About Nordic Swan Ecolabelled

Disposables for food



Version 4.6

Background document
01/09/2020

Nordic Ecolabelling

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Addresses

In 1989, the Nordic Council of Ministers decided to introduce a voluntary official ecolabel, the Nordic Swan Ecolabel. These organisations/companies have been given responsibility for the official Nordic Swan Ecolabelling system by their own country's government. For more information, see the websites:

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1 Summary

Nordic Ecolabelling has conducted a revision of the criteria for the Nordic Swan Ecolabelling of Disposables for Food. Before the revision, an evaluation indicated that the level of ambition in the first generation of the criteria was too high and the requirements were tough on several parameters at once. The criteria have worked quite well for relatively simple products such as coffee filters and products made from secondary raw materials, but products that comprise several different materials have found it more difficult to meet the requirements.

The aim of the revision has therefore been to simplify the entire criteria document so that all the requirements work better together.

Other key points in the revision have been:

- a clarification of the product group definition
- considering the possibility of allowing recycled materials
- assessing the energy requirement for bio-based polymers
- seeing what waste requirements can be set with regard to the circular economy and better use of resources
- introducing reference values and requirement limits for energy, CO_2 and emissions to air and water for coffee filters and other paper/board types that are not currently part of Nordic Ecolabelling's Basic Module or Supplementary Modules for Paper Products.

Production of raw materials is the life cycle phase with the greatest environmental impact in terms of energy consumption and climate impact for disposable articles. A switch to renewable raw materials will cause less of an impact on the climate, since they contain CO_2 that is part of the natural ecocycle. It will also reduce the dependence on fossil raw materials. Nordic Ecolabelling therefore wishes to promote the use of bio-based materials in the criteria, and considers that there is potential to steer the trend towards more bio-based materials and away from fossil resources. There is also a potential to improve the carbon footprint by using recycled materials, and Nordic Ecolabelling allow products made from recycled plastic.

The waste phase is also important for this product group, since the products are disposable and will generate a significant amount of waste. Nordic Ecolabelling therefore set requirements that ensure the products can be recycled and thus contribute to the circular economy. The requirements focus on that the products should be designed for material recycling, for example in requirements concerning the type of adhesive and use of dyes and inks, and requirements that encourage the consumer to recycle. One consequence of the products having to be recyclable is that products that only consist of plastic cannot be made from biodegradable/compostable plastics, since these kind of plastic are not wanted in the composting-and biogas facilities today and they also create problems for the material recovery of other types of plastic.

Chemical consumption during conversion and in the production of the constituent materials is important in terms not only of emissions to the environment, but also

of the health risks associated with use of the products. Chemical requirements have therefore been set for the production of constituent materials and for the chemicals used in the conversion of the actual disposable article. The chemicals are also a consideration when recycling the products. For this reason, it is important to restrict chemical use in general, but also restrict chemicals that are harmful to health and the environment, so that these do not make it into the recycling streams. Less use of chemicals will also increase the quality of the recycled material.

The key changes in the revision are:

- products made from recycled plastics can be ecolabelled. Recycled paper/board will continue to be prohibited

- products that only consist of plastic cannot be made from biodegradable/compostable plastics

- an alternative has been added to the energy requirement for bio-based polymers. The requirement can also be fulfilled by the manufacturer of the polymer being certified to ISO 50001

- permitting the use of the mass balance system for biobased polymers used as coating, but not for plastic in products that only consist of plastic

- the waste requirements focus on ease of material recovery for the disposable article by setting requirements for clear labelling of the waste category for disposal of the product, and requirements concerning the type of adhesive and the colouring of the disposable article. The specific requirement concerning compostability has been removed

- new general and specific chemical requirements have been introduced, such as a ban on a number of problematic substances in the chemicals used, plus a ban on problematic residual monomers such as bisphenols and styrene in plastics

Please see chapter 8.2 for an overview over changes from generation 3 to generation 4.

2 Basic facts about the criteria

Products eligible for the Nordic Swan Ecolabel

The product group comprises various products that are intended to be in contact with foods for a short period and that are intended for single use. The product types covered can be divided into the following categories:

- Take-away packaging such as coffee cups, pizza boxes, containers and paper for the packaging of food
- Disposable tableware such as cups/glasses, plates, cutlery and drinking straws
- Bags and films for packaging food, such as bread bags, freezer bags and bags for fruit and vegetables
- Coffee and tea filters

- Toothpicks/cocktail sticks and stirrers

Products that cannot be Nordic Swan Ecolabelled

Below is a specification of the types of products that cannot be ecolabelled according to these criteria. Some of these products may, however, be ecolabelled under other criteria. This applies to:

- Napkins – may be ecolabelled under the criteria for Tissue Paper
- Food paper and baking paper – may be ecolabelled under the criteria for Grease-proof Paper
- Straws, disposable cutlery, plates, toothpicks /cocktail sticks and stirrers made of plastic - cannot be ecolabelled
- Waste bags – cannot be ecolabelled
- Carrier bags (for carrying food home from the store) – cannot be ecolabelled

Packaging that is part of a prepacked* food product, e.g. a milk carton or juice bottle, where the finished product has to be labelled in line with Regulation No (EU) 1169/2011 on the provision of food information to consumers, is not included in this product group.

**In this context, prepacked food refers to the definition used in Regulation No (EU) 1169/2011: any single article for presentation as such to the final consumer and to mass caterers, consisting of a food and the packaging into which it was put before being offered for sale, whether such packaging encloses the food completely or only partially, but in any event in such a way that the contents cannot be altered without opening or changing the packaging; "prepacked food" does not cover foods packed on the sales premises at the consumer's request or prepacked for direct sale. Disposable articles that are used for food intended for immediate sale can thus be Nordic Swan Ecolabelled.*

If there is any doubt about whether a product type falls within the product group definition, Nordic Ecolabelling will decide whether the product can be ecolabelled.

For more information about the product group definition and the assessments that form the basis for what products can/cannot be ecolabelled, see section 7.1.

In addition to the definition of what types of products can be ecolabelled, there are also restrictions on what kind of material the disposable articles can be made of. At least 90% by weight of the materials in the disposable article must comprise renewable raw materials, such as paper or bio-based plastic. This means that no more than 10% of the product may comprise other materials, such as fossil plastics, adhesives or coatings. Inorganic fillers such as kaolin, calcium carbonate and clay are not to be counted in the proportion of non-renewables. This means that paper or bio-based plastics with inorganic fillers count as renewable, even if they contain inorganic fillers. There is, however, a limit for the content of inorganic fillers in plastic products, see more in O2. The products may also comprise recycled plastic. Metal and recycled pulp/paper/paperboard/cardboard are not permitted. For more background on this, see O2.

Justification for Nordic Swan Ecolabelling

Disposable articles are used in large quantities in our society, and although there are some who actively choose not to use disposable packaging, for example by taking their own cup to the café to get a coffee, it is quite unlikely that this product group will decline over time. For certain restaurants, the use of disposable articles can even be a statutory requirement for reasons of hygiene. Disposable articles involve considerable use of resources and generate large quantities of waste, since the products are designed for single use only and quickly end up as waste. Disposable products in the form of plastic film, freezer bags and bags for packaging food are products that are difficult to replace with multiuse products, whether in the restaurant industry or for private use.

It is not the intention that Nordic Swan Ecolabelling of disposables for food will encourage increased use of disposable articles, but instead the focus is on ensuring that there is a differentiation between the products on the market and on raising awareness of the environmental impact of disposables. Nordic Ecolabelling wishes to guide consumers or purchasers of disposable products towards choosing the least environmentally harmful products on the market.

Disposable articles may comprise many different materials, such as paper, board, plastic and metal, plus wood and vegetable materials such as palm leaves. The plastics may be fossil-based or bio-based. In this product area, new material types have come on stream in recent years in the form of various bio-based plastics. The choice of material affects the environmental impact of the product. The choice of renewable raw materials will generally be positive for the environment since, from a life cycle perspective, renewable raw materials do not contribute to a rise in greenhouse gases, plus they help to reduce the dependence on fossil raw materials. Bioplastic is put forward by ZERO and others as a good solution for reducing the impact that plastics production has on the environment.[1],[2] The fact that the raw material is renewable also means that it can be regenerated and used again. Use of recycled materials can also reduce the impact on the climate[3], but here it is also important to consider the health implications of the chemicals in the recycled material. Nordic Ecolabelling wishes to promote products that comprise a large proportion of renewable raw materials and recycled materials, but limits this to recycled plastics due to the concerns associated with chemicals in recycled paper/board.

Even if the product is made from renewable raw materials, there are various environmental impacts associated with extraction of the raw material and in the production process for the product in terms of chemical use, energy use and emissions. The chemicals used in the plastics and paper industry can have problematic environmental and health properties, such as being non-readily degradable, bioaccumulative, toxic or carcinogenic. Emissions from production can have major negative impacts, e.g. emissions of chemicals and organic material to water. Reducing energy use, particularly in the production of materials, is an important parameter for reducing the environmental impact. By setting strict

[1]Marius Gjerset, Siri Hall Arnøy and Johannes Fjell Hojem; Klimaløsning: Bioplast! Status, barrierer og virkemidler for fornybar plast, ZERO January 2014
[2] Olav Andreas Opdal and Mikkel Heiberg Storm, 2011: Utlippsfri plast – et prosjekt omkring mulighetene for klimagassreduksjoner i plastsektoren med fokus på bio-basert plast
[3] Karl Hillman, Anders Damgaard, Ola Eriksson, Daniel Jonsson and Lena Fluck, Climate Benefits of Material Recycling, TemaNord 2015:547

requirements concerning these parameters, Nordic Swan Ecolabelling can reduce the environmental impact from the production of the various materials.

The waste phase also makes a major contribution to the environmental impact of a disposable product, since these products with their short lifetime generate a great deal of waste. The way that the waste is processed depends on the types of materials, and on what waste management facilities are available in the country in question and within the individual municipalities. There is a strong focus on the circular economy in today's society. This involves better use of the resources we have available, by making sure they are used again and not immediately turned into waste. Nordic Swan Ecolabelling contributes to this by setting requirements that make the products easier to recycle and the materials easier to recover. Requirements concerning chemicals or restrictions on products comprising composite materials will be positive for material recycling and the quality of the recycled product. The Swedish packaging and paper recycling firm FTI and its plastics recycling operation Plastkretsen have issued a guide[4] on how products should be designed to make recycling easier, and Nordic Ecolabelling wishes to promote recycling by setting design requirements. The waste management facilities in the Nordic countries are not something Nordic Ecolabelling has any steerability over, but it is possible to guide consumers on which recycling category to use when disposing of the product, where there are recycling systems for this.

Disposable articles are also a product area in which a number of environmental assertions are used in marketing, such as "biodegradable", "bioplastic" and "recycled material". Consumers and professional purchasers can find it difficult to identify which of these claims provides a real environmental benefit and the industry has therefore requested the Nordic Swan Ecolabel in this product area[5].

For a more detailed description of the environmental impact associated with the products in the product group and assessments that have been made, see section 6.

Version and validity of the criteria

This is the background document for generation 4 of the criteria for the Nordic Swan Ecolabelling of Disposables for Food. The first generation of the criteria for Disposables for Food was developed in 2011–2012. In 2014, however, the decision was taken to change the product group number to number 047 (previously the product group number for the criteria for Coffee Filters), and the new criteria were therefore given the generation number 3, despite this essentially being the first time that Nordic Ecolabelling had criteria for Disposables for food. This is because the existing criteria for Coffee Filters were incorporated into the new criteria and the product group took on the product number previously assigned to Coffee filters.

Nordic Swan Ecolabel licences

As per April 2017, there are 9 licences in the Nordic market. There are 3 licences in Finland, 5 in Sweden, 1 in Denmark and none in Norway. Some of the licensed products are sold in several Nordic countries. We currently have licences in the

[4] "Bättre förutsättningar för återvinning av plastförpackningar", FTI and Plastkretsen
[5] Background to the Nordic Swan Ecolabelling of Disposables for Food, version 3.2. March 2012.

areas of coffee filters, coffee cups, disposable tableware and freezer bags/plastic bags for food packaging.

3 The Nordic market

Large quantities of disposable articles are used in our society. A “hectic” lifestyle drives people to buy cups of coffee on their way to work and to grab a quick take-away lunch from the nearest restaurant or shop. Disposable articles are also used in conjunction with large events such as exhibitions and parties and during recreation in shopping centres and leisure centres (for example, popcorn tubs and drinks cups at the cinema). Disposable articles can also be sold to the ordinary consumer in retail stores, and often the products used in the different markets can be the same, such as coffee cups and disposable cutlery. It has been difficult to find figures for the size of the industry for the product areas covered by the product group. Disposable articles for food are included in other larger product categories, so clear statistics cannot be obtained, but it is estimated that sales are four times greater in the professional segment than in retail[6].

There are several manufacturers of disposable articles and materials for disposable articles in the Nordic region, primarily in the area of paper and board.[7] There are also manufacturers in the Nordic region that make products from bioplastics such as PLA, but they focus on the conversion process. Nordic Ecolabelling is not currently aware of any manufacturers in the Nordic region that produce bio-based plastics for this purpose, but there are players such as Scanfill who produce plastic comprising 50% minerals and 50% bio-based plastic.[8] They do not, however, manufacture the bio-based plastic themselves. There are also a number of importers of various disposable articles operating in the Nordic market. Visits to the websites of manufacturers and wholesalers show that a wide range of products are available[9],[10],[11],[12],[13],[14],[15].

The environment is a focus for many players in the industry when marketing their products. The manufacturers may have their own brands that highlight environmental commitment, such as Duni’s Ecoecho®[16], PAPSTAR’s Pure[17] and BioWare from Huhtamaki[18]. Some players emphasise the importance of limiting the impact on the climate. McDonald’s, for example, writes that it limits its climate impact by reducing the quantity of materials and by using renewable materials and recycled plastic/wood in its disposable articles[19]. The Swedish burger chain Max describes on its website how it reduces the quantity of materials and sorts its

[6] Background document, Nordic Swan Ecolabelling of Disposables for Food, version 1.
[7] Examples of Nordic manufacturers: Stora Enso, Metsä, SCA, Nordic Paper, Billerud Korsnäs
[8] http://www.scanfill.se/100-miljovanliga-forpackningsmaterial/ (accessed 06.09.2016)
[9] http://www.huhtamaki.com/our-products
[10] http://www.duni.com/sv/products
[11] http://www.suomenkerta.fi/
[12] https://www.eskimofinland.fi/
[13] https://www.stenqvist.com/SE_index.htm
[14] https://online.abena.dk/Catalog#path=33378&cg=33378
[15] http://www.tingstad.se/#menu/products
[16] http://catalogues.duni.com/International/2015/CorporateResponsibility/ (accessed 06.09.2016)
[17] http://www.papstar-pure.com/en (accessed 06.09.2016)
[18] http://www.nonfood.no/article.php?articleID=6663&categoryID=200 (accessed 06.09.2016)
[19] http://www.mcdonalds.se/se/om_mcdonald_s/vart_hallbarhetsarbete/forpackningar.html (accessed 15.12.2015)

waste in order to reduce the impact of its disposable articles on the climate[20]. There has generally been a positive trend in the market for bio-based plastics (see more in section 6.1), and this is also reflected in the market for disposable articles. There are several manufacturers of disposables for food who use bioplastics in their products. Huhtamäki, for example, has cups for cold drinks, beer glasses, lids for coffee cups and salad bowls in PLA[21]. Duni's products in their Ecoecho® range are made from materials such as PLA, green PE and bio-based PBS[22], and PAPSTAR has the PAPSTAR Pure range which includes PLA products[23]. Scanfill has products made from bio-based PE mixed with minerals[24]. In addition to the above-mentioned environmental focus on materials and climate impact, properties such as compostability, degradability and recyclability are also put forward as environmental arguments in the industry.

There is a great deal of innovation going on in the world of packaging, and new materials are being brought to market, including nanocellulose[25]. There are also products that are edible, such as "Ooho, the edible water bottle"[26] or plastic made from the milk protein casein.[27]

4 Other labels

4.1 Life cycle-based labelling schemes

Other labelling schemes have similar criteria for packaging, but there are not many that have criteria covering disposables for food. The GEN (Global Ecolabelling Network) website[28] lists examples such as China's label CEC for "Disposable Food & Drink Containers" and Green Seal in America for "Food Service Packaging ".[29] Green Label Singapore also has criteria for "Food packaging, Crockery and Cutlery".[30] Green Label in Hong Kong has criteria for "Degradable Food/Drink Containers and Bags". The New Zealand Ecolabelling Trust has criteria for "Packaging and Paperboard Products" which cover egg boxes and fruit trays, for example.

[20] Max sustainability report: http://www.max.se/Global/Download%20Files/klimatbokslut-f%c3%b6r_2012.pdf (15.12.2015)
[21] http://www2.huhtamaki.com/web/foodservice_eu/productcategories (accessed 12.11.2015)
[22] http://www.duni.com/no/til-virksomheten/produkter/Duni-ecoecho/ (accessed 12.11.2015)
[23] http://www.papstar-pure.com/en/Produkte/PLA-Artikel-4.html (accessed 12.11.2015)
[24] http://www.scanfill.se/wp-content/uploads/msds-SCANFILL-BIO-Foil-GYX52C1-sv.pdf (accessed 21.09.2016)
[25] Abstract from the article "Nanocellulose in bio-based food packaging applications", Azeredo et al, 2016, Industrial Crops and Products: http://www.sciencedirect.com/science/article/pii/S092666901630156X (accessed 06.10.2016)
[26] http://blog.drupa.com/edible-bottle/ (accessed 06.10.2016)
[27] https://www.acs.org/content/acs/en/pressroom/newsreleases/2016/august/edible-food-packaging-made-from-milk-proteins-video.html (accessed 06.10.2016)
[28] http://www.globalecolabelling.net/ (accessed 05.06.2016)
[29] http://www.greenseal.org/GreenBusiness/Standards.aspx?vid=StandardCategory&cid=0&search=GS_35 (accessed 05.06.2016)
[30] http://www.greencouncil.org/eng/greenlabel/cert.asp (accessed 05.06.2016)

4.2 Raw material labelling

Disposables in paper/paperboard/cardboard may carry the FSC (Forest Stewardship Council) or PEFC (Programme for the Endorsement of Forest Certification) label. These labels are raw material labels that only make a statement about forest management and traceability, not other environmental conditions related to the production. For the label to be used on a product, the product's fibre raw material must come from sustainable forestry and contain a specified amount of FSC/PEFC certified wood. There are also equivalent labelling schemes in bio-based plastics, such as certifications associated with the renewable raw material used. This may include Bonsucro certified sugar cane, RSPO (Roundtable of Sustainable Palm Oil) certified palm oil or RTRS (Roundtable of Responsible Soy) or ProTerra certified soy. As with FSC and PEFC, these labelling schemes only relate to the production of the actual raw material, not the environmental impact in later stages of the production chain.

There are also other labelling schemes for bio-based raw materials such as ISCC Plus (International Sustainability and Carbon Certification) and RSB (Roundtable on Sustainable Biomaterials). These are global certifications that relate to sustainability and ethics. ISCC Plus also covers emissions of greenhouse gases.[31] Organic labels are another raw material certification that may be relevant for the raw materials for bio-based polymers.

4.3 Environmental product declarations (EPDs)

Environmental product declarations give detailed environmental information but are not subject to specific requirements concerning the products. In other words, there are no predetermined requirement levels. An EPD is based on the relevant product category rules (PCR). These rules set the requirements for EPDs in a particular product category (system limits and conditions) and make it possible to compare different EPDs that are based on the same PCR. There are currently 48 EPDs in the category "wood and paper products". Product specific rules exist for many paper products such as liquid packaging board and kraft paper, but there are none specifically for disposable articles.

4.4 Green Public Procurement (GPP)

The EU's Green Public Procurement (GPP) scheme sets common criteria for public procurement. There is no GPP or national procurement document in the Nordic region covering disposables for food.

4.5 Environmental management

Environmental management systems create order in a company's own operations and bring improvements based on that company's own targets in the environmental field. However, the environmental management systems contain no specific requirement levels for the products or for production. The most important systems are ISO 14001 and EMAS. These are common among manufacturers of disposable articles.

[31] http://www.iscc-system.org/en/iscc-system/about-iscc/ (accessed 03.03.2016)

4.6 Other labels

Composting

The property of compostability is marketed on products and is occasionally used incorrectly as an ecolabel. Compostability labels that can be found in the Nordic market are "The Seedling logo"[32] and "OK Compost"[33], both of which are based on EN 13432 (composting packaging), see figure 1.



Figure 1: Seedling logo and logo for OK Compost.

The Seedling logo is an international labelling scheme for compostable packaging. The bioplastics industry is keen to promote the fact that their industry applies the harmonised standard EN 13432 or EN 14995 (composting plastics) and thus labels their products with the Seedling logo. The certification process is performed either by Vincotte in Belgium or DIN CERTO in Germany.[34]

The certification body Vincotte, which has its headquarters in Belgium, has developed two labelling schemes for composting: OK Compost and OK Compost Home.[35] OK Compost certification is in line with the standard EN 13432. They have also developed the certification scheme OK Compost Home, which can be awarded to products that can be composted in a home composter, which does not generate the same amount of heat.

Degradability

Vincotte has an additional certification for degradability, OK Biodegradable. Under this scheme there are three possible certifications: OK Biodegradable Marine, OK Biodegradable Soil and OK Biodegradable Water.[36] No specific test methods are given for this on Vincotte's websites, but they do state that OK Biodegradable Soil requires testing for biodegradability (chemical degradation of polymer), ecotoxicity

[32] http://www.european-bioplastics.org/bioplastics/standards/labels/ (accessed 26.10.2016)
[33] http://www.okcompost.be/en/recognising-ok-environment-logos/ok-compost-amp-ok-compost-home/ (accessed 26.10.2016)
[34] http://www.european-bioplastics.org/bioplastics/standards/labels/ (accessed 21.09.2016)
[35] http://www.okcompost.be/en/recognising-ok-environment-logos/ok-compost-amp-ok-compost-home/ (accessed 21.09.2016)
[36] http://www.okcompost.be/en/recognising-ok-environment-logos/ok-biodegradable/ (accessed 21.09.2016)

and content of heavy metals, while the certifications that cover water only require testing of biodegradability.

Bio-based

There are also certifications for labelling products with their proportion of bio-based content. According to European Bioplastics, there are two schemes for this: DIN Geprüft and Vincotte OK Bio-based.[37] Such product claims are subject to the EU standard CEN/TS 16137:2011 "Plastics – Determination of biobased carbon content". The standard specifies the calculation methods for determining biobased carbon content, based on measurements of the content of C14.

Figure 2 shows the OK Bio-based star system.

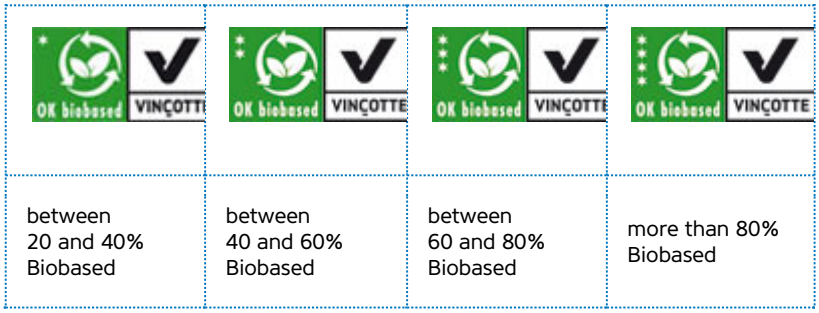

Figure 2: OK biobased logos

The number of stars indicates the proportion of renewable materials in the product. The highest range of 80% or more is represented by four stars.[38]

Environmental claims

In addition to the labels mentioned above, there are various different environmental claims about features such as "bioplastic", "bio-based" and "biodegradable" that are often used about the products without reference to any label or standard. However, these terms don't necessarily ensure that the product is made from sustainable and renewable raw materials, that the production is energy-efficient or that the product can be composted or used to create biogas.

5 About the criteria review/revision

Goals of the criteria review/revision

Before this revision began, an evaluation of the criteria was conducted in order to check whether the requirements have an environmental benefit, have the correct limit values/levels, are not too complex and restrictive for the development of the product types, and so on. The conclusion of the evaluation was that the criteria should be revised. The aim of the revision is to:

[37] http://www.european-bioplastics.org/bioplastics/standards/labels/ (accessed 21.09.2016)
[38] http://www.okcompost.be/en/recognising-ok-environment-logos/ok-biobased/ (accessed 21.09.2016)

- Develop reference values for the paper/paperboard/cardboard materials that are currently used in disposables, but that are not part of Nordic Ecolabelling's criteria for paper at this time. This applies to reference values and requirement limits for paper to coffee filters and board.
- Generally simplify the criteria and requirement levels. The first generation of the criteria has been ambitious, and some requirements have been contradictory.
- Consider the possibility of allowing recycled materials.
- Assess possible waste requirements from the perspective of the circular economy and the different waste management systems that exist in the Nordic region.
- Review the product group definition in order to clarify which products can be labelled and which cannot.

About this criteria review/revision

The work was conducted as an internal review by the secretariats of Nordic Ecolabelling. The working group maintained ongoing contact with the industry through licensees and other industry players, including material manufacturers, the waste management industry, research institutions and public authorities. Eline Olsborg Hansen at Ecolabelling Norway was project manager. Rebecca Uggla at Ecolabelling Sweden served as advisor to the project.

6 Ecolabelling of disposables

Section 6 gives a description of various relevant materials and the environmental problems associated with the product group of disposables for food. The development of the first generation of the criteria for the product group involved a MECO analysis (Materials, Energy, Chemicals and Other characteristics), which describes the key environmental impacts in the product group's various life cycle phases. The MECO analysis is updated and examined below in section 6.2. In addition, section 6.3 provides a brief summary of which LCA studies have been looked at and the results of these. Section 6.4 addresses the environmental assessments associated with renewable raw materials, energy use, chemicals and waste processing. This forms the basis for an RPS analysis that examines, in terms of environmental impact, how relevant it is to ecolabel the disposable articles (Relevance), the potential for improvement in the product group (Potential) and what scope ecolabelling has to influence this (Steerability).

The results show that the environmental gains lie mainly in using renewable raw materials and setting strict requirements concerning use of energy in the production of the ingoing materials, chemicals and emissions from the manufacture of materials. It is also important to ensure good waste processing channels for the disposable article and to ensure that the article makes material recovery easy, for example through requirements concerning the adhesive used and clear labelling with recycling advice.

6.1 Materials in the product group

The materials commonly used in disposables for food are traditional fossil plastics such as PET (polyethylene terephthalate), PE (polyethylene) or PS (polystyrene), bio-based plastics such as PLA (polylactate), PHAs (polyhydroxyalkanoates) and bio-based PE, metals such as aluminium, paper/paperboard/cardboard/pulp, and wood or vegetable materials such as wood veneers and palm leaves.

Since Nordic Ecolabelling has chosen to set requirements concerning a high proportion of bio-based materials in disposable articles, this chapter focuses on these materials below, along with a brief description of fossil polymers.

Fossil polymers

Since the products in the product group have to mainly be made from materials based on renewable raw materials, it is not relevant to consider products made from 100% fossil polymers, for example a PET salad bowl or a PS cup. Such materials may, however, be used as a coating (e.g. a PE coating on a paper cup), or as part of a product (e.g. a PS lid on a take-away coffee cup). Since the criteria now permit the use of recycled plastics, a product may comprise fossil plastic if that plastic has been recycled.

Bio-based polymers

The organisation European Bioplastics defines bioplastics as follows:[39]

- Bio-based – plastics that are based on renewable raw materials
- Biodegradable – polymers that meet all the criteria in scientifically assessed standards for biodegradability and compostability for plastics and plastic products. In Europe the standard used is EN 13432.

Bioplastics must comply with either bullet point one or two. Note that fossil-based biodegradable polymers count as bioplastics under this definition. Nordic Ecolabelling do not consider fossil based polymers that are biodegradable/compostable as biobased. The european committee for standardization, CEN, has published a standard for definitions that are not related to bio-based polymers specifically, but bio-based products in general and terms related to this.[40] In that standard bio-based is defined as "derived from biomass", and a bio-based product is a product wholly or partly derived from biomass. There is also plastic on the market that are bio-based by using the mass balance method. This is a system where a certain amount of renewable raw materials are mixed with fossil raw materials in the beginning of the production process. Then these raw materials are sent together into the production facility without traceability knowing what kind of raw materials goes where. Finally, biobased polymer is sold, corresponding to the amount of renewable raw materials that originally entered the system. See more about Nordic Ecolabelling's view on the mass balance method in O2.

[39] Definition of “Bioplastics” on the European Bioplastics website, see http://en.european-bioplastics.org/press/faq-bioplastics/#define (accessed 17.11.2015)
[40] http://www.cen.eu/work/areas/chemical/biobased/Pages/default.aspx (accessed 26.10.2016)

Examples of different types of bio-based plastics are:

- Polymers that are extracted directly from biomass. These include polysaccharides such as starch and cellulose or chitin, and proteins such as casein (milk protein). One example of a known starch polymer is Mater-Bi® from Novamont S.p.A. in Italy.[41]
- Polymers produced through classic chemical synthesis, using monomers of a bio-based origin. The monomers may be produced through fermentation or chemical synthesis. One example is PLA (polylactate), which is polymerised from milk protein monomers. NatureWorks makes PLA from maize.[42] Another example is polyethylene made using ethylene from sugar cane manufactured by Braskem in Brazil.[43]
- Polymers produced through bacterial fermentation of sugar or lipids. One example is the class of substances known as PHAs (polyhydroxyalkanoates).

Today, bioplastics play a key role in the field of packaging.[44] There are two main trends when it comes to the production of bioplastics. One is the appearance of new types of plastic (such as PLA) and the other is the use of renewable materials for the production of traditional plastic types such as polyethylene, known as drop-in bioplastics. The bioplastics market has previously been dominated by plastic materials that are made for composting and/or are marketed as biodegradable. In recent years, there has been a major increase in bioplastics which have the same properties as fossil plastics (drop-in), are not compostable/biodegradable, can be included in recycling systems and are able to directly replace fossil plastics. This is amply illustrated in the report "Bio-based Building Blocks and Polymers in the World, Capacities, Production and Applications: Status Quo and Trends towards 2020" from the Nova Institute, published in 2015.[45]

Bioplastics Europe has split the relevant bioplastic materials on the market into biodegradable and non-biodegradable, see Table 1.

Table 1: Types of bioplastics categorised as biodegradable and non-biodegradable materials

Bio-based, biodegradable	Bio-based, non-biodegradable
Cellulose derivatives[1] Regenerated cellulose[2] Other biodegradable polyester (PBAT, PBS, PCL) Polyhydroxyalkanoate (PHA) Polylactic acid incl. blends (PLA, PLA blends) Biodegradable starch blends[3] (Starch blends)	Bio-polyamide (Bio-PA) Bio-polypropylene (Bio-PP) Bio-polyethylene (Bio-PE) Bio-polyurethane (Bio-PUR) Bio-polyethylene terephthalate (Bio-PET) Thermoplastic elastomer (Bio-TPE) Bio-polycarbonate (Bio-PC)

[41] http://www.novamont.com/eng/mater-bi (accessed 26.10.216)
[42] http://www.natureworksllc.com/The-Ingeo-Journey/Eco-Profile-and-LCA/How-Ingeo-is-Made (accessed 26.10.216)
[43] http://www.braskem.com/site.aspx/Im-greenTM-Polyethylene (accessed 26.10.216)
[44] Michael Carus & Nova team, Jan Ravenstijn, Wolfgang Baltus, Dirk Carrez, Harald Kaeb, Stefan Zepnik: 2013. Bio-based Polymers in the World Capacities, Production and Applications: Status Quo and Trends towards 2020, available at http://bio-based.eu/markets/
[45] "Bio-based Building Blocks and Polymers in the World, Capacities, Production and Applications: Status Quo and Trends towards 2020", Nova Institute, 2015. Available on the website: http://en.european-bioplastics.org/market/market-development/market-data-methodology/ (accessed 05.11.2015)

	Polyethylenefuranoate (PEF) Polytrimethyleneterephthalate (PTT)

[1] Cellulose ester only, [2] Hydrated cellulose foils certified to be compostable (in packaging segment), [3] Excluding starch filled polyolefins.

Generally speaking, the new bioplastics such as PLA and PHA are made to be composted, while the drop-in bioplastics have the same properties as their fossil-based equivalents, and they tend to be designed not to be biodegradable.

There are around 115 producers in the market who play a significant role in biopolymer/bioplastic production capacity[46]. In 2013, Asia accounted for the most bioplastic production[47]. The report "Market study on Bio-based Polymers in the World"[48] estimates that the production capacity for bio-based polymers will rise from 3.5 million tonnes in 2011 to 12 million tonnes in 2020. Bio-based PET, PE/PP polymers and the new polymers PLA and PHA are showing the strongest market growth. The greatest investment is expected in Asia and South America. The most dynamic development is expected in the area of "drop-in" polymers, which are chemically similar to their petrochemical counterparts, such as PET, PE and PP. It is difficult to establish how many raw material suppliers are involved in the production of biopolymers. It is possible to produce only the raw material, for example lactic acid or succinic acid from renewable raw materials, and sell this on to a manufacturer of the actual polymer itself. The manufacturer of the biopolymer may thus have several different material suppliers.

At the time of developing the criteria for disposables, use of first-generation renewable raw materials (raw materials produced on agricultural land) dominated. However, there are also bio-based polymers in development that are based on forest raw materials or waste products, known as second-generation bio-based raw materials. It is difficult to establish how widespread the use of second-generation raw materials is, but NatureWorks (PLA) reports that while it uses first-generation raw materials at the moment, research is currently underway to investigate the use of second-generation raw materials.[49]

Paper, paperboard, cardboard and pulp

The use of paper, paperboard, cardboard and paper pulp is widespread in food packaging, including disposable articles such as take-away coffee cups, paper plates, coffee filters and containers, and paper for wrapping food. The raw material for these is cellulose fibre from wood, which may be bleached or unbleached. More information about the environmental impact of producing paper products can be found in the background document for the ecolabelling of Paper Products – Basic Module and Chemicals Module, version 2, 2011.

Other bio-based materials

[46] European Bioplastics website: http://en.european-bioplastics.org/market/market-development/market-data-methodology/ (accessed 05.11.2015)
[47] European Bioplastics website http://en.european-bioplastics.org/market/europebeyond/(accessed 09.02.2015)
[48] Market study on Bio-based Polymers in the World, Capacities, Production and Applications: Status Quo and Trends towards 2020, Nova Institute, Version 2013-07.
[49] NatureWorks website: http://www.natureworksllc.com/The-Ingeo-Journey/Raw-Materials (accessed 13.01.2016)

Solid wood/wood veneer is not very common, but it may be used in products such as cutlery. The use of bagasse, which is a by-product of sugar production, is also becoming more widespread. Duni[50] and Greenway[51], for example, offer packaging made from bagasse. Greenway also offers disposable tableware made from palm leaves.[52]

6.2 MECO analysis

A MECO analysis has been conducted in order to provide an overview of the life cycle for "Disposables for Food". The analysis is summed up in Table 2 below. The analysis assumes that the product mainly comprises bio-based raw materials or recycled plastic, since the product group definition is limited to products made from such materials.

Table 2: MECO analysis of the product group

	Raw material phase	Production phase	Use phase	Waste phase	Transport phase
Materials	Agricultural raw materials for bioplastics Wood for paper pulp	Coatings Additives/fillers		Production of compost Recycling of materials	
Energy	Energy for cultivation phase Energy for recycling processes for plastics	Energy for production of polymer/plastic granules and pulp/paper/paper-board/cardboard. Energy for moulding of disposable article		Incineration – both energy consumption and heat and energy production Composting: Energy consumption and capacity for composting	Transport of agricultural raw materials and logs Transport of plastic granules and paper pulp Transport to the consumer
Chemi-cals	Fertilisers and herbicides	Chemicals for the production processes, e.g. production of pulp and paper, and monomer and polymer production Chemicals used during conversion, printing, bonding (adhesive) Workers' exposure to chemicals during production	Exposure to substances harmful to health	Methane production at landfill site Leakage to groundwater/ nearby watercourses Emissions of chemicals during incineration	Emissions from transport
Other	Use of foods for non-food products GMO ingredients		Major consump-tion as it is a disposable product	Advice for the consumer about correct disposal Design of product to simplify recycling	

[50] https://www.duni.com/en/products/boxes-and-bowls/ (accessed 10.10.2016)
[51] http://www.greenway-denmark.dk/Shop/greenway/tallerkner-fat/Default.aspx (accessed 10.10.2016)
[52] http://www.greenway-denmark.dk/greenway-norge.aspx (accessed 10.10.2016)

Raw material phase

In the raw material phase, the cultivation of biomass has an impact in the form of agricultural raw materials or wood from the forest. The parameters of the cultivation include land use, energy in the cultivation phase and use of herbicides and fertilisers. When considering land use, one has to consider that biomass could be food or could be taking up land that could otherwise be used to grow food. Disposable products can, however, be made from typical waste products, where this is a less relevant factor. As regards land use, it is also important that areas of high biological or social value are not used for the cultivation.

Production phase

Here energy is used for the polymerisation and production of plastic granules and for the production of paper pulp, paper and board, plus the moulding of the disposable article. Chemicals are also used in the production processes, e.g. in the production of paper pulp and paper or monomer and polymer production. Chemical substances are also used in the form of additives, coatings, adhesives and printing.

Use phase

The use phase is short and an important parameter here is that these are disposable products, which contribute to major use of resources. Consumers may also be exposed to substances that are harmful to health when using the disposable article, e.g. fluorinated compounds or mineral oils from the printing inks.

Waste phase

The processing of used disposables for food covers various different waste scenarios, depending on the waste management systems that exist in the particular Nordic country and the local municipality. Relevant waste processing channels include composting, incineration with/without energy recovery, material recycling or landfill with a risk of methane emissions. Biogas production is considered of little relevance, since the biogas plants only want wet organic waste. Other products, including disposable articles, are picked out and removed.

To ensure correct sorting, it is also important to provide the consumer with information explaining which category the disposable article in question should be recycled as. This is, for example, relevant if the product can be composted or sent for material recycling.

Transport phase

In the transport phase, the key feature is energy consumption in the form of fuel, and the associated CO_2 emissions from the combustion of the fuel. The transport phase includes transport of agricultural raw materials and wood raw materials, transport of recycled plastic material and polymers/plastic granules, transport of finished paper/cardboard/polymers/plastic granules to the manufacturer of the article/converter and then end-transport to the consumer.

6.3 LCA studies of disposables

Caution should be exercised when using LCA studies as underlying data, since the studies can vary in quality and the system parameters used will have a major impact on the results. Additionally, the functional unit used in the study, e.g. energy consumption per cup or energy consumption per kg polymer produced, have an impact on the results. The results also depend on whether the study is "cradle to gate" or "cradle to grave". However, the studies can give an indication of which products have the least impact on the environment in different categories. LCA studies can provide useful information on where in the product's life cycle the environmental impact is greatest.

The development of the first generation of the criteria involved several LCA studies of disposables, while Nordic Ecolabelling conducted its own LCA screening of salad bowls made from PLA and fossil plastic in a range of waste scenarios. For the details of these studies and the screening, see the background document to generation 1. A couple of new LCA studies were also examined as part of this review[53],[54]. Here is a brief summary of the results: The studies show that production of the raw materials represents the greatest environmental impact for the disposable article. The disposal phase also has a relatively large effect on the results. Use of recycled materials generally gives a better result with regard to the materials and energy/climate parameters.

6.4 Environmental aspects of renewable raw material use

Renewable materials contribute to sustainable development through reduced CO_2 emissions and reduced use of materials from fossil sources. However materials based on renewable raw materials are not automatically sustainable. There are several key problems concerning the cultivation and production of the renewable materials, such as land use in competition with food production, use of genetically modified organisms and energy and chemical use in the production processes.

Nordic Ecolabelling wishes to contribute to the "green shift" through increased use of bio-based materials, but at the same time wishes to see this occur in a sustainable way. Below is a description of different environmental aspects of renewable raw material use.

Resource use and climate impact

Disposables contribute to a high use of resources, and so it is relevant to consider that natural resources are limited, although with different supply horizons. According to the "Håndbog for Miljøvurdering" (*Handbook on Environmental Assessment*) crude oil and natural gas, which are raw materials for fossil plastic, have a resource consumption figure of 0.04 mPR/kg (milli Person Reserves) and 0.06 mPR/kg[55]. Materials such as paper, board and bioplastics have a value of 0 mPR/kg. In terms of resources, it is therefore better to use renewable raw

[53] Andreas Detzel, Benedikt Kauertz, Cassandra Derreza-Greeven, 2013, Study of the Environmental Impacts of Packagings Made of Biodegradable Plastics, Project No. (FKZ) 37 10 95 314, Report No. 001643/E
[54] Life Cycle Inventory of foam Polystyrene, paper-based, and PLA foodservice products, Prepared for THE PLASTIC FOODSERVICE PACKAGING GROUP by FRANKLIN ASSOCIATES, 4 February 2011
[55] Pommer, K. et al, 2000, Håndbog i miljøvurdering af produkter, National Institute of Technology and Institute for Product Development

materials than fossil raw materials. An EU project concluded that the use of renewable raw materials is beneficial compared with fossil raw materials, when considering energy consumption and greenhouse gases.[56] Renewable raw materials in themselves do not contribute to greater emissions of greenhouse gases, since the CO_2 released in the waste phase is biogenic and part of the natural CO_2 ecocycle. This CO_2 balance does, however, depend on the assumption that the land use changes that may be caused by an increased demand for biomass do not lead to land clearance, which would produce higher CO_2 emissions (see more about this below). The use of fossil raw materials contributes to greater emissions of greenhouse gases, since they are not part of the natural CO_2 ecocycle. Although raw materials are given a figure of 0 mPR/kg and have low CO_2 emissions, it should also be taken into account that renewable resources are not infinite unless they are sustainably managed.

If it is possible to use recycled materials in the product in question, e.g. recycled plastic, this can in principle be taken into account. For the majority of the materials, material recycling would require fewer resources than extraction/cultivation and production of new materials.

Energy and climate impact in the production phase

Energy is used in every stage of production, from extraction of the raw materials to production of the product, and in the waste phase. LCA studies of disposable articles show that the energy used in the actual production of the constituent materials, e.g. paper or polymer, accounts for one of the product's greatest environmental impacts.[57] The type of energy sources used will have a major effect on the carbon footprint. However, the energy sources are difficult to control and will often depend on external factors such as the country in which the production is located and the energy sources that are available, e.g. whether the electricity derives from hydro power, coal or nuclear power. Another important factor is how efficiently the energy is used at the production facility. Efficient production that uses less energy than other equivalent production lines will have lower energy consumption overall, and thus also lower greenhouse gas emissions. As mentioned before, LCA studies should be used with care, not least because the results of different studies vary. Several of the LCA studies commissioned when developing the first generation of criteria show that disposable articles made from renewable raw materials have lower fossil energy consumption and greenhouse gas emissions

[56] Wolf O. Crank M. Patel M. Marscheider-Weidemann F. Schleich J. Hüsing B. Angerer G. 2005, Techno-economic feasibility of large-scale production of bio-based polymers in Europe, Joint Research Centre, Institute for Prospective Technological Studies, Technical report EUR 22103 EN
[57] Report on bioplastic disposables in Denmark, 2010 Force Technology http://www.plastnet.dk/images/stories/downloads/engangsartikler_i_bioplast_i_danmark_med_bilag.pdf

than disposable articles made from fossil raw materials.[58],[59],[60],[61],[62],[63] Renewable raw materials in themselves do not contribute to greater emissions of greenhouse gases, but for fossil raw materials it is common to include the energy content of the raw material in the energy calculations.

Land use and competition for biomass

The use of renewable raw materials to produce bioplastics can lead to changes in land use. In relative terms, biomass for bioplastics is, however, less significant in scale than biomass for fuels and heating. Changes in land use affect greenhouse gas emissions and biodiversity first and foremost. It is difficult to predict the consequences of changes in land use, but it is important not to consider renewable raw materials as an unlimited resource. [64],[65]

Political objectives and increased demand for bio-based products have led to greater demand for renewable raw materials. Combined with greater population growth and thus greater demand for food, this can increase competition for biomass and agricultural land, and affect food prices. It is, however, difficult to pinpoint just how much food prices are affected. The Norwegian report "Bærekraftig biodrivstoff – et avgjørende klimatiltak" (*Sustainable biofuels – a crucial climate measure*) states that production of biofuels could, in conjunction with other factors, lead to higher food prices, but that this has not been a major factor to date. [66] A report published by the World Bank in 2013 states that bio-based plastics have a negligible impact on food prices.[67] The market for bioplastics remains small compared with the market for biofuels, but it is important to promote more sustainable bio-based products based on secondary agricultural products, instead of primary crops that could also be used for food production. Second and third-generation products also do not require more agricultural land. The use of secondary raw materials is also being advocated by the bioplastics producers themselves.[68]

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[58] Vercalsteren, A., C. Spirinckx, T. Geerken, P. Claeys, 2006. Eco-Efficiency analysis of 4 types of drinking cups used at events, OVAM (Openbare Afvalstoffenmaatschappij voor het Vlaams Gewest), Belgium
[59] Detzel, A. & M. Krüger, 2006. Life Cycle Assessment of PLA – A comparison of food packaging made from NatureWorks® PLA and alternative materials, Final report, IFEU GmbH Heidelberg, July 2006
[60] Vink et al 2010, The Eco-profile for current Ingeo polylactide production, Industrial Biotechnology, vol. 6, No. 4, pp. 211–224
[61] Naryan and Patel, Review and analysis of bio-based product LCAs. Available at www3.abe.iastate.edu/biobased/LCAreview.pdf, (14.03.2011)
[62] Garraín et al 2007, LCA of biodegradable multilayer film from biopolymers, Abstract LCM2007, 3rd International Conference on life cycle management, Zurich, University of Zurich at Irchel, August 2007: www.lcm2007.org/presentation/Mo_2.05-Garrain.pdf
[63] Johansson M. 2005, Life cycle assessment of fossil and bio based materials for 3D shell applications – Material eco-profiles and example with a blow moulded clear rigid packaging, Stockholm
[64] UNEP (2009): Towards sustainable production and use of resources: Assessing Biofuels. International Panel for Sustainable Resource Management, United Nations Environment Programme
[65] Note from Force Technology "The land use aspect" 2010
[66] "Bærekraftig biodrivstoff - et avgjørende klimatiltak", the ZERO Foundation
[67] Long-Term Drivers of Food Prices, The World Bank Development Prospects Group & Poverty Reduction and Economic Management Network Trade Department, May 2013
[68] Vink, E.T.H., D.A. Glassner, J.J. Kolstad, R.J. Wooley & R.P. O'Connor, 2007. The eco-profiles for current and near-future NatureWorks® polylactide (PLA) production, Industrial Biotechnology, vol. 3, no. 1, 2007, pp. 58–81

Sustainable raw materials

As described previously, it is important to ensure that renewable raw materials are sustainable and produced in a good manner that limits the environmental impact. Crucially it is important to know what kind of raw material is being used, how it is grown and the method of cultivation. Some raw materials, such as palm oil and soy, require extra awareness, as these raw materials can be associated with major negative environmental and social effects such as rainforest clearance. Herbicide use is also a relevant consideration.

Use of certification schemes can be a good way of promoting more sustainable production. Nordic Ecolabelling has long set requirements concerning sustainable forestry for products that include wood products, in the form of FSC and PEFC certification. There are also certification schemes for other relevant raw materials, such as Bonsucro for sugar cane, Roundtable for sustainable palm oil (RSPO) for palm oil and Roundtable for responsible Soy (RTRS) for soy. Use of less environmentally problematic cultivation methods such as organic farming is positive, since it promotes greater biodiversity in the soil and avoids the use of herbicides.

Genetically modified plants

Use of genetically modified plants also affects the sustainability of the raw material. A genetically modified organism (GMO) has had its genetic material changed using laboratory techniques, which combines DNA from different individuals or species that have the required genes. The plants grown are primarily genetically modified plants with amended growing properties such as herbicide tolerance (HT) and insect resistance (IR), or a combination of the two. The EU has so far been extremely restrictive in approving GM plants, compared with the USA and Brazil, for example.

GMO (genetically modified organisms) are a much debated topic and many countries have banned the cultivation of GM crops. The themes of the debate include food safety, land use, lack of scientific knowledge about the effects of GM crops under local agricultural/forestry conditions and the risk of negative impacts on health and the environment. The argument often put forward by advocates of genetic modification is that it will reduce the use of herbicides. Recent studies have, however, raised questions about this.[69] The report from Genøk: "Genetically Modified Organisms – A Summary of Potential Adverse Effects Relevant to Sustainable Development" [70], commissioned by Nordic Ecolabelling in 2011, states that GMO has possible negative effects along the whole value chain from plant research and development, via growing, to storage, use and waste processing. The report also describes a lack of scientific research in several of these phases and a lack of assessment of the overall picture. The report particularly highlights the lack of research results on the long-term effects of GM plants.

[69] http://www.bioteknologiradet.no/2012/06/gmo-kan-gi-mindre-sproytemidler/ (accessed 08.10.2016)
[70] Georgina Catacora-Vargas, 2011, Genetically Modified Organisms – A Summary of Potential Adverse Effects Relevant to Sustainable Development, Biosafety Report 2011/02, GenØk – Centre for Biosafety

Several agricultural raw materials that may be of use in the production of bioplastics could be genetically modified, such as maize and soy. The forest certification schemes FSC and PEFC prohibit the use of genetically modified trees.

6.5 Chemicals

Many different types of chemicals are used in both the plastics and paper industries. A survey in Denmark shows that around 1300 substances are used in the Danish plastics industry[71]. The survey shows that these are mainly additives and auxiliary chemicals. The chemicals are added to the actual polymer to change the polymer's physical properties or they are added in the processing to limit the problems that might arise at this stage. The chemicals added to improve the physical properties usually relate to the polymer's strength and heat resistance. Other types of chemicals may also be added, such as UV stabilisers, antioxidants, antistatic agents, plasticisers and colourants. Various fillers may also be added. Bioplastics are very similar to the conventional plastics in that it may be necessary to use additives and auxiliary chemicals to improve weaknesses associated with processing and physical properties. According to an article in the online magazine Plastic Technology[72] biopolymer manufacturers offer the polymer either "pure", i.e. without additives, or with already incorporated additives, before being sold on for conversion. According to the article, great attention is paid to whether the additives in the biopolymers are bio-based and biodegradable, or both. It mentions that biodegradable additives are suitable for disposable products or short-lived products, and that it is relevant for these to meet a compostability standard such as EN13432.

According to the Swedish Chemicals Agency, 3100 different chemical products were supplied to the Swedish pulp and paper industry in 2004. Production chemicals in the pulp and paper industry can be divided into process chemicals for pulp production and additives and auxiliary chemicals in the paper production. Process chemicals may be biocides, retention agents, flocculants, foam inhibitors and cleaning agents. Additives and auxiliary chemicals are used to give the paper different properties and to simplify the production process. The most common additives for paper are coating chemicals that comprise filler and binder. The filler is usually clay and calcium carbonate. Other chemicals used in the production of paper are wet strength agents, colourants and optical brighteners. For more details about the chemicals used in pulp and paper production, see the background document for the Nordic Swan Ecolabelling of Paper Products – Basic Module and Chemicals Module, version 2 (2011).

The chemicals used in both the plastics and the paper industry can have problematic environmental and health properties. They can be non-readily degradable, bioaccumulative and toxic, or they can be carcinogenic and endocrine disruptors. Examples of problematic substances include phthalates, bisphenol A, isocyanates and styrene.

In addition to the chemicals used in the actual production of polymers and paper, other chemicals may also be used in the conversion to disposable articles, including

[71] "Øget videnberedskab om kemiske stoffer i plastindustrien", Working report from the Danish Environmental Protection Agency, No. 5 2008
[72] Enhancing Biopolymers: Additives Are Needed for Toughness, Heat Resistance & Processability, Plastic Technology, July 2008

adhesives, coatings and printing inks. Adhesives may contain problematic chemicals such as isocyanates from the production of polyurethane adhesive, rosin, phthalates and formaldehyde. Coatings and surface treatments may include varnishes such as epoxy resin, paints, oils or paraffin waxes, silicones, metals, Teflon, enamel, plastic foils and so on. Polyethylene is an example of a coating used on paper and board products. Many of the substances that may be used as coatings can be problematic for health and the environment, such as the perfluorinated compounds[73],[74] and siloxanes from silicone treatment [75],[76] which may be used to impregnate/coat paper.

Fillers may be used in both plastics and paper and may be added for economic reasons and to affect the properties of the material. A 2006 report from the Danish Environmental Protection Agency[77] states that filler in plastics varies from "very little" to as much as 50%. The cheap fillers such as clay, chalk, wood flour and stone dust are added primarily to keep the price down. According to a data sheet from NatureWorks, the filler may be talc and silica. Common fillers in paper are kaolin, chalk, talc, calcium carbonate and titanium dioxide.[78] All of these are mineral substances that cannot be considered renewable resources. Varying quantities of filler are used in paper, depending on the type of paper being produced. Printing paper commonly contains 10–20% filler, while the level in packaging paper is somewhat lower.

6.6 Waste

In terms of disposables for food, the production of the raw materials is the life cycle phase with the greatest environmental impact. Next comes the waste phase. The waste phase is affected by many factors, such as the waste recycling facilities available in the particular country and municipality, and the waste disposal method chosen by the consumer. The majority of the products in the product group are likely to end up as household waste or waste from restaurants and in public litter bins. Depending on the waste sorting options available, waste processing may involve composting, incineration, recycling or landfill. In the Nordic countries the possibilities for waste sorting varies from country to country and in each country, both in public spaces and in each household. That many of the prodcuts will be used in public areas and that the product often will be contaminated with food waste are general challenges for an effective material recovery. But in many cases it will also be possible to sort these products in a suitable waste fraction.

Composting and biogas (digestion)

Composting and biogas production are not considered the most likely waste processing channel in the Nordic region, since the plants prefer to sort out

[73] Report "Survey of Chemical Substances in Consumer Products", No. 99, 2008, Danish Environmental Protection Agency
[74] Per- and polyfluorinated substances in the Nordic Countries, Use, occurrence and toxicology, TemaNord 2013:542, report funded by Nordic Council of Ministers, 2013
[75] http://www.miljostatus.no/Tema/Kjemikalier/Noen-farlige-kjemikalier/Siloksaner/ (accessed 09.10.2016)
[76] http://www.miljostatus.no/prioritetslisten (accessed 09.10.2016)
[77] Miljø- og sundhedsforhold for plastmaterialer, Miljøprojekt No. 1103 2006
[78] https://www.mn.uio.no/ibv/tjenester/kunnskap/plantefys/leksikon/p/papir.html (accessed 06.10.2016)

materials other than food/garden waste. This applies in particular to biogas plants, where other materials would ruin the processes (see more under 7.7).

Disposables that are biodegradable/compostable could, however, conceivably end up sorted as wet organic waste, particularly if they are labelled as “compostable” or “biodegradable”.

Material recycling

With recycling and material recovery, the material can be used again, thus reducing the use of resources associated with the production of the raw material. The report Climate Benefits of Material Recycling by the Nordic Council of Ministers[79] shows that using recycled plastic significantly reduces the environmental impact compared with virgin plastic. A key precondition for exploiting the opportunities of waste recycling is, however, that there has to be a collection scheme for the material type in question. Disposables made from synthetic polymers based on plant material, e.g. green polyethylene, are suitable for material recycling and can be included in already existing recycling systems for fossil plastics. A disposable article that is compostable will usually not be suitable for material recycling, since it will break down. There is currently no material recycling system for the “new” bioplastics such as PLA in the Nordic region. They can also create problems if they enter today’s material recycling systems for plastics. Collection and material recycling for paper and board products is, however, relevant in the Nordic region, although there are differences from country to country.

Incineration

The environmental benefit of incinerating waste is that it generates energy that can replace the burning of fossil resources. If the waste that is incinerated also comprises renewable materials, it will only emit biogenic CO_2 and the amount of greenhouse gases in the atmosphere will not increase (as long as the cultivation has not caused any change in land use, resulting in increased CO_2 emissions). The scale of the benefit also depends on which energy supply one assumes that the waste will replace. In addition to greenhouse gas emissions, emissions to air of other environmentally harmful substances such as NOx, VOC and dioxins are also relevant environmental parameters, but with modern waste incineration systems in the Nordic region, these are well regulated.

Landfill

A disposable article may well end up in landfill. There is, however, a strong focus on reducing the amount of waste that is sent to landfill, particularly organic waste. One of the reasons for this is the EU’s landfill directive, which sets limits for how much organic waste from households in the EU countries may be sent to landfill. Landfill is thus still used in the EU, but it is gradually being phased out. From a climate perspective, sending biodegradable waste to landfill has a major impact on the environment, since it forms methane, a serious greenhouse gas.

[79] Karl Hillman, Anders Damgaard, Ola Eriksson, Daniel Jonsson and Lena Fluck, Climate Benefits of Material Recycling, TemaNord 2015:547

6.7 RPS analysis

The RPS analysis focuses primarily on bioplastic disposables, since Nordic Ecolabelling's Basic Module for Paper developed an RPS analysis for paper and selected board products and found a high RPS. For paper, board and pulp, there are environmental problems associated with forestry and the actual paper production in the form of energy consumption, emissions to air and water and the chemicals used. It is therefore relevant to consider whether the wood raw materials come from sustainable forestry, to focus on reduced energy consumption and emissions, and to set environmental and health requirements concerning the chemicals used. For more about the RPS for pulp/paper/board production, see the background document for the Nordic Swan Ecolabelling of Paper Products – Basic Module and Chemicals Module, version 2 (2011).

Below is a summary of the Relevance (the disposable article's relevance for ecolabelling in terms of environmental impact), Potential (potential for improvements in the product group) and Steerability (what opportunities ecolabelling has to influence this).

Relevance

As mentioned previously, raw material production is the life cycle phase with the greatest environmental impact in terms of energy consumption and climate impact, while the waste phase also has a major effect on the net results. Transport and packaging production are of less significance. Resource consumption focusing on fossil raw materials versus renewable and recycled materials is also important. Land use will to some degree be an environmental impact for all material types in the product group. The products are by definition disposable products and they will therefore generate substantial waste. Material recycling is preferable environmentally, since the resources remain in the ecocycle and can be used again. Further environmental impact occurs with regard to chemical use, for example when using adhesives, printing inks, coatings and various additives, where the migration of substances harmful to health from the product into the food is a relevant consideration.

Potential

Since raw material production and waste processing are the two most important phases for a material or a disposable product's environmental impact, these are also the two phases with the greatest potential for environmental improvements. On the production front, the focus is particularly on reducing energy consumption. For first-generation bioplastics such as PLA, emissions of CO_2 are comparable with fossil plastics. Many of the bio-based polymers are new to the market and the production processes are not optimised compared with the processes for fossil plastics, which have been in production considerably longer. Here there should therefore be potential to optimise the production processes and reduce energy consumption for the bio-based polymers. However, there are few manufacturers in the market, so although there is potential for improvement within the bio-based polymer industry regarding energy use, the scope for setting a meaningful requirement is limited, see also under Steerability. There is, nevertheless, potential and steerability concerning a switch from fossil plastics to bioplastics. Switching to renewable raw materials will generally reduce the impact on the climate, since the CO_2 involved is part of the natural ecocycle, plus such raw materials would reduce

dependence on fossil raw materials. Switching to secondary raw materials would be even better for the bio-based raw materials in terms of the climate and energy use.

Many different chemicals are used in the production of the materials and the products, including conversion. These are also products that are in contact with food. There is potential to reduce and substitute the use of chemicals that are harmful to health and the environment.

When it comes to paper, ecolabelling of other paper products has shown that there are environmental differences between the products on the market. The potential to reduce the environmental impact of paper disposables for food is therefore the same as for other paper products, but with an extra focus on chemical use and migration to food, for example by substituting fluorinated compounds that are harmful to health and the environment.

Nordic Ecolabelling also sees potential in focusing on the environmental impact of this product group, and a need for third-party confirmation that the products are safe for use and that the environmental claims used in the marketing are true. Making the Nordic Swan Ecolabel available in this product area also sends a signal that there is an environmental impact that can be reduced.

Steerability

Bioplastic granules are generally manufactured by large companies around the world, but it will mainly be their customers, i.e. the customers who buy bio-based plastics and produce or deliver disposable products, who will be the licensees. This can pose a challenge, since some of the documentation must come from suppliers. In its experience with other criteria documents, Nordic Ecolabelling has sometimes found it difficult to get information from the plastics industry. However, those involved in the bio-based plastics industry appear to be more positive about providing information, as we found when developing the first generation of the criteria and during licensing. The manufacturers of bio-based plastics are aware that their major competitive advantage is their environmental credentials and it is therefore vital for them to have environmental data regarding their production process. Some fossil plastics are permitted in the products, and in this area it can be more difficult to obtain information. It is, however, considered essential to have information on chemical use in the production of the ingoing materials and in the converting process to the finished disposable article, and to set requirements for this for all the constituent materials.

The requirements concerning chemicals such as adhesives, coatings and colourants make it necessary to source information from suppliers and chemical manufacturers. This is also the case in many of Nordic Ecolabelling's other product groups, and steerability is considered to be relatively good in this field. It is important that the manufacturer of the Nordic Swan Ecolabelled disposable article has control over the input materials and chemical substances used in production.

When it comes to energy consumption, there are currently few businesses that produce bio-based polymers on a large scale. This limits the scope to control the environmental impact through an energy requirement. In order to separate out the best players, there has to be a certain number of manufacturers, and it is also necessary to know how much energy each player uses. The conclusion is therefore

that, although energy consumption is relevant and there is potential for improvement, steerability is low and it would be difficult to set an energy requirement that separates out the best production processes. Despite the reduced potential and steerability for a concrete energy requirement Nordic Ecolabelling does, however, feel it is important to maintain a focus on energy in the criteria, since the relevance is high and there is already an energy requirement in the current criteria. Removing the energy requirement entirely would therefore send a signal that this is of less importance. An area where steerability does exist is the promotion of bio-based plastics over fossil plastics in the criteria. Promoting material recycling and use of recycled materials would also go some way towards reducing resource consumption generally and help to lower the impact on the climate. Nordic Ecolabelling could, at the same time, contribute to the "green shift".

Steerability over waste management is relatively low, due to the differing waste management systems in the Nordic region, but there is a possibility of influencing the way the product is disposed of through clear labelling on the product. There is also good steerability in setting requirements that make the products better suited to material recovery by, for example, setting a requirement that the adhesive should not create problems in the recycling process. Some bio-based plastics that are compostable/biodegradable cannot currently be sent for material recovery, and they can create problems for the recycling of other plastics at the recycling plants. A ban on such types of plastic in products that only consist of plastic (pure plastic products) would mean that the pure plastic products that carry the Nordic Swan Ecolabel could also undergo material recycling. A limit on the proportion of inorganic filler in pure plastic products would also promote material recycling, since too much filler makes the product more difficult to material recover.

7 Justification of the requirements

This section presents proposals for new and revised requirements, and explains the background to the requirements, the chosen requirement level and any changes since generation 1.

7.1 Definition of the product group

These criteria cover products that are intended to be in contact with foods for a relatively short period and that are generally used only once. The product group definition has not changed to any great degree compared with the previous generation of the criteria. It has been specified that drinking straws, toothpicks/cocktail sticks and stirrers for coffee etc. are covered by the criteria, and there is clarification about what "prepacked food" means, with reference to Regulation No (EU) 1169/2011. This is because there was a certain amount of confusion about this term, which made it difficult to determine exactly which products could be ecolabelled. For example, a type of product such as a salad bowl could be used by a customer to pack their own salad, but it could also be used by a café that had prepacked salads in its chiller for take-away sale. It is difficult for Nordic Ecolabelling to influence precisely which products are defined as "prepacked" and which are not, since the same product can be used in different ways. Reference is therefore made to the EU Regulation in order to clarify which products can be ecolabelled and what is meant by "prepacked food".

The definition of prepacked food as set out in EU Regulation No (EU) 1169/2011 is: any single article for presentation as such to the final consumer and to mass caterers, consisting of a food and the packaging into which it was put before being offered for sale, whether such packaging encloses the food completely or only partially, but in any event in such a way that the contents cannot be altered without opening or changing the packaging; “prepacked food” does not cover foods packed on the sales premises at the consumer’s request or prepacked for direct sale. This means that prepacked products such as juice and milk cartons cannot be ecolabelled.

There is also a more precise specification of what other products cannot be ecolabelled under these criteria. These include napkins (which can be ecolabelled under the criteria for Tissue Paper), food paper and baking paper (which can be ecolabelled under the criteria for Grease-proof Paper), and waste bags and carrier bags (for carrying food home from the store). The last two are products that cannot be ecolabelled. A judgement has been made that these products do not fit into the criteria, since they are not a typical disposable for food.

On 18 September 2018, the Nordic Ecolabelling Board adopted a ban on labeling straws, disposable cutlery, plates, toothpicks/cocktail sticks and stirrers made of plastic. This is also clarified in requirement O2 Material composition. In January 2018, the EU has come up with a new plastic strategy. One of the main features of this strategy is related to littering and the negative environmental impact of the plastic. The follow-up of the EU's plastic strategy has resulted in a proposal for a new directive[80] to ban and limit the use of plastic in single disposable products. These are products that are often found in nature. There is no distinction between fossil and biobased plastics in the proposal for a new directive, so even if the products are manufactured in biobased plastics they will be prohibited. Nordic Ecolabelling has therefore introduced a ban on ecolabelling these to be in advance of legislation and reduce the risk of plastic littering.

The product group definition in the criteria document is as follows:

Products that may be Nordic Swan Ecolabelled

The product group comprises various products that are intended to be in contact with foods for a short period and that are intended for single use. The product types covered can be divided into the following categories:

- Take-away packaging such as coffee cups, pizza boxes, containers and paper for the packaging of food
- Disposable tableware such as cups/glasses, plates, cutlery and drinking straws
- Bags and films for packaging food, such as bread bags, freezer bags and bags for fruit and vegetables
- Coffee and tea filters
- Toothpicks/cocktail sticks and stirrers

[80] Proposal for a Directive of the European parliament and of the Council on the reduction of the impact of certain plastic products in the environment, 28.5.2018

Products that cannot be Nordic Swan Ecolabelled

Below is a specification of the types of products that cannot be ecolabelled according to these criteria. Some of these products may, however, be ecolabelled under other criteria. This applies to:

- Napkins – may be ecolabelled under the criteria for Tissue Paper
- Food paper and baking paper – may be ecolabelled under the criteria for Grease-proof Paper
- Straws, disposable cutlery, plates, toothpicks /cocktail sticks and stirrers made of plastic - cannot be ecolabelled
- Waste bags – cannot be ecolabelled
- Carrier bags (for carrying food home from the store) – cannot be ecolabelled

Packaging that is part of a prepacked* food product, e.g. a milk carton or juice bottle, where the finished product has to be labelled in line with Regulation No (EU) 1169/2011 on the provision of food information to consumers, is not included in this product group.

**In this context, prepacked food refers to the definition used in Regulation No (EU) 1169/2011: any single article for presentation as such to the final consumer and to mass caterers, consisting of a food and the packaging into which it was put before being offered for sale, whether such packaging encloses the food completely or only partially, but in any event in such a way that the contents cannot be altered without opening or changing the packaging; "prepacked food" does not cover foods packed on the sales premises at the consumer's request or prepacked for direct sale.*

If there is any doubt about whether a product type falls within the product group definition, Nordic Ecolabelling will decide whether the product can be ecolabelled.

7.2 General requirement areas, description of the product

This section addresses the general requirement areas such as the product descriptions, definitions and constituent substances in the products.

The following definitions apply:

Bio-based: Bio-based means that something is made from biomass that may have undergone physical, chemical or biological treatment. Biomass has a biological origin, but this excludes materials created in geological and/or fossil formations. Examples of biomass include: (whole or parts of) plants, trees, algae, marine organisms, microorganisms, animals, etc. This also includes secondary raw materials.

Secondary raw materials: Secondary raw materials are defined here as residual products from other production processes, such as waste products from the food industry or by-products such as straw from grain production and bagasse from sugar cane production.

Renewable raw materials: Renewable raw materials are defined as coming from biological materials that are continuously renewed in nature within just a few years, such as grain and trees, including secondary raw materials.

Bio-based polymer/plastic: Polymer/plastic that is wholly or partially based on biomass. Note that Nordic Ecolabelling does not consider biodegradable/compostable fossil plastics as bio-based plastics.

The definitions of bio-based, renewable raw materials and bio-based polymer/plastic are based on the descriptions in the European standard EN 16575:2014[81].

Bio-based polymer with full traceability: full traceability means that there is traceability on the renewable raw material through the whole production chain, for instance by having a separate production line where it is only used renewable raw materials, so that the finished polymer will only comprise of renewable raw materials.

Bio-based polymer by mass balance method: With mass balance method means mixing fossil and renewable raw materials in the beginning of the production process with mathematical allocation of the renewable raw material to the finished polymer. This means that there is not full traceability on the renewable raw material through the production plant and that the amount of renewable raw material in the finished polymer will vary.

Recycled materials: Recycled materials follow the definition in ISO 14021. For recycled plastic in contact with food the definition used in the Regulation 282/2008 is also used, meaning that offcuts and scraps from the production of plastic food contact materials, that has not been in contact with food or otherwise contaminated, is not considered as recycled if it is re-melted on the premises into new products or sold to a third party as part of a quality control system in compliance with the rules for good manufacturing practice laid down in Regulation No 2023/2006.

Individual packaging: Individual packaging means the packaging that may be around the individual disposable article, e.g. paper around chopsticks or plastic around cutlery. The individual packaging and disposable article constitute one unit, and the individual packaging should therefore be counted as part of the product's material composition. Less extensive material and chemical requirements are set for individual packaging than for the materials in the actual product.

Primary packaging: Primary packaging means retail packaging for the consumer, for example, the packaging that wraps 100 disposable forks or that is around 200 coffee filters, and that the consumer will encounter when making a purchase in the store.

Below is a table with an overview of the various requirements. It makes clear that individual packaging and cores (for example, the cardboard tube that plastic bags are rolled around) now have their own requirements, which are less extensive than

[81] https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/policy/CEN%20Bio-Based%20Definitions%20EN16575.pdf (accessed 11.10.2016)

the requirements for the disposable article itself. This is a change compared with the previous generation. Read more about this in section 7.5.

Table 3: Overview of the requirements

Material	**Requirement area/type**	**Req. no.**	**Use form**
	Information about the product	O1	1
	Material composition	O2	1
PVC/PVDC		O3	1
Pulp	Production requirement – emissions, energy and chemicals	O4	
Paper/paperboard/ cardboard	Production requirement – emissions, energy and chemicals	O5	
Pulp/paper/paperboard/cardboard	Requirements to fiber raw material - sustainable forestry and traceability	O6	2
Grease-proof paper	Production requirement – emissions, energy and chemicals	O7	
Pulp/paper/paperboard/ cardboard	Optical brightener	O8	
Wood, veneer and bamboo	Name, traceability and certification	O9	3
Material	**Requirement area/type**	**Req. no.**	**Use form**
Agricultural raw materials including palm oil, soy and sugar cane	Name, traceability and certification	O10	
Agricultural raw materials	Genetically modified raw materials	O11	
Bio-based polymers	Energy	O12	
Chemical products, classification	General chemical requirement	O13	4a-4e dependent on type of chemical
Classification of ingoing substances	General chemical requirement	O14	4a-4e dependent on type of chemical
Ingoing substances – prohibition list	General chemical requirement	O15	4a-4e dependent on type of chemical
Aromas, flavourings and fragrances	General chemical requirement	O16	1
Adhesives – constituent chemical substances	Specific chemical requirement	O17	4b
Coatings and impregnations	Specific chemical requirement	O18	4d for silicone 4e for others
Colourants for printing and dyeing	Specific chemical requirement	O19	4c
Chemicals for coffee and tea filters	Specific chemical requirement	O20	
Plastics	Additives for plastic	O21	5
Plastics	Residual monomers in polymers	O22	
Recycled plastics	Chemicals in recycled plastics	O23	
	Individual packaging and cores	O24	
Materials in contact with food	Food contact	O25	
Compostable/ biodegradable plastics	Waste requirement – ban on composting/biodegradable plastic in plastic products	O26	
	Waste requirement – material blends	O27	

Plastics	Waste requirement – black dyes prohibited	O28	
Adhesives	Waste requirement – adhesive for labels	O29	
	Waste requirement – recycling advice	O30	
	Information on properties – general requirement for product properties	O31	
Coffe and tea filters	Specific product requirement – quality requirement for coffee and tea filters	O32	
	Quality and regulatory requirements	O33–O39	

O1 Information about the product

Applicants must provide the following information about the product(s):

1. Brand/trading name

2. Where the products are to be sold (grocery store, online shop, take-away industry or similar)

3. Description of the product(s)

- the type of product (e.g. coffee filter, cup for hot/cold drinks, salad bowl, bread bag, freezer bag)
- constituent materials (e.g. paper, board, plastic (including types such as PE, PP, PLA, etc.)), plus a declaration of the constituent quantities of the different material types (% by weight of the individual material in relation to the total weight of the product).

Adhesives and coatings are counted as constituent materials, but not other chemicals such as printing inks.

The overview must include the trading name of the material and the supplier.

Product data sheet or equivalent for each material must be submitted. Materials in the individual packaging*, cores or other parts** that accompany the disposable article must also be declared.

* *individual packaging means the packaging that may be around the individual disposable article, e.g. paper around chopsticks or plastic around cutlery.*

** *core means, e.g. the cardboard tube that plastic film or plastic bags are rolled around. Other parts may include lids for coffee cups and so on.*

4. Description of the production process for the product, including conversion.

Suppliers must be specified by business name, production site, contact person and the production processes they perform (e.g. printing).

5. It must be stated whether chemicals are used in the conversion, e.g. adhesives, coatings or printing inks. Chemicals used in the individual packaging, cores or other parts must also be included.

If yes, submit a list of the chemicals used in the conversion.

☒ Description in accordance with the requirement. Appendix 1, form 1 may be used. A product data sheet may be sent as part of the documentation.

Background to the requirement

The purpose of setting the requirement is to gain an overview of the product for which a licence is being sought, plus the production processes and suppliers. This will make it easier to determine which requirements have to be fulfilled.

O2 Material composition

Products in plastic

Straws, disposable cutlery, plates, toothpicks /cocktail sticks and stirrers made of plastic cannot be ecolabelled. See also requirement O27.

Ingoing materials

At least 90% by weight of the disposable article must be bio-based* or made from recycled** plastic.

The recycled plastic must fulfill Regulation (EC) No 282/2008 on recycled plastic materials and articles intended to come into contact with foods. The recycling process must be approved and published on EU's official list over approved recycling processes, see article 9 in the regulation 282/2008.

A maximum of 10% by weight of the disposable article may comprise non-renewable materials. Coatings and adhesives are to be included in the material composition calculation. Other chemicals, such as printing inks and additives, should not be included.

Inorganic filler*** should not be counted in the proportion of non-renewable materials. Inorganic fillers can be used in plastic, but the plastic can have a density of max 0,995 g/ccm or it must be documented in another way that the addition of inorganic fillers will not affect the possibility for material recovery in the floating/sinking processes. The limit does not apply to plastics that are used in the lamination and coating of paper and board-based products.

Metal and recycled pulp/paper/paperboard/cardboard are not permitted.

Individual packaging, cores and other parts as described in O1 must be included in the material composition.

**Biobased plastic: Nordic Ecolabelling will not approve plastic that are biobased by mass balance method in products that only consist of plastic.*

For plastic used as coating, for instance coating on paperboard for coffe cups and drinking cups and or for bio-based plastic that comprise less than 10 % by weight in the disposable article, Nordic Ecolabelling will approve the use of the mass balance method under the following assumptions:

1. It can be confirmed that the renewable raw material is not used as an energy source, but is used in the production of products

2. The mass balance system must be controlled by an independent third party. As a minimum it must be controlled that the amount of renewable raw material purchased corresponds with the amount of polymer sold as biobased.

If the mass balance method is used the producer of the disposable article/license holder must show that they have purchased biobased polymer, for instance with a specification on the invoice.

***for recycled plastic the definitions in ISO 14021 as well as in Regulation 282/2008 applies, see Terms and defintions.*

****examples of inorganic fillers are kaolin, calcium carbonate and clay.*

✉ Calculation showing that at least 90% by weight of the disposable article is bio-based or made from recycled plastic.

✉ Bio-based plastic for products that only consist of plastic: confirmation that only renewable raw materials are used in the production. If both bio-based and fosill based plastic are produced at the same production site it must be shown that there is full traceability on the renewable raw material in the production, for instance a confirmation that there are separate production lines or batchwise production. Alternatively it can de documented by a test for biobased content in accordance to the method in EN 16640:201, EN 16785-1:2015 or equivalent.

☒ Bio-based plastic for coating: If the mass balance method is used, a declaration/certificate from an independent third party confirming that:

- the renewable raw material is used in the production of products, not as an energy source in the production facility

- there is a system in place for controlling amount of purchased renewable raw material and the amount of bio-based polymer sold, so that no more bio-based polymer is sold than purchased from renewable raw materials

Producer of the disposable article/license holder shall document that they buy bio-based polymer, for instance with a specification on the invoice.

☒ For recycled plastics, documentation must be provided to confirm that the plastic is approved under the stated EU regulation - meaning that the process must be approved in the Community register of authorised recycling processes, as stated in article 9 in the regulation 282/2008.Specify name of the recycling process and name of company of the approved process.

☒ Declaration from the manufacturer of the disposable article, or the supplier of the material, stating that it does not contain metal or recycled paper, cardboard, paperboard. Appendix 1, form 1 can be used.

☒ Information on the type of inorganic filler and its quantity (% by weight) in the plastic, as well as the density of the plastic, or other documentation that confirms that the plastic will not sink in the material recovery process.

Background to the requirement

Changes to the requirement

The requirement has been changed in this generation. There is still a requirement that the product should mainly comprise renewable materials (90% by weight) and that the remaining proportion may be other materials such as fossil plastics, adhesives and coatings. The products may also contain recycled plastic. In addition there is a specification that any individual packaging such as the paper around chopsticks, is also subject to the requirement and must be counted as part of the product. The calculation of max 20% by weight inorganic filler has been removed for paper. Inorganic fillers such as kaolin, calcium carbonate, chalk and silicates are used in both paper and plastic materials to varying degrees. Nordic Ecolabelling does not set limits on the content of such fillers in our other paper criteria. In the case of plastics, however, it has been shown that too much inorganic filler makes recycling of plastics difficult, since they are too heavy and sink to the bottom at the plant, and as such end up in the fraction that is sent for incineration. As the criteria wish to promote material recycling, the inclusion of too much inorganic filler is problematic for plastics, and so a limitation has been set for the content. In the consultation proposal it was suggested a limit of max 20% inorganic fillers in the plastic. After the consultation this is changed based on comments from Grønt Punkt in Norway and FTI in Sweden as well as contact after the consultation period, as such an amount of inorganic fillers will affect the possibilities for material recovery of the plastic. This is due to changes of the density of the plastic. If the plastic is to heavy it will sink to the bottom in the floating/sinking process and therefore end up in fraction for incineration rather than material recovery. Therefore there is a requirement that the density of the plastic must be maximum 0,995 g/ccm or that it can be documented in another way that the plastic will not sink in the recovery process.This does not apply to plastics that are used as a laminate/coating, on paperboard products for example, since these plastics are

always sent for incineration. Nordic Ecolabelling does not have knowledgde that similar recycling problems exist for paper.

In addition to this change, there is now an explicit ban on metals in the products. As in the previous generation, a ban remains on the use of recycled pulp/paper/paperboard/cardboard.

Nordic Ecolabelling has evaluated whether so-called bio-based polymers by the mass balance method (see description in chapter 6.1 and 7.2) can be used to fulfil the requirement of minimum 90% by weight of bio-based materials in the product. Nordic Ecolabelling considers that bio-based by mass balance cannot be approved for products that only consists of plastic and considers it important with full traceability on the renewable raw material in a Nordic Swan Ecolabelled disposable article in plastic, for instance a plastic cup, salad tray or freezing bags. Mass balance method means mixing of fossil and renewable raw material in the beginning of the production process with mathematical allocation of the renewable raw material to the finished polymer. This means that there is not full traceability for bio-based and fossil raw materials (separate production). By demanding full traceabiltiy the final product actually would comprise of bio-based materials. Nordic Ecolabelling is positive to more renewable raw materials coming into the production flows, but consider it important that a Nordic Swan Ecolabelled disposable article actually contains renewable raw materials considering our credibility and communication to the outside world and the consumer. For plastic used as coating, for instance plastic used as coating on a paperboard for coffe cups, or for plastic that comprise less than 10 % by weight in the disposable article, Nordic Ecolabelling will approve the use of the mass balance method. To be able to use this method it must be confirmed that the renewable raw material is not used as an energy source, but is used in the production of products, and the mass balance system must be controlled by an independent third party. As a minimum it must be controlled that the amount of renewable raw material purchased corresponds with the amount of polymer sold as bio-based. Nordic Ecolabelling acknowledge that the phasing out of fossil raw materials in complex production processes will take time, and then the use of mass balance is a step in the right direction.

On 18 September 2018, Nordic Ecolabelling Board adopted a ban on labeling straws, disposable cutlery, plates, toothpicks /cocktail stick and stirrers in plastic. For more information, see chapter 7.1

Renewable raw materials

Nordic Ecolabelling generally wishes to promote the use of renewable materials in these criteria. In terms of resources, it is beneficial to use renewable raw materials instead of fossil-based equivalents (see section 6.4). It helps to reduce dependence on fossil raw materials and, as the resource is renewable, it can be regenerated. Renewable raw materials in themselves do not contribute to greater emissions of greenhouse gases compared with fossil raw materials, since the latter are not part of the natural ecocycle. It is, however, important that the renewable raw materials are used sustainably (see section 6.4 and the requirements in section 7.3). In products that only comprise of plastic, the criteria restrict what kind of plastic may be used (see O26 in the section on waste processing).

Ban on metal

Due to other requirements in the previous generation, such as the composting requirement, metal was not a particularly relevant material. The requirement concerning waste processing has, however, now been changed and a ban on metal has been introduced. There are several environmental problems associated with the production of metals, including extraction of raw materials, emissions and high energy consumption. Metals combined with other materials, particularly plastic, can also make the recycling of the product more difficult. The FTI and Plastkretsen guide[82] on designing products for easy recycling recommends that metal seals are not used. Residual metals can lead the plastic to be discarded and cause problems later in the plastic production process.

Recycled materials

The requirement has been changed and now approve the use of recycled plastic. Recycled follows the defintions in ISO 14021 which concerns both pre-and post consumed plastic. It is however also stated that the definition used in regulation 282/2005 also applies that states that offcuts and scraps from the production of plastic food contact materials, that has not been in contact with food or otherwise contaminated, is not considered as recycled if it is re-melted on the premises into new products or sold to a third party as part of a quality control system in compliance with the rules for good manufacturing practice laid down in Regulation No 2023/2006. The ban on using recycled board and paper remains in place. Both the evaluation of the criteria that were drawn up in 2015/2016 and the revision work examined whether Nordic Ecolabelling should accept the use of recycled materials in disposables. Nordic Ecolabelling is generally positive about using recycled materials. A report by the Nordic Council of Ministers on climate gains from recycled materials comes to the conclusion that recycled plastics can lead to a much lower environmental impact compared with the production of virgin materials.[83] Combined with the desire to stimulate better use of resources and contribute to the circular economy, this is why Nordic Ecolabelling is open to labelling products made from recycled plastics.

A ban on recycled paper/paperboard/cardboard remains in place. Due to the challenges associated with materials in contact with food and the health considerations, the ban has been retained. The investigations conducted during the revision have included contact with numerous players of various kinds, such as authorities, researchers and research institutions, plus the industry itself. Generally, there is considerable scepticism about the use of recycled pulp/paper/paperboard/cardboard in contact with food, while there are fewer concerns about plastics. This is due in part to the fact that the use of recycled pulp/paper/paperboard/cardboard is poorly regulated by the authorities, while recycled plastics have to comply with a specific regulation on recycled plastics in contact with food, EU 282/2008. There is also the specific Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food, while paper/paperboard/cardboard only has to comply with the general provisions contained in Regulation (EC) No 1935/2004 on materials and articles intended to come into contact with food, which apply for all materials.

[82] "Bättre förutsättningar för återvinning av plastförpackningar", FTI och "Plastkretsen"
[83] Karl Hillman, Anders Damgaard, Ola Eriksson, Daniel Jonsson and Lena Fluck, Climate Benefits of Material Recycling, TemaNord 2015:547

Recycled pulp/paper/paperboard/cardboard

With pulp/paper/paperboard/cardboard, there are concerns associated with mineral oils, phthalates, bisphenol A and other chemical residues, for example from adhesives and printing inks, and several studies have found substances that are harmful to health and the environment in products that use recycled pulp/paper/paperboard/cardboard. According to Xenia Trier, researcher at DTU in Denmark, recycled fibre may contain chemicals that are harmful to health, and packaging made from recycled material can be a source of food impurities.[84] Diisobutyl phthalate (DIBP) and bisphenol A have been found in pizza boxes, for example, and these substances can migrate from the packaging to the pizza when the melted cheese comes into contact with the packaging.[85] A study performed by the Danish Veterinary and Food Administration in 2010, which analysed various phthalates and bisphenol A in paper and cardboard packaging, compared this with the action values for migration.[86] Values above the action values were found in packaging for pizza and pasta, and the packaging was primarily made from recycled paper/cardboard. A similar study was conducted in Italy, analysing DIBP in the actual pizza box. The study indicates that potential migration is particularly relevant when hot pizzas are placed in the box. This illustrates a more realistic situation than simply measuring the packaging, and the method can be used as a measure of potential risk to health. The conclusion of the study is that relatively high quantities of DIBP are released from the pizza boxes.[87]

An extra challenge with some substances is that, in addition to potentially being in recycled material, they may also be found in the printing inks that are used on the packaging. This means that materials approved for use in contact with food might still include printing inks that could migrate into the food. These inks will then enter the recycling system and could create problems if the material was initially approved as food safe.

Germany's Bundesinstitut für Risikobewertung (BfR), which works on the analysis of risks associated with materials for food contact, has published its own opinion with regard to paper, paperboard and mineral oils.[88] To prevent impurities in the food, it recommends either the use of virgin fibre, or the use of an extra barrier, such as a separate inner bag for the food or a coating on the inside of the paperboard. According to the opinion, use of such barriers causes a substantial reduction in the migration of mineral oils into the food from the recycled paperboard/the printing inks on the packaging.

It has been difficult to find concrete information on whether a barrier of virgin fibre or a plastic coating would be good enough to prevent migration of harmful substances into food from recycled paper/paperboard/cardboard.

[84] http://politiken.dk/forbrugogliv/sundhedogmotion/forbrugerkemi/ECE2898808/giftigt-genbrugspap-er-skjult-ingrediens-i-mange-emballager/ (accessed 12.11.2015)
[85] http://kemi.taenk.dk/bliv-groennere/ny-test-bekraefter-problematiske-kemikalier-i-pizzabakker (accessed 10.12.2015)
[86] Danish Veterinary and Food Administration, 2010, Kemiske stoffer fra fødevarekontaktmaterialer av trykt pap og papir, J.nr. 2010-20-64-00229
[87] Bononi M, Tateo F., 2009, Identification of Diisobutyl Phthalate (DIBP) Suspected as Possible Contaminant in Recycled Cellulose for Take-away Pizza Boxes, Packaging Technology and Science, January 2009, 1.71 · DOI: 10.1002/pts.805
[88] BfR Opinion No. 008/2010, 9 December 2009: Migration of mineral oil from packaging materials to foodstuffs

FoodDrinkEurope has developed a guide on this theme, which states that metal or glass is an absolute barrier, whereas LDPE or PP films are not necessarily a good enough barrier for volatile compounds such as mineral oils, and therefore a risk assessment must be carried out in each individual case.[89] Plastic barriers would reduce the risk, but the amount of substance that migrates is entirely dependent on the individual foodstuff, temperature and so on, so it is extremely difficult to give a definitive answer as to whether barriers in plastic or virgin fibre are good enough. Recycled materials also pose difficulties, as the question arises of what to test for – there can be many unknown substances involved.

The authorities in the Nordic countries recommend exercising caution when using recycled pulp/paper/paperboard/cardboard in contact with food. Although the authorities see problems with the use of recycled paper and board, there are no specific regulations dealing with this.

In light of the studies conducted, recommendations from the authorities, and the lack of specific regulations, Nordic Ecolabelling therefore wishes to maintain the ban on recycled pulp/paper/paperboard/cardboard. The recycled material can easily be used in other products where this risk is not relevant.

Recycled plastics

The studies raise fewer concerns about harmful substances in recycled plastics for foodstuffs than in recycled pulp/paper/paperboard/cardboard. This is mainly due to the fact that recycled plastics in contact with food are subject to specific regulations (see below). This is confirmed in a study conducted by IVL in Sweden, which examined various harmful chemicals in the recycling of plastics.[90] In the literature studied as part of the project, no mention was made of restrictions on the recycling of plastic packaging due to the occurrence of harmful substances. On the other hand, the material recycling industry has informed us that the food industry sets strict requirements concerning plastics that will be used in contact with food, which greatly restricts what kind of recycled plastic can be used in contact with food. In fact, the strict requirements make it difficult to maintain a market for recycled plastic in contact with food. The exception is plastic from bottles (PET). This is also apparent in the EU's list of recycling processes which are evaluated in relation to contact with food – the vast majority relate to PET.

There are better regulations for plastics, and the authorities do not view the specific use of recycled plastic for food contact in the same way as recycled paper/paperboard/cardboard. The Swedish National Food Agency comments generally that there are very few recycled products on the market today made from recycled plastic, while the Norwegian Food Safety Authority[91] and the Danish

[89] FoodDrinkEurope: Guidelines on the safe use of paper and board made from recycled fibres for food contact use, Updated March 2016
[90] Momina Bibi, Hanna Andersson, Carl Jensen, Tomas Rydberg, 2012: Vad vet vi om farliga ämnen vid materialåtervinning av plast, IVL Report B2031
[91] Norwegian Food Safety Authority: http://www.mattilsynet.no/mat_og_vann/produksjon_av_mat/matkontaktmaterialer/plast_i_matkontaktmaterialer.3214 (accessed 11.07.2016)

Veterinary and Food Administration[92] write nothing specifically about the use of recycled plastics in contact with food, only about the regulations.

The use of barriers may also be relevant for plastics, but mainly in the form of multilayered packaging. The FDA's guideline document[93] for the use of recycled plastics in food packaging talks about the potential risk reduction from using barriers in multilayer packaging to ensure that the recycled plastic is not in direct contact with the food. Generally speaking, the same barrier-related challenges apply for recycled plastics as for recycled paper/paperboard/cardboard – the efficacy of a barrier depends on the specific foodstuff, temperature, pH, etc.

Regulations for plastics and recycled plastics

For recycled plastics to be used in contact with food, they must comply with Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food. The Regulation contains restrictions on which monomers and other inputs may be used. Only substances listed in Annex 1 of the Regulation may be used. This list covers monomers and other inputs, additives (excluding colourants) and aids to polymerisation. There are also requirements concerning migration limits.

In addition, the plastic must fulfil the specific Regulation (EC) No 282/2008 on recycled plastic materials and articles intended to come into contact with foods. In accordance to the regulation there shall be established a list over approved recycling processes which must contain among other things, name of company and address of the approved process, a short description of the recycling process and any conditions as to what the recycled plastic may be used for. This list over approved recycling processes is currently not published, but EFSA has evaluated (published Scientic Opinions) a number of processes. The evaluations relate primarily to processes for the recycling of PET The USA has the same type of regulation, with the FDA requiring that processes for the manufacture of recycled plastic for food contact must be approved in advance.[94] Even though a list over approved recycling processes has not been established yet, there are products for food contact that contain recycled plastic on the market. Nordic Ecolabelling has chosen to have a strict policy and only wants to approve products that are produced using one of the recycling processes on the official list that shall be established. This to make sure that the regulations are followed and that the plastic is safe in use. Nordic Ecolabelling are aware of the consequences of this, and that recycled plastic can not be approved today. Nordic Ecolabelling has considered whether recycled plastic could be approved based on EFSA's evaluations, but do not wish to make own evaluations of EFSA's work.

When using recycled plastic, documentation must be provided to show that the process is approved under Regulation (EC) No 282/2008. The documentation must

[92] Danish Veterinary and Food Administration: https://www.foedevarestyrelsen.dk/Leksikon/Sider/Plast.aspx (accessed 11.07.2016)
[93] http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm120762.htm#theuse (accessed 30.08.2016)
[94] http://www.fda.gov/Food/IngredientsPackagingLabeling/PackagingFCS/RecycledPlastics/default.htm (accessed 30.08.2016)

state the name of the recycling process and the name of the company that has been approved.

As well as the plastic having to be approved under Regulation (EC) No 282/2008, it must also be ensured that the recycled material does not contain specific substances for which there are requirements in these criteria, such as phthalates and bisphenol A. Read more about which chemical requirements apply for recycled plastic in section 7.4 on Chemicals.

O3 PVC and PVDC

PVC and PVDC must not be present in the product, included individual packaging, cores and other parts or the primary packaging∗.

∗*Primary packaging applies to the packaging which the customer gets in hand when purchasing a product, for example the plastic packaging covering 100 disposable forks or the plastic covering 200 coffeefilters.*

✉ Declaration from the manufacturer of the disposable article, or from the supplier of the plastic material, that no PVC or PVDC is present. Appendix 1, form 1 may be used.

Background to the requirement

The requirement has not been changed from the previous generation. The key problem areas for PVC (polyvinyl chloride) and PVDC (polyvinylidene chloride) are described in Nordic Ecolabelling's background report on Floor Coverings[95]. A brief summary of the challenges is, however, provided here. The main problem areas are waste processing, the use of additives and dioxin emissions. According to the report "Hazardous substances in plastic materials"[96] published by the Norwegian Environment Agency in 2013, PVC may have over 50% plasticiser added, of which phthalates remain the most popular. PVC requires stabilisers to tolerate the temperatures needed to manufacture a PVC product (extrusion, injection moulding, etc.). These stabilisers may be based on lead, metal mixtures (such as barium-zinc and calcium-zinc), tin or cadmium. Modern production plants have reduced their environmental impact, for example in the area of dioxin emissions from production. Dioxins may also be formed during waste incineration. Within the EU the Waste Directive (91/689/EC) sets limits for emissions of dioxins from incineration plants. Overall, the environmental impact associated with the production, use and disposal of PVC is steadily reducing, in part due to new knowledge and technical advances. However, there is every suggestion that problems associated with PVC remain. There are also not good enough controls over PVC imported into the EU and the Nordic region from other parts of the world, which is not subject to the same European restrictions. There is therefore a ban on the use of PVC in both products and packaging.

[95] Nordic Ecolabelling. About Nordic Swan Ecolabelled floor coverings, Version 6.0. Background to Nordic Swan Ecolabelling, 18 November 2014. http://www.svanemerket.no/for-bedrifter/sok-om-svanemerket/svanens-krav/byggevarer-og-hus/gulv/ (accessed 03.10 2016)
[96] Norwegian Climate and Pollution Agency, Hazardous substances in plastic materials, COWI, January 2013

7.3 Renewable raw materials

The requirements concerning renewable raw materials comprise requirements for pulp, paper, paperboard and cardboard, solid wood, veneers and bamboo, plus other agricultural raw materials, including palm oil, soy and sugar cane.

7.3.1 Pulp, paper, paperboard and cardboard

The requirements concerning pulp, paper, paperboard and cardboard are stated below. Nordic Ecolabelling has requirements for paper products in other sets of criteria, to which the requirements below refer. Reference is made to the following modules and criteria:

- Nordic Swan Ecolabelling of Paper Products – Basic Module, version 2 or later
- Nordic Swan Ecolabelling of Paper Products – Chemicals Module, version 2
- Criteria for the Nordic Swan Ecolabelling of Grease-proof Paper, version 4 or later

In addition to the existing criteria for paper products mentioned above, other types of pulp, paper, paperboard and cardboard may be present in disposables for food that are not covered by the above-mentioned criteria. These are subject to their own requirements concerning energy and CO_2 emissions and emissions to air and water. Reference values and requirement limits for these are stated in requirement O4 and O5 below.

Please note that O18 and O19 under the chapter 2.3 Chemicals (in the criteria document) also applies to the production of pulp, paper, paperboard and cardboard.

Individual packaging made from paper/paperboard/cardboard does not need to meet these requirements, but is subject to its own requirement (see O24).

The pulp-, and paper manufacturer must document the requirements in the web-based application tool My Swan Account. My Swan Account can be found on http://www.nordic-ecolabel.org/portals/paper/my-swan-account1/.

The requirements in chapter 2.1 (in the criteria document) concerns ingoing materials in the disposable article and not the converting process or the finished disposable article.

O4 Pulp

Pulp has to meet all the relevant requirements in the Basic Module for Paper Products, version 2 or later.

The reference values for undried NSSC* pulp is for electricity: Elreference = 3200 kWh/tonne and for fuel: Fuelreference = 700 kWh/tonne pulp.

Reference values for emission from NSSC pulp:

	Reference values emission (kg/tonne pulp)			
	COD	**P**	**S**	**NOx**

NSSC	8	0,02	0,4	1,5

∗ *NSSC stands for Neutral Sulfite Semi Chemical*

Documentation of the requirements must be done in the application tool My Swan Account (MSA). Please contact Nordic Ecolabelling for username and password.

☒ The pulp manufacturer must show that the requirements are fulfilled with completed forms in MSA. Documentation as specified in the requirements referred to in the Basic Module for Paper Products.

O5 Paper, paperboard and cardboard

Paper and board covered by the Basic Module for Paper Products

Paper and board that is covered by the Basic Module for the "Nordic Swan Ecolabelling of Paper Products" version 2 or later must meet all the requirements in the Basic Module and the Chemicals Module for Paper Products, version 2 or later with the exception of R7 Fiber raw materials and R11 Transport in the Basic Module. There is an own requirement for fiber raw material in this criteria document, see O6.

If the paper or board already carries the Nordic Swan Ecolabel, or has been checked by Nordic Ecolabelling the requirement is considered to be fulfilled. This is to be documented by providing licence certificate or information on the trading name and the manufacturer of the checked material.

Paper, paperboard and cardboard not covered by the Basic Module

Paper, paperboard and cardboard that are not covered by the Basic Module for the Nordic Swan Ecolabelling of Paper Products version 2 or later must meet all the relevant requirements in the Basic Module and the Chemicals Module for Paper Products, version 2 or later, with the exception of R7 Fiber raw materials and R11 Transport in the Basic Module. For energy and CO_2, plus emissions to air and water, the reference values and requirement limits for the paper machine apply, as stated below. The calculation methods used in the Basic Module for Paper Products, version 2, are to be used.

Energy and CO_2

Table 2: Referance values for energy and requirement limits

	Energy – reference values (kWh/tonne paper/paperboard/cardboard)		CO_2 – requirement limit (kg CO_2/tonne paper/paperboard/cardboard)
	Fuel	Electricity	
Filter paper for coffee/tea	1700	700	*
Paperboard for disposables ("cupboard")	1700	800	*
Kraft liner	1700	700	*
Fluting	1700	700	*/1200**

∗Limit value varies based on constituent pulps, see K10 in the Basic Module, version 2 or later.

∗∗If NSSC pulp is constituent the limit value is 1200 kg CO_2/tonne fluting.

Emissions to air and water

Table 3: Reference values for COD, P, S and NOx

	Reference values (kg/tonne paper/paperboard/cardboard)

	COD	P	S	NOx
Filter paper for coffee/tea	1.3	0.01	0.2	0.5
Paperboard for disposables (“cupboard”)	2.0	0.01	0.15	0.7
Kraft liner	2.0	0.01	0.15	0.7
Fluting	2.0	0.01	0.15	0.7

An application for approval of pulp, paper and board is to be made via the electronic application tool My Swan Account (MSA). Contact Nordic Ecolabelling for a user name and password.

☒ The paper/paperboard/cardboard manufacturer must show that the requirements are fulfilled with completed forms in MSA. Documentation as specified in the requirements referred to in the Basic Module and Chemical Module for Paper Products, version 2 or later or licence certificate from Nordic Ecolabelling or details of the trading name and the manufacturer of the checked material.

Background to the requirement

The requirement has been changed since the previous version. Reference is still made to the Basic Module for Paper Products, version 2, and to the possibility of meeting the requirements if the paper has been checked ("inspected") by Nordic Ecolabelling. Previously, there was reference only to certain requirements in the Basic Module. Now, reference is made to all the requirements, with the exception of the requirements concerning CO_2 emissions from transport and fiber raw material. The requirements that have been added relate primarily to quality assurance and traceability in the production of the pulp, paper, paperboard and cardboard products that are present in a Nordic Swan Ecolabelled disposable article. This will ensure compliance with the requirements for the whole of the licence period, to a greater degree than is the case in the current criteria. New reference values and requirement limits have also been introduced for energy, CO_2 and emissions for paper used for coffee and tea filters, plus paperboard for disposable articles, kraft liner and fluting to well cardboard (for e.g. pizza boxes) that is currently not included in the Basic Module for the Nordic Swan Ecolabelling of Paper Products. The proposed new reference values are based on contact with the industry and on the values stated in the BREF document for paper and pulp.[97] Some of the reference values have been changed and increased after the consultation based on received consultation comments. For coffe filter the reference valules for fuel has been increased from 1600 to 1700 kWh/ton, COD from 1,0 to 1,3 kg/ton and NOx from 0.4 to 0.5 kg/ton paper. The reference values will be more strict for fuel and COD compared to the last generation when the reference values in the criteria document for tissue paper was used (1800 kWh/ton for fuel and 1,5 kg/ton for COD). The NOx-value has been increased from 0.4 to 0.5 after the consultation and will be at the same level as in the last generation. For paperboard, kraft liner and fluting the referance values for COD is increased from 0.5 to 0.7 kg/ton and NOx from 0.6 to 0.7 kg/ton paper. It should be noted that O18 in section 7.4 also applies. This addresses the addition of

[97] Best Available Techniques (BAT) Reference Document for the Production of Pulp, Paper and Board, 2015

fluorine and silicone treatment with regard to pulp/paper/paperboard/cardboard. Please also note that recycled pulp/paper/board is forbidden in O2.

O6 Fiber raw material

1. Tree species listed on Nordic Ecolabelling's list of prohibited tree species* must not be used.

**The list of prohibited tree species is located on the website: www.nordic-ecolabel.org/wood/*

2. The pulp producer must state the name (species name) of the wood raw material used in the production
3. The pulp,- and paper/paperboard/cardboard producer must be Chain of Custody certified in accordance to FSC or PEFC
4. Certification:

Yearly/the latest 12 months:

Paper/paperboard/cardboard: A minimum of 50% of the wood raw material that are used in the paper/paperboard/cardboard must origin from forestry certified under the FSC or PEFC schemes. The remaining proportion of wood raw material must be covered by the FSC/PEFC control schemes (FSC controlled wood/PEFC controlled sources).

Pulp: If the pulp is used directly in the finished disposable article, for instance as pressed pulp, a minimum of 50% of the wood raw material in the pulp must origin from forestry certified under the FSC or PEFC schemes. The remaining proportion of wood raw material must be covered by the FSC/PEFC control schemes (FSC controlled wood/PEFC controlled sources).

✉ Declaration from the pulp producer that the requirement to tree species not permitted to be used are met. Appendix1, form 2 may be used.

✉ Name (species name) of the wood raw materials used in the pulp production. Appendix 1, form 2 can be used.

✉ A valid FSC/PEFC Chain of Custody certificate from the pulp,- and paper/paperboard/cardboard producer covering all the wood raw materials in the pulp/paper/paperboard/cardboard.

✉ Certification pulp/paper/paperboard/cardboard: The producer of the disposable article shall document, for instance based on invoice or delivery note, that the requirement of minimum 50% certified pulp/paper/paperboard/cardboard are purchased on a yearly basis.

Background to the requirement

There is an own requirement to wood raw materials in pulp/paper/paperboard/cardboard in this criteria document instead of referring to the Basic Module as before. This is due to the new forestry requirement approved by Nordic Ecolabelling after the approval of the Basic Module and in all new and revised criteria documents it is the new forestry requirement that should apply. The formulation of the requirement is based on the requirement as formulated in appendix 1E in the Basic Module. However, the formulations are adjusted to be suitable for disposable articles.

Nordic Ecolabelling wants to contribute to sustainable forestry (ecologically, economically and socially). From a life cycle perspective, forestry is an important part of a wood-based product's environmental impact. Nordic Ecolabelling's forest requirement focuses on sustainable forestry and traceability of wood raw

materials. Sustainably managed forests deliver a whole host of benefits to society in the form of wood for materials and energy, protection against global warming, a place to live and thrive for local communities and indigenous peoples, preservation of biodiversity, and protection of water and soil against pollution, erosion and so on. By setting a requirement that wood raw materials must come from certified forestry, Nordic Ecolabelling supports the trend towards more sustainable forestry. There is now also a ban on the use of the species listed at: www.nordic-ecolabelling.org/wood/.

The criteria on which the list is based are:

- IUCN's red list of species categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) and relevant wood species that are Near Threatened (NT).

- CITES, lists I, II and III.

- Non-sustainable forestry, such as logging from high conservation value forest (HCVF), intact forest landscapes (IFL) and areas in countries/regions with high levels of corruption.

There is also a requirement that the pulp/paper/paperboard/cardboard producer are Chain of Custody (CoC) certified in line with FSC/PEFC's schemes. The requirement for Chain of Custody certification contributes to traceability in the supply chain within the FSC and PEFCs guidance and control systems for traceability. The company's Chain of Custody certification proves how certified wood is kept separate from not certified wood in the production, administration and warehousing and is checked annually by independent certification bodies. The certification limit of 50% is based on the situation and availability of certified material in the market. This could be increased in the future. See also Nordic Ecolabelling's background document for the Basic module for paper products.

O7 Grease-proof paper

Grease-proof paper must meet the requirements set out in "Nordic Swan Ecolabelling of Grease-proof Paper – Supplementary Module", version 4 or later. The Supplementary Module refers to the Basic Module for the Nordic Swan Ecolabelling of Paper Products, version 2 or later on certain points. Exception is made for R11 Transport in the Basic Module. There is an own requirement for fiber raw material in this criteria document, see O6.

An application for approval of grease-proof paper is to be made via the electronic application tool My Swan Account (MSA). Contact Nordic Ecolabelling for a user name and password.

If the grease-proof paper is already Nordic Swan Ecolabelled in line with the criteria for the Nordic Swan Ecolabelling of Grease-proof Paper – Supplementary Module, version 4 or later, the requirement is fulfilled and may be documented with a licence certificate.

✉ The manufacturer of the grease-proof paper must show that the requirements are fulfilled with completed forms in MSA. Documentation as described in the stated requirements in Grease-proof Paper – Supplementary Module, or certification of the licence.

Background to the requirement

Nordic Ecolabelling has its own criteria for Grease-proof Paper and reference is therefore made to these criteria, if grease-proof paper is present in the disposable

article. See the background document for Grease-proof Paper[98] for more information on the background to the requirements.

O8 Optical brightener

Optical brighteners must not be added in the production of pulp, paper, paperboard or cardboard.

✉ Declaration from the producer of the pulp, paper or board confirming that optical brighteners are not used.

Background to the requirement

The requirement remains unchanged. Optical brighteners are used in order to make paper whiter, in other words to "trick" the eye into believing that the paper is whiter than it actually is. The requirement has been set to limit the use of unnecessary chemicals that may cause environmental and health problems. The use of optical brighteners is described in more detail in the background to Grease-proof Paper[99], which explains that impurities have low retention on the paper machine and thus may be carried away in the wastewater. Optical whiteners can contain up to 30% urea as a stabilising agent, which may result in an overdose of nitrogen in the biological treatment plant. Optical brighteners are also prohibited in the paper criteria for Blaue Engel, while the background document to the EU's Green Public Procurement document for Copying and Graphic Paper justifies the ban on optical brighteners on the grounds that they can cause allergies, they are toxic and they are not readily degradable in aquatic environments. In the German BfR guidelines, use of optical brighteners is permitted in paper in contact with food, but there must be evidence that they do not transfer to the foodstuff.

7.3.2 Wood, veneer and bamboo

O9 Wood, veneer and bamboo

1. Tree species on Nordic Ecolabelling's list of prohibited tree species∗ must not be used.

∗ *The list of prohibited tree species on the website: www.nordic-ecolabel.org/wood/*

2. The applicant/manufacturer/supplier must state the name (species name) of the wood raw materials/bamboo used in the Nordic Swan Ecolabelled disposable article.

3. Suppliers of wood raw materials/bamboo must have Chain of Custody certification under FSC/PEFC's schemes.

4. 70% of the wood/bamboo used in the Nordic Swan Ecolabelled disposable article must origin from forestry certified under the FSC or PEFC schemes.

The remaining proportion of wood raw material/bamboo must be covered by the FSC/PEFC control schemes (FSC controlled wood/PEFC controlled sources).

The requirement must be documented as purchased amount of wood/bamboo annually.

✉ Declaration from the applicant/manufacturer/supplier confirming fulfilment of the requirement concerning prohibited tree species. Appendix 1, form 3 may be used.

[98] About Nordic Swan Ecolabelled Grease-proof Paper – Supplementary Module, version 4, 18 November 2014
[99] About Nordic Swan Ecolabelled Grease-proof Paper – Supplementary Module, version 4, 18 November 2014

- ☒ Name (species name) of the wood raw materials/bamboo used in the Nordic Swan Ecolabelled disposable article. Appendix 1, form 3 may be used.
- ☒ A valid FSC/PEFC Chain of Custody certificate from all the suppliers, covering all the wood raw materials/bamboo used in the Nordic Swan Ecolabelled disposable article.
- ☒ Documentation such as an invoice or delivery note (paper or via e-invoicing) from the producer of the disposable article/licence holder showing fulfilment of the certification requirement on a yearly basis.

Background to the requirement

The requirement has been changed to include traceability (Chain of Custody) certification from suppliers of wood raw materials and a ban on the use of wood species on the stated list. Bamboo is included in the requirement. Bamboo was previously included in the requirement on agricultural raw materials, but bamboo can be certified in forest certification schemes and has thus been moved into this requirement. The limit of minimum 70% certified raw material is kept. The requirement that timber must not be treated with pesticides classified by the WHO as type 1A or type 1B has been removed, since the certification schemes FSC and PEFC cover this for the certified part. For background to the requirement about sustainable forestry, the list over forbidden species and CoC-certification, see Background to O6.

7.3.3 Agricultural raw materials

O10 Agricultural raw materials including palm oil, soy and sugar cane

The requirement does not apply to secondary raw materials*.

For all agricultural raw materials, state the name (in Latin and English), plus geographical origin (country/state) and supplier of the agricultural raw materials used.

Sugar cane

For bio-based plastic in products that only consist of plastic or that constitute more than 10% by weight in the disposable article: Sugar cane must be Bonsucro-certified.

Palm oil and soy oil:

Bio-based plastic in products that only consist of plastic:

Palm oil and soy oil can not be used as a raw material in the production of bio-based plastic.

Bio-based plastic used for coating or that constitute less than 10% by weight in the disposable article:

Palm-and soy oil are allowed as a raw material in bio-based plastic used as coating and in plastic that constitute less than 10% by weight in the disposable article. This also applies if the bio-based plastic for coating is bio-based by using the mass balance method. The raw materials shall have the following certification:

- Palm oil, palm kernel oil and palm oil derivatives must be RSPO certified
- Soy oil must be RTRS certified

Certified raw material (sugar cane, palm oil and soy oil)

Producer of biobased polymer or suppliers of certified raw materials must be traceability (Chain of Custody, CoC) certified in line with the current certification system, and the traceability must be assured via the mass balance system. The book and claim system is not accepted.

The producer of the bio-based polymer must document the purchase of certified raw materials.

The licenseholder/producer of the disposable article must document that it is purchased bio-based polymer with the use of certified raw materials, for instance by a specification on the invoice or delivery note.

∗ *Secondary raw materials are defined here as residual products from other production processes, such as waste products from the food industry, by-products such as straw from grain production, by-products from maize and dried palm leaves. PFAD from palm oil is not counted as a residual/waste product.*

Nordic Ecolabelling may assess other certification schemes for the raw materials above as they become relevant. The certification scheme will be assessed according to Nordic Ecolabelling's requirements concerning standards and certification systems, as set out in Appendix 2.

☒ Name (in Latin and English language) and geographic origin (country/state) of the agricultural raw materials used.

☒ Copy of valid CoC certificate or certification number. Documentation such as an invoice or delivery note from the producer of the bio-based polymer and the disposable article, showing that bio-based polymer with certified raw material was purchased.

Background to the requirement

The requirement has been changed since the previous version to include a specific requirement for the raw materials palm oil, soy oil and sugar cane. These raw materials can be associated with major environmental and social problems. The establishment of palm oil plantations is one of the main reasons behind the destruction of rainforest, which threatens the habitats of indigenous peoples, plants and animals. The rainforests are particularly important for biodiversity, since they are the richest ecosystems on the planet in terms of species density. Cutting down rainforest is also a serious threat to the planet's climate, and rainforest conservation was one of the themes at the UN's climate negotiations in Paris in 2015. Other environmental problems related to palm oil are the use of toxins in production, air pollution from the burning of the original forest, soil erosion and silting in rivers and watercourses, plus discharges of wastewater from the palm oil mills. Palm oil production is also associated with social problems, such as the risk of labour rights abuses.[100]

Soy beans are grown on land that is often established in the place of forest and forest savannah in South America. Global soy production has risen sharply since 1950 and has led to major landscape changes such as large-scale monoculture farming of soy. 80% of the world's soy production takes place in the USA, Brazil and Argentina.[101] Soy production is one of the greatest threats to the rainforest on the American continent, particularly in the southern Amazon.[102] This is due directly to the felling of rainforest in order to establish soy fields, and to soy cultivation forcing small-scale farmers off their previous land and into the rainforest. Soy has

[100] OLSEN LJ, FENGER NA & GRAVERSEN J 2011. Palmeolie - Danmarks rolle i forhold til den globale produktion af palmeolie. WWF Report DK. WWF World Wide Fund for Nature Denmark.
[101] http://www.worldwildlife.org/industries/soy, (27.01.2016)
[102] http://www.regnskog.no/no/hva-du-kan-gjore/bruk-mindre-palmeolje/lys-uten-palmeolje, (27.01.2016)

also brought land changes to the savannah in South America, known as the Cerrado – which is one of the areas declared a biodiversity hotspot.[103] Use of chemicals in production is also a serious environmental and health problem. The extent of pesticide use in Argentina is so great in soy production that many Argentinians, both farm workers and local residents, come into contact with toxic substances on a daily basis.[104]

Nordic Ecolabelling wishes the requirements to have an extra focus on the two raw materials above. For Nordic Ecolabelling the starting point is to set as strict requirements as possible for these raw materials, depending on their use in the specific product group. Nordic Ecolabelling is not currently aware that the raw materials palm oil and soy oil are relevant raw materials in any specific production of bio-based polymers, and therfore have a prohibition. However, it can not be ruled out that these raw materials become relevant in the future, The standards for certification of palm oil (RSPO) and soy oil (RTRS) have been assessed by the expert group for renewable raw materials at Nordic Ecolabelling, and the conclusion is that both the standards have their shortcomings. For bio-based polymers used as coating, and where we allow the use of the mass balance method, as well as for bio-based plastic that constitute less than 10% by weight in the disposable article, the raw materials palm oil and soy oil are allowed if they are certified according to RSPO or RTRS. Nordic Ecolabelling evaluates that these are the best tools on the market for a more sustainable production. Both RSPO and RTRS have a positive development, and Nordic Ecolabelling will follow the development of the systems and evaluate if it is possible in the future to accept these two systems on a general basis.

Sugar cane, on the other hand, is a highly relevant raw material, with the green polyethylene produced by Braskem, for example, using ethanol from sugar cane in its production. Sugar cane is not currently associated as strongly with the problems of rainforest destruction mentioned above as palm oil and soy oil are, but there can also be challenges linked to its production. Over the period 1960–2008, the land used for sugar cane cultivation rose from 1.4 to 9 Mha. Around 65% of newly planted sugar cane is grown on plains (grasslands and savannahs) and the remainder comprises areas previously used for other types of farming. According to the background document for the Nordic Swan Ecolabelling of Biofuels[105], only one producer of sugar cane in Brazil is located in the area around the Amazon. However, as demand for sugar cane as a raw material rises, opportunities to expand the production areas are being explored. A loss of biodiversity in the rainforest may therefore become a problem associated with sugar cane in the future. At this point in time, the Cerrado is under the greatest pressure from the sugar cane industry. The Cerrado is a tropical savannah in Brazil that has unique biodiversity and specific ecosystems that are under threat.[106]

Nordic Ecolabelling's expert group on renewable raw materials has also assessed the standard for certification of sugar cane, Bonsucro, and has concluded that in its current form it does not meet Nordic Ecolabelling's requirements concerning standards. For one thing, it is unclear whether the standard goes any further than the relevant legislation, plus it does not refer to any international conventions.

[103] http://www.cepf.net/resources/hotspots/South-America/Pages/default.aspx, (27.01.2016)
[104] Siri Helle, Maten vår fra Sør-Amerika, article from Dag og Tid, 22 January 2016
[105] About the Nordic Swan Ecolabelling of Biofuels, version 2, June 2012
[106] http://www.wwf.dk/wwfs_arbejde/skov/soja/skovomrader/cerrado/ (accessed 14.07.2016)

Nevertheless, the standard is considered the best available tool in the market for sustainable sugar cane production, which is why requirements are set concerning certified raw material.

Nordic Ecolabelling may also assess and approve other certification schemes. In such a case, a certification scheme will be assessed according to the requirements concerning standards, as set out in Appendix 2 of the criteria.

For all the certifications, a requirement is set concerning traceability at mass balance level. The book and claim system is not approved. According to Braskem's website[107] and Bonsucro's overview[108] of certified companies, Braskem is CoC certified at mass balance level.

Other agricultural raw materials, like different grains as corn or wheat are subject to a simpler requirement than before. In addition to raw material traceability, the previous requirement said that the applicant needed a written procedure to ensure that the agricultural raw materials did not come from protected areas or areas where rights of ownership were unresolved, and that they had not been illegally harvested. Now there is a specific requirement concerning the raw materials for which this is considered most problematic (palm oil, soy and sugar cane), this requirement has been removed for other agricultural raw materials, since it is considered that the environmental problems are generally less than for the three raw materials mentioned above. However, there is also a GMO-requirement for the raw materials, see O11.

O11 Genetically modified raw materials

The requirement applies to bio-based polymer in products that only consist of plastic and if the bio-based polymer makes up more than 10% of the product by weight. The requirement do not apply to bio-based plastic used as coating on paper/paperboard/cardboard.

The use of genetically modified agricultural raw materials in the production of bio-based polymer is prohibited. GMO based on bacterias or enzymes manufactured in closed systems is allowed.

Secondary raw materials are exempted from the requirement, see O10 for a definition.

✉ Declaration from the manufacturer of the bio-based polymer that genetically modified raw materials are not used.

Background to the requirement

The requirement is mainly unchanged. In the consultation proposal it was suggested to approve the use of the mass balance system to document the requirement, instead of having a total prohibition as in generation 3. This change was suggested since the explicit ban created a strict requirement which proved an obstacle to getting products Nordic Swan Ecolabelled. This was mainly due to the fact that most of the PLA on the market was made of genetically modified corn.The judgement was made that promoting new development and production of bio-based polymers was more important than having a ban for using genetically modified raw materials. However, after the consultation it is no longer possible to use mass balance (mixing of GM-raw material and non-GM raw material), and the

[107] http://www.braskem.com/site.aspx/Certifications-pe (accessed 03.10.2016)
[108] http://bonsucro.com/site/certification-process/certified-members/ (accessed 03.10.2016)

requirement is as it was in the last generation of the criteria. This is mainly due to the fact that PLA is no longer permitted in products that only consists of plastic due to requirement on material recovery (see O26), and therefore genetically modified corn for PLA-production is less relevant. Nordic Ecolabelling do not have knowledge about the use of other genetically modified raw materials for bioplastic production today. Based on consultation comments it is however an exception as genetically modified raw materials based on GM-bacterias and enzymes in closed systems is allowed, as this will not be a threat to the environment.

The ban on GMOs are based on the precautionary principle. GMOs (genetically modified organisms) are a much debated topic and many countries have banned the cultivation of GM crops. The themes of the debate include food safety, land use, lack of scientific knowledge about the effects of GM crops under local agricultural/forestry conditions and the risk of negative impacts on health and the environment. The argument often put forward by advocates of genetic modification is that it will reduce the use of herbicides. Recent studies have, however, raised questions about this.[109] The report from Genøk: "Genetically Modified Organisms – A Summary of Potential Adverse Effects Relevant to Sustainable Development" [110], commissioned by Nordic Ecolabelling in 2011, states that GMO has possible negative effects along the whole value chain from plant research and development, via growing, to storage, use and waste handling. The report also describes a lack of scientific research in several of these phases and a lack of assessment of the overall picture. The report particularly highlights the lack of research results on the long-term effects of GM plants. It is important to make clear that Nordic Ecolabelling is not an opponent of the technology in itself, but is concerned about the consequences when genetically modified plants spread into nature. See also section 6.4.

7.3.4 Energy

O12 Energy – bio-based polymers

The requirement applies to bio-based polymers that make up more than 10% of the disposable article by weight. Requirement a) or b) must be fulfilled.

a) The manufacturer of the polymer (production plant) must be certified in line with ISO 50001.

or

b) The energy consumed in the production of the bio-based polymers must not exceed 50 MJ/kg polymer. The calculation of energy consumption must include all the processes from monomer production to finished polymer. Energy from cultivation and extraction of the raw material, transport of the raw material to the production site and the energy content of the actual raw material should not be included in the calculation.

Energy from both renewable and non-renewable energy sources must be included in the calculation.

✉ For alternative a) certificate showing that the manufacturer of the polymer (production plant) is certified in line with ISO 50001.

[109] http://www.bioteknologiradet.no/2012/06/gmo-kan-gi-mindre-sproytemidler/ (accessed 08.10.2016)
[110] Georgina Catacora-Vargas, 2011, Genetically Modified Organisms – A Summary of Potential Adverse Effects Relevant to Sustainable Development, Biosafety Report 2011/02, GenØk – Centre for Biosafety

☒ For alternative b) information about electricity and fuel consumption and copy of invoice or confirmation of consumption from the supplier. State total kg polymer produced plus a calculation of total energy consumption in MJ/kg polymer produced. A description must be provided of how the energy consumption from the different subprocesses is included in the calculation.

Background to the requirement

The requirement has been changed so that now there are two options for fulfilling the requirement. An additional option has been added, whereby the requirement can be fulfilled by being certified in line with ISO 50001. ISO 5001 is an international energy management system which among other things, includes controlling purchases and measuring consumption, employee engagement and focus on maintenance of equipment and machinery to maximize energy efficiency. It is a standard suitable for all types of productions and both small and large enterprises can certify themselves. It is pointed out that such a standard does not stipulate an absolute energy requirement, but that production constantly focuses on improving energy efficiency.The absolute requirement has also been modified and the calculation simplified by removing the factor of 2.5 for electricity, and now including the steps from monomer production to finished polymer. The requirement limit of 50 MJ/kg polymer remains unchanged. The requirement for energy consumption is based on information from the literature, but it is limited with information. Most of the studies published include the production of PLA, but some information is also found for PHA production and various starch polymers. Often, only the fossil energy consumption is stated. The following information is taken from the previous background document.

According to Vink et al (2003) fossil energy consumption in the production of PLA is allocated between the following processes:

1. *The production of maize and shipment to corn wet mill: 9.8%*

2. *Conversion of maize starch to dextrose: 17.4%*

3. *Production of lactic acid: 49%*

4. *Production of lactide and subsequently PLA: 24%*

Stages 2, 3 and 4 account for 90.4% of total energ consumption. A total energy consumption of 54.1 MJ/kg of polymer means that 48.7 MJ/kg PLA is expended in these stages.

According to the article, energy consumption in stages 1 and 2 is not expected to fall markedly in the future, whereas the potential for reducing energy consumption lies largely in stages 3 and 4. Assuming the same distribution of energy consumption and applying the figures published in Vink et al (2010), this provides an energy consumption of 37.8 MJ/kg of PLA. In the case of PHA, the fermentation process is stated to account for approximately 60% of energy consumption. Fossil energy consumption varies between 69 107 MJ/kg in various studies. If it is assumed that wet milling expends as much energy in the production of PHA as in the production of PLA and taking the lowest energy consumption (69 MJ/kg of polymer) as a point of departure, the fossil energy consumed in wet milling and fermentation will be 53.4 MJ/kg of polymer. In the case of starch polymers such as TPS (thermoplastic starch) fossil energy consumption is stated to be 25 MJ/kg of polymer.

Nordic Ecolabelling judges the potential of an energy requirement to be low, but since the relevance is high, it is considered important to retain an energy requirement. As our experience with the criteria shows that the limit of 50 MJ/kg of polymer is possible to meet, no changes have been made to the requirement or made major investigations to assess a change in the level of energy consumption in this revision, but the energy requirement will be reviewed again in later revisions.

7.4 Chemicals

This section deals with chemical products and ingoing substances in chemical products. The requirements apply to chemical products that:

- are used in the production/composition (conversion) of the disposable article, such as adhesives, printing inks and coatings
- are added to the disposable article, such as aroma and fragrance
- additives in plastic (both fossil and bio-based plastics included, irrespective of quantity)
- residual monomers in plastic (both fossil and bio-based plastics included, irrespective of quantity)

The requirements do not apply to:

- auxiliary chemicals used during manufacture, such as lubricants, cleaning chemicals and so on.
- chemicals used in the production and printing of primary packaging.
- chemicals in the production process for pulp/paper/paperboard/cardboard, including grease-proof paper, since these must meet the requirements in "Nordic Ecolabelling of Paper Products – Chemical Module", version 2 or later. Chemicals that may be used in the production process for pulp/paper/paperboard/cardboard must also meet:
    - O18 in this criteria document which includes chemical additives for pulp.
    - O19 for colourants in this criteria document.

There are also chemical requirements concerning individual packaging and cores, see specific requirement O24.

The chemical requirements address the chemical product (e.g. a classification requirement for adhesives), but they may also address ingoing substances in the individual chemical product, i.e. ingoing substances in the adhesive. These requirements apply to all ingoing substances in the chemical product, but not to impurities unless otherwise stated in the specific requirement. Ingoing substances and impurities are defined below.

Ingoing substances: all substances in the chemical product, including additives (e.g. preservatives and stabilisers) in the raw materials. Substances known to be released from ingoing substances (e.g. formaldehyde, arylamine, in situ-generated preservatives) are also regarded as ingoing substances.

Impurities: residuals, pollutants, contaminants etc. from production, incl. production of raw materials that remain in the raw material/ingredient and/or in the chemical product in concentrations less than 100 ppm (0,0100 w-%, 100 mg/kg). Examples of impurities are residues of the following: residues or reagents incl. residues of monomers, catalysts, by-products, scavengers, and detergents for production equipment and carry-over from other or previous production lines.

O13 Chemical products, classification

Chemical products used in the production/composition (conversion) of the disposable article (e.g. adhesive or colourant) must not be classified as specified in Table 4.

The requirement also applies to additives to plastics, where it later in the criteria document is referred to this requirement, see O21.

Table 4: Classification of chemical products

Classification under CLP Regulation (EC) No 1272/2008		
Hazard class	**Category**	**Hazard code**
Hazardous to the aquatic environment	Aquatic Acute 1 Aquatic Chronic 1-4	H400 H410, H411, H412
Acute toxicity	Acute Tox. 1, 2 Acute Tox. 3	H330, H310, H300 H331, H301, H311
Specific target organ toxicity	STOT SE 1 STOT RE 1	H370 H372
Allergenic	Resp. Sens. 1 or Skin Sens 1	H334 H317
Carcinogenic	Carc. 1A/1B Carc. 2	H350 H351
Germ cell mutagenicity	Muta. 1A/B Muta. 2	H340 H341
Reproductive toxicity	Repr. 1A/1B Repr. 2	H360, H361 H362

The producers of the chemical products are responsible for the classification.

☒ Overview of chemicals used

☒ Safety data sheet for all chemical products pursuant to prevailing European legislation.

☒ Duly completed and signed Appendix 1, form:

- 4a Declaration - Other chemical products, or
- 4b Declaration - Adhesive, or
- 4c Declaration - Colourants/printing inks, or
- 4d Declaration - Silicone coating, or
- 4e Declaration - Coating/impregnation chemicals

The form must be filled in by the manufacturer/supplier of the chemical product.

Background to the requirement

The changed requirement now contains a ban on the use of products classified as allergenic. This is a general chemical requirement that Nordic Ecolabelling sets in many criteria documents, and it is set in order to reduce the use of chemicals that are harmful to health and the environment in the production of the Nordic Swan Ecolabelled disposable article. The requirement relates to chemicals used in the

production and composition/conversion of the disposable article, such as coatings, adhesives and printing inks. The requirement does not apply to printing inks on the disposable article's packaging. It has been pointed out that the requirement addresses the chemical product and not the individual substances that make up the product. The requirement must be documented with an overview of the chemicals used, data sheets for the various chemicals used, plus a declaration from the manufacturer/supplier of the chemical product.

O14 Classification of ingoing substances

Ingoing substances in chemical products used in the production/composition (conversion) of the disposable article (e.g. adhesive or colourant) must not have a classification listed in Table 5.

An exception is made for:

- formaldehyde in newly produced polymer, see O17

The requirement also applies to additives to plastics, where it later in the criteria document is referred to this requirement, see O21.

Table 5: Classification of CMR substances

Classification under CLP Regulation (EC) No 1272/2008		
Hazard class	**Category**	**Hazard code**
Carcinogenic	Carc. 1A/1B Carc. 2	H350 H351
Germ cell mutagenicity	Muta. 1A/B Muta. 2	H340 H341
Reproductive toxicity	Repr. 1A/1B Repr. 2	H360, H361 H362

✉ Duly completed and signed Appendix 1, form:

- 4a Declaration - Other chemical products, or
- 4b Declaration - Adhesive, or
- 4c Declaration - Colourants/printing inks, or
- 4d Declaration - Silicone coating, or
- 4e Declaration - Coating/impregnation chemicals

The form must be filled in by the manufacturer/supplier of the chemical product.

O15 Chemical substances – prohibition list

The following substances must not be ingoing substances in chemical products used in the production/composition (conversion) of the disposable article (e.g. adhesive or colourant):

- Substances on the Candidate List*

D4, D5 and D6 in silicone polymer have an own requirement, see O18.

- Substances that have been judged in the EU to be PBT (Persistent, Bioaccumulative and Toxic) or vPvB (very Persistent and very Bioaccumulative)**
- Substances considered to be potential endocrine disruptors in category 1 or 2 on the EU's priority list of substances that are to be investigated further for endocrine disruptive effects***
- Phthalates****
- APEO – alkylphenol ethoxylates and alkylphenol derivatives (substances that release alkylphenols on degradation)

- BHT - butylhydroxytoluene

  There is an exemption for BHT up to 2 ppm in water-repelling coatings used on articles made from board. Please note that a plastic layer on the product is not considered a coating. The exemption expires if the substance fulfils one of the following during the validity of the criteria:

  - *The substance is included on the EU Candidate list* or List 1 on the website www.edlist.org*
  - *ECHA Endocrine Disruptor Expert Group assesses the substance and considers it an endocrine disruptor http://echa.europe.ej/sv/ed-assessment*
  - *The substance is included on List 3 on the website www.edlist.org*

- Bisphenols A, F and S
- Halogenated organic compounds. An exceptions is made for:

  - halogenated organic pigments that meet the European Council's "Resolution AP (89) 1 on the use of colourants in plastic materials coming into contact with food", point 2.5

- Antibacterial agents (e.g. nanosilver)*****

The requirement also applies to additives to plastics, where it later in the criteria document is referred to this requirement, see O21.

* *The Candidate List can be found on the ECHA website: http://echa.europa.eu/candidate-list-table*

** *PBT and vPvB in accordance with the criteria in Annex XIII of REACH*

*** *Substances considered to be potential endocrine disruptors in category 1 or 2, see following link: http://ec.europa.eu/environment/chemicals/endocrine/strategy/being_en.htm*

**** *The prohibition does not include polyethylene terephthalate (PET).*

***** *An antibacterial agent is a chemical/product that inhibits or stops growth of microorganisms such as bacteria, fungi or protozoa (single-celled organisms). The requirement does not apply to preservatives used to preserve the chemical product, so-called in-can preservatives.*

☒ Duly completed and signed Appendix 1, form:

- 4a Declaration - Other chemical products, or
- 4b Declaration - Adhesive, or
- 4c Declaration - Colourants/printing inks, or
- 4d Declaration - Silicone coating, or
- 4e Declaration - Coating/impregnation chemicals

The form must be filled in by the manufacturer/supplier of the chemical product.

Background to the requirement

The requirements O14 and O15 are new to this generation of the criteria. These are general chemical requirements that Nordic Ecolabelling sets in many criteria documents and has therefore introduced here. They state that there must be no chemical substances with a range of problematic properties present in the chemical products used in the production and composition/conversion of the disposable article. ChemSec has drawn up its own SIN (Substitute It Now!) list of substances

from materials in contact with food.[111] The requirements concerning constituent substances capture almost all the substances on this list, including a number of aromatic amines, alkylphenols, glycol ethers and phthalates. The reason for their listing is usually that the substances have CMR properties.

Substances of Very High Concern (SVHC) meet the criteria in article 57 of the REACH Regulation, which defines SVHC as: substances that are CMR (category 1 and 2 under the Dangerous Substances Directive 67/548/EEC or category 1A and 1B under the CLP Regulation), PBT substances, vPvB substances (see section below) and substances that have endocrine disruptive properties or are environmentally harmful without meeting the criteria for PBT or vPvB. SVHCs may be included on the Candidate List with a view to them being inscribed on the Authorisation List, which means that the substance becomes regulated (ban, phasing out or other form of restriction). Since these substances face being phased out or banned, it is only logical for Nordic Ecolabelling not to permit this type of substance in ecolabelled products. A substance may meet the criteria for SVHC without being included on the Candidate List, so there is no direct equivalence between SVHC and the Candidate List. To avoid cross-references between PBT, vPvB, CMR and endocrine disruptors, instead of excluding SVHC (which does cover some CMR, PBT, vPvB, etc.) Nordic Ecolabelling chooses to exclude from use the substances on the Candidate List and to separately exclude PBT, vPvB and endocrine disruptors. This should still cover all SVHC substances. “Persistent, bioaccumulative and toxic (PBT) organic substances” and “very persistent and very bioaccumulative(vPvB) organic substances” are substances whose inherent properties are not desirable in Nordic Swan Ecolabelled products. PBT and vPvB substances are defined in Annex XIII of REACH (Regulation (EC) No 1907/2006).

Potential endocrine disruptors are substances that may affect the hormone balance in humans and animals. Changes in the hormone balance can have unwanted effects and here there is an extra focus on hormones that affect sexual development and reproduction. Nordic Ecolabelling bans the use of substances that are considered to be potential endocrine disruptors, category 1 (there is evidence of a change in endocrine activity in at least one animal species) or category 2 (there is evidence of biological activity related to changes in hormone balance), in line with the EU’s original report on “Endocrine disruptors” or later studies. This entails a ban on substances such as bisphenol A, several phthalates and certain alkylphenols. Phthalates are included as a separate point on the exclusion list to make it absolutely clear that no phthalates are permitted. Phthalates were also prohibited in generation 1 of the criteria. Phthalates are a substance group comprising many different substances. They are used primarily as plasticisers in plastics and since they are not chemically bonded into the plastic, they can leach out into their surroundings. Several phthalates are toxic for reproduction and environmentally harmful. For some phthalates, food is considered the main exposure route, with materials in contact with food being a relevant source.[112] Some phthalates are listed in Annex 1 to Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food, which means that their use is permitted. Limits for the use of these have rightly been

[111] The SIN (Substitute it Now!) List is a globally used database of chemicals likely to be banned or restricted in the near future. The chemicals on the SIN List have been identified by ChemSec as Substances of Very High Concern (SVHC) based on the criteria established by the EU chemicals regulation REACH: http://chemsec.org/business-tool/sin-list/ (accessed 03.11.2016)
[112] http://www.foodpackagingforum.org/food-packaging-health/phthalates (accessed 03.10.2016)

introduced, but phthalates that are classified as reprotoxic, for example DEHP, are permitted under the Regulation. A ban therefore ensures that these substances are not present in a Nordic Swan Ecolabelled disposable article. See also the background text on PVC requirements under O3.

After the consultation is butylhydroxytoluene (BHT) and the bisphenols A, F and S added to the requirement based on received consultation comments and that these are relevant substances in food contact materials. BHT does not have an official harmonized classification and is not on the EU list of potential endocrine disruptors. However, BHT is suspected of being hormonal disorder even though it is not on the EU list and is on the guidance list for self-classification, including CMR properties and harmful for the environment.[113] Nordic Ecolabelling has reviewed ChemSec's SIN.LIST for food contact[114] and notes that BHT is listed on this list. Based on the fact that this is a relevant chemical in food contact materials, Nordic Ecolabelling has introduced BHT specifically on the list of prohibited substances, as it is not captured by the EU list of potential endocrine disruptors or the requirement for CMR-classified substances.

Articles made from board require a water-repelling coating, which can be achieved by coating the surface with a wax or applying a thin layer of plastic to the surface. Such a plastic layer requires a substantial amount of resources and also causes difficulties in recycling of these products. Such products are not intended to be recycled, however often end up being recycled. The wax requires an antioxidant, which can be either a small amount of BHT or a larger amount of an antioxidant classified as skin sensitising. Therefore, an exemption is given for BHT up to 2 ppm in water-repelling coatings used on articles made from board, given that BHT is not included on any of the lists of endocrine disruptors mentioned in the requirement.

On SIN.LIST for food contact, other bisphenols than bisphenol A are also listed, such as bisphenol F and S. These can be used as substitutes for bisphenol A. Nordic Ecolabelling has therefore introduced a general ban on bisphenol A, F and S based on the precautionary principle and suspicion that these substances may be endocrine disrupters.[115] Bisphenol A is also on the Candidate List, and is thus already prohibited, but it is further clarified when listing it as a separate point together with Bisphenol F and S.

Alkylphenol ethoxylates can break down into alkylphenols which are not readily degradable, and some of which are suspected endocrine disruptors. There is a strong political desire in the Nordic region to phase out these substances, and they are inscribed on the Danish List of Undesirable Substances[116], for example.

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113 http://mst.dk/virksomhed%E2%80%90myndighed/kemikalier/stoflister%E2%80%90og%E2%80%90databaser/vejledende%E2%80%90liste%E2%80%90til%E2%80%90selvklassificering%E2%80%90af%E2%80%90farlige%E2%80%90stoffer/

114 http://sinlist.chemsec.org/search/search?query=&uses=15 (accessed 24.04.2017)

115 Johanna R. Rochester and Ashley L. Bolden Bisphenol S and F: A Systematic Review and Comparison of the Hormonal Activity of Bisphenol A SubstitutesEnviron Health Perspect; DOI:10.1289/ehp.1408989 http://ehp.niehs.nih.gov/wp-content/uploads/advpub/2015/3/ehp.1408989.acco.pdf

116 http://www2.mst.dk/udgiv/publikationer/2010/978-87-92617-15-6/pdf/978-87-92617-16-3.pdf (accessed 05.10.2016)

Halogenated solvents pose a major environmental and work environment problem, while many chlorinated solvents deplete the ozone, and some are classified as carcinogenic.

Antibacterial substances/products are not desirable in ecolabelled products, and particularly not in products that come into direct contact with the body or food. There has been an increase in products with added antibacterial agents. Nanosilver, for example, is found in everything from socks and toothbrushes to refrigerators. There is particular concern that extensive and unnecessary use of nanosilver and other antibacterial agents may eliminate desirable bacteria and cause resistance in bacteria, so that in contexts where they are needed such agents will no longer have the desired effect.

O16 Aromas, flavourings and fragrances

Aromas, flavourings, fragrances or other aroma compounds (e.g. essential oils, plant oils and plant extracts) must not be ingoing substances in the disposable article.

✉ Declaration from the manufacturer of the disposable article that there are no aromas, flavourings, fragrances or other aroma compounds as ingoing substances in the disposable article. Appendix 1, form 1 may be used.

Background to the requirement

The requirement remains unchanged. Aromas, flavourings, fragrances, essential oils and plant oils and extracts often contain a number of allergens or carcinogens. To avoid adverse health effects from this type of substance, the use of aromas, flavourings, fragrances and other aroma compounds is prohibited. There are examples of various aroma compounds being added to packaging, for example to accentuate the aroma of bread.[117] The Foodtech portal talks about the use of aromas and flavourings in packaging.[118] This is not particularly widespread in the Nordic region, but since it entails unnecessary use of chemicals, the choice has been made to include a ban in the criteria.

O17 Adhesives

Ethylene glycol ethers or rosin must not be ingoing substances in adhesives. The exception is modified rosin derivative which is not classified as allergenic.

Formaldehyde generated during the production process may amount to no more than 250 ppm (0.0250% by weight) measured in newly produced polymer dispersion*. The content of free formaldehyde in hardened adhesive must not exceed 10 ppm (0.001% by weight)**.

Hotmelt adhesives are exempted from the requirement to document formaldehyde.

Information on test methods and analysis laboratories is provided in Appendix 3.

** Measured using the VdL-RL 03 method "In-can concentration of formaldehyde determined by the acetyl-acetone method" or the Merckoquant method (see Appendix X of RAL-UZ 102), or some other equivalent method.*

*** Measured using the Merckoquant method (see Appendix X of RAL-UZ 102), or some other equivalent method.*

[117] "EU åbner for duftende emballage til maden" Article in Ingeniøren, 22 Nov 2008
[118] http://www.foodtech-portal.eu/index.php?title=Special:PdfPrint&page=Flavour+and+aroma+release+packaging (accessed 05.10.2016)

✉ Safety data sheet for the product. Declaration from the adhesive producer that the requirement is fulfilled. Appendix 1, form 4b may be used. Results of analysis of the formaldehyde content of the adhesive.

Background to the requirement

The requirement remains unchanged, although some of the substances specified as being prohibited in this requirement are now covered by the general requirement concerning constituent substances and have therefore been removed from here. Adhesive may be used to bond together the packaging or to affix coatings and labels and so on. In most cases, it is not in direct contact with food, but contact may occur unintentionally at the seams and edges or via migration through the packaging or in the gas phase for volatile compounds. [119] Many different types of adhesive may be used in materials in contact with food, depending on the material and function, including reactive polyurethane (PU) adhesive, adhesive based on natural polymers such as dextrin and starch, and hotmelt adhesive. Adhesives may contain problematic substances, and Nordic Ecolabelling therefore sets requirements concerning certain constituent substances in adhesives via the general chemical requirements in O13 and O14 and other specific substances in this requirement.

Rosin is prohibited because it can cause contact allergies. Rosin is tapped from pine trees as a resin and extracted with turpentine. The blend contains many allergens. Formaldehyde is also allergenic, in addition to being classified as carcinogenic. A separate impurity limit has been introduced for formaldehyde. The content of formaldehyde must not exceed 250 ppm in newly produced polymer dispersion and there is a limit of 10 ppm in hardened adhesive. To document the requirement, one must submit the results of testing carried out in accordance with the Merckoquant method or the VdL-RL 03 method "In-can concentration of formaldehyde determined by the acetyl-acetone method." If the VdL-RL 03 method is used, it must be calibrated to measure results <100 ppm in order to be valid. The formaldehyde requirement does not require documentation of hotmelt adhesives, since such adhesives do not contain these substances.

O18 Coatings and impregnations

Chromium compounds and fluorinated compounds must not be ingoing substances in the chemicals used for coating/impregnating/mixing into the pulp/paper/paperboard/disposable article.

The following requirements apply to the silicone treatment of disposable articles or parts thereof:

- Solvent-based silicone coatings must not be used.
- Octamethylcyclotetrasiloxane, D4 (CAS 556-67-2), decamethylcyclopentasiloxane, D5 (CAS 541-02-6) and dodecamethyl cyclohexasiloxane, D6, (CAS 540-97-6) must not be present in the chemical products used for silicone treatment. The requirement does not apply to D4, D5 and D6 contained as impurities in the finished commercial product in concentrations below 800 ppm (0.08% by weight).∗
- Organotin catalysts must not be used in the production of the silicone polymer.

∗ *Finished commercial product refers to the silicone emulsion's coating bath.*

[119] Migration testing of adhesives intended for food contact materials, FEICA – Guidance paper, May 2016

Nordic Swan Ecolabelled grease-proof paper fulfils the requirement.

☒ Declaration from the chemical supplier that chromium or fluorinated compounds are not ingoing substances in the coating/impregnation chemicals. Appendix 1, form 4e may be used. Safety data sheet for the product.

☒ Declaration from the manufacturer of the pulp, paper, paperboard and cardboard that no chromium or fluorinated compounds were added in the production of the pulp or paper/paperboard/cardboard.

☒ Declaration from the chemical supplier that octamethylcyclotetrasiloxane, D4, decamethylcyclopentasiloxane, D5, and/or dodecamethyl cyclohexasiloxane, D6, are not present in the chemical products used for silicone treatment in concentrations above 800 ppm. State the amount of D4, D5 and D6. Appendix 1, form 4d may be used.

Background to the requirement

The requirement has been changed to bring it in line with the requirement in the criteria for Grease-proof Paper from 2014. A new feature is the requirement that solvent-based silicone coatings must not be used, and that organotin catalysts cannot be used in the production of silicone polymers. The limit for impurities was originally for the siloxanes D4 and D5, but on December 12, 2018, Nordic Ecolabelling approved adding dodecamethylcyclohexasiloxane, D6 (CAS-nr. 540-97-6) to the requirement. This is because both D4, D5 and D6 in 2018 was added to the Candidate list. At the same time, a reference was made to O18 in O15 under the point of the Candidate List. The limit for impurities is 800 ppm, based on experience of what the industry is able to achieve at this time. The limit will be reassessed in the next revision. Beyond this, the requirement is unchanged.

Chromium coatings are no longer used in Europe, but it cannot be ruled out that they might be used in other places around the world. Chromium compounds are not readily degradable and can accumulate in organisms to varying degrees. Hexavalent chromium compounds are classified as very toxic to aquatic organisms. Trivalent chromium compounds are generally somewhat less toxic, although certain species can be particularly sensitive to these. The emission of chromium to the waste system from factories or factory wastewater should thus be avoided.

The requirement that coating/impregnation chemicals/chemicals added to pulp must not contain fluorinated compounds has been set in order to prevent the dispersal of fluorinated compounds such as PFAS (perfluoroalkyl sulphonates) in the environment. [120]PFAS is an umbrella term for various types of fluorinated compounds that are persistent and tend to bioaccumulate. PFOS (perfluorooctane sulphonate) and PFOA (perfluorooctanoic acid) are the two fluorinated compounds about which most is currently known. Both of these have serious effects on health and the environment. Long-chain perfluorocarboxylic acids (C9-PFCA – C14-PFCA) are another type of fluorinated substance that is also persistent, with high potential for bioaccumulation. There is less knowledge about short-chain perfluorinated compounds, but a new literature review published in 2015 by the Danish Ministry of the Environment shows that some short-chain PFAS may be just

[120] Miljøstatus i Norge: http://www.miljostatus.no/Tema/Kjemikalier/Noen-farlige-kjemikalier/PFOS-PFOA-og-andre-PFCs/, (accessed 22.10.2015)

as harmful as the long-chain compounds they replace. [121]The study shows that the new substances have the potential to accumulate in nature, and since they have to be used in higher concentrations to achieve the same effect, the conclusion is that they are not a good enough alternative to the substances that have been partially phased out. Studies show that fluorinated coatings are used in food packaging and that various fluorinated compounds can migrate from paper and paperboard in contact with food.[122],[123],[124] The authorities in many countries have developed a strong focus on the use and occurrence of fluorinated substances in products and the environment. Previously, fluorinated compounds were mainly used as a coating to make the product waterproof, but since the price of chemicals has dropped, fluorinated compounds have also been added to the paper pulp, with the result that the paper may contain up to 10 times more fluorinated compounds than if it was just coated.[125] This may, for example, be relevant for plates that are made from pressed pulp, where fluorine in the pulp is used to make the plates waterproof. It should be noted that this requirement applies to the addition of fluorine. Wood contains natural fluorine, and fluorinated compounds may therefore be found in products made from wood, even if no fluorine is added in the production process or as a coating[126].

Siloxanes are not readily degradable and therefore have the capacity to accumulate in the environment. Siloxanes are volatile and can become easily enriched in sludge from wastewater. Cyclic siloxanes are a group of compounds that the authorities have long had in their sights. Of the cyclic siloxanes, there has been a particular focus on octamethylcyclotetrasiloxane (D4) and decamethylcyclotetrasiloxane (D5), and D5 is on the priority list of the Norwegian authorities, for example[127]. The requirement therefore limits the use of these two siloxanes, but permits silicone coatings. See also the background document for Grease-proof Paper for more information on the silicone requirement.

O19 Colourants for printing and dyeing

The requirement applies to colourants for printing, dyeing and shading.

All colourants used for printing, dyeing and shading must be declared and safety data sheets for the products must be submitted. All colourants must meet the following requirements:

- Halogenated organic pigments must meet the European Council's "Resolution AP (89) 1 on the use of colourants in plastic materials coming into contact with food".

In addition, the following requirements apply:

[121] Danish Ministry of the Environment, 2015: Short-chain polyfluoroalkyl substances (PFAS), A literature review of information on human health effects and environmental fate and effect aspects of short-chain PFAS, Environmental project No. 1707, 2015
[122] Trier X. et al, 2011: Polyfluorinated surfactants (PFS) in paper and board coatings for food packaging, Environ Sci Pollut Res Int. 2011 Aug;18(7):1108-20
[123] Tænk (2012) Muffinsformer, Denmark. Tænk des/2013: 8–11.
[124] The Danish Veterinary and Food Administration 2012, Migration af fluorerede stoffer fra fødevarekontaktmaterialer af pap og papir, J. nr.: 2010-20-793-00107
[125] Background document to the Criteria for the Nordic Swan Ecolabelling of Grease-proof Paper, version 4, November 2014
[126] https://www.foedevarestyrelsen.dk/SiteCollectionDocuments/Kemi%20og%20foedevarekvalitet/FKM/Fakta%20ark%20fluorerede%20stoffer.pdf (accessed 25.10.2016)
[127] http://www.miljostatus.no/prioritetslisten (accessed 05.10.2016s)

- Colourants used for printing, dyeing and shading must meet BfR's (Federal Institute for Risk Assessment) recommendations: "IX. Colorants for Plastics and other Polymers Used in Commodities"* or Swiss Ordinance 817.023.21 Annex 2 and 10.

Alternatively, colourants used for shading and/or dyeing of paper/paperboard/ cardboard can meet the following requirement:

- BfR's recommendation XXXVI. Paper and board for food contact, from July 2015 or more recent versions.

* *In case of colourants used for printing on paper/paperboard/cardboard, condensation products of aromatic sulfonic acids with formaldehyde are exempted from the requirement in BfR IX, but must fulfil the requirements in BfRs XXXVI. See also O25.*

Note that colourants for printing/dyeing paper, paperboard or cardboard must also meet the requirements set out in the Chemicals Module for Paper Products, version 2 or later, see requirement O5.

✉ State which colourants are used. Safety data sheet for the colourant. Declaration from the manufacturer of the colourant that the requirement is fulfilled. Appendix 1, form 4c may be used.

Background to the requirement

When disposable articles are in contact with food, it is considered particularly important to have a requirement for colourants for printing, shading and dyeing, since they can involve problematic substances. The requirement concerning colourants therefore contains both requirements for printing inks from the Chemicals Module for Paper Products and requirements for compliance with BfR's recommendations, Swiss Ordinance 817.023.21 Annex 2 and 10 and the requirements in Resolution APs (89) concerning halogenated organic pigments.

Colourants that are not in direct contact with food are not covered by legislation, and Nordic Ecolabelling therefore believes it is relevant to set requirements for colourants that are used to dye/shade or print on the disposable article.

The Federal Institute for Risk Assessment (BfR) provides a recommendation for colourants used in plastics that is well established in the industry, BfR IX. Colorants for Plastics and other Polymers Used in Commodities. Initial contact with the industry showed that these guidelines are also used for paper products. However, there is a general challenge that colourants for paper/paperboard/cardboard are not specifically regulated. Some of the requirements in BfR IX are difficult to fulfil for colourants used on other materials than plastic, like paper/paperboard/card-board. Therefore, Swiss Ordinance 817.023.21 Annex 2 and 10 and BfR XXXVI are introduced as alternatives to BfR IX.

Colourants used for printing, shading and/or dyeing must meet the recommendations of the Federal Institute for Risk Assessment (BfR): IX. Colorants for Plastics and other Polymers Used in Commodities or Swiss Ordinance 817.023.21 Annex 2 and 10. The recommendations can be found on BfR's website and the Swiss FSVO's website.[128, 129] BfR's recommendations are a type of restriction list that sets maximum limits for the content of different substances,

[128] https://bfr.ble.de/kse/faces/resources/pdf/090-english.pdf;jsessionid=FE1429F27793CC9BFA3F7E53BEF85B04 (accessed 07.10.2016)
[129] https://www.blv.admin.ch/blv/en/home/gebrauchsgegenstaende/materialien-in-kontakt-mit-lebensmitteln/verpackungen.html (accessed 2020-06-15)

including various oils and fatty acids, heavy metals and aromatic amines. The Swiss Ordinance 817.023.21 is a Swiss legislation for materials and articles intended to come into contact with foodstuffs, and Annex 2 and 10 lists permitted substances in the material and in printing inks used for printing on said articles. Colourants used for dyeing/shading of paper/paperboard/cardboard are not covered either by BfR IX or Swiss Ordinance 817.023.21 Annex 2 and 10, therefore these substances shall fulfill the requirements set out in BfR XXXVI for paper and board for food contact.

BfR writes in its recommendation that the most suitable colourants for plastic are insoluble pigments that are incorporated so well in the plastic that they do not migrate out into the foodstuff. Incorrect use of soluble colourants poses a risk that they might migrate out into the food. Since the recommendations do not prohibit the use of toxic substances, it is extremely important that colourants do not migrate into the food. The recommendations point out that this should be verified.

On 13 June 2018 an exemption was made for colourants used for paper/paperboard/cardboard from BfR's IX. Colourants that contains condensation products of aromatic sulfonic acids with formaldehyde are exempted from the requirement in BfR IX, but must fulfil the requirements in BfR XXXVI. It is referred to BfR XXXVI in O25.

In addition to BfR's recommendations, organic pigments must also meet Resolution AP (89) 1 on the use of colourants in plastic materials coming into contact with food.[129] This requirement prohibits substances such as PCBs, which are not covered by BfR's recommendations.

PCBs were found in analyses of paint that contained organic pigments. It is known that PCBs are present in two organic pigments, azo pigments and phthalocyanine pigments. Now, however, PCBs have also been found in products with other pigments. PCBs are not added, but can be formed in the production process as a result of reactions between various chlorinated solvents and the organic pigment. These pigments may be used in a wide range of products, including paint, textiles, paper and food.[130] Concern has been expressed about the content of PCBs, and the Norwegian authorities have looked at the Council of Europe's recommendation with a view to introducing measures against PCBs in pigments.

The requirement must be documented by submitting safety data sheets for the colourants used, plus a declaration from the manufacturer of the colourant showing fulfilment of the requirement. Remember that the general chemical requirements, such as the classification requirement O13 and the constituent substances requirements O14 and O15, also apply to colourants.

O20 Chemicals in coffee and tea filters

No adhesives or other chemicals may be added to the paper in the conversion process.

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129 https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=09000016804f8648

130 Hu D, Hornbuckle KC. Inadvertent polychlorinated biphenyls in commercial paint pigments. Environ Sci Technol 44(8):2822–2827 (2009)

✉ Declaration from the manufacturer confirming that no adhesives or other chemicals are added to the paper in the conversion process for coffee and tea filters.

Background to the requirement

The requirement remains unchanged. The requirement has been set in order to limit the use of unnecessary chemicals such as adhesives or colourants, which may impact on health and the environment during use and production. The requirement corresponds to the requirements in the previous criteria for the Nordic Swan Ecolabelling of Coffee Filters.

O21 Additives in plastic

Additives in plastic, such as stabilisers, antioxidants, plasticisers, colourants/pigments and fillers (except for inorganic fillers) must meet the requirement concerning classification of chemical products, O13, and the requirements concerning ingoing substances in the chemical products, O14 and O15.

✉ Declaration from the plastic manufacturer that the requirement is fulfilled. Appendix 1, form 5 may be used. Safety data sheet for the additive.

Background to the requirement

The requirement is new, but it largely corresponds to the previous requirement, whereby additives in materials had to meet the classification requirement. There was, however, some confusion about which requirements applied to additives in plastic, and so a separate requirement has been introduced to clarify the situation.

O22 Residual monomers in polymers

Residual monomers that have a classification listed in Table 6 below may only be present in the polymer to a maximum of 100 ppm. The amount can be maximum 100 ppm for each classification.

The content of residual monomers must be measured on the newly produced polymer.

Table 6: Classification of CMR substances

Classification under CLP Regulation (EC) No 1272/2008		
Hazard class	**Category**	**Hazard code**
Carcinogenic	Carc. 1A/1B Carc. 2	H350 H351
Germ cell mutagenicity	Muta. 1A/B Muta. 2	H340 H341
Reproductive toxicity	Repr. 1A/1B Repr. 2	H360, H361 H362

✉ Declaration from the polymer manufacturer that the content is no more than 100 ppm. Appendix 1, form 5 may be used.

Background to the requirement

The requirement is new to this generation of the criteria. Residual monomers in polymers can cause negative health effects. Several residual monomers may have carcinogenic, mutagenic and reprotoxic properties, which is why Nordic Ecolabelling sets a requirement concerning such monomers. Examples of residual monomers that may be present in polymers used in materials in contact with food

are styrene from the production of polystyrene and bisphenol A from polycarbonate. Styrene is classified as toxic for reproduction (Rep 2 H362d) and is a suspected endocrine disruptor. Products made from 100% polystyrene (PS) cannot be labelled due to the requirement that at least 90% of the disposable article by weight must comprise bio-based materials. Polystyrene may, however, be present in components such as the lid of a take-away coffee cup. There are no specific requirements concerning styrene in the regulations on plastic materials in contact with food. All that applies is the general migration limit. Another residual monomer covered by the requirement is bisphenol A. Bisphenol A is employed in the production of polycarbonate and is used to make containers for food and drinks, soda bottles and storage containers. The substance is also used in epoxy resins, which are used as a protective surface treatment inside metal containers (cans)[131], but since metal is not permitted as a material in disposable articles, this is not relevant. As the use of some fossil plastic and recycled plastic is permitted, the use of polycarbonate cannot be ruled out. Bisphenol A is classified as toxic for reproduction and is banned from use in baby bottles in the EU. Sweden[132] and Denmark[133] also have a ban on bisphenol A in products in contact with food for children under 3 years of age. The requirement limit is 100 ppm, which corresponds to the general impurities limit we have with regard to substances in chemical products.

O23 Chemicals – recycled plastics

Phthalates, bisphenol A and styrene must not be present in the recycled plastic. This may be documented using a test of the recycled material, or documentation of full traceability can be used to show that these substances are not present.

Additives in recycled plastic must meet requirements O13, O14 and O15.

For test methods, see Appendix 3.

✉ Test or documentation showing that the recycled plastic contains no phthalates, bisphenol A or styrene.

✉ Declaration from the supplier of the recycled plastic that any additives meet requirements O13, O14 and O15.

Background to the requirement

The requirement is new, since the use of recycled material is now permitted. It is important that the recycled plastic does not contain chemicals that we would otherwise not permit in virgin plastic. The requirement therefore states that the additives in plastic must meet O13, O14 and O15, and that documentation must be provided to show that the plastic does not contain phthalates, bisphenol A or styrene. These are substances that can occur in plastic approved for food, and they can potentially end up in the recycled plastic. This can be documented via a test or documentation showing that the recycled plastic material comes from known sources (with traceability from the recycling of the original product up to

131 http://www.mattilsynet.no/mat_og_vann/produksjon_av_mat/matkontaktmaterialer/bisfenol_a.3202 (accessed 03.10.2016)
132 http://www.kemi.se/vagledning-for/konsumenter/kemiska-amnen/bisfenol-a (accessed 07.10.2016)
133 http://mst.dk/borger/kemikalier-i-hverdagen/kend-kemikalierne/bisphenol-a/ (accessed 07.10.2016)

the finished recycled plastic material), substantiating the fact that these chemicals are not present.

7.5 Individual packaging and cores

Less extensive material and chemical requirements are set for any individual packaging (e.g. the paper around chopsticks or the plastic wrapper for cutlery) and cores (e.g. the cardboard tube that plastic film or plastic bags are rolled around) to make the documentation burden less comprehensive.

O24 Individual packaging and cores

Individual packaging or cores made from paper/paperboard/cardboard must meet the following requirements:

a) The paper/paperboard/cardboard or the pulp used for this must not be bleached using chlorine gas (Cl_2).

b) The manufacturer of the paper/paperboard/cardboard must be CoC certified in line with the FSC/PEFC schemes.

c) The requirement concerning aromas, fragrances and flavourings, O16

d) The chemicals used, such as adhesives, printing inks and coatings, must meet the following requirements:

- O13 Classification of chemical products

  The requirement does not apply to chemicals in the production of the pulp/paper/paperboard/cardboard, but the chemicals used for example when bonding seams or printing on individual packaging.

- O18 Coatings and impregnations

Individual packaging or cores made from plastic must meet the following requirements:

a) Name (in Latin and English), plus geographical origin (country/state) and supplier of the agricultural raw materials used in the bio-based plastic.

b) The requirement concerning aromas, fragrances and flavourings, O16

c) The chemicals used, e.g. adhesives and printing inks, must meet:

- O13 Classification of chemical products

The requirement does not apply to chemicals in the production of the plastic, but the chemicals used for example when bonding seams or printing on individual packaging.

d) Additives in plastic must meet:

- O13 Classification of chemical products

Documentation for individual packaging or cores made from pulp/paper/paperboard/cardboard:

☒ Declaration from the manufacturer of pulp, paper, paperboard, cardboard that chlorine gas is not used for bleaching.

☒ Declaration from the manufacturer or supplier that O13 and O18 are fulfilled.

Documentation for individual packaging or cores made from plastic

☒ For bio-based polymers, state the name and origin of the raw material.

☒ Declaration from the producer/supplier of the chemical that O13 is fulfilled.

☒ Declaration from the plastic manufacturer that the chemicals used and the additives for the polymer fulfil O13.

O16 is documented by the manufacturer of the disposable article, see O16.

Background to the requirement

The requirement is new to this version of the criteria. Previously, individual packaging and cores had to meet all the requirements in the criteria document. This proved too great a burden of documentation for a small part of the product. These are also parts of the disposable article that do not come into direct contact with the food. It is therefore considered reasonable to set fewer requirements, both on the material front and concerning the chemicals, for these parts of the disposable article.

7.6 Food contact

O25 Materials in contact with food

The product must comply with Regulation (EC) No 1935/2004, as amended, on materials and articles intended to come into contact with food and the production of the product must comply with the Regulation (EC) No 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food.

In addition, the following requirements for plastics and for pulp, paper, paperboard and cardboard apply:

Plastics

If the product comprises or contains parts made from plastic, it must comply with Regulation (EU) No 10/2011, as amended, on plastic materials and articles intended to come into contact with food.

For recycled plastic, see also O2.

Pulp, paper, paperboard, cardboard

Pulp, paper, paperboard, cardboard in the product must meet one of the two following recommendations:

- BfR's recommendation XXXVI. Paper and board for food contact, from July 2015 or more recent versions, or
- CEPI's Industry guideline for the Compliance of Paper & Board materials and articles for food contact, Issue 2, September 2012 or more recent versions.

Fulfilment of the requirements must be certified/evaluated by an independent third party.

It is emphasized that the requirements of this criteria document are superior to the requirements in regulations and recommendations. This means that a chemical may be prohibited in a swan-labeled disposable article, although permitted by regulations and recommendations.

✉ Copy of the certificate or declaration from an independent third party, confirming fulfilment of the requirement.

Background to the requirement

The requirement remains mainly unchanged, but it has been stated that the product should also be manufactured according to Regulation 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food. In addition, it is referred to O2 for recycled plastic which states that recycled plastic must be approved in accordance with Regulation 282/2008. These are legal requirements that all products have to comply with, and for this reason the requirement could seem superfluous. Nordic Ecolabelling has nevertheless

chosen to introduce the requirement based on feedback from an industry seminar that was held in January 2011 in connection with the development of the first generation of the criteria. The seminar made it clear that the regulations are monitored differently by the authorities in the Nordic countries, and in addition, products that are ecolabelled may be produced in countries other than the Nordics and also outside Europe. The requirement represents additional assurance that the products are safe to use, regardless of the country of manufacture. The requirement must be documented via a confirmation from an independent third party. Sweden has Normpack and Norway has Emballasjekonvensjonen, which help companies to verify that their products meet prevailing laws and regulations. Denmark does not have any such regulatory framework. Nordic Ecolabelling does not specify that only Normpack and Emballasjekonvensjonen may perform the third party assessments and evalutions, meaning that others may also perform these.

There are no regulatory requirements for products made from paper, paperboard or cardboard, beyond the general legislation (Regulation (EC) No 1935/2004), and there is therefore a requirement that BfR's recommendations or CEPI's Industry guideline must be followed, in order to provide extra assuranc/e that the product is safe for use. These recommendations and guidelines are well known in the industry, at least in the Nordic countries. Both are included in order to provide greater flexibility. The option of using the Council of Europe's guidelines has been deleted, since Nordic Ecolabelling has gained the impression that these are not used in the industry. Documenting the requirement once again requires a certificate or other confirmation from an independent third party showing fulfilment of the requirements in the recommendation/guideline. Nordic Ecolabelling believes it is important to retain the requirement concerning third party verification.

Over the years 2013–2015, a joint project was conducted in the Nordic region to check how manufacturers and importers of plastic materials in contact with food comply with the regulations: whether they have declarations of compliance, plus the necessary knowledge and documentation for the plastic in question. The project led to the report "Nordic project food contact materials – Control of declarations of compliance (DoC)"[134]. The report concludes that the manufacturers, importers and those who use the materials in contact with food need to improve in this area. Nordic Ecolabelling considers it extremely important that the regulations are followed in order to minimise the health risks for the consumer, and therefore wishes to see an extra check on this via a third party.

7.7 Waste processing

Waste processing is an important parameter when it comes to the environmental impact of a disposable article. These products are generally used only once and thus generate a great deal of waste.

Changes have been made to the requirements concerning waste processing. The previous generation of the criteria set a requirement that the disposable article must be either compostable or able to be disposed of in an existing recycling system (as with green PE, which can be included in the recycling stream for fossil PE). Over the course of the criteria's period of validity, this requirement was

[134]Ågot Li, Signe Sem, Julie Tesdal Håland, Jens Højslev Petersen and Lisbeth Krüger Jensen: Nordic project food contact materials – Control of declarations of compliance (DoC), TemaNord 2015:559

changed to a more general wording, stating that the disposable article must be recyclable, and that it must be labelled with the relevant recycling symbol. The idea behind this was to open up the Nordic Swan Ecolabel to more products, such as products that were coated with plastic, which had difficulty meeting the original requirement concerning waste processing.

In this new generation, Nordic Ecolabelling wishes to set requirements that ensure a greater degree of material recycling of the products, so that the materials can be used again, thus contributing to the circular economy. The EU's waste management hierarchy in its Waste Framework Directive sets out a list of priorities for legislation and policy that focus on preventing and handling waste. This is often illustrated by a waste pyramid. The most important thing is to prevent waste, followed by reuse, recycling, energy recovery and landfill. The aim is that the waste should be processed as close to the top of the hierarchy as possible. In the EU's action plan "Closing the loop – An EU action plan for the Circular Economy"[135] increased recycling and material recycling is highlighted as a key aspect of the circular economy. Nordic Ecolabelling therefore considers requirements addressing material recycling to be important. It is emphasized that combustion with energy recovery is not considered as material recovery.

O26 Biodegradable/compostable polymers in plastic products

Products that only consist of plastic must not comprise polymers/plastics that cannot undergo material recovery in current recycling plants.

"Polymers/plastics that cannot undergo material recovery" refers to biodegradable/compostable plastics such as PLA.

It is emphasized that combustion with energy recovery is not considered as material recovery.

✉ Documentation showing the product's constituent materials, see O1

Background to the requirement

The requirement is new to this generation of the criteria. Nordic Ecolabelling wishes to promote products made from renewable raw materials. At the same time, the waste phase is considered a key parameter in the disposables product group, since it generates large quantities of waste. Compostable/biodegradable plastics such as PLA cannot be recycled in today's systems, and they can also cause problems for the existing recycling process. Such compostable/biodegradable plastics therefore do not fit in with the EU's goal of increasing recycling and promoting a circular economy. Composting and biogas facilities also do not want these plastics, since they create problems in the plants. Materials other than organic waste are sorted before the composting or biogas process. Nordic Ecolabelling therefore proposes that products that only consists of plastic, such as bags for fruit and vegetables, boxes for salads or plastic cups, cannot be made from compostable/biodegradable plastic. Compostable/biodegradable plastics may, however, be used as a laminate, coating, etc. in contexts such as cardboard products or as the plastic window in a bread bag. In such cases, the plastic will be sorted out and sent for incineration, as is the

[135] Closing the loop – An EU action plan for the Circular Economy, EU Commission 2015 http://eur-ex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-01aa75ed71a1.0001.02/DOC_1&format=PDF

current procedure. Nordic Ecolabelling wishes to point out that this requirement may be changed if, in the future, there is a recycling system for compostable/biodegradable plastics.

O27 Mixing different materials

The mixing of polymer and pulp/paper/board, where the materials cannot be separated from each other in a material recycling process* or easily by the consumer (using just their hands), is not permitted.

** use of laminates and plastic coatings on paper and board-based products is exempted from the requirement, since these can be separated from the paper/board material in the recycling plants.*

✉ Description of the materials in the product and documentation showing fulfilment of the requirement.

Background to the requirement

The requirement is new to this generation of the criteria. One of the clearest guidelines for the material composition of the product is that the product should be produced from materials that can be incorporated into existing recycling systems. Good material composition is not, however, determined simply by which materials make up the product, but also how they relate to each other. There are products that may comprise a mix of materials that cannot be separated from each other. One example of this is the way PLA and cellulose-based fibre may be blended together into a "paste".[136] In such a product, the materials cannot be recovered, and will be sent for incineration instead. It is this kind of product that Nordic Ecolabelling wishes to cover in the requirement. Plastic coatings on board do not cause a problem, and are therefore exempt.

O28 Dyed plastic products

Pure plastic components must not be dyed black.

✉ Documentation (such as a product data sheet) for any plastic components and their colourants, showing fulfilment of the requirement.

Background to the requirement

The requirement is new to this generation of the criteria. Nordic Ecolabelling wishes to encourage a situation in which the products that enter the recycling systems are of as high a quality and purity as possible. The Swedish packaging and paper recycling firm FTI and its plastics recycling operation Plastkretsen have compiled 10 tips[137] on how grocery stores can improve their plastic packaging for simpler recycling. Reduced use of chemicals such as colourants is one of the tips. Colourant-free plastics have the highest recycling value, which makes them easier to reuse. Dark colours, including the use of carbon black, can create problems in modern and automated sorting facilities, since the systems have difficulty analysing darker colours. These products may consequently end up in the waste category, rather than being recycled. Nordic Ecolabelling therefore sets a requirement that pure plastic products must not be dyed black.

O29 Adhesive for labels

Adhesive used to attach a label to the disposable article must be hotmelt adhesive (melts at 60–80°C) or water-soluble and alkaline.

[136] http://signprint.se/2016/10/27/3d-forpackningar-av-biomaterial/ (accessed 21.11.2016)
[137] "Bättre förutsättningar för återvinning av plastförpackningar", FTI and Plastkretsen

✉ Documentation (e.g. product data sheet) for the adhesive, showing that it is water-soluble and alkaline, or that it is a hotmelt adhesive.

Background to the requirement

The requirement is new to this generation of the criteria. Another of the tips from FTI and Plastkretsen is to use as little adhesive as possible, and if labels are going to be applied, hotmelt adhesive or water-soluble adhesive should be used to make the labels more easily removable.

O30 Recyclability and labelling

Recyclability

- The product must be recyclable *

or

- consist of 100% renewable materials such as wood or palm leaves provided that the product is not added/surface treated with chemicals or coated with other materials.

Information about compostable/biodegradable

It is prohibited to label product and packaging with compostable **, biodegradable or other similar statements.

Labelling

For products that the consumer buys with them, e.g. freezer bags, plates, cutlery, cups/glasses the following applies:

- the main material in the product must be specified, e.g. "cardboard cup", "plastic"
- it must be labelled with the following information: sort correctly - do not throw in nature **
- the information may be on the product and/or packaging
- the information must be in the form of text
- the information must be visible and readable to the consumer
- the information can be embossed, stamped or printed on

For products sold to the professional market (B2B) such as restaurants, cafés, hotel/conference facilities, gas stations and the like, e.g. coffee cups, salad bowls, bags and paper for food wrapping the following applies:

- the main material in the product must be specified
- it must be labelled with the following information: do not throw in nature
- the information must be on the product ***
- the information can be in the form of text and/or symbol
- the information must be visible and readable to the consumer
- the information can be embossed, stamped or printed on

* *Incineration with energy recovery is not considered as material recovery.*

** *Exceptions are given for coffee filters.*

**** Exceptions are given for products where it is technically difficult to label the product due to its design and size, e.g. cutlery, straws and stirrers. In such cases, the information must be on the packaging.*

☒ Provide documentation such as images of the stamp, label, artwork or similar, showing fulfilment of the requirement.

Background to the requirement

The requirement was changed from the previous generation to more clearly specify that the product must be labelled with advice to the consumer on how to dispose of the product. The formulation of the requirement has proved to be demanding in the case processing as there are no common rules for labelling products in the Nordic countries, there are different waste sorting solutions and the treatment of the waste is also different. Although the idea was that labelling could be the same although the recommendations and symbols may differ across national boundaries, this was not so easy to handle in practice. In addition, it has been found that requiring that the product should be possible to recycle present challenges for some product types that Nordic Ecolabelling wishes to label, even though there is no recycling fraction for them. Nordic Ecolabelling has therefore reviewed the entire requirement and made changes from what was originally adopted. The intention with the requirement remains that the consumer should be guided to sort.

Recyclability

The product should still be recyclable. However, for some product types such as wood cutlery and products of dried palm leaves, there is no material recovery fraction for such products today. The products in question, however, are simple products that are based on renewable raw materials without significant processing. Nordic Ecolabelling therefore wishes to be able to label these and therefore states in the requirement that the product must either be possoble to recycle or consist of 100% renewable materials, provided that the product is not added/surface treated with chemicals or coated with other materials.

Compostable/biodegradable

A new requirement has been introduced which states that it is prohibited to label product and/or packaging with compostable/biodegradable or similar statements such as biogas production. Labelling with composting was also not seen as fulfilling the previous requirement formulation that the product should be labelled with a relevant sorting fraction, as composting is not a separate waste fraction. However, it was not prohibited to write anything about composting if at the same time the product had information on how to sort the product. But composting is currently not a very relevant treatment path for products in the Nordic countries. There are no major industrial composting plants to any extent, so industrial composting according to standard EN13432 is not applicable. This is the standard that many of the so-called compostable products meet. Labelling such as "compostable" and "biodegradable" can also confuse the consumer, and in the worst case, the product may end up in nature.

Labelling

It is no longer required that the product must be labelled with which waste fraction the product is to be sorted into. If the licensee writes something about how the product is to be sorted/recycled, it is important that the licensee is aware of what applies in the market in which the product is sold. This is not something Nordic Ecolabelling requires and controls. It will be up to the licensee to investigate this with the authorities and organizations in the country in question.

Since it will not be possible to have a common labelling that makes sense throughout the Nordic region, Nordic Ecolabelling nevertheless wants to make the consumer aware that waste sorting is important. A study by IVL in Sweden[138] emphasises the importance of labelling the product as a means of increasing consumer awareness and thus increasing the chance that the product will end up in the correct waste category, where it can be recycled. Under the EU's proposed action plan for a circular economy, every country will have to increase its focus on this in the future, and Nordic Ecolabelling wishes to play its part in this.

It is therefore required that the product/packaging should at least contain information about the main material in the product, e.g. cardboard cup, paper bag or plastic. In addition, there should be information that says that the product should not be thrown in nature. The information provided must be visible and readable to the consumer. By this is meant e.g. that the information must be of a certain size.

It is chosen to keep a distinction between products that the consumer buys with them and products that are sold to the business market such as cafés, restaurants, conference facilities and the like. For products that the consumer buys with them at home, the label can be on the packaging and/or the product. The marking must be in the form of text, as text is easier for the consumer to understand than symbols. For the products sold to the professional market and typically used as take-away, the information must be on the individual product. This is because in such cases the consumer never sees the packaging in which the products are packed. In order for the consumer to be guided, it is therefore important to have the labelling on the product itself. The labelling can be done with text or symbol, e.g. symbol showing "throw in trash", "don't throw in nature":



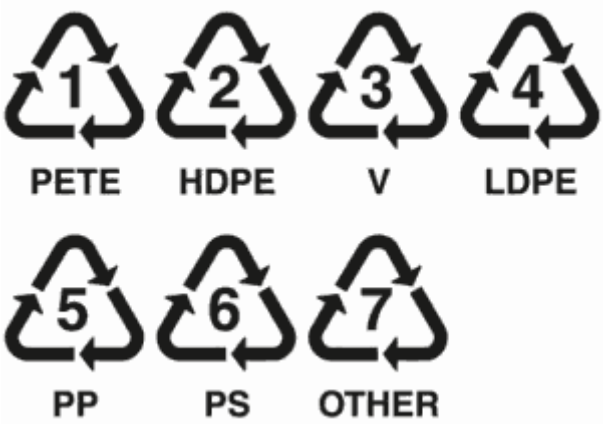
Pictures from GettyImages

These are just examples of symbols - it is up to the licensee to design the labelling according to the requirement formulation.

Symbols that say something about the material, such as the symbols listed below will also be approved. Symbols/pictograms such as those developed by Grønt Punkt, FTI, Rinki for example cardboard and plastic will be approved for those products where such labelling is relevant. The "grønt punkt" label will not be

[138] Anna Fråne, Lisa Schmidt, John Sjöström, Sanita Vukicevic and Martina Tapper, "Kunskapsunderlag för ökad kälsortering av plastförpackningar", report no. B 2247, December 2015

accepted, as this is only a receipt mark for payment contributing to the packaging recycling systems.





The information can be embossed, stamped or printed on.

For some product types, it will be technically difficult to have information on the product itself due to the design and size of the product. This applies for example to cutlery, straws and stirrers. In such cases, the information may be on the packaging.

7.8 Product properties

O31 Information about properties

Product data sheets are to be drawn up for all the relevant languages for the Nordic Swan Ecolabelled disposable article. The product data sheet must, as a minimum, contain information about the properties of the product as stated in Appendix 4 – if they are relevant for the product type.

Documentation must show that the disposable article has the properties which the product is marketed as having and which are stated on the product data sheet. The documentation should, in the first instance, be a standardised test. If no standardised tests are available for the property in question, an argument in favour of the chosen test conditions is to be put forward. The test may either be a laboratory test or relevant internal quality tests. Where standardised test methods exist for the properties, these must be used. No specific quality certification of the test laboratory is required.

✉ Product data sheet for the Nordic Swan Ecolabelled disposable article, plus a report of the test results.

Background to the requirement

The requirement remains unchanged. Generally, it is important that packaging, materials and products are only used for the purposes for which they are designed. Both businesses and consumers should follow the user instructions and so on, in order to ensure that there is no contamination due to incorrect use. It is therefore important that a product data sheet is provided, documenting properties for the Nordic Swan Ecolabelled disposable article. Several food authorities in the Nordic region also recommend drawing up a product data sheet or a form on which to declare that the product is suitable for contact with food and what, if any,

limitations apply[139]. The requirement has been set to ensure that information about the product's properties accompanies all Nordic Swan Ecolabelled disposable articles, irrespective of where the product is manufactured.

O32 Quality requirement for coffee and tea filters

Coffee and tea filters must be tested for seam strength and filtration properties. The seam strength must not be less than 10 N/m or 0.15 N/15 mm, and it must be measured directly after production in line with ISO 3781. Alternatively, a test that an independent and competent body judges to be an equivalent may be approved. The seam strength can be measured by the filter manufacturer.

✉ Test results for seam strength and filtration properties.

Background to the requirement

The requirement remains unchanged. The requirement is originally from previous criteria for the Nordic Swan Ecolabelling of Coffee Filters. The seam strength must be tested in line with ISO 3781 or a corresponding test, if an independent and competent body judges it to be equivalent. No international standards for filtration have been found that are worth referring to. It is nevertheless important that a coffee and tea filter meets normal requirements for filtration. As there is no standardised test, the way the manufacturer documents this is more open. The test may be a laboratory test, the applicant's internal quality test, a consumer test or a comparative test with an equivalent product.

7.9 Quality and regulatory requirements

Quality and regulatory requirements are general requirements that are always included in Nordic Ecolabelling's product criteria. The purpose of these is to ensure that fundamental quality assurance and applicable environmental requirements from the authorities are dealt with appropriately. They also ensure compliance with Nordic Ecolabelling's requirements for the product throughout the period of validity of the licence.

O33 Responsible person and organisation

The company shall appoint a responsible person for ensuring the fulfilment of Nordic Ecolabelling's requirements, as well as a contact person for communications with Nordic Ecolabelling.

✉ Organisational chart showing who is responsible for the above.

O34 Documentation

The licensee must archive the documentation submitted as part of the application (including test reports, documents from subcontractors and so on), or in a similar way maintain information in Nordic Ecolabelling's data system.

🔑 Checked on site as necessary.

O35 Quality of the disposable article

The licensee must guarantee that the quality of the Nordic Swan Ecolabelled disposable article does not deteriorate during the validity period of the licence.

[139] https://www.foedevarestyrelsen.dk/SiteCollectionDocuments/Kemi%20og%20foedevarekvalitet/FKM/Faktaark_køkkengrej.pdf (accessed 05.10.2016)

✉ Procedures for dealing with claims/complaints concerning the quality of the Nordic Swan Ecolabelled disposable article.

🔑 Overview of received complaints checked on site.

O36 Planned changes

Written notice of planned product and market changes that affect Nordic Ecolabelling's requirements must be submitted to Nordic Ecolabelling.

✉ Procedures detailing how planned changes in products and markets are handled.

O37 Unforeseen non-conformities

Unforeseen non-conformities affecting Nordic Ecolabelling's requirements must be reported in writing to Nordic Ecolabelling and logged.

✉ Procedures detailing how unforeseen non-conformities are handled.

O38 Traceability

The licensee must be able to trace the Nordic Swan Ecolabelled disposable article in the production.

✉ Description of/procedures for how the requirement is fulfilled.

O39 Take-back system

The Nordic Ecolabelling's Criteria Group decided on the 9 October 2017 to remove this requirement.

There has previously been a voluntary industry agreement on packaging operations in Norway, which has led Nordic Ecolabelling to have a requirement to ensure that licensees for a number of (45) product groups comply with this regulation. Requirements for return systems have now been incorporated into the Norwegian Waste Regulations, which means that the Nordic Ecolabelling requirement for membership in a return company will be out of date and therefore no longer need to be managed by Nordic Ecolabelling in a separate requirement.

7.10 Areas without requirements

Nanoparticles

As in the previous criteria, there remains no requirement concerning nanomaterials. This issue has been reviewed, and the relevance has been found to be low for disposables for food. Nanomaterials may be used in packaging in contact with food, primarily in the form of antimicrobial substances and to improve barrier properties. Both these uses can extend the shelf life of the food in the pack. Barrier properties are improved by including nanoparticles in the polymer matrix, which ensures that the diffusion of gases is slower. They can also be used to make "intelligent" packaging that can warn the consumer of the presence of microbes, mould or other impurities.[140] However, these properties are not relevant for disposables, which are not expected to preserve food for an extended period, and so the use of nanoparticles in such products is not considered particularly relevant. Nanoparticles are considered to be of low relevance in paper production, but nanocellulose may be used. Nordic Ecolabelling does not consider nanocellulose to

[140] http://www.foodpackagingforum.org/food-packaging-health/nanomaterials (accessed 12.10.2016)

be problematic, as it is a nanostructure and does not contain particles that can be released. Nanoparticles are also regulated in Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food. The Regulation states that nanoparticles may only be present in the plastic if they are listed in Annex 1 of the Regulation. Annex 1 lists three different compounds that may be of nanosize: titanium nitride (TiN), silicon dioxide (SiO2) and carbon black. Of these, TiN is specifically described as a nanoparticle. The form of SiO2 that is permitted is: "primary particles of 1–100 nm which are aggregated to a size of 0.1–1 µm which may form agglomerates within the size distribution of 0.3 µm to the mm size." This means that it is not permitted as a nanoparticle. Carbon black may also comprise agglomerates of nanosize, but it is not considered problematic as long as the particles are bound in a matrix. TiN is not considered particularly relevant to disposables for food. It is a hard ceramic material with uses that include coatings on knives, drill bits and so on. Bentonite (clay), mica (clay), zinc oxide, cellulose and titanium dioxide are compounds that are widely used in nanoform. These are listed in Annex 1, but are not labelled nanomaterials and therefore cannot be used when they are of nanoparticle size. Based on this information, Nordic Ecolabelling has chosen not to set a requirement concerning the use of nanoparticles in today's criteria. It is felt that the use of nanoparticles is well regulated enough already and that the likelihood of materials with nanoparticles being used in disposables for food is small. A general requirement concerning antibacterial additives has been included in O12, and this will cover the addition of nanosilver, for example.

8 Changes compared to previous version

8.1 Requirements that have been deleted

Requirement for the subtitle "Disposable"

The requirement concerning labelling of the disposable article has been reworked and no longer contains the requirement that the Nordic Swan Ecolabel logo must be accompanied by the explanatory subtitle "Disposable".

Biocides – wood raw material

The requirement that timber must not be treated with pesticides classified by the WHO as type 1A or type 1B has been removed, since the certification schemes cover this for the certified part.

8.2 Changes

An overview for changes from generation 3 to 4 is shown in the table below.

Table 4: An overview of changes from generation 3 to 4.

Requirement in generation 3	Requirement in generation 4	Description of change
O1 information on the product	O1 Information about the product	No significant changes
O2 Material composition	O2 Material composition	Recycled plastic is allowed. Metal and recycled paper/cardboard /paperboard are explicitly forbidden.

		Polymers that are bio-based with the mass balance method is allowed for polymers used as a coating on paper/cardboard/paperboard. For polymers in products that consist only of plastic, there must be full traceability on the renewable raw material in the plastic. The limit of at least 90% by weight renewable (or recycled) raw material and up to 10% by weight of fossil material is kept. Inorganic fillers are limited in plastic so that the plastic can be recovered and will not sink in the recycling plants.
O3 PVC and PVDC	O3 PVC and PVDC	No changes
O4 Recycled materials		The specific requirement for recycled material has been removed in generation 4. Requirement to recycled is included in O2.

Requirement in generation 3	Requirement in generation 4	Description of change
O5 Paper, board and pulps	O4 Pulp	The requirements for paper, cardboard and pulp are divided into several requirements in generation 4 (O4, O5 and O6). Reference is still made to the Basic Module and the Chemical Module for Paper Products and that the requirements here must be met with some exceptions. However, own reference values for NSSC pulp in O4 have been introduced, which are pulp not included in the Basic Module, but which are relevant to disposable articles. In addition, separate reference values have been introduced for coffee and tea filter, paperboard for disposables, kraft liner and fluting, which are specific grades relevant to disposables and not included in other paper criteria in Nordic Ecolabelling. There is also a separate requirement for wood raw materials based on Nordic Ecolabelling's new forest requirements. It includes a list of prohibited wood species, requirements to CoC-certification as well as requirements for a minimum of 50% certified wood raw material.
	O5 Paper, paperboard and cardboard	
	O6 Fiber raw material	
O6 Greaseproof paper	O7 Greaseproof paper	The requirement is essentially unchanged, but there is only an exception for K11 Transport in the Basic Module. In generation 3, there was also the possibility of a simplified way of documenting the requirements of the Chemical Module, but these possibilities were removed in generation 4.
O7 Optical brighteners	O8 Optical brighteners	The requirement is not changed
O8 Colouring and toning	See O19	The requirement has been moved to O19 under the chapter of Chemicals in generation 4
O9 Solid wood, plywood and palm oil - origins and traceability	O9 Wood, veneer and bamboo	Requirements O9 and O11 in generation 3 are merged to one requirement, O9 in Generation 4. Requirements for palm oil have been moved to an own requirement, see O10. The requirements for wood raw materials are based on the Nordic Ecolabelling's new forest requirements and prohibit wood species on a specified list, requirement to traceability and minimum 50% certified wood raw materials. The remaining share must be covered by the FSC / PEFC control scheme.
O10 Biocides		The requirement is removed in generation 4
O11 Certified solid wood, plywood and palm oil	See O9	See O9

Requirement in generation 3	Requirement in generation 4	Description of change
O12 Agricultural raw materials - origin and traceability	O10 Agricultural raw materials including palm oil, soy and sugar cane	There is a ban on the raw materials of palm oil and soy oil in biobased plastics which are included in products that only consist of plastic. This is a sharpening in the requirement relative to generation 3, when palm oil was allowed if it was certified. Palm oil and soy oil are allowed as a raw material for plastics used for coating or for plastics that comprise less than 10% by weight in the product. Requirements for certification for sugar cane is new in this generation. Requirements for certification of soy oil and sugar cane replace the previous requirement that traceability should be provided and that the raw material should not come from protected land areas, etc. The requirement is otherwise simplified for other agricultural commodities where it is now required that the name of the commodity and its origin is given.
O13 Genetically modified raw materials	O11 Genetically modified raw materials	The requirement is essentially unchanged, but a 10% by weight threshold is introduced and that the requirement does not apply to biobased plastics used as coating.
O14 Energy consumption in polymer production	O12 Energy - bio-based polymers	The requirement limit is retained, but the calculation method is simplified. It is also possible to meet the requirement if a polymer manufacturer is certified according to ISO 50001. A 10% by weight threshold is introduced and that the requirement does not apply to biobased plastics used as coating.
O15 Classification	O13 Chemical products - classification	The requirement has not been changed for chemical products used in the production (composition) of the disposable article. It is new that the requirement also applies to additives to polymers.
O16 Phtalates	See O15	
	O14 Classification of ingoing substances	The requirement is new in this generation and prohibits ingoing substances in chemical products or additives for plastics that are classified CMR.
	O15 Chemical substances – prohibition list	The requirement is partly new in this generation. It prohibits a number of substances with problematic environmental and health properties, including phthalates which also was prohibited in generation 3.
O17 Aromatic substances, flavorings and perfume	O16 Aromas, flavourings and fragrances	The requirement is not changed
O18 Colourants for printing and dying	O19 Colourants for printing and dyeing	The requirement is not changed
O19 Adhesives	O17 Adhesives	The requirement is not changed

Requirement in generation 3	Requirement in generation 4	Description of change
O20 Coatings and impregnations	O18 Coatings and impregnations	The requirement is essentially unchanged, but updated based on the formulation of a similar requirement in the criteria for grease-proof paper. It is more clearly stated that the requirement also applies to fluoride added to pulp. In addition, it is stated that solvent-based silicone coating / impregnation is not allowed, and that the D4 and D5 limit for silicone treatment should not exceed 800 ppm.
O21 Chemicals in coffee and tea filters	O20 Chemicals in coffee and tea filters	The requirement is not changed
	O21 Additives in plastic	The requirement is new
	O22 Residual monomers in polymers	The requirement is new
	O23 Chemicals - recycled plastics	The requirement is new
	O24 Individual packaging and cores	The requirement is new. Simpler requirements are introduced for single packagings and cores in generation 4 compared to generation 3, as this is not part of the product that comes into direct contact with food/drink.
O22 Materials in contact with food	O25 Materials in contact with food	The requirement has essentially not been changed, but it has been added that the products must be manufactured according to Regulation 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food
O23 Compostability or recycling	O26 Biodegradable/compostable polymers in plastic products	The requirement has been changed, meaning that products that only consist of plastic can not be made of biodegradable / compostable plastics such as PLA.
	O27 Mixing different materials	The requirement is new. Mixing of materials so that the material can not be recycled (separated from each other) is not allowed.
	O28 Dyed plastic products	The requirement is new. Plastic can not be black.
	O29 Adhesive for labels	The requirement is new. If there are labels on products, the glue used should be easy to remove in material recovery processes
O24 Labelling of the disposable article	O30 Product recyclability and labelling	The requirement has changed due to the change from composting to material recovery (see O26), but it will still be required that the product are labelled with a relevant sorting symbol or general recycling symbol / text. It is no longer necessary for the product to be labeled with the additional text "Disposable article" if the Swan label is used on the product.
O25 Information on properties	O31 Information about properties	The requirement is not changed

Requirement in generation 3	Requirement in generation 4	Description of change
O26 Quality requirements for coffee and tea filters	O32 Quality requirement for coffee and tea filters	The requirement is not changed
O27 Packaging	See O3	The requirement is not changed, but included in O3
O28-035 Environmental management and regulatory requirements	O33-O39 Quality and regulatory requirements	The requirements are not changed