About Nordic Swan Ecolabelled

Candles

Generation 3 • 21 May 2026 – 31 May 2031

Nordic Ecolabelling

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Contact information

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

Denmark

Ecolabelling Denmark

www.svanemaerket.dk

Iceland

Ecolabelling Iceland

www.svanurinn.is

Finland

Ecolabelling Finland

https://joutsenmerkki.fi/

Norway

Ecolabelling Norway

www.svanemerket.no

Sweden

Ecolabelling Sweden

www.svanen.se

1 Summary

The Nordic Ecolabelling criteria for candles have been revised to generation 3. Nordic Swan Ecolabelled candles must comply with strict requirements to reduce the environmental and climate impact throughout the whole life cycle. The candles have a reduced environmental and health impact due to the high amount of renewable raw materials in the candles, restrictions on health and environmentally hazardous chemicals and low particle emissions to indoor air. In addition, the candles must comply with requirements regarding fire safety, burning time and safety labelling.

To reduce the climate impact from burning of candles, Nordic Ecolabelling requires that at least 90% of the candle raw materials must be renewable. A high share of renewable sustainable raw materials will reduce the release of CO_2 during burning and thus, contribute to reduce the greenhouse effect compared with burning of fossil raw materials.

Palm- or soy oil is not allowed as these raw materials are associated with significant environmental and social problems in both the cultivation and the production phase.

Genetically modified raw materials are not allowed either. Nordic Ecolabelling emphasizes the precautionary principle and discourages the use of GMOs that are commercially available today due to the risk for negative consequences when genetically modified plants, animals and microorganisms are propagated in nature.

Nordic Swan Ecolabelled candles must also comply with strict requirements for the material used in the wick, the wick holder, the container and the packaging.

New and strict chemical requirements have been introduced in this generation of the criteria. The requirements apply to chemicals such as stearin, paraffin, wax, oil, printing inks, dyes, adhesives, pigments and similar used in the candle production. Perfume is still not allowed.

Chemical requirements have been introduced for surface treatment of containers in generation 3, and a prohibition against the use of halogenated flame retardants in wood fiber container material, has been included in the material requirement. The background is the increased use of renewable non-combustable wood fiber containers which often require the application of flame retardants to enhance fire resistance.[14]

Emissions to indoor air/sooting is an important health impact from burning of candles, and Nordic Ecolabelling has kept the strict requirements for testing of soot index for indoor candles. For outdoor candles, Nordic Ecolabelling has removed the requirement for sooting test as such requirement will influence the type of wick used which again might give shorter burning time and increased wax leftover. Nordic Ecolabelling has added a requirement for maximum wax leftover for outdoor candles in containers. In addition, Nordic Ecolabelling has set a stricter limit in this generation for the total content of organic solvents in candles.

A new requirement regarding fire safety test of candle containers, is included. It will now be required to test the fire safety of candles containers separately and according to a specific test standard in addition to the tests for fire safety of candles and candle burning time.

For an overview of the changes in this revised generation 3, see the table in the next section 1.1.

1.1 Changes compared to previous generation

Table A. Overview of changes to criteria for candles generation 3 compared with previous generation 2.

Requirement generation 3	Require-ment gene-ration 2	Same require-ment	Change	New require-ment	Comments
O1	O1	x			The requirement text has been rephrased and restructured to be clearer. Appendix 1 has been changed from text to table format.
O2	O1	x			The requirement for description of the production has been moved to a separate requirement (O2) in this generation 3.
O3	O2, O3	x			The requirement text has been rephrased and restructured to be clearer. For all renewable raw materials, it is specified that source and supplier must be given. For clarity, O2 and O3 in gen. 2 has been merged into 1 requirement (O3) in this generation 3.
O4	O4	x			The requirement text has been rephrased and restructured to be clearer. Information on supplier has been added in Appendix 2.
O5	O5		x		The text is updated to be accordance with the latest version of the GMO framework requirements.
O6	O6	x			No changes.
O7	O7	x			No changes.
O8	O8		x		The requirement is made stricter by inclusion of: Chemicals used for surface treatment of the disposable containers, must comply with the chemical requirements and a prohibition against the use of halogenated flame retardants in wood fiber container material. The heading has been changed.
O9	O9		x		The requirement is made stricter by inclusion of: Chemicals used for surface treatment of the reuseable containers, must comply with the chemical requirements. The heading has been changed.
O10	O10		x		Minor update of the excluded metals. Aluminium has been removed and arsenic (As) has been added to be in line with the new and updated chemical requirements prohibited list.
O11	O11	x			No changes.
O12	O12		x		The requirement is updated according to the new chemical framework requirements.

O13	O13		x		The requirement is updated according to the new chemical framework requirements.
O14	O14, O16		x		The requirement is updated according to the new chemical framework requirements. The requirement for azo dyes is not a separate requirement as in last generation but is included in the prohibited list.
O15	O15		x		The limit for content of organic solvents is made stricter.
O16	O17	x			No changes.
O17	O18		x		Removal of the requirement for sooting from outdoor candles.
O18	O19		x		A new requirement for fire safety test of candle containers according to the standard ASTM F2417-23 has been included.
O19	O20		x		The requirement is made stricter by introduction of a new requirement for maximum wax leftover for outdoor candles in containers (information requirement for indoor candles in containers). Accepted difference in claims for burning time and actual test results, is included. Test report for burning time is included as documentation. The heading has been changed.
O20	O20	x			Requirement O20 i gen. 2 is splitted in two different requirements in gen. 3.
O21	O23	x			No changes.
O22	O26	x			No changes.

1.2 Justification of the product group definition

The requirement concerning candles comprising one or more wicks, surrounded by a material that is solid/semi-solid at room temperature (20°C – 27°C) remains unchanged in this generation of the criteria. The requirement follows the definition in EN 15493 Candles – Specification for fire safety, EN 15426 Candles – Specification for sooting behaviour and EN 15494 Candles – Product safety labels.

The requirement that the proportion of renewable materials must be a minimum of 90% by weight remains unchanged in this generation 3 of the criteria. A renewable material is a material that is composed of biomass and that can be continually replenished, according to the standard EN 16575:2014. It includes the degradable part of products, waste and residues from agriculture (both plant-based and animal), sustainable forestry and similar industries and the biodegradable fraction of industrial waste and municipal waste. Peat is not included as it cannot be continually replenished. Paraffin is a synthetic petroleum product and is therefore never renewable.

Both biomass (plant-based raw materials) and fossil fuels release carbon dioxide during burning and thus contribute to the greenhouse effect. The benefit of burning biomass is that

it does not contribute additional carbon dioxide to the atmosphere, as is the case with fossil fuels, if the biomass comes from sustainable sources[1].

Biomass removes carbon dioxide from the air as it grows. When wood, for example, is then burned or decays, it releases the carbon dioxide again and it can then be absorbed by other trees. The benefit for the climate comes when the wood is burned instead of being left to decay, since it is possible to use the energy in the wood and avoid taking energy and carbon from the Earth in the form of coal, oil and gas. This then avoids adding atmospheric carbon dioxide that is not already part of the plants' carbon dioxide cycle. The fundamental condition for the carbon neutrality of wood is that the size of the forest is maintained, and more trees are not harvested than can be counterbalanced by ongoing growth. Carbon dioxide from biofuels is also absorbed much more quickly than from fossil sources. Biomass therefore has a relatively short impact on the climate compared with fossil carbon dioxide where the effect lasts for several thousands of years.

It is currently possible to produce certain types of candles from 100% renewable materials with the help of certain production techniques. This applies in particular to white dinner/taper candles with no over-dipping.

When it comes to pillar and ball candles, it is often necessary to add a small amount of paraffin for quality reasons. This is to ensure that the candle does not split/crack during hardening. Paraffin is also often used to ensure that stearin candles release from their molds, since stearin has a tendency to stick.

Paraffin is also used in the dyes generally used for the over-dipping of candles. This paraffin typically has a higher melting point (70 – 75°C) than stearin (60 – 62°C) and thus makes sure that the candle will not bend in sunlight for example. The paraffin also gives a smooth, uniform surface and smooth, round edges. The over-dipping is around 1 mm thick.

Paraffin also tends to be used in the dyes used for colouring a whole candle.

It will therefore still be possible to use a small amount of paraffin in a Nordic Swan Ecolabelled candle to allow for ecolabelling of several types of candles and candles in different colours.

The product definition includes oil candles/oil lamps. This is candles comprising one or more wicks, surrounded by a material that is liquid at room temperature (20°C – 27°C). The liquid material (the oil) must be made from 100% renewable raw materials by weight. The increasingly dominant lamp oil that is available on today's market is based on petroleum (n-paraffin), i.e. it has been developed from fossil fuels. This type of oil is classified as H304 ("May be fatal if swallowed and enters airways") and is therefore subject to separate rules for the labelling of the oil. The requirement that the liquid material must have a flash point of at least 65°C ensures that liquid materials classified as flammable are not used in a Nordic Swan Ecolabelled oil candle. Data from producers of oil candles based on 100% plant-based oil indicates good burning properties compared with traditional fossil-based lamp oil and candles made from solid wax[2].

[1] "Nordic Swan Ecolabelled Candles", RISE, E.E.Lindvall and K.Lorentzon, 20.11.2023

[2] "Test af 3 forskjellige lampeolier i 2 forskjellige typer lamper", Anne Gry Hemmersam and Susanne Borg Calundann, Teknologisk Institut, 3.11.2009

The oil candle must be in a single-use container such that it cannot be refilled. This ensures steerability of the product, i.e. that it is not refilled with a type of lamp oil other than the one used in the soot test. The wick must also not be adjustable, which ensures that the oil candle burns in the same way as at the time of testing.

Powder candles are not possible to ecolabel. The main reason for not allowing ecolabelling of powder candles is the lack of steerability of the sooting from such “selfmade” candles. It is important with steerability of the product/candle to ensure that the candle burns in the same way as at the time of soot testing. Ensuring steerability of the sooting means that the candle is not refilled by the consumer with a type of powder other than the one used in the soot test, and that the wick is not adjusted by the consumer.

2 Requirements and justification of requirements

This chapter explains the background for all requirements.

2.1 Description of the product and the production

The candle and the container, the manufacturing process and the suppliers/production chain must be described to know which requirements apply for the product.

Background to requirement O1 and O2

The requirements for the description of the product and the production are unchanged in this generation. Some text is clarified, among others it is clearly stated that for renewable raw materials, both source and supplier must be given.

The intention of these requirements is to provide a sufficient picture of the life cycle of the product, product packaging and the production: what materials and chemicals are used, what production processes are used, what surface treatment or additives are used and so on. The information about the product and the production will give an insight in order to ensure correct processing of the application.

The requirement for description of the production has been established as a separate requirement in this generation of the criteria.

2.2 Material requirements

The material requirements are divided into the following sections:

- Candle raw materials
- Wick and wick holder materials
- Container materials
- Packaging materials

2.2.1 Candle raw materials

Background to requirement O3

The requirement for the minimum share of renewable materials in the candle/oil candle at respectively 90% and 100% by weight, remains unchanged in this generation 3 of the criteria. The requirement for no use of renewable raw materials from palm- and soy oil, remains as in generation 2, but is not kept as a separate requirement, but is merged into this requirement.

Background for the requirement for high proportion of renewable materials is previously described in the background for the product group definition, refer 3.1.

It is currently possible to produce some types of candles from 100% renewable materials with the help of certain production techniques. This applies in particular to white taper candles. When it comes to pillar and ball candles, it is often necessary to add a small amount of paraffin for quality reasons. This is to ensure that the candle does not split/crack during setting. Paraffin is also often used to ensure that stearin candles release from their mould, since stearin has a tendency to stick.

Paraffin is also used in the dyes generally employed in the over-dipping of candles. This paraffin typically has a higher melting point (70 – 75°C) than stearin (60 – 62°C) and thus makes sure that the candle will not bend in sunlight, for example. The paraffin also gives a smooth, uniform surface and smooth, round edges. The over-dipping is around 1 mm. Paraffin also tends to be used in the dyes used for colouring a whole candle. Nordic Ecolabelling would like to continue to allow to ecolabel several types of candles and in different colours, which is why it will remain possible to use a small amount of paraffin.

If raw materials of animal origin are used, name of production site(s) and approval number (EU Code) must be disclosed. Raw materials of animal origin are subjected to Regulation (EC) No 1069/2009 concerning health rules concerning animal by-products, not intended for human consumption. The requirement ensures traceability to where waste and residue arise.

Palm oil is used as raw material in the production of stearin or oil to oil candles while soy is used in soya candles. Both raw materials are, however, associated with significant environmental and social problems in both the cultivation and the production phase and are therefore not allowed as raw materials in ecolabelled candles.

Background to requirement O4

This requirement is unchanged from generation 2.

For Nordic Swan Ecolabelled candles/oil candles made from plant-based renewable raw materials, it is important to set requirements concerning the areas from which the raw materials are sourced since use of land is a relevant environmental aspect for this product group. The aim is to ensure that areas of high biological or social value are not used for cultivation.

To know where the raw material comes from and who produced it, it is important to check the traceability back to the origin of the raw material. There must be a written procedure in place that describes the system for traceability and for the purchase of raw materials that

ensures that all raw materials come from legal sources. The plant-based renewable raw materials must not be sourced from the following:

- protected areas or areas under preparation as protected areas
- areas where ownership or usage rights are unclear
- illegally harvested crops

If the raw material can be defined as a waste or residue, there must be traceability to the process from which the waste or residue derived by means of invoices.

Plant-based raw materials for candles/oil candles can be for example coconut-, sunflower- or rapeseed (canola) oil.

Background to requirement O5

The requirement has been updated according to Nordic Ecolabelling's general requirement for GMO. Genetically modified organisms (GMOs) are controversial. Topics that are discussed include food security, land use, lack of scientific knowledge about long term effects and effects under local agricultural/forest conditions and risk of adverse effects on health and the environment.

Four GM crops dominate: soybean, cotton, maize, and rapeseed. The dominating traits are resistance to one or several herbicides and production of one or several insecticidal proteins or a combination of the two. Research has not clearly shown that GMOs contribute to development towards sustainable agriculture with less use of pesticides. Problems include herbicide resistant weeds due to GM agricultural practises, resistance among target insect pests and gene flow from GM plants to agricultural or wild relatives. Research shows conflicting results on performance and environmental effects of GMOs, especially on yield and non-target organisms. There are knowledge gaps on effects on microorganisms in the soil and aquatic organisms, GMOs with combined traits, socioeconomic consequences, and risks in an ecosystem perspective.

Nordic Ecolabelling emphasizes the precautionary principle and discourage the use of GMOs that are commercially available today. Nordic Ecolabelling is concerned about the consequences when genetically modified plants, animals and microorganisms are propagated in nature. However, Nordic Ecolabelling is not against genetic engineering or GMOs as such, and we believe that GMOs should be assessed on a case-by-case basis. We promote a holistic approach to GMOs and assess sustainability, ethics, and benefit to society as well as possible risks to health and the environment. We believe that GMOs made with new gene editing techniques should be assessed according to the same guidelines as other GMOs, which is in line with EU regulations. For more information on Nordic Ecolabelling’s approach on GMO: https://www.nordic-swan-ecolabel.org/nordic-ecolabelling/environmental-aspects/

Background to requirement O6

The requirement has not been changed for this generation 3 of the criteria.

The aim of the requirement for hydrogenated paraffin is to ensure that only high quality paraffin/fully purified paraffin is used in the candle. The quality of the paraffin has a major effect on the burning process and emissions from the candle.

Crude oil contains many different chemical compounds, made up primarily of carbon and hydrogen. In addition, crude oil always contains compounds of sulphur, nitrogen and trace elements. There are, in fact, several thousand different compounds. Most important of these in the production of crude oil products is the saturated hydrocarbons, a group known as alkanes. There are also olefins, naphthenes and aromatics which are defined by their different carbon bonds.

The German quality standard for candles, Quality Assurance RAL-GZ 041, is a voluntary standard used by a large number of candle manufacturers in Europe[3]. The standard sets tough requirements concerning the quality of the paraffin, which matches the hydrogenated grade.

The candle manufacturer must document fulfilment of the requirement through invoices or similar documentation.

2.2.2 Wick and wick holder materials

Background to requirement O7

The wick: The requirement has not been changed in this generation 3.

Wicks are generally made from cotton and can have different thicknesses and shapes. Some wicks contain paper fibres to stiffen the wick. It used to be normal to stiffen the wick with a metal, such as lead, tin and zinc, but this is no longer standard practice. It may, however, still happen and there is therefore a ban on the use of metal in wicks. All heavy metals are more or less toxic to people and the environment, and many are classified as potentially CMR-substances.

The wick controls the melting, evaporation and burning of the candle material and transports the liquid wax from the melting area to the burning zone. To keep the wicks stiff and upright, they can be impregnated with various waxes, or they can be interwoven with paper fibres. The stiffness of the wick is an important factor in avoiding bends in the wick, which will increase the level of sooting.

For stearin candles, it is necessary to impregnate the cotton wick, otherwise it will be “eaten away” by the acid in the stearin. This impregnation usually takes the form of inorganic potassium or sodium salts.

The production of a wick traditionally involves three steps:

1. Washing the cotton to remove any impurities.
2. Bleaching the cotton wick. This has no effect on the burning properties of the wick and is done entirely for cosmetic reasons to keep the wick white.
3. Impregnating the wick to determine its strength, acid resistance and burning properties.

Nordic Ecolabelling considers bleaching the cotton wick to be an unnecessary process in environmental terms, if its purpose is purely cosmetic. The chemicals used tend to be oxidisers and reducing agents. Feedback from manufacturers and resellers of candles is, however, that consumers only want candles with white wicks. This is due to the fact that

[3] http://guetezeichen-kerzen.com/en/home/

candles are also an interior design item used for decoration. Bleaching cotton wicks is therefore permitted.

Wick holder: The requirement has not been changed in this generation 3.

Wick holders are used primarily in tea lights to ensure that the wick does not collapse when the wax becomes liquid. The hot liquid wax requires that the wick holder shall withstand high temperatures and is the reason that wick holders are made of metal. The requirement prohibits to add in the wick holder heavy metals that are particularly harmful to health and the environment.

The manufacture of **aluminium** is associated with high energy consumption and emissions of environmentally harmful substances, which is why its' use is not permitted in containers for Nordic Swan Ecolabelled candles (e.g. tea lights). It is therefore relevant to ensure that any metal used in a candle's wick holder is free from aluminium (Al) also in addition to the following metals: lead (Pb), mercury (Hg), chromium VI (Cr), cadmium (Cd), cobalt (Co), antimony (Sb), zinc (Zn,), copper (Cu) and nickel (Ni). These metals are more or less toxic to people and the environment, and many are classified as potentially CMR-substances. This "free from" requirement for certain metals does not apply to wick holders of steel.

Wick holders of **steel**: The carbon content of steel is between 0.002% and 2.1% by weight for plain iron–carbon alloys. These values vary depending on alloying elements such as manganese, chromium, nickel, iron, tungsten, carbon and so on. Other materials are often added to the iron/carbon mixture to produce steel with desired properties. Stainless steel contains at least 11% chromium, often in combination with nickel, in order to resist corrosion.

2.2.3 Container materials

Material requirements for containers sold with candles/oil candles are given in this chapter. For disposable containers (containers intended only to be used once), requirement O8 apply. For reusable containers (containers intended to be used several times), requirement O9 apply. Containers (both disposable and reuseable) containing plastic must additionally also apply to requirement O10.

Background to requirement O8

The requirement for materials in disposable containers is kept unchanged except for the inclusion of a new requirement for chemicals used for surface treatment of containers and a new requirement for prohibition of the use of halogenated flame retardant in wood fiber containers.

Surface treatment of disposable containers

All chemicals used for surface treatment of disposable containers must now comply with the chemical requirements. The increased use of renewable non-combustable wood fiber containers and thereby use of flame retardants on these containers[14, 4], is the background for the decision of letting the chemical requirements apply to surface treatment chemicals.

[4] "Consultation report from consultation for 088 Candles generation 3", Nordic Ecolabelling, Mars 2026

As flame retardants might be used on all types of container materials, the chemical requirements apply to all types of container materials.

Glass and ceramic:

Nordic Ecolabelling does not wish to promote Nordic Swan Ecolabelled candles in disposable/single-use containers made from glass and ceramic, known as filled glass or ceramic candles. Production of glass and ceramic is highly energy-intensive, and the product is relatively heavy in relation to the actual candle, and even with a long burning time (40 hours), the environmental impact remains considerable if the container is disposed after use.

Metal:

Nordic Ecolabelling does not wish to allow disposable containers in metal, as there are environmentally preferable alternatives such as plastics with a high share of recycled plastic and renewable wood fiber containers which is a more recent innovation aimed at reducing environmental impact compared to aluminium and plastic.

Aluminium is the most widely used material for containers in tea lights. Tea light aluminium containers should be recycled as recycling the aluminium considerably reduces the environmental impact in terms of the container life cycle[5]. Due to the small steel wick holder, recycling of aluminium becomes more difficult in practice. If the steel wick holder is not separated from the aluminium container, the aluminium will “follow” the magnetic steel and thus be destroyed as aluminium.

In practice, the majority of tea light aluminium containers are incinerated as domestic waste at end-of-life, and thereby there is a substantial environmental impact from aluminium tea light containers, compared with the alternatives. This is the reason for maintaining the prohibition on aluminium containers for candles also in this criteria generation.

The lid on graveyard candles and oil candles is exempted from the general prohibition on metal. Graveyard candles are designed to be used outside, why it is in most cases designed in a plastic container with a metal lid to withstand the elements. The lid must be able to withstand high temperatures and therefore often made of metal (often steel coated with another metal coating). The oil candle must be in a disposable container in order to obtain the Nordic Swan Ecolabel. In order to ensure that the container is leak proof, a special metal lid is used, which simultaneously also serves as wick holder that must withstand high temperatures. For the background on the heavy metal requirement, refer the background for wick holders.

Plastic:

It is considered to be an environmental aspect to use a greater proportion of renewable or recycled plastic in candle containers. The requirement limit of 75% by weight post-consumer recycled raw material was set based on dialogue with the candle industry.

[5] "LCA Screening of aluminium and plastic cups", Nordic Ecolabelling, Marie Kampmann Eriksen, 2024

Silicone is technically a polymer that can be classified as a plastic, but its chemical structure and properties differ significantly from common plastics. Silicone is therefore not subject to the requirement for plastic requiring at least 75% of the plastic materials used to be made of either biobased or post-consumer recycled raw materials as silicone is not currently re-used in the same manner as other plastic materials. Silicone is considered as hazardous waste, and silicone consists of inorganic polymers of polysiloxanes in which the chain is built up of silicon and oxygen atoms.

PVC is not known to be used in candle containers, but chlorinated polymers such as PVC (polyvinyl chloride) and PVDC (polyvinyldiklorid) is still explicitly prohibited. There are several environmental challenges regarding both the production of PVC and the handling of waste PVC.

Wood fiber:

The increased use of renewable non-combustable wood fiber containers and thereby use of flame retardants in the wood fiber container material[14,4], is the background for the decision of including a prohibition for the use of halogenated flame retardant in the wood based container material.

Halogenated flame retardants are suspected of contributing to a number of unwanted health effects. Several of the substances are suspected of causing birth defects, cancer, and endocrine disrupting effects. Many of them are on the EU candidate list under REACH.

Many brominated flame retardants are persistent and bio accumulative chemicals that can now be found dispersed in nature. The focus on phasing out brominated flame retardants has led to the use of alternatives such as phosphorus and nitrogen-based flame retardants.

Background to requirement O9

The requirement for materials in reusable containers is kept unchanged except for the inclusion of a new requirement for chemicals used for surface treatment of containers. For further background for this, please refer the background for O8.

There is an exception for banning the use of aluminium in containers that are designed to be used multiple times. It is allowed to use aluminium in the container, if the amount is less than 15% of the container's total weight. It has been found that it can be difficult to clean containers (e.g., glass cups) of stearin when used several times. Refills are available on the market, wherein the container consists of parts which are easy to dismantle in order to remedy the cleaning and waste in the end. These refill systems consist of a base plate made of aluminium and the sides of either glass or plastic. Refill systems using plastic cups cannot comply with the limit at 15% of the container's total weight. Refill systems which use glass cups will be able to meet the requirement limit.

Background to requirement O10

The requirement is unchanged except for a minor update of the excluded metals. Aluminium has been removed and arsenic (As) has been added to be in line with the new and updated chemical requirements, please refer the background for O14.

Container made from polycarbonate: Polycarbonate is produced from bisphenol A (BPA). Nordic Ecolabelling is aware that there may be small residues of BPA present in the plastic after the polymerisation (ppm) levels. We accept this risk because the alternative is actively added flame-retardants. People are only marginally exposed to this kind of product.

It is also possible to use other types of plastic than polycarbonate in candle containers, but this would then require that the plastic is added flame-retardants. Flame-retardants function is mainly to protect the product in the use phase. Therefore, they are deliberately constructed so that they do not break easily, making the flame-retardants persistent if spread in the nature. The greatest attention is directed toward the brominated flame-retardants, partly because they are detected in breast milk and in blood. Because of this, halogenated flame-retardants must not actively be added in the plastic/plastic parts.

The requirement also applies for recycled plastic. According to manufacturers of candle containers made from recycled polycarbonate, it is possible to produce containers from 100% recycled polycarbonate. In order to ensure a sufficiently strong and good quality of the plastic, they often use a lower proportion (50-60%) recycled polycarbonate.

It is not necessary to add additives to the polycarbonate granules in order to produce candle containers. Because of this, a number of substances must not actively be added in the plastic/plastic parts (virgin, biobased and recycled plastic). The requirement includes constituents to master batches or compounds. The requirement does not concern the actual polymer production.

Recycled plastic granules must not contain halogenated flame-retardants. The manufacturer or supplier of the recycled plastic granules must therefore test/declare that recycled plastic granules do not contain halogenated flame-retardants in concentrations above 100 ppm.

Nordic Ecolabelling wishes to promote products that can be used multiple times rather than just once. Therefore, the requirement regarding the share of bioplastic or recycled plastic in container is differentiated between containers designed to be used only ones and multiple times.

Halogenated organic compounds include many substances that are harmful to the environment and health, highly toxic for aquatic organisms, carcinogenic or harmful to health in other ways. The halogenated organic compounds are degraded slowly in the environment, which also increases the risk of harmful effects from the substances. Halogenated organic compounds may, for example, appear as flame retardants in plastic.

2.2.4 Packaging materials

Background to requirement O11

The requirement is unchanged from previous generation. PVC is not allowed to be used in product or transport packaging since PVC might lead to adverse environmental impacts in waste handling systems.

2.3 Chemical requirements

The chemical requirements apply to all chemical products and their ingoing substances used:

- In the manufacture of candles/oil candles and containers.
- At the candle/oil candle production site or by suppliers.

The requirements apply to:

- Chemical products such as stearin, paraffin, wax, oil, fat, printing inks, dyes, lacquers, adhesives, pigments, hardeners and similar used in the candle production.
- Chemical products used for surface treatment of containers.

The requirements do not cover:

- Wicks, wick sustainers or candle/oil candle containers except from the surface treatment of containers.
- Auxiliary chemicals used during manufacture, such as lubricants, cleaning chemicals and so on.
- Refining processes, i.e., refining of plant-based or fossil oil.
- Packaging such as printing inks and adhesives.
- Printing inks used to print on candle surface that remain in the chemical product in concentrations less than 1000 ppm (0.100 w%).

Impurities are not regarded as ingoing substances and are exempt from the requirements. Ingoing substances and impurities are defined in the definitions section.

Background to requirement O12

The requirement has been tightened compared to the previous generation and is based on the chemical framework requirements.

Nordic Ecolabelling aims to minimize the health and environmental impact of chemical products. Therefore, chemical products used in the manufacture of candles/oil candles with the following classifications cannot be used in the Nordic Swan Ecolabelled product: Hazardous to the aquatic environment, hazardous to the ozone layer, very toxic, toxic, causes damage to organs, sensitising, carcinogenic, mutagenic, toxic for reproduction, endocrine disruptive, and persistent, bioaccumulative/mobile and toxic.

The updated CLP classifications now include endocrine disruptors, PBT/vPvB and PMT/vPvM substances, covering environmental toxicity, persistence, mobility and bioaccumulation. Including PMT and vPvM substances is essential due to their persistence, mobility and potential impact on water quality. The new rules entered into force 20 April 2023. From this date, the Member States may propose harmonized classification and labelling (CLH) with the new hazard classes and manufacturers, importers, downstream users and distributors may also self-classify their substances and mixtures accordingly.

There are transitional periods following the Delegated Regulation's into force. During these periods classification under the new hazard classes is voluntary. This means that manufacturers, importers, downstream users and distributors are not yet required to classify

their substances or mixtures according to the new hazard classes. During these periods, the new hazard classes can be applied on a voluntary basis. However, if an ingoing substance is classified according to these new hazard classes and used in a product, it will be excluded under these criteria.

This is a standard requirement, based on the precautionary principle and is only partially tailored to the specific product group. The requirement is intended to exclude problematic substances that are not necessarily found in products on the market today.

Nordic Ecolabelling has removed the exemption that paraffin may be classified as H412 and/or H350. Input from industry representatives indicates that the exemption is redundant.

Background to requirement O13

The requirement has been tightened compared to the previous generation and is based on the chemical framework requirements.

Nordic Ecolabelling strives to ensure that the health and environmental impact of the products are as low as possible. The requirements therefore make it clear that ingoing substances with the following classifications cannot be used in the chemical product: Hazardous to the ozone layer, causes damage to organs, sensitising, carcinogenic, mutagenic, toxic for reproduction, endocrine disruptors, and persistent, bioaccumulative/mobile and toxic.

The new CLP classifications for endocrine disruptors, PBT/vPvB and PMT/vPvM (environmental toxicity, persistency, mobility and bioaccumulation) are included. The inclusion of PMT and vPvM substances is crucial due to their persistence, mobility and potential impact on water quality. The new rules are in force as of 20 April 2023. From this day on, the Member States can make proposals for harmonized classification and labelling (CLH) with the new hazard classes and manufacturers, importers, downstream users and distributors can self-classify their substances and mixtures accordingly.

There are transitional periods from the entry into force of the Delegated Regulation, during which manufacturers, importers, downstream users and distributors are not yet required to classify their substances or mixtures according to the new hazard classes. During these periods, the new hazard classes can be applied on a voluntary basis. If applied to an ingoing substance it is excluded in these criteria.

This is a standard requirement, that is set by the precautionary principle and is only partially adapted to the product group. The requirement is intended to exclude problematic substances that are not necessarily found in products on the market today.

Background to requirement O14

The requirement has been tightened compared to the previous generation and is based on the chemical framework requirements.

Certain problematic substances and substance groups are difficult to exclude through general chemical requirements. To address this, Nordic Ecolabelling has compiled a list of substances that must not be present as ingoing substances in the ecolabelled product/chemical product.

The purpose of this list is to prohibit substances that may not be excluded by other requirements but are associated with environmental and health hazards. Some substances are included for clarity, even if they are already prohibited under other requirements.

This is a standard requirement, based on the precautionary principle and is only partially tailored to the specific product group. The requirement is intended to exclude problematic substances that are not necessarily found in products on the market today.

Alkylphenols (AP) (e.g. butylated hydroxy anisole (BHA, CAS No. 25013-16-5), butylated hydroxytoluene (BHT, CAS No. 128-37-0), alkylphenol ethoxylates (APEO) and other alkylphenol derivates (APD)

The non-ionic APEO group of surfactants are produced in large volumes and their uses lead to widespread release to the aquatic environment. APEOs are highly toxic to aquatic organisms and degrade to more environmentally persistent compounds (APDs). Ethoxylated nonylphenol and several other alkylphenols are included in the Candidate List due to endocrine disrupting properties.

Nordic Ecolabelling has been in dialogue with wax producers[13] and based on this input, BHT has been exempted in paraffin wax at levels below 20 ppm per paraffin wax. BHT is widely used in the wax industry as an antioxidant and stabiliser to prevent oxidation of waxes, particularly paraffin waxes in their molten state. Oxidation of paraffin waxes has direct effect on the odour and colour of waxes and its products. Oxidation directly affects the odour and colour of the wax and its final products, potentially reducing candle quality and resulting in products that do not meet consumer expectations. Wax manufacturing process takes place in closed systems. During candle production, appropriate industrial hygiene measures like closed systems, fume extraction, ventilation etc. are in place to ensure safe handling and minimal exposure.

Aromatic solvents and carriers, incl. chlorotoluenes, chlorophenols and chlorobenzenes

Aromatic solvents, including substances like benzene, toluene, xylenes, chlorobenzenes, chlorotoluenes, and chlorophenols, are used for their strong solvency but pose serious health and environmental risks. They can cause neurological, reproductive, and organ toxicity, and some are carcinogenic. Many are persistent in the environment, toxic to aquatic life, and contribute to air pollution.

Azo dyes that may release aromatic amines with carcinogenic properties

Aromatic amines released by azo dyes may be carcinogenic, allergenic, irritating, and toxic.

Bisphenols and bisphenol derivatives

Several bisphenols with the general bisphenol structure and 'bisphenol derivatives' which have constituents with structural properties common to bisphenols are now prohibited. Based on the potential for widespread use and available information on potential endocrine

disruptors, reproductive toxicity and PBT/vPvB properties, 34 substances were identified in need for further regulatory risk management in EU[6].

Halogenated flame retardants

Halogenated flame retardants are suspected of contributing to a number of unwanted health effects. Several of the substances are suspected of causing birth defects, cancer, and endocrine disrupting effects. Many of them are on the EU candidate list under REACH.

Many brominated flame retardants are persistent and bio accumulative chemicals that can now be found dispersed in nature. The focus on phasing out brominated flame retardants has led to the use of alternatives such as phosphorus and nitrogen-based flame retardants.

Halogenated organic compound

Halogenated organic compounds, including short-chain chlorinated paraffins (C10-C13), medium-chain chlorinated paraffins (C14-C17), chlorophenols and dimethyl fumarate derivates, is a large group of substances that are harmful to both the environment and human health. They are often carcinogenic, highly toxic to aquatic organisms and very persistent to degradation. It is therefore a requirement that halogenated organic compounds must not appear in candles. However, dialogue with both candle and pigment manufacturers uncovered that an exemption is needed for chlorinated pigments that meet the EU's requirement concerning colourants in food packaging under Resolution AP (89) point 2.5. The exemption is needed to enable certification of pigmented candles. Nordic Swan Ecolabelled candles still must comply with strict requirements to reduce hazardous emissions to indoor air, strict requirements for sooting, content of TVOC and chemicals in general.

Heavy metals and metalloids: Mercury (Hg), chromium VI (Cr), cobalt (Co), zinc (Zn), copper (Cu), nickel (Ni), cadmium (Cd), lead (Pb), arsenic (As), antimony (Sb)

Heavy metals refer to heavy and particularly environmentally harmful metals as specified in the requirement. They are prohibited/restricted because they are toxic to people and other organisms, both on land and in the aquatic environment. In forest land, metals can, for example, inhibit microorganisms in such a manner that degradation of dead organic matter, and thereby release of nutrients, is slowed down. A slower cycling of nutrients will in turn have consequences for the plants in the forest. In agricultural land as well, metals can disturb the soil-living organisms or have a toxic effect on the plants. A big problem with metals in agricultural land is that they can be taken up to varying degrees by the crop and thereby give rise to exposure of man[7]. Mercury, cadmium, arsenic, and lead are toxic to the human nervous system and kidneys, amongst other things, and the metals can accumulate

[6] Assessment of regulatory needs: Bisphenols. ECHA – 16 December 2021: Section 2.1: Bisphenols for which further EU RRM is proposed https://echa.europa.eu/documents/10162/5e60f2fe-12d0-7f6b-5868-f199cfd7f984
[7] Regeringskansliet: Varor utan faror - förslag till genomförande av nya riktlinjer inom kemikaliepolitiken. Betänkande från Kemikalieutredningen - Regeringen.se https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2000/06/sou-200053/ (visited 2026-18-03)

in living organisms[8]. Chromium VI is classified as: very toxic, CMR and harmful to the environment.

PBT and vPvB as defined in REACH Annex XIII, including those under ECHA PBT assessment

PBT and vPvB are abbreviations for substances that are persistent, bioaccumulative and toxic, and very persistent and very bioaccumulative, respectively, in accordance with REACH Annex XIII. This means that they are not biodegradable and that they accumulate in living organisms. Based on these adverse characteristics they pose a threat to the environment and human health. They are prohibited in all Nordic Swan Ecolabel products.

Per- and polyfluoroalkyl substances (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are used in many types of products due to their water and dirt repellent properties. These compounds constitute a group of substances that have highly problematic intrinsic hazardous properties. They are extremely persistent and accumulate in the body. They are spread all over the globe, from the large oceans to the Arctic, and are found in e.g. wild birds and fish and their eggs. Also, shorter chain compounds (2–6 carbon atoms) have been discovered in nature. The substances in this group are suspected to be endocrine disruptors, carcinogenic and to have a negative impact on the human immune system.

Phthalates (Esters of 1,2-benzenedicarboxylic acid (orthophthalic acid, CAS No. 88-99-3))

A number of phthalates are identified as endocrine disruptors and some of them are classified as reprotoxic. For these reasons several phthalates are included in the Candidate list.

Based on their hazardous properties, phthalates pose a threat to the environment and human health and there is a ban on this group of substances.

Potential or identified endocrine disruptors, listed in any of the following "Endocrine Disruptor Lists" List I; II; and III

Endocrine disruptors (EDs) are chemicals that alter the functioning of the endocrine (hormone) system and consequently cause adverse health effects. The term potential EDs is used for chemicals with properties that make them suspected to be EDs. The hormone system regulates many vital processes in living organisms and when normal signalling is disturbed, adverse effects may result. EDs raise high concern for their risk of causing serious negative impact on the environment as well as on human health specifically. Special concern is raised for effects on reproduction and development and about possible links to increases in public health diseases. While effects in wildlife populations have been confirmed, evidence is pointing to effects also in humans.

[8] Toxicity, mechanism and health effects of some heavy metals: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4427717/ (visited 2022-06-01)

Substances on the REACH Candidate list of SVHC substances

The Candidate List identifies substances of very high concern which fulfil the criteria in article 57 of the REACH Regulation (EC 1907/2006). The list includes carcinogenic; mutagenic; and reprotoxic substances (CMR, categories 1A and 1B in accordance with the CLP Regulation); and PBT (persistent, bioaccumulative and toxic) and vPvB (very persistent and very bioaccumulative) substances (as defined in REACH Annex XIII). In addition, two more substance groups are included if they are of equivalent level of concern (ELoC) as the ones previously mentioned. These are endocrine disruptors and substances which are environmentally hazardous without fulfilling the requirements for PBT or vPvB. Based on these adverse characteristics, Nordic Ecolabelling prohibits substances on the Candidate List. This means that we act ahead of the legislation and ban the substances before they are subject to authorisation and restriction in accordance with REACH.

Background to requirement O15

The requirement for permitted level of organic solvents in candles has been tightened compared to the previous generation of the criteria based on input from candle producers.[14] The limit for the content of organic solvents has been reduced from 1% to 0,1% by weight of the candle, and for the alternative requirement, test results which show the Total Volatile Organic Compounds (TVOC) in the candle, the limit is reduced from 1200 to 200 µg/m^3 of air.

Several organic solvents are harmful to health. They can be absorbed through lungs and skin, causing acute or chronic organ damage. Acute effects include headaches, tiredness, etc. Organic solvents may also irritate eyes, nose, throat, dry out skin and cause eczema. Long-term exposure can damage the brain and nervous system, and some solvents might cause cancer or damage to reproduction. Additionally, certain solvents contribute to the greenhouse effect, ozone depletion or photochemical smog. Organic solvents are generally hazardous due to CMR risks and potential tissue damage, including brain tissue.

WHO proposes a maximum TVOC in the range of 200–1000 µg/m^3 for living spaces. Studies[9] show that TVOC emissions can deteriorate indoor air quality and affect human health. Nordic Ecolabelling has therefore set the emission limit at the low end of the proposed range[10].

Background to requirement O16

The requirement was also included in the previous generation of the criteria. Nordic Swan Ecolabelled candles/oil candles must not contain perfumes, aromas or other aroma compounds. Aromas, flavourings, perfume, essential oils, plant oils, and plant extracts often contain several allergens or carcinogenic substances. Many candles contain aroma compounds to make them attractive to consumers, and in some cases to conceal odours that occur when burning the other substances in the candle. Aroma compounds may also be

[9] Volatile Organic Compounds' Impact on Indoor Air Quality: https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality (visited 2025-11-11)

[10] "Kortlægning og risikovurdering af partikel- og tungmetalemission fra levende lys", Miljøstyrelsen, Peter Bøgh Pedersen et.al, April 2027

used in candles/oil candles to irritate insects and keep them away from the area around the candle.

To avoid adverse health effects from this type of substance the use of aromas, flavourings, perfume, and aroma compounds is prohibited. As aromas, perfumes, and other aroma compounds are not necessary and entail unnecessary use of chemicals, a prohibition has been included in the criteria.

2.4 Requirements for test of emissions, fire safety and burning behaviour

Requirements for test of emissions to air (sooting), fire safety and burning behaviour are given in this chapter in addition to requirements for the product safety label of candles.

Candles with the same candle mass, wick and thickness, but which is found in many different colours, only need to test one coloured candle according to the requirements in this chapter. For decorative candles, the testing must be done on candles with the final decoration.

Background to requirement O17

The requirement for the soot index for indoor candles remains the same in generation 3 as in the previous generation.

Nordic Ecolabelling has evaluated the possibility of setting more requirements to emissions of particles from burning candles in addition to the testing for soot particles. As there per today are no standardized test methods[11] for such extended testing, no new requirement for particle emissions testing is included as expanded testing in addition to the testing for sooting.

Air movement around a candle will tear particles free faster, and more particles will be emitted to the air per hour due to air movement and faster burning of a candle. Wick design and wax composition and purity are also very important for the combustion and the emissions from candles[12].

The reason for providing a differentiated requirement for soot index by type of candle is that there is a correlation between how much raw material is burned per hour and soot index/amount of particles. A normal taper candle burn faster than the pillar and ball candles and tea-light candles.

Oil candles are not covered by the standard EN 15426, which only applies for solid/semi-solid materials at room temperature. The method is, however, judged to be transferable to the analysis of sooting from oil candles, since the key aspect of the test standard is the height from the fuel to the collection plate. Oil candles must meet the requirements concerning dimensions and burning periods that currently apply to candles made from a solid/semi-solid material.

[11] E-mail from Danish Technological Institute, P.Egholm Bøgh Pedersen, 31.10.2025
[12] Ultrafine Particles: Exposure and Source Apportionment in 56 Danish Home, Technical University of Denmark, Bekö, Gabriel; Toftum, Jørn; Clausen, Geo, et al:, 2013

Based on the feedback from producers of outdoor candles during the consultation[4,13], Nordic Ecolabelling has removed the requirement for soot index for outdoor candles. Due to the sooting requirement, outdoor candle producers inform that they must use a wick which is too "weak" for outdoor conditions. With a weak wick, self-extinction of the candle will occur sooner than with a "strong" wick resulting in shorter total burning time and an increased leftover of wax mass which has an environmental and quality impact. Based on this and the fact that outdoor candles are labelled and are not intended to be used in breathing zones, Nordic Ecolabelling has removed the requirement for sooting from outdoor candles and introduced a new requirement for maximum wax leftover for outdoor candles in containers.

Background to requirement O18

Candles can cause accidental fires if they are not used correctly, and the requirement for testing of fire safety of candles remains the same in this generation 3 as in the previous generation.

The licensee must test fire safety in line with standard EN 15493 for indoor candles or EN 17616 for outdoor candles. For taper candles with the same candle mass, wick and thickness, but with varying length, it is seen as sufficient to test one white and one coloured candle. The reason for testing the coloured candle, is that it may have been dipped in paraffin.

The requirement for fire safety for oil candles was adjusted in generation 2 so that oil candles too must comply with EN 15493 and not EN 14059 (Decorative oil lamps – Safety requirements and test methods). EN 14059 includes oil lamps which is based on petroleum (n-paraffin), i.e. developed from fossil fuels. This type of oil is classified with H304 (harmful particularly if swallowed), and therefore subject to special rules for the labelling of the oil product. Nordic Ecolabelling does not allow fossil oil in oil lamps, so the safety standard EN 14059 is not relevant.

The requirement for the fire safety of candle containers is updated and made stricter because new container materials like renewable non-combustable wood fiber are introduced in the market. Fire safety testing of containers must now be done according to the standard ASTM F2417-23 (Standard Specification for fire safety for candles). This standard is used by container producers[14] and recommended by test laboratories[15] and the quality certification RAL[16].

Background to requirement O19

Based on the feedback from producers of outdoor candles during the consultation[4,13], Nordic Ecolabelling has introduced a requirement for maximum wax leftover for outdoor candles in containers in this generation 3. The requirement text is based on a similar requirement used by the quality certification RAL.

[13] Interviews/meetings with candle producers during the consultation, January-February 2026
[14] Contact with candles producers, autumn 2025
[15] E-mail contact with DEKRA, autumn 2025
[16] https://www.ral-c.com/, specification "Candles Quality Assurance" RAL-GZ 041, July 2020

Wicks customized for minimal sooting might be too "weak" to ensure proper burning time and little wax leftover for outdoor candles in containers. With a "weak" wick, self-extinction of the candle will occur sooner than with a "strong" wick resulting in shorter total burning time and an increased leftover of wax mass which has an environmental and quality impact. Based on this and the fact that outdoor candles are labelled and are not intended to be used in breathing zones, Nordic Ecolabelling has removed the requirement for sooting from outdoor candles and introduced a new requirement for maximum wax leftover for outdoor candles in containers.

For indoor candles in containers, the requirement is only for information. As wax mass leftover has an environmental and quality impact, Nordic Ecolabelling wants to get information on possible maximum limits for wax leftover also for ecolabelled indoor candles in containers that are produced with wicks customized for minimal sooting. Based on collected data on wax leftover, Nordic Ecolabelling might introduce a requirement for maximum limit of wax leftover also for these types of candles.

2 additional minor changes have been included in this requirement in generation 3:

For outdoor candles it is included as a requirement that information on testing temperature, must be written on the candle's label for burning time. This is also a requirement used by the quality certification RAL[16]. Outdoor candles might be used at temperatures outside the testing temperature range at 15 – 25°C which will result in other burning time during real conditions.

For documentation of the burning time, it is in this generation 3 required to send in the test report.

Background to requirement O20

Candles might impose a risk for fire if they are not used correctly. The licensee must therefore label the candles with safety information and warnings according to specific standards relevant for indoor candles (EN 15494), outdoor candles (EN 17617) and oil candles (EN 14059).

Fireproof glass has a higher melting point compared to normal glass, and therefore it cannot be recycled together with normal glass. A small proportion of fireproof glass can ruin a ton of glass packaging sent for recycling.

2.5 Licence maintenance

The purpose of the licence maintenance is to ensure that fundamental quality assurance is dealt with appropriately.

Background to requirement O21

Nordic Ecolabelling requires that your company has implemented a customer complaint handling system. To document your company’s customer complaint handling, you must upload your company’s routine describing these activities. The routine should be dated and signed and will normally be part of your company’s quality management system.

If your company does not have a routine for customer complaint handling, it is possible to upload a description of how your company perform these activities. During the on-site visit, Nordic Ecolabelling will check that the customer complaint handling is implemented in your company as described. The customer complaints archive will also be checked during the visit.

Background to requirement O22

Nordic Ecolabelling requires that your company has implemented a traceability system. To document your company's product traceability, you must upload your company's routine describing these activities. The routine should be dated and signed and will normally be part of your company's quality management system.

If your company does not have a routine for product traceability, it is possible to upload a description of how your company perform these activities. During the on-site visit, Nordic Ecolabelling will check that the product traceability is implemented in your company as described.

3 Environmental impact of candles

The relevant environmental impacts found in the life cycle of candles are set out in a MECO analysis, see below. A MECO describes the key areas that have impact on the environment and health throughout the life cycle of the product – including consumption of materials/resources (M), energy (E), chemicals (C) and other impact areas (O).

Nordic Ecolabelling sets requirements concerning the topics and processes in the life cycle that have a high environmental impact – also called hotspots. Based on the MECO analysis, an RPS tool is used to identify where ecolabelling can have the greatest effect. R represents the environmental relevance, P is the potential to reduce the environmental impact, and S is the steerability on how compliance with a requirement can be documented and followed up. The criteria contain requirements in those areas in the life cycle that have been found to have the highest RPS, since there is potential to achieve reduced environmental impact.

RPS analysis

Table B. Summary of the RPS analysis

Life cycle stages	Area and assessment of R, P, S (high, medium or low)	Comments
Raw materials		
	Raw material extraction R: High P: High S: Medium	R: The extraction of raw materials for candle wax is associated with different environmental issues as described below. **Fossil raw material:** Depletion of fossil resources. **Renewable raw material:** *Animal fat:*

		Since it is a waste product it may be considered to have low environmental impact. However, there may be different views related to animal welfare, religious beliefs, in relation to animal fat extraction. *Soy & Palm:* Land use: Cultivation are linked to deforestation and biodiversity issues. Soy is often a GMO-crop. Possible issues with pesticides, fertilizers. Competition with food cultivation. *Rapeseed:* Land use: Competition with food cultivation and biodiversity issues. However, the sourcing is often European which means less risk of deforestation. *Shea:* Wild growing fruit (less land use and biodiversity issues). Also gives work opportunities and economic growth in less developed populations. *Pine oil:* Competition with biofuel industry. No competition with food crops. Issues (i.e. biodiversity) related to forestry. P: There is a potential to reduce impact by choosing raw materials that are sustainably sourced. S: There are medium high possibilities for Nordic Ecolabelling to prohibit specific raw materials or demand traceability or raw material certifications. Candle producers are not totally free to choose between different raw materials, since the production lines are adapted to specific raw materials. And some raw materials are not possible to use for production of specific candle types. Religious matter (Islamic and Kosher) makes animal fat impossible in some markets.
	Energy use in candle wax refining/production R: Medium/Low P: Low S: Low	R: For stearin candles from animal fat, the main part of the energy use lies in the extraction and refining of animal fat. The energy mix can vary between different suppliers (electricity, natural gas, oil) and is relevant for the climate impact. We do not have knowledge of energy use of other raw materials. P: The potential to reduce energy use is limited but there is a potential to choose less fossil fuels in the extraction/refining process. S: The steerability is limited, since the main energy is used at subcontractors. This makes it difficult to regulate and follow-up.
	Wick material R: Medium/Low P: Medium S: High	R: Wick is most often produced from cotton yarn. Cotton has a high water demand, use of pesticides and chemicals. However, the amount and thus the relevance of wick is minor compared to the candle as a whole. P&S: There is medium high potential and steerability to choose organic or certified cotton.

Production/distribution		
	Energy use in candle production R: Low P: Medium S: Medium	R: Energy is needed in the production of candles for heating/melting or pressing of the material. A minor part of the energy use in the life cycle renders from the production in the candle factory. The energy mix can vary and has an impact on the climate impact. However, it is still a small part of the overall climate impact over the life cycle. P: There may be a potential to reduce the use of fossil fuels and possibly energy efficiency measures to some extent. S: There are issues with finding reliable energy data for candle production, especially for specific candle types that are produced in the same factory as others.
	Chemicals in candle production R: Medium P: Medium S: High	R: Chemicals are used for dyeing the wax or printing on the candle. Could also be used in the wick, and in cups (plastics and wood fiber based). Perfumes and aromas are used for scented candles. There is a risk of emissions to air and water, and risk for enhanced exposure of hazardous emission at production site. The more additives in the candle the more emissions. Overall, the relevance is medium high. P: There is a potential to some extent to choose less harmful chemicals, or to totally skip colours, prints, scents etc. S: There is a demand for coloured and scented candles, why the producers steerability is low. For other chemicals it is possible to use pigments and dyes that meets our chemical requirements. Overall steerability is high.
	Container’s material R: Medium P: Medium S: Medium	R: There is a need for material extraction/refining for cups used for container candles. The cups can be made from different material: Aluminium, plastics, glass, wood fiber based etc. The climate impact from containers are assessed to be a minor part in the life cycle of one candle. However, there is a relatively large issue with recycling of cups. There are new alternatives entering the market, for example wood fiber based cups which are assessed to have less climate impact and less recycling issues. P: There are different choices of candle containers, and thus there is a potential. S: The steerability are assessed to be medium. The producers can change cups but there may be special demands from consumers.

	Packaging R: Low P: Medium S: High	R: Standard materials like cardboard and plastics are used today, which can be recycled in ordinary recycling systems. Chemicals for printing on packaging or in glues etiquettes. P: There is a potential to use less packaging material and to use paper packaging instead of plastics. S: No specific issues related to steerability. The producers are free to choose packaging material and design.
Use phase		
	Greenhouse gas emissions R: High P: High S: Medium	R: Greenhouse gas emissions occur when burning any type of candle. Stearin is of biogenic origin and generate biogenic CO_2 when burning. Paraffin is of fossil origin and generate fossil CO_2 when burning. Biogenic carbon is assessed to have no climate impact in the use phase due to its shorter carbon cycle. However, it is not climate neutral in the life cycle and it's of great significance that the biogenic raw material is sustainably produced. Thus, requirements on raw materials are very important. The choice of raw material has a significant impact on the overall climate impact. The climate impact from a Nordic Swan Ecolabelled candle (90% animalic stearin) is assessed to be 55-60% lower than a paraffin candle. P: There is a potential to reduce impact by choosing a sustainable source, renewable or waste based raw material. S: Medium high steerability to prohibit specific raw materials or demand traceability or raw material certifications. Candle producers are not totally free to choose between different raw materials, since the production lines are adapted to specific raw materials. And some raw materials are not possible to use for production of specific candle types. Religious matter makes animal fat impossible in some markets.
	Emissions/pollutants to indoor air R: High P: Medium S: Low/Medium	R: During combustion of candles there are exposure to gases and particles that may be harmful to health like soot (carbon black), PAHs, inorganic salts, VOC, small particles, formaldehyde etc. The concentration in indoor air can be significantly higher than in outdoor air. P: No significant difference in pollutants to indoor air between different candle wax types (paraffin, stearin etc.). It is the combination wax vs wick that mainly affects the emissions of soot (BC black carbon), PM2.5, and particle-bound PAHs. Nevertheless, the composition of wax wick does not influence level of emissions of NOx, formaldehyde, and gas-phase PAHs – they remain unaffected.

		Also, the more additives (pigments, perfumes etc.) the more pollutants. Scented candles give more indoor pollutants especially VOC and can give rise to allergenic substances in indoor air. Also, the conditions during combustion is important to minimise emissions of soot particles etc. S: The candle producer can design the candle (combination of wick and wax) and minimize the use of additives and thus affect the emissions to some extent. However, there will still be emissions from all candles. The producer does not have steerability over the consumer's behaviour and how/when/where/how often they light candles.
End-of-life		
	End-of-life handling R: High P: High S: Low	R: The main part of candle cups, regardless of material (Aluminium or Plastic), goes to incineration (with household waste). Plastic cups are made of PC (or PC+PET). Plastics incineration leads to emissions of fossil or biogenic carbon depending on plastic type. Aluminium is mixed with other metals in the waste fraction and degraded to ash and combustion residue. The high value of aluminium is therefore lost. If aluminium cups instead are sorted as alumina for material recycling the small steal circle holding the wick in place must be removed - which not very many consumers actually do. P: The climate impact of the life cycle of an aluminium cup is heavily dependent on the end-of-life handling (40% less CO_2 if recycled). S: The steerability is low. Nordic Ecolabelling cannot set requirements directly at the consumers. And there are also issues with recycling systems for candle cups.

The following aspects have the highest RPS and are subject to requirements in the revised criteria:

- Raw material extraction
- Wick material
- Chemicals in candles and containers
- Container material
- Greenhouse gas emissions in use phase
- Emissions to indoor air
- End-of-life handling

MECO analysis

Functional unit 1 kg candle	Raw material	Production	Use	End of life
Material	Extraction of material resources for paraffin candles causes depletion of fossil resources. Growth of vegetable raw materials such as rapeseed, shea, palm oil, soy: - Risk of deforestation, lack of biodiversity and food production competition (see Other) Animal fat is defined as waste/residue which means lower carbon impact. Cultivation of cotton for the wick.	Material for primary packaging (paper & plastics). Material for containers/cups: aluminum, plastic, glass, wood fiber. Aluminum cups contain less material than plastic cups (1g vs. 3g) which significantly affects the climate impact. The difference is not much affected by recycled content of the cup. (8) Renewable, non-combustible fiber-based materials are entering the market with significantly lower climate impact than alumina cups. Risk of burden-shift due to needed flame-retardants.	Greenhouse gas emissions from burning candles (fossil CO_2 from paraffin, biogenic CO_2 from renewable candle mass) (2) No significant difference in other pollutants to indoor air between different candle wax types (paraffin, stearin etc.). It is the combination wax vs wick that affects the emissions. (7) Single-use containers/cups causes material demand. Burning behavior and quality of the candle may have an impact on the consumption pattern (for example if there are a lot of residues left)	Candle cups are, in the best case, recycled. But main part, both aluminium and plastics, goes to incineration (with household waste) (5) Incineration give rise to fossil emissions or biogenic emissions depending on plastic type. When aluminum is incinerated the value of the material is more or less destroyed. The climate impact of the life cycle of an aluminum cup is heavily dependent on the end-of-life handling (40 % less CO_2 if recycled) (8) Due to the little steel circle that holds the wick recycling of aluminium becomes more difficult in practice. Aluminum will “follow” the magnetic steel and thus destroyed as aluminium. The new fiber-based cups are fully recyclable. If incinerated the climate impact is significantly lower than aluminium and plastics. Packaging material (cardboard and plastics) is sorted as packaging to material recovery.
Energy	Energy to extract and process raw materials for the candle mass Energy use for production of candle mass (refining animal fat, hydrogenation, etc..) (1): - Stearin (animalic): 8 kWh/kg - Paraffin: 15 kWh/kg The energy mix can vary and is relevant for the climate impact (see next slide). No knowledge about energy consumption of other raw materials. Energy is also needed for extraction and production of aluminum and plastics.	Energy for candle manufacturing: ca 1 kWh/kg candle (ex. 80% electricity, 6 % fuel, 15 % stearin). (2) (4) The energy mix can vary. Energy use for production of containers (aluminum, plastics). (see slides 4-5) Energy used for transporting raw material and final products.	Tealights are sometimes used to keep liquids warm, but candles are primarily used for the “coziness factor”:	Energy recovery if candle wax and plastic containers are incinerated.

Functional unit 1 kg candle	Raw material	Production	Use	End of life
Chemicals	In the production of vegetable raw material + cotton: pesticides and fertilizers for cultivation (except for Shea which is a fruit from a wild growing tree)	Chemicals (pigments) used for dyeing and printing on the candle. Chemicals for printing on packaging. Perfumes and aromas are used for scented candles. Additives to the wick to obtain the preferred burning properties. Possible additives to plastic cup. Possible additives, surface treatment and flame retardants of fiber-based cups.	Exposure to chemicals that can be harmful to health through breathing the exhaust gases. Exposure of soot (Black carbon) , PAHs, inorganic salts, VOC, small particles and formaldehyde . (3) The more additives (flame retardant additives to the wick, pigments and perfumes in the candle wax) the more pollutants. Scented candles give more indoor pollutants especially VOC and can give rise to allergenic substances in indoor air.(7) The design of the candle does affect the combustions properties, and thus the emissions. Also, the conditions during combustion is important to minimize emissions of soot particles etc.	na
Other	Animal fat: +Waste fraction (can be considered “burden free”) - Animal welfare issues - Religious issues (Halal, Kosher) Shea: +wild growing fruit (no land use/biodiversity issues) +social advantages (work opportunities and economic growth in least developed countries) Rapeseed: +European sourcing – less risk of deforestation. - Land use – competition with food - Biodiversity loss risk Soy & Palm - Linked to deforestation and biodiversity issues - GMO (Soy) Pine oil is a new raw material for candles not linked to deforestation and food competition Bioplastic cups. –Sugar cane: land use, biodiversity etc..	na	na	na

Sources for MECO

1) RISE (2021) LCA of Stearin and Paraffin

2) RISE (2023) Climate impact from Nordic Swan Ecolabelled Candles Climate case Candles.pdf (nordicecolabel.org)

3) Salthammer et. Al. (2021) Measurement and evaluation of gaseous and particulate emissions from burning scented and unscented candles

4) Delsbo Candle (2020) Hållbarhetsrapport Delsbo Candle 2020

5) Nordic Ecolabelling (2013). Evaluering af Svanemærkede Levende lys.

6) The Danish Environmental Protection Agency (2018). Environmentally friendly candles with reduced particle emissions (mst.dk)

7) Svt Nyheter (2024). Levande ljus kan vara hälsofarliga – så minskar du föroreningarna

8) Nordic Ecolabelling (2024) LCA Screening of aluminium and plastic cups. Marie Kampmann Eriksen