasing rechargeable batteries. This is an example of showing that the "qualitative approach" behind the Nordic Swan Ecolabel can achieve significant results, which might not be identified by the LCA method behind the PEF method.

3.6.4 *Paints*

For the comparison of the included environmental aspects of paints, it should be emphasized that the PEFCR and the Nordic Swan Ecolabel criteria documents do not cover exactly the same product categories. The PEFCR for decorative paints has four sub-categories:

- Indoor wall paint (substrate: mineral)
- Indoor wood paint (substrate: wood)
- Outdoor wall paint (outdoor mineral wall paint)
- Outdoor wood paint (exterior trim and cladding paints for wood).

The Nordic Swan Ecolabel has criteria for:

- indoor paint and varnishes (indoor decorative paints and varnishes, wood-stains and related products intended for use by consumers and professional users);
- chemical building products, which is a broader product group, which, amongst other products, includes covers adhesives, sealants, fillers, outdoor paints and varnishes, paints and varnishes for industrial application, and primers to these.

In the PEFCR for decorative paints, *the most relevant impact categories* identified to be:

- Climate change
- Particulate matter
- Acidification
- Photochemical ozone formation
- Resource use, fossils.

The most relevant life cycle stages combined with the most relevant impact categories according to the PEFCR as well as the environmental aspects, represented by ecolabel criteria, are shown in Table 18. The table is merged from the conclusions from the sub-categories.¹³⁵ As the requirements in the Nordic Swan Ecolabel for chemical building products are rather similar to the requirements for indoor paint and varnishes, from an overall perspective (i.e. the focus on substances that can harm human health), the requirements for indoor paints and varnishes are not listed in Table 18.

Table 18: Significant identified environmental aspects included in the PEFCR and the Nordic Swan Ecolabel for paint (the sub-categories are merged)

	Raw material acquisition	Production of main product	Product distribution	Use stage	End-of-Life
	Climate change				
	Titanium dioxide production	Electricity	Thermal energy from natural gas	Application of paint	Waste incineration of paint
PEF	Styrene acrylate dispersion			Passenger car*	Landfill of municipal solid waste
	Propylene glycol production				
Swan	Paint additives				
	Alkyd resin (sunflower oil)				
	Resource use, fossils				
	Titanium dioxide production	Electricity		Passenger car*	
PEF	Styrene acrylate dispersion				
	Paint additives				
Swan	Alkyd resin (sunflower oil)				
	Propylene glycol production				
	Particulate matter				
	Titanium dioxide production			Passenger car*	
PEF	Styrene acrylate dispersion				
	Propylene glycol production				
Swan	Paint additives				
	Alkyd resin (sunflower oil)				
	Acidification				
	Titanium dioxide production			Passenger car*	
PEF	Styrene acrylate dispersion				
	Alkyd resin (sunflower oil)				

¹³⁵ Further details can be found in The PEFCR Guidance document (2017), pp. 29–33.

	Raw material acquisition	Production of main product	Product distribution	Use stage	End-of-Life
Swan	<i>Titanium dioxide production¹</i>				
	Photochemical ozone formation				
PEF	Titanium dioxide production			<i>VOC emissions (application)</i>	
	Styrene acrylate dispersion			Passenger car*	
Swan	Alkyd resin (sunflower oil)			<i>Max content of VOCs²</i>	
	Ozone depletion				
PEF					
Swan				If containing substances that are hazardous to the ozone layer, the paint cannot be ecolabelled. ³	
	Waste				
PEF					
Swan	Restrictions on waste from the Titanium dioxide production ⁴				
	Toxicity				
PEF					
Swan		If containing substances classified as toxic, carcinogenic, mutagenic, toxic for reproduction, etc. the paint cannot be ecolabelled. ⁵	If containing substances classified as toxic, carcinogenic, mutagenic, toxic for reproduction, etc. the paint cannot be ecolabelled.	If containing substances classified as toxic, carcinogenic, mutagenic, toxic for reproduction, etc. the paint cannot be ecolabelled.	
	Working conditions, safety, human health				
PEF					
Swan		Requirement: "Low-dust" working environment for handling raw materials in powder form. ⁶		If containing substances classified as harmful to health, the paint cannot be ecolabelled (see note above).	
	Other				
PEF					
Swan	Nanoparticles ⁷				

Note: Blocks marked in italics and blue mean that this part is covered by both schemes, at least to some extent.

* "Passenger cars" correspond to environmental impacts caused by transport in a passenger car (activities related to the application: e.g. going to the shop, having meetings with a professional painter and finally selecting and getting the materials to do the work). The total average distance travelled for these activities is 60 km by car, according to the PEF CR. It is calculated under the "use stage", although according to the guidance it should be calculated under "product distribution. This will be updated in a next version of the PEF CR (EC 2018d, p. 26).

Source: ¹ Requirement 09 in the Nordic Swan Ecolabel for Indoor paint and varnishes: If the product contains more than 3.0% by weight titanium dioxide, there are requirements to SOX emissions and production of waste from the production of titanium dioxide.

² Requirement 13 in the Nordic Swan Ecolabel for Indoor paint and varnishes: Limits for the content of Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs).

³ Requirement 02 in the Nordic Swan Ecolabel for Indoor paint and varnishes: Products classified as Hazardous to the ozone layer cannot be ecolabelled.

⁴ Requirement 09 in the Nordic Swan Ecolabel for Indoor paint and varnishes: If the product contains more than 3.0% by weight titanium dioxide, there are requirements to waste from the production of titanium dioxide.

⁵ Requirements in the Nordic Swan Ecolabel for Indoor Paint And Varnishes: Requirement 02 Products classified as classified as harmful, very toxic, toxic, harmful to health, corrosive, sensitising, carcinogenic, mutagenic, toxic for reproduction, explosive, oxidising and/or highly flammable cannot be ecolabelled. The criteria document exempts chemicals classified as leading to an "allergic reaction", if it is due to the content of preservatives, if these substances are considered necessary preservatives. In addition to this, requirement 03 sets restrictions on the classification of ingoing substances (e.g. carcinogenic, mutagenic, toxic for reproduction etc.). Furthermore, requirement 04 sets concentration limits and multiplying factors for substances classified as H410 (toxic to aquatic organisms). Moreover, requirement 05 sets restrictions on added preservatives, e.g., "No preservatives added to the product or its raw materials may be bioaccumulative.", requirement 06 contains restrictions regarding formaldehyde, requirement 08 sets restrictions regarding heavy metals, requirement 12 sets restrictions on a row of other substances that might have various impacts on human health, requirement 14 sets requirements on volatile aromatic hydrocarbons.

⁶ Requirement 10 in the Nordic Swan Ecolabel for Indoor Paint and Varnishes: Substances in powder form must be added in a closed system that ensures a "low-dust" working environment.

⁷ Requirement 11 in the Nordic Swan Ecolabel for Indoor Paint and Varnishes: Nanoparticles are not permitted in the product. Background: There remains a great deal of uncertainty about how nanoparticles affect health and the environment.

The Swan criteria for indoor paint include requirements, restrictions ("the product must not contain") or concentration limits. Furthermore, there are requirements, which relate to "quality aspects":¹³⁶

- White pigment content (indirectly related to the functional unit defined in the PEF)
- Wet scrub resistance
- Spreading rate (indirectly related to the functional unit defined in the PEF)
- Resistance to water
- Adhesion
- Abrasion (for floor paints and floor coatings).

The Swan thereby includes environmental aspects that are currently not covered by the PEFs, including toxic substances and nanoparticles. PEF, on the other hand, also includes environmental aspects, that are not covered by the Swan.

In the longer run, toxicity impact categories will be included in the PEF method. However, an LCA will only "catch" toxic substances, if there are characterisation factors for these, and as there are thousands of chemicals, it might be a challenge to make sure that they are all included (which requires that the PEF is able to find/develop factors for all the relevant chemicals).

¹³⁶ Nordic Ecolabelling, 2018k, p. 25–28.

The conclusion is that for paints, the differences with regard to “the most relevant impact categories and life cycle stages” in the PEFCR and the “the most important environmental issues” selected by the Nordic Swan Ecolabel might lead to different results when determining which products are “the best performing products” with regard to environment.

3.6.5 Textiles/T-shirts

The case study on textiles/T-shirts compared the PEFCR on T-shirts¹³⁷ with the Nordic Swan Ecolabel for textiles, hides/skins and leather,¹³⁸ with a focus on the textiles part of the criteria.

The PEFCR is sub-divided into sub-categories (corresponding to different sizes of T-shirts). In this comparison, the conclusions from these have been merged.

The most relevant impact categories for T-shirts in the PEFCR are:

- Acidification (terrestrial and freshwater)
- Climate Change
- Resource use, energy carriers
- Respiratory inorganics
- Water scarcity
- Freshwater eutrophication
- Marine eutrophication.

The most relevant processes within each of these impact categories are shown in Table 19 below. *The overview does not contain a full list of all Swan criteria; it only includes the ones considered relevant for the purpose of the comparison.* The Swan criteria include many quality requirements, and these are not listed in the table, but are addressed in the text.

Table 19: Identified significant environmental aspects included in the PEFCR and the Nordic Swan Ecolabel. PEFCR: T-shirts. Nordic Swan: Textiles

	Raw material acquisition	Production of main product	Product distribution	Use stage	End-of-Life
	Acidification				
	Cotton fibres	Spinning, production of cotton yarn (combed)	Passenger car (transport by customer)	Electricity (washing)	
PEF		Spinning, production of cotton yarn (carded)			
		Circular knitting			
		Fabric dyeing			
		Yarn dyeing			
		T-shirt assembly			

¹³⁷ EC., 2019d). Product Environmental Footprint Category Rules (PEFCR). T-shirts.
¹³⁸ Nordic Ecolabelling (2018k). About Nordic Ecolabelled Textiles, hides/skins and leather.

	Raw material acquisition	Production of main product	Product distribution	Use stage	End-of-Life
Swan	Polyamide: max emissions of N ₂ O ¹	Energy consumption for each wet treatment process must be stated. ²			
	Climate change				
PEF	Cotton fibres	Spinning, production of cotton yarn (combed) Spinning, production of cotton yarn (carded) Circular knitting Fabric dyeing Yarn dyeing T-shirt assembly	Passenger car (transport by customer)	Electricity (washing)	
Swan		Energy consumption for each wet treatment process must be stated. ³			
	Resource use, fossil fuels ⁴				
PEF	Cotton fibres	Spinning, production of cotton yarn (combed) Spinning, production of cotton yarn (carded) Fabric dyeing Yarn dyeing T-shirt assembly	Passenger car (transport by customer)	Electricity (washing) Electricity (drying)	
Swan		Energy consumption for each wet treatment process must be stated. ⁵			
	Particulate matter ⁶				
PEF	Cotton fibres	Spinning, production of cotton yarn (combed) Spinning, production of cotton yarn (carded) Spinning, production of polyester filament Circular knitting Fabric dyeing T-shirt assembly			
Swan		Energy consumption for each wet treatment process must be stated. ⁷			
	Water scarcity				
PEF	Cotton fibres			Tap water (washing)	
Swan		Water consumption for each wet treatment process must be stated. ⁸			
	Freshwater eutrophication				
PEF	Cotton fibres	Yarn dyeing, fabric dyeing and apparel dyeing, including de-sizing			
Swan	Organic cotton	Biodegradability of detergents and process chemicals ⁹ Limitations of COD emissions from wet processes ¹⁰			
	Marine eutrophication				
PEF	Cotton fibres	Spinning, production of cotton yarn (combed) Spinning, production of cotton yarn (carded) Circular knitting Fabric dyeing Yarn dyeing T-shirt assembly		Electricity (washing) Treatment of residential wastewater	
Swan		Biodegradability of detergents and process chemicals Limitations of COD emissions from wet processes			

	Raw material acquisition	Production of main product	Product distribution	Use stage	End-of-Life
Photochemical ozone formation					
PEF		Coating or lamination processes: Max on VOC emissions ¹¹ VOC in printing pastes ¹² Polymerisation and spinning of polyester fibre: Requirements for VOC emissions ¹³			
Swan					
Toxicity					
PEF	Cotton: More than 10% organic cotton (will reduce use of pesticides) ¹⁴ Flax, bamboo and other bast fibres must only be farmed with pesticides allowed ¹⁵ Wool: Max amount of harmful chemicals ¹⁶ Elastane: Requirements regarding chemicals ¹⁷ Polyester: Requirements regarding chemicals ¹⁸ Polypropylene: Lead-based pigments not allowed ¹⁹ Regenerated cellulose fibres: Chlorine gas must not be used for bleaching ²⁰ Viscose: Requirements regarding emissions of sulphur, zinc and copper ²¹	Textile chemicals: Long list of chemicals that are restricted ²² Acrylic: Requirements regarding acrylonitrile content in raw fibres and emissions of acrylonitrile into the air (during polymerisation and spinning of fibre etc.). ²³			
Swan					
Working conditions, safety, human health					
PEF		Working environment related to solvents from silicone treatment. ²⁴			
Swan					
Other					
PEF	Flax, bamboo and other bast fibre: Water retting is only allowed if a minimum of COD or TOC is removed. ²⁵ Wool: Restrictions on COD, pH and temperature for scouring effluent (waste-water) ²⁶ Mulesing of sheep is not permitted ²⁷ Bamboo used for regenerated cellulose fibres: Traceability for the origin of wood and fibre raw materials, written procedure regarding protected areas, illegally harvested raw materials and GMOs. ²⁸	Effluent from all wet processes: requirements regarding COD, pH and temperature for effluent (waste-water). ²⁹	Packaging of PVC not allowed ³⁰		
Swan					

Note: Blocks marked in italics and blue mean that this part is covered by both schemes, at least to some extent.

Source: ¹Requirement 09 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. Polyamide: Emissions of nitrogen dioxide (N₂O) into the air from the production of monomers must not exceed 10 g/kg of produced polyamide 6 fibre, and 50 g/kg of produced polyamide 6.6 fibre.

²Requirement 63 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. The consumption of electricity (in kWh) and fuel as well as water consumption (in litres) for each wet treatment must be stated. The data must also

contain information on the amount of fibre/textile which is treated in kg.

³ Requirement 63 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. The consumption of electricity (in kWh) and fuel as well as water consumption (in litres) for each wet treatment must be stated. The data must also contain information on the amount of fibre/textile which is treated in kg.

⁴ In the PEFCR, this category is called "Resource use, energy carriers". In the PEFCR Guidance document (2017) v. 6.3, the impact category is called "Resource use, fossils".

⁵ Requirement 63 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. The consumption of electricity (in kWh) and fuel as well as water consumption (in litres) for each wet treatment must be stated. The data must also contain information on the amount of fibre/textile which is treated in kg.

⁶ In the PEFCR, this category is called "respiratory inorganics". In the PEFCR Guidance document (2017) v. 6.3, the impact category is called "Particulate matter".

⁷ Requirement 63 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. The consumption of electricity (in kWh) and fuel as well as water consumption (in litres) for each wet treatment must be stated. The data must also contain information on the amount of fibre/textile which is treated in kg.

⁸ Requirement 63 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. The consumption of electricity (in kWh) and fuel as well as water consumption (in litres) for each wet treatment must be stated. The data must also contain information on the amount of fibre/textile which is treated in kg.

⁹ Requirements O29, and O37 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather.

¹⁰ Requirement O60 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather.

¹¹ Requirement 53 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. VOC emissions into the air during the coating or lamination process must not exceed 10 g C/m².

¹² Requirement 54 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. Printing pastes must not contain more than 5% volatile organic compounds (VOC), such as mineral turpentine.

¹³ Requirement 10 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. Polyester. VOC emissions during polymerisation and fibre production, measured in the process steps where this occurs, including diffuse emissions, must not exceed 1.2 g/kg produced polyester resin.

¹⁴ Requirement 03 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. At least 10% of the weight of the cotton must be organically farmed or armed during a transition to organic farming.

¹⁵ Requirement 04 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. Flax, bamboo and other bast fibres must only be farmed with pesticides allowed used in EU Regulation 1107/2009.

¹⁶ Requirement 05 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. Wool and other keratin fibres (wool from sheep, camel, alpaca and goats). The total content of specified chemicals must not exceed 0.5 ppm. The reason behind this is: "To prevent the animals being exposed to a range of problematic substances".

¹⁷ Requirement 08 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. Elastane: Organotin compounds must not be used. Emissions into the air of aromatic diisocyanates during polymerisation and fibre production must be less than 5 mg/kg produced fibre. N,N – Dimethylacetamide (DMAc, case no 127-19-5) may not be used in elastane production.

¹⁸ Requirement 10 in the Nordic Swan Ecolabel for Textiles hides/skins and leather. Polyester. The amount of antimony in polyester fibres measured as an annual average must not exceed 260 ppm + requirements for test.

¹⁹ Requirement 11 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. Polypropylene. Lead-based pigments must not be used.

²⁰ Requirement 12 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. Regenerated cellulose fibres: Chlorine gas must not be used when bleaching cellulose mass or cellulose fibres.

²¹ Requirement 13, 14 and 15 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. Viscose: The sulphur content of the emissions of sulphur compounds into the air must not exceed 120 g S/kg of filament fibre and 30 g/kg of staple fibre produced. Emissions of zinc into water must not exceed 0.3 g Zn/kg of regenerated cellulose. The copper content of the effluent from the plant that produces cupro fibres must not exceed 0.1 ppm, expressed as an annual average.

²² Requirement 024, 025, 026, 027, 028, 029, 030, 031, 032, 033, 034, 035, 036, 037, 038, 039, 048, 052, 055, 056, 058, 067 and 068 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. Textile Chemicals. A number of requirements related to textile chemicals.

²³ Requirement 07 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. Acrylic: The residual of acrylonitrile content in raw fibres from the fibre production plant must be less than 1.5 mg/kg. Emissions of acrylonitrile into the air (during polymerisation and until the solution is ready for spinning) must be less than 1g/kg of produced fibre, analysis report required.

²⁴ Requirement 57 in the Nordic Swan Ecolabel for Textiles, hides/skins and leather. If solvents are used in silicone

treatment, the manufacturer must ensure that the workers are protected from the solvents.

²⁵ Requirement 04 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. Production of flax, bamboo and other bast fibres using water retting is only allowed if the effluent from the water retting is treated so that the chemical oxygen demand (COD) or the total organic carbon (TOC) is reduced by at least 75% for hemp fibre and at least 95% for flax and other bast fibres. Test report from laboratory required.

²⁶ Requirement 06 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. Unprocessed wool and other keratin fibres: For scouring effluent treated on-site or off-site and discharged to surface waters, the COD discharged to surface waters must not exceed 20 g/kg greasy wool. water must be 6–9, and the temperature must be below 40°C.

²⁷ Requirement K83 of the Nordic Swan Ecolabel for Textiles, skins/hides and leather.

²⁸ Requirement 16 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. Traceability and certified raw materials.

²⁹ Requirement 60 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. Requirements related to COD, temperature and pH of effluent from wet processes.

³⁰ Requirement 66 in the Nordic Swan Ecolabel for Textiles, skins/hides and leather. Chlorinated plastics must not be used in packaging.

As it can be seen from Table 19, there is almost no overlap between the “most relevant impact categories and processes” identified by the PEFCR and the criteria by the Swan for textiles.

3.6.6 Intermediate Paper Products

For the comparison of requirements for paper products, it should be emphasized, that PEF contains a PEFCR for “Intermediate Paper Products”, which does NOT contain requirements for final paper products. The Swan has a “Basic Module for Paper”, in addition to which it has requirements in different criteria documents for specified final paper products. It is the requirement in this Basic Paper Module, which have been used in the comparison below. The range of other paper products is listed in table 8.

The documents, used for the comparison for intermediate paper products are:

- *PEF*: European Commission (EC) (2018e); Product Environmental Footprint (PEF) Category Rules (PEFCRs) for Intermediate Paper Products. Version number: Final draft. Date of publication: 18 October 2018. Time validity: 31 December 2020. Retrieved 15 March 2019 from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final;
- The Swan: Nordic Ecolabelling of Paper Products – Basic Module Version 2.4. 11 June 2011–31 December 2020. Aloo1, Paper products – Basic Module, Version 2.4 14 December 2017 (2017c);
- *The Swan*: Nordic Ecolabelling (2017e). About Nordic Ecolabelled Paper products – basic and chemical module. Version 2.4. Background to ecolabelling. 14 December 2017. Document: Aloo1 Paper products – Paper products – basic and chemical module, version 2.4, 14 December 2017. Background document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

The PEF product category “Intermediate Paper Product” is divided into three sub-categories:

- Graphic papers (including newsprint)
- Packaging papers
- Tissue.

The Nordic Ecolabel has a modular system for paper products, whereby the “Basic Module” contains general requirements regarding forestry management, emissions, energy use and waste disposal in regard to pulp and paper production, and the “Chemical Module” contains requirements for chemicals in the manufacture of pulp and paper. The supplementary modules contain requirements regarding specific paper products. A product must fulfil all the relevant requirements specified in the Basic Module and Chemicals Module, as well as the applicable requirements in the supplementary module.

The PEFCR requires: “All default Environmental Footprint (EF) impact categories and additional environmental information on energy, biodiversity and other parameters (Adsorbable Organic Halogens (AOX) and Chemical Oxygen Demand (COD)) shall be included”.¹³⁹ This means, that the PEFCR has included additional parameters in addition to the default environmental impact categories, defined by the PEF Guide (2017). While biodiversity is not one of the environmental impact categories of the PEF, it is included as additional environmental information in the PEFCR.¹⁴⁰

“Biodiversity is also highly relevant, although not an LCA impact category, and shall be reported as additional environmental information.”

However, the process and functional chemicals used in the pulp and paper production are omitted in the PEF, whereas in Swan there is a chemicals module that contains the general requirements in regard to the uses of chemicals in the manufacture of pulp and paper. The use of chemicals is therefore beyond the scope of this comparison, but it is recognised that their omission might be important. According to the PEFCR, the emissions from the process or functional chemicals are omitted because of the required work load to identify the chemicals as input to life cycle impact assessment purposes is unjustified.¹⁴¹

In the PEF, benchmarks are not provided for intermediate products. For this reason, there is no benchmark calculated in this PEFCR. The most relevant impact categories, life cycle stages, processes and elementary flows in the PEFCR for intermediate paper products are shown in Table 6 on page 37 in the PEFCR.

The most relevant impact categories identified in the PEFCR for intermediate paper products are:

¹³⁹ EC, 2018e, p. 2.

¹⁴⁰ EC, 2017, p.38.

¹⁴¹ EC, 2018e, p. 36.

- Climate change
- Abiotic resource depletion – fossil fuels
- Particulate Matter
- Acidification.

The PEFCR for Intermediate Paper Products only includes two life cycle stages:

- *Raw material acquisition (upstream processes)*: The production of wood, collection of recovered paper, production of energy wares, and other materials needed in the production of pulp and paper; as well as the transport of raw materials;
- *Production of the main product (core processes)*: Production of pulp, transport of pulp, and the production of paper and paperboard.

However, the life cycle stage dealing with the “production of the main product” accounts for more than 90% of the contributions to the four-most impact categories.¹⁴²

In Table 20, the significant environmental aspects identified by the two schemes are compared.

Table 20: Significant identified environmental aspects included in the PEFCR and the Nordic Swan Ecolabel for intermediate paper products

	Raw material acquisition	Production of main product	Product distribution	Use stage	End-of-Life
Climate change					
PEF		Electricity grid mix Thermal energy from fossil fuels			
Swan	CO ₂ emissions from transport of raw material to pulp mill ¹	Energy consumption CO ₂ emissions from purchased electricity and fossil fuel used for heating ²			
Resource use, fossils					
PEF		Electricity grid mix Thermal energy from fossil fuels			
Swan		Energy consumption			
Particulate matter					
PEF	Precipitated calcium carbonate PCC production** Starch production Alkyl ketene dimers (AKDs) production *	Pulp production Electricity grid mix Thermal energy from fossil fuels Transoceanic ship transport Sulphate pulp production			
Swan		Energy consumption ³			
Acidification					
PEF	Precipitated calcium carbonate PCC production** Starch production Alkyl ketene dimers (AKDs) production *	Pulp production Electricity grid mix Thermal energy from fossil fuels Transoceanic ship transport Sulphate pulp production			
Swan		Energy consumption ⁴ Emissions of S into the air ⁵			

¹⁴² EC, 2018e, p. 38, Table 7.

	Raw material acquisition	Production of main product	Product distribution	Use stage	End-of-Life
Eutrophication, aquatic					
PEF					
Swan		Emissions of P and NO _x into water/air ⁶			
Toxicity					
PEF					
Swan		Chlorine gas bleaching ⁷ Emissions of chlorate to water from chemical pulp production ⁸ .			
Biodiversity					
PEF	<i>Content of forest management certification scheme certified fibre included as additional environmental information.⁹</i>				
Swan	<i>Traceability and legality of wood and fibre raw material.¹⁰</i>				
Adsorbable organic halogens (AOX)					
PEF		<i>AOX emissions</i>			
Swan		<i>AOX emissions¹¹</i>			
Waste					
PEF					
Swan		Waste sorting ¹²			
Chemical oxygen demand (COD)					
PEF		<i>Chemical oxygen demand (COD)</i>			
Swan		<i>Chemical oxygen demand (COD)</i>			

Note: Blocks marked in italics and blue mean that this part is covered by both schemes, at least to some extent.

* Alkyl ketene dimers (AKDs) are a family of organic compounds. The main application for alkylated ketene dimers is in the sizing of paper and cardboard, as well as in the hydrophobization of cellulose fibres.

** Precipitated calcium carbonate PCC is used as filler, and its properties as porosity, ensure levels of whiteness and opacity significantly higher than those obtained with the use of other non-synthetic fillers.

Source: ¹ Nordic Ecolabelling, 2017c, Requirement R11.

² Ibid., Requirements R9, R10.

³ Ibid., Requirement R9.

⁴ Ibid., Requirement R9.

⁵ Ibid., Requirement R12 "Emissions into air and/or water from the production of pulp and finished paper must be specified in terms of emissions points scores for each of the four parameters (COD, P, S, NO_x). The measured emissions must be compared to reference values relating to specific production methods," (p. 12) and the Background document, p.32.

⁶ Nordic Ecolabelling of Paper Products Basic Module, 2017, Requirement R12.

⁷ Ibid., Requirement R14: Bans the use of chlorine gas for bleaching, p.12.

⁸ Ibid., Requirement R16 Emissions of chlorate, p. 13.

⁹ EC, 2018e, PEFCR Intermediate Paper, p. 65–68.

¹⁰ Nordic Ecolabelling, 2017c, Requirement R 7 a) Certified traceability and control of wood raw material; b) Traceability and control of wood and fibre raw material and c) Certification of wood and fibre raw material. Requirement R7b specifies: "... in addition the forest management must not harm: natural woodland, biodiversity, special ecosystems and important ecological functions..." (p.9).

¹¹ Nordic Ecolabelling, 2017 c: Requirement R13 (p.12): the weighted average value of AOX must not exceed 0.17 kg/tonne paper. AOX emission from each individual pulp used in the paper must not

exceed 0.25 kg/tonne (p.12).

¹² Nordic Ecolabelling, 2017c, R17, p. 13.

In addition to the usual impact categories, the PEFCR for intermediate paper requires the reporting of biodiversity as additional environmental information. It describes two routes for addressing biodiversity:

- A proxy based on forest management systems where “the percentage of fibre in the product that is third party, chain of custody certified under a forest management certification scheme that includes performance-based measurement criteria for maintaining or enhancing biodiversity and ecosystem services” is reported; or
- A report of the “percentage of fibre content that comes from forests that have been managed to maintain or enhance conditions for biodiversity”. This must be “demonstrated by regular monitoring and reporting of biodiversity levels and gains or losses”.¹⁴³
- The Swan requires traceability of the wood and fibre raw material, including a Chain of Custody complying with a forest certification. This requirement aims at for example ensuring that no harm is done to natural woodland, biodiversity, special ecosystems etc.¹⁴⁴

Given the scope of an intermediate product, there is more overlap between the life cycle stages and the environmental aspects and processes leading to those, than in the other product groups. PEFCR for an intermediate product does not include a benchmark.

Both the Swan and the PEF identify the production phase to be important, especially in terms of fossil fuel use and CO₂ emissions from the production of pulp. The Swan allows for a modelling-based calculation of CO₂ emissions related to transport but requires the reporting of assumptions and databases. The Swan allows for the use of calculation and secondary data for transport emissions. The calculation requirements could be aligned with the PEF methodology requirements. Raw material origin and related biodiversity issues are important in both the PEF and the Swan. In the PEF it is considered that 90% of the impact comes from production, but Swan has many criteria for raw materials. The PEFCR has recognised biodiversity and requires reporting on it in the “additional environmental information” section. The required information could be aligned with the requirements of the Swan.

- The PEFCR has recognised biodiversity and requires reporting on it in the “additional environmental information” section. The required information could be aligned with the requirements of the Swan;

¹⁴³ EC, 2018e, p.65–67.

¹⁴⁴ Nordic Ecolabelling, 2017c, R7, p. 9.

- The Swan allows for the use of calculation and secondary data for transport emissions. The calculation requirements could be aligned with the PEF methodology requirements.

3.6.7 *Conclusions regarding significant environmental aspects*

The case studies show that there are significant differences with regard to which environmental aspects/environmental impact categories are included as “relevant”. Hence, the products within the same product categories are assessed on very different parameters in the two schemes:

- *Rechargeable batteries*: There is overlap in 1) the raw material acquisition stage in terms of metal and critical raw material content, leading to resource use impacts; 2) the energy consumption of the use stage (leading to particulate matter, resource use and climate change impacts); and 3) end-of-life in terms of resource use impacts;
- *Paints*: There is overlap in terms of the raw material acquisition stage from the titanium oxide production, leading to acidification impacts. Both schemes also point to VOC-emissions in the use stage, with photochemical ozone formation impacts. What the PEF does not catch for instance are nanoparticles, which are pointed out as important by the Swan. Currently also the toxicity impacts are not pointed out;
- *Textiles*: There is limited overlap between the case studies. The Swan criteria are much more about the raw material origin and toxicity whereas the PEF points to the production stage. There is some overlap in the climate change and “resource use, fossils” impact categories in the production stage, but the processes from which these are seen to arise are different. According to the PEFCR, transport by passenger car in the use stage is significant. This would presumably be an aspect that would be considered to have zero steerability by the Swan and would therefore not be included in the criteria;
- *Intermediate paper*: There is more overlap between the environmental aspects and processes leading to them, than in the other product groups. In both systems fossil fuel use and CO₂ emissions from the production of pulp are identified and raw material origin and related biodiversity issues.

As the case studies show, the Swan criteria tend to include many chemical (toxicity) related requirements. At the time of writing this report, the three toxicity related categories of the PEF are temporarily excluded from the PEFCRs.

However, the Technical Secretariats of the PEF pilot projects are in a position to include requirements for “additional environmental information” on those aspects that are currently not quantifiable, such as toxicity or biodiversity.

3.6.8 *Implications regarding significant environmental aspects*

The product-group related review indicated many differences in the environmental categories selected for specific product groups. This may have eventual implications in terms of which products are regarded as the most environmentally sound ones, depending on how the PEF will be used.

The “most relevant processes” are not identical in the two schemes. The Swan starts out with the MECO (and various available LCAs for products within the product category), but some of the relevant areas may not be included in the criteria because of “steerability”. If it is not possible to influence a process or environmental impact by setting criteria, this is excluded by the Swan. PEF uses relevance in a different way: the “most relevant processes” require higher data quality for the relevant processes. Those that are not “most relevant” are still included, just with lower quality data (secondary data or proxies), rather than leaving out the processes and environmental impacts from that aspect totally. This may have eventual implications in terms of which products will be appointed as amongst the best in class in their product category. It might lead one product being assessed at the top end in one of the schemes, but at the lower end in the other. Right now, this is not a problem, as PEF has not implemented classes of performance.

Both schemes have strengths. They include different environmental aspects. If used in combination they may be able to point out which products are best from an environmental perspective. At the current stage, where the PEFCRs only contain benchmark calculations for the representative products, it is difficult to include qualitative or semi-quantitative aspects in the PEFCRs. In a future version, where classes of performance are included, the semi-quantitative approach used by the Swan could be included; e.g. for products in the “best performance class” could have requirements like the Swan, corresponding to the Swan (e.g. that certain chemicals are not allowed).

One important difference is related to mixtures of materials in the products. Some of the important environmental aspects of different materials will not be accounted for in PEFs because their environmental problems will not come up in the identification of the most important processes. For example the PEFCR for T-shirts base the “most relevant impact categories and processes” on a mix of materials (see page 20 in the PEFCR – and see below). Regarding wool, for example (Figure 7), it only counts for less than 1%. This means that environmental aspects of wool will not be identified in this PEFCR. At the same time, the Swan treats the materials one by one and may set criteria (based however on RPS) for each of these materials so that only the best third of the textile fibres within each type will be able to fulfil the requirements, or can also exclude fibre types totally or by a fraction based on environmental profile.

Figure 7: Bill of materials of a representative product: T-shirts

Materials *	Men T-shirts	Women T-shirts	Children (2 to 7 years old) T-shirts	Children (8 to 14 years old) T-shirts	Babies T-shirts
	g / 1 T-shirt				
Cotton	122,25	114,55	76,05	99,15	71,59
Polyester	25,30	23,71	15,74	20,52	0
Viscose	3,01	2,82	1,87	2,44	0
Polyamide	2,76	2,59	1,72	2,24	0
Polypropylene	2,02	1,89	1,25	1,64	0
Acrylic	1,54	1,45	0,96	1,25	0
Wool	0,87	0,82	0,54	0,71	0
Elastane	0,40	0,37	0,25	0,32	0
Chlorofibre	0,34	0,32	0,21	0,28	0
Flax	0,12	0,11	0,08	0,10	0
Hemp	0,07	0,07	0,04	0,06	0
Silk	0,08	0,08	0,05	0,07	0
Brand tag	0,25	0,25	0,25	0,25	0,25
Care label	0,60	0,60	0,60	0,60	0,60
Buttons	0,14	0,14	0,14	0,14	2,57
Zips	0,25	0,25	0,25	0,25	-
Strass	0,001	0,001	0,001	0,001	-
Total weight	160 g	150 g	100 g	130 g	75 g

Source: EC 2019d, p. 20–21.

3.7 Data quality and verification

Both schemes prioritise the use of company-specific data and have requirements regarding data quality requirements from companies. However, it is interesting to analyse whether the two schemes require data from the same supply chain stages and processes, and if it is the same data they request. This has implications on whether the companies (license-applicants) can reuse data from one scheme for the other (and thereby save time).

3.7.1 The Nordic Swan Ecolabel

Companies applying for the Ecolabel must submit information about the applicant company, the products concerned, and the turnover, as well as information specific for the product group.¹⁴⁵ They must be in compliance with the requirements in the criteria document valid at the time of application. The Swan requires supply-chain-specific data from the license applicants and means of verification. Only in certain defined and

¹⁴⁵ Nordic Ecolabelling, 2016b.

exceptional cases may secondary data be used, if supply-chain-specific data is not available.¹⁴⁶

It is the manufacturer of a product that can apply for a licence; hence it is expected that the data provided is specific to the product. Other companies, such as importers, dealers and distributors can apply, if they are the only company responsible for that specific product on the Nordic market.

3.7.2 The PEF

The PEF requires the use of a combination of company specific data and secondary datasets. According to the PEFCR Guidance document (2017), the Technical Secretariat for a product category must prepare a list of mandatory company-specific activity data and list the processes to be modelled with company specific data.¹⁴⁷ The same guidance also specifies requirements on data quality, and presents a formula for calculating a data quality rating (DQR), based on representativeness related to time, geography and technology and precision/uncertainty.¹⁴⁸ All processes required needed to model the product and outside the list of mandatory company-specific data must be evaluated using a data needs matrix. There are 3 situations which should be taken into consideration:

- Situation 1: The process is run by the company applying the PEFCR;
- Situation 2: The process is not run by the company applying the PEFCR, but the company has access to (company-) specific information;
- Situation 3: The process is not run by the company applying the PEFCR and this company does not have access to (company-)specific information.

In addition to the “situation”, the data needs matrix includes options, which depend to which degree the applicant has access to company-specific data or to which degree secondary datasets from databases need to be used, related to the data quality rating (DQR). If the processes are amongst the “Most relevant processes”, the aim for company-specific data is higher.

In addition to company-specific data, the PEF uses data from various databases. This data is used for the calculation of environmental impacts (for example electricity production, and extraction of raw materials).

The PEFCR Guidance document (2017) requires that the most relevant impact categories, life cycle stages, processes and elementary flows are identified. These should be the contributions which companies, stakeholders, consumers, and policy

¹⁴⁶ For example, the Criteria for Liquid and Gaseous Fuels (Nordic Ecolabelling, 2018x) “the calculation must follow the article 17–19 of the Renewable Energy Directive (2009/28/EC). Requirement O9 says “rules and default values for calculation... must comply with the official regulation in each Nordic Country...”

¹⁴⁷ EC, 2017, p. 173–183.

¹⁴⁸ EC, 2017, p. 173–183.

makers should focus on.¹⁴⁹ Furthermore, these must be assessed by using higher quality data compared to the less relevant processes, independently from where these processes happen in the life cycle of the product. There is no requirement that there should be company-specific data for most relevant life cycle stages or processes (as this might not always be possible, e.g. if “the most relevant process” was mining a specific rare earth mineral in China, this requirement would be impossible to fulfil). However, the data requirements are higher for “the most relevant process” (to the extent possible). The PEFCR Guidance (2017) document states:

“Data requirements: as the most relevant processes are those driving the environmental profile of a product, these shall be assessed by using data with higher quality compared to the less relevant processes, independently from where these processes happen in the life cycle of the product.”¹⁵⁰

3.7.3 Case studies

Case studies are used to show the similarities and differences between the Nordic Swan Ecolabel and the PEF scheme. It should be emphasized, that the tables only show examples of the company-specific data. For both schemes, it would be too comprehensive to include all details and all requirements. Furthermore, for the PEF the requirements depend on combinations of “situations 1, 2 or 3” and the options defined by the Data Needs Matrix (as described above).

3.7.4 Paint

As can be seen in Table 21, both schemes require company-specific input from the paint producer and product-specific data regarding the specific paint; however, there are significant differences between the data that the two schemes demand. The Swan requires various test reports related to the quality of the paint, and information related to substances with potential health and safety implications. The PEF, on the other hand, requires data that can be used for calculating the environmental impacts from the life cycle. A paint producing company will only be able to re-use some of the information from one scheme for the other.

¹⁴⁹ EC, 2017, p. 130.

¹⁵⁰ EC, 2017, p. 130.

Table 21: Required company-specific data for paint

The Nordic Swan Ecolabel *	The PEF *
<p>Company-specific data Company-specific data, mandatory if the paint contains more than 3% titanium oxide:</p> <p><i>Description from the titanium dioxide producer:</i> If the final product contains more than 3.0% by weight of titanium dioxide a description from the titanium dioxide producer and calculation is to be submitted, clearly showing that the requirements are fulfilled, i.e. emissions and waste must not exceed: <i>Sulphate processes:</i> Max for SOX emissions [kg/tonne TiO₂] and max for sulphate waste [kg/tonne TiO₂] <i>Chloride process:</i> Max for chloride waste [kg/tonne TiO₂]</p>	<p>Company-specific data Paint production</p> <p><i>Product Properties:</i></p> <ul style="list-style-type: none"> – Paint density [kg/L]; – Biocidal content: Quantity and type of biocidal substance present in the paint (e.g. BIT, MIT, terbutryn, carbamic acid, morpholine). [gram/kg]; – VOC content [grams of VOCs per litre of paint]; – Dry mass [gram/kg]; – Coverage: The surface area one can paint with one litre of the product at an appropriate coverage level. Based the product-specific test data. Determined according guidance [m²/L]; – Maintenance multiplier: The number of maintenance cycles over the lifetime of the building. Calculated according to the Guidance document.
<p>Handling of powdered raw materials Description of how powdered raw materials are handled during the production process.</p> <p><i>Product Properties:</i></p> <ul style="list-style-type: none"> – Content of volatile (VOC) and semi-volatile organic compounds (SVOC) [g/L] – including test report or calculation; – Calculation of the level of volatile aromatic hydrocarbons in the product (based on data for all ingoing raw materials); – Claims for the wet scrub resistance – test report according to EN 13300 and documentation from test laboratory; – Spreading rate (coverage, i.e. the surface area one can paint with one litre of the product at an appropriate coverage level. Test according to ISO standards. Test reports from laboratory [m²/L]; – Resistance to water (floor painting) in according to ISO standards. Test report from laboratory; – Adhesion (to substrate) according to ISO standards. Test report from laboratory; – Abrasion (floor painting) – resistance against heavy wear according to ISO standards. Test report from laboratory. 	<p>Production process Inputs</p> <ul style="list-style-type: none"> – Bill of materials: For each raw material in the paint formulations; the name and quantity in %weight/weight must be collected; – Production losses; – Diesel consumption [kg/kg paint produced]; – Electricity [kWh/kg produced]; – Light fuel oil: Fuel oil for heating. [kg/kg produced]; – Liquefied petroleum gas (LPG) [kg/kg produced]; – Natural gas (NG): Natural gas for heating. [MJ/kg produced]; – Process water: Operating materials should be used when possible. Water consumption for other purposes must be included [kg/kg produced].
<p>Information about the product</p> <ul style="list-style-type: none"> – Formulation detailing complete composition with a specification of all ingoing substances, including the trade name of the raw materials, the function of each raw material, the chemical name and CAS# (if possible) of the ingoing substances, content in % per ingoing substance in the product; – A declaration of the concentration of the preservatives; – Calculation (and limits for) content of ingoing substances classified as environmentally harmful with risk phrases according to CLP regulation; – Safety data sheet for all raw materials in line with Annex II to REACH; – Documentation showing that none of the preservatives are bio accumulative; – For pigment that contains antimony integrated into a TiO₂ rutile lattice, documentation must be submitted to show that the molecular structure is inert, and that the environmental and health effects of the pigment are on the same level as, or better than, the results for ...[specified pigments]; – The producer must declare any nanomaterials present in the product. <p>Documentation for the test laboratory (for required tests).</p>	<p>Production process outputs</p> <p>Hazardous waste [kg/kg produced]. Non-hazardous waste [kg/kg produced]. Water emitted: Total water emitted to wastewater treatment systems [kg/kg produced].</p>

Note: Only examples, not the entire list of required information.

* For the Nordic Swan Ecolabel: The list only contains a selection of the requirements from the criteria for the Nordic Swan Ecolabel from Indoor paint and varnishes. It would be too comprehensive to include the entire list of criteria here.

The list for PEF is based on the list of mandatory company-specific data (EC, 2018d, pp. 33–35).

In the addition to this, the PEFCR for decorative paints describes how to handle data gaps:¹⁵¹

“Data gaps: Due to the large number of raw materials used in the decorative coatings industry, not all raw materials might be represented in the EF compliant datasets available in the different nodes available [i.e. the databases]. For substances which do not have an EF-compliant dataset available in any node the following alternative sources of data sets must be used:” followed by some data gap selection guidance.

3.7.5 Textiles/T-shirts

The required company-specific data for textiles/T-shirts for the PEF and the Swan is shown in Table 22. Information on the required company-specific and product-specific data is based on the background document for the Nordic Swan Ecolabel for Textiles, hides/skins and leather¹⁵² and the PEFCR for T-shirts¹⁵³ including a Life Cycle Inventory Excel sheet with a list of all company-specific data to be collected, related to the PEFCRs for T-shirts.¹⁵⁴

Table 22: Required company-specific data for textiles/T-shirts

The Nordic Swan Ecolabel*	The PEF*
Product specific data Brand/trade name, possibly article number Where the products are sold (store, web-shop, etc.) An overview of the production process and sub-suppliers Description of material composition of the product	Product specific data <ul style="list-style-type: none"> – Weight of T-shirt; – Textile material input and output and losses for each process; – % of each raw material in the final product; – % of recycled material (R1); – Raw material type.
Organic cotton at least 10% Documentation showing that at least 10% of the weight in organic cotton is organically farmed or farmed during a transition to organic farming.	Activity data to be used in the calculations <ul style="list-style-type: none"> – Spinning: Technology (carded/combed/open-end etc.) and production location (continent); – Printing: Printed surface; – Finishing: Type of finishing (if relevant); – Accessories: Type and quantity of material (e.g. composition label, brand label, button, zip, snaps etc.); – Packaging: Type and quantity of primary, secondary and tertiary packaging; – Assembly: Assembly time, use of ironing: Yes or No; – Washing: Type of washing (machine or hand washing), washing machine cycle (gentle or normal), washing temperature; – Drying: Use of a tumble drier is allowed: Yes or No – Ironing: Ironing is allowed (Yes or No) and temperature.

¹⁵¹ EC, 2018d, p. 36.

¹⁵² Nordic Ecolabelling, 2018k.

¹⁵³ EC, 2019d.

¹⁵⁴ EC, 2019f, Life Cycle Inventory. Excel sheet with list of all company-specific data to be collected in relation the PEFCR for T-shirts.

The Nordic Swan Ecolabel*	The PEF*
<p>Conventional cotton Documentation showing that the conventionally farmed cotton has a maximum of 0.05 ppm of each of a defined list of chemicals. Test report required in accordance with specified test methods.</p>	<p>List of company-specific data to be collected (examples only) Most of the data below should be included for spinning, sizing, knitting, dying, printing and finishing:</p> <ul style="list-style-type: none"> – Electricity consumption (including source) [MJ/kg] – Heat consumption [MJ/kg] – Heat production (energy type) – Water consumption [L/kg] – Chemical consumption [g/kg] – Wastewater quantity [L/kg] – Textile waste [%] – VOC emissions [g/kg] <p>Furthermore, the company has to provide information regarding packaging and transport distances.</p>
<p>Flax, bamboo and other bast fibres Documentation that the flax, bamboo and other bast fibres are farmed with pesticides allowed in the relevant EU Regulation Test report from the flax/bast fibre manufacturer showing that if using water retting, this complies with requirements for water treatment and reduction of chemical oxygen demand (COD) or the total organic carbon (TOC) in effluent.</p>	
<p>Wool and other keratin fibres (wool from sheep, camels, alpaca and goats) Documentation that the wool has a maximum of x ppm of each of a defined list of chemicals. Test report required, in accordance with specified test methods. Documentation that scouring effluent comply with requirements regarding pH value, temperature and COD</p>	
<p>Synthetic fibres and regenerated cellulose fibres Various requirements regarding documentation of chemicals: Maximum chemical content in raw fibres, emissions during production, or chemicals that are not permitted or restricted in ecolabelled textiles.</p>	
<p>Textile chemicals Various requirements regarding documentation of chemicals use in the textile production.</p>	
<p>VOC in printing pastes and plastisol-based printing Documentation that the requirement regarding maximum content of VOC in printing pastes is fulfilled.</p>	
<p>Emissions, energy and water consumption Requirement for documentation for various emissions, e.g. <i>Effluent from wet processes (COD, temperature and pH)</i> <i>Water consumption</i> <i>Energy consumption (electricity, use of gas and fuel)</i></p>	
<p>Packaging and transportation Documentation regarding the restriction of PVC use. Documentation regarding the restriction to use on chemicals during transport.</p>	

Note: Only examples, not the entire list of required information (quality tests excluded).

* For the Nordic Swan Ecolabel: The list only contains a selection of the requirements from the criteria for the Nordic Swan Ecolabel for Textiles, hides/skins and leather. It would be too comprehensive to include the entire list of criteria here.

The list for PEF is based on a list of mandatory company-specific data (EC, 2018d, pp. 33–35).

3.7.6 Rechargeable Batteries

The required company-specific data for rechargeable batteries for PEF and the Swan is shown in Table 23.

Table 23: Required company-specific data for rechargeable batteries

The Nordic Swan Ecolabel*	The PEF*
Product specific data <ul style="list-style-type: none"> – Brand/trade name; – Description of the product(s) (detailing all constituent substances present in the battery; metals, other solid substances and liquid chemical substances) in the application (weight %); – Description of raw materials used in the casing of the battery charger or the portable charger; – Description of materials used in the primary packaging; – Description of the manufacturing process for the product. + a flow chart (recommended); – Metal content of batteries – documentation for required maximum content of mercury, cadmium and lead (analysis from test laboratory); – Chemicals in casing of the battery charger and in the outer casing – documentation for required maximum content of chemicals. 	Company-specific data <p>In the PEFCR for Rechargeable Batteries, two different cases are possible, meaning that two types of companies might perform a PEF study:</p> <p>Case 1: A cell manufacturer company (assembly of cells)</p> <p>Case 2: A battery manufacturer company (assembly of batteries with the cells and the electric/electronic components, and passive components).</p> <p>Different company-specific data are required for these two cases.</p>
Corporate Social Responsibility <p>Documentation: The company must have a public conflict minerals policy and support the responsible sourcing of tin, tantalum, tungsten, gold, cobalt and their ores from conflict-affected and high-risk areas by:</p> <ol style="list-style-type: none"> Conducting due diligence in line with the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict. Affected and high-risk areas; and Promoting responsible mineral production and trade within conflict affected and high-risk areas for the identified minerals, as used in components of the products and in accordance with OECD guidance. 	Manufacturing <p>However, the overall information are:</p> <ul style="list-style-type: none"> – Materials; – Energy; – Water; – Wastes; – Emissions to air: Particles (dust PM₁₀ + PM_{2.5}), SO₂ and NO_x.
Sourcing of critical raw materials <p>Documentation that the company has a written policy that describes how the licensee works actively to phase out/recycle any critical raw materials in batteries, supports recycling programs for collecting used batteries and minimizes the use of critical raw materials in the future.</p>	End-of-Life <ul style="list-style-type: none"> – Collection rate; – Recycling of the cell; – Landfill; – Incineration.
Working conditions <p>Licensees must submit a written code of conduct that explains how the licensee ensures that its suppliers comply with the requirements of the UN conventions and the UN Global Compact.</p>	Use stage <p>Electricity consumption.</p>
Test reports from test laboratories <ul style="list-style-type: none"> – Battery capacity; – Endurance in cycles; – Battery safety; – Portable charger safety. 	
Recyclable design of portable charger <p>Declaration from the manufacturer of the portable charger showing that the portable charger is designed in such a way that dismantling is possible.</p>	

Note: Only examples, not the entire list of required information.

* For the Nordic Swan Ecolabel: The list only contains a selection of the requirements from the criteria for the Nordic Swan Ecolabel for Textiles, hides/skins and leather, version. It would be too comprehensive to include the entire list of criteria here.

The list for PEF is based on a list of mandatory company-specific data (EC, 2018d, pp. 33–35).

3.7.7 *Conclusions regarding data quality*

- Both schemes require company-specific and product-specific information, and for both schemes, it requires time for companies to get this data;
- In addition to this, the Swan requires documentation from the applicants and suppliers and their sub-suppliers or often directly from the raw material producers regarding the content of chemicals (all ingoing substances) in products – i.e. an analysis from test laboratories;
- PEF uses the approach of “identifying the most relevant impact categories, life cycle stages, processes and elementary flows” (“hotspots”) for identifying where high-quality data is needed. Also, “the most relevant impact categories, life cycle stages, processes and elementary flows” are taken into account when defining which information should be company-specific/product specific. The Swan could take the outcome of the PEF analysis of “Identifying the most relevant impact categories, life cycle stages, processes and elementary flows” into account when setting criteria (i.e. in the MECO analysis). The company-specific and product-specific information required by the Swan is different from the information required by the PEF, and the overlap is not large. The Swan requires documentation for all data, but this is not a requirement in PEF. It will certainly require extra work for a company to gather the necessary product-specific information for both purposes;
- In some cases, the documentation required by the Swan is not relevant for the PEF, unless the PEF CRs would include “additional environmental information”. This is shown for example by the requirements regarding corporate social responsibility, sourcing of critical raw materials, or working conditions, see the case study for rechargeable batteries). The focus of the two schemes is different, and this requires different information;
- Both systems have a way of facilitating the work of companies in collecting data for less significant/material issues. The “steerability” approach used by the Swan means that requirements are not set for issues which are beyond control of the applicants. The PEF allows the use of secondary data for less relevant issues.

3.7.8 *Implications regarding data quality*

From the perspective of the companies, there is currently not much possibility to use the data required for PEF for the Swan or vice versa. If PEF would be introduced as its own instrument this would mean more work for companies. In addition, the Swan requires documentation for all data. A PEF profile does not have the same requirement. This would pose a challenge for using a PEF profile as an input to prove environmental performance in an ecolabel application.

3.8 Establishing credibility and verification

An overview of the procedures for establishing credibility by the Swan and PEF scheme is shown in Table 24 below. The comparison is based on the general procedures, and the case studies have not been used, as the procedures are identical for all product categories, the details for the case studies will not add to this.

Table 24: Establishing credibility

Topic	The Nordic Swan Ecolabel	The PEF
Development of criteria documents	<p>Development of new criteria and revision of criteria:</p> <ul style="list-style-type: none"> – Cooperation with relevant stakeholders; – Open public consultation for comments (from stakeholders and others); – Comments are taken into consideration for the final criteria. 	<p>Development of PEF category rules in the pilot phase:</p> <p><i>Involving stakeholders</i></p> <ul style="list-style-type: none"> – Open and transparent consultation process – Internet based, so everybody can participate; – The Technical Secretariat for each PEFCR has the responsibility for identifying and inviting all the relevant stakeholders to participate; – Industry stakeholders participating to the whole process cover at least 51% of the EU market; – Other stakeholders are also invited (e.g. consumers' and environmental associations); – PEFCRs should be based on consensus, if possible. <p><i>Verification of PEFCR supporting studies</i> Verification of 1/3 of the PEFCR supporting studies, e.g. by on-site checking, reviewing calculations, mass balance calculations, or cross-checks with other sources. At least verification of 1 supporting study within each pilot (i.e. product category).</p> <p><i>The PEFCR review</i> The PEFCRs are reviewed by a review panel, consisting of a minimum of 3 members.</p> <p><i>Final draft of the PEFCR</i> The final draft of the PEFCR is sent to the final consultation.</p>
Revision of criteria	Criteria are normally revised after 4 years. Includes an open public consultation.	<p>The validity of any PEFCR developed during the pilot phase is 31 December 2020.*</p> <p>As the PEF is new, revision of the PEFCR has not been performed yet.</p>
Control/verification before certification	<p>A company can apply for the Nordic Swan Ecolabel, and if their product fulfils the criteria it will be certified.</p> <p>Inspection visits by the Nordic Ecolabel at the production site before a company is granted a licence.</p>	<p>Verification and validation of the EF study is mandatory if the EF study is used for any type of external communication.</p> <p>According to the PEFCR Guidance (2017), the verification and validation must cover the following three areas:</p> <ul style="list-style-type: none"> – The EF study (including, but not limited to, the data collected, calculated, and estimated and the underlying model); – The EF report; – The technical content of the communication vehicles.

Topic	The Nordic Swan Ecolabel	The PEF
Control with applicants within the validity period	Ongoing inspections for companies holding a license for an Ecolabel. All companies are inspected by the Nordic Ecolabel at least once within the period for which their licence is valid.	The verification is valid for a maximum of 3 years. Monitoring follow up is recommended once per year, but the exact periodicity is agreed between the commissioner and the verifier and the focus items are suggested in the PEFCR. A new EF study must be carried out in case the total aggregated score worsens by more than 5.0% (PEFCR, p. 154).

Source: * EC, 2017, p. 41.

3.8.1 The Nordic Swan Ecolabel

New criteria and revision of criteria for a product group is developed by experts from Nordic Ecolabelling in cooperation with relevant stakeholders for each product category. The background documents, including the criteria go through an open public consultation (sent to central stakeholders, and published on the national ecolabel websites). The comments from this process are taken into consideration for the final criteria. On its homepage, the Nordic Swan Ecolabel describes the development of criteria as follows:¹⁵⁵

“Our experts from all Nordic countries contribute to the development of ideas for new or revised criteria. The revision takes place in close contact with businesses and other stakeholders with relevant knowledge, and of course by using available literature from academic institutions and experts.”

In order to ensure the credibility of the Nordic Swan Ecolabel, Nordic Ecolabelling inspects whether manufacturers fulfil with the criteria before the certification.¹⁵⁶

Nordic Ecolabelling performs various inspections:

- Nordic Ecolabelling always conducts an inspection visit before a company is granted a licence for an ecolabel (no matter where in the world the products are produced);
- Ongoing inspections of companies’ production, products or services (random checks/follow-up inspections). All companies are inspected at least once within the period for which their licence is valid;
- Ongoing inspections of how the ecolabels are used in marketing.

For example, around 28% of the 370 companies holding a license to use an ecolabel in Denmark were inspected in 2017.¹⁵⁷

¹⁵⁵ Nordic Ecolabelling, 2019d.

¹⁵⁶ Nordic Ecolabelling, 2019e.

¹⁵⁷ Nordic Ecolabelling, 2019e.

3.8.2 Product Environmental Footprint

Involving stakeholders: The development of a PEFCR involves interested stakeholders and includes an open and transparent consultation process.¹⁵⁸ The Technical Secretariat for each PEFCR has the responsibility for identifying and inviting all the relevant stakeholders to participate in the PEFCR development. As the consultation process is Internet-based, it is possible for all stakeholders to participate. If possible, the PEFCR should be based on consensus.

For the PEF Pilot phase, it was a requirement that the industry stakeholders (producers/importers, or business associations) participating in the whole process cover at least 51% of the EU market (in terms of yearly turnover or production).¹⁵⁹ Furthermore, the Technical Secretariat should invite and involve other stakeholders, for example consumers' and environmental associations.¹⁶⁰

During the development of the PEFCRs, there are two verification procedures:

Verification of the PEFCR supporting studies: During the PEF Pilot phase, the PEFCR supporting studies were verified before their public release.¹⁶¹ About 1/3 of all supporting studies went through verification. At least one PEFCR supporting study per each pilot was verified. The verifications are done via on-site checking, reviewing calculations, mass balance calculations, or cross-checks with other sources.

The PEFCR review: The PEFCRs are reviewed by a review panel, consisting of a minimum of 3 members.¹⁶² The Technical Secretariat has the responsibility for setting up an independent, third-party review panel, including at least one LCA expert (preferably with a background in the product category), one representative from NGOs, and one industry expert. Their comments have to be compiled in a review report.

Final draft of the PEFCR sent into the final consultation: When the comments from the reviewers have been addressed, the final draft of the PEFCR is sent for the final consultation.¹⁶³

Revision of criteria: The validity of any PEFCR developed during the pilot phase is 31st December 2020. As the PEF is new, revision of the PEFCR has not been performed yet.

Verification and validation of EF studies, reports, and communication vehicles:

The verification and validation must cover the following three areas:¹⁶⁴

1. The EF study (including, but not limited to, the data collected, calculated, and estimated and the underlying model)
2. The EF report
3. The technical content of the communication vehicles.

¹⁵⁸ EC, 2017, pp.30–31.

¹⁵⁹ EC, 2017, pp. 30–31.

¹⁶⁰ EC, 2017, p. 30.

¹⁶¹ EC, 2017, pp. 39–41.

¹⁶² EC, 2017, pp. 41–4.

¹⁶³ EC, 2017, p. 43.

¹⁶⁴ EC, 2017, pp. 145–154.

Verification is carried out by an independent third party (ISO/EC 17020:2012), where the verifier requirements are defined in the PEF Guide and JRC suggestions. The verifier self declares compliance with the requirements.

3.8.3 *Conclusion regarding verification*

Both the Swan and PEF have procedures in order to safeguard the credibility of their schemes. The procedures are not identical, but as long as they work, they will obtain the same result: credibility. The differences with regard to the procedures for establishing credibility will not be a major cause of potential differences with regard to appointing “which products are best from an environmental point of view.”

4. Discussion

This chapter aims to discuss the possible coexistence of the PEF and Swan schemes from the perspective of the ecolabel and ecolabelled products. It discusses the opportunities and challenges from the perspective of the Nordic Ecolabel organisation, the license applicant and the consumer. The final section discusses the possibilities that PEF presents for Swan and the different options it would have to use PEF.

4.1 Introduction

Both schemes aim to steer the market towards green products and services through information. Ultimately both schemes aim at providing Nordic and European consumers with a tool that supports “greener” purchasing decisions. Their information basis is different, but they have many similarities and possibilities for synergies and cooperation. It is a question of a strategic process to strengthen the environmental information made available on the European market.

At the end of the PEF transition phase a policy proposal is expected to be disclosed by the European Commission and the future use of the PEF will become clearer. The need for communicating the best products to buy to the consumer is clear. Cooperation between Type 1 ecolabels and the PEF is important in this regard and a process for understanding any differing results should be in place.

The transition phase is a good moment for the Nordic Swan to further reflect on how it could use the already existing PEF materials and to further deepen the understanding of the efforts required to reduce possibility for different results regarding environmentally preferable products, thus contributing to the future development of the uses of PEF.

The purpose of this section in light of the methodological differences is to discuss:

- a future situation in which both the PEF and Swan exist;
- whether and how it is possible for the Nordic Ecolabel to make use of the PEF; and
- the relevance of the synergies and discrepancies from the perspective of competent bodies (Swan and possibly the EU Commission in regard to the PEF), businesses (license holders), and consumers.

This discussion is inspired by a document analysis and workshop and other discussions and further depth into the insights could later be obtained by interviewing different stakeholder groups.¹⁶⁵

4.2 Hypothetical future situation¹⁶⁶

It is important that communication to consumers on any major contradicting results between any eventual PEF results and Type 1 ecolabels are avoided. Our analysis showed that there can be quite noticeable differences in the environmental aspects that are identified as “most relevant”. The different approaches to chemicals and biodiversity for instance are significant in pinpointing differing results. One of the most significant challenges therefore is to streamline the two schemes so as to avoid situations in which “disagreeing results” would be communicated to the consumer. There is a significant risk of mistrust in both systems if their results are not similar and this could destroy confidence in both PEF and Swan.

The PEF method does not require performance classes and product-group-specific performance classes are not currently identified by PEFCRs and therefore there is no direct guidance available on identifying the “best in class”. If PEF is made mandatory, and a communication vehicle, it is likely that performance classes would be needed to make comparisons meaningful. However, there is currently no decision on how performance classes or any communication vehicle would be applied in the future. The text below presents on a general level a situation where both schemes would co-exist.

The following Figure 8 describes *a hypothetical situation* in which PEF results are taken as a prerequisite for ecolabel application. We want to stress that these examples are purely hypothetical and fictive, and this is not based on any PEF-analyses of eco-labelled products. If there is a PEFCR, the product would have to perform “better-than-average” in comparison to the benchmark in order to be in a position to apply for the Nordic Swan Ecolabel. It still would still have to fulfil the requirements of the Swan. Products with an impact profile that is worse-than-average cannot apply for a Swan Ecolabel. Only products that have better than impact profile are eligible for the ecolabel.

The result may be that in consequence some of the *products that have a Swan Ecolabel now, might not be able to obtain this in the future* given that the two schemes are so different with respect to significant environmental aspects. This corresponds in general to the situation when Swan criteria are updated – some products are no longer able to fulfil the requirements.

¹⁶⁵ Workshop 4.5.2017, Ecolabel meeting 14.3.2019.

¹⁶⁶ We want to stress that these examples are purely hypothetical and fictive, and this is not based on any PEF-analyses of eco-labelled products.

Figure 8: A hypothetical situation where a better-than average – PEF value is a prerequisite for ecolabel applicants

4.3 Opportunities and challenges

This section addresses some of the possible opportunities and challenges that relate to the use of PEF in criteria setting and in ecolabel criteria requirements. As above, this analysis is not based on the current situation but rather considers the opportunities and challenges relating to any eventual integration of PEF-based requirements into the Swan label. These considerations have focused on differences in environmental information and the methodological reasons that may lead to such differences. There will be other opportunities and challenges that would need to be addressed in a different study. These are for example:

- costs to different stakeholders;
- environmental improvement resulting from use of PEF or Swan;
- benefits and drawbacks of flexibility/agility and the lack of it.

4.3.1 For the Swan

Opportunities: Existing or purpose-developed PEFCRs or PEF studies, as well as screening studies are appropriate and good sources information to identify product-group-specific hotspots and contribute to the "Relevance" assessment of an RPS study. The benchmark (or eventual classes of performance) would support the identification of the RPS "Potential" for a product group. The benchmark calculated for a representative product, can be used to define a better-than-average product. Also the PEF profiles prepared by companies could be used as background data for criteria setting and for defining potential areas for improvement, if they are third-party verified.

Challenges: Steerability is an important characteristic of the criteria setting of the Nordic Swan ecolabel. Currently the Swan requirements are set so that the criteria can make a difference and the license applicant can have an influence on the environmental issue in question. The PEF may point to processes that are not currently considered “steerable” by the Swan’s assessment, in particular in the use and end-of-life stages. For example, passenger car transport has been identified as a “most important” life cycle stage (T-shirts, paints), but typically this would be an environmental aspect that is considered not steerable for setting the criteria of the Swan ecolabel. Additionally the examples highlighted processes such as waste water treatment and waste management (incineration/landfilling), which would generally be out of control of the license applicant.

In addition, *the Scope/product group definitions of the Swan and PEFCRs* are currently not aligned, which makes comparisons or use of PEF information challenging. *The data required from the companies in the Swan ecolabelling scheme* is different from the data requirements relating to a PEF study. The difference may be illustrated as follows: The Swan may include a percentage of recycled material and limits for residues of environmental toxins in a product as a requirement.¹⁶⁷ The PEFCR would offer a method for calculating the environmental impact of different percentages of recycled materials. The largest difference is in the approach to chemical substances. In addition, the current PEFCRs have excluded toxicity impact categories.

Verifying PEF data differs from the type of data that the Swan currently requires from companies. If PEF data would be required from license applicants, Swan experts would need to verify the PEF calculations or externalize the verification work. The verification of a PEF-value based requirement may require more effort, in comparison to the current simple “pass/fail” for a certain activity or process.

4.3.2 For companies (license applicants)

Opportunities: The level of effort required from an ecolabel licensee to fulfil eventual new PEF-based requirements depends on its general approach to the use of LCA. For companies using an LCA the PEF can possibly offer a way to simplify the data creation requirements for multiple purposes. It could be seen as an opportunity for enhancing eco-design, product development and overall environmental reporting and communication of environmental information, in particular comparative claims. It could also be seen as a way to track product performance and benchmark products.

Challenges: For other companies, voluntary PEF-based requirements could present a large and expensive effort. If PEF were voluntary, but required by the Swan, *the increased costs for the companies* applying for Swan could reduce the willingness of companies to apply for Swan certification and may in particular affect smaller companies. On the other hand, companies may carry out a PEF study anyway, e.g. due

¹⁶⁷ As a way to prepare for a “clean” circular economy.

to use in B-to-B communication, and this way if the Swan required information on the PEF this would not cause any extra costs.

The data required currently for the PEF and the Swan schemes is different and this would lead to extra work by companies. Concerns have been raised that companies are unfamiliar with what to do with LCA results. If ecolabel criteria are set in a way that the role of “steerability” is no longer so prominent, there may be new environmental concerns that the company would need to consider to fulfil the criteria. Examples could be energy generation or waste management systems that are generally considered out of scope of influence of the license applicant. The changed way of setting criteria could also mean that in the transition some ecolabelled products could lose their license. For example, since climate change has a high weighting score in the PEF, a fictive Swan ecolabelled product may end up not being eligible for the Swan ecolabel, if a good PEF value is required for applying for an ecolabel.

4.3.3 For consumers

Opportunities: The Swan is a very well-known brand on the Nordic market and there is significant consumer trust in the label. It could be considered that for the consumer a larger challenge than the integration of PEF based methods into the ecolabel, would be the continued proliferation of different labels, making the integration of the new method existing instruments a good idea. Consumers look for a trustworthy and uncomplicated indication of the environmental performance on a product. Using the PEF within the Swan label would contribute to the provision of trustworthy information on products. Consumer concerns are currently considered by the Swan in setting criteria and new issues can be taken on board. This provides consumers with the feeling of being able to influence matters and make product choices that contribute their own values.

Challenges: To ensure that the label can respond to the concerns of consumers in terms of toxicity, quality, social, health as well as emerging issues it would be necessary to maintain the Swan’s process for requirements on those issues. If the PEF becomes a label, it will be a challenge for the consumer to interpret the product’s environmental performance, if mismatching results are presented by the two labels.

4.4 How the PEF could be used by the Nordic Swan Ecolabel

Below we present three levels for Swan to use the PEF in its setting of requirements for the eco-labelled products and services. Here it is worth noting that PEF is still under development and is not a mature methodology. There are still many open questions in terms of methodology, in addition to which there is currently no knowledge regarding to what extent the PEF will develop into an environmental information scheme in the future. Therefore, the three levels could best be seen as a possible progression over time:

1. *Use PEF information (most simple)*: The Swan could use the PEFCRs and any other possible readily available PEF studies as an information source in the criteria setting process, whenever such information is available. The most relevant impact categories, life cycle stages, processes and elementary flows identified in the PEFCR provide a useful indication of the “hotspots” for which criteria would be set. The Swan could look at PEFCRs in setting criteria for new product groups (e.g. in feasibility studies);
2. *Create PEF information*: The Swan could actively participate in producing PEF information. This could involve participating in the PEFCR development processes or proposing the development of new PEFCRs for the purpose of criteria setting. This would imply being invited by the TS of a PEFCR development process to participate. On the other hand PEFCR related stakeholders could be invited to participate in the criteria setting. The PEFCR would be a key source of information for criteria setting;
3. *Require PEF information (most demanding)*: The Swan could promote the integration of PEF into voluntary ecolabelling schemes, by assimilating the ecolabel criteria with the PEF criteria, and requiring PEF studies from the license-applicants. Based on a PEFCR, the criteria requirements would be based on a functional unit and focus on the most relevant impact categories, but this would be complemented by the Swan’s own process for introducing requirements on chemical risks, social aspects, durability and emerging issues. There may be costs associated with this, which have not been addressed in this study. As a less demanding option, or a more short-term option, a PEF study/value could be included as a “point requirement” in the Swan criteria. In both of these cases the Swan would define the PEF value that would be required from applicants or would act as a baseline for giving points.

5. Conclusions and Recommendations

In this report we have focused on the environmental information and methodology used in the Swan and the PEF schemes with the purpose of identifying similarities and differences. Some specific conclusions and recommendations for both schemes and their cooperation are below:

- *Increase cooperation between PEF and the type 1 eco-label schemes:* we recommend for both schemes increase of mutual cooperation, related to e.g. the differences in the methodological approaches, to avoid very different results in what will be considered as an environmentally sound product.
- *Product categories:* The analysis shows that the definitions of product categories differ between the two schemes. It makes it difficult to compare product groups across the two schemes or to use one as an input for the other. This starting point is one major reason why the two schemes can give differing results ("results" understood as: "Which products will be selected as the 'best' from an environmental point of view" by the two schemes). In addition, the reasons for including or excluding items from a product group are different, which becomes an important issue in communicating matters to consumers:
 - Recommendation 1: In collaboration with the EC and the EU Ecolabel, assess the development of new PEFCRs where possible and available, and whether more aligned product groups would give more similar results in terms of significant environmental aspects and consider coordinating future product group definitions;
 - Recommendation 2: For new PEFCRs, the TS could use the ecolabel background documents to gain an overview of the product system, the considerations regarding quality aspects relating to the functional units (where available), and any eventual need for "additional environmental information".
- *Functional units:* The PEF analysis is always carried out on the basis of a functional unit. In Swan it is possible that a functional unit is used if a MECO assessment is performed. However, our case studies showed that defining a functional unit is difficult. In the product group case studies we looked at, a functional unit was not always used by the Swan. Some case studies showed that the Swan does not see the use of a functional unit as purposeful. However, there are Swan product groups that are based on functional units. Whether the functional unit approach or its lack of use is another reason for divergent results and are indeed whether

they are even incomparable should be further looked into. Also setting the functional unit in the right way (including quality/efficiency) is important. Looking at products from a function –perspective is becoming more important in aiming towards the circular economy:

- *Recommendation:* Initiate discussion between the Nordic Ecolabel, the EU Ecolabel and the EC and possibly other schemes to discuss setting functional units so that they sufficiently cover the relevant aspects, including quality and to understand whether a functional unit approach for criteria definition would give more similar results in terms of significant environmental aspects and life cycle stages.
- *Significant environmental aspects:* The case studies showed that in these product groups there was only a limited overlap in the significant environmental aspects or life cycle stages. Both schemes have strengths. They sometimes catch different environmental aspects, as a result of 1) differing focus of the analysis (included environmental aspects/categories); 2) a differing level of quantification used in the analysis; 3) the steerability approach of the Swan and 4) possibly also the exclusion of the toxicity categories by PEF. It is important that the diverging environmental impacts are not externally communicated in a way that could cause confusion:
 - *Recommendation 1:* It is possible and recommended for the Swan to start using existing PEFCRs and where possible and available existing PEF studies as a part of the MECO assessment to decide on the environmental “hotspots”;
 - *Recommendation 2:* It is recommended that the Technical Secretariats developing new PEFCRs would consider the significant environmental aspects identified in Swan criteria and background documents to include additional environmental and technical information, where relevant.
 - *Further research is needed on the following:* The impacts of the fact that the PEF representative product refers to a European average, as opposed to a Nordic average, would be useful to study from the perspective of the Nordic Swan; There is no common understanding regarding the environmental improvements that could be achieved. Are highest environmental improvements achieved through PEF, Swan or a combination of both? This of course depends on the benchmarking and kind of communication vehicle that would be developed for PEF. A process to initiate this understanding is recommended.
 - The possibilities to use PEF as a method to show the environmental gains from using an ecolabel, could be studied.
- *Data quality:* Both schemes have rules in place in terms of the type of data to be used. The Swan requires primary data and proof from the company. In the PEF scheme, the type of data required depends on the situation and is defined by the method. Where a PEFCR exists it specifies the situations where primary data must be used. The PEF method specifies what to do in situations where primary data is not available and provides a hierarchy for the options. However, there is only a

limited overlap in terms of the type of data required by the schemes, meaning that companies cannot easily use data used for one scheme for the other. *If* the PEF becomes integrated in policy instruments, it will be relevant to understand to which extent the differing data requirements would significantly increase the workload of companies and in what ways the EC and the Nordic Swan Ecolabel could reduce that workload:

- *Further research is needed* to understand whether the data requirements in existing or forthcoming PEFCRs are contradictory to the primary data requirements of the Swan label and whether there are cases where secondary data from pre-defined databases could be helpful also for the Swan label.
- *Establishing credibility and verification:* In both schemes a verification of information is performed by a third party. The Swan verifies the information and performs audits of the license-applicants and in PEF a verifier with the required capacity (self-declared) performs a review of an environmental footprint report, through a review of documentation and the model. The verification approaches become important if the PEF should be integrated into existing instruments, such as the ecolabels. If there are PEF-based threshold values or an overall PEF value required from ecolabel applicants, then the question is whether it should be the Swan organisation that would verify that the company fulfils the requirements. If PEF-based requirements are included as part of the Swan criteria, then the Nordic Ecolabelling organisation would either be the verifier of the PEF studies or accept the verification by self-declared third-party verifiers;
- *How the Nordic Swan could use PEF, and PEF gain input from type 1 eco-labels:* Three options were defined for Swan. These can be seen as a possible progression over time, as PEF is not a mature methodology and product environmental information scheme yet, but may well develop to this direction in the coming years. The Nordic Swan could:
 1. use PEF information, such as PEFCRs, in identifying life cycle “hotspots” for criteria setting;
 2. actively participate in producing PEF information, for example by developing PEF studies or participating in processes to develop new PEFCRs, and use this information in criteria setting; and
 3. integrate PEF into the ecolabel criteria set and require PEF information from companies to show fulfilling of the eco-label criteria.

Sammanfattning

EU-kommissionen publicerade år 2013 "Kommissionens rekommendation 2013/179/EU om användningen av gemensamma metoder för att mäta och kommunicera produkters och organisationers miljöprestanda utifrån ett livscykelperspektiv". Rekommendationen tillhandahåller gemensamma och enhetliga regler för användning av livscykelanalys vid beräkning av en produkts miljöprestanda. För närvarande är den nordiska Svanenmärkningen ett väletablerat sätt att kommunicera produkters miljövänliga egenskaper till konsumenter i Norden.

Det nordiska ministerrådet beslutade att finansiera ett projektet "Miljömärkning Svanen, cirkulär ekonomi och miljöavtryck" år 2016 som ett av projekten under Finlands ordförandeskap. Projektets uppgift har varit att bedöma synergier och skillnader i insamling, bearbetning och användning av miljöinformation i PEF och den nordiska Svanenmärkningen. Syftet har varit att identifiera synergier som kan stärka användningen av båda metodologierna. Denna rapport är resultatet av en process som har engagerat experter på miljömärkning och livscykelanalys. Rapporten grundar sig på ett arbetsdokument som publicerades i nordiska arbetsdokumentserien i juni 2017, som syftade till att uppmuntra till diskussion baserat på de utkast till dokument som var tillgängliga vid den tidpunkten.

Syftet med denna rapport är att jämföra den nordiska Svanenmärkningen och PEF med fokus på miljöinformation. Rapporten beskriver den nordiska Svanenmärkningen och PEF:s inställning vid fastställandet av särskilda krav på produktgrupper. Rapporten jämför de metoder som används av Svanenmärkningen och PEF för att identifiera specifika relevanta miljöaspekter för produktgrupper och analyserar betydelsen av skillnaderna. Analysen baseras på de kriterier som för närvarande gäller för Svanen och pilotfasen för de slutliga kategorireglerna som används av PEF (PEFCR) beträffande följande metodologiska aspekter: definitioner av produktkategorier, funktionella enheter, väsentliga miljömässiga aspekter och livscykelstadier, liksom uppgifternas kvalitet och krav på verifiering. Följande produktgrupper används som fallstudier för att illustrera skillnaderna: laddningsbara batterier, T-shirts/textilier, färger och mellanprodukter av papper.

Rapporten drar slutsatsen att det finns metodologiska skillnader i sättet på vilket de olika systemen definierar produktgrupperna och jämför produkter. Definitionen av produktkategorier skiljer sig mellan de två systemen, vilket gör det svårt att jämföra produktgrupper mellan de två systemen eller att använda en som input för den andra. PEF definierar produktkategorier utifrån produkter som kan fylla samma funktion, medan Svanens definition av kategorier kan vara bredare. PEF genomförs alltid på grundval av produktens funktionella enhet. Enligt Svanen är det möjligt att en funktionell enhet används om en MECO-bedömning genomförs.

Den nordiska Svanenmärkningens krav och förklaringar i bakgrundsdokumentet jämfördes med de "mest relevanta miljöpåverkningarna, livscykelstadier och processer" som identifierades i PEF:s regler för kategorisering av samma produktgrupper. De specifika fallstudierna av de fyra produktgrupperna visade att det endast var en begränsad överlappning av de väsentliga miljömässiga aspekterna eller livscykelstadierna till följd av 1) olika fokus i analysen (inkluderat miljömässiga aspekter/kategorier), 2) olika nivåer av kvantifiering som har använts i analysen, 3) Svanens inställning till styrbarhet och 4) potentiellt PEF:s uteslutande av toxicitetskategorier.

Den särskilda jämförelsen av produktgrupper visar också att det endast finns en liten överlappning vad gäller typen av uppgifter som krävs av systemen, vilket betyder att företag inte på ett enkelt sätt kan använda uppgifter som används för ett system i det andra systemet. Om PEF integreras i politiska instrument, kommer det bli viktigt att förstå i vilken omfattning de olika uppgiftskraven väsentligen skulle öka arbetsbelastningen för företag och på vilka sätt EC och det nordiska miljömärket kan minska sådan arbetsbelastning.

De specifika kriterierna för produktgrupper kan användas för att identifiera viktiga frågor som borde inkluderas som "ytterligare miljöinformation" i PEFCR.

Möjligheterna för Svanen har anknytning till användningen av PEF-information (särskilt PEFCR) för "relevansen" och "potentialen" i RPS-bedömningen, och har i åtanke att de två systemen kan leda till olika väsentliga miljöpåverkningar, särskilt när det finns skillnader mellan definitioner av produktgrupper, tillämpningsområde och funktionell enhet. Dessutom kan PEF peka på processer som för närvarande inte anses vara "styrbara" enligt Svanens bedömning.

Denna rapport föreslår tre alternativ för den nordiska Svanenmärkningen, som kan ses som en möjlig utveckling med tiden. Den nordiska Svanenmärkningen kan: 1) använda PEF-information, såsom PEFCR, vid identifiering av "kärnområden" i livscykler för att fastställa kriterier, 2) aktivt delta i framtagandet av PEF-information, till exempel genom att utveckla PEF-studier eller genom att delta i processer för att utveckla nya PEFCR och använda denna information för att fastställa kriterier, och 3) integrera PEF i uppsättningen med miljömärkets kriterier och kräva PEF-information från företag för att visa att de uppfyller kriterierna. I tillägg till det bredare perspektivet ger rapporten rekommendationer för båda systemen, i fråga om samarbete och ytterligare arbete som krävs, beträffande de metodologiska skillnaderna, för att undvika stora skillnader i resultaten av vad som ska anses vara en miljövänlig produkt.

References

- Council of the European Union (2008) *Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan*, Brussels 5 December 2008 (16914/08)
- European Commission (EC). (2008). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan* {SEC(2008) 2110} {SEC(2008) 2111} COM/2008/0397 final. Retrieved 23 March, 2019 from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008DC0397>
- European Commission (EC). (2013a). *Communication from the Commission to the European Parliament and the Council. Building the Single Market for Green Products Facilitating better information on the environmental performance of products and organisations* (COM/2013/0196 final). Brussels, 9.4.2013 Retrieved 22 March 2019 from <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0196:FIN:EN:PDF>
- European Commission (EC). (2013b). *Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations* (2013/179/EU). Retrieved from <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32013H0179&from=EN>
- European Commission (EC). (2016a). *Pilot Phase Product Environmental Footprint Guidance - version 5.2* (February 2016). Unpublished.
- European Commission(EC). (2016b). *Pilot Phase Product Environmental Footprint Guidance - version 6.0* (November 2016). Unpublished.
- European Commission (EC). (2017). *PEFCR Guidance document - Guidance for the development of Product Environmental Footprint Category Rules* (PEFCRs), version 6.3, December 2017, retrieved from: http://ec.europa.eu/environment/eussd/smgp/pdf/PEFCR_guidance_v6.3.pdf
- European Commission (EC) (2018a). *PEFCR - Product Environmental Footprint Category Rules for High Specific Energy Rechargeable Batteries for Mobile Applications*. Published: February 2018. Version: H. Time of validity: 31 December 2020. Retrieved March 15, 2019, from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final
- European Commission (EC) (2018b) *Product Environmental Footprint Category Rules for IT equipment (Storage)*. Version number: 1.1. Date of publication: 20 April 2018. Date of expiration: 31 December 2020. Retrieved 15 March 2019 from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final
- European Commission (EC). (2018c) *Product Environmental Footprint Category Rules. Leather*. Final version 25 April 2018. Valid until 31 December 2020. Retrieved 15 March 2019 from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final
- European Commission (EC). (2018d). *Product Environmental Footprint Category Rules - Decorative Paints. Product category: Decorative paints*. Version number: version 1.0. Date of publication/revision: April 2018. Date of expiration: December 31st, 2020. Retrieved 15 March 2019 from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final
- European Commission (EC). (2018e). *Product Environmental Footprint (PEF) Category Rules (PEFCRs) for Intermediate Paper Products*. Version number: Final draft. Date of publication: 18 October 2018. Time validity: 31 December 2020. Retrieved 15 March 2019 from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final
- European Commission (EC). (2019a). *Single Market for Green Products Initiative. Background information. Web text, no pdf files*. Retrieved 22 March 2019 from <http://ec.europa.eu/environment/eussd/smgp/index.htm>

- European Commission (EC). (2019b). *Single Market for Green Products Initiative. Policy background. Web text, no pdf files*. Retrieved 23 March 2019 from http://ec.europa.eu/environment/eussd/smgp/policy_footprint.htm
- European Commission (EC). (2019c). *Product Environmental Footprint Category Rules (PEFCR). Household Heavy Duty Liquid Laundry Detergents (HDLLD) for machine wash*. February 2019 Version 1.0 Time validity: 31st December 2020 Retrieved 15 March 2019 from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final
- European Commission (EC). (2019d). *Product Environmental Footprint Category Rules (PEFCR). T-shirts*. Version 1.0. February 2019. Valid until 31st December 2020. Retrieved 15 March 2019 from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final
- European Commission (EC). (2019e). *Results and deliverables of the Environmental Footprint pilot phase. Final Product Environmental Footprint Category Rules and Organisation Environmental Footprint Sector Rules*. Retrieved 30 March 2019, from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final
- European Commission (EC). (2019f). *Life Cycle Inventory. Excel sheet with list of all company-specific data to be collected in relation to the Product Environmental Footprint Category Rules (PEFCR). T-shirts*. Version 1.0. February 2019. The Excel sheet is retrieved 15 March 2019 from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm#final
- International Organization for Standardization. (ISO). (2018). *ISO 14024:2018. Environmental labels and declarations - Type I environmental labelling - Principles and procedures*. <https://www.iso.org/standard/72458.html>
- International Organization for Standardization. (ISO). (2000). *ISO 14020:2000. Environmental Labels and Declarations - General Principles*.
- International Organization for Standardization. (ISO). (2006a). *ISO 14025:2006. Environmental labels and declarations - Type III environmental declarations - Principles and procedures*.
- International Organization for Standardization. (ISO). (2006b). *ISO 14040:2006 Environmental Management- Life Cycle Assessment- Principles and Framework*.
- International Organization for Standardization. (ISO). (2006c). *ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines*.
- Lupiáñez-Villanueva, Francisco, Tornese, Pietro, Veltri Giuseppe A., Gaskell, George. (2018). *Assessment of different communication vehicles for providing Environmental Footprint information (Request for Specific Services for the implementation of the Framework Contract no. EAHC-2011-CP-01) Final Report*. Retrieved 17 April 2019 from http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm
- Nissinen A., Heiskanen E., Perrels A., Berghall E., Liesimaa V., Mattinen M. K. (2015). Combinations of policy instruments to decrease the climate impacts of housing, passenger transport and food in Finland. *Journal of Cleaner Production* 107: 455–466.
- Nissinen, A. et al. (2019 - forthcoming). Product Environmental Information and Product Policies.
- How Product Environmental Footprint (PEF) changes the situation?.
- Nordic Council of Ministers. (2012). *Nordic Environmental Action Plan 2013–2018*. ANP 2012:766. <http://dx.doi.org/10.6027/ANP2012-766>
- Nordic Council of Ministers. (NCM). (2014a). *Arbetsordning för Nordiska miljömärkningsämnden [Regulation for Nordic Ecolabelling Board]*. Retrieved from: <http://www.ecolabel.dk/da/virksomheder/regler-for-miljoemaerkning>
- Nordic Council of Ministers (NCM). (2014b). *Goals and Principles for the Nordic Ecolabel (the Swan)*. Retrieved 22 March 2019 from <https://www.nordic-ecolabel.org/contentassets/89f071a34537452f9e64754c1c049d4a/goals-and-principles-nordic-ecolabel-oct-2014.pdf>
- Nordic Council of Ministers (NCM). (2015). *Vision för Svanen 2015*.
- Nordic Ecolabelling. (2000). *Nordisk Miljömärknings Miljöfilosofi [Environmental Philosophy for the Nordic Ecolabel]*. Internal Document.

Nordic Ecolabelling Steps (2001) Retrieved from: <http://www.nordic-ecolabel.org/CmsGlobal/Downloads/Ecolabelling%20Steps%20towards%20Sustainability.pdf>

Nordic Ecolabelling (2011). *About Nordic Ecolabelled Printing companies, printed matter, envelopes and other converted paper products. Version 5.0. Background for ecolabelling.* 15 December 2011. Background document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2013a). *Internt notat om RPS: Et verktøy for å vurdere og prioritere miljøkrav for å oppnå størst mulig miljøgevinst* [Internal note on RPS: A tool for assessing and prioritizing environmental requirements to achieve the greatest possible environmental benefits]. *Internal document.*

Nordic Ecolabelling. (2013b). *MEKA Vejledning for Nordisk Miljømærkning* [MECO Guide for Nordic Ecolabelling]. Retrieved 6 October 2017, <https://docplayer.dk/17727967-Meka-vejledning-for-nordisk-miljoemaerkning.html>

Nordic Ecolabelling. (2014). *Nordic Ecolabelling for Laundry detergents for professional use.* Version 3.5. 19 March 2014–31 December 2021. *Background document.* Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2015a). *Annual Report 2015.* 23 p. Retrieved from https://issuu.com/svanen123/docs/nordic_ecolabeling_annual_report_20

Nordic Ecolabelling (2015b). *Nordic Ecolabelling of Computers.* Version 7.4. 23 October 2013–30 June 2020. Document: 048 Computers, version 7.4, 15 December 2016. *Criteria document.* Retrieved March 20, 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling (2015c). *About Nordic Ecolabelled Computers.* Version 7.3. Background to ecolabelling. 5 November 2015. Document: 048 Computers, version 7.3, 5 November 2015. *Background document.* Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2016a). *Fee Regulations for Nordic Swan Ecolabelling.* Retrieved from <http://www.ecolabel.dk/da/virksomheder/regler-for-miljoemaerkning>

Nordic Ecolabelling. (2016b). *Regulations for the Nordic Ecolabelling of Products.* Retrieved 11 April 2019 from <https://www.nordic-ecolabel.org/contentassets/89f071a34537452f9e64754c1c049d4a/regulations-for-the-nordic-ecolabelling-of-products-2016.pdf>

Nordic Ecolabelling & Husbanken. (2016). *Rapport til Husbanken Bærekraftige materialvalg i kriterier for svanemerkeet renovering* [Report to the Norwegian Housing Bank: Sustainable selection of materials in criteria for Nordic Swan Ecolabelling of renovation]. Retrieved from <http://docplayer.me/41329114-Rapport-til-husbanken-baerekraftige-materialvalg-i-kriterier-for-svanemerkeet-renovering.html>

Nordic Ecolabelling. (2017a). *Applying for the Nordic Swan Ecolabel.* Retrieved 10 October 2017, from <http://www.nordic-ecolabel.org/apply/>

Nordic Ecolabelling. (2017b). *Report regarding inspection activities in 2017.* Retrieved April 10, 2019 from <https://www.ecolabel.dk/~media/Ecolabel/Files/om-os/kontrolrapporter/Engelske-kontrolrapporter/Efterkontrolrapport-2017-UK.ashx?la=da>

Nordic Ecolabelling. (2017c). *Nordic Ecolabelling of Paper Products – Basic Module.* Version 2.4. 11 June 2011–31 December 2020. Document: A001, Paper products – Basic Module, version 2.4, 14 December 2017. *Criteria document.* Retrieved March 20, 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2017d). *Nordic Ecolabelling for Copy and printing paper - supplementary module.* Version 4.3. 22 June 2011–31 December 2020. Document: 044 Copy and printing paper, version 4.3, 14 December 2017. *Criteria document.* Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2017e). *About Nordic Ecolabelled Paper products – basic and chemical module.* Version 2.4. Background to ecolabelling. 14 December 2017. Document: A001 Paper products – Paper products – basic and chemical module, version 2.4, 14 December 2017.

Background document. Retrieved March 20, 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2017f). *Nordic Ecolabelling for Copy and printing paper - supplementary module*. Version 4.3. 22 June 2011–31 December 2020. Document: 044 Copy and printing paper, version 4.3, 14 December 2017. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2017g). *Nordic Ecolabelling of Paper Products - Chemical Module*. Version 2.5. 22 June 2011–31 December 2020. Document: Paper Products - Chemical Module, version 2.5, 14 November 2017. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2017h). *Background to Nordic Ecolabelling for Copy and printing paper – supplementary module*. Version 4.3 – 14 December 2017. Document: 044 Copy and printing paper, version 4.3, 14 December 2017. Background document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2017i). *About Nordic Ecolabelled Paper products – basic and chemical module*. Version 2.4 Background to ecolabelling 14 December 2017. Document A001 Paper products - Paper products – basic and chemical module, version 2.4, 14 December 2017. Background document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2018a). *Nordic Ecolabelling for Rechargeable batteries and portable chargers*. Version 5.0. 15 June 2018–30 June 2023. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2018b). *About Nordic Swan Ecolabelled Rechargeable batteries and portable chargers*. Version 5.0. Background to ecolabelling. 15 June 2018. Background document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2018c). *Nordic Ecolabelling for Primary Batteries*. Version 5.0. 7 November 2018–31 December 2023. Document: 001 Primary batteries, version 5.0, 7 November 2018. Criteria document. Retrieved March 20, 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2018d). *About Nordic Swan Ecolabelled Primary Batteries*. Version 5.0. 07 November 2018–31 December 2023. Document: 001 Primary Batteries, version 5.0, 7 November 2018. Background document. Retrieved March 20, 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2018e). *About Nordic Ecolabelled Laundry detergents and stain removers*. Criteria Version 7. Background document. 10 October 2018. Background document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling (2018f). *Nordic Ecolabelling of Laundry detergents and stain removers*. Version 7.10. 15 December 2011–31 October 2020. Document: 006 Laundry detergents and stain removers, version 7.10, 10 October 2018. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2018g). *About Nordic Ecolabelled Indoor paint and varnishes*. Version 3.4. Background to ecolabelling. 15 May 2018. Background document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2018h). *Nordic Ecolabelling for Indoor paints and varnishes*. Version 3.4. 05 November 2015–30 June 2021. Document: 096 Indoor paints and varnishes, version 3.4, 15 May 2018. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2018j). *Nordic Ecolabelling of Tissue paper*. Version 5.7. 11 October 2011–31 December 2021. 005 Tissue paper, version 5.7, 19 December 2018. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>

Nordic Ecolabelling. (2018k). *About Nordic Ecolabelled Textiles, hides/skins and leather*. Version 4.9 Background to ecolabelling 05 December 2018. Document: 039 Textiles, hides/skins and leather, version 4.9, 05 December 2018. Background document. Retrieved 20 March 2019,

from <https://www.nordic-ecolabel.org/product-groups/>

- Nordic Ecolabelling. (2018m). *Nordic Ecolabelling for Textiles, hides/skins and leather*. Version 4.9. 12 December 2012 – 31 December 2020. Document: 039 Textiles, hides/skins and leather, includes products for apparel and furnishings, version 4.9, 5 December 2018. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>
- Nordic Ecolabelling. (2018p). *Nordic Ecolabelling of Chemical building products*. Version 2.12. 19 March 2014–30 June 2021. Document: 097 Chemical building products, version 2.12, 07 November 2018. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>
- Nordic Ecolabelling. (2018q). *About Nordic Ecolabelled Chemical building products*. Version 2.12. Background to ecolabelling. 7 November 2018. Document: 097 Chemical building products, version 2.12, 7 November 2018. Background document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>
- Nordic Ecolabelling. (2018r). *About Nordic Swan Ecolabelled Grease-proof paper*. Version 4.2. Background to ecolabelling 19 December 2018. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>
- Nordic Ecolabelling. (2018s). *About Nordic Swan Ecolabelled Disposables for food*. Version 4.3. Background document 19/12/2018. Document: 047 Disposables for food, version 4.3, 19/12/2018. Background document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>
- Nordic Ecolabelling. (2018t). *Nordic Ecolabelling of Grease-proof paper*. Version 4.2. 18 November 2014–31 December 2022. Document: 049 Grease-proof paper, version 4.2, 19 December 2018. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>
- Nordic Ecolabelling. (2018u). *Nordic Ecolabelling for Printing Companies, Printed Matter, Envelopes and Other Converted Paper Products*. Version 5.13. 15 December 2011–31 March 2021. Document: 041 Printing companies, Printed matter, Envelopes and other Converted Paper Products, version 5.13, 19 June 2018. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>
- Nordic Ecolabelling. (2018v). *Nordic Ecolabelling for Disposables for food*. Version 4.3. 14 June 2017–30 June 2022. Document: 047 Disposables for food, version 4.3, 19 December 2018. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>
- Nordic Ecolabelling. (2018x). *Nordic Ecolabelling of Liquid and Gaseous Fuels*. Version 3.1. 14 June 2017–31 March 2022. 099 Liquid and gaseous fuels, generation 3.1. 19 December 2018. Criteria Document. Retrieved 12 June 2019 from <https://www.svanen.se/en/nordic-swan-ecolabel/criteria-application/liquid-and-gaseous-fuels-099/>
- Nordic Ecolabelling. (2019a). *The Nordic Swan Ecolabel and EU-Ecolabel*. Text from webpage. Retrieved 22 March 2019. <https://www.ecolabel.dk/en/about/the-nordic-swan-ecolabel-and-eu-ecolabel>
- Nordic Ecolabelling. (2019b). *Life cycle perspective*. Text from webpage. Retrieved 24 March 2019. <https://www.nordic-ecolabel.org/why-choose-ecolabelling/life-cycle/>
- Nordic Ecolabelling. (2019c). *Nordic Ecolabelling for Laundry detergents for professional use*. Version 3.5. 19 March 2014–31 December 2021. Document: Laundry detergents for professional use, version 3.5, 15 January 2019. Criteria document. Retrieved 20 March 2019, from <https://www.nordic-ecolabel.org/product-groups/>
- Nordic Ecolabelling. (2019d). *Criteria development process*. Text from webpage. Retrieved 10 April 2019. <https://www.nordic-ecolabel.org/the-nordic-swan-ecolabel/criteria-process/>
- Nordic Ecolabelling. (2019e). *Inspection of the Nordic Swan Ecolabel and EU Ecolabel*. Text from webpage. Retrieved 10 April 2019. <https://www.ecolabel.dk/en/about/inspection-activities>
- Nordic Ecolabelling. (2019f). *Rekordmange danskere briger Svanemaerket som pejlemærke*. Retrieved on 29 April 2019 from

<https://www.ecolabel.dk/da/aktuelt/nyheder/2019/4/rekordmange-danskere-bruger-svanemaerket-som-pejlemaerke>

Salo, H., Suikkanen, J. and Nissinen, A. (2019). *Nordic Swan Ecolabel and Organisation Environmental Footprint: Focus on the organisation environmental information used in the retail sector*.

Salo, H., Nissinen A., and Suikkanen, J. (2019) *Use of ecodesign tools and expectations for Product Environmental Footprint. Case study of Nordic textile and IT companies*.

Suikkanen, J. and Nissinen, A. (2017). *Circular Economy and the Nordic Swan Ecolabel: An Analysis of Circularity in the Product-Group-Specific Environmental Criteria*. TemaNord, ISSN 0908-6692; 2017:553

YouGov. (2015). *A Computer Assisted Web Interview Study in Norway, Sweden, Denmark, Finland and Iceland, commissioned by the Nordic Swan Ecolabel*. Internal document

Zampori, L. and Pant, R. (2019) *Suggestions for updating the Product Environmental Footprint (PEF) method*. EUR 29682 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-00654-1, doi:10.2760/424613, JRC115959.

Annex I: Workshop Questions

A workshop was organised in Helsinki on 4 May 2017 for which a Nordic Working Paper (NA2017:910) to guide the discussion was prepared. The aim was to consider the synergies, opportunities and challenges in the use of environmental information between PEF and Swan.

The following questions were prepared to guide the expert discussion. The outcomes of the discussions were used as input to this report. The Workshop Report is available online at: <https://www.syke.fi/hankkeet/scepef>

- To what extent can the PEF Screening Studies, PEF Category Rules or PEF profiles be used in setting or revising criteria for the Nordic Swan Ecolabel's product groups?
 - And should a "good PEF-value" be one requirement in the Swan criteria set?
- How could the PEF-information prepared by companies be used by applicants of the Nordic Swan Ecolabel?
 - What are the special requirements by Swan for the PEF-studies?
 - What are differences in the data quality requirements of Swan and PEF?
 - Verification of data?
 - Accepting secondary data?
 - Requiring product-chain-specific data?
 - What implications do the differences have?
- How can we avoid situations where the two schemes give "disagreeing results"?
 - If they cannot be avoided, what to communicate to consumers and companies about the reasons for the differences?

Below are some other questions that have arisen during the process. Some of these may also be discussed in the workshop:

- How can the non-quantitative information dealt with the Swan-criteria be addressed by PEF (e.g. sustainable forestry)?
 - Can it be in the "Additional Environmental Information" of PEFCRs?
 - More generally, could some Swan criteria complement the Additional Environmental Information in PEFCRs?
- Is there any other way in which the assessments of environmental information (for Swan and PEF) can complement each other?

- Could the Nordic Swan Ecolabel Criteria be helpful in defining benchmarks for PEFs?
 - Is this question of relevance, considering that PEF probably will have its own method for defining benchmarks?
- What kinds of possible implications there are of the various proposed communication vehicles (e.g. like energy label, or traffic light scale) on the Nordic Swan?
- From the producers' point of view, what are the implications of the two schemes for product environmental information and labelling?
- From the consumers'/purchasers' point of view, what are the implications of the two "official but profoundly different" eco-labels?
- What are the possible synergies between the two systems?
 - Focus on the methods behind the two schemes, and product environmental information.
 - What are the implications for the experts developing the Ecolabel criteria or PEF Category Rules?

Annex II: Workshop Report

Workshop Report of the Nordic workshop on Product Environmental Footprint and the Nordic Swan Ecolabel – Focus on product environmental information

Date and time: 4 May 2017, 9:00 – 15:30.
Place: Room Muuttohaukka, Finnish Environmental Institute (SYKE), Mechelininkatu 34a, Helsinki.

Introduction

The workshop was organized by the project “Nordic Swan, Circular Economy and Product Environmental Footprint”, funded by the Nordic Council of Ministers (NCM) and belonging to the projects of Finnish Presidency in NCM (2016) (See project at: www.syke.fi/en-US/content/39483/25245).

The objectives of the workshop were to discuss:

1. synergies, opportunities and challenges between PEF and Swan in their use of environmental information;
2. implications for companies and consumers in a situation where a Swan-label and PEF-label would exist in parallel at the market (with a focus on environmental information).

A draft Nordic Working Paper, prepared during the project, provided the background material for the workshop. The Working Paper “Product Environmental Footprint and the Nordic Swan Ecolabel: Focus on product environmental information” is being published and will be found at: <http://norden.diva-portal.org/smash/search.jsf?dsid=-3148>

Ari Nissinen and Johanna Suikkanen from Finnish Environment Institute co-chaired the workshop.

Setting the Scene

The morning session aimed to set the scene for the topic of the workshop and provide different perspectives for the afternoon’s workshop sessions. The morning consisted of presentations by the Finnish Environment Institute (SYKE), comments by the reviewers of the Draft Working Paper (Marianne Wesnaes from SDU Life Cycle engineering University of Southern Denmark, Tomas Rydberg from IVL, Catharina Hohenthal from VTT), by Karin bergbom from the Nordic Swan Ecolabel, and An de Schryver from the

European Commission and Erwin Schau from EU's Joint Research Centre. Kindly refer to the agenda and the presentations for more information.

Workshop Sessions

The participants were divided into three groups, each group discussing each of the three key questions which were identified in the Working Paper. A summary of the discussions for each of the three questions is outlined below:

Question 1 (Moderated by Tomas Rydberg):

To what extent can the PEF Screening Studies, PEF Category Rules or PEF profiles be used in setting or revising criteria for the Nordic Swan Ecolabel's product groups? And should a "good PEF value" be one requirement in the Swan Criteria?

In response to the question the groups provided the following perspectives:

In general, the groups agreed that if a PEFCR exists for a product group, using it would be helpful as information source in setting the Swan Criteria¹⁶⁸. Both systems attempt to determine an average product: the PEF screening studies could be helpful in this regard. Currently the Swan sets a benchmark based on industry data. The participants considered that, for example, the benchmarks identified in the PEF screening study are a useful start to pinpointing life cycle impacts and benchmark values. Also the PEF profiles prepared by companies could be used as background data in criteria setting if they are 3rd party verified.

The discussion indicated that one option would be to use the PEF-values as a basis for setting the criteria. Other requirements on aspects not covered by PEF (quality, performance etc.) would be added to complement the PEF-values. The discussion indicated that the well-established type I eco-labels should accept PEF as a basis. PEF could be an especially useful data source in particular in relation to supporting criteria setting of the raw materials.

Some concerns were related to:

- verifying compliance if PEF-values were used to set criteria, especially in terms of data quality for the product groups for which the supply chains are long;
- how local and regional issues are taken into account;
- weighting;
- system boundaries (granularity); how applicable the PEF values are if the different product groups are defined in a different way in the two systems; and
- costs associated with requiring PEF values from applicants, if PEF is voluntary.

¹⁶⁸ It was also seen to be a decision of the Nordic Swan Eco-labelling organisation.

However, the participants expressed some uncertainty in answering the second question. Mostly, the participants noted that whether a “good PEF value” should be a requirement depends on whether the PEF-scheme will be mandatory:

- if PEF becomes a mandatory scheme, then PEF value could be requirement in the Swan criteria. When mandatory, it is easier for the Swan to use the requirements for setting criteria (compare to the current situation with the RED directive);
- if PEF becomes a voluntary system, then preparing a PEF study would present an additional cost for Swan applicants. It may be required as additional information. Participants considered the PEF scheme to be “heavy” for a voluntary system.

Further to the above, the discussion indicated that some participants questioned whether it would make sense to have a grading of A–E for PEF as a voluntary system. It was also noted that both systems involve some subjectivity, through weighting and expert judgement.

Question 2 (Moderated by Catharina Hohenthal):

How could the PEF-information prepared by companies be used by applicants of the Nordic Swan Ecolabel?

The participants well agreed that the information provided by PEF on hotspots can be used as a basis for setting the Swan criteria. It was also suggested that the information used or provided by a company could be used as an input for the application for Swan, provided that the information is verified and the system boundaries fit. For companies, having the same framework for both, would be beneficial.

Much of the discussion focused on assessing whether generic or secondary data would be usable in the context of the Swan. It was suggested that verified secondary data of good quality could in the future be accepted for use for other than the core processes of Swan. However, it was mentioned that there may be cases (in PEF) where secondary data is used on the excuse that primary data is not available.

A key concern expressed by the group related to the proxies used by PEF to estimate data for less-important functions of the company, supported by country-specific data. Swan does not allow the use of proxies. Instead Swan accepts only reported data from companies. Where an industrial plant lacks data, it will be excluded from the products gaining an ecolabel. One conclusion from the discussion was that Swan could make good use of the *inventory data* prepared in the PEF system, but there were doubts on the usefulness of the *overall aggregated PEF result*.

Some of the differences in data quality requirements that were discussed included the following:

- PEF sets data quality requirements: time, geography, precision, technological and methodological consistency;
- Primary PEF data cannot be older than 3 years; In Swan the acceptable age of data depends on the product group;
- PEF has a sampling rule for data that is difficult to collect; Swan looks at this case by case per product group;
- PEF weighs secondary data; Swan does not accept weighing.

A couple of examples were discussed in relations to energy and chemicals. PEF uses country specific data to calculate energy-related environmental impacts. Swan uses data on electricity consumption which is translated to GHG emissions by using the specific emissions of the electricity bought. In terms of assessing chemicals the approach is different. PEF will look at all the environmental impacts of a chemical production, but the Swan may look at the hazard properties. An example of plastics and hygienic products was also mentioned. In this case data is often not available, and secondary data for plastics is the only available data for use.

Question 3 (Moderated by Marianne Wesnæs):

How can we avoid situations where the two schemes give “disagreeing results”? If they cannot be avoided, what to communicate to consumers and companies about the reasons for the differences?

The discussion on the third question was first based on the assumption that there would be a PEF label, and then also a situation without any PEF-label was considered. The groups discussed three perspectives:

- a. Avoiding “disagreeing” results;
- b. Communicating to consumers and companies;
- c. Situation without a PEF-label.

(a) Avoiding “disagreeing” results:

The participants stated that it is very important that a situation with “disagreeing” results does not happen. They viewed that this is a matter that should be discussed at the political level, so as not to accept such a situation, especially considering the EU goal of reducing the proliferation of labels. The discussion indicated that “disagreeing results” would destroy confidence in both PEF and Swan and may also have a larger effect on other discussion on environmental policies and impacts. It was emphasized that if we are not able to designate the “green products” and agreeing on this, the overall environmental sector has a serious problem, which will affect consumers’ confidence as well as producers’ awareness: How can we ask people to purchase with environmental concern, if we can’t agree on which products to buy? Communication and cooperation between Swan and PEF already before the PEF would be adopted is important in this regard. This means that Swan delegates should participate in the PEF

process. Active participation even in only one or two product pilots would have brought a lot of experience of the PEF process, both its theoretical basis and the practice. But now the pilots and the process have proceeded quite far already, and it was discussed whether a commitment to cooperate was needed and whether there would be an efficient way for Swan to participate in the already well advanced PEF development process.

In addition, participants discussed that it is important to cooperate during the criteria development process. For example, contradictions can be avoided if Swan uses the best PEF scores in setting criteria. It was considered that there would be no conflict in the Swan using PEF as a starting point and adding other criteria.

(b) Communicating to consumers:

It was viewed that any “disagreeing” results should not be communicated further before the reasons for the differing results are understood. However a process for this understanding is currently missing. While for example a researcher can understand reasons behind differing results, explaining the difference to companies or consumers is not easy. Consumers tend not to be well aware of different environmental aspects and problems. This implies that information towards consumers should be unambiguous.

Items that could be communicated to consumers on what differentiates the two labels could include, e.g., that they focus on different markets and countries. Hotspots also depend on the geographical location. This is important for issues like paper recycling, energy and water. The fact that Swan covers additional aspects was also brought up. In addition it could be highlighted that the Swan covers quality and health aspects. It was discussed by the groups whether PEF covers all the important environmental aspects; or whether Swan does so either. A disclaimer on PEF regarding quality and health aspects was suggested to communicate clearly that PEF is purely an environmental label, whereas the Swan identifies also other matters.

The question also sparked a discussion on the decision on the voluntary or mandatory nature of the PEF scheme. If the PEF scheme, including a label, were mandatory, consumers would be able to identify also the “worst” products and not just the most ecologically sound ones which the eco-labels can show.

(c) Situation without a PEF-label:

Participants discussed a situation where PEF results would not be expressed as a label on the product. Instead other ways of informing about PEF would be used. Other ways to communicate the PEF information include QR codes that would include the details of all 16 impact categories, possibly without any weighing. Otherwise, it was also suggested that PEF communication could focus on companies and experts, not consumers.

It was considered during the discussion that such a situation where there would be no “simple” PEF label targeting consumers, the differences or “disagreeing” results are not as significant. At the same time, broad environmental information about products is needed and PEF like this would be very beneficial. That, however, depends on

whether weighting of the environmental impacts will be included in the PEF, or not (leading to a “single number results” and “benchmarks”).

The third discussion also identified some other issues, including issues related to the costs of PEF. Swan participants also described an analogy to the appearance of energy labelling:

The Swan label criteria exists for some white goods, however, it appears that the Nordic Swan Label has difficulties in competing with the Energy labels for white goods, as White goods manufacturers considers that the energy label is sufficient. The same could happen with PEF, so that the extra value of having eco-label would not be appreciated and the eco-label not be used.

Wrap up

The final session of the day included short presentations of the group work by each of the moderators, a short discussion, and some final remarks by Ari Nissinen. Ari warmly thanked the participants and stressed the importance to have more cooperation and discussion between the experts of product environmental information, most of them now focusing on either life cycle assessment methodologies or eco-labelling but in future hopefully having at least some understanding of both methodologies. Ari also stressed that Swan eco-label should now quickly consider its relation to PEF and strive for active cooperation between Swan and PEF.

Nordic Council of Ministers
Nordens Hus
Ved Stranden 18
DK-1061 Copenhagen K
www.norden.org

Nordic Swan Ecolabel and Product Environmental Footprint

The purpose of this report is to compare the Nordic Swan Ecolabel and the Product Environmental Footprint with a focus on environmental information. The report compares the methods used by the Nordic Swan Ecolabel and the PEF to identify the product-group-specific relevant environmental aspects. The analysis is based on the currently valid Swan Criteria and pilot phase final PEF Category Rules (PEFCRs). The report concludes that there are methodological differences in the way product comparisons are made. The report proposes recommendations for both schemes in terms of co-operation and required further work, related to the differences in methodological approaches, to avoid very different results in what will be considered as an environmentally sound product.

9 789289 362597