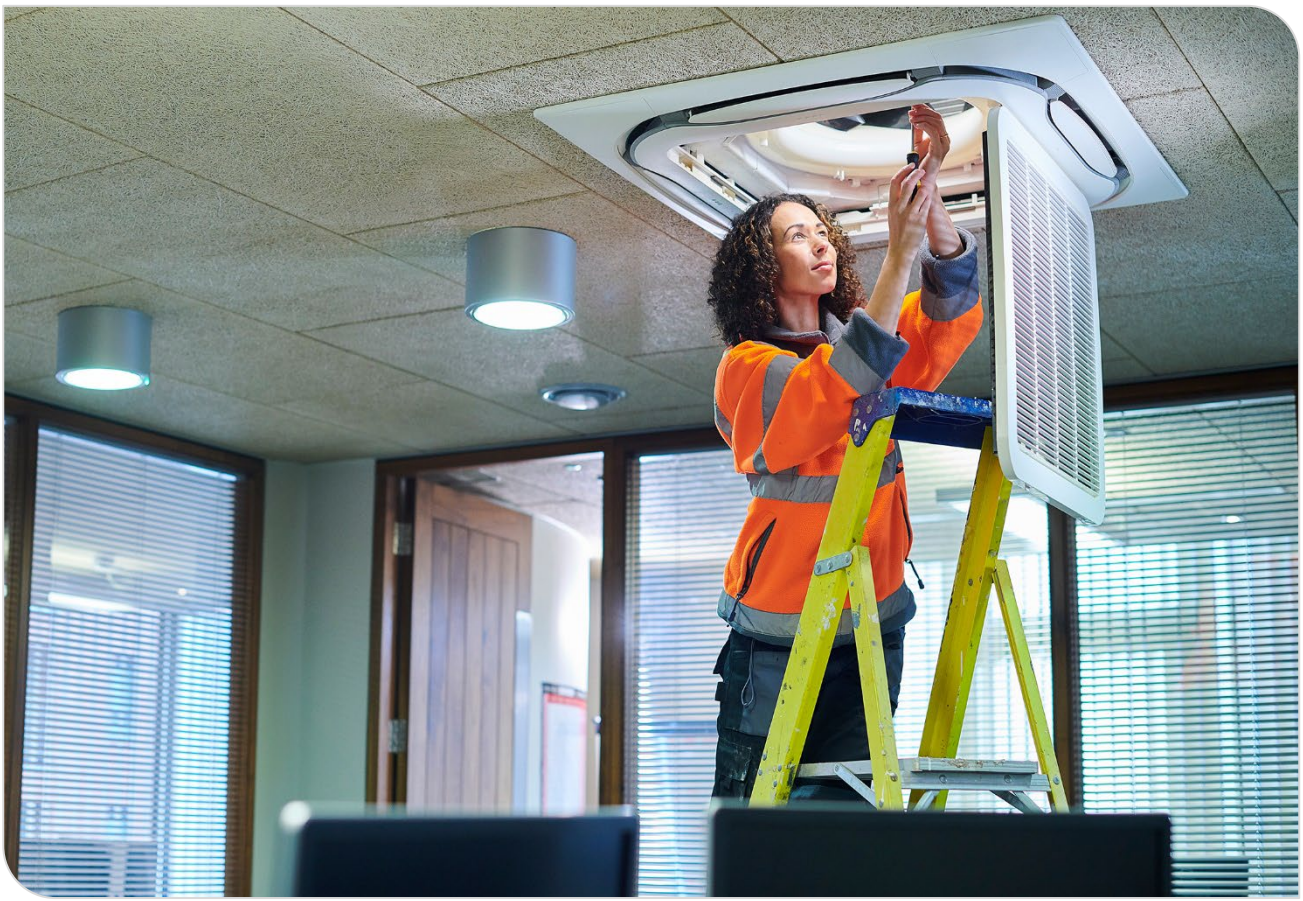
Nordic Ecolabelling for

Building operations



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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
www.joutsenmerkki.fi

Norway
Ecolabelling Norway
www.svanemerket.no

Sweden
Ecolabelling Sweden
www.svanen.se

1 Summary

In June 2023, the Nordic Swan Ecolabel decided to initiate the development of the new criteria for Nordic Swan Ecolabel Building operations. The decision included the start of a Nordic project to develop the new criteria set.

A Nordic Swan Ecolabel Building operations aims to accelerate the transition toward an efficient building operation that lowers the environmental and climate impact of existing buildings in the Nordics. As the first generation of new criteria within Nordic Swan Ecolabel Building operations, the product development has focused on creating few but effective mandatory requirements within areas with high environmental relevance for the use phase of a building. The criteria are designed to be clearly relevant to the market while also encouraging market improvement towards environmental sustainability.

The proposal for criteria for consultation includes 38 mandatory requirements, distributed across 9 different chapters:

1. General requirements
2. Management
3. Energy
4. Climate change
5. Indoor environment
6. Water
7. Recycling, reuse & waste management
8. Outdoor environment & biodiversity
9. Services and products in daily operations, maintenance and building improvements

The emphasis has been on implementing measures to reduce energy consumption and mitigate the climate impact of existing buildings. Given that buildings contribute significantly to society's energy usage, addressing issues like inefficient ventilation, excessive heating or cooling, and improperly adjusted fans is crucial to decreasing unnecessary kWh consumption. While approximately 97 % of the existing building stock in Sweden does not require extensive renovation in the foreseeable future, there is still room for improvement in terms of environmental impact through better management and operation of the building installations and the overall condition of the building.[1]

The criteria have been aligned with the requirements for the EU Taxonomy wherever possible, see the section "Alignment with the EU Taxonomy framework" for details.

[1] Warfvinge, Wahlström, Klimatstegen för drift och förvaltning av befintliga byggnader, E2B2, 2022. Klimatstegen (e2b2.se)

2 Requirements and justification of these

This chapter presents the requirements and explains the background to them. The appendices referred to are those that appear in the criteria document "Nordic Swan Ecolabelling of Buildings operations". The requirements are divided into 9 main chapters:

1. General requirements
2. Management
3. Energy
4. Climate change
5. Indoor environment
6. Water
7. Recycling, reuse, and waste management
8. Outdoor environment and biodiversity
9. Services and products

Buildings certified within Nordic Ecolabelling for New Buildings and Renovation of buildings

Buildings certified within Nordic Ecolabelling for New Buildings, generation 3 or generation 4, have fulfilled strict requirements for the whole life cycle of the building and automatically fulfil the following requirements within these criteria:

- O8 Energy action plan
- O13 Risk analysis Climate change*
- O14 Adaptation to a changing climate**
- O15 Damp, mould, and moisture survey
- O17 Inventory of environmental hazardous substances
- O18 Measurement of PCB levels in indoor air
- O21 Radon
- O26 Water-saving technologies and measures

Buildings certified within Nordic Ecolabelling for Renovation of buildings, generation 2, have fulfilled strict requirements for the renovation of the building and automatically fulfil the following requirements within these criteria:

- O15 Damp, mould, and moisture survey
- O17 Inventory of environmental hazardous substances
- O18 Measurement of PCB levels in indoor air
- O21 Radon

Buildings certified within Nordic Ecolabelling for New Buildings or Nordic Ecolabelling for Renovation of buildings must be able to show their license and must guarantee that no changes have occurred that would result in the requirements not being met.

**Only applicable if meeting the point requirement for "Assessment of risks in a changing climate" in Generation 4.*

***Only applicable if gathering the point requirement regarding "Adaptation to a changing climate" in generation 4.*

2.1 Background to the product group definition

The product group is defined in chapter 2 in the criteria document “What can carry the Nordic Swan Ecolabel?”. This chapter contains information on the background for the product group definition.

In these criteria, building operations refers to the technical operation of a building, emphasising its operational and managerial aspects. Additionally, considerations are made regarding the technical condition of the building and its systems, as well as the actions of its users/tenants. These factors collectively influence the environmental impact during the use phase of the building.

Both building owners and building operation contractors can obtain a license, provided they have control over the outlined requirements. Nordic Ecolabelling acknowledge that the criteria are more straightforward for buildings where the operation is managed directly by the building owner. This clarity arises from the definite authority of the license holder, not because of any differences in criteria for these types of licensees or the buildings. Due to the significant environmental potential in all buildings the aim is to also include buildings where operations are managed by a building operation contractor, rather than excluding them. As an example, a Bostadsrättsförening (building owner in terms of a housing cooperative) can certify their building under the Nordic Swan Ecolabel. These building owners have two options: they can either become the licensee themselves, hiring individual suppliers and ensuring they meet the requirements, or they can engage a licensed company (building operation contractor) that will be responsible for meeting all criteria in partnership with the Bostadsrättsförening.

Nordic Ecolabelling aims to align these criteria with the criteria for New Buildings and Renovation. Consequently, the same building types are eligible for certification, except for hotels, which have their own criteria document (Nordic Swan Ecolabelled Hotels and other accommodation). Buildings with very specialised use, for example hospitals, are exempted from these criteria since they typically have very specific conditions concerning technical installation. This can make it more difficult for these building types to fulfil e.g. the energy requirements. Nordic Ecolabelling continuously evaluates the possibility of extending the scope of the criteria.

The reason decentralized heating and ventilation systems in residential apartment buildings are excluded is due to the complexity involved in monitoring and controlling all individual units. It is challenging for a company to manage all the apartments in a building where the units are privately owned, which is for example common in Norway. Our experience indicates that there are no common industrial control systems (ICS) in residential apartment buildings, making it difficult to gain access to and manage private apartments effectively. These requirements are not designed to accommodate this level of complexity, which is why residential apartment buildings with decentralized systems are excluded from these criteria.

Buildings certified within Nordic Ecolabelling for New Buildings, generation 3 or generation 4, and Nordic Ecolabelling for Renovation of buildings, generation 1 or generation 2, have fulfilled strict requirements for the building and automatically fulfil some specific requirements within these criteria. As Nordic Ecolabelling

cannot guarantee that another certification system meets the same standards as the Nordic Swan Ecolabel for New Buildings or Renovation, it cannot be stated that other certifications automatically fulfil specific requirements in these criteria. However, those seeking to meet specific requirements through another certification system can likely demonstrate compliance with our requirements using the same documentation from other certification schemes.

2.2 General

Background to requirement O1 Description of the buisiness

Nordic Ecolabelling requires a detailed description of the business, to ensure the setting of appropriate and relevant requirements, tailored to the type of business and its operations. This information must be correct, as it forms the basis for the application process and the requirements that apply to your particular business. The information is relevant to ensure efficient and correct certification in relation to the rest of the document.

A responsible person is required to ensure that Nordic Ecolabelling's requirements are fulfilled throughout the entire validity period of the licence and that the annual follow-up and reporting are completed. The company may comprise several departments but should in the first instance appoint just one person to be responsible for the licence and contact with Nordic Ecolabelling. The company may internally split responsibility between different departments and several people. A large turnover of staff can be a challenge in the industry, not least with regard to the Nordic Swan Ecolabelling of the business. When a person who has had responsibility for producing documentation and carrying out annual reporting leaves, important experience may be lost. Passing on information and knowledge to their successor is thus vital.

Background to requirement O2 General information about the building

The purpose of the requirement is to give an overview of the building/s and the immediate surroundings that are to be part of the Nordic Swan Ecolabelled certification. The information is relevant to ensure efficient and correct certification in relation to the rest of the document.

Background to requirement O3 Annual follow up

The business is responsible for complying with all requirements in the criteria during the validity period of the license. However, certain building requirements evolve over time, necessitating ongoing follow-up to ensure that the progress and development upon which the license was granted continue to be maintained. This requirement is therefore included to ensure that the business complies with the requirements in the criteria document during the validity period of the Nordic Swan Ecolabel licence. Nordic Ecolabelling may review and control all requirements, or selected ones. It is always the latest version of the annual report that forms the basis for ensuring that the criteria are met. If the annual report reveals that circumstances have changed, Nordic Ecolabelling must be informed of this. Appendix 2 provides examples of information that the licensee

must maintain within their own systems and be capable of presenting during the annual follow-up process. Nordic Ecolabelling will inform about the control and deadline for submitting documentation in advance of an annual follow-up.

2.3 Management

Background to requirement O4 Maintenance plan

A well-executed maintenance plan not only ensures the longevity and efficient operation of buildings but also contributes significantly to environmental conservation and sustainability by minimizing resource use, energy consumption, and waste generation. The basic principle in environmental work is to try to extend the technical or aesthetic lifespan of building and installation products. The maintenance plan is crucial in the environmental work during planned maintenance, renovations, and energy-saving measures. It indicates the theoretical technical lifespan and when it is time for replacement. These details are essential for assessing the profitability of energy measures and to determine when actions are needed. The idea of the maintenance plan is to note future maintenance needs. The plan therefore needs to have a long-term horizon. The maintenance plan should initially at least cover the next thirty years. To ensure that the maintenance plan stays relevant, it must be considered and updated at least once a year. It is however important to note that while a 30-year plan outline major maintenance activities, such as roof replacements or façade renovations, the specific details, like the materials to be used or methods employed, are usually determined closer to the time of implementation. This flexibility allows the plan to adapt to advancements in technology, changes in regulations, and the evolving condition of the building.

A responsible person for the maintenance plan is important to ensure the effect of the planning. In another case, it is easy for the issue to fall through the cracks, and the environmental effects may be lacking.

Background to requirement O5 Training of employees

Training in the work of Nordic Ecolabelling is important in creating engagement across the whole organisation during the licence period. It is important that the contact person does not feel alone in this work and that all the departments are on board from the outset. The departmental managers are the key people for building up good environmental work at the facility from the beginning and for motivating the rest of the employees.

The training must contain both basic environmental knowledge and the knowledge that is necessary to maintain the Nordic Swan Ecolabel licence. The training material should be supplemented with specific information about the environmental impacts of the particular building and what is being addressed in the respective specific license.

Background to requirement O6 Information to the users/tenants

The actions of users/tenants significantly influence energy consumption, water usage, and waste generation within a building. The licensee can influence their behaviour by providing information and prioritizing sustainability initiatives. Involving building users/tenants in the operation promotes collaboration towards sustainability, resource efficiency, and occupant well-being, leading to a dynamic and responsive environment. User involvement is crucial for several reasons. Firstly, users/tenants can adopt energy-efficient practices like turning off lights and appliances when not in use, adjusting thermostats, and using appliances mindfully, contributing to overall energy conservation. Secondly, they play a key role in responsible water usage by promptly reporting leaks, using water-saving fixtures, and being mindful of consumption habits, reducing unnecessary water use. Thirdly, user participation is essential for effective waste management through promoting recycling, reuse, and following waste disposal guidelines, thereby reducing the environmental impact associated with waste generation. Moreover, engaging users/tenants fosters a culture of sustainability within the building community, encouraging shared responsibility and environmentally friendly practices. Additionally, users/tenants provide valuable feedback on maintenance needs, potential improvements, and usage patterns, aiding in the continuous improvement of building performance.

Real-time monitoring systems for energy and water have several advantages. They increase awareness and accountability, as tenants and managers can see real-time data on their usage, making them more conscious of their consumption habits. Such systems improve efficiency by identifying patterns and spikes in usage, which helps in optimizing energy and water consumption, leading to cost savings. They also allow for early detection of issues, such as leaks or faults, reducing the risk of severe damage and costly repairs. However, there are also disadvantages to these systems. The initial installation costs can be high, including expenses for hardware, software, and integration with existing systems.

Within a Nordic Swan Ecolabelled Building operation, it is essential for all users/tenants, whether in residential or commercial units, to receive information about the environmental performance. This information provides insights into the building's operational performance, specifically addressing energy consumption and water usage. This transparent and informative approach serves as an effective means to involve residents and users/tenants in the principles of the Nordic Swan Ecolabel initiative. Since systems with constantly available information to users/tenants can be costly, annual information will be available in this first generation of criteria set.

Background to requirement O7 User complaints and fault reports

The actions of users/tenants play a crucial role in influencing the environmental performance of the building. Users/tenants often notice and report problems in the early stages. This allows for prompt identification and resolution of issues before they escalate, preventing potential damage or extensive repairs. Some user complaints may be related to energy inefficiencies, such as draughts from ventilation, heating or cooling issues, or malfunctioning equipment. Addressing these concerns can lead to improved energy performance and cost savings.

Factors like air quality, moisture, and thermal comfort help in maintaining a healthy and comfortable indoor environment. This is essential for the well-being and productivity of building users/tenants. Further, user complaints often point to areas that may require preventive maintenance. Addressing these issues proactively helps in preventing larger, more costly problems in the future.

Addressing user complaints promptly also contributes to user satisfaction. It shows responsiveness on the part of building management, enhancing the overall experience for users/tenants.

2.4 Energy

Background to requirement O8 Energy action plan

The national legislation in all EU countries is based on the EU Directive on the energy performance of buildings 2010/31/EU and the concept of Nearly-zero-energy buildings (NZEB). However, national classifications for energy performance/energy efficiency are not directly comparable between the Nordic countries. The countries' classification system includes different parts of a building's total energy demand. Other differences concern parameters such as net energy needs, purchased/delivered energy, and primary energy. Furthermore, building areas are calculated in different ways, which makes it difficult to compare numbers that are normalised in relation to area. Nordic Ecolabelling has therefore chosen to set energy requirements based on national legislation. An Energy Performance Certificate (EPC) remains valid for 10 years across all Nordic countries from the date of issuance and is therefore accepted as documentation.

The EU is working on a revision of the building directive. Among other things, it is suggested that all public and commercial buildings must as a minimum have energy label F in 2027 and E in 2030. For residential buildings, energy labels F and E must be achieved in 2040 and 2033 respectively.

The buildings considered to be worst performing within energy in each Nordic country are excluded from these criteria set (Part A). The buildings that are in the lowest levels of energy performance are referred to the Nordic Swan Ecolabel criteria for Renovation where they can improve their energy performance before they can apply within these criteria.

The Nordic Swan has granted an exemption for highly energy-efficient buildings in each country (section B1), as significant energy measures are not immediately necessary for them. However, for buildings below the limit, with potential for improved energy performance and reduced climate impact, an energy audit is mandatory (section B2). Recognizing that these measures may not be within the licensee's budget from the start, licensees are given a 3-year window to enhance their buildings. Stricter improvement levels apply to buildings with lower energy performance, emphasizing greater energy-saving potential.

In Denmark, buildings classified as energy class B are considered to perform well in terms of energy efficiency and do not require significant changes to their technical installations to reduce energy consumption. Buildings in energy class E or below are considered to be low performing. Similarly, the energy class C designation in Sweden, Norway, and Finland corresponds to buildings

performing well in respective country. Buildings in energy class F or below are considered to be low performing.

Heritage-listed buildings are not covered by this requirement since they have limited possibilities to change their energy performance by changing the construction of the building. However, they can improve for example their energy performance through an optimized operation of the building and can improve their energy performance through other requirements.

Buildings certified under the Nordic Swan Ecolabel Renovation of Buildings must adhere to section A. However, they are exempt from meeting Section B1 or B2 in these criteria. This exemption is granted because strict energy requirements have already been met during the renovation process. By achieving notable energy savings through the previous renovation efforts, these buildings may struggle to meet the upper limit outlined in section B, posing a challenge to compliance with these criteria.

An Icelandic company seeking certification is required to contact the Nordic Swan Ecolabel to agree on an acceptable energy level or protocol to fulfil this requirement. This is due to that Iceland has not participated in the development of the criteria. When available, the levels will be implemented in the criteria to make it accessible to everyone.

Background to requirement O9 Energy metering

Today there is a lack of knowledge regarding the daily operation of buildings where there are few examples where correlations between users, technical, energy- and environment-related, economic, and other parameters are analysed to improve and impact the overall building performance.[2] To measure is to know, and a well-established metering structure is crucial for monitoring individual energy categories to quickly identify and rectify errors.[3] Continuous monitoring of energy consumption allows for prompt troubleshooting, enabling immediate corrections and energy savings. Additionally, compiling annual usage into key performance indicators is essential for accurate operational statistics, aiding in the planning of technical measures to reduce energy consumption. By maintaining operational statistics, we gain insights into the specific building, facilitating targeted improvements. Further, within a Nordic Swan Ecolabelled Building operations, it is essential for all users/tenants, whether in residential or commercial units, to receive annual information about the energy performance of the building. The actions of users/tenants play a crucial role in influencing energy consumption. Their awareness and cooperation contribute to overall energy conservation.

An Icelandic company seeking certification is required to contact the Nordic Swan Ecolabel to agree on an acceptable energy level or protocol to fulfil this requirement. This is due to that Iceland has not participated in the development

[2] Martinac, et al., Brukaranpassad, hållbar byggnadsdrift med fokus på inneklimat och energiprestanda i kontorsbyggnader – en kunskapssyntes, 2017. sbuf_13293_slutrapport_brukaranpassad_haallbar_byggnadsdrift_med_fokus_pa_inneklimat_och_energiprestanda_i_kontorsbyggnader.pdf (e2b2.se)

[3] Kempe, Vidareutveckling av metoder för idrifttagning och driftuppföljning av installationssystem i flerbostadshus, 2014. Mall BeBo (bebostad.se)

of the criteria. When available, the levels will be implemented in the criteria to make it accessible to everyone.

Background to requirement O10 Energy efficiency – continuous operation optimisation

Building-specific procedures for ongoing operational optimization are crucial to ensure energy efficiency. Each building has unique characteristics, usage patterns, and energy consumption profiles. Building-specific procedures allow for a customized approach to optimizing operations based on the specific needs and features of the structure. By having building-specific procedures, it becomes easier to identify specific areas and systems that offer opportunities for energy efficiency improvements. This targeted approach ensures that the optimization efforts focus on the most impactful areas.

Since buildings undergo changes over time, for example modifications to infrastructure, occupancy patterns, or technology upgrades, having routines for continuous operation allows for adaptation to these changes, ensuring that energy optimization measures remain effective. Ongoing operational optimization also involves real-time monitoring of energy usage and system performance. Building-specific routines facilitate the implementation of monitoring systems tailored to the building's characteristics, enabling prompt identification and correction of inefficiencies.

A responsible person for the continuous operation is important to ensure that the work is continuously performed. In another case, it’s easy for the issue to fall through the cracks, and the environmental effects may be lacking.

Background to requirement O11 Operation and maintenance instructions

Today, it is a common problem in the industry that operation and maintenance instructions are difficult to access and are not regularly updated.[4] [5] All technical systems must be properly maintained to function correctly.[6] Insufficient operation and maintenance instructions can result in operational disruptions and indoor environments failing to meet desired standards.[7] Conducting post-incident investigations to identify the root cause and implement appropriate solutions can incur significant expenses. Moreover, the complexity of these investigations is exacerbated when understanding how the facility should function is hindered by incomplete or absent operation and maintenance instructions. Easily accessible, updated, and specific operation and maintenance instructions are essential for an effective work by operational staff. The clearer the operation is described, the easier it is for new operational staff to truly engage in the operation. Operation cards are designed to provide operational staff with an understanding of the function and handling of each part of the installations, individual units, etc.

[4] Kempe, Vidareutveckling av metoder för idrifttagning och driftuppföljning av installationssystem i flerbostadshus, 2014. Mall BeBo (bebostad.se)
[5] Bengtsson, Förstudie systematik för kravställning och överlämning av drift- och underhållsdokumentation, SBUF, 2021. Systematik för kravställning och överlämning av drift- och underhållsdokumentation - Smart Built
[6] Glaumann et al., Miljöklassning av byggnader – slutrapport april 2008, Boverket, 2008.
[7] Risker med brister i drift och underhåll - Boverket

In a Nordic Swan Ecolabel Building operations, operation and maintenance instructions must be easily accessible, comprehensible, adapted to the specific system, and updated with any changes. Further, a responsible person for the continuous operation is important to ensure that the work is continuously performed. In another case, it's easy for the issue to fall through the cracks, and the environmental effects may be lacking. If a professional external service provider is hired, the necessary knowledge and expertise are often already in place, and the documentation can therefore be limited to basic information about the technical systems for the specific building required to enable a change of service provider.

Background to requirement O12 Purchasing of white goods

Energy classification of household appliances and professional kitchen appliances is an important tool for reducing energy use during the use phase of the building. However, it is important that well-functioning equipment are not changed until it is needed to ensure resource efficiency both in terms of raw material and waste. Therefore, this requirement only applies to new purchases. The requirement on energy efficiency is based on both Energy Labelling Directive 2010/30/EC and Energy Labelling Regulation 2017/1369 with later supplements. The specific requirement concerning the energy label for each product group is set on the best performing appliances in their class.

2.5 Climate change

Background to requirement O13 Risk analysis climate change

Climate change is giving rise to a warmer climate and more extreme weather. Problems with heat waves, floods and heavy downpours are present today and will become more frequent. The construction sector has good opportunities to reduce future damage and health hazards in the built environment by working with climate change adaptation.[8] In Sweden and Denmark, the ultimate responsibility for implementing climate adaptation measures on the property lies with landowners, developers, and property owners.[9] Municipalities have the main responsibility for implementing climate-adapted measures in the planning work in Norway, Sweden, and Finland.[10] In Denmark, climate adaptation is primarily regulated by laws and regulations, and Norway also has legislation that covers climate adaptation. Iceland currently has no requirements for climate adaptation.

There are holes to fill in the Nordic climate adaptation work of properties and Nordic Ecolabelling wishes to encourage developers and property owners to work with climate adaptation of existing buildings. The climate and vulnerability analysis must be based on RCP (Representative Concentration Pathways) scenarios from IPCC and correspond to a period of at least 50 years. Nordic Swan Ecolabel requires that risk scenarios based on either RCP2.6 or RCP4.5 and

[8] Klimatsäkra din fastighet - Fastighetsägarna (fastighetsagarna.se)
[9] 2017/18:163 Nationell strategi för klimatanpassning
[10] PBL 2010:900

RCP8.5 should be performed based on FAQ 221219.166-170[11] regarding the Taxonomy written by the Commission.

Nature-based solutions (blue or green infrastructure[12]) are multifunctional measures that, in their design, are based on the functions that ecosystems possess and contribute, i.e., ecosystem services. Nature-based solutions are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions can bring more diverse nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions (e.g. green roofs, shady trees, dams that delay runoff, etc.).[13] By using nature-based solutions, ecosystems benefit while providing socially beneficial functions[14]. Nature-based solutions promote climate adaptation in a variety of ways and can, for example, improve resilience to floods and extreme rainfall, provide coolness for residents and cool building surfaces such as roofs and walls, and reduce risks of collapse and landslides.

The adaptation measures must ensure that they do not compromise the adaptation efforts or resilience level to physical climate risks of various entities, including individuals, nature, cultural heritage, assets, and other economic activities. For instance, an example of this could be if a structure incorporates an earth embankment that raises the risk of flooding in the surrounding area.

There are many uncertainties on how EU Taxonomy compliance can be documented as well as the interpretation. Even though Nordic Ecolabelling has done its best in interpreting the EU Taxonomy, Nordic Ecolabelling cannot guarantee alignment through the criteria for Building operations. Read more about this subject under chapter 7 Alignment with the EU Taxonomy.

Background to requirement O14 Adaptation to a changing climate

The construction sector has good opportunities to reduce future damage and health hazards in the built environment by working with climate change adaptation.[15] The EU Taxonomy Annex II chapter 7.7 Acquisition and ownership of buildings states that *"The economic activity has implemented physical and non-physical solutions ('adaptation solutions') that substantially reduce the most important physical climate risks that are material to that activity."*. Nordic Ecolabelling does not require that all adaptation solutions must be implemented from the first day of an approved license. However, the Nordic Swan Ecolabel mandates organizations to integrate identified measures into their maintenance plan, derived from climate risk and vulnerability analyses. Further, the climate change adaptation measures must be integrated into maintenance or renovation projects. This approach enables tailored adjustments for specific buildings and further aligns with the principles of economic and resource sustainability.

There are many uncertainties on how EU Taxonomy compliance can be documented as well as the interpretation. Even though Nordic Ecolabelling has

[11] DRAFT COMMISSION NOTICE on the interpretation and implementation of certain legal provisions of the EU (europa.eu)
[12] Green infrastructure (GI) – Enhancing Europe's Natural Capital (COM(2013) 249 final
[13] https://research-and-innovation.ec.europa.eu/research-area/environment/nature-based-solutions_en
[14] Naturbaserade lösningar (naturvardsverket.se)
[15] Klimatsäkra din fastighet - Fastighetsägarna (fastighetsagarna.se)

done its best in interpreting the EU Taxonomy, Nordic Ecolabelling cannot guarantee alignment through the criteria for Building operations.

2.6 Indoor environment

Background to requirement O15 Damp, mould and moisture survey

Moisture problems in buildings have environmental, health and financial effects.[16] A building's lifetime might decrease due to moisture problems, with an increased need for renovations. Moisture in buildings increases the risk of bronchitis, chronic bronchitis, and respiratory irritation by 50%. The costs associated with increased illness and reduced health are considerable, but society's economic losses from reduced learning and lower productivity are even higher.[17] One third of Sweden's buildings have moisture or mould damage. The building elements most often subject to moisture damage are windows, building foundations and wet rooms.

Moisture exposure in building materials can increase the emissions of volatile chemical substances (secondary emissions). The degradation is usually due to moisture damage in concrete beams since, besides moisture, the chemical reaction also needs alkaline conditions. Moisture-critical constructions are flat roofs, terrace joists, cold winds, internal roof irrigation, drainage systems, ground runoff, single-stage sealed facades, crawl spaces, wet rooms without waterproofing and kitchens without the possibility of forcing exhaust air at the stove.[18] Suspected moisture damage must always be investigated. When you suspect moisture damage in a building, measures need to be taken because moisture damage often gets worse and more difficult to repair the longer you wait.

This requirement includes a moisture survey providing the status of the building, which has as purpose to identify moisture damage, fungal growth, dry rot fungus, odours, and water damage in the building.

Background to requirement O16 Damp, mould and moisture prevention and handling plan

Moisture problems in buildings have environmental, health and financial effects.[19] A building's lifetime might decrease due to moisture problems, with an increased need for renovations. Moisture in buildings increases the risk of bronchitis, chronic bronchitis, and respiratory irritation by 50%. The costs associated with increased illness and reduced health are considerable, but society's economic losses from reduced learning and lower productivity are even higher.[20] One third of Sweden's buildings have moisture or mould damage. The

[16] https://www.boverket.se/sv/byggande/forebygg-fel-brister-skador/
[17] Fukt i bygninger-hva koster det? (Moisture in buildings - what does it cost?); Bakke, J.W, Norwegian Labour Inspection Authority, Allergi i Praxis (Allergy in Practice), n4 2012.
[18] Warfvinge, Åtgärdskatalog, 2023. Klimatstegen | Svensk Energiutbildning (svensk-energiutbildning.se)
[19] https://www.boverket.se/sv/byggande/forebygg-fel-brister-skador/
[20] Fukt i bygninger-hva koster det? (Moisture in buildings - what does it cost?); Bakke, J.W, Norwegian Labour Inspection Authority, Allergi i Praxis (Allergy in Practice), n4 2012.

building elements most often subject to moisture damage are windows, building foundations and wet rooms.

Exposure of building materials to moisture can lead to increased emissions of volatile chemical substances (secondary emissions). The degradation is usually due to moisture damage in concrete beams since, besides moisture, the chemical reaction also needs alkaline conditions. Moisture-critical constructions are flat roofs, terrace joists, cold winds, internal roof irrigation, drainage systems, ground runoff, single-stage sealed facades, crawl spaces, wet rooms without waterproofing, and kitchens without the possibility of forcing exhaust air at the stove.[21] Suspected moisture damage must always be investigated. When you suspect moisture damage in a building, measures need to be taken because moisture damage often gets worse and more difficult to repair the longer you wait.

The requirement is divided into two sections. The first section ensures that the business has routines and work procedures that prevent moisture problems from arising preventing any adverse effect on the indoor environment and air quality. The second section ensures routines for dealing with moisture problems.

The plan must also include a follow-up of any damp, mould or water damage discovered. The follow-up must focus on identification, management, and remediation of damage.

Background to requirement O17 Inventory of asbestos and PCB

Older buildings may have been constructed using materials that contain various hazardous substances. Depending on the substances, they may pose a risk to the environment and/or human health. The requirement covers the hazardous substances considered to be of higher human risk in relation to operations and maintenance of a building, PCB and asbestos. PCBs are a group of chemicals that affect the development of the brain and nervous system and are suspected carcinogens, immune system- and endocrine disruptors.[22] They were used in e.g. sealants, mastics, windows, paints, and electrical equipment until the 1970s. Asbestos is a collective term for several minerals found in nature.[23] The predominant type of asbestos is chrysotile (white asbestos). Asbestos has been used for a long time due to the valuable technical properties of the material. When working with or demolishing materials containing asbestos, a large amount of asbestos fibres is released into the air, where they remain suspended for a long time because the fibres are very light and thin. Inhaling asbestos fibres is dangerous because they can cause several serious lung diseases, such as cancer. Asbestos is forbidden but was frequently used in, for example, pipe insulation, ventilation joints and wall and floor materials. The initial restrictions on asbestos usage were implemented in the 1970s, but it wasn't until 2005 that a comprehensive ban was enacted, prohibiting both the production and importation

[21] Warfvinge, Åtgärdskatalog, 2023. Klimatstegen | Svensk Energiutbildning (svensk-energiutbildning.se)
[22] PCB i miljön (naturvardsverket.se)
[23] Asbest - Arbetsmiljöverket (av.se)

of asbestos and asbestos-containing products.[24] [25] Hence, this requirement applies to buildings constructed before 2005.

The purpose of this requirement is to identify the existence of these substances in the building. This knowledge and the precautious measures due to it must be used when performing daily operations, maintenance, and improvements in the building, eliminating the risk related to these substances for the inhabitants and the workers.

The hazardous material survey must be performed by a person qualified to conduct an environmental survey. Due to the rapid changes in regulations and knowledge within the field of environmental surveys, a previous survey may not be more than three years old. If a previously performed survey is more than three years old, the person/company responsible for writing the report must assess whether there is a need to update the report.

In residential buildings, 10% of the apartments or a representative number must be controlled and taken as reference depending on the type of building. It may be unnecessarily cumbersome and costly to survey 10% of the apartments and therefore a representative number is allowed. The representative number of apartments must be argued by the applicant and approved by licensing in the country of application.

Background to requirement O18 Measurement of PCB levels in indoor air

PCBs are a group of chemicals that affect the development of the brain and nervous system and are suspected carcinogens, immune system- and endocrine disruptors[26]. They were used in e.g. sealants, mastics, windows, paints, and electrical equipment until the 1970s. Buildings with Nordic Swan Ecolabelled operations must be guaranteed to have low levels of PCBs that may pose a risk to health and the environment. Nordic Ecolabelling therefore requires measurements to be carried out in the building in cases where PCBs have been identified in materials with concentration above the national threshold limit for hazardous waste. Many circumstances affect the PCB-levels in the indoor air, e.g. the placement of the materials, the material structure, ventilation and migration properties of the materials. A Danish study[27] has mapped PCB in the indoor air in 67 existing buildings. The buildings in the study were selected based on the criteria that there should be either materials indoors with more than 50 mg/kg PCB (threshold limit for hazardous waste) or materials outdoors with more than 5,000 mg/kg PCB. With these selection criteria, it was expected that all buildings where PCB concentrations in the indoor air of more than 300 ng/m^3 could occur would be covered by the measurement program. The summary of the study shows that ≥300 ng/m^3 was found at 7% of the locations surveyed. ≥3,000 ng/m^3 was found at two locations, corresponding to 0.4 % of the locations surveyed. In addition, the PCB-guiden (Social og boligstyrelsen in DK) states PCB must typically be present in concentrations of 1 % in materials to result in the indoor air reaching the reactions levels (300 ng/m^3). Based on this and NSE's experience with the result of PCB measurements in buildings with PCB findings below the

[24] Phoenix, Bygge- og anlægs- affald, Harkev Kommune, 2024-03-04.
[25] Asbest - Arbejdstilsynet (at.dk)
[26] https://www.naturvardsverket.se/amnesomraden/miljofororeningar/organiska-miljogifter/pcb-i-miljon/
[27] KORTLÆGNING AF PCB I MATERIALER OG INDELUFT RAPPORT_STANDARD_GROOWI

threshold limits for hazardous waste, it is found reasonable to limit the requirement to measurements in buildings with materials in the indoor environment above the national threshold limits for hazardous waste. The requirement also applies if PCBs have previously been found in the building before the Nordic Swan.

Nordic Ecolabelling's threshold limit value of 300 ng PCB/m3 for indoor air is the same as the level set by the Danish Health Authority as guidance when no action is required. If the level of PCBs per cubic meter of indoor air is below 300 nanograms, this is considered an acceptable level where exposure to PCBs is not expected to pose a significantly increased risk. If the level of PCBs exceeds the threshold limit value stated in the requirement, further action must be taken to trace the source of the PCB and then remove/remediate it. The indoor air must then be tested once again to analyse PCB levels.

Background to requirement O19 Air quality and ventilation – continuous operation optimisation

In offices, schools and pre-schools, there is an increased risk of poor indoor air quality because there are larger groups of tenants than the building was originally planned and built to accommodate. Poor ventilation can cause several indoor climate problems even in residential buildings. Some of the symptoms caused by poor air quality are concentration difficulties, headaches, allergies, and asthma.[28] [29] It is common for settings on valves, dampers, air diffusers, thermostats, and other components to be adjusted by either users/tenants or maintenance staff in response to user complaints. Changes in building usage, new or changed users/tenants, comfort preferences, or operational schedules can also impact the air quality and energy consumption if adjustments are not made to setpoints and timers accordingly.[30]

Operational optimization is a continuous process. A well-optimized building experiences higher user satisfaction and lower energy usage because part of optimization involves closely monitoring indoor climate conditions.[31] Experiences from active operational optimization show that the energy consumption of particularly complex buildings can be reduced by 20-25% through well-executed commissioning, coordinated functional testing, and effective operation.[32] [33] Additionally, this approach allows for a more tailored indoor climate adjustment to better suit the needs of the users/tenants. Efficient ventilation is key to creating a good indoor climate and indoor air. There is a risk that a too narrowed focus on tighter and more energy-efficient buildings can have a negative impact on air circulation and ventilation. Energy-saving measures should not be carried

[28] Risker med dålig ventilation - Arbetsmiljöverket (av.se)
[29] Din hälsa kan påverkas av dålig luftkvalitet - Boverket
[30] Klimatstegen vers 1.0, Del-3-Klimatnyckeltalen-fakta-Klimatstegen-vers-1.0-230127.pdf (svensk-energiutbildning.se)
[31] Warfvinge, Wahlström, Klimatstegen för drift och förvaltning av befintliga byggnader, E2B2, 2022. Klimatstegen (e2b2.se)
[32] Martinac, et al., Brukaranpassad, hållbar byggnadsdrift med fokus på inneklimat och energiprestanda i kontorsbyggnader – en kunskapssyntes, 2017. sbuf_13293_slutrapport_brukaranpassad_haallbar_byggnadsdrift_med_fokus_pa_inneklimat_och_energiprestanda_i_kontorsbyggnader.pdf (e2b2.se)
[33] Kempe, Vidareutveckling av metoder för idrifttagning och driftuppföljning av installationssystem i flerbostadshus, 2014. Mall BeBo (bebostad.se)

out at the expense of the quality of the indoor climate. With quality-assured operation and maintenance work, many of the deficiencies noted during ventilation inspections can be detected and addressed in advance.[34] These deficiencies often lead to poorer indoor environments. Therefore, there should be a plan for operation and maintenance, along with clear checklists for inspections to ensure that ongoing work functions properly. Inadequate instructions for operation and maintenance increase the risk of components not being replaced on time, necessary adjustments being neglected, and it is becoming more difficult to rectify operational disruptions and faults.

Nordic Ecolabelling sets a requirement that focuses on monitoring and maintenance of the ventilation system. While operational optimization may be a singular task in some cases, adopting a climate and health-centric approach, necessitates its continual work.[35] Some checks must be conducted daily, while others occur annually or in relation to changed activities. The sooner deviations are addressed, the less energy is consumed and the better air quality. The aim is to ensure a good indoor environment with good air quality, and to avoid excessive energy consumption. Moreover, the requirement wants to contribute to the circular economy by prolonging the lifetime of the systems by promoting good maintenance routines.

[34] Risker med brister i drift och underhåll - Boverket
[35] Warfvinge, Wahlström, Klimatstegen för drift och förvaltning av befintliga byggnader, E2B2, 2022. Klimatstegen (e2b2.se)

Background to requirement O20 Thermal comfort – continuous operation optimisation

Thermal comfort impacts health, productivity, and stress levels. With well insulated buildings and a warming climate, overheating is becoming a common problem. The longer and more frequent heat waves with higher temperatures result in heat stress which costs human lives and health, especially among the elderly. It is common for settings on thermostats, and other components to be adjusted by either users/tenants or maintenance staff in response to user complaints. Changes in building usage, new or changed users/tenants, comfort preferences, or operational schedules can also impact the thermal comfort and energy consumption if adjustments are not made to setpoints accordingly.[36]

Operational optimization is a continuous process. A well-optimized building experiences higher user satisfaction and lower energy usage because part of optimization involves closely monitoring indoor climate conditions.[37] Experiences from active operational optimization show that the energy consumption of particularly complex buildings can be reduced by 20-25% through well-executed commissioning, coordinated functional testing, and effective operation.[38] [39] Additionally, this approach allows for a more tailored indoor climate adjustment to better suit the needs of the users/tenants. There is a risk that a too narrowed focus on tighter and more energy-efficient buildings can have a negative impact on the thermal comfort in the building. Energy-saving measures should not be carried out at the expense of the quality of the indoor climate. With quality-assured operation and maintenance work, many of the deficiencies noted during inspections can be detected and addressed in advance. These deficiencies often lead to poorer indoor environments. Therefore, there should be a plan for operation and maintenance, along with clear checklists for inspections to ensure that ongoing work functions properly. Inadequate instructions for operation and maintenance increase the risk of components not being replaced on time, necessary adjustments being neglected, and it is becoming more difficult to rectify operational disruptions and faults.

Nordic Ecolabelling sets a requirement that focuses on monitoring and maintenance to ensure thermal comfort across the whole year. While operational optimization may be a singular task in some cases, adopting a climate and health-centric approach, necessitates its continual work.[40] Some checks must be conducted daily, while others occur annually or in relation to changed activities. The sooner deviations are addressed, the less energy is consumed and the better thermal comfort. The aim is to ensure a good indoor environment with good thermal comfort, and to avoid excessive energy consumption. Moreover, the

[36] Klimatstegen vers 1.0, Del-3-Klimatnyckeltalen-fakta-Klimatstegen-vers-1.0-230127.pdf (svensk-energiutbildning.se)
[37] Warfvinge, Wahlström, Klimatstegen för drift och förvaltning av befintliga byggnader, E2B2, 2022. Klimatstegen (e2b2.se)
[38] Martinac, et al., Brukaranpassad, hållbar byggnadsdrift med fokus på inneklimat och energiprestanda i kontorsbyggnader – en kunskapssyntes, 2017. sbuf_13293_slutrapport_brukaranpassad_haallbar_byggnadsdrift_med_fokus_pa_inneklimat_och_energiprestanda_i_kontorsbyggnader.pdf (e2b2.se)
[39] Kempe, Vidareutveckling av metoder för idrifttagning och driftuppföljning av installationssystem i flerbostadshus, 2014. Mall BeBo (bebostad.se)
[40] Warfvinge, Wahlström, Klimatstegen för drift och förvaltning av befintliga byggnader, E2B2, 2022. Klimatstegen (e2b2.se)

requirement wants to contribute to the circular economy by prolonging the lifetime of the systems by promoting good maintenance routines.

Background to requirement O21 Radon

Long-term exposure to radon gas can cause lung cancer.[41] The risk of lung cancer increases with prolonged exposure and particularly in combination with smoking. Radon gas in the air inside buildings can have several causes, including air permeability in the building envelope, emissions from building materials and radon from tap water. The annual average concentration inside a building also depends on users/tenants habits, for example ventilation settings and how often rooms are aired. Radon can be a problem in newly constructed buildings since the gas can come from the ground and it can create a problem if the ventilation system is not operated properly. Further, it is only recommendations on how often measurements should be carried out.[42]

In 2009, WHO and the Nordic radiation safety authorities published recommendations for radon concentrations in buildings to be below 100 Bq/m^3. Under Danish law, radon concentrations in homes in all new-build projects after 2010 must be below 100 Bq/m^3. In existing buildings, simple and cheap improvements should be implemented if radon concentrations are between 100 Bq/m^3 and 200 Bq/m^3, and more effective improvements should be implemented if the radon concentration exceeds 200 Bq/m^3 (BR15). This is the most stringent Nordic legislation and Nordic Ecolabelling is aware that this level will appear very ambitious in some other countries. It is therefore accepted that the countries have different construction and building traditions and that national laws, practices and levels of ambition also vary.

The purpose of the requirement is to ensure a very low radon level in buildings where the operations and maintenance service is Nordic Swan Ecolabelled. Measurements of radon in the indoor air are the preferred basis of the risk evaluation, but have seasonal constraints tied to them.

The radon concentration must be measured during the heating season. Natural ventilation creates negative pressure which draws ground-level air into the building. Natural ventilation is less efficient when there is little difference between the indoor and outdoor temperature. Radon concentrations must also be measured in buildings with mechanical ventilation during the heating season. Short-term measurements are advisory in nature and are not accepted as fulfilment of the requirement. National regulations and guidelines should be followed for measurement methods, number of measurement points, location of meters and so on.

The limit levels for annual average radon concentration are based on national recommendations in each country. No requirement exists for Iceland due to the low radon risk. This is due to the Icelandic bedrock, which contain minimal uranium, resulting in a significantly lower radon risk in the country.

[41] World Health Organization, 2023. Radon (who.int)
[42] Vad finns det för krav på mätning av radon i min bostad? - Strålsäkerhetsmyndigheten (stralsakerhetsmyndigheten.se)

Background to requirement O22 Legionella

Legionella is a bacterium that naturally occurs in water.[43] In the tap water systems in buildings, it can proliferate under favourable conditions, spread, and cause Legionnaires' disease, which is a type of pneumonia. Legionnaires' disease is particularly severe as it affects people with weakened immune systems, with mortality rates of up to 20 %. People become infected by inhaling small water droplets (aerosols) containing the legionella bacterium, for example, in showers or bubble baths. Legionella can also occur in humidification systems and parts of cooling water systems. Drinking water containing the legionella bacterium is not considered dangerous.

Legionella bacteria multiply at water temperatures between 20°C and 45°C, most rapidly between 35°C and 40°C, and where the water remains stagnant for extended periods.[44] Bacteria are killed at higher temperatures.

The Legionella problem is recognized in all Nordic countries. Despite knowledge of both the spread and methods to control the legionella bacterium, disease outbreaks and deaths are not decreasing at the desired rate.[45] One reason may be that, during building operation, the hot water temperature is lowered to save energy.[46]

For most operations and buildings, legionella growth is prevented by ensuring that the hot water temperature is sufficiently high in both the tap water system and in the hot water tank with stagnant water. And by ensuring that cold water is not inadvertently heated.

An Icelandic company seeking certification is required to contact the Nordic Swan Ecolabel to agree on an acceptable energy level or protocol to fulfil this requirement. This is due to that Iceland has not participated in the development of the criteria. When available, the levels will be implemented in the criteria to make it accessible to everyone.

2.7 Water

Background to requirement O23 Water metering

While clean water is not currently a scarce resource in the Nordic countries, it remains a vital and finite resource that must be used carefully due to its essential role in sustaining life.[47] Additionally, the environmental impact of clean water usage underscores the importance of its wise and efficient utilization.

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[43] Folkhälsomyndigheten, Legionella i miljön – en kunskapssammanställning om hantering av smittrisker, 2022. Legionella i miljön – en kunskapssammanställning om hantering av smittrisker — Folkhälsomyndigheten (folkhalsomyndigheten.se)
[44] Managing legionella in hot and cold water systems (hse.gov.uk)
[45] Andersson, Schönning, Legionella – sjukdomsförekomst och europeisk utblick, Folkhälsomyndigheten, 2023. http://www.stoppalegionella.se/download/27-23FC4CBA066F390A8CC729C7592B6EE8/Legionella--sjukdomsforekomst-och-europeisk-utblick--Caroline-Schonning-Folkhalsomyndigheten-.pdf
[46] Klimatstegen vers 1.0, Del-3-Klimatnyckeltalen-fakta-Klimatstegen-vers-1.0-230127.pdf (svensk-energiutbildning.se)
[47] European Environment Agency, Water resources across Europe – confronting water scarcity and drought, 2009. Water resources across Europe — confronting water scarcity and drought (europa.eu)

Not all existing buildings have implemented measures to reduce the water consumption, and not all have meters to monitor consumption.[48] It is common for multiple buildings to share the same meter within the same property, making it challenging to pinpoint leakages. Having submeters for each individual building is important to monitor water usage. Submeters provide a more precise and accurate measurement of water consumption at the individual building level. This accuracy is crucial for identifying specific patterns, detecting leaks, and optimizing water use. With submeters, it becomes easier to identify and locate leaks within a specific building. Rapid detection of leaks allows for prompt repairs, minimizing water wastage and potential damage to the building.

Monitoring water consumption at the building level also helps in understanding usage patterns and optimizing water management strategies. This information is valuable for implementing water-saving measures and promoting sustainable practices. Submeters allow for evaluating of the water performance of each building independently. This information can be used to set targets, measure improvements over time, and implement targeted conservation measures. Within a Nordic Swan Ecolabelled Building operations, it is essential for all users/tenants, whether in residential or commercial units, to receive information about the water consumption of the building. The actions of users/tenants play a crucial role in influencing the water consumption. Their awareness and cooperation contribute to overall water conservation.

Background to requirement O24 Water - continuous operation optimisation

While clean water is not currently a scarce resource in the Nordic countries, it remains a vital and finite resource that must be used carefully due to its essential role in sustaining life.[49] Additionally, the environmental impact of clean water usage underscores the importance of its wise and efficient utilization.

Building-specific procedures for ongoing operational optimization are crucial to ensure water efficiency. Each building has unique characteristics, usage patterns, and water profiles. Building-specific procedures allow for a customized approach to optimizing operations based on the specific needs and features of the structure. By having building-specific procedures, it becomes easier to identify specific areas and systems that offer opportunities for water efficiency improvements. Ongoing operational optimization involves real-time monitoring of water usage and system performance. Building-specific routines facilitate the implementation of monitoring systems tailored to the building's characteristics, enabling prompt identification and correction of inefficiencies.

A responsible person for the continuous operation is important to ensure that the work is continuously performed. In another case, it's easy for the issue to fall through the cracks, and the environmental effects may be lacking.

[48] Warfvinge, Wahlström, Klimatstegen för drift och förvaltning av befintliga byggnader, E2B2, 2022. Klimatstegen (e2b2.se)
[49] European Environment Agency, Water resources across Europe – confronting water scarcity and drought, 2009. Water resources across Europe — confronting water scarcity and drought (europa.eu)

Background to requirement O25 Purchasing of sanitary tapware

Energy and water classification of household appliances and professional kitchen appliances is an important tool for reducing water and energy use during the use phase of the building. However, it is important that well-functioning equipment are not changed until it is needed to ensure resource efficiency both in terms of raw material and waste. Therefore, this requirement only applies to new purchases. The purpose is to reduce water and energy use by either selecting energy efficient taps or taps with a limited water flow. Touchless taps save both energy and water primarily in educational and office buildings, by ensuring that taps are never left on. Relevant water flows are defined according to the technical specifications for water appliances and should follow the EU Taxonomy Appendix E, Annex 1 to the Commission Delegated Regulation (EU) 2021/2139. However, for dual-flush toilets a small flush of 3 litres is accepted, hence this requirement does not cover the "average flush" according to the Taxonomy. This allowance is made due to the challenge posed by the fact that older pipes may not be sized to accommodate small water volumes, potentially causing significant issues for piping installations in existing buildings.

Background to requirement O26 Water saving technologies and measures

Water-saving technologies are crucial for promoting effective water management and contributing to climate change mitigation by reducing the energy demands associated with water treatment and distribution. To advance the adoption of these technologies, the Nordic Swan Ecolabel has integrated specific measures that must be implemented within one year from the application date. This requirement allows for a one-year overlap since it has a slightly lower RPS and provides flexibility for financial investments. If any of the conditions are already met at the time of application, the requirement is considered fulfilled, and no further action is required.

One addition is the installation of a system capable of identifying normal water usage patterns and promptly detecting any leakages. This proactive approach empowers building operations to swiftly rectify errors within the system, enhancing overall efficiency. Reuse of rainwater has also been added to the requirement to lower the need for tap water for toilet flushing. There are instances where water savings have exceeded 50 percent of total water consumption in offices by using rainwater for toilet flushing instead of drinking water. [50] [51]

The installation of water-efficient nozzles has been included, encouraging the optimization of existing equipment. This measure promotes resource efficiency, ensuring that water is used judiciously and in line with sustainable practices. Conducting a water mapping is not only a step towards environmental sustainability but also an investment in the building's long-term success and resilience. This process offers a detailed overview of water usage and misuse within the building. By identifying inefficiencies and unnecessary consumption, the building can reduce its environmental impact and achieve significant cost savings. Examples of measures from a water mapping could be installation of water-saving nozzles on faucets and taps, replacement of water-efficient faucets

[50] Guide för användning av regn- och dagvatten i fastigheter (vasyd.se)
[51] Inspirationsguide-regnvatten-230704.pdf (vasyd.se)

and taps, insulation of hot and cold water pipes (reduces flushing of heated cold water and cold hot water), reducing the flush volume in toilets, introducing metering and billing for each tenant's water usage, providing users with information on behaviour and water usage, and installation of systems that continuously display users' water usage.

2.8 Recycling, reuse and waste management

Background to requirement O27 Information to users/tenants and possibility of sorting at source

By promoting recycling, reuse, and following waste disposal guidelines, users/tenants contribute to reducing the overall environmental impact associated with waste generation. User participation is crucial for effective waste management since the actions of users/tenants play a crucial role in influencing the waste generation. The licensee can affect the users/tenants' behaviours by information, facilitating the right actions, and putting the issue on the agenda. Various types of buildings face challenges in offering recycling options, as the building's initial design may constrain sorting possibilities. Additionally, the location of buildings in areas with municipal waste management restrictions can further limit waste fraction management. Textile waste are not covered by the requirement since it is covered by law and are handled differently in different municipalities and the different countries.

Background to requirement O28 Promotion of repair and reuse for users/tenants

Promoting repair and reuse is a crucial aspect of responsible building operations. Repair and reuse contribute to resource conservation by extending the lifespan of products and materials. This helps reduce the demand for new resources, promoting a more sustainable and circular economy. Encouraging users/tenants to repair and reuse items helps minimize waste generation. It redirects items away from incineration or landfills, reducing the environmental impact associated with waste disposal. Further, repairing, and reusing items result in lower environmental impact compared to the production of new goods. For users/tenants, engaging in repair and reuse practices can lead to a mindset shift encouraging them to be more mindful of their consumption habits. It contributes to an educational aspect of sustainable living. To promote the adoption of such incentives, the Nordic Swan Ecolabel has incorporated specific measures that facilitate users/tenants in making environmentally responsible choices.

Background to requirement O29 Promotion of repair and reuse in relation to building improvements and tenant adaptations

Incorporating repair and reuse practices in minor renovations and tenant adaptations supports the principles of resource efficiency, waste reduction, and sustainable building practices. Repairing and reusing materials both reduce the demand for new resources and minimize the generation of construction and demolition waste.

It is important to guide the users/tenants in the reuse of materials and components in relation to minor renovation and tenant adaptation through for

example to reuse and repair the things already in place. To promote the adoption of such incentives, the Nordic Swan Ecolabel has incorporated specific measures. These measures aim to help licensees establish effective routines for guiding users/tenants in making environmentally responsible choices, fostering a culture of resource conservation and waste reduction within the building community.

Nordic Ecolabelling acknowledges the challenge this requirement poses for residential buildings. This requirement is more applicable to other buildings where operations are managed directly by the building owner or where the building operation contractor can provide support for building improvements and tenant adaptations. Due to the lack of steerability, Nordic Ecolabelling has decided to exempt residential buildings from this requirement.

2.9 Outdoor environment and biodiversity

Background to requirement O30 Outdoor area

Biodiversity deteriorates rapidly, and changes in land use result in limited habitats, overexploitation of plants and animals, climate change, pollution and foreign, invasive species.[52] The UN's Sustainable Development Goal 15.5 deals specifically with biological diversity and states that the world must reduce the deterioration of habitats, stop the loss of biodiversity, and prevent the extinction of endangered species.[53]

While both pesticides and herbicides are used to manage unwanted organisms, pesticides target a broader range of pests, including insects (insecticides), rodents (rodenticides), and fungi (fungicides), while herbicides specifically target unwanted plants or weeds.[54,55,56] Historically, several toxic agents have been used, but the industry has developed, and herbicides now degrade more quickly and do not have long-term effects on the environment. Nevertheless, several herbicides and pesticides can have negative effects on the environment, and it is unclear how their use over time will affect different ecosystems. Nordic Ecolabelling therefore prohibits the use of herbicides since weeds can be easily removed mechanically without the use of chemicals. The use of pesticides is sometimes necessary for pest and vermin control and cannot be completely banned. However, other alternatives, such as mechanical or biological treatments, should be tested first before resorting to pesticides. If it is considered necessary to use insecticides/fungicides/rodenticides, this must then be carried out by licensed professionals (trained pest controllers).[57] In Sweden it is Jordbruksverket that issues licenses.

Foreign invasive species are one of the five biggest causes of biodiversity loss.[58] Nordic Ecolabelling therefore wants these species to be removed, and if they return, they must be removed again. In this way, the species are controlled.

[52] Biodiversity — European Environment Agency (europa.eu)
[53] Goal 15 | Department of Economic and Social Affairs (un.org)
[54] Förordning - 528/2012 - EN - EUR-Lex (europa.eu)
[55] CCOHS: Pesticides - General
[56] Chemical safety: Pesticides (who.int)
[57] Requirements for approved training and equipment - Jordbruksverket.se
[58] Biodiversity: new IPBES report finds invasive alien species a growing and costly threat worldwide - European Commission (europa.eu)

Removing these species in favour of local species is good for biodiversity. Objectives to prevent the spread and removal of invasive foreign species are found both in the UN's Sustainable Development Goals and under the UN Convention on Biological Diversity. These are plant and animal species that can change the living conditions of species that are found naturally in one place or displace the local species. They can crossbreed with local species, and they can carry diseases. Many alien species of trees and ornamental plants have been imported for horticulture, and have since spread with the wind, with animals or via garden waste. The species that are most at risk of spreading and damaging biodiversity are usually banned from being imported and traded today but are still found in many gardens and parks. It is not illegal to keep them, but you have a duty to prevent them from spreading. The way that this is followed up varies greatly.

Features of high natural value, such as old trees and watercourses, should be preserved and maintained. In some cases, they are mapped by the municipality because they are protected by law. This applies, for example, to old oaks. Nevertheless, the degree of mapping varies between municipalities. There are also features of high value that are not legally protected, including other large trees, such as beech and birch. Nordic Ecolabelling wants the building operator to take responsibility and ensure that trees that are over 50 years old and natural watercourses are protected as far as possible.

2.10 Services and products in daily operations, maintenance and building improvements

Background to requirement O31 Cleaning products and services

A significant number of chemical products are used in the daily cleaning of buildings, exposing both workers and tenants to these chemicals regularly.

Nordic Ecolabelling requires the company to use a Nordic Swan Ecolabelled cleaning service, if an external cleaning service is going to be used. This is because a Nordic Swan Ecolabelled cleaning service uses chemicals that meet strict chemical and health requirements, and a large proportion of them are ecolabelled. They also minimize the use of unnecessary chemicals, and the staff is trained in both the environment and cleaning methods. Choosing an ecolabelled cleaning has also an impact on the energy used since it minimizes the environmental impact from transport. Besides, it has a quality system that ensures a high-quality cleaning.

Nordic Ecolabelling requires that, if the company does not use an external cleaning service, all of the products used for the general cleaning are ecolabelled certified. This is to ensure the use of products among the best in terms of environmental profile, where the whole life cycle of the product is considered, and strict requirements are set concerning the environment and health effects of the constituent substances. The environmental requirements include strict requirements as to the content of environmentally harmful substances and substances not readily degradable in aquatic environments.

The overview of all the chemicals used by the company is demanded to guarantee that there is control over the chemicals used and to ensure that chemicals that do not meet Nordic Ecolabelling's requirements are not used.

An Icelandic company seeking certification is required to contact the Nordic Swan Ecolabel to agree on an acceptable level to fulfil this requirement. This is due to that Iceland has not participated in the development of the criteria. When available, the levels will be implemented in the criteria to make it accessible to everyone.

Background to requirement O32 Ecolabelled products

Construction materials and chemical products have been shown to contribute to environmental impacts such as energy and resource consumption, undesirable chemical risks, and negative effects on biodiversity. The building materials represent an increasingly larger share of the environmental burden. The criteria for ecolabelled construction materials and chemical products set requirements for environmental parameters throughout the product's life cycle, having a relevant environmental impact that can be reduced and documented in relation to ecolabelling. There is a big potential in using construction materials and chemical products with a reduced environmental impact.

All production and products, whether ecolabelled or not, have an impact on the environment, and therefore Nordic Ecolabelling allow the use of reused products as an alternative to ecolabelled products in this requirement. Per definition only floors, building panels, kitchens, and playgrounds can be reused from the specified list. This limits the risk of harmful substances due to the limited number of products covered.

Construction materials and chemical products are available in all Nordic markets and in order to make a difference, it is important that a Nordic Swan Building operations uses building materials and chemical products with a reduced environmental impact.

Some product categories are exempted to be fulfilled in Finland, because the availability of these products in the finish market is less than 80 % of what is found in the rest of the Nordic countries.

Background to requirement O33 PVC in floors, ceilings, walls, doors and windows

PVC (polyvinyl chloride) is one of the most widely used thermoplastic material. PVC is normally divided into two different categories due to its physical properties: rigid (hard) and soft PVC.[59]

The environmental impact of PVC is associated primarily with emissions of harmful organic chemicals from the entire production chain, potential use of harmful additives and challenges associated with its waste management. There is a development towards products and production less harmful to the environment and health, where the EU has gone a long way, however, in other parts of the world the development is slower.

[59] PVC (nordic-swan-ecolabel.org)

This requirement covers interior doors and surface layers on floors, ceilings and walls including both PVC and PVDC as a material or component. The latter may involve cork flooring coated with a thin outer layer of PVC or textile flooring with a PVC backing.

In general Nordic Ecolabelling restricts PVC in products where there are better environmental alternatives fulfilling the same function. Nordic Ecolabelling has traditionally been taking a restrictive position in relation to PVC due to emissions of harmful organic chemicals from manufacturing and waste management, as well as emissions of potential endocrine disrupters such as phthalates in the use stage. It is worth noticing that PVC products today can be produced in a much more circular way as additives such as phthalates and lead/cadmium-based stabilisers can be replaced by non-hazardous alternatives. Issues associated with PVC products end-of-use are being addressed, as both techniques to safely incinerate PVC waste and handle neutralisation residues in a responsible manner exist, while take-back, collection, identification, and separation processes to increase the amount of PVC which is recycled, already exist or are being developed. It will however require a relatively extensive list of requirements to regulate the PVC used in buildings according to this. Nordic Ecolabelling will follow the development closely but does not currently see the possibility of allowing PVC more generally without overcomplicating the criteria. Exemptions are made for areas or surfaces with specific needs for high durability or slip resistance (related to working environment legislation) and for smaller details.

Background to requirement O34 Copper

Sheet metal on the outside of buildings (roofs and facades) and contact cables for the railway, made of copper, are relatively large sources of copper spreading into the environment. The primary recipients of the copper differ. A predominant percentage (60–80%) of the copper entering the treatment plants originates from tap water pipes in properties.

A large part of the copper that reaches the treatment plants via wastewater ends up in the sludge. Unfortunately, the general positive trend for reduced levels of metals in the sludge does not apply to copper and zinc. One reason is that copper is largely built into the infrastructure and it is therefore not as easy to reduce the supply of copper as it is for other metals that should be reduced in the cycle. The Swedish Environmental Protection Agency states that the copper levels found in arable land do not show negative microbiological effects, but that the margin is small. Both the background content of copper and local factors varies across the country. To provide general protection against the effects of copper, it is therefore justified to have stricter requirements regarding copper for the return of sludge. The Swedish Environmental Protection Agency further states that the supply of copper must specifically be reduced for sludge to be recycled in a manner that is sustainable in the long term. This is important as increased recycling of phosphorus from sludge is desirable from a resource efficiency and recycling point of view. This is the primary reason why Nordic Ecolabelling wants to limit copper as a material in tap water pipes and as a roof and facade material.

A study carried out by SYKES[60] on behalf of the Finnish Ministry of Employment and Economic Affairs concludes that the negative effects of the supply of copper to the environment through sludge returned to agricultural land are not a general Nordic problem. This is correct. However, the problem is not limited to the Stockholm area, which is incorrectly pointed out in the investigation. On the contrary, copper is a limiting factor for returning sludge to arable land in large parts of Sweden. Nordic Ecolabelling has concluded that it is not relevant to write geographically adapted requirements. Therefore, a general Nordic restriction requirement remains in the criteria. However, protected buildings and buildings worthy of preservation that have copper roof or façade can apply for an exemption for the requirement if they can prove that these building parts are specifically protected. This is because protected buildings and buildings worthy of preservation often have limited flexibility in modifying their roofs and façades.

Background to requirement O35 Prohibited and restricted tree species

A number of tree species are restricted or not permitted for use in Nordic Swan Ecolabelled buildings. The requirement applies only to virgin forest tree species and not tree species defined as recycled material according to ISO 14021. The list of restricted tree species is based on the wood species that are relevant to Nordic Ecolabelling's criteria, i.e., tree species that have the potential to be included in Nordic Swan Ecolabelled products. Listed tree species are indicated by the

[60] Jyrki Laitinen and Riikka Malila, Finish Environment Institute, Sustainable Water Management, Assessment of pipe material used in buildings, Carbon footprint and health and toxicity effects, November 2020.

scientific name and the most common trade names. The criteria for tree species found in the list relate to wood originating from:

- Tree species listed on CITES32 Appendices I, II and III.
- IUCN red list 33, categorised as critically endangered (CR), endangered (EN) and vulnerable (VU).
- Regnskogsfondet34 (Rainforest Foundation Norway) tree list
- Siberian larch (originating in forests outside the EU)

Many of the tree species on the list are grown in countries which still have large areas of Intact Forest Landscapes (IFLs). Protecting these is important for biodiversity and climate. Many of these countries also have a high risk of corruption and the national legislation related to the environment, human rights and land ownership are weak and/or not controlled by the authorities. There are different views on whether certification is good enough to meet the challenges of forest management in countries with a high risk of corruption and illegal logging. Due to the uncertainty about whether FSC and PEFC certification systems are good enough in protecting important areas of biodiversity and ethical aspects such as human rights and land ownership in areas with a high risk of corruption, Nordic Ecolabelling takes a precautionary approach and wants further documentation about the tree species and its origin. Nordic Swan Ecolabelling is aware that tree species originating from b, c or d can originate from legal and sustainable forestry. Therefore, it is possible to use tree species listed in b, c or d if the applicant/manufacturer/supplier can demonstrate compliance with a number of strict requirements regarding certification and traceability.

Background to requirement O36 Wood and bamboo

Wood is a key resource for sustainable development. The forest provides many ecosystem services and is also very important in relation to global climate change. The intention behind the requirement is to ensure that all purchased wood raw materials, such as solid wood and wood-based panels, required for daily maintenance work come from responsibly managed forests. FSC[61] and PEFC[62] certification systems enable businesses and consumers to choose wood-based products that support responsible forestry.

The applicant must have routines in place for the purchasing and documentation of wood- and bamboo raw materials to ensure that all purchased materials are FSC or PEFC certified. The purchase shall be documented through invoices/delivery notes from suppliers which prove that the wood raw material is certified e.g., name of tree species, license/CoC code, FSC/PEFC claim and quantities of wood. Pictures of product packaging with a clear FSC/PEFC logo can also be included in the documentation.

Background to requirement O37 Procurement procedures

The requirement is intended to ensure fulfilment of the chemicals and materials during the whole validation period and between the different parties involved in operations and maintenance work. It is important that the company has good purchasing procedures in place and a person who is responsible for purchasing

[61] https://fsc.org/en
[62] https://www.pefc.org/

chemicals, materials, and services, to ensure that only approved ones are purchased, in order to comply with all the chemical, material and service requirements throughout the validity period of the license.

In some cases, the responsibility for purchasing does not lie with the applicant. This was one of the difficulties founded during the pre-study and this has also been a concern for different stakeholders and future license holders. The Nordic Swan Ecolabel cannot enforce the fulfilment of requirements by private parties that are not contracting the certification. Section B has been added to the requirement, to deal with this situation, ensuring the guide and promotion of better purchases for the environment and health. This option will only be used when applicable, e.g. in apartment buildings with housing cooperative, where the apartments are owned by private users. In this case the building operator do not have the authorization to make any changes inside the apartments (only in common rooms), and the responsibility of purchases for the apartments lies within the owner of the apartment. In those cases, it is mandatory for the licensee to provide the private users with an informative protocol with the purpose to guide them and promote the best practise in accordance with the Nordic Swan criteria. However, it is important to note that the private users of the building are not obligated to fulfil requirements O31 to O37.

3 Environmental impact of the Nordic Swan Ecolabel Building operations

The relevant environmental impacts found in the life cycle of Nordic Swan Ecolabel Building operations are set out in a MECO scheme. A MECO describes the key areas that have an 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).

Building Operations	Operation (monitoring, follow-ups, quickly correcting errors, preventive rounds, adaptation to current users, etc)	Maintenance (management of purchases, maintenance plan, reparation)	Change (minor renovation, adaptation to tenants/users)
Material	Management of purchases (chemical products, installations etc.)	Management of purchases (chemical products, installations etc.)	Installations (ventilation, heating, cooling, water supply systems, sewage) Focus on not harmful materials (see renovation criteria)
Energy	Energy consumption - efficient energy use (heating/cooling/ventilation) Energy from energy intensive equipment Refrigerant leakage	Maintenance of buildings "envelope" (windows, doors, insulation, installation systems for ex. energy efficient)	Change of buildings "envelope" (windows, doors, insulation, installation systems for ex. energy efficiency)
Chemicals	Cleaning Management of purchases (chemical products, installations etc.)	Painting Cleaning/monitoring of installations (ventilation, heating, cooling, water supply systems, sewage) Floor treatment PCB Asbestos	Adaptation to users/tenants PCB Asbestos
Other	Water use Waste from users: Quantity and sorting, minimizing waste Indoor climate (air quality, Thermal comfort, comfort and health aspects, legionella) (Mold/moisture) Canteens	Maintenance plan Climate adaption Mold/moisture Radon	Circular economy: minimizing waste in relation to building improvements and tenant adaptations (take care of what you have)

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 high RPS, since there is potential to achieve positive environmental gains.

Area	R, P, S level (high, medium or low)	Comments
Energy consumption	R: High P: High S: Medium	The relevance regarding energy is high for the building operations since buildings account for a significant portion of society's energy consumption.[63] Having a building which uses less energy or is operated in an optimal way ensures a reduced environmental impact. Approximately 97 % of the existing building stock (area coverage in Sweden) is not in need of a larger renovation but can still lower the environmental impact by having control over the condition of the building and its installations and having control over how it is operated and managed. [64] Energy consumption in buildings encompasses heating, cooling, ventilation, and hot water, among other factors. Strategies to control energy consumption include the use of energy meters, regular follow-ups, energy audits, and maintenance plans. However, due to the unique conditions of each building, setting specific energy consumption targets or prescribing maintenance measures such as window replacements or additional insulation presents challenges. This results in a medium level of steerability.
Climate change	R: High P: High S: High	Changes in the future climate are a fact and to ensure that existing buildings will be able to withstand for example higher temperatures measures are needed. Because of this, both the relevance and potential are considered high.[65] [66] However, given the unique circumstances of individual buildings, including their location and condition, the feasibility of implementing standardized measures is limited. Instead, emphasis should be placed on conducting thorough risk assessments and implementing adaptive strategies to mitigate these risks.[67]
Indoor environment	R: High P: Medium S: Medium	The indoor environment, such as air quality and thermal comfort, in a building is crucial for the well-being of the users/tenants and reflects the overall quality function of the building. Maintaining or establishing a high-quality indoor environment is crucial to sustaining the building's intended purpose, making its relevance high.[68] A Nordic Swan Ecolabelled Building operations must encompass measures to guarantee optimal thermal comfort and air quality while also ensuring the absence of harmful elements such as mould, hazardous substances, radon, or legionella for users/tenants' well-being. However, each individual building possesses unique characteristics, which makes the potential and steerability for an ecolabel in this area considered to be medium.
Water consumption	R: Medium P: Medium S: High	Water consumption from existing buildings holds medium relevance in the Nordic countries.[69] While clean water is not currently a scarce resource in this region, it remains a vital and finite resource that must be used carefully due to its essential role in sustaining life. Additionally, the environmental impact of clean water usage underscores the importance of its wise and efficient utilization. There is a medium potential to lower the water use in a

[63] Utsläpp av växthusgaser från bygg- och fastighetssektorn - Boverket
[64] Warfvinge, Wahlström, Klimatstegen för drift och förvaltning av befintliga byggnader, E2B2, 2022. Klimatstegen (e2b2.se)
[65] IPCC — Intergovernmental Panel on Climate Change
[66] Klimatanpassning i planeringen - Boverket
[67] Directorate-General for Climate Action (European Commission), EU-level technical guidance on adapting buildings to climate change, 2023. EU-level technical guidance on adapting buildings to climate change - Publications Office of the EU (europa.eu)
[68] Warfvinge, Wahlström, Klimatstegen för drift och förvaltning av befintliga byggnader, E2B2, 2022. Klimatstegen (e2b2.se)
[69] European Environment Agency, Water resources across Europe – confronting water scarcity and drought, 2009. Water resources across Europe — confronting water scarcity and drought (europa.eu)

		building today. Not all existing buildings have implemented measures to reduce the water consumption, and not all have meters to monitor consumption.[70] There are several techniques and systems that enable a lower water consumption in the market and the steerability is therefore considered high.
Waste from users/tenants of the building	R: High P: Medium S: Low	Waste has a significant impact on the environment and it is important that as much waste as possible can be minimized, reused or recycled.[71] While many existing buildings already implement some form of waste sorting for material recycling, there is still room for improvement in waste minimization efforts. Consequently, the potential for improvement is deemed medium. The ability to steer waste management practices is limited due to the fact that building users/tenants generate the waste. However, building operations can incentivize users/tenants and facilitate proper waste disposal practices. Nonetheless, establishing absolute requirements poses challenges because waste generation can vary significantly based on the building's usage. This variability makes direct comparisons between different building types challenging.
Outdoor environment and biodiversity	R: Low to medium P: Low to medium S: High	The importance of the outdoor environment of a building can vary depending on the size of the outdoor area which makes the relevance and potential considered to be low to medium.[72] Nevertheless, the steerability is high, and buildings with an outdoor area can with relatively simple measures, ensure that the garden's biodiversity is improved by for example avoiding the use of herbicides.
Purchasing of products	R: Medium P: Medium S: Medium	Products such as for example cleaning products and paints are used more or less frequently within the operation of a building which makes the environmental and health relevance considered to be medium. The variety of products in the market is large, and the potential lies in, when in need of purchasing new products, only buying ecolabelled products to ensure products that have been controlled in terms of environmental issues. Although more and more Ecolabelled options are coming onto the market, the steerability is rated medium, since there might be areas where there might be a gap in Ecolabelled products.
Procurement of services	R: Medium P: Medium S: Medium	For certain buildings, such as for example office buildings, additional services are needed to ensure optimal functionality for the users/tenants. These services can have a notable environmental impact, and the relevance is therefore considered medium depending on the building. The potential lies in the selection of services with a lower environmental impact when the services are required. Not all buildings are in need of additional services and there might be areas where for example ecolabelled services are not available.
Refrigerants	R: High P: High S: 0 to low	Refrigerants are categorized into natural and synthetic types.[73] Natural refrigerants, such as propane, ammonia, and carbon dioxide, are characterized by their low Global Warming Potential (GWP) and absence of PFAS substances. However, they have historically been replaced by synthetic refrigerants, often called F-gases, due to lower safety risks related to flammability and toxicity. Today, the most commonly used refrigerants are synthetic, which, in case of leakage, break down into trifluoroacetic acid (TFA), PFAS-classified substances. Additionally, F-gases have significantly higher GWP compared to natural alternatives. Refrigerants are essential in all heating and cooling systems, and leakage is a known challenge.[74] Hence refigerants is a critical environmental issue with high relevance and potential. However, legal regulations govern annual reporting of refrigerant quantities added to systems, with penalties for non-compliance, ensuring robust enforcement. The selection of heating and cooling system, and the associated refrigerant, is determined during the building's design and construction phases. Retrofitting an existing system to accommodate a different refrigerant is often not possible, as it relies on the technology of the system.

[70] Warfvinge, Wahlström, Klimatstegen för drift och förvaltning av befintliga byggnader, E2B2, 2022. Klimatstegen (e2b2.se)
[71] Waste and recycling (europa.eu)
[72] Campell, Ojala. Building in biodiversity - For climate, for health - How can we best use the built environment as part of the ecological system?, Sweco Group, 2020. urban-insight-report_building-in-biodiversity_booklet.pdf (swecogroup.com)
[73] Köldmedier (skvp.se)
[74] Vagledning-vid-val-av-koldmedium.pdf (enrad.se)

		Consequently, changing the refrigerant typically necessitates a complete overhaul of the entire heating and cooling system. Due to this there is a very low steerability to require specific refrigerants during a buildings operational phase. During the operational phase, efforts should be on minimizing refrigerant leakage, which is effectively managed by existing regulations. Given the limitations of requiring refrigerant changes during operation, this is not currently part of the criteria. However, Nordic Ecolabelling will assess the potential for mandating natural refrigerants in future revisions.

4 Alignment with the EU Taxonomy framework

There are many uncertainties on how EU Taxonomy compliance can be documented as well as the interpretation. Therefore, Nordic Ecolabelling cannot guarantee EU taxonomy alignment through our criteria for Building operations.

Nordic Swan Ecolabel does not take any legal responsibility for the (degree of) alignment, nor can a building be claimed as taxonomy aligned based on the ecolabelling criteria.

The responsibility for documentation of EU taxonomy compliance solely belongs to the company that is claiming it.

This section describes how the Delegated Act on the objective climate change mitigation (Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021) is handled in these criteria for Building operations. From here on it will be referred to as "the EU Taxonomy".

The following table displays how Nordic Ecolabelling assume how the EU Taxonomy can be interpreted in relation to the criteria for Building operations. This assessment is done to the best of our knowledge and no responsibility is taken on these interpretations.

Nordic Ecolabelling closely follows interpretations of the EU Taxonomy criteria in both the Nordic countries and from the EU. In the end the interpretation is a task for national authorities or other officially appointed bodies.

The technical screening criteria for significant contribution to climate change mitigation and climate change adaptation and the Do No Significant Harm criteria are according to the internal assessment done by Nordic Ecolabelling and assumed to be handled in the following way (please note the disclaimer at the beginning of this section):

Technical screening and Do No Significant Harm criteria in the EU Taxonomy	Nordic Ecolabelling evaluation of the screening criteria compared to the Nordic Swan Ecolabel criteria for Building operations generation 1
7.3. Installation, maintenance, and repair of energy efficiency equipment (Annex I) The activity consists in one of the following individual measures provided that they comply with minimum requirements set for individual components and systems in the applicable national measures implementing Directive 2010/31/EU and, where applicable, are rated in the highest two populated classes of energy efficiency in accordance with Regulation (EU) 2017/1369 and delegated acts adopted under that Regulation: (a) addition of insulation to existing envelope components, such as external walls (including green walls), roofs (including green roofs), lofts, basements and ground floors (including	An evaluation has determined that it is not feasible as an ecolabel to mandate requirements for all equipment categories listed from a) to f) in the provided list. This decision stems from the recognition that not all buildings require upgrades to energy-efficient equipment at the time of application. However, under requirement "O8 – Energy action plan," buildings identified as needing to enhance their energy performance are obliged to implement specific measures based on an energy audit. These measures may align with the equipment categories

measures to ensure air-tightness, measures to reduce the effects of thermal bridges and scaffolding) and products for the application of the insulation to the building envelope (including mechanical fixings and adhesive); (b) replacement of existing windows with new energy efficient windows; (c) replacement of existing external doors with new energy efficient doors; (d) installation and replacement of energy efficient light sources; (e) installation, replacement, maintenance and repair of heating, ventilation and air-conditioning (HVAC) and water heating systems, including equipment related to district heating services, with highly efficient technologies; (f) installation of low water and energy using kitchen and sanitary water fittings which comply with technical specifications set out in Appendix E to this Annex and, in case of shower solutions, mixer showers, shower outlets and taps, have a max water flow of 6 L/min or less attested by an existing label in the Union market. **DNSH criteria in the EU Taxonomy** (2) Climate change: The activity complies with the criteria set out in Appendix A to this Annex. (5) Pollution prevention and control: Building components and materials comply with the criteria set out in Appendix C to this Annex. In case of addition of thermal insulation to an existing building envelope, a building survey is carried out in accordance with national law by a competent specialist with training in asbestos surveying. Any stripping of lagging that contains or is likely to contain asbestos, breaking or mechanical drilling or screwing or removal of insulation board, tiles and other asbestos containing materials is carried out by appropriately trained personnel, with health monitoring before, during and after the works, in accordance with national law.	outlined from a) to e) but are not controlled in the first generation of the criteria. Category f) is however addressed in greater detail within the requirements. The procurement of sanitary tapware is covered in " O25 – Purchasing of sanitary tapware". In the Nordic Swan Ecolabel criteria, the applicant must have routines to ensure that all newly installed sanitary water fittings including showers comply with the demanded levels. The applicant must have routines to ensure that documentation is collected from the producer/supplier. **DNSH criteria** (2) Covered by “O13 Risk analysis Climate change” and “O14 Adaptation to a changing climate”. See 7.7. Acquisition and ownership of buildings (Annex II) in this table. (5) Not covered in these criteria set since it relates to renovation of a building. See the criteria for the Nordic Swan Ecolabelled Renovation.
7.7 Acquisition and ownership of buildings (Annex II) The economic activity has implemented physical and non-physical solutions (‘adaptation solutions’) that substantially reduce the most important physical climate risks that are material to that activity. 2. The physical climate risks that are material to the activity have been identified from those listed in Appendix A to this Annex by performing a robust climate risk and vulnerability assessment with the following steps: (a) screening of the activity to identify which physical climate risks from the list in Appendix A to this Annex may affect the performance of the economic activity during its expected lifetime; (b) where the activity is assessed to be at risk from one or more of the physical climate risks listed in Appendix A to this Annex, a climate risk and vulnerability assessment to assess the materiality of the physical climate risks on the economic activity; (c) an assessment of adaptation solutions that can reduce the identified physical climate risk. The climate risk and vulnerability assessment is proportionate to the scale of the activity and its expected lifespan, such that: (a) for activities with an expected lifespan of less than 10 years, the assessment is performed, at least by using climate projections at the smallest appropriate scale; (b) for all other activities, the assessment is performed using the highest available resolution, state-of-the-art climate projections across the existing range of future scenarios	The requirements defined for climate change adaption are covered by the requirements for "O13 Risk analysis Climate change" and "O14 Adaptation to a changing climate". It is assessed that the documentation required to verify O13 and O14 can be used as documentation to verify taxonomy alignment. Please note that the building must also comply with the DNSH criteria. **DNSH criteria in the EU Taxonomy** (1) The primary energy demand of the building is restricted in requirement “O8 Energy action plan”. The requirement is divided into three, Section A, Section B1 and Section B2. If the building complies with the Section B1 of the requirement it is restricted in accordance with the DNSH criteria in the EU taxonomy, Energy Performance Certificate (EPC) class C. In conclusion, the documentation can be used to verify taxonomy alignment if the building also complies with Section B1 of O8.

consistent with the expected lifetime of the activity, including, at least, 10 to 30 year climate projections scenarios for major investments. 3. The climate projections and assessment of impacts are based on best practice and available guidance and take into account the state-of-the-art science for vulnerability and risk analysis and related methodologies in line with the most recent Intergovernmental Panel on Climate Change reports, scientific peer-reviewed publications and open source or paying models. 4. The adaptation solutions implemented: (a) do not adversely affect the adaptation efforts or the level of resilience to physical climate risks of other people, of nature, of cultural heritage, of assets and of other economic activities; (b) favour nature-based solutions or rely on blue or green infrastructure to the extent possible; (c) are consistent with local, sectoral, regional or national adaptation plans and strategies; (d) are monitored and measured against pre-defined indicators and remedial action is considered where those indicators are not met; (e) where the solution implemented is physical and consists in an activity for which technical screening criteria have been specified in this Annex, the solution complies with the do no significant harm technical screening criteria for that activity. **DNSH criteria in the EU Taxonomy** (1) Climate change mitigation The building is not dedicated to extraction, storage, transport or manufacture of fossil fuels. For buildings built before 31 December 2020, the building has at least an Energy Performance Certificate (EPC) class C. As an alternative, the building is within the top 30 % of the national or regional building stock expressed as operational Primary Energy Demand (PED) and demon tarted by adequate evidence, which at least compares the performance of the relevant asset to the performance of the national or regional stock built before 31 December 2020 and at least distinguishes between residential and non-residential buildings. For buildings built after 31 December 2020, the Primary Energy Demand (PED) (617) defining the energy performance of the building resulting from the construction does not exceed the threshold set for the nearly zero energy building (NZEB) requirements in national regulation implementing Directive 2010/31/EU. The energy performance is certified using an as built Energy Performance Certificate (EPC).	
3.5. Manufacture of energy efficiency equipment for buildings (Annex I) The economic activity manufactures one or more of the following products and their key components: (a) windows with U-value lower or equal to 1,0 W/m^{2}K; (b) doors with U-value lower or equal to 1,2 W/m^{2}K; (c) external wall systems with U-value lower or equal to 0,5 W/m^{2}K; (d) roofing systems with U-value lower or equal to 0,3 W/m^{2}K; (e) insulating products with a lambda value lower or equal to 0,06 W/mK; (f) household appliances falling into the highest two populated classes of energy efficiency in accordance with Regulation (EU) 2017/1369 of the European Parliament and of the Council (95) and delegated acts adopted under that Regulation; (g) light sources rated in the highest two populated classes of energy efficiency in accordance with Regulation	An evaluation has determined that it is not feasible as an ecolabel to mandate requirements for all equipment categories listed from a) to q) in the provided list. This decision stems from the recognition that not all buildings require all upgrades to energy-efficient equipment at the time of application. We prioritize overall building energy efficiency rather than prescribing specific techniques or measures. Therefore, while the criteria can be fulfilled using measures from the provided list, these are not obligatory within this set of criteria.

(EU) 2017/1369 and delegated acts adopted under that Regulation; (h) space heating and domestic hot water systems rated in the highest two populated classes of energy efficiency in accordance with Regulation (EU) 2017/1369 and delegated acts adopted under that Regulation; (i) cooling and ventilation systems rated in the highest two populated classes of energy efficiency in accordance with Regulation (EU) 2017/1369 and delegated acts adopted under that Regulation; (j) presence and daylight controls for lighting systems; (k) heat pumps compliant with the technical screening criteria set out in Section 4.16 of this Annex; (l) façade and roofing elements with a solar shading or solar control function, including those that support the growing of vegetation; (m) energy-efficient building automation and control systems for residential and non-residential buildings; (n) zoned thermostats and devices for the smart monitoring of the main electricity loads or heat loads for buildings, and sensoring equipment; (o) products for heat metering and thermostatic controls for individual homes connected to district heating systems, for individual flats connected to central heating systems serving a whole building, and for central heating systems; (p) district heating exchangers and substations compliant with the district heating/cooling distribution activity set out in Section 4.15 of this Annex; (q) products for smart monitoring and regulating of heating system, and sensoring equipment. **DNSH criteria in the EU Taxonomy** (2) Climate change: The activity complies with the criteria set out in Appendix A to this Annex. (3) Sustainable use and protection of water and marine resources: The activity complies with the criteria set out in Appendix B to this Annex. (4) Transition to a circular economy: The activity assesses the availability of and, where feasible, adopts techniques that support: (a) reuse and use of secondary raw materials and reused components in products manufactured; (b) design for high durability, recyclability, easy disassembly and adaptability of products manufactured; (c) waste management that prioritises recycling over disposal, in the manufacturing process; (d) information on and traceability of substances of concern throughout the life cycle of the manufactured products. (5) Pollution prevention and control: The activity complies with the criteria set out in Appendix C to this Annex. (6) Protection and restoration of biodiversity and ecosystems: The activity complies with the criteria set out in Appendix D to this Annex.	

5 Future criteria generation

In the next revision, the following areas will be investigated, with the focus on exploring to tighten or add requirements:

- Energy efficiency
- Circular economy
- Refrigerants
- Peak power demand