Chapter 24
Environmental Labels and Declarations

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Abstract Based on the terminology and structure developed by the International Organization for Standardization, a description is given on the types of ecolabels that build on life cycle assessments. Focus is on type I labels that point out products and services with an overall environmental preferability within a specific product category. Type I labels include official labels set up by government and international institutions. Examples are given on operation of labelling schemes, development and focus area for criteria that must be met to obtain a label, effects on environment and legislation of labelling, the use of ecolabels in marketing, and the way ecolabels help build a market for "greener products". Type III labels—or Environmental Product Declarations—are also briefly described with indicative examples from the building sector, a declaration for office furniture, and an introduction is given to the European Commission's programme for product—and organisational environmental footprints.

Learning Objectives
After studying this chapter, the reader should be able to:

- Explain the process of ecolabelling design and development
- Know the main types of environmental labelling as they are standardised by ISO
- Understand the purpose of ecolabels in communicating sustainability efforts
- Explain the main challenges in using ecolabelling for decision support
- Understand the extensive variety of environmental labelling schemes
- Understand the purpose and the importance of harmonising ecolabelling schemes.

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24.1 Introduction

Environmental labels and declarations are a form of sustainability performance measure. They provide information about certain environmental aspects of a product or service to non-environmental experts. The intention is to inform and influence consumer and professional purchasers to take into account such concerns when choosing between products and services. By changing their consumption patterns in favour of environmentally friendlier options consumers and professional purchasers can thus contribute to more sustainable consumption and support the goal of sustainable development (see Chap. 5).

Environmental labels have been developed since the 70s (first of them being the Blue Angel developed in 1978 by the German Federal Ministry of Interiors) due to a growing concern for the environment, both on government, business and consumer levels. But they evolved mostly after the late 80s and particularly after the '92 UN conference on environment and development when the adoption of the Agenda 21 put the target of sustainable development in the political dialogue globally (UN 1992; UNOPS 2009).

From a producer perspective, the growing environmental concern opened a new market opportunity and therefore the so-called "green marketing" emerged. This aimed to enhance company reputation to the consumers and show a responsible code of conduct by promoting products of presumable environmental superiority. To capitalise on environmentally friendlier practices companies used green claims, in many cases expressed in the form of some kind of product logo, declaration and labelling.

In the beginning, there were no standards or guidelines for developing and using such labels, which means that there was no credibility or validation of the claims. Thus, there was a risk for distorting the market and confusing the consumers if not misleading them, which is commonly referred to as "greenwashing". To tackle this challenge and provide an objective basis for verifying a company's claims about its product's performance, standardisation initiatives took place. Most significant is the development of the ISO 14000 family, which started already in 1991. The family contains more than 20 standards which are designed to guide a voluntary environmental management system (IISD 1996; ISO 2009). Additionally, since the 1990s governments in many countries have been introducing national or regional programmes or schemes for environmental labels. Labelling programmes have also been initiated by private companies and non-governmental organisations. The goal is to obtain environmental improvement by using market forces, and giving the consumers credible labels that point out products with a lower environmental burden.

Despite the existing efforts, at the UN summit in 2002, 10 years after the adoption of Agenda 21, a need was identified on a global scale to "develop and adopt, where appropriate, on a voluntary basis, effective, transparent, verifiable, non-misleading and non-discriminatory consumer information tools to provide

information relating to sustainable consumption and production" (UN 2002). Therefore, the purpose of this chapter is to outline different types of such tools and to present the benefits from and the barriers for their implementation.

24.2 Types of Labels

The private initiative "the Ecolabel Index" (www.ecolabelindex.com) has listed more than 400 different labels from 199 countries and 25 industry sectors. Some of these deal with single environmental issues, for example in relation to carbon emissions or water consumption. Single-issue labels can be used by a variety of sectors, e.g. a forest management label can be used for various wood-containing products. Single issues can also be sector specific like the organic cotton labels used in the textile industry, window energy rating schemes used in the building sector, or the dolphin-safe label specifically for tuna products. Other labels deal with multiple environmental issues. Such is the case of the EU and the Nordic ecolabels. These can be attributed to a broad range of products (cosmetics, white goods, windows, etc.). Multiple-issue labels can also be sector specific as seen in the case of electronic or ecotourism specific labels.

Regarding the organisations that administer the various labels there is regional variation and overlapping initiatives also occur. Taking the example of organic food, there are countries with comprehensive legislation and corresponding labelling such as the US, France, Canada, Denmark and Japan. EU has established related legislation and a label additionally to national schemes. In countries where a corresponding law is not in place, labelling is based on nonprofit organizations, private companies and others.

Beyond the environmental considerations there are also labels dealing with other dimensions of sustainability (see Chap. 5) touching upon ethics and social issues. For example the Coalition for Consumer Information on Cosmetics deals with animal testing while other labels certify wild life protection and animal welfare. Regarding human relations there are labels certifying fair trade conduct, fair labour practices, abolishment of child labour, socially responsible investing, just to name some examples.

While most labels are voluntary, in some cases, they can be *mandatory*. An example is the EU Energy label (regulated by the EU's Energy Labelling Directive) that shows the energy consumption efficiency of energy-related products such as white goods. Similar mandatory energy rating labels are found around the globe, e.g. in Australia and Singapore.

Figure 24.1 from Rubik and Frankl (2005) gives an overview of the different labelling types. It also indicates that consumers are exposed to a large number of different labels that follow different sustainability principles and meet different criteria. This variety in characterising products can be difficult to understand in the purchase situation. This chapter refers only to labels that deal with environmental issues and that are voluntary.

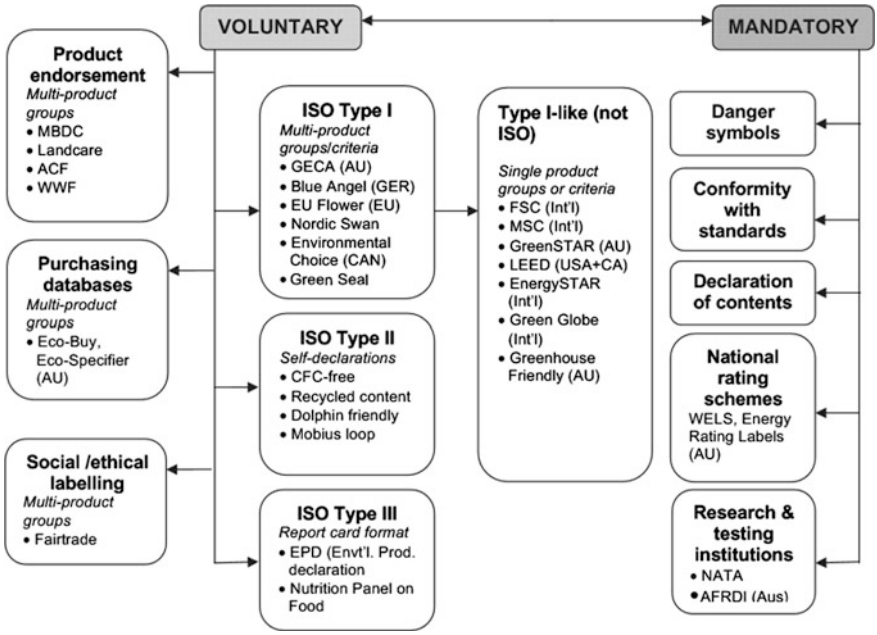


Fig. 24.1 Taxonomy of labels for communication of environmentally relevant information about products, adapted from Rubik and Frankl (2005)

24.2.1 ISO-Definitions

As discussed, to support voluntary initiatives the International Organization for Standardization (ISO) started a process of developing a set of rules and guidelines for different types of environmental labels. As part of the ISO 14000 series of environmental management standards, the ISO 14020 series defines three broad types of labels/declarations. Two of these ('Type I' and 'Type III') are life cycle based as part of the definition, whereas the last ('Type II') is not. Apart from these three types, ISO has also developed a general set of principles for labels that are neither of these types.

Type I Environmental Labelling (ISO 14024)
Type I environmental labels are defined as voluntary, multi-criteria-based and third party-verified labels that indicate an overall environmental preference in a life cycle perspective of a product or service within a specific product category (ISO 1999). This type of environmental label, or Ecolabel, is a tool to help the market stimulate continuous environmental improvements. All the label examples in Fig. 24.2 are Type I ecolabels.

Fig. 24.2 Examples of type I ecolabels (name, year of establishment and management body)

Type II Self-declared Environmental Claims (ISO 14021)
The overall objective of the ISO standard 14021 is to harmonise the use of self-declared environmental claims and thereby try to reduce the number of inaccurate and misleading claims (ISO 2016). However, it is important to keep in mind that many self-declared environmental claims do not follow the standard of ISO 14021 and some might also be in conflict with the marketing regulation. As all other marketing claims—environmental claims are also regulated by e.g. the marketing legislation. Since they lack a foundation in LCA, the self-declared environmental claims will not be discussed further in this chapter.

Type III Environmental Declarations (ISO 14025)
Type III environmental declarations are quantified environmental data based on LCA (life cycle inventory data or impact assessment results) primarily intended for business-to-business communication for the purchaser to be able to compare the environmental performance of different products fulfilling the same function (ISO 2006a). This aim requires consistency between the studies underlying the declaration of the compared products, and the standard encourages harmonisation between different declaration schemes.

24.3 Ecolabels

To clarify the terminology, ecolabels are thus a subset of environmental labels that identify environmental preferability of a given product or service compared to other products in the same product group. It is the purpose of the ISO 14024 standard to ensure more consistent consumer information and credibility by setting a number of minimum requirements that a Type I ecolabelling scheme has to fulfil:

- It is based on the life cycle perspective;
- It is multi-criteria based (not only looking at single environmental issues, such as climate change)
- Environmental criteria are based on sound scientific and engineering principles. To ensure objectivity, a broad range of stakeholders is involved in the selection of criteria (e.g. government, consumers, industries, etc.);
- It includes functional requirements (fitness for use) to ensure a sufficient quality of labelled products and services;
- Criteria are time-limited and revised if the situation has changed (e.g. if new and better technologies have been introduced) to ensure that the criteria continuously support identification of the products that have an overall environmental preferability;
- There is transparency in all stages of its operation and development, which, e.g. includes, but is not limited to, the following aspects:
  - Publicly available criteria,
  - Public hearing or hearing among interested parties of criteria,
  - Information about the funding sources for the programme development,
  - Public listing of all certified products and services;
- It is accessible to all potential applicants;
- It involves third-party certification;
- There is compliance monitoring after the licence is awarded.

Out of the more than 400 labels mentioned in the introduction, which include all sustainability related labels, the Global Ecolabelling Network (GEN) (www.globalecolabelling.net) has less than 30 members worldwide. GEN is a non-profit membership association for Type I ecolabelling organisations (including governmental, non-governmental, non-profit, etc.). Members include the organisations that award the most-used Type I labels in the world such as the ecolabels of the EU, Germany, China, India, North America, Brazil and Australia. A more detailed example for the Nordic ecolabel is given in Box 24.1.

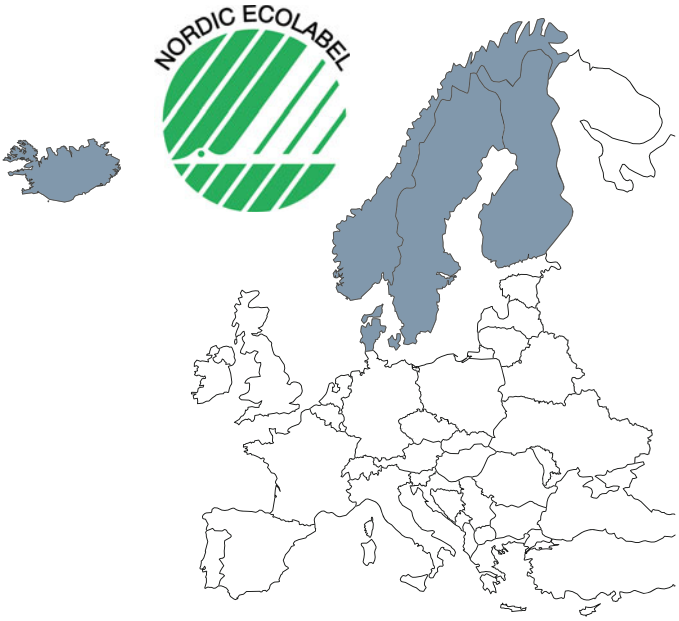
Box 24.1 The Nordic Ecolabel—The Official Ecolabel in the Nordic Countries

The Nordic Ecolabel is the official Ecolabel of the Nordic countries but can be used and is recognised globally.

It was initiated in 1989 by the Nordic Council of Ministers with the purpose of providing an environmental labelling scheme that would contribute to a sustainable consumption and production.

The Nordic Ecolabel is a voluntary, positive ecolabelling of products and services and was also initiated as a practical tool for consumers to help them actively choose environmentally-sound products. The Nordic Ecolabel is an ISO 14024 type I ecolabel and Nordic Ecolabelling is a third-party verification body.

The Nordic Ecolabel is well established and internationally recognised. Annual consumer surveys show that 90–95% of the consumers in the Nordic Countries recognise the Nordic Ecolabel.



24.3.1 Criteria for Type I Ecolabels

Ecolabels ensure consistency with the two main principles of LCA presented in the introduction to this book (see Chap. 2): (i) the life cycle perspective and (ii) the multiple environmental issues.

Life Cycle Perspective
The publicly available criteria document should list all the requirements that a product or service has to fulfil to be awarded an ecolabel and these criteria should cover the life cycle. For the example of printed matter products, Box 24.2 shows a comparison between the criteria for a Type I ecolabelling scheme and a labelling scheme dealing with a single environmental issue—sustainability of forestry.

Box 24.2 Two Types of Product Labelling for Printed Matter

There is a large number of labels in the graphic industry used by companies to promote the products as environmentally friendly. Type I ecolabels and raw material labels claiming sustainable forestry are among the most common. The figure below illustrates the difference between the Nordic Ecolabel for printed matter products—a Type I ecolabel and a raw material label focusing on sustainable forestry.

Life cycle stage of printed matter	Type I ecolabel	Raw material label requirements
Raw materials	• Sustainable forestry and/or recycled fibres in a high proportion of the paper used	• Sustainable forestry and/or recycled fibres
Pulp manufacturing	• Chemical requirements • Consumption of energy	-
Paper production	• Chemical requirements • Consumption of energy	-
Printing	• Printing inks and other chemicals • %-waste/shredded paper • energy consumption	-
Finishing	• Glue and coating	-
Use	• None directly, but the chemical requirements of the other stages will influence the chemical exposure of the user	-
Disposal/recycling	• Design for recycling	-

For a type I ecolabel, requirements are set for the environmental performance in all relevant stages of the life cycle whereas the raw material label only sets requirements for the forestry.

Since the purpose of type I ecolabel, is to drive improvement of the environmental performance of products, the criteria should focus on points where the manufacturer's decision affects the environmental performance. This means that requirements will not have to be set for all stages of the life cycle as it may not be possible for the manufacturer to influence the whole life cycle. For example, it is not relevant to set requirements for consumer behaviour of an ecolabelled product, but it is possible to set requirements for the product that allow and encourage the consumer to ensure low impacts in the use and disposal stages. To take the example of an ecolabelled laundry machine, such requirements could include:

- Low-temperature washing as standard programme;
- High spinning as standard (relevant especially in countries where tumble drying is common);
- Design for disassembly and recycling.

Multiple Environmental Impact Categories

Criteria for Type I ecolabelling also have to consider multiple environmental impact categories to prevent burden shifting from one impact to another which is a risk when there is single focus on one environmental impact category—such as climate

change (see Chap. 2). Different environmental impact categories are considered depending on their relevance for each product group. Taking the example of the European ecolabel for hand dishwashing detergents, the criteria aim at promoting products that have a reduced impact on aquatic ecosystems while for the case of paints and varnishes, there is special focus on volatile and semi-volatile organic compounds (EC 2011a, 2014a). Note that different ecolabelling schemes use different classification schemes for product groups. If corresponding criteria have not been developed for a product group, the products within the group cannot be eligible for labelling or environmental claims (see also Sect. 24.3.4). For the EU ecolabel, every non-food and non-medical product marketed in the European economic market is entitled and various actors across the supply chain can apply (e.g. producers, manufacturers, retailers, wholesalers, importers). Labelling schemes can also be sector specific such as the Type I ecolabelling scheme operated by the nonprofit organization natureplus (www.natureplus.org), targeting building and accommodation with validity across the whole of Europe according to uniform criteria.

The specifics of environmental criteria as well as technical and quality requirements also differ across ecolabelling schemes. For the example of hand-washing detergents, the EU ecolabel provides formulas for calculating the toxicity to aquatic organisms using as an indicator the Critical Dilution Volume for all substances while the Australian Standard Good Environment Choice for Australia (GECA) does not. The requirements and upper limits of substances allowed to be used can also differ. For the quoted example, EU thus excludes the use of formaldehyde while GECA has an upper limit of 0.1% by weight. Additionally, the substances allowed to be used in the products can be regulated by different regulations (national and international standards), e.g. GECA requires that colourants in cleaning products are either compliant with certain EU regulation or are approved for use in foods by the Australian government standards (EC 2011a; GECA 2015).

24.3.2 Setting and Revising the Criteria

When setting new criteria or revising existing criteria, a public consultation with key experts and relevant stakeholders is compulsory, which may take substantial amounts of time and resources. In the case of the European ecolabel, the preparatory work, which is the first step of the process, includes feasibility, environmental and market studies, improvement analysis and revision of existing life cycle assessment or implementation of new studies where necessary. Depending on the results, the criteria are drafted and iterated by the European Union Eco-labelling board. The outcome is circulated for approval among the relevant European Commission services. The process is then brought to a member state level where a vote is taken by national regulatory authorities (EC 2016a). Note that these decision

steps are subject to change and continuous improvement. Currently, from the start until the adoption of criteria through a Commission Decision, the process takes 2 years on average.

For all ecolabelling schemes, the criteria have to be evaluated from time to time and if necessary revised (setting stricter requirements) to make sure that the requirements continuously favour the products on the market that have the best environmental performance and thus ensuring a continuous improvement incentive. Box 24.3 gives a comprehensive example of the criteria development cycle for a product group within Nordic Ecolabelling.

Box 24.3 The Criteria Development Cycle for the Nordic Ecolabel

The process of developing new criteria starts with a *feasibility study* in which the potential (see below) of labelling a product area is investigated looking at both environmental aspects and the market situation. During *criteria development* a set of criteria are developed and input from stakeholders (including a 2 months public consultation) are obtained. When the criteria have been adopted, companies can obtain a licence to use the ecolabel if they demonstrate compliance with the criteria. Before the criteria expire, an evaluation is performed and based on that the criteria are revised in a process similar to criteria development.

When looking into the life cycle aspects of a given product group during the development of criteria, some of the tool used by Nordic Ecolabelling are the MECO-matrix (Wenzel et al. 1997), existing LCA knowledge, literature studies plus information and data collected from the industry.

Nordic Ecolabelling has developed a tool called RPS that is used when evaluating the potential in developing ecolabel criteria for new product groups and when

setting up the specific requirements for a product group. RPS is an abbreviation for Relevance, Potential and Steerability.

Relevance. As the overall goal of ecolabelling is to have a positive effect on sustainable consumption and production it makes sense that the product groups that are selected for ecolabelling have a high environmental relevance. Likewise, the specific requirements for a product group also have to have a high environmental relevance or a positive effect on product quality or health impacts.

Potential. When selecting a new product group for ecolabelling, or when setting a specific requirement for a given product group, it is very important that it is not only environmentally relevant, but also that the products on the market differ so that the ecolabel can point to the better products. If all products on the market have the same environmental performance, there would be no potential for the ecolabel to make a positive impact.

Steerability. Relevance and potential is not enough when selecting a product group for ecolabelling. There also has to be an interest between the stakeholders of the product group to use ecolabels to increase the supply or demand for ecolabelled products. If no manufacturer is interested, the development of the criteria might be a waste of time as there will be no direct impact from ecolabelling if there are no ecolabelled products on the market. However, there might be some indirect effects as shown later in this chapter. The specific requirements within a product group also have to be steerable meaning that, e.g. it has to be possible for the licence holders to influence and to document and control the fulfilment of the criteria.

When revising the criteria an overlap will be ensured between criteria generations so that the existing licence holders have time to implement the changes needed to fulfil the new and stricter requirements and to go through the recertification process.

After the public hearing, the criteria proposal is finalised and sent to the Nordic Ecolabelling Board who will decide whether to adopt the criteria. The Nordic Ecolabelling Board consists of the chairmen of the national ecolabelling boards that collaborate on the scheme and represent a wide range of stakeholders including NGOs, authorities, retailers and industry. In Denmark the national ecolabelling board is appointed by the Danish Minister of Environment.

24.3.3 The Certification Process

The certification for a Type I ecolabel—also referred to as licensing—has to be carried out by an independent third party. In order to be awarded a licence the applicant must be in compliance with the general rules of the programme and the product must meet all product environmental criteria and functional requirements as defined in the publicly available criteria document.

In general, the process is that the applicant will collect all necessary documentation including documentation from suppliers and test laboratories and send it together with an application to the ecolabelling body running the programme that has to do the verification. After being awarded the licence, the licence holder is responsible for ensuring that the products continuously meet the ecolabel requirements and the ecolabelling body has to be informed about any changes in the product or manufacturing process that might influence the compliance. Typically, the licence lasts for 3–4 years.

The licensing specifics depend on the ecolabelling scheme. Taking some examples from Fig. 24.1: For the EU ecolabel, licensing is managed in each country by a dedicated national independent organisation called 'Competent Body', typically anchored in the ministry of environment. The competent body assists with the application process, evaluates the application and decides on the award of the label (EC 2016b). In Australia GECA, a nonprofit organization, is responsible for the management of the scheme and setting the rules that detail the requirements and procedures for products to be certified. The fulfilment of requirements is verified through audits by third party conformity assessment bodies (CABs) which are required to comply with corresponding standards such as ISO/IEC 17065 (Conformity assessment—Requirements for bodies certifying products, processes and services) and ISO/IEC Guide 28 (Guidance on a third-party certification system for products) (ISO 2004, 2012). The CABs need to be accredited by the government appointed accreditation body for Australia and New Zealand (GECA 2015). In China, it is a governmental body, the State Environmental Protection Agency, which issues the guide and requirements for accrediting the labelling and supervises the management and certification. The documentation is reviewed by a certification centre and the licensing process includes onsite inspection and sampling (CEPACEC 2016).

Regarding the monitoring of continued compliance with the ecolabel criteria, testing is done through verified bodies. For example, in China testing is done by the adequate agency. In the EU it is done by qualified laboratories, preferably accredited under ISO 17025 (ISO 2005), or equivalent, that should be approved by the competent body. As for the monitoring, in EU it includes sampling from time to time, factory inspections and product tests. A file of the test results and all relevant documentation needs to be kept and be available at all times. In China, annual inspections take place until the label expires.

Box 24.4 describes the certification process in the Nordic Ecolabelling system.

Box 24.4 Certification at Nordic Ecolabelling The Nordic Council of Ministers has set up requirements that Nordic Ecolabelling, besides the requirements of ISO 14024 for type I ecolabelling schemes, also needs to fulfil the ISO 17065 standard when it comes to the certification process. The standard includes, among other, requirements related to independence and the quality of the certification process.

Further, Ecolabelling Denmark is by law subject to the rules of the public administration act when it comes to the certification process.

Before awarding a licence, Nordic Ecolabelling will be checking all submitted documentation for compliance with the requirements of the criteria. An evaluator will go through the documentation and make sure that all relevant documentation is present and shows compliance. A double check is performed by another staff member, that has not been involved in the checking before, and who also goes through the case to verify compliance. Before the licence is awarded, Nordic Ecolabelling will do an inspection visit at the production site to ensure that the situation is in line with the documentation sent. Inspection visits are performed all over the world where the production of ecolabelled products takes place.

After certification, Nordic Ecolabelling has procedures for monitoring the continued compliance, e.g. by follow-up inspection visits, spot checks of ecolabelled products on the market and other types of follow-up evaluation during the validity of the licence.

During the recertification/renewal process, the same certification process applies as for a new application—including inspection visit at the production site.

Inspection visit at a textile production site in Bangladesh

24.3.4 Ecolabels as a Marketing Tool

Ecolabels are market-driven tools. By using the label in their marketing, manufacturers or suppliers can provide credible information showing that the product or service has a good environmental performance. Indeed, such an attribute is positively evaluated by consumers. Results from a pan-European survey showed that 95% of respondents considered environmental change to be an important issue while the majority is willing to pay more for environmentally friendly products/services (EC 2014b). Ecolabels can be a useful tools for promoting

environmental policies aiming to reward the environmentally best performing products and companies, such as those established by the European Commission (EC 2008, 2016c). Ecolabelling is further promoted as a marketing tool in emerging economies, e.g. for African products (UNEP 2016). Labels can be useful towards reaching the UN Sustainable Development Goals, particularly Goal 12. Which is to 'ensure sustainable consumption and production patterns' (UN 2016).

However, the proliferation of environmental claims and labels also has adverse marketing effects. Indicatively in the aforementioned European surveys, a decline in confidence in environmental claims was observed, from 52% in 2007 to 47% in 2011. This has led to guidelines for green claims developed by national authorities, self-regulatory bodies, and the private sector. An example for Denmark is the Guidance from the Danish Consumer Ombudsman on the use of environmental and ethical claims in marketing (Danish Consumer Ombudsman 2016). This stipulates that it is not allowed to promote a product with general environmental claims such as "environmentally friendly", "environmentally correct", "gentle on the environment", "green", "blue", "more environmentally friendly", "smaller environmental footprint", "better for the environment" etc., unless being substantiated by a proven, significantly lower environmental burden compared to similar products. The Consumer Ombudsman further states that this would normally require that a complete product life cycle assessment has been carried out. However, the use of such general environmental claims is justified if a product is awarded a license to use the ecolabel of an official ecolabel scheme, such as 'the Swan' from the Nordic Ecolabel or 'the Flower' from the European Union Ecolabel. The latter point indicates that official ecolabels have a unique status in the use as a marketing tool as they are assumed credible and not misleading.

Criticism

Even if ecolabels are a powerful marketing tool, there is also criticism from parts of the business sector. One objection is the fact that in most schemes a fee has to be paid for the verification process and the subsequent use of the label. It has been argued that this puts a financial burden on companies that are actually doing something beneficial for the environment. However, the rationale behind the scheme is that consumers are actually willing to pay a little bit more for ecolabelled products, and in most cases the fee will not affect the final price for the consumer significantly.

Another criticism from the business sector is that the criteria are set up in a way that obstructs innovation, because they are based on analysis of existing technologies focusing on their strengths and weaknesses. The criteria are, however, not prescribing the use of a specific technology but aim at minimizing consumption of resources and emissions to the environment. In cases where totally new technologies emerge during the validity period of a set of criteria, these might not fit totally to that new technology, but in cases like that a number of schemes have the possibility to change or adjust the criteria.

24.3.5 Increasing the Demand for Green Products Using Ecolabels

To ensure a maximum positive impact of an ecolabelling scheme, it is important to not only target suppliers of products, but also work with increasing the demand for ecolabelled products to create a pull effect in the market. Here there are three main target audiences—all with a great potential for increasing the demand and thereby yielding environmental benefits from changing the consumption to more sustainable products and services:

- Consumers;
- Public procurement;
- Procurement in private companies and organisations.

Until recently, it has been difficult to realise the potential in public procurement at the European market because of EU regulation that did not allow the public authorities to set ecolabels as a requirement for procurement in tenders. However, in the context of sustainable consumption and production, since 2008 EU has supported green public procurement initiatives, "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured" (EC 2016d). A challenge for the public sector has been that purchasers might not have sufficient skills to set up environmental requirements in a tender. Even when they do, they might lack resources for defining relevant requirements, and for verifying the fulfilment by the tenderers. In this context, EU passed a new directive in 2014 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts, which explicitly allows the use of ecolabels as a requirement (EC 2014c). Thus, the possibility to use official ecolabels in the tenders facilitates the implementation of relevant environmental requirements while saving resources. Additionally, the implementation of the directive in the national legislation of the EU member states may have a positive influence on the demand for ecolabelled products and services in the public sector in Europe.

The Private sector does not have similar regulatory restrictions in demanding ecolabelled products. Yet, if companies (particularly the ones with large market share and considerable purchasing power) start demanding ecolabelled products and services, a significant difference can be made. Box 24.5 explains the example of a procurement network in the Nordic countries that successfully focuses on increasing demand for ecolabelled products and services in the private sector.

Box 24.5 Increasing the Demand for Ecolabelled Products Through a Professional Procurement Network

Ecolabelling Denmark, like its sister organisations in the other Nordic countries, has established a procurement network to help increase the demand for ecolabelled products and services in the Danish market and thereby increase the environmental benefits of the official ecolabelling schemes using a market pull effect.

The current members include—among other—financial companies and banks, insurance companies and consultants. The network has, for example achieved an increased supply of ecolabelled cleaning services by demanding ecolabelling from their suppliers and thereby established a more competitive market for ecolabelled cleaning services. Apart from cooperating on increased supply of ecolabelled goods and services, the members share experience with procurement of green products.

Members of the network have to fulfil the following requirements:

1. Have a publicly available purchasing policy in which it is clearly stated how environmental requirements are proactively used in tenders and other procurement situations. The use of the official ecolabels in procurement has to form an important part of the policy.
2. Comply with the principles of UN Global Compact and banks and investment companies further have to comply with the UN Principles for Responsible Investment.
3. Commit to report the purchase of ecolabelled products and services every year and with the reporting be able to document a significant improvement every year.

The network has been very efficient in motivating the suppliers of the members in adapting to the ecolabelling requirements and applying for an ecolabel licence.

24.3.6 Positive Side Effects of Ecolabels

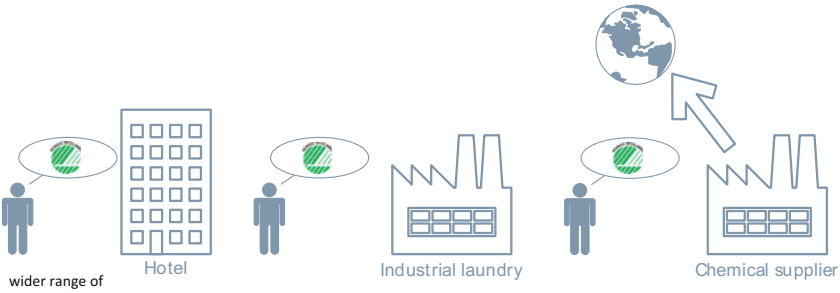
Besides the direct effects, ecolabelling has also shown to have indirect effects with a positive influence on the environment (see Box 24.6 for the so-called rippling effect and Box 24.7 for the link to ecodesign and regulation). Some of these positive side effects are:

- Some companies use ecolabelling criteria for benchmarking to get an idea on environmental improvement options—and even though they do not necessarily take active part by applying for an ecolabel, they still might implement some improvements based on this.

- An increased demand by single consumers or companies can have a much wider impact than the 'few' products that they buy. When experiencing an increasing demand for ecolabelled products a manufacturer will often in response implement improvements in their standard products that is also supplied to the consumers not actively demanding ecolabels, and in that way their consumption inadvertently becomes more sustainable.
- Ecolabelling criteria and ecolabelled products on the market can demonstrate that it is possible to provide greener products on the market, and ecolabelling can thereby be a driver for stricter environmental requirements in legislation.

Box 24.6 The Rippling Effect of Ecolabelling

Ecolabelled goods or services have a broad influence that goes beyond the reduction of environmental burdens due to a single purchase. This is because implementing ecolabelling requirements might cause a rippling effect. For example, a demand for ecolabelled hotel services can lead to a demand for corresponding ecolabelled products and services such as laundering service. Consequently, there will be a demand for laundry detergents fulfilling the ecolabel requirements in every stage of the life cycle. This can bring environmentally improved products on the market and thus make them available not only for those who actively demand for them, but for a broader audience because the required product improvements are often implemented in the standard products. Further, when e.g. the leading company in a branch starts ecolabelling their products and services—then other companies will follow and a wider range of the products on the market would be developed to meet the ecolabelling requirements. Therefore, what initially might start as a demand for ecolabelled hotel services could spread like ripples in the water with a higher influence on sustainable production and consumption.



Box 24.7 Ecolabels as a Driver for Ecodesign and Stricter Mandatory Regulation

Since 2008, according to the Danish legislation all fireplaces sold in Denmark cannot emit more than 10 g of particulate matter per kg of wood burned. In 2015, the limit value was reduced to 5 g/kg and from 2017 a maximum of 4 g/kg is allowed.

Since the first criteria for fireplaces were adopted in 2001 and since the first licence was awarded in 2004, Nordic Ecolabelling has shown that it is possible to produce fireplaces with lower emissions than the legal limit and the continuously stricter ecolabelling requirements have been a driver for the development of cleaner fireplaces and demonstrated to the authorities that it is possible to set up a tighter regulation. Even with a stricter legislation enforced by the authorities, the Nordic Ecolabel will still be driving the development of fireplaces with lower emissions as the requirements of the ecolabel is also becoming stricter. Hence, in 2015 new ecolabel requirements for emissions of particulate matter is 3 g/kg and by 2017 only 2 g/kg.

On top of the strict requirements on emissions of particulate matter, the Nordic Ecolabel certainly also has numerous other requirements to ecolabelled fireplaces—e.g. the efficiency of the fireplace and requirements related to the production process and raw material sourcing.

24.4 Environmental Product Declarations (EPDs)

ISO Type III Environmental declarations, also referred to as "environmental product declarations", are documents that transparently communicate environmental information and that can be used to compare the environmental performance of different products fulfilling the same function.

Worldwide, there is a number of different programme operators of Type III declaration schemes. The Global Environmental Declarations Network (GEDnet) is an international organisation of Type III environmental declaration bodies and practitioners with about 10 members (www.gednet.org)—most of them responsible for different national declaration schemes. Nevertheless, there are more operators.

One sector worth mentioning, where the use of environmental product declarations has especially increased globally is the one of building products. In Europe the reason is that EU regulation from 2011 includes a reference to the use of environmental declarations, which has increased the demand for them, stating that: "For the assessment of the sustainable use of resources and of the impact of construction works on the environment Environmental Product Declarations should be used when available" (EC 2011b).

As a response to the legislation EPD programme operators have come to cooperate and harmonise approaches. Indeed, the ECO Platform (www.eco-platform.org) (see Box 24.8) was initiated by a group of EPD programme operators, LCA practitioners and European building sector branch organisations and aims to harmonise the different declaration schemes so that the resulting environmental declarations can be used in all European countries. This is in accordance with the original intention of the ISO 14025 standard for type III declaration schemes. The harmonisation within the sector is further supported by a European standard EN 15804 that provides core product category rules for type III environmental declarations for any construction product or service. Similarly in the US, where the LEED certification developed by the non-profit organisation US Green Building Council (USGBC), prevails. This includes a set of rating systems for the design, construction, operation, and maintenance of green buildings, homes and neighbourhoods, and it is one of the most popular green building certification programmes used worldwide (EC-DG Energy 2014; LEED 2016).

Box 24.8 ECO Platform—Harmonising Environmental Declarations in the Building Sector

"The objective of ECO Platform is the development of verified environmental information of construction products, in particular type III declarations called EPD (Environmental Product Declarations). The added value of EPD under the ECO Platform framework is the possibility to use these declarations in all European but also international markets.

ECO Platform is not a programme operator. It is a group of them together with LCA practitioners, industrial associations and other stakeholders working to guarantee a coherent framework for EPD".

24.4.1 Product Category Rules (PCR)

According to ISO 14025, an environmental declaration scheme has to develop PCRs for each product group where the scheme operates. These are meant to enable transparency and comparability between EPDs. The PCR will normally establish for example:

- functional unit for the product area,
- allocation rules,
- system boundaries,
- LCIA methods,
- data sources.

The development of PCR of a Type III environmental declaration scheme has three recommended steps according to the standard ISO 14025 (ISO 2006a):

1. *Define the product category*:
2. *Collect and/or produce appropriate LCA*;
3. *PCR: Specify common goal and all relevant rules for product category LCA, predetermined parameters, rules on additional environmental information, requirements for reporting. Write instructions on how to produce the data required for the declaration.*

The development of a PCR requires consultation involving interested parties. Yet there is no global consensus for developing sound PCRs. Box 24.9 gives an example of a PCR developed by the Norwegian EPD Foundation.

Box 24.9 Product Category Rules for Seating—The Norwegian EPD Foundation

The product category rules for seating for the Norwegian EDP system, e.g. defines the functional unit to use, what stages to include, the system boundary, data quality requirements and the calculation rules and impact categories that have to be applied.

Functional unit:

"*Production of one unit of seating provided and maintained for a period of 15 years*".

The PCR indicates that secondary materials are included only as recycling processes and that electricity is included as national grid mix of either the country or the region where main energy-consuming processes take place. This is very different from the overall rules of the Danish pilot EPD scheme (www.MVD.dk) where a consequential approach is applied, stipulating the use of data for the marginal suppliers (see Chap. 8 for a discussion of the difference between consequential and attributional perspectives in LCA). Such differences in methodology can lead to large variations in the results of the declaration.

In the Norwegian EPD system, a panel of stakeholders is involved in the development of the PCRs and the documents are sent out for consultation to ensure acceptance and transparency. After the consultation period, the technical committee (TC) of the programme operator decides on the final PCR for the product group. The TC of the Norwegian declaration scheme shall consist of no less than 5 LCA/EPD experts.

Verification of Environmental Declarations
Even though it is not an explicitly stated requirement of the ISO standard, most type III environmental declarations make use of third party verification to make sure that the LCA follows the product category rules and that the overall requirements of the declaration scheme is fulfilled.

24.4.2 Benefits and Drawbacks of Environmental Declarations

The intention of Type III environmental declarations is to provide reliable, detailed information about the environmental performance in the life cycle of a given product or service to the decision maker in a purchasing situation. In this way, the purchaser can use it to choose products with a lower environmental burden. Thereby, as marketing tools, the environmental declarations can influence the shift to more sustainable products and yield a positive effect in the environment. Additionally, even if they are driven by marketing purposes, Type III declarations can, like Type I ecolabels, inspire product development changes with positive effects on the environment. For example, the information and knowledge gained from performing a life cycle assessment can spark new ideas for incremental product development to improve the environmental performance, leading to ecodesign initiatives (see Chap. 23). Suppliers of raw materials and intermediates can also supply their customers with cradle-to-gate data in the form of an environmental declaration, which makes it possible for manufacturers to enhance the accuracy of their LCAs.

Environmental declarations are seen by some companies as a possibility to provide much more detailed information about product improvements than the Type I label and it also supports further distinction between products that all have a Type I label. However, since it can be produced for all products—no matter the relative environmental burden of the product within that product group, an environmental declaration, contrary to the ecolabel, is not an indicator of the overall environmental preferability. This means that a purchaser, whose expertise in interpreting environmental information is often limited, needs to make dubious choices, e.g. when buying a product with low climate change but high ecotoxicity impact potential. Also, in case of product comparisons, to make a meaningful decision, a purchaser would have to compare environmental declarations for two different products with the same functional unit covering the whole life cycle and the same impact categories. However, declarations are only available for a limited number of products and are not always consistent in their descriptions of technical and environmental information. Given the need for validation of environmental claims, there is thus a requirement for clear product rules. This requirement is set in various standards, i.e. except for the PCRs in ISO 14025 there are also the Product Rules in the GHG Protocol Product Life Cycle Accounting and Reporting Standard, and the Supplementary Requirements in PAS 2050. Other standards, such as BP X30 (France), SMRS (Sustainability Consortium), TS 0100 (Japan) and ISO 14067 on carbon footprint, also require the use of PCRs. The result is that various EPD programmes have been using any of the above standards to develop PCRs independently and without cross recognising other programmes. As Box 24.10 exemplifies, these reasons combined, make it difficult to use EPDs in practice. Consequentially, as discussed in Sect. 24.5 there is a need for harmonisation in order to improve the validity of EPDs.

Box 24.10 Environmental Declaration of Office Chairs—Two Examples

Steelcase was the first contract furniture company to offer environmental declarations to its customers on the international market. HÅG, which today is part of Scandinavian Business Seating, has also been one of the pioneers within the use of environmental declarations. Both companies have chosen two different approaches as Steelcase is not following an established scheme of a programme operator, but instead uses external experts to review the LCA and declarations, whereas HÅG uses the Norwegian EPD system.

Even though both declarations seem to be for the same product type and for a 15-year use, it is not possible for a purchaser to compare the environmental performance based on the declarations, as they do not have identical impact categories. Furthermore, the allocation, calculation and data modelling rules differ which can have a significant influence on the result. Even for LCA experts this can be complicated, let alone the average procurer with limited LCA competence.

24.5 The Need for Harmonisation

The standardisation efforts have tackled the issue of legitimacy and credibility of environmental claims. Yet, the rising number of methods for measuring the environmental performance of products, services and organisations has been overwhelming. By 2010, for carbon emissions only, there were 62 leading initiatives and methods on product carbon footprinting and 80 on carbon reporting (EC 2016e). This trend seems to be continuing in the future since governments are more and more using LCA in voluntary or mandatory public policy initiatives (see also Chap. 18). Apart from the potential confusion on the market discussed in the introduction of this chapter, this proliferation of methods often leads to additional costs for cross border trading since companies might have to comply with requirements of schemes that have divergent methodological choices some of which are even left to the user to decide. Comparability is not established either because the methods are different or due to their inherent flexibilities. The situation is even more blurred when trying to measure environmental performance with time, since consistency of the corresponding methodological choices (e.g. year by year) would need to be guaranteed.

There is therefore a need for aligning and harmonising the different EPD schemes to avoid distortion in the market, to ensure transparency, increase

comparability and avoid unfair competition. Benefits from doing so can be identified in relation to different stakeholders:

- *Consumers*: Will gain by improved comparability and more informed decisions;
- *Companies*: By ensuring both credibility and harmonisation, companies can make legitimate environmental claims and benchmark themselves within a certain sector or product category. This allows to also monitor their performance, to compare to their peers and therefore to better focus any improvement efforts. Aside the incremental changes, this can potentially lead to more radical innovations for strong improvements that may shift the reference environmental performance of the whole sector/product category.
- *Small Medium Enterprises (SME)s*: SMEs increasingly have to provide inventory data as part of their communication about their products in global supply chains. They also have to comply with diverging schemes in order to compete with their multinational counterparts. Having a common methodological reference will thus facilitate them to reduce complexity and cost.
- *Investors*: Along the same line, investors can better target their decisions by having a consistent reference to the sector and a common ground for assessing how companies perform.
- *Policy makers*: These benefits also relate to governmental actors and policy makers. By knowing the environmental performance of stakeholder groups they can better identify gaps, allocate resources and incentivize consumption of reliably greener alternatives. They can apply this information in policies, e.g. by setting environmental limits for products or by linking economic instruments to environmental performance so that in the long term they can support the sustainable development goals.

In practice, it is very difficult to use EPDs for comparisons of products, because a meaningful comparison requires that the declarations include all stages of the life cycle, use the same environmental indicators, and are based on LCAs with the same scope, methodology and data quality. This means that they should be based on the same Type III declaration scheme where a specific set of product category rules has been defined. Despite the challenges, there are more and more initiatives for criteria harmonisation. Such are the aforementioned for the building sector and the broad EU initiative discussed in Sect. 24.5.1. Across countries, there are several recognition arrangements occurring not only in Europe (see Sect. 24.3.4) but also in North America, Asia and elsewhere (DigitalEurope 2015).

24.5.1 EU's Product and Organisational Environmental Footprints (PEF/OEF)

In 2011, the European Commission started working on methodology harmonisation for Product Environmental Footprints (PEFs) and Organisational Environmental

Footprints (OEFs) which are the EU Commission's term for the impact profiles resulting from LCAs, i.e. similar to Type III based environmental declarations for products or organisations (EC 2016f).

Rather than suggesting a new approach, the idea was to build upon well-established, verified and broadly used methods, standards and guidelines, such as ISO 14040-44, ISO 14064, PAS 2050 and WRI/WBCSD GHG protocol (ISO 2006b, c; EC-JRC 2010; BSI 2011; WRI/WBCSD 2016). Two years later the Product Environmental Footprint (PEF) and Organizational Environmental Footprint (OEF) Guides where released under the "Single Market for Green Products Initiative". The aim of these voluntary initiatives is to provide a common methodological basis and support a single metric for a single market. PEF relates to single products (i.e. goods or services) while OEF refers to an organisation comprising a well-defined portfolio of products and/or services. The latter can be calculated using aggregated data (thus, it is not required to have individual PEFs and sum them up to get the OEF). Both apply common rules, which further allow to explore synergies between the organizational and product levels. PEF/OEF are life cycle based and cover 15 impact categories in the ILCD method (see Chap. 10). Still, in line with what was discussed in Sect. 24.3.1 the choice of impact categories to communicate could further be tailored to each product category and sector so that consumers can more easily grasp the information (EC 2016e).

The release of the PEF/OEF guides was followed by a 3-year period (2013–2016) of testing and refining of the method on the basis of 26 selected pilot case studies within different sectors. An additional intention is to complement them with product category and sector specific rules to facilitate streamlining of the LCA and ensure comparability between similar products and sectors. The pilot studies are also investigating strategies for communicating life cycle environmental performance to business partners, consumers and other company stakeholders.

From a policy point of view, PEF/OEF are considered to strengthen existing product instruments such as Ecolabel, Green Public Procurement and Ecodesign. ISO Type I labels can also benefit since PEFs can consistently inform on the most relevant environmental impacts and life cycle stages. The possibility for benchmarking will additionally allow to refine existing labels based on market performance. PEF/OEF also have a place in the bigger framework of circular economy, which is the strategic vision for European economic development (EC 2015). Overall, regardless its European focus, the initiative has attracted global attention given the global nature of the economy, the importance of the European market and the UN Sustainable Development Goals.

Yet, such a broad harmonisation attempt does not come without challenges. Critics undermine the comprehensiveness of the approach, i.e. within the PEF framework one could still get different results for the same product, which jeopardises the principles of consistency and credibility. They also question the suitability of PEF for consumers, who would still lack the competences that would enable them to weigh different environmental impacts and their trade-offs. Additionally, the attempt to make the methodology more feasible may lead to lower accuracy and meaningfulness, e.g. PEF includes only selected parts of the spectra of

problems, which is not always sufficient. New developments take place both on product system modelling level, e.g. with consequential LCA, and on a LCIA level, e.g. with endpoint modelling. Once consensus is reached on such methodological choices, the PEF/OEF methodology will constantly need to be updated in order to keep up with methodological developments that improve the reliability of LCA results. Despite the drawbacks indicated, the PEF/OEF address the need for harmonisation and take a step towards it. Rather than redundant tools that add complexity, PEF and OEF are conceived and further refined as tools that act in synergy with existing schemes.

References

BSI: PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services (2011)

CEPACEC: Certification scope and procedure for the environmental labelling products in China. In: China Environ. United Certif. Cent. http://www.sepacec.com/cecen/ (2016). Accessed 30 Jun 2016

Danish Consumer Ombudsman: Environmental and ethical marketing claims. http://www.consumerombudsman.dk/Regulatory-framework/dcoguides/Environmental-and-ethical-marketing (2016). Accessed 30 Jun 2016

DigitalEurope: Ecolabels—criteria harmonisation and recognition arrangements. http://www.digitaleurope.org/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=951&PortalId=0&TabId=353 (2015)

EC: Communication from the commission to the European parliament, the council, The European economic and social committee and the committee of the regions on the sustainable consumption and production and sustainable industrial policy action plan. Brussels (2008)

EC: 2011/263/EU: Commission Decision of 28 April 2011 on establishing the ecological criteria for the award of the EU Ecolabel to detergents for dishwashers (notified under document C (2011) 2806). Off. J. Eur. Union **111**, 22–33 (2011a)

EC: Regulation (EU) no 305/2011 of the European parliament and of the council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC. Off. J. Eur. Union **88**, 5–43 (2011b)

EC: 2014/312/EU: Commission Decision of 28 May 2014 establishing the ecological criteria for the award of the EU Ecolabel for indoor and outdoor paints and varnishes (notified under document C(2014) 3429). Off. J. Eur. Union **164**, 45–73 (2014a)

EC: Consumer Market Study on Environmental Claims for Non-Food Products. Brussels (2014b)

EC: Directive 2014/24/EU of the European parliament and of the council of 26 February 2014 on public procurement and repealing directive 2004/18/EC. Off. J. Eur. Union **94**:65–242 (2014c)

EC: Circular Economy Strategy. http://ec.europa.eu/environment/circular-economy/index_en.htm (2015)

EC: EU Ecolabel criteria development and revision. In: EC-Environment. http://ec.europa.eu/environment/ecolabel/criteria-development-and-revision.html (2016a). Accessed 30 Jun 2016

EC: How to apply for EU Ecolabel. In: EC-Environment. http://ec.europa.eu/environment/ecolabel/how-to-apply-for-eu-ecolabel.html (2016b). Accessed 30 Jun 2016

EC: Single market for green products initiative. In: EC-Environment. http://ec.europa.eu/environment/eussd/smgp/index.htm (2016c). Accessed 30 Jun 2016

EC: Green public procurement. In: EC-Environment. http://ec.europa.eu/environment/gpp/index_en.htm (2016d). Accessed 30 Jun 2016

EC: Questions about the product environmental footprint (Pef) and organisation environmental footprint (Oef) methods. In: EC-Environment. http://ec.europa.eu/environment/eussd/smgp/pdf/q_a.pdf (2016e). Accessed 30 Jun 2016
EC: Single market for green products-policy background. In: EC-Environment. http://ec.europa.eu/environment/eussd/smgp/policy_footprint.htm (2016f). Accessed 30 Jun 2016
EC-DG Energy: ENER/C3/2012-436—market study for a voluntary common European Union certification scheme for the energy performance of non-residential buildings (2014)
EC-JRC: International Reference Life Cycle Data System (ILCD) Handbook—General guide for Life Cycle Assessment—Detailed guidance, 1st edn. Publications Office of the European Union, Luxembourg (2010)
GECA: Good Environmental Choice Australia-Certification Scheme Rules (version 15). New South Wales (2015)
IISD: Global Green Standards-ISO 14000 and Sustainable Development. Manitoba (1996)
ISO: ISO 14024:1999 Environmental Labels and Declarations—Type I Environmental Labelling—Principles and Procedures. ISO, the International Organization for Standardization, Geneva (1999)
ISO: ISO/IEC Guide 28:2004 Conformity Assessment—Guidance on a Third-Party Certification System for Products. ISO, the International Organization for Standardization, Geneva (2004)
ISO: ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories. ISO, the International Organization for Standardization, Geneva (2005)
ISO: ISO 14025:2006 Environmental Labels and Declarations—Type III Environmental Declarations—Principles and Procedures. ISO, the International Organization for Standardization, Geneva (2006a)
ISO: Environmental Management—Life Cycle Assessment—Principles and Framework (ISO 14040). ISO, the International Organization for Standardization, Geneva (2006b)
ISO: Environmental Management—Life Cycle Assessment—Requirements and Guidelines (ISO 14044). ISO, the International Organization for Standardization, Geneva (2006c)
ISO: Environmental Management—The ISO 14000 Family of International Standards. ISO, the International Organization for Standardization, Geneva (2009)
ISO: ISO/IEC 17065:2012 Conformity Assessment—Requirements for Bodies Certifying Products, Processes and Services. ISO, the International Organization for Standardization, Geneva (2012)
ISO: ISO 14021:2016 Environmental Labels and Declarations—Self-Declared Environmental Claims (Type II Environmental Labelling). ISO, the International Organization for Standardization, Geneva (2016)
LEED: LEED. http://leed.usgbc.org/leed.html (2016). Accessed 30 Jun 2016
Rubik, F., Frankl, P.: The Future of Eco-labelling: Making Environmental Product Information Systems Effective. Greenleaf Pub, Sheffield (2005)
UN: Agenda 21: programme of action for sustainable development. In: United Nations Conference on Environment and Development (UNCED), p. 343. United Nations, Rio de Janerio (1992)
UN: Johannesburg declaration on sustainable development and plan of implementation of the world summit on sustainable development: the final text of agreements negotiated by governments at the world summit on sustainable development. In: World Summit on Sustainable Development, and United Nations. United Nations Department of Public Information, Johannesburg (2002)
UN: Goal 12: ensure sustainable consumption and production patterns. In: Sustain. Dev. Goals. http://www.un.org/sustainabledevelopment/sustainable-consumption-production/ (2016). Accessed 30 Jun 2016
UNEP: Ecolabelling—as a potential marketing tool for African products (an overview of opportunities and challenges). http://www.unep.org/roa/docs/pdf/Eco-labelling-Brochure.pdf (2016)
UNOPS: A guide to environmental labels for procurement practitioners of the United Nations system (2009)

Wenzel, H., Hauschild, M.Z., Alting, L.: Environmental Assessment of Products, vol. 1. Kluwer Academic Publishers, Berlin (1997)
WRI/WBCSD: Greenhouse gas protocol. http://www.ghgprotocol.org/ (2016). Accessed 30 Jun 2016

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