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Methodological challenges for eco-labels in the Global Ecolabelling Network

Evaluation and traceability of critical raw materials and determination of quantitative environmental relief potentials

Final report

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Evaluation and traceability of critical raw materials and determination of quantitative environmental relief potentials
Final report

by

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Abstract: Methodological challenges for eco-labels in the Global Ecolabelling Network

The main objective of this project was to strengthen the use and cooperation of type-I ecolabels worldwide. As markets are becoming increasingly international and products are no longer developed for national markets, the cooperation and joint efforts of ecolabels in developing common environmental standards are indispensable. Specifically, the project addressed two central challenges faced by ecolabels worldwide: (1) Integrating sustainability issues of raw material supply chains in ecolabelling schemes, and (2) Measuring the performance of ecolabels. For the first challenge, the project proposed a set of potential ecolabel criteria based on sustainable mining of raw materials in notebooks, with focus on supply chain due diligence for environmentally and socially critical raw materials. As the focus of the due diligence efforts has mostly been on addressing conflict financing and human rights violations, the project proposed an approach on how ecolabels can extend the due diligence concept to cover severe environmental issues. As for the second challenge, the project concluded that calculation of the environmental savings through ecolabelled products could be a promising approach for measuring the performance of ecolabels. In this regard, the project developed and tested a methodological guidance document for measuring the performance of ecolabels. The methodological guidance document was designed primarily for the practitioners in ecolabelling institutions. The results showed that it is possible to calculate the environmental savings reliably by ecolabelling schemes, if they are provided with capacity building on methodological and technical aspects. The project activities were conducted in close cooperation with the Global Ecolabelling Network (GEN).

Kurzbeschreibung: Methodische Herausforderungen für Umweltzeichen im Global Ecolabelling Network (GEN)

Das Hauptziel dieses Projekts war es, die Nutzung und Zusammenarbeit von Typ-I-Umweltzeichen weltweit zu stärken. Da die Märkte immer globaler werden und die Produkte selten nur für nationale Märkte entwickelt werden, ist die Zusammenarbeit der Umweltzeichen bei der Entwicklung gemeinsamer Umweltstandards unverzichtbar. Konkret ging das Projekt auf zwei zentrale Herausforderungen für Umweltzeichen ein: (1) Integration von Nachhaltigkeitsaspekten der Rohstofflieferketten in Umweltzeichensysteme und (2) Messung der Leistung von Umweltzeichen. Für die erste Herausforderung schlug das Projekt mögliche Umweltzeichenkriterien vor, die auf dem nachhaltigen Abbau von Rohstoffen in Notebooks basieren, wobei der Schwerpunkt auf den menschenrechtlichen Sorgfaltspflichten in den Lieferketten für umwelt- und sozialkritische Rohstoffe lag. Da der Schwerpunkt der Prüfung der menschenrechtlichen Sorgfaltspflichten vor allem auf der Auseinandersetzung mit Konfliktfinanzierung und Menschenrechtsverletzungen liegt, schlug das Projekt einen Ansatz vor, wie Umweltzeichen das Konzept auf schwere Umweltprobleme ausweiten können. Bezüglich der zweiten Herausforderung, der Messung der Leistung von Umweltzeichen, kam das Projekt zu dem Schluss, dass die Berechnung der Umweltentlastungen durch Produkte mit Umweltzeichen ein vielversprechender Ansatz sein könnte. In diesem Zusammenhang entwickelte und testete das Projekt einen methodischen Leitfaden zur Messung der Leistung von Umweltzeichen. Der methodische Leitfaden wurde in erster Linie für die Nutzung in Umweltzeichen-Institutionen konzipiert. Die Ergebnisse zeigten, dass die Umweltzeichensysteme die Umweltentlastungen zuverlässig berechnen können, sofern sie mit Kapazitäten und Expertise in Bezug auf methodische und technische Aspekte ausgestattet werden. Die Projektaktivitäten wurden in enger Zusammenarbeit mit dem Global Ecolabelling Network (GEN) durchgeführt.

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3TGs	Conflict Minerals (Tin, Tungsten, Tantalum, Gold)
ASM	Artisanal Small-Scale Mining
BAJ	Battery Association of Japan
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CCCMC	Chinese Chamber of Commerce of Metals, Minerals & Chemicals Importers & Exporters
CED	Cumulative Energy Demand
CENELEC	European Committee for Electrotechnical Standardization
DRC	Democratic Republic of the Congo
ECNZ	Environmental Choice New Zealand
EITI	Extractives Industries Transparency Initiative
EPEAT	Electronic Product Environmental Assessment Tool
EU	European Union
GECA	Good Environmental Choice Australia
GEN	Global Ecolabelling Network
GeSi	Global Enabling Sustainability Initiative
GPP	Green Public Procurement
GTIN	Global Trade Item Number
GWP	Global Warming Potential
HDD	Hard-Disc-Drive
ICT	Information and Communication Technology
IEEE	Institute of Eletrical and Electronics Engineers
ILO	International Labour Organization
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
LCI	Life cycle Inventory
NGO	Non-Governmental Organization
OECD	Organization for Economic Cooperation and Development
OEM	Original Equipment Manufacturer
PGM	Platinum Group Metals
RAL gGmbH	Awarding body for the Blue Angel ecolabel
RAM	Random Access Memory
SSD	Solid-State-Drive
TWh	Terrawatt Hour
UBA	Umweltbundesamt (German Environment Agency)
UN	United Nations
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WEEE Directive	Waste Electrical and Electronic Equipment Directive

Summary

Ecolabels are an important element of the EU product policy framework. Along with the green public procurement, ecolabels trigger market innovations by setting incentives for producers and service providers to go beyond the mandatory environmental requirements. As markets are becoming increasingly international and products are no longer developed for national markets, it is important to strengthen the global positioning of ecolabels by developing and harmonizing ecolabel criteria internationally. In this regard, Germany's ecolabel, the Blue Angel, has intensified its international cooperation with ecolabel programmes worldwide. Such cooperation usually involves close dialogue in the development of award criteria, mutual recognition agreements between the ecolabelling programmes and support activities within the framework of technical international cooperation. The underlying principle of the international activities of the Blue Angel is to increase the effectiveness of type-I ecolabels in achieving environmental goals and targets, as also specified under the UN Sustainable Development Goal 12 on responsible consumption and production. As ecolabels worldwide face common challenges, their cooperation and joint efforts in developing common environmental standards is indispensable. This facilitates more effective communication to consumers and public authorities as well as provides a stable orientation for potential ecolabel license holders.

Against this background, this project was initiated by the German Environment Agency (Umweltbundesamt - UBA) as part of the Environmental Research Plan (research code 3717 37 316 0). The overall objective of the project is to strengthen the use and cooperation of type-I ecolabels worldwide. In concrete terms, the project pursues the following objectives:

- Analysis and description of two common challenges faced by type-I ecolabels
- Analysis of the current situation of the identified common challenges within the ecolabelling schemes as well as within companies and potential license holders
- Identification of solutions for overcoming the common challenges, followed by the implementation of two concrete measures in cooperation with the ecolabelling schemes
- Support the discussion process on common challenges between the type-I ecolabelling programmes within the Global Ecolabelling Network (GEN)
- Conceptual planning, organization and implementation of the Annual GEN Meeting in 2018 in Berlin as well as of an international conference and a parliamentary discussion on topics relevant for the ecolabels, and
- Publication of a special issue on ecolabels in an international scientific journal

The German Environment Agency (UBA) and the Global Ecolabelling Network (GEN) identified two central challenges for the scope of this project:

- Integrating sustainability issues of raw material supply chains in ecolabelling schemes
- Measuring the performance of ecolabels

The key underlying principle of the project was to develop practical solutions that can easily be understood and implemented in the day-to-day activities of ecolabel programmes within the GEN. Experiences from the past had shown that overly complex approaches, even though promising on paper, were not embraced by the ecolabelling institutions due to the lack of

financial and technical resources. Thus, the core of the overall methodological approach was participatory, practice-oriented and ownership-based where project activities were conducted in very close cooperation with the ecolabelling institutions. Such a project design was important to increase the responsiveness of the ecolabelling schemes towards developed solutions for the identified challenges.

Integrating sustainability issues of raw material supply chains in ecolabelling schemes

Product policies (incl. ecolabelling) seek to reduce the environmental and social impact of extraction of primary raw materials entailed in the products. Thereby, one key challenge is the diversity of raw materials and their wide range of associated environmental impacts. Furthermore, the nature and scale of environmental impacts varies from raw material to raw material and from mining project to mining project. While Life Cycle Assessment (LCA) data are relatively robust for some environmental impacts, such as energy demand (CED) and GHG-emission (GWP), various environmental impacts of mining and ore processing such as those on ecosystems and biodiversity are insufficiently covered. For complex product groups, this limitation results in a lack of reliable guidance for ecolabelling schemes, for instance, when it comes to applying methodological approaches for prioritizing the efforts for more effective control of raw material related environmental problems. Especially being a voluntary environmental instrument, ecolabelling schemes require a good balance between ambitious environmental criteria and willingness of progressive companies to respond to the certification. At the same time, there is a broad agreement that producers cannot take equally ambitious measures for all raw materials as well. Therefore, a methodology to prioritize the environmentally most relevant materials from cradle-to-gate perspective is required.

In order to address this challenge, the project utilized the methodology and assessments conducted by the ÖkoRess project financed by the German Federal Environment Agency (Umweltbundesamt). The ÖkoRess project developed a methodology to assess and compare the environmental hazard potentials of mineral raw materials, which was applied to > 50 commodities, and helped in prioritizing raw materials from an environmental perspective. As an additional to the results of the ÖkoRess project on prioritizing raw materials according to their environmental hazard potential, this project added a second dimension that represents the role a product group / an application in the total world consumption of a raw material. Therefore, for ecolabelling, it is recommended to focus criteria on a limited number of raw materials that:

(1) have a high environmental relevance (also referred to as “environmental hazard potential”), and

(2) where a product group has a high share of the total material demand in relation to the world production.

In this project, this approach was applied to the product group of notebooks. The market analysis conducted within this project indicated that notebook production is a major factor for global demand for tantalum (~14% of world primary production) cobalt (~6% of world primary production) and, to a lesser extent, palladium (~2% of world primary production). Subsequently, these are also raw materials, where the notebook producing industry is likely to have significant influence (market power) over raw material supply chains and where appropriate recycling efforts might hold considerable potential for raw material recovery. In the following step, environmental hazard potentials for tantalum, cobalt and palladium were assessed using the results of the ÖkoRess project (Table 6, Table 7 and Table 8). As extraction of these raw materials is also associated with severe social impacts and human right risks, the next step entailed the analysis of these aspects for the three raw materials (chapter 3.3.5). Additionally, criteria of several ecolabelling schemes were screened for the aspects of durability,

recyclability, responsible sourcing of raw materials and supply chain responsibility to understand how these schemes are addressing raw material related issues (chapter 3.3.6). Finally, interviews with IT companies and sector experts of the ecolabelling schemes were conducted to understand their position and experience in applying due diligence concept as a product-based sustainability measure.

The analysis showed that some ecolabelling schemes have started using criteria related to supply chain due diligence according to the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-affected and High-risk Areas (chapter 3.3.6.3). However, it has to be emphasized that the OECD guidance asks for supply chain due diligence only for issues around conflict financing and human rights violations. Environmental issues and other social aspects (e.g. health & safety in mining, development aspects) are not necessarily addressed by corporate due diligence efforts. Furthermore, it needs to be considered that a wrong interpretation of due diligence can lead to boycotts of certain mining areas and subsequently to unintended negative socio-economic side effects (see section 3.1.4). In this context, ecolabels should additionally consider requiring active support of in-region initiatives aiming at a sustainable improvement of mining conditions on the ground and particularly in mining areas located in conflict-affected and high-risk areas. In this context, the project recommended to apply the due diligence concept not only for the so-called 'conflict minerals', but also for other relevant raw materials that have a high relevance for a defined product group.

Furthermore, it needs to be mentioned that transparency is an important aspect of all debates around mineral supply chains and due diligence. It should be kept in mind that a full transparency of supply chains is not a goal by itself. While tracing and tracking of mineral supply chains can certainly help to understand relationships within supply chains and to design suitable response strategies, there is a certain danger that strong calls for full transparency will lead to a situation where enterprises spend most of their due diligence resources on supply chain mapping rather than in improvement processes. Therefore, the aspect of transparency should not be overstretched in ecolabelling schemes.

It was seen that the willingness of the ecolabelling schemes to go a step further and discuss or implement the proposed criteria within their programmes continued to be low. The reason lies in the fact that the ecolabelling schemes find it hard to translate the process-based due diligence approach into measurable and verifiable ecolabel criteria. Moreover, ecolabelling schemes seem to get overwhelmed by the challenge of dealing with many raw materials used in the products. As a result, there is a general skepticism with respect to the possibilities of verifying the compliance in a reliable manner.

On the other hand, supply chain due diligence is increasingly becoming an integral part of the corporate policy of many international brands. While the focus of the due diligence efforts has been on addressing conflict financing and human rights violations, interviews with leading companies also reveal that concept can also be extended for **severe environmental issues** (chapter 3.4). However, as companies do not yet perceive voluntary ecolabelling schemes as strong incentives for implementing a full-scale supply chain due diligence, the project suggested to initially focus on two core elements of due diligence schemes to derive **environmental due diligence criteria** that can either be used individually or in combination:

- Require producers to conduct a risk assessment with extended scope (step 2 of the supply chain due diligence process) for key raw materials of a product group (e.g. tantalum, cobalt and palladium for notebooks). Thus, ecolabelling criteria would motivate producers to

systematically assess environmental risks in their supply chains which is expectedly a first important step for corporate mitigation measures.

- Require producers to support in-region initiatives that have a scope beyond conflict-financing and human rights.

Furthermore, it was recommended that producers implement supply chain due diligence for addressing conflict financing and human rights violations for most relevant raw materials according to the OECD due diligence guidance for responsible supply chains of minerals from conflict-affected and high-risk areas. This requirement should be verified by providing a weblink to the published corporate due diligence report that shall not be older than 2 years and covers all 5 steps of the OECD Due Diligence framework.

Such an approach would reduce the risk that companies are incapable or unwilling to implement related ecolabelled criteria. In general, it is expected that the impact of ecolabels in this field will increase only if many more ecolabelling schemes take up the concept of due diligence in their criteria. Few GEN members, such as the TCO Development and Blue Angel, are already doing a pioneering work in this regard and be good examples for knowledge dissemination.

From this perspective, the following ecolabelling criteria are suggested:

- *The notebook producer shall demonstrate that he conducts supply chain due diligence for tin, tantalum, tungsten, gold and cobalt used in its notebooks. The applied due diligence process is conducted in-line with the OECD due diligence guidance for responsible supply chains of minerals from conflict-affected and high-risk areas.*

Verification:

  - ✓ *The applicant provides a weblink to the published corporate due diligence report covering all 5 steps of the OECD Due Diligence framework. The report shall not be older than 2 years at the date of submission of the application.*
  - ✓ *The applicant shall provide a copy of this due diligence report where the headings of all 5 due diligence steps, as well as all materials addressed are graphically marked.*

- *The notebook producer shall demonstrate that his due diligence efforts for raw materials involve an assessment of environmental risks.*

Verification:

  - ✓ *The applicant shall provide a copy of its due diligence report where the environmental risk assessment of raw materials is addressed and where relevant sections are marked.*

- *The notebook producer shall demonstrate that he actively supports in-region initiatives1 that supporting sustainable production of primary raw materials in conflict affected and high-risk areas. In-regions initiatives should follow a holistic approach and encompass human rights as well as relevant other social and environmental issues.*

Verification:

  - ✓ *The applicant shall list at least one in-region initiative he is actively supporting. He shall specify the type of support (e.g. annual financial support) and give a reference*

[1] It is recommended to develop a positive list of in-region initiatives that are regarded as eligible for this criterion. This list might encompass (but might not necessarily be limited to) the Conflict-Free Tin Initiative (CFTI); Solutions for Hope (SfH); Fairtrade Gold; Fairmined Standard, the Responsible Cobalt Initiative (RCI)

contact of each listed initiative to allow independent verification of the given information.

- ✓ *The applicant provides information on the type of initiative (organisation structure, aim, country, material scope, type of support…) and describes how the project leads to an improvement of human rights, as well as relevant social and environmental conditions in and around the mining site(s).*
- ✓ *The applicant shall provide information on the monetary value of its support of in-region activities (yearly average) and shall specify how this support is granted (direct payment to initiative, financing of individual measures, in-kind contribution…)*

Measuring the performance of ecolabels

The debate on the role of ecolabels in driving the sustainable consumption and production (SCP) has been going on for several years. In recent years, several questions have been raised on the effectiveness of the ecolabels when it comes to accomplishing the defined environmental goals and targets. As this debate continues, the ecolabelling schemes worldwide face the uphill task of delivering solid empirical evidence to political decision-makers and other societal actors in terms of the impact of ecolabels in driving a market shift towards better performing products and services.

Only few ecolabelling schemes worldwide have already been working on tracking the development and effectiveness of their ecolabelled products. The assessment of the selected ecolabelling schemes in terms of using performance measurement indicators shows that the schemes use a varying degree of indicators to monitor and evaluate the performance of their ecolabels. While indicators, such as number of licences, ecolabelled products and criteria documents as well as consumer awareness and perception seem to have been adopted by several ecolabelling schemes, changes in number of licences, products and companies over time, market share of ecolabelled products and environmental benefits are covered by very few to none schemes.

Implementing a monitoring and evaluation system to measure the performance and effectiveness of ecolabels is not a trivial task. Moreover, only limited knowledge is available on how the performance of ecolabel programmes can be evaluated and what constitutes success of ecolabelling. The main challenge lies in the lack of availability of market data on the share or sales of eco-labelled products and resultant environmental benefits. Furthermore, it is very difficult to measure indirect positive effects of ecolabels in quantifiable terms. Few examples of indirect positive benefits include use of ecolabel criteria in Green Public Procurement, in defining minimum mandatory environmental standards, driving manufacturers or industry towards adapting the production-line according to the ecolabel criteria etc. Against this background, few ecolabelling schemes have been using alternative proxy indicators, such as number of products, criteria documents, licenses and license holders. However, the element of risk associated with the misinterpretation of such proxy indicators is also significant, as also explained in the chapter 4.3.

Upon analysis of possible approaches and indicators for the performance measurement of Type I ecolabels, and the results of a survey and interviews with several ecolabelling schemes (refer to chapter 4.4), the project concluded that calculation of the environmental savings through eco-labelled products could be a promising approach for measuring the performance of ecolabels. Even though other indicators, such as number of products, number of licenses, consumer awareness etc. may be much easier to monitor, they do not give reliable and quantifiable information on true environmental benefits of ecolabels.

A participatory, practice-oriented and ownership-based project design was developed where ecolabelling schemes took the lead in measuring the performance of ecolabels (see chapters 2 and 4.5 for more details). The core of this exercise was a working group that was initiated in 2017 in Stockholm. The working group consisted of seven ecolabelling schemes - Environmental Choice New Zealand, Green Product Certification India, Green Mark Taiwan, Thai Green Label, Blue Angel Germany, Vitality Leaf Russia and the China Environmental Labelling.

Öko-Institut organized the working group and provided technical guidance to the ecolabelling schemes (see chapter 4.5 for the pilot exercise). The basis of calculating environmental relief potentials of ecolabelled products (see chapter 4.5 for the selection of product groups) was a guidance document developed by the Öko-Institut (see annexes A and B). The guidance document was designed primarily for the practitioners in ecolabelling institutions and considered their limitations in terms of financial and personnel resources. It seeks to help the practitioners to understand and interpret existing LCA studies, collect important primary data and calculate environmental savings.

According to the feedback of the participating ecolabelling schemes, the exercise as well as the use of the methodological guidance provided several practical insights for the assessment of environmental impacts and savings of products. The ecolabelling schemes not only gained methodological experience for calculating the environmental benefits of their schemes, but also realized the importance of formulating quantifiable and measurable ecolabel criteria, which is a prerequisite for calculating environmental savings in a more reliable manner

The exercise stimulated the exchange between the ecolabelling schemes within GEN. The ecolabelling schemes discussed their approaches, difficulties and results not only during the webinars, but also bilaterally, when for instance, they were working on similar product groups. This exchange and interaction were mentioned to have provided fresh perspectives and were found to be a valuable resource for further work within GEN.

Finally, the results of the environmental benefit analysis itself were impressive. Ecolabelling schemes mentioned that they intend to use the results for internal as well as external communication. This step was found to be necessary to demonstrate the benefits of the ecolabelled products and raise awareness among policy-makers, companies and consumers. Some examples of the results are summarized below:

- Savings of 21,000 tonnes of CO_2 emissions annually can be attributed to the sale of ECNZ licenced toilet paper in New Zealand.
- Over 5 million litres of paint and about 332 tons of VOC content have been saved through the sale of paints with vitality leaf in Russia in 2018.
- Almost 10 TWh of electricity was saved in 2018 in China through the sale and use of printer-based multifunctional devices certified by the China Environmental Labelling.
- GreenPro labelled cement and concrete result in a reduction of almost 8 million tonnes of greenhouse gas emissions annually

The abovementioned results, which were also presented at the Annual GEN Meeting in Suzhou in 2019, show that ecolabels play an important role in reducing the environmental impact of our consumption patterns. In the project exercise it was shown that it is possible to calculate the environmental savings reliably by ecolabelling schemes, if they are provided with capacity building on methodological and technical aspects. Furthermore, it was seen that that continuous

technical & methodological support of the ecolabelling schemes over a longer time-period is a key for overcoming the inherent inhibitions related to dealing with complex problems. Overall, cost and effort of implementing the pilot on measuring the environmental performance of ecolabels were low.

However, there are some aspects that need to be considered when dealing with the performance measurement of ecolabels in the future. Expert knowledge and experience in conducting Life-Cycle Assessments (LCA) as well as access to (commercial) data bases and LCA-software are still very crucial when it comes to conducting calculations pertaining to environmental impacts and savings. Moreover, interpretation of a vast amount of LCA-data is not trivial and requires deep technical understanding of product systems. Therefore, even though ecolabelling institutions gained some first-hand experience with the calculations, they will not be able to substitute the vast LCA expertise generally required. The pilot exercise only helped in taking a first step in calculating the environmental savings through ecolabelled products based on existing LCA studies. The exercise did not aim to establish comprehensive LCA expertise within the ecolabelling institutions. Therefore, it is advisable that ecolabelling institutions continue to consult LCA experts during the process of performance measurement. For instance, it will still be difficult for the ecolabelling schemes to judge the effectiveness of alternative modelling approaches, in case data and information required for the main environmental impact categories are not available. Hence, it must be emphasized that the pilot exercise and the methodological guidance document were created primarily for the practitioners in eco-labelling institutions while considering their limitations in terms of financial and personnel resources. Therefore, the overall approach was very pragmatic and did not aim to establish comprehensive LCA expertise within the ecolabelling institutions.

Another important aspect that needs special mention is external communication of the calculation results to the public or decision-makers. Again, especially as a simplified approach is chosen, the results of the calculations may have to be dealt with carefully. This could be the case, if the communication of environmental benefits of an ecolabelled product against a reference product reveals any kind of sensitive information of a single company. In such cases, it is advised to mention specifically that calculations of environmental benefits are done only for average products and are not company or product-specific. Also, there might not be many LCA studies that were conducted specifically for ecolabelled and their corresponding reference products that can be used for the own calculations. Therefore, it is important to highlight in the external communication that the calculated environmental benefits are only reflecting a trend, are based on several assumptions of the ecolabelling scheme and are not specific to an exact product of a certain company (see A.4.1 and B.4.1) for more details on principles of external communication).

Recommendations and Outlook

As for the topic of raw material supply chains covered in this project, it is recommended to

- support GEN in spreading awareness on and developing concrete measures for mainstreaming the principles of due diligence of raw materials in ecolabels.

TCO Development and the Blue Angel could take the lead of such a working group as they have been working with the due diligence related criteria for some years now. As the issue of raw material consumption can also be dealt with criteria on durability, reuse, repair and recyclability, it is also recommended to:

- support GEN in spreading awareness on and developing concrete measures for integrating and mainstreaming the circular economy principles in ecolabels.

The success of the pilot exercise on performance measurement of ecolabels was to a great extent due to the initiative and high motivation of the participating ecolabelling schemes. Thereby, the framework given through the project and the external support (e.g. guidance document, backstopping, facilitation etc.) contributed to the successful accomplishment of the exercise. The workshop at the Annual GEN meeting in Suzhou in October 2019 clearly demonstrated the enormous interest among the ecolabelling schemes in continuing with the process. Therefore, it is recommended to:

- support the outreach of the pilot exercise to more GEN members and/ or more product groups

Furthermore, an important aspect could be to assign a responsible person (or a group) within GEN who drives the issue of performance measurement forward, for instance, by implementing a permanent exchange platform on this topic. The exchange platform could be in an online-format with up-to-date information on who is currently working on which product groups, presentations or reports on finalized assessments or other information material (e.g. the guidance document). This platform could be supported by organizing a regular session for the reporting of new results at the Annual GEN meetings. This would keep the topic alive and would facilitate direct exchange between members.

The project has shown that ecolabelling schemes worldwide face several common challenges. Thus, a joint and reconciled approach for addressing these challenges is not only efficient in terms of financial resources, but also increases the possibilities of triggering positive environmental impacts substantially. Furthermore, a joint effort of ecolabel schemes gives a clear message to the industry that ecolabels are increasingly addressing the global markets. Thus, at a general level, it is recommended to:

- continue supporting the ecolabel schemes in their endeavor to developing and implementing common approaches for common environmental challenges.

In this regard, technical support in the development of award criteria and mutual recognition agreements between the ecolabels continue to be necessary in the future. Precisely, it is recommended to:

- support GEN in developing joint environmental requirements for one or two relevant key sectors.

For the selection of sectors, it is recommended to

- conduct an assessment of the overall and relative environmental impacts associated with consumption and production of goods and services in selected countries.

This approach would help in identifying focus sectoral areas for ecolabels and possible interventions at the level of criteria development. The advantage of such an approach would be to address the specific environmental impacts of an economy without necessarily having to go through a complete harmonization of criteria between various ecolabels. More importantly, it will help in contextualizing individual ecolabels in a much better way at the level of environmental impacts while leaving the freedom to develop criteria that are better suited for local conditions.

The selection of sectors can also be done on the basis of innovative and environmentally relevant product groups of the Blue Angel. Building on the experiences with the UBA-project on the international harmonization and dialogue on air-conditioners, it is recommended to

- cover one or more of the following product groups in the working groups within GEN: data centres, retail stores, textile products and reusable cup systems.

Zusammenfassung

Umweltzeichen sind ein wichtiges Element des produktpolitischen Rahmens der EU. Zusammen mit der umweltfreundlichen, öffentlichen Beschaffung (Green Public Procurement, GPP) sind Umweltzeichen Impulsgeber für Marktinnovationen, indem sie Anreize für Hersteller und Dienstleister schaffen, über die verpflichtenden Umweltanforderungen hinauszugehen. Da die Märkte immer internationaler werden und die Produkte nicht mehr nur für nationale Märkte entwickelt werden, ist es wichtig, die globale Positionierung von Umweltzeichen durch die Entwicklung und internationale Harmonisierung von Umweltzeichenkriterien zu stärken. In diesem Zusammenhang hat das deutsche Umweltzeichen, der Blaue Engel, seine internationale Zusammenarbeit mit Umweltzeichenprogrammen weltweit intensiviert. Diese Zusammenarbeit beinhaltet in der Regel einen engen Dialog bei der Entwicklung von Vergabekriterien, Vereinbarungen über die gegenseitige Anerkennung der Umweltzeichenprogramme und unterstützende Aktivitäten im Rahmen der technischen internationalen Zusammenarbeit. Das Grundprinzip der internationalen Aktivitäten des Blauen Engels ist die Erhöhung der Wirksamkeit von Typ-I-Umweltzeichen bei der Erreichung von Umweltzielen, wie sie auch im UN-Nachhaltigkeitsziel 12 „Nachhaltig produzieren und konsumieren“ festgelegt sind. Da Umweltzeichen weltweit vor gemeinsamen Herausforderungen stehen, ist die Zusammenarbeit und das Engagement der Umweltzeicheninstitutionen bei der Entwicklung gemeinsamer Umweltstandards unverzichtbar. Durch die gemeinsamen Anstrengungen der Umweltzeicheninstitutionen wird eine effizientere Kommunikation mit Verbraucherinnen und Verbraucher und Behörden ermöglicht und schafft eine bessere Orientierung für potenzielle Umweltzeichenträger.

Vor diesem Hintergrund wurde dieses Projekt vom Umweltbundesamt (UBA) im Rahmen des Umweltforschungsplans (Forschungskennzeichen 3717 37 316 0) initiiert. Das Gesamtziel des Projekts ist die Stärkung der Nutzung und Zusammenarbeit von Typ-I-Umweltzeichen weltweit. Konkret verfolgt das Projekt die folgenden Ziele:

- Analyse und Beschreibung von zwei gemeinsamen Herausforderungen, mit denen Umweltzeichen des Typs I konfrontiert sind
- Analyse der aktuellen Situation der identifizierten gemeinsamen Herausforderungen innerhalb der Umweltzeichensysteme sowie innerhalb der Unternehmen und potenziellen Umweltzeichenträger
- Ermittlung von Lösungen zur Bewältigung der gemeinsamen Herausforderungen, gefolgt von der Umsetzung zweier konkreter Maßnahmen in Zusammenarbeit mit den Umweltzeichensystemen
- Unterstützung des Diskussionsprozesses über gemeinsame Herausforderungen zwischen den Typ-I-Umweltzeichenprogrammen innerhalb des Global Ecolabelling Network (GEN)

- Konzeptionelle Planung, Organisation und Durchführung des GEN-Jahrestreffens 2018 in Berlin sowie einer internationalen Konferenz und eines parlamentarischen Diskussionsabends zu den für die Umweltzeichen relevanten Themen, und
- Veröffentlichung einer Sonderausgabe über Umweltzeichen in einer internationalen wissenschaftlichen Zeitschrift

Das Umweltbundesamt (UBA) und das Global Ecolabelling Network (GEN) benannten zwei zentrale Herausforderungen im Rahmen dieses Projektes:

- Integration von Nachhaltigkeitsaspekten der Rohstofflieferketten in Umweltzeichensystemen
- Messung der Leistung von Umweltzeichen

Das wichtigste Grundprinzip des Projekts war die Entwicklung praktischer Lösungen, die leicht verständlich sind und in der täglichen Arbeit der Umweltzeichenprogramme im Rahmen des GEN-Netzwerks umgesetzt werden können. Die Erfahrungen aus der Vergangenheit hatten gezeigt, dass allzu komplexe Ansätze, auch wenn sie auf dem Papier vielversprechend klangen, von den Umweltzeichen-Institutionen aufgrund fehlender finanzieller und technischer Ressourcen nicht angenommen wurden. Daher war der Kern des methodischen Gesamtansatzes partizipatorisch, praxisorientiert und auf Eigenverantwortung basiert, wobei die Projektaktivitäten in sehr enger Zusammenarbeit mit den Umweltzeichen-Institutionen durchgeführt wurden. Ein solches Projektdesign war wichtig, um die Aufnahmebereitschaft der Umweltzeichensysteme auf die für die identifizierten Herausforderungen entwickelten Lösungen zu erhöhen.

Integration von Nachhaltigkeitsaspekten der Rohstofflieferketten in Umweltzeichensystemen

Die Produktpolitik (einschließlich der Umweltzeichen) versucht, die ökologischen und sozialen Auswirkungen der Gewinnung von in den Produkten enthaltenen Primärrohstoffen zu verringern. Eine zentrale Herausforderung ist dabei die Bandbreite der Rohstoffe und die damit verbundenen vielfältigen Umweltauswirkungen. Darüber hinaus variieren Art und Umfang der Umweltauswirkungen von Rohstoff zu Rohstoff und von Bergbauprojekt zu Bergbauprojekt. Während für einige Umweltauswirkungen, wie den kumulierten Energiebedarf (CED) und die Treibhausgasemissionen (GWP) relativ belastbare Ökobilanz- (LCA-) Daten vorhanden sind, werden verschiedene Umweltauswirkungen des Bergbaus und der Erzaufbereitung, wie zum Beispiel die Auswirkungen auf die biologische Vielfalt, nur unzureichend erfasst. Bei komplexen Produktgruppen führt diese Einschränkung zu einem Mangel an verlässlichen Leitlinien für Umweltzeichensysteme, z.B. wenn es um die Priorisierung der Maßnahmen zur Reduzierung rohstoffbezogener Umweltprobleme geht. Da es sich bei Umweltzeichensystemen um ein freiwilliges Umweltinstrument handelt, ist ein gutes Gleichgewicht zwischen ambitionierten Umweltkriterien und der Bereitschaft fortschrittlicher Unternehmen, auf die Zertifizierung zu reagieren, erforderlich. Gleichzeitig besteht ein breiter Konsens darüber, dass die Produzenten nicht für alle Rohstoffe gleichermaßen weitreichende Maßnahmen ergreifen können. Daher ist eine Methode erforderlich, um die umweltrelevantesten Materialien von der Wiege bis zur Bahre zu priorisieren.

Um dieser Herausforderung zu begegnen, hat das Projekt die Methodik und Bewertungen des vom Umweltbundesamt finanzierten Projekts ÖkoRess genutzt. Im Rahmen des Projekts Öko-Ress wurde eine Methodik zur Bewertung und zum Vergleich der Umweltgefährdungspotenziale von mineralischen Rohstoffen entwickelt, die auf mehr als 50 Rohstoffe angewendet wurde, und

die Priorisierung von Rohstoffen aus Umweltperspektive unterstützte. Als Ergänzung zu den Ergebnissen des ÖkoRess-Projekts zur Priorisierung von Rohstoffen nach ihrem Umweltgefährdungspotential fügte dieses Projekt eine zweite Dimension hinzu, die die Bedeutung einer Produktgruppe / einer Anwendung im weltweiten Gesamtverbrauch eines Rohstoffs darstellt. Daher wird empfohlen, die Kriterien für die Umweltkennzeichnung auf eine begrenzte Anzahl von denjenigen Rohstoffen zu konzentrieren,

1. die eine hohe Umweltrelevanz haben (auch als "Umweltgefährdungspotential" bezeichnet), und
2. bei denen eine Produktgruppe einen hohen Anteil an der Gesamtrohstoffnachfrage im Verhältnis zur globalen Produktion ausmacht.

In diesem Projekt wurde dieser Ansatz auf die Produktgruppe der Notebooks angewandt. Die im Rahmen dieses Projektes durchgeführte Marktanalyse ergab, dass die Notebookproduktion ein wichtiger Faktor für die globale Nachfrage nach Tantal (~14% der Weltprimärproduktion), Kobalt (~6% der Weltprimärproduktion) und in geringerem Maße auch Palladium (~2% der Weltprimärproduktion) ist. Darüber hinaus handelt es sich auch um Rohstoffe, bei denen die Notebook-produzierende Industrie wahrscheinlich einen erheblichen Einfluss (Marktmacht) auf die Rohstoffversorgungsketten hat und bei denen entsprechende Recycling-Anstrengungen ein erhebliches Potenzial für die Rohstoffrückgewinnung bergen könnten. Im folgenden Schritt wurden die Umweltgefährdungspotentiale für Tantal, Kobalt und Palladium anhand der Ergebnisse des ÖkoRess-Projekts bewertet (Tabelle 6, 7 und 8). Da die Gewinnung dieser Rohstoffe auch mit gravierenden sozialen Auswirkungen und Menschenrechtsrisiken verbunden ist, wurden im nächsten Schritt diese Aspekte für die drei Rohstoffe analysiert (Kapitel 3.3.5). Zusätzlich wurden die Kriterien verschiedener Umweltzeichensysteme auf die Aspekte Haltbarkeit, Recyclingfähigkeit, verantwortliche Beschaffung von Rohstoffen und Verantwortung in der Lieferkette untersucht, um zu verstehen, wie diese Systeme rohstoffbezogene Fragen behandeln (Kapitel 3.3.6). Schließlich wurden Interviews mit IT-Unternehmen und Branchenexperten der Umweltzeichenprogramme durchgeführt, um deren Position und Erfahrungen bei der Anwendung des Konzepts der menschenrechtlichen Sorgfaltspflichten (Due-Diligence) als produktbezogene Nachhaltigkeitsmaßnahme zu verstehen.

Die Analyse zeigte, dass einige Umweltzeichensysteme damit begonnen haben, Kriterien für die menschenrechtlichen Sorgfaltspflichten in der Lieferkette gemäß dem Leitfadens „OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-affected and High-risk Areas" (Kapitel 3.3.6.3) zu verwenden. Es muss jedoch betont werden, dass die Due Diligence der Lieferkette gemäß den entsprechenden OECD-Leitlinien nur Fragen der Konfliktfinanzierung und der Menschenrechtsverletzungen abdeckt. Umweltfragen und andere soziale Aspekte (z.B. Gesundheit und Sicherheit im Bergbau, Entwicklungsaspekte) werden bei den Due Diligence-Bemühungen von Unternehmen nicht unbedingt berücksichtigt. Darüber hinaus ist zu bedenken, dass eine falsche Auslegung der Due Diligence zu Boykotten bestimmter Bergbaugebiete und in der Folge zu unbeabsichtigten negativen sozioökonomischen Nebenwirkungen führen kann (siehe Abschnitt 3.1.4). In diesem Zusammenhang sollten Umweltzeichen zusätzlich die Forderung nach aktiver Unterstützung von vor-Ort Initiativen in der Region in Betracht ziehen, die auf eine nachhaltige Verbesserung der Abbaubedingungen vor Ort und insbesondere in Bergbaugebieten in Konflikt- und Hochrisikogebieten abzielen. In diesem Zusammenhang wurde in dem Projekt die Empfehlung ausgesprochen, das Due-Diligence-Konzept nicht nur für die so genannten "Konfliktminerale", sondern auch für andere relevante Rohstoffe, die für eine definierte Produktgruppe eine hohe Relevanz haben, anzuwenden.

Darüber hinaus muss erwähnt werden, dass Transparenz grundsätzlich ein wichtiger Aspekt bei allen Debatten über Rohstofflieferketten und die Sorgfaltspflicht ist. Dabei sollte man bedenken,

dass eine vollständige Transparenz der Lieferketten nicht das Ziel an sich ist. Zwar kann die (Rück-)verfolgung von Rohstofflieferketten sicherlich dazu beitragen, die Beziehungen innerhalb der Lieferketten zu verstehen und geeignete Strategien zu entwerfen, doch besteht eine gewisse Gefahr, dass starke Forderungen nach vollständiger Transparenz dazu führen, dass Unternehmen den größten Teil ihrer Due-Diligence-Ressourcen für die Abbildung der Lieferkette und nicht für Verbesserungsprozesse aufwenden. Daher sollte der Aspekt der Transparenz bei Umweltzeichensystemen nicht überstrapaziert werden.

Es wurde festgestellt, dass die Bereitschaft der Umweltzeichenprogramme, einen Schritt weiter zu gehen und die vorgeschlagenen Kriterien innerhalb ihrer Programme zu diskutieren oder umzusetzen, weiterhin gering war. Der Grund dafür liegt darin, dass es den Umweltzeichensystemen schwerfällt, den prozessbasierten Due-Diligence-Ansatz in messbare und überprüfbare Umweltzeichenkriterien zu überführen. Darüber hinaus scheinen die Umweltzeichensysteme von der Herausforderung überfordert zu sein, mit vielen in den Produkten verwendeten Rohstoffen umzugehen. Folglich besteht eine allgemeine Skepsis hinsichtlich der Möglichkeiten, die Einhaltung der Vorschriften zuverlässig zu überprüfen.

Auf der anderen Seite wird der Due-Diligence-Ansatz in der Lieferkette zunehmend zu einem integralen Bestandteil der Unternehmenspolitik vieler internationaler Marken. Zwar lag der Schwerpunkt der Due-Diligence-Bemühungen auf der Auseinandersetzung mit Konfliktfinanzierung und Menschenrechtsverletzungen, doch zeigen Interviews mit führenden Unternehmen, dass das Konzept auch auf **schwere Umweltprobleme** ausgedehnt werden kann (Kapitel 3.4). Da die Unternehmen freiwillige Umweltkennzeichnungsprogramme jedoch noch nicht als starke Anreize für die Durchführung einer umfassenden Due-Diligence-Prüfung der Lieferkette wahrnehmen, schlug das Projekt vor, sich zunächst auf zwei sehr spezifische Kernelemente von Due-Diligence-Programmen zu konzentrieren, um **Kriterien für die ökologische Due-Diligence-Prüfung** abzuleiten, die entweder einzeln oder in Kombination verwendet werden können:

- Die Hersteller sollten dazu verpflichtet werden, eine Risikobewertung mit erweitertem Umfang (Schritt 2 des Lieferketten-Due-Diligence-Prozesses) in Bezug auf wichtige Rohstoffe einer Produktgruppe (z.B. Tantal, Kobalt und Palladium für Notebooks) durchzuführen. Somit würden die Kriterien für die Umweltkennzeichnung die Hersteller dazu motivieren, die Umweltrisiken in ihren Lieferketten systematisch zu bewerten, was allgemein als ein erster wichtiger Schritt für die Maßnahmen der Unternehmen zur Minderung der Umweltrisiken angesehen wird.

- Die Hersteller sollten dazu verpflichtet werden, vor Ort Initiativen, die über Konfliktfinanzierung und Menschenrechte hinausgehen, in der Region zu unterstützen.

Darüber hinaus wurde empfohlen, dass die Hersteller die Umsetzung der Lieferketten-Sorgfaltsprüfung zur Bewältigung von Konfliktfinanzierung und Menschenrechtsverletzungen für die meisten relevanten Rohstoffe im Einklang mit dem Leitfaden „OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-affected and High-risk Areas" nachweisen. Diese Anforderung sollte von den Produzenten durch die Bereitstellung eines Weblinks zu dem veröffentlichten Due-Diligence-Bericht des Unternehmens (nicht älter als 2 Jahre), der alle 5 Schritte des OECD-Rahmens für die Sorgfaltspflicht abdeckt, überprüft werden.

Ein solcher Ansatz würde das Risiko verringern, dass Unternehmen nicht in der Lage oder nicht bereit sind, die entsprechenden Kriterien für das Umweltzeichen umzusetzen. Generell wird erwartet, dass die Auswirkungen von Umweltzeichen in diesem Bereich nur dann zunehmen

werden, wenn viel mehr Umweltzeichensysteme das Due-Diligence-Konzept in ihren Kriterien aufgreifen. Nur wenige GEN-Mitglieder, wie das TCO Development-Label und der Blaue Engel, leisten in dieser Hinsicht bereits Pionierarbeit und sind gute Beispiele für die Wissensvermittlung.

Aus dieser Perspektive werden die folgenden Kriterien für die Vergabe von Umweltzeichen vorgeschlagen:

- *Der Notebook-Hersteller muss nachweisen, dass er für Zinn, Tantal, Wolfram, Gold und Kobalt, die in seinen Notebooks verwendet werden, eine Due Diligence-Prüfung für die Lieferkette durchführt. Der angewandte Due-Diligence-Prozess wird in Übereinstimmung mit dem Leitfaden „OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-affected and High-risk Areas" durchgeführt.*

Verifizierung:

- ✓ *Der Antragsteller stellt einen Weblink zum veröffentlichten Bericht über die Sorgfaltspflicht von Unternehmen zur Verfügung, der alle 5 Schritte des OECD-Due Diligence-Rahmens für die Sorgfaltspflicht abdeckt. Der Bericht darf zum Zeitpunkt der Einreichung des Antrags nicht älter als 2 Jahre sein.*
- ✓ *Der Antragsteller muss ein Exemplar dieses Due-Diligence-Berichts vorlegen, in dem die Überschriften aller 5 Due-Diligence-Schritte sowie alle behandelten Materialien grafisch markiert sind.*

- *Der Notebook-Hersteller muss nachweisen, dass seine Due-Diligence-Bemühungen für Rohstoffe eine Bewertung der Umweltrisiken beinhalten.*

Verifizierung:

- ✓ *Der Antragsteller muss ein Exemplar seines Due-Diligence-Berichts vorlegen, in dem die Umweltrisikobewertung von Rohstoffen behandelt wird und in dem die relevanten Abschnitte markiert sind.*

- *Der Notebook-Hersteller muss nachweisen, dass er aktiv vor-Ort Initiativen in der Region[2] unterstützt, die eine nachhaltige Produktion von Primärrohstoffen in Konflikt- und Risikogebieten fördern. Initiativen in den Regionen sollten einem ganzheitlichen Ansatz folgen und sowohl die Menschenrechte als auch andere relevante soziale und ökologische Fragen umfassen.*

[2] Es wird empfohlen, eine Positivliste von Initiativen in der Region zu erstellen, die für dieses Kriterium als förderungswürdig angesehen werden. Diese Liste könnte (muss aber nicht unbedingt darauf beschränkt sein) die Conflict-Free Tin Initiative (CFTI); Solutions for Hope (SfH); Fairtrade Gold; Fairmined Standard sowie die Responsible Cobalt Initiative (RCI) umfassen.

Verifizierung:

- ✓ *Der Antragsteller muss mindestens eine vor-Ort Initiative in der Region aufführen, die er aktiv unterstützt. Er muss die Art der Unterstützung (z.B. jährliche finanzielle Unterstützung) angeben und einen Ansprechpartner für jede aufgelistete Initiative nennen, um eine unabhängige Prüfung der gegebenen Informationen zu ermöglichen.*
- ✓ *Der Antragsteller gibt Auskunft über die Art der Initiative (Organisationsstruktur, Ziel, Land, materieller Anwendungsbereich, Art der Unterstützung...) und beschreibt, wie das Projekt zu einer Verbesserung der Menschenrechte sowie der relevanten sozialen und ökologischen Bedingungen in und um die Bergbaustätte(n) führt.*
- ✓ *Der Antragsteller muss Informationen über den monetären Wert seiner Unterstützung von Aktivitäten in der Region (Jahresdurchschnitt) vorlegen und angeben, wie diese Unterstützung gewährt wird (direkte Zahlung an die Initiative, Finanzierung der einzelnen Maßnahmen, Sachleistungen...).*

Messung der Leistung von Umweltzeichen

Die Debatte über die Rolle von Umweltzeichen bei der Förderung des nachhaltigen Konsums und der nachhaltigen Produktion (SCP) wird seit mehreren Jahren geführt. In den letzten Jahren wurden mehrere Fragen zur Wirksamkeit der Umweltzeichen im Hinblick auf die Erreichung der festgelegten Umweltziele und -vorgaben aufgeworfen. Im Zuge dieser Debatte stehen die Umweltzeichensysteme weltweit vor der Herausforderung, den politischen Entscheidungsträgern und anderen gesellschaftlichen Akteuren solide empirische Beweise dafür zu liefern, wie die Umweltzeichen eine marktwirtschaftliche Lenkungswirkung in Richtung nachhaltigere Produkte und Dienstleistungen unterstützen.

Bislang haben nur wenige Umweltzeichensysteme weltweit daran gearbeitet, die Entwicklung und Wirksamkeit ihrer mit dem Umweltzeichen gekennzeichneten Produkte zu verfolgen. Die Bewertung der ausgewählten Umweltzeichensysteme im Hinblick auf die Indikatoren zur Leistungsmessung zeigt, dass die Systeme in unterschiedlichem Maße Indikatoren zum Monitoring und zur Bewertung der Leistung ihrer Umweltzeichen verwenden. Während Indikatoren wie die Anzahl der Lizenzen sowie der mit dem Umweltzeichen gekennzeichneten Produkte und der Kriteriendokumente als auch das Bewusstsein und die Wahrnehmung der Verbraucher und Verbraucherinnen von mehreren Umweltzeichensystemen verwendet wird, werden Veränderungen in der Anzahl der Lizenzen, Produkte und Unternehmen im Laufe der Zeit, der Marktanteil der mit dem Umweltzeichen gekennzeichneten Produkte und der Umweltnutzen von sehr wenigen bis gar keinen Umweltzeichensystemen abgedeckt.

Die Einführung eines Monitorings- und Bewertungssystems zur Messung der Leistung und Wirksamkeit von Umweltzeichen ist kein einfaches Unterfangen. Darüber hinaus ist nur begrenztes Wissen darüber verfügbar, wie die Leistung von Umweltzeichenprogrammen bewertet werden kann und was den Erfolg von Umweltzeichen ausmacht. Die größte Herausforderung liegt dabei in der mangelnden Verfügbarkeit von Marktdaten über den Anteil bzw. den Verkauf von Produkten mit Umweltzeichen und den daraus resultierenden Umweltvorteilen. Darüber hinaus ist es sehr schwierig, die indirekten positiven Auswirkungen von Umweltzeichen in quantifizierbaren Größenordnungen zu messen. Die wenigen Beispiele für indirekte positive Vorteile sind u.a. die Verwendung von Umweltzeichen-Kriterien bei der umweltfreundlichen öffentlichen Beschaffung, bei der Festlegung von verpflichtenden Mindestumweltstandards sowie bei der Förderung von Herstellern oder der Industrie zur Anpassung der Produktionslinie gemäß den Umweltzeichen-Kriterien usw. Vor diesem Hintergrund verwenden wenige Umweltzeichensysteme alternative Proxy-Indikatoren, wie z.B. die Anzahl der Produkte, Kriteriendokumente, Lizenzen und Lizenzinhaber, um die Wirkung ihrer

Umweltzeichen zu messen. Das mit der Fehlinterpretation solcher Proxy-Indikatoren verbundene Risiko ist jedoch ebenfalls beträchtlich, wie auch in Kapitel 4.3 erläutert wird.

Nach der Analyse möglicher Ansätze und Indikatoren für die Leistungsmessung von Umweltzeichen des Typs I und auf Grundlage der Ergebnisse einer Umfrage und von Interviews mit verschiedenen Umweltzeichenprogrammen (siehe Kapitel 4.4) kam das Projekt zu dem Schluss, dass die Berechnung der Umweltentlastungen durch Umweltzeichenprodukte ein vielversprechender Ansatz zur Messung der Leistung von Umweltzeichen sein könnte. Auch wenn andere Indikatoren wie die Anzahl der Produkte, die Anzahl der Lizenzen, das Bewusstsein der Verbraucher usw. viel leichter kontrollierbar sind, liefern diese keine zuverlässigen und quantifizierbaren Informationen über den tatsächlichen Umweltnutzen von Umweltzeichen.

Es wurde ein partizipatorisches, praxisorientiertes und auf Eigenverantwortung basiertes Projektdesign entwickelt, bei dem Umweltzeichensysteme die federführende Rolle bei der Messung der Leistung von Umweltzeichen übernahmen (siehe Kapitel 2 und 4.5 für weitere Einzelheiten). Den Kern dieser Übung bildete eine Arbeitsgruppe, die 2017 in Stockholm initiiert wurde. Die Arbeitsgruppe bestand aus sieben Umweltzeichensystemen – Environmental Choice New Zealand, Green Product Certification India, Green Mark Taiwan, Thai Green Label, Blauer Engel Deutschland, Vitality Leaf Russia und China Environmental Labelling.

Das Öko-Institut koordinierte die Arbeitsgruppe und leistete fachliche Beratung zu den Umweltzeichensystemen (siehe Kapitel 4.5 für das Pilotvorhaben). Grundlage für die Berechnung der Umweltentlastungspotenziale von Produkten mit Umweltzeichen (Auswahl der Produktgruppen siehe Kapitel 4.5) war ein vom Öko-Institut entwickelter Leitfaden (siehe Anhänge A und B). Der Leitfaden richtete sich in erster Linie an die Mitarbeiterinnen und Mitarbeiter in den Umweltzeichen-Institutionen, wobei deren Sachzwänge hinsichtlich der finanziellen und personellen Ressourcen berücksichtigt wurden. Er soll den Mitarbeiterinnen und Mitarbeiter dabei helfen, bestehende Ökobilanzstudien zu verstehen und zu interpretieren, wichtige Primärdaten zu sammeln und Umweltentlastungen zu berechnen.

Nach den Rückmeldungen der teilnehmenden Umweltzeichensysteme lieferten sowohl der Austausch in der Arbeitsgruppe als auch die Anwendung des methodischen Leitfadens diverse praktische Erkenntnisse für die Bewertung der Umweltauswirkungen und Einsparungen an Produkten. Die Umweltzeichensysteme sammelten nicht nur methodische Erfahrungen für die Berechnung des Umweltnutzens ihrer Systeme, sondern erkannten auch die Notwendigkeit der Formulierung quantifizierbarer und messbarer Umweltzeichenkriterien, die eine Voraussetzung für eine zuverlässige Berechnung von Umweltentlastungen ist.

Das Vorhaben regte den Austausch zwischen den Umweltzeichensystemen innerhalb des GEN an. Die Umweltzeichensysteme diskutierten ihre Ansätze, Schwierigkeiten und Ergebnisse nicht nur während der durchgeführten Webinare, sondern auch auf bilateraler Ebene, z.B. während der Bearbeitung ähnlicher Produktgruppen. Dieser Austausch und die entsprechenden Interaktionen haben neue Perspektiven eröffnet und sich als wertvolle Ressource für die weitere Arbeit innerhalb des GEN erwiesen.

Auch die Ergebnisse der Umweltnutzenanalyse selbst waren beeindruckend. Die Umweltzeichensysteme bekundeten ihre Absicht, die Ergebnisse sowohl für die interne als auch für die externe Kommunikation zu nutzen. Dieser Schritt wurde als notwendig erachtet, um die Vorteile der mit dem Umweltzeichen versehenen Produkte zu demonstrieren und das Bewusstsein bei politischen Entscheidungsträgern, Unternehmen und Verbraucherinnen und Verbrauchern zu erhöhen. Einige Beispiele für die Ergebnisse sind im Folgenden zusammengefasst:

- Einsparungen von 21.000 Tonnen CO_2-Emissionen pro Jahr sind auf den Verkauf vom Toilettenpapier zurückzuführen, die mit dem Neuseeländischen Umweltzeichen gekennzeichnet sind.
- Über 5 Millionen Liter Farbe und etwa 332 Tonnen VOC-Gehalt wurden durch den Verkauf von Farben, die mit dem russischen Umweltzeichen gekennzeichnet sind, im Jahr 2018 eingespart.
- In China wurden 2018 fast 10 TWh Strom durch den Verkauf und die Verwendung von druckerbasierten Multifunktionsgeräten, die durch das chinesische Umweltzeichen zertifiziert sind, eingespart.
- Zement und Beton mit dem indischen Umweltzeichen führen zu einer Reduzierung der Treibhausgasemissionen um fast 8 Millionen Tonnen jährlich.

Die oben genannten Ergebnisse, die auch auf der GEN-Jahrestagung 2019 in Suzhou, China vorgestellt wurden, zeigen, dass Umweltzeichen eine wichtige Rolle bei der Verringerung der Umweltauswirkungen unseres Konsumverhaltens spielen. Im Rahmen des Projekts wurde gezeigt, dass es möglich ist, diese Einsparungen auch bei Umweltzeichensystemen mit begrenzten Ressourcen zu berechnen, sofern diese zu methodischen und technischen Aspekten Hilfestellung erhalten. Darüber hinaus zeigte sich, dass eine kontinuierliche technische und methodische Unterstützung der Umweltzeichensysteme über einen längeren Zeitraum hinweg ein Schlüssel zur Überwindung der inhärenten Hemmschwelle im Umgang mit komplexen Problemen ist. Insgesamt waren die Kosten und der Aufwand für die Umsetzung des Pilotprojekts zur Messung der Umweltleistung von Umweltzeichen gering.

Es gibt jedoch einige Aspekte, die bei der zukünftigen Leistungsmessung von Umweltzeichen berücksichtigt werden müssen. Expertenwissen und Erfahrung bei der Durchführung von Ökobilanzen (LCA) sowie der Zugang zu (kommerziellen) Datenbanken und LCA-Software sind immer noch sehr entscheidend, wenn es um die Durchführung von Berechnungen bezüglich der Umweltauswirkungen und -einsparungen geht. Darüber hinaus ist die Interpretation einer großen Menge von LCA-Daten nicht trivial und erfordert ein profundes technisches Verständnis der Produktsysteme. Daher können Umweltzeicheninstitutionen, auch wenn sie einige Erfahrungen aus erster Hand mit den Berechnungen gesammelt haben, die im Allgemeinen erforderliche umfassende LCA-Expertise nicht ersetzen. Das Pilotprojekt half nur dabei, einen ersten Schritt zur Berechnung der Umweltentlastungen durch Produkte mit Umweltzeichen auf der Grundlage vorhandener LCA-Studien zu machen. Das Vorhaben zielte nicht darauf ab, umfassendes LCA-Fachwissen innerhalb der Umweltzeichen-Institutionen aufzubauen. Daher ist es ratsam, dass die Umweltzeichen-Institutionen weiterhin Experten bzw. Expertinnen für Ökobilanzen während des Prozesses der Leistungsmessung konsultieren. Beispielsweise wird es für die Umweltzeichensysteme immer noch schwierig sein, die Wirksamkeit alternativer Modellansätze zu beurteilen, wenn die für die wichtigsten Umweltwirkungskategorien erforderlichen Daten und Informationen nicht verfügbar sind. Es muss daher betont werden, dass die Pilotstudie und der methodische Leitfaden in erster Linie für die Mitarbeiterinnen und Mitarbeiter in Umweltzeichen-Institutionen erstellt wurden, wobei dort vorhandene Sachzwänge in Bezug auf finanzielle und personelle Ressourcen berücksichtigt wurden. Somit war der Gesamtansatz sehr pragmatisch und zielte nicht darauf ab, umfassende LCA-Expertise innerhalb der Umweltzeichen-Institutionen aufzubauen.

Ein weiterer wichtiger Aspekt, der besonderer Erwähnung bedarf, ist die externe Kommunikation der Berechnungsergebnisse an die Öffentlichkeit oder die Entscheidungsträger. Auch hier ist ein sorgfältiger Umgang mit den Ergebnissen der Berechnungen, insbesondere wenn ein vereinfachter Ansatz gewählt wurde, ratsam. Dies könnte der Fall sein, wenn die Kommunikation der Umweltvorteile eines mit dem Umweltzeichen versehenen Produkts gegenüber einem Referenzprodukt bestimmte sensible Informationen eines Unternehmens offenbaren würde. In solchen Fällen ist es ratsam, ausdrücklich zu erwähnen, dass die Berechnungen des Umweltnutzens nur für durchschnittliche Produkte durchgeführt werden und nicht unternehmens- oder produktspezifisch sind. Außerdem gibt es möglicherweise nicht viele LCA-Studien, die speziell für das Umweltzeichen und die entsprechenden Referenzprodukte durchgeführt wurden, die für die eigenen Berechnungen verwendet werden können. Daher ist es wichtig, in der externen Kommunikation hervorzuheben, dass die berechneten Umweltvorteile nur einen Trend widerspiegeln, auf mehreren Annahmen des Umweltzeichensystems basieren und nicht spezifisch für ein konkretes Produkt eines bestimmten Unternehmens sind (siehe A.4.1 und B.4.1 für weitere Einzelheiten zu den Grundsätzen der externen Kommunikation).

Empfehlungen und Ausblick

Was das in diesem Projekt behandelte Thema der Rohstoffversorgungsketten betrifft, wird empfohlen:

- GEN bei der Entwicklung konkreter Maßnahmen zur Integration der Grundsätze der Sorgfaltspflicht (Due-Diligence) bei Rohstoffen sowie bei der Erhöhung des Bewusstseins bei den Mitgliedern in diesem Bereich zu unterstützen.

TCO Development und der Blaue Engel könnten die Leitung einer solchen Arbeitsgruppe übernehmen, da sie bereits seit einigen Jahren mit den Kriterien der Sorgfaltspflichten arbeiten. Da das Thema Rohstoffverbrauch auch anhand von Kriterien zur Haltbarkeit, Wiederverwendung, Reparatur und Recyclingfähigkeit behandelt werden kann, wird darüber hinaus empfohlen:

- GEN bei der Entwicklung konkreter Maßnahmen zur Integration und Berücksichtigung der Prinzipien der Kreislaufwirtschaft in Umweltzeichen sowie bei der Erhöhung des Bewusstseins bei den Mitgliedern in diesem Bereich zu unterstützen.

Der Erfolg des Pilotprojekts zur Leistungsmessung von Umweltzeichen war zu einem großen Teil auf die Initiative und die hohe Motivation der teilnehmenden Umweltzeichenprogramme zurückzuführen. Dabei trugen der durch das Projekt vorgegebene Rahmen und die externe Unterstützung (z.B. Leitfaden, Backstopping, Moderation etc.) zur erfolgreichen Durchführung der Aufgabe bei. Der Workshop auf der GEN-Jahrestagung in Suzhou im Oktober 2019 zeigte deutlich das enorme Interesse der Umweltzeichensysteme an einer Fortführung des Prozesses. Daher wird empfohlen:

- die Ausweitung des Pilotprojekts auf mehr GEN-Mitglieder und/oder mehr Produktgruppen zu unterstützen.

Darüber hinaus könnte ein wichtiger Aspekt darin bestehen, eine verantwortliche Person (oder eine Gruppe) innerhalb GEN zu bestimmen, die das Thema Leistungsmessung vorantreibt, z.B. durch die Einrichtung einer ständigen Austauschplattform zu diesem Thema. Die Austauschplattform könnte als Online-Format betrieben werden und aktuelle Informationen darüber enthalten, wer derzeit an welchen Produktgruppen arbeitet, sowie Präsentationen oder Berichte über abgeschlossene Bewertungen oder anderes Informationsmaterial (z.B. das Leitfadendoku-

ment). Die Plattform könnte durch die Organisation einer regelmäßigen Sitzung für die Berichterstattung über neue Ergebnisse bei den jährlichen GEN-Treffen unterstützt werden. Dies würde das Thema lebendig halten und den direkten Austausch zwischen den Mitgliedern erleichtern.

Das Projekt hat gezeigt, dass Umweltzeichensysteme weltweit vor mehreren gemeinsamen Herausforderungen stehen. Daher ist ein gemeinsamer und abgestimmter Ansatz zur Bewältigung dieser Herausforderungen nicht nur im Hinblick auf die finanziellen Ressourcen effizient, sondern steigert auch erheblich die Möglichkeiten, positive Umweltauswirkungen auszulösen. Darüber hinaus vermittelt eine gemeinsame Anstrengung von Umweltzeichensystemen der Industrie die klare Botschaft, dass Umweltzeichen zunehmend auf die globalen Märkte ausgerichtet sind. Daher wird auf allgemeiner Ebene empfohlen:

- die Umweltzeichensysteme weiterhin in ihrem Bemühen zu unterstützen, gemeinsame Ansätze für gemeinsame Umweltprobleme zu entwickeln und umzusetzen.

In diesem Zusammenhang ist auch in Zukunft technische Unterstützung bei der Entwicklung von Vergabekriterien und Vereinbarungen zur gegenseitigen Anerkennung der Umweltzeichen erforderlich. Daher wird empfohlen:

- GEN bei der Entwicklung gemeinsamer Umweltanforderungen für ein oder zwei relevante Schlüsselsektoren zu unterstützen.

Für die Auswahl der Sektoren wird empfohlen:

- eine Bewertung der allgemeinen und relativen Umweltauswirkungen durchzuführen, die mit dem Konsum und der Erzeugung von Gütern und Dienstleistungen in ausgewählten Ländern verbunden sind.

Dieser Ansatz könnte dazu beitragen, sektorale Schwerpunktbereiche für Umweltzeichen und mögliche Interventionen auf Ebene der Kriterienentwicklung zu identifizieren. Der Vorteil eines solchen Ansatzes wäre es, auf die spezifischen Umweltauswirkungen einer Wirtschaft eingehen zu können, ohne unbedingt eine vollständige Harmonisierung der Kriterien zwischen verschiedenen Umweltzeichen durchlaufen zu müssen. Darüber hinaus – und das ist noch wichtiger – würde dieser Ansatz dazu beitragen, die einzelnen Umweltzeichen auf der Ebene der Umweltauswirkungen in einen viel besseren Kontext zu stellen, wobei gleichzeitig der Handlungsspielraum gegeben ist, Kriterien zu entwickeln, die besser an die lokalen Bedingungen angepasst sind.

Die Auswahl der Sektoren kann auch auf der Grundlage innovativer und umweltrelevanter Produktgruppen des Blauen Engels erfolgen. Aufbauend auf den Erfahrungen mit dem UBA-Projekt zur internationalen Harmonisierung und zum Dialog über Klimaanlagen wird empfohlen:

- eine oder mehrere der folgenden Produktgruppen in den Arbeitsgruppen innerhalb des GEN abzudecken: Rechenzentren, Einzelhandel, Textilprodukte und Mehrwegbechersysteme.

1 Introduction

Ecolabels are an important element of the EU product policy framework. Along with the green public procurement, ecolabels, as a voluntary instrument, aim to trigger innovations and "pull" the market towards more sustainable consumption and production patterns. Thereby, their role is to complement the mandatory minimum product requirements that push the poorest performing products out of the market. Thus, ecolabels are instruments that set incentives for producers and service providers to go beyond the minimal requirements and contribute towards a shift in the overall market towards more sustainability.

There are several hundred ecolabels worldwide, of which the Type-I ecolabels have the strongest credibility as they are independent third party programmes. Type-I ecolabels entail multiple-criteria developed based on life cycle considerations. For instance, Germany's ecolabel, the Blue Angel, belongs to the category of Type-I ecolabels and was the world's first independent environmental protection label for products and services. It is one of the most ambitious environmental labels in the world and certifies over 12,000 products and services in approx. 120 product categories from around 1,500 companies worldwide. Similarly, many countries have implemented national ecolabel programmes. Furthermore, there are few regional initiatives, such as EU-Ecolabel of the European Commission, Nordic Swan for the Nordic countries Denmark, Finland, Iceland, Norway and Sweden and Sello Ambiental for the Latin American region involving Colombia, Mexico and Costa Rica, that have implemented regional ecolabels for promoting the regional harmonization of product-based environmental standards.

As markets are becoming increasingly international and products are no longer developed for national markets, it is important to strengthen the global positioning of ecolabels by developing and harmonizing ecolabel criteria internationally. This has also been one of the demands of the companies that operate in global markets. In this regard, Germany's Blue Angel has intensified its international cooperation with ecolabel programmes worldwide. Such cooperation usually involves close dialogue in the development of award criteria, mutual recognition agreements between the ecolabels and supporting ecolabel programmes within the framework of technical international cooperation. Several harmonization activities are underway with the ecolabels from Austria, China, Korea and Japan as well as with the Nordic Swan. Furthermore, international cooperation within the framework of the International Climate Initiative of the Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) has supported ecolabel programmes in Southeast Asia, Latin America and Eastern Africa in developing and implementing ambitious environmental criteria. Also, the German Environment Agency (Umweltbundesamt - UBA) supported the development of award criteria for air conditioning units and international harmonization work between the Blue Angel and ecolabels in Asia within the framework of Environmental Research Plan (research code 3714 95 3060).

The underlying principle of the abovementioned international activities of the Blue Angel is to increase the effectiveness of type-I ecolabels in achieving environmental goals and targets, as also specified under the UN Sustainable Development Goal 12 on responsible consumption and production. As ecolabels worldwide face common environmental challenges, their cooperation and joint efforts in developing common environmental standards is indispensable.

Thus, this project was initiated by the German Environment Agency (Umweltbundesamt - UBA) as part of the Environmental Research Plan (research code 3717 37 316 0) and financed with federal funds. The project is intended to contribute to ensuring that solutions to common global environmental problems are implemented as uniformly as possible by the ecolabels in future. This facilitates more effective communication to consumers and public authorities as well as provides a stable orientation for potential ecolabel license holders.

The overall objective of the project is to strengthen the use and cooperation of type-I ecolabels worldwide and contribute towards establishing them as one of the key instruments for sustainable consumption. In concrete terms, the project pursues the following objectives:

- Analysis and description of two common challenges faced by type-I ecolabels
- Analysis of the current situation of the identified common challenges within the ecolabelling schemes as well as within companies and potential license holders
- Identification of suitable solutions and approaches for overcoming the common challenges, followed by the implementation of two concrete measures in cooperation with the ecolabelling schemes
- Support the discussion process on common challenges between the type-I ecolabelling programmes within the Global Ecolabelling Network (GEN), and
- Conceptual planning, organization and implementation of the Annual GEN Meeting in 2018 in Berlin as well as of an international conference and a parliamentary discussion on topics relevant for the ecolabels
- Publication of a special issue on ecolabels in an international scientific journal

The project was led by the Öko-Institut, Germany and executed in cooperation with adelphi consult GmbH und Professor Fabio Iraldo of the Bocconi University in Milano.

The report has the following structure: chapter 2 presents the methodological approach applied in the project. The backbones of the report are chapters 3 and 4 where analysis of the two main identified challenges is presented in detail. In chapter 5, the results of the project are discussed, also in terms of their relevance for the Blue Angel. Finally, the report concludes with few recommendations for the German Environment Agency in chapter 6.

2 Methodology

In the beginning of the project, German Environment Agency (UBA) and the GEN board of directors prioritized two following central challenges for the scope of this project:

- Integrating sustainability issues of raw material supply chains in ecolabelling schemes
- Measuring the performance of ecolabels

Öko-Institut applied a mix of methodological instruments for analyzing the identified challenges and defining and implementing possible solutions. As the target group of the project was ecolabelling institutions within GEN, the key underlying principle of the project was to develop practical solutions that can easily be understood and implemented in the day-to-day activities of ecolabel programmes. Experiences from the past had shown that overly complex approaches, even though promising on paper, were not embraced by the ecolabelling institutions. The reasons were diverse and ranged from cost-intensive nature of the approaches, lack of technical capacity within the ecolabelling schemes and lack of understanding of the ground realities around the ecolabel landscape. Acknowledging these factors was the key step for the methodological design of this project.

The methodological design of the project consisted of following elements:

- **Desk research**: To start with, Öko-Institut carried out a brief literature research on the background of the identified challenges. The idea was to understand the status quo of the scientific and political discourse on identified challenges. The analysis was summarized in discussion papers on respective challenges and sent to the GEN members before the Annual GEN meeting in Stockholm in 2017.
- **Establishing two working groups for the identified challenges**: On the basis of the presentation of the discussion papers at the Annual GEN meeting in Stockholm in 2017, Öko-Institut opened two working groups for the identified challenges and invited the ecolabelling schemes to participate actively therein. The idea was to work closely with the ecolabelling schemes for analyzing the current situation on the ground with respect to the identified challenges and clearly identify practical obstacles encountered by the ecolabel programmes in addressing them. Furthermore, the objective of establishing the working groups was to involve the ecolabelling schemes in defining possible solutions and implementing them in pilot exercises. Such an approach was thought to create more ownership of the development solutions, not only within the ecolabelling schemes that participated actively within the working groups, but also among other GEN members. The idea was to trigger the motivation among other GEN members by showing that definition of solutions as well as their implementation came from within the ecolabel community. Additionally, it was sought to showcase that even ecolabelling schemes with limited resources are capable of dealing with complex challenges if they are provided with some methodological and technical assistance. In the following, constitution of the two working groups is presented:

Table 1: Working groups

Working group 1: Integrating sustainability issues of raw material supply chains in ecolabelling schemes	Working group 2: Measuring the performance of ecolabels
Blue Angel, Germany	Blue Angel, Germany
TCO Development, Sweden	Environmental Choice New Zealand
Good Environmental Choice, Australia	GreenPro, India
	Vitality Leaf, Russia
	China Environmental Labelling
	Good Environmental Choice Australia
	Green Label, Thailand
	Green Mark Program, Chinese Taipei
	RAL gGmbH, Germany

- **Survey and interviews with the ecolabelling schemes**: The modus operandi of the two working groups was slightly different from each other. While members of the working group 1 on raw materials commented the discussion paper of the Öko-Institut thoroughly and provided information on further research, members of the working group 2 on performance measurement participated in a questionnaire survey. Additionally, Öko-Institut conducted telephone interviews with selected ecolabelling schemes to extract more information on identified issues.
- **Interviews with companies**: For the topic on raw materials, Öko-Institut conducted interviews with three IT-companies (Fairphone B.V., Hewlett Packard Inc. and Dell GmbH) to get the information on current and best industry practices as well as to get their feedback on the potential ecolabel criteria.
- **Webinars**: One of the key instruments for the exchange of information within the working groups was webinars. On the one hand, webinars were used to discuss the outstanding technical and methodological issues. On the other hand, they were carried out for the capacity building of the participating ecolabelling schemes, especially for the working group 2 on performance measurement. In the webinars for the working group on performance measurement:
  - Öko-Institut introduced the methodological guidance document prepared for measuring the performance of ecolabels,
  - Ecolabelling schemes presented their intermediary results for selected product groups
  - Öko-Institut supported in trouble-shooting by providing answers to problems encountered by the ecolabelling schemes during the pilot exercise
  - Ecolabelling schemes had a mutual exchange of information and experience with each other, and identified ways of cooperating for solving common problems

- **Backstopping**: Apart from the webinars, Öko-Institut provided technical and methodological backstopping to the ecolabelling schemes regularly via e-mails.
- **Workshops**: Progress of the working group was regularly presented at the workshops that were held at the Annual GEN meetings in 2017, 2018 and 2019. These workshops were used to get the feedback from other GEN members who did not participate actively in the working groups. Furthermore, the workshops were also used to promote a dialogue among the GEN members and motivate the larger group for implementing the identified solutions.

Thus, the core of the overall methodological approach was participatory, practice-oriented and ownership-based. Such a project design was important to increase the responsiveness of the ecolabelling schemes towards developed solutions.

3 Integrating sustainability issues of raw material supply chains in ecolabelling schemes

3.1 Raw materials – major sustainability issues & responses

3.1.1 Scarcity & criticality

Sudden and drastic increases of world market prices for some mineral commodities (e.g. tantalum in 2000, rare earth elements 2010-11) raised widespread fear of scarcities and unreliable supply that could negatively impact companies, industries, sectors and even entire economies. This fear was further stimulated by various projections on the growing world demand for a wide range of materials (e.g. caused by the rapid economic development of emerging economies) and an increasing number of trade restrictions for raw materials.

According to Frondel et al. (2006), scarcities of abiotic resources can be divided into two types:

- Absolute scarcity = Depletion of the geological reserves;
- Relative scarcity = Sufficient availability of geological reserves, but resource supply is, for various reasons, not sufficient to satisfy demand. In the scientific literature, such socio-economic induced scarcity is commonly referred to as 'limited availability'.

While absolute scarcities are mostly discussed in relation with fossil energy resources (in particular with conventional oil), there is widespread consensus that the recent price hikes for metals were caused by relative scarcities, in particular in relation to trade restrictions, as well as time-lags between increases in demand and increases in production (Frondel et al. 2006; Mudd und Jowitt 2018). As a consequence, various research groups developed methodologies to assess supply risks for raw materials and the associated vulnerability of companies, sectors, countries and regions (EU Commission 2014; Graedel et al. 2012; Graedel et al. 2015; National Research Council of the National Academies 2008; OECD 2015). These methodologies and their outcomes are widely known as "criticality studies" and started to support resource related decision-making around a decade ago.

While this so-called "criticality debate" raised the awareness of mineral supply chains and the complex interlinkages between resource producing and resource consuming regions, the following issues need to be considered for ecolabelling:

- The "criticality" of raw materials is commonly defined as the product of supply risks and vulnerability. In particular, the values for vulnerability fully depend on the geographical and sectorial scope of the studies. An industry or a region that is strongly dependent on a certain raw material is much more vulnerable to supply restrictions than industries and regions that do not depend on this material. Thus, the results of most of existing criticality studies are only valid for pre-defined regions and/ or sectors/industries. For universal and global application, the scope for the vulnerability analysis would have to be global, including all sectors and applications. This approach is only followed by some few studies such as those by Graedel et al. (Graedel et al. 2012; Graedel et al. 2015).
- Results of criticality studies are aimed at providing risk radars for industries and economies in relation to relative scarcities of raw materials. Therefore, criticality assessments are tools

for economic risk assessments and do not allow conclusions on environmental and social impacts and risks.

3.1.2 Conflict financing & human rights

In parallel to the debate about scarcities and „critical raw materials" (see section 3.1.1), world's attention was drawn to the fact that mining and trade of certain minerals were (and still are) interwoven with financing of armed conflicts, as well as severe human rights abuses. The issue became obvious around the year 2000 when illegal armed groups started to use mineral commodities from artisanal small-scale mining (ASM) to finance their activities in the eastern Democratic Republic of the Congo (DRC). The situation moved up the political agenda after the formal end of the 2nd Congo war 2002/2003 when UN-experts proved that the revenues from mining and mineral trade were a major barrier for peacebuilding and a factor for continuous violence in the eastern DRC (UN 2002; 2003; Manhart und Schleicher 2013). In the following years, UN-experts and OECD developed a 5-step due diligence approach that should help companies to "respect human rights and avoid contributing to conflict through their sourcing decisions, including the choice of their suppliers" (OECD 2012; UNGoG 2010). Although the OECD Due Diligence Guidance are applicable for all types of minerals from conflict affected and high-risk areas, due diligence activities and schemes are mostly developed for tin, tantalum, tungsten and gold[3] as these commodities have been found to be the main minerals mined in the eastern DRC.

Due Diligence for minerals from conflict-affected and high-risk areas gained significant importance with the US Dodd-Frank Act (Section 1502) that was signed by US President Obama in 2010 and that made related efforts mandatory for all companies listed on the US stock exchange market and using 3TGs in their products[4]. While the US Dodd-Frank Act focuses on minerals from the DRC and neighbouring countries, the new EU conflict mineral regulation (EU Regulation 2017/821) has a global scope and addresses 3TGs from all conflict affected and high-risk areas. This EU Regulation makes the due diligence mandatory for importers of 3TGs and encourages due diligence for EU downstream (manufacturing) industries. Mineral supply chain due diligence has also been taken up by Chinese industries that developed an own guideline document that is closely aligned with those of OECD but also includes some additional issues such as severe environmental misconduct (CCCMC 2015).

During the implementation of due diligence schemes, a major critical aspect emerged that is mostly related to some corporate efforts to avoid any material from political unstable areas and to label products as "conflict free": Such evasion strategies often do not contribute to solving the problems and are in turn often counterproductive in areas with weak economic development (Manhart und Schleicher 2013). Therefore, due diligence is today widely seen as a process that should help companies identify their human rights risks in mineral supply chains and guide them towards activities that support improvements. While the use of certified material can be a suitable response mechanism, also co-financing of on-the-ground projects can be chosen as a pathway for corporate engagement towards improvements.

This is reflected by the five-step framework whereof step 2 and 3 are seen as decisive in guiding corporate engagement:

[3] This group of commodities is often referred to as 3TGs (Tin, Tantalum, Tungsten and Gold).

[4] This new policy also affected a large number of supplier companies all over the world as US companies passed-on related requirements through their supply chain.

- Step 1: Establish strong company management systems
- Step 2: Identify and assess risks in the supply chain
- Step 3: Design and implement a strategy to respond to identified risks
- Step 4: Carry out independent third-party audit of due diligence practices
- Step 5: Report annually on supply chain due diligence

For ecolabelling, the following issues need to be considered:

- Today, supply chain due diligence is a globally accepted framework for companies to take proactive action against human rights violations and conflicts that are linked to resource extraction.
- Due diligence for tin, tantalum, tungsten and gold (3TGs) are often responses to mandatory legal requirements such as Section 1502 of the Dodd-Frank Act.
- Although most established due diligence frameworks (e.g. those of the OECD) only address conflict and human rights abuses, the concept and the 5-step framework can also be applied to a wide range of sustainability issues in global supply chains (e.g. severe environmental damage).
- Due diligence is a framework and can be implemented in various ways and levels of ambition. Generally, the risk assessment (step 2 of the due diligence framework) can be used to prioritize those materials that are of particular importance in terms of total use by an application[5], as well as known hot spots in supply chains.
- It should be considered that due diligence related response strategies (step 3 of the framework) can go beyond the use of certified materials and might also encompass the support of on-the-ground projects in high risk areas.

3.1.3 Environmental impacts

Extraction of primary raw materials is always associated with a range of environmental impacts that are mostly tied to the removal of soil and rock, the degradation of ecosystems, the use of water, energy and chemicals and the disposal of mining waste (Dolega et al. 2016). Moreover, environmental impacts are sometimes dramatically enhanced when external shocks (e.g. earthquakes, heavy rainfall) cause disaster events such as the failure of tailing dams and the uncontrolled release of large volumes of liquid and muddy mining waste (Dolega et al. 2016; Priester und Dolega 2015). Some of these events – such as the tailing dam failure of Bento Rodrigues in 2015 in Brazil – received global media attention.

While mitigation measures can significantly reduce many environmental impacts of mining and processing operations, best practices have not yet been applied globally and there are often significant differences between best- and worst-performers.

[5] Generally, it is advised to use an application's total consumption in relation to world raw material production. Raw materials where an application (e.g. the global smartphone industry) has particular high world market shares should be prioritized as it points towards above average influence of the related industry on raw material supply chains.

For product policies (incl. ecolabelling), one challenge is the diversity of raw materials and their wide range of associated environmental impacts (Manhart et al. 2016). The nature and scale of environmental impacts varies from raw material to raw material and from mining project to mining project. This large variety – together with the fact that many environmental impacts are tied to irregularities and disaster events – are a major challenge for established product specific assessment methodologies such as Life-Cycle Assessment (LCA): While existing datasets give a reasonable depth of information on energy use, GHG-emissions and some other impact categories (Nuss und Eckelman 2014), impacts such as those on biodiversity are insufficiently covered and there is doubt if Life Cycle Inventory data (LCI-data) reflects mining specific risks such as acid mine drainage (Dehoust et al. 2017). From this perspective, it can be asserted that LCI-data is quite complete and reliable in downstream manufacturing processes, but that various environmental risks related to mining and processing of minerals are less completely and reliably covered by related datasets.

In particular for complex product groups such as electrical and electronic equipment, this limitation results in a lack of reliable guidance: While there is a broad agreement that producers cannot take equally ambitious measures on a large number of raw materials (some electronic devices contain >50 chemical elements (Manhart und Grießhammer 2006)), a methodology to prioritize the environmentally most relevant materials in terms of their primary production phase (cradle to gate) is needed.

This methodological problem was addressed by the ÖkoRess project[6] financed by the German Environment Agency (Umweltbundesamt - UBA): The project developed a methodology to assess and compare the environmental hazard potentials of mineral raw materials, which was applied to around 47 commodities in the second project phase[7]. Although the results cannot be used to quantify environmental impacts of defined material quantities, it can be used to prioritize raw materials from an environmental perspective (see Figure 1).

[6] Full project title: Environmental Limits, Environmental Availability and Environmental Criticality of Primary Raw Materials [Ökologische Grenzen, ökologische Verfügbarkeit und ökologische Kritikalität von Primärrohstoffen]. Öko-Institut e.V. in cooperation with Institut für Energie- und Umweltforschung Heidelberg GmbH (IFEU) & Projekt-Consult GmbH (in progress). Commissioned by: German Federal Environment Agency (UBA), Dessau.

[7] Full title: Environmental Criticality of Raw Materials – An assessment of environmental hazard potentials of raw materials from mining and recommendations for an ecological raw material policy. Öko-Institut e.V. in cooperation with Institut für Energie- und Umweltforschung Heidelberg GmbH (IFEU), Projekt-Consult GmbH & adelphi (in progress). Commissioned by: German Federal Environment Agency (UBA), Dessau.

Table 2: Results of the ÖkoRess evaluation of environmental hazard potentials of abiotic raw materials

	Copper	Gold	Aluminium	Tungsten	Graphite
Environmental hazards	Environmental hazard potential (EHP)				
Preconditions for acid mine drainage	High	High	Low	Medium	Low
Paragenesis with heavy metals	High	Medium	Medium	Medium	Low
Paragenesis with radioactive substances	Medium	High	Medium	Medium	Low
Mining method	Medium	Medium	High	Low	Low
Use of auxiliary substances	High	High	High	Medium	Medium
Accident hazards due to floods, earthquakes, storms, landslides	High	Medium	Medium	Medium	Medium
Water Stress Index and desert areas	High	Medium	Medium	Low	Medium
Protected areas and AZE sites[8]	Medium	High	Medium	Low	Medium
Size of material flow	High	High	High	Medium	Low
Size of energy flow	High	High	High	Medium	Low
Environmental governance in major production countries	Medium	Medium	Medium	Medium	High

Source: Dehoust et al. (forthcominga)

For product groups with quite complex material composition (e.g. electrical and electronic devices) this evaluation can be used to prioritize certain raw materials for consideration in ecolabelling criteria.

To do so, it is recommended to use a two-dimension analysis: While one dimension is represented by the evaluation results of ÖkoRess (to be available in 2020 for 47 mineral raw materials), the other dimension should represent the role a product group / an application plays in the total world consumption of a raw material. This approach is graphically illustrated in Figure 1: While the Y-axis can refer to ÖkoRess results, the X-axis requires an application specific analysis of the total consumption of a product group in relation to the world production. A part of this approach is illustrated in Table 3 for smartphones and tablets, which indicates that these two product groups had a significant role in the global consumption of cobalt (~9.4%) and palladium (~8.9%) in 2014. In case the ÖkoRess analysis (Table 2) will also yield significant environmental hazard potentials for these two materials, ecolabelling criteria for smartphones and tablets should primarily focus on measures addressing these two raw materials.

[8] Sites identified by the Alliance for Zero Extinction (AZE).

Table 3: Total material requirements of smartphones and tablets in relation to the world primary production of mineral commodities

Material		Content in all smartphones & tablets sold in 2014	World primary production in 2014	Global average recycled content (for all applications)	Percentage of smartphone & tablet demand of world primary production
Aluminium	Al	41,845 t	49,300,000 t	> 25-50%	0.085%
Copper	Cu	29,031 t	18,700,000 t	> 10-25%	0.16%
Cobalt	Co	10,572 t	112,000 t	> 25-50%	9.4%
Magnesium	Mg	10,329 t	907,000 t[9]	> 25-50%	1.1%
Tin	Sn	2,305 t	296,000 t	> 10-25%	0.78%
Iron (Steel)	Fe	1,708 t	1,190,000,000 t[10]	> 25-50%	0.00014%
Tungsten	W	630 t	82,400 t	> 25-50%	0.76%
Silver	Ag	467 t	26,100 t	> 25-50%	1.8%
Rare Earth Elements	REE	250 t	110,000 t[11]	< 1% & 1-10%[12]	0.25%
Gold	Au	46 t	2,860 t	> 25-50%	1.6%
Tantalum	Ta	32 t	1,200 t	< 10-25%	2.7%
Palladium	Pd	17 t	190 t	> 25-50%	8.9%
Indium	In	12 t	820 t	> 25-50%	1.4%
Gallium	Ga	0.9 t	440 t	> 10-25%	0.21%

Source: (Manhart et al. 2016)

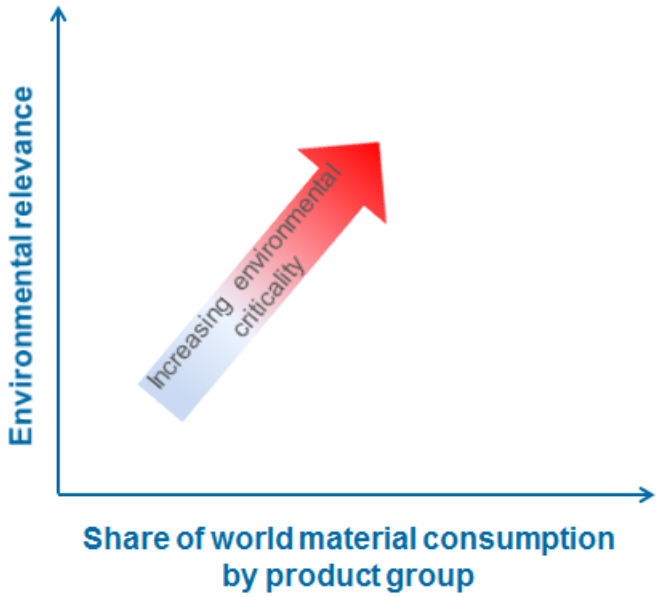
[9] Data for magnesium metal.

[10] Data for pig iron.

[11] Data for rare earth oxides (REO).

[12] < 1% for Sm, Eu, Tb, Ho, Er, Tm, Yb, Lu; 1-10 % for La, Ce, Pr, Nd, Gd, Dy.

Figure 1: Concept for the product group specific evaluation of the environmental criticality of raw materials



Source: Öko-Institut e.V. on the basis of (Dehoust et al. 2017)

For ecolabelling, the following issues need to be considered:

- Primary production (mining) of raw abiotic raw materials cause severe environmental impacts in many parts of the world.
- For product policies (incl. ecolabelling), one challenge is the diversity of raw materials and their associated environmental impacts.
- While LCA-data are relatively robust in relation to energy demand (CED) and GHG-emission (GWP), various environmental impacts of mining and ore processing such as those on ecosystems and biodiversity are insufficiently covered by LCI data.
- For complex product groups, these limitations result in a lack of reliable guidance: While there is a broad agreement that producers cannot take equally ambitious measures on many raw materials, a methodology to prioritize the environmentally most relevant materials from cradle-to-gate perspective is needed.
- Such prioritization can be supported by the methodology and assessments conducted by the ÖkoRess project financed by the German Federal Environment Agency (Umweltbundesamt).
- For ecolabelling, it is recommended to focus criteria on a limited number of raw materials that (1) have a high environmental relevance (also referred to as “environmental hazard potential”) and (2) where a product group has a high share of the total material demand in relation to the world production.
- In terms of response strategies, ecolabels can refer to a broad variety of measures mostly related to reducing the demand (e.g. long product life-times, improved recyclability) and a more responsible supply (e.g. environmental due diligence, use of certified material).

3.1.4 Development aspects

In many countries, mining is one of the few economic sectors offering opportunities for job and income generation, economic growth and development. But the abundance of minerals is by no means a guarantee for prosperity of nations and societies. Negative consequences from mineral extraction are not only limited to potential human rights violations and environmental impacts sketched in sections 3.1.2 and 3.1.3, but also to situations in which abundance of raw materials is a factor for weak governance and corruption (Ross 2013)[13]. While this problem is addressed by the Extractives Industries Transparency Initiative (EITI), there is also a wide consensus that efforts for change should mainly aim at successively improving the situations in vulnerable countries (mostly developing countries and emerging economies) (Hodge 2011) and that boycotts of certain mining regions are measures that should only be applied to cases of extreme misconduct.

In this context, it needs to be stressed that certification systems for commodities, as well as other types of requirements aiming at a responsible sourcing of raw materials can have unintended side-effects. This is mostly due to the circumstance that ambitious criteria can quite easily be met by mines and productions in nations with developed environmental governance. Thus, certification can easily lead to situations in which they represent an unintended discrimination of whole mining regions and production schemes while favouring production systems that already comply with sound practices (Manhart et al. 2015). Most likely, such types of discriminations negatively affect small scale productions in developing countries who usually have quite limited capacities to participate in certification schemes. To address this problem, some initiatives financed or co-financed by industry started to support small-scale mining in developing countries. As already indicated in section 3.1.2 such support of in-region activities can be a meaningful way for corporates to support improvement processes in mineral supply chains.

For ecolabelling, the following issues need to be considered:

- Although governance problems exist in many world regions, mining is in many countries one of the few economic sectors offering opportunities for job and income generation, economic growth and development.
- Certification systems for raw materials can unintentionally lead to the discrimination of raw materials from developing countries and from quite labour-intensive small-scale productions. Ecolabelling schemes should strive to avoid such unintended effects.
- Therefore, corporate support of in-region initiatives should be regarded as an important means to support improvement processes in mineral supply chains.

3.2 Interim conclusion

The extraction of raw materials from geological deposits is one of the most immediate interventions into the natural environment in the life cycle of products. Mining and processing of ores and other mineral raw materials are associated with various environmental impacts and also conflict financing and human rights issues are relevant in some world regions and supply chains. Already today ecolabelling schemes use various criteria aiming at a reduction of primary

[13] This nexus is often referred to as *resource curse* and applies to situations in which government elites use incomes from the extractives sector for their personal gains. In this context, one key problem is the fact that revenue streams from the extractives sector do not depend on the general economic development of a nation. Thus, corrupt elites can rely on financing independent from the general economic development and might lose interest in the development of the wider national economy.

raw material demand (e.g. use of secondary raw materials, recyclability, durability etc.). Nevertheless, it has also been recognized that – despite all efforts to promote efficient use and recycling – mining will still be necessary for decades to come. In this context, holistic sustainability concept for products should not only promote efficient use and recycling but should also consider responsible mining and primary raw material sourcing.

While this situation calls for a consideration of raw material related issues in product policies including ecolabelling schemes, the sketched impacts and sustainability issues are located at the beginning of product supply chains and product manufacturers often have limited influence over related practices. In this context, the following considerations might help to design future requirements of ecolabelling schemes in this field:

- The concept of supply chain due diligence has been developed over the last years and is today increasingly applied by manufacturing companies. Although it is mostly applied in the field of the so-called 'conflict minerals', it could also be applied for other raw materials and sustainability issues.
- Supply chain due diligence is a concept that requires the implementation of a 5-step framework by companies. Although there is a certain level of guidance for each of these steps, the complexity of the issues prohibits the sole use of checklists. Due diligence is a process where companies are asked to assess and monitor their sustainability risks in mineral supply chains and to search for viable means to support improvement processes. Thus, different companies might find different responses to certain problems and there is no external authority that can decide on the "right" or "wrong" response strategies.
- This somehow vague nature of due diligence makes it difficult for ecolabelling schemes to use it in product specific criteria. While it is possible to ask manufacturers to provide their report on mineral supply chain due diligence (public reporting is 5th step of the due diligence concept), it is difficult to gauge the level of ambition and to translate this into clear and verifiable criteria.
- To overcome this problem, it is firstly recommended to reduce complexity: Manufactures should not be required by ecolabelling schemes to conduct supply chain due diligence for all raw materials embedded in a product, but only for those where this particular application consumes a high share of the world supply and that are associated with proven sustainability hot spots.
- For these selected raw materials manufacturers should provide proof of due diligence efforts to ecolabelling schemes in the form of a due diligence report. In addition, it should be considered to add requirements related to response strategies (e.g. use of certified material, support of on-the-ground projects, durability etc.).
- As indicated in various sections of this paper, due diligence should not only be limited to the use of certified material. In some cases (e.g. in particular related to development aspects), certifications can have unintended side-effects. Therefore, it should be considered that policy tools such as ecolabelling schemes should encourage corporate engagement (e.g. co-financing) of on-the-ground projects aiming at a more sustainable raw material production in developing countries.

- While such a requirement is currently difficult to be translated into clear and verifiable criteria, the OECD (who is coordinating a large part of due diligence related concept work) might provide a list of meaningful on-the-ground projects that can be recommended for support by companies. Such a list could be used as reference for eligible in-region project engagement.

- Transparency is an important aspect of all debates around mineral supply chains and due diligence. It should be kept in mind that a full transparency of supply chains is not a goal by itself. While tracing and tracking of mineral supply chains can certainly help to understand relationships within supply chains and to design suitable response strategies, there is a certain danger that strong calls for full transparency will lead to a situation where enterprises spend most of their due diligence resources on supply chain mapping rather than in improvement processes. Therefore, the aspect of transparency should not be overstretched in ecolabelling schemes.

3.3 Translating the concept – ecolabelling, raw material and notebooks

In this chapter, the findings and recommendation of chapter 3.2 are tested by using notebooks as demonstration case. Notebooks have been chosen because they are in the scope of multiple labelling schemes and because they are usually produced for global markets so that criteria harmonization can yield significant benefits in terms of uptake by producers as well as consumers.

The demonstration case is made to show how the findings and recommendations of chapter 3.2 can be translated in a practical pathway leading to meaningful and viable ecolabelling criteria.

3.3.1 Market data

According to TrendForce (2017) around 162.4 million notebooks have been produced and shipped in 2017 worldwide.

3.3.2 Material composition and world primary production

Material compositions of electronic equipment are mostly not readily available to the public. Important data sources are recycling companies and scientific studies in the field of recycling and recovery of raw materials. For electrical and electronic equipment, a number of studies generated data on material contents and composition of various product types, including TVs, smartphones, tablet computers, printers, beamers and microwave ovens (Sander et al. 2012; Lovik et al. n.d.; Haig et al. 2012; Manhart et al. 2016). Contents of various raw materials in notebooks are available from Buchert et al. (2012), which is displayed in Table 4. As the data provided on this study is based on product models available prior to 2012, some corrections where made that are based on the following considerations:

- While notebooks manufactured prior to 2012 where equipped with hard disk drives (HDD), modern notebooks are mostly equipped with solid state disks (SSD) for data storage. Also, many notebooks are not equipped with optical drives (CD, DVD, blu-ray) any more.

- The average product weight has been on the decline over the last years. It is assumed that modern notebooks have a total weight equalling two thirds of those of older notebooks. It is

subsequently assumed that this reduction in weight also lead to a roughly equal reduction of individual metal contents.

Table 4: Material contents in notebooks

Metal	Chemical symbol	Content per notebook [mg] (2012 data)	Estimated content in modern notebooks [mg]	Comments & assumptions
Cobalt	Co	65,000	43,333	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Neodymium	Nd	2,100	700	According to Buchert et al. (2012), 37% of the Nd are contained in HDDs and 34% in spindle motors of HDDs and CD/DCD drives. As both components are not standard components of notebooks any more, it is assumed that modern notebooks contain 1/3 of pre-2012 models.
Tantalum	Ta	1,700	1,133	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Silver	Ag	440	293	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Praseodymium	Pr	270	85	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Gold	Au	100	67	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Dysprosium	Dy	60	0.0	According to Buchert et al. (2012) Dy is contained in HDDs, which is not a standard component of notebooks any more.
Indium	In	40	27	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Palladium	Pd	40	27	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Platinum	Pt	4	0.0	According to Buchert et al. (2012) Pt is contained in HDDs, which is not a standard component of notebooks any more.
Yttrium	Y	1.6	1.1	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Gallium	Ga	1.6	1.1	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Gadolinium	Gd	0.75	0.5	Assumption: Modern notebooks contain 2/3 of pre-2012 models.

Metal	Chemical symbol	Content per notebook [mg] (2012 data)	Estimated content in modern notebooks [mg]	Comments & assumptions
Cerium	Ce	0.10	0.07	Assumption: Modern notebooks contain 2/3 of pre-2012 models.
Europium	Eu	0.03	0.02	Assumption: Modern notebooks contain 2/3 of pre-2012 models.

Source: Buchert et al. (2012)

The data provided in Table 4 – and, in particular the corrected data for 2017 models – are subject to various uncertainties and gaps, which can be described as follows:

- The list does not encompass all materials contained in notebooks. Its focus is moistly on critical raw materials as defined by the EU in its 2010 report, as well as on precious metals. Other abiotic raw materials such as copper, aluminium and ferrous metals are not covered by the dataset. Nevertheless, calculations with some rough assumptions (the unrealistic extreme assumptions that each notebook contains 500g of copper, steel and aluminium) prove that notebooks have a negligible influence on the global demand for these raw materials.
- The data provided by Buchert et al. (2012) is based on various data sources and was generated with the philosophy of using the best-available data during the time the study was made. While this leads to uncertainties in the 2012 study, this problem is even more relevant for modern models, as various design patterns have changed over the last years and there have been considerable efforts to substitute critical raw materials. Although this is partly reflected with the assumptions and corrections described above and in Table 4, the values for modern notebooks are not based on up-to date research and analysis[14].

These uncertainties need to be considered when interpreting the following analysis. Generally, the data quality appears to be too weak to base decision-making regarding ecolabelling criteria on this analysis. Thus, it is recommended to base final raw material related criteria development for notebooks on updated and more accurate material data. For this exercise, the analysis of Table 4 is used as the main aim is to demonstrate and test a general approach rather than developing a final set of criteria.

The data of Table 4 were used and combined with the annual production and shipment volume for notebooks (see section 3.3.1) and the annual primary production volumes (mine production) available from USGS (2018). The results are displayed in the following table.

[14] Due to limited resources in this project, no up-to data information on material compositions of notebooks can be generated or compiled from other sources.

Table 5: Material requirements of notebooks in relation to the world primary production of mineral commodities

Metal		Content in all notebooks shipped in 2017	World mine production in 2017	Percentage of notebook demand of world primary production
Cobalt	Co	7037 t	110,000 t	6.4 %
Tantalum	Ta	184 t	1,300 t	14.2 %
Rare earth elements	REE	128 t	130,000 t[15]	0.1 %
Silver	Ag	48 t	25,000 t	0.2 %
Gold	Au	11 t	3,150 t	0.3 %
Indium	In	4 t	720 t	0.6 %
Palladium	Pd	4 t	210 t	2.1 %
Yttrium	Y	0.2 t	6,000 t16	0.003 %
Gallium	Ga	0.2 t	315 t	0.05 %

Source: Calculations based on data from (TrendForce 2017; USGS 2018; Buchert et al. 2012)

Table 5 indicates that notebook production is a major factor for global demand for tantalum, cobalt and, to a lesser extent, palladium. Subsequently, these are also raw materials, where the notebook producing industry is likely to have significant influence (market power) over raw material supply chains and where appropriate recycling efforts might hold considerable potential for raw material recovery. Therefore, the following analysis primarily focuses on these raw materials and how related aspects can be taken up by ecolabelling schemes.

3.3.3 Use and recyclability of key raw materials

3.3.3.1 Tantalum

For notebooks, tantalum is used in some types of capacitors of electronic equipment that are usually mounted on electronic circuit boards. Although recycling capacities for tantalum exist, recycling is only possible when related scraps have high Ta-concentrations. Subsequently, Ta-capacitors would have to be removed from circuit boards, which is associated with considerable efforts and costs. In addition, removal of Ta-capacitors might cause unintended losses of other materials (particularly tin and silver from solder pastes). Therefore, Ta-recycling from end-of-life notebooks is currently not practiced (Buchert et al. 2012).

3.3.3.2 Cobalt

Cobalt is contained in the rechargeable Li-ion batteries of notebooks in significant concentrations. Together with the relatively high material value of cobalt, recycling of such batteries is attractive and practiced in some few plants in Belgium, Germany, Canada and USA (Harvey 2017). For recycling, the batteries need to be separated from the equipment and stored and transported in a safe manner to avoid potential fire risks from thermal-runaway of old and damaged batteries. Critical factors are also related to the product design as an effective

[15] Value for rare earth oxides.

[16] Value for Y_2O_3.

separation of batteries should be achieved within a short time of (manual) labour input and ideally without the use of tools (Manhart et al. 2016).

3.3.3.3 Palladium

In notebooks, palladium is contained in various electronic components (e.g. some type of capacitors). Palladium and other precious metals such as gold and silver are major value carriers of waste electrical and electronic equipment and a major economic motivation for related recycling. Recycling efficiencies are commonly quite high and in a range of 95% presupposing the Pd-containing printed circuit boards and electronic components are thoroughly separated from other fractions and channelled to sound recycling. Product design can partly facilitate sound extraction by enabling a sound and full extraction of circuit boards with limited labour input during the depollution phase (depollution is the first step in the physical e-waste recycling process and a mandatory treatment step according to the European WEEE Directive) (Manhart et al. 2016; Buchert et al. 2012).

3.3.4 Environmental issues related to key raw materials

The information on the environmental issues of raw material production (cradle to gate) is based on the methodology developed in the ÖkoRess Project (Dehoust et al. 2017). The methodology was applied to 47 abiotic raw materials and results will be published in 2020 (Dehoust et al. forthcomingb). The following tables contain raw material specific information from this project. Full environmental raw material profiles can be taken from the original publication.

3.3.4.1 Tantalum

Table 6: Environmental hazard potentials of tantalum

Environmental hazard potential	Explanation	Data quality
Indicator 1: Pre-Conditions for acid mine drainage (AMD)		
Low EHP	Both primary and secondary (sedimentary) occurrences of tantalum minerals are paragentially free or very poor in sulfidic compounds, which could have an autooxidation potential.	high
Indicator 2: Paragenesis with heavy metals		
Medium EHP	Tantalum itself is not a heavy metal. Data from Nigerian deposits show increased Cd concentrations (> 5,000 ppm). This, together with the recommendations of the method description, indicates a medium potential for environmental hazard.	medium
Indicator 3: Paragenesis with radioactive substances		
High EHP	Tantalum is usually associated with high concentrations of U and/or Th. This is confirmed by data from Chinese deposits (5.1 % of world production). Up to 10 Bq /g	high
Indicator 4: Mine Type		
Medium EHP	Solid rock surface mining, loose rock surface mining, underground mining, alluvial mining.	high

Environmental hazard potential	Explanation	Data quality
Indicator 5: Use of auxiliary substances		
Low EHP	Gravimetry, magnetic separation	high
Indicator 6: Accident hazards due to floods, earthquakes, storms, and landslides		
Low EHP	The results for tantalum range in the low quantile area ≤ 25 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 40 % low, 45 % medium, 15 % high EHP.	medium
Indicator 7: Water Stress Index and desert areas		
Low EHP	The results for tantalum range in the low quantile area ≤ 25 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 97 % low, 0 % medium, 3 % high EHP.	medium
Indicator 8: Designated protected areas and Alliance for Zero Extinction (AZE) sites		
Medium EHP	The results for tantalum range in the medium quantile area > 25 % quantile and ≤ 75 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 92 % low, 8 % medium, 0 % high EHP.	medium
Indicator 9: Environmental governance in major production countries (EPI)		
High	From the EPI and the production share of the individual countries results an EGov-Score of 43.76. Relevant quantities are produced in ASM countries.	high
Indicator 10: Cumulated raw material demand of global production CRD_{global}		
Medium	CRD_{global} of 11 million t/a results from the $CRD_{specific}$ of 9,180 t/t and the global annual production of 1,504 t/a.	high
Indicator 11: Cumulated energy demand of global production CED_{global}		
Medium	CED_{global} of 5.4 PJ/a results from the $CED_{specific}$ of 4,360,000 MJ-eq/t and the global annual production of 1,504 t/a.	high
Indicator 12: Position of mining sites in the arctic region		
Low	The results for tantalum range in the low quantile area ≤ 25 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 100 % low, 0 % medium EHP.	medium

Source: Dehoust et al. (2017), Dehoust et al. (forthcominga)

3.3.4.2 Cobalt

Table 7: Environmental hazard potentials of cobalt

Environmental hazard potential	Explanation	Data quality
Indicator 1: Pre-Conditions for acid mine drainage (AMD)		
High EHP	Nickel and cobalt ores are in most cases present in the form of sulphuric iron-nickel-cobalt minerals (e.g. nickel magnetic gravel).	high
Indicator 2: Paragenesis with heavy metals		
High EHP	Cobalt is mainly extracted from nickel and copper ores. Both nickel and copper are considered heavy metals according to the method description.	medium
Indicator 3: Paragenesis with radioactive substances		
High EHP	Copper-cobalt deposits in the DR Congo and Arizona (USA) show high concentrations of uranium and/or thorium. A large part of world cobalt production comes from deposits in the DR Congo.	high
Indicator 4: Mine Type		
Medium EHP	Surface mining, underground mining	high
Indicator 5: Use of auxiliary substances		
High EHP	Cobalt-nickel-sulphide ores are processed by flotation to cobalt-nickel concentrates, followed by arc melting and hydrometallurgical separation of the metals; copper-cobalt ores if necessary roasting of the sulphides and acid leaching; weathered copper-cobalt ores are leached with sulphuric acid; in the case of laterite ores the digestion is carried out with acids (here too the question arises as to the boundary between processing and smelting).	high
Indicator 6: Accident hazards due to floods, earthquakes, storms, and landslides		
Low EHP	The results for cobalt range in the low quantile area ≤ 25 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 87 % low, 4 % medium, 9 % high EHP.	medium
Indicator 7: Water Stress Index and desert areas		
Low EHP	The results for cobalt range in the low quantile area ≤ 25 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 93 % low, 0 % medium, 7 % high EHP.	medium
Indicator 8: Designated protected areas and Alliance for Zero Extinction (AZE) sites		
Medium EHP	The results for cobalt range in the medium quantile area > 25 % quantile and ≤ 75 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment.	medium

Environmental hazard potential	Explanation	Data quality
	The results of the GIS assessment are: 93 % low, 6 % medium, 1 % high EHP.	
Indicator 9: Environmental governance in major production countries (EPI)		
High	From the EPI and the production share of the individual countries results an EGov-Score of 41.68. Relevant quantities are produced in ASM countries.	high
Indicator 10: Cumulated raw material demand of global production CRD_{global}		
Medium	CRD_{global} of 7.3 million t/a results from the $CRD_{specific}$ of 57 t/t and the global annual production of 128,648 t/a.	high
Indicator 11: Cumulated energy demand of global production CED_{global}		
Medium	CED_{global} of 16,5 PJ/a results from the $CED_{specific}$ of 128,000 MJ-eq/t and the global annual production of 128,648 t/a.	high
Indicator 12: Position of mining sites in the arctic region		
Medium	The results for cobalt range in the medium quantile area > 25 % quantile and ≤ 75 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 99 % low, 1 % medium EHP.	medium

Source: Dehoust et al. (2017), Dehoust et al. (forthcominga)

3.3.4.3 Palladium

Table 8: Environmental hazard potentials of palladium

Environmental hazard potential	Explanation	Data quality
Indicator 1: Pre-Conditions for acid mine drainage (AMD)		
High EHP	Deposits are in nickel magnetic gravel deposits which have high sulphide contents and bring with them a corresponding acid formation potential.	medium
Indicator 2: Paragenesis with heavy metals		
High EHP	Extraction from nickel-magnetic gravel deposits and thus closely associated with the heavy metal nickel.	medium
Indicator 3: Paragenesis with radioactive substances		
medium EHP	No specific data are available. In accordance with the procedure described in the method document, an evaluation with medium EHP is carried out.	low
Indicator 4: Mine Type		
medium EHP	underground mining, open pit solid rock mining, dredging	high
Indicator 5: Use of auxiliary substances		

Environmental hazard potential	Explanation	Data quality
High EHP	Flotation to marketable PGM concentrate, later roasting, leaching, electrolysis	high
Indicator 6: Accident hazards due to floods, earthquakes, storms, and landslides		
Low EHP	The results for palladium range in the low quantile area ≤ 25 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 89 % low, 4 % medium, 7 % high EHP.	medium
Indicator 7: Water Stress Index and desert areas		
Medium EHP	The results for palladium range in the medium quantile area > 25 % quantile and ≤ 75 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 67 % low, 1 % medium, 32 % high EHP.	medium
Indicator 8: Designated protected areas and Alliance for Zero Extinction (AZE) sites		
Medium EHP	The results for palladium range in the medium quantile area > 25 % quantile and ≤ 75 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 95 % low, 4 % medium, 1 % high EHP.	medium
Indicator 9: Environmental governance in major production countries (EPI)		
Medium	From the EPI and the production share of the individual countries results an EGov-Score of 57.97.	high
Indicator 10: Cumulated raw material demand of global production CRDglobal		
Medium	CRDglobal of 6.8 million t/a results from the CRDspecific of 36,937 t/t and the global annual production of 184 t/a.	high
Indicator 11: Cumulated energy demand of global production CEDglobal		
Medium	CEDglobal of 13 PJ/a results from the CEDspecific of 72,700,000 MJ-eq/t and the global annual production of 184 t/a.	high
Indicator 12: Position of mining sites in the arctic region		
High	The results for palladium range in the high quantile area > 75 % quantile of the combined assessment results for 42 raw materials where sufficient data availability allowed the GIS assessment. The results of the GIS assessment are: 72 % low, 28 % medium EHP.	medium

Source: Dehoust et al. (2017), (Dehoust et al. forthcominga)

3.3.5 Social issues related to key raw materials

The following sections are widely taken from (Manhart et al. 2016).

3.3.5.1 Tantalum

Mining and trade of tantalum ores in the eastern part of the Democratic Republic of the Congo is known to be interwoven with the financing of various armed groups of the region (see section 3.1.2). This situation was identified as major factor prolonging the civil war and instability in the region (Manhart und Schleicher 2013). As a reaction, the UN Group of Experts on the Democratic Republic of the Congo, the OECD and the UN Security Council developed and endorsed the concept of human rights due diligence for tantalum using industries. With Section 1502 of the Dodd-Frank Act, the USA was the first country that made such due diligence requirements obligatory within its jurisdiction. Despite these measures, the human rights issues around tantalum mining in the eastern DR Congo are not fully resolved. Amongst others, a recent report from the UN Group of Experts on the Democratic Republic of the Congo documents that various armed groups still profit from mineral exploitation in the region and that non-certified ores are smuggled into neighboring Rwanda (UN Group of Experts on the Democratic Republic of the Congo 2015). Thus, it must be assumed that at least some of the official production volumes of Rwanda in fact originated from the DR Congo.

On the other hand, the labor-intensive nature of small scale and artisanal mining (ASM) is a major source of income in the Central African region. For this reason, Rwanda encourages small scale mining industries for poverty reduction strategies. Some local projects try to improve transparency and general working conditions in the artisanal mining of tantalum and tin ores without reducing job and income opportunities for the local population.

3.3.5.2 Cobalt

Despite being mined in the Democratic Republic of the Congo, cobalt is not listed as a "conflict mineral" under the US-American Dodd-Frank Act or the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas (see section 3.1.2). The reason is that the area of the copper belt where cobalt is mined has not been affected by armed and violent conflicts after the end of the Second Congo war in 2002/2003. Nevertheless, cobalt mining in the DR Congo has manifold adverse social impacts in the region, which are thoroughly described by Amnesty International (2016), Pact (2010) and Tsurukawa et al. (2011):

- A significant share of the Cobalt production is done using artisanal methods (artisanal and small-scale mining – ASM). Although these labor-intensive mining methods provide income opportunities to about 120,000 – 150,000 individuals, the work is associated with significant and potentially fatal hazards such as flooding, insufficient mine ventilation and collapse of underground pits.

- In addition, artisanal miners are usually not equipped with any protective equipment and are therefore exposed to health hazards such as inhalation of dusts. Together with long working hours and the physically demanding nature of artisanal mining, adverse health effects are widespread.

- Child labor is common – particularly in the beneficiation of ores (crushing, washing and sorting) and collecting of ores from surface deposits and mining tailings. It is also reported that some children work in underground mines.

- Artisanal mining is partly carried-out in densely populated areas such as the city of Kolwezi. In these locations, mining has a severe impact on urban development.
- Although not interlinked with armed and violent conflicts, cobalt mining activities often cause tension with local populations. Common reasons for such tension are the negative impacts on other activities and land-uses such as agriculture and housing. In addition, tension exists between artisanal miners and operators of larger mining concessions.
- Artisanal miners are often subject to illegal taxation by government officials or unjustified fines and duties by mine guards.

In addition, the publications around the so-called Paradise-Papers suggest that also industrial Cobalt mining in the DR Congo is associated with shortcomings related to a potential positive stimulus of from the mining sector. In particular, the publications highlight issues around securing cobalt concession at quite unfavorable conditions for the Congolese State and allegedly using a middle man bribing key government officials (Doherty et al. 5 Nov 2017).

3.3.5.3 Palladium

The Russian mining city of Norilsk – where a large portion of the world's palladium supply comes from – is ranked amongst the worst polluted places in the world. Thus, certain environmental impacts also have a strong social dimension as they impact on the health of workers and local residents (Blacksmith Institute & Green Cross Switzerland 2013). Mining of platinum group metals (PGM) in South Africa has been repeatedly subject to labor disputes. In 2014, at least 70,000 mining workers were on strike for several months demanding higher wages (U.S. Geological Survey 2015). Social tension, labor disputes and unrest have been troubling characteristics of the South African PGM mining industry for several years. The situation peaked on 16th of August 2012 when police opened fire on wildcat strikers in the Marikana area. 34 workers were killed in the incident. The labor situation in South Africa's mining industry is characterized by fiercely competing labor unions, which makes it difficult to negotiate lasting agreements between management and workers.

3.3.6 Existing raw material related criteria of ecolabelling schemes

There are currently five relevant ecolabelling schemes for notebooks. As ecolabelling schemes are often addressing a wider product group, there is only one scheme especially focusing on notebooks. In most cases the criteria for notebooks are included in the ecolabelling schemes for computers:

- Nordic Swan - Ecolabelling for Computers
- Blue Angel - Computers and Keyboards
- EU Ecolabel for personal, notebook and tablet computers
- TCO Certified Notebooks
- IEEE / EPEAT Draft Standard for Environmental and Social Responsibility Assessment of Computers and Displays

Whereas the Blue Angel, the European Ecolabel, the Nordic Swan and TCO define only obligatory criteria, the EPEAT / EPEAT criteria are divided in required and optional ones. Depending on

how many optional points are reached, the conformance to the EPEAT standard is divided in three levels: Bronze, Silver and Gold. To achieve Bronze, the product shall conform to all of the required criteria, for Silver, all required criteria plus at least 50% of the optional points, for Gold all required criteria plus at least 75% of the optional points.

The following sections contain an analysis of the product criteria, which directly or indirectly address the extraction and use of raw materials.

3.3.6.1 Criteria related to the durability of products

A longer product lifetime makes a significant positive contribution to more efficient resource use as fewer amounts of raw materials are used for a defined function over time. Therefore, the five ecolabels were screened for criteria, which support the durability of certified notebooks. A pre-condition for prolonged lifetime is that the product is of high quality. The schemes address the product quality either by warranty requirements, or different product tests which have to be conducted in accordance with existing (technical) guidelines. Further requirements for a longer product lifetime include upgradeability and repairability. If the function of a product can easily be upgraded, it is more likely that it will comply with consumer requirements for a longer period of time. Good repairability of a product presupposes the availability of spare parts and easy repair mechanisms. In this context the schemes request repair processes, which shall be possible with commonly available tools. Except the Nordic Swan all ecolabels at hand request certain minimum times for spar part availability. Furthermore, the ecolabels request user instructions for upgrade and repair activities. A detailed overview of all durability criteria of the ecolabelling schemes is available in Table 9.

Table 9: Durability criteria in ecolabelling schemes for notebooks

Ecolabelling scheme	Version & Validity	Durability criteria
Nordic Swan - Ecolabelling for Computers	Version 7.4 23 Oct 2013 - 30 June 2020	Upgradeability ► At least one additional interface for external storage media and other peripheral devices and primary memory expansion must be possible. Quality of the product ► The quality in the production of the Nordic Ecolabelled computer must be maintained throughout the validity period of the license. Instructions for use ► The product shall be delivered with an instruction manual which provides advice on how the product is best used from an environmental perspective. Service and support ► The licensee shall offer the possibility of service and support in the official Nordic language where the Nordic Ecolabelled product is sold.
Blue Angel - Computers and Keyboards DE UZ 78	Version 1.0 - January 2017	Spare parts availability ► Spare Parts must at least be available for at least 5 years from the time the production cease and must be offered at reasonable cost.

Ecolabelling scheme	Version & Validity	Durability criteria
		► The product documents shall include detailed information on the provision of spare parts. ► Information on the provision of spare parts and expansion options shall be available in the product documents Capacity expansion ► Easy accessibility to replaceable components and expansion interfaces must be possible. For this purpose, it must be possible to open housing parts, chassis and battery covers easily and without expert knowledge. ► Following expansion/replacement options must be provided: Random Access Memory (RAM) and mass storage (if any) ► Following interfaces must be provided: two or more USB 3.0 or later ports and connectivity to external monitors Replaceability of the battery ► The computers shall be designed to allow the easy replacement of the batteries/accumulators without the need for expert knowledge. ► Following information on the battery/accumulator shall be available in the product documents: ● Instructions how to remove / replace the battery ● Nominal capacity and voltage and type designation and instructions for decoding the date of manufacture ● Minimum of achievable full charge cycles ● Software tools for battery/accumulator protection Battery/accumulator durability ► A minimum of 500 full charge cycles must be achieved ► After 500 full charge cycles the remaining capacity must be at least 80% of the nominal capacity Battery/accumulator status and protection software ► Software to limit the battery´s/accumulators charge to a value smaller than the maximum amount of usable electricity to extend the battery´s/accumulator´s life has to be freely available or pre-installed on the computer ► The software has to be available at least 6 years after the production ceases
EU Ecolabel for personal, notebook and tablet computers	(EC) No 2016/1371 of 10 August 2016	Product lifetime extension ► Notebooks computers shall pass following durability tests: resistance to shock/ vibration, accidental drop, temperature stress, screen resilience, water spill ingress, keyboard lifespan, screen hinge lifespan

Rechargeable battery quality and lifetime

- A minimum of 7 hours of rechargeable battery life after full charge must be achieved.
- If rechargeable batteries can be changed without tools: batteries shall maintain 80 % of their declared minimum initial capacity after 750 charging cycles. If any tools are necessary, it should maintain the capacity after 1000 charging cycles.
- A minimum two-year commercial guarantee for defective batteries shall be provided
- Information about known factors influencing the lifetime of rechargeable batteries, as well as instructions on how the user can prolong battery life, shall be included in factory installed energy management software, written user instructions and posted on the manufacturer's website.

Data storage drive reliability and protection

- The primary data storage drive used in notebooks shall be specified to protect both the drive and data from shock and vibration.

Design for upgrade and repair

- Data storage, memory, screen assembly and LCD backlight units (when integrated), keyboard and track pad shall be easily accessible and exchangeable using universal tools

Rechargeable battery replacement

- It shall be possible to extract the rechargeable battery manually without tools. Simple instructions how the battery should be removed shall be provided in a repair manual or via the manufacturer's website.

Repair manual

- Clear disassembly and repair instructions shall be provided.

Repair service/information

- Information where to obtain professional repairs and servicing should be included in the user instructions or on the manufacturer's website.

Availability of spare parts

- Spare parts must be available at least five years following the end of production for the model.

Commercial guarantee

- A minimum of three year guarantee effective from purchase of the product shall be provided.

User instructions

- The computer shall be sold with relevant user information that provides advice on the environmental performance of the product, including:

Ecolabelling scheme	Version & Validity	Durability criteria
		• Information, that extension of the computer's lifetime reduces the product's overall environmental impacts • Indications on how to prolong the lifetime of the computer • Instruction and repair manual(s) shall be provided in a print version and online in electronic form for a period of at least five years.
TCO Certified Notebooks 8.0	2019	Lifetime extension ▶ The brand owner shall provide a product warranty for at least one year on all markets where the product is sold. ▶ Instructions on how to replace critical replaceable component must be available online for anyone to read, free of charge. For the validity of the certificate, all critical replaceable components • are available for anyone to purchase or • may be replaced by a service network for repair and maintenance of the certified product on all markets where it is sold. ▶ The device must carry at least one USB Type-C connector that is backward compatible with USB 2.0. ▶ The product must be tested according to the MIL-STD-810G w/CHANGE 1 or IEC 60068-2 test procedure with the modified storage / operational temperature interval and duration as well as the drop test height. ▶ The main battery must be able to withstand a minimum of 300 charging cycles with at least 60% of the initial capacity. ▶ The brand owner must guarantee that the main battery is replaceable by the end-user and/or technician. Instructions on how to replace the battery must be available for anyone to read, free of charge online throughout the whole lifetime of the certificate. ▶ The brand owner must provide media sanitization software, either by: • A. pre-installing it on the product before it is shipped. • B. providing the software for download on their webpage, free of charge. • C. providing a direct link on their own webpage to an external webpage where the software is available for download, free of charge. ▶ The media sanitization software must conform with the guidelines of N IST 800-88 Revision 1, for the level of “Clear” in accordance with the products storage technology. Users must be able to use it at least once, free of charge.

Ecolabelling scheme	Version & Validity	Durability criteria
IEEE Draft Standard[17] for Environmental and Social Responsibility Assessment of Computers and Displays	P1680.1™/D36 December 2017	► Information how to obtain repair and replacement services shall be provided by the manufacturer without access restriction to the purchaser for a minimum of three years from the date of sale. ► A long-life rechargeable battery should be used for the products. ► The manufacturer should provide information regarding disassembly, spare parts, maintenance, troubleshooting instructions, instructions for software updates and the removal of personal data on a publicly accessible website. ► Manufacturer shall provide information about the availability of spare parts. ► Batteries providing primary power to the product shall be replaceable. Manufacturer shall disclose information on replaceability. ► Update or repair features can be awarded with optional points within the evaluation.

Source: Öko-Institut, based on Nordic Ecolabelling (2013), RAL gGmbH (2017),(RAL gGmbH 2017), IEEE (2017) and European Commission (2016)

3.3.6.2 Criteria aiming at improving recyclability of products

When it is no longer possible to prolong the lifetime, it is important to facilitate material recycling of the products. The more secondary raw materials can be recovered via recycling, the less new materials must be mined[18]. In this context the ecolabels request several product compositions, which allow for higher recycling rates and easier recycling processes. In order to achieve high collection rates of discarded notebooks, the schemes request the manufactures to provide take-back systems. Criteria concerning the disassembly of the products are aiming to support the technical suitability for recycling, which is further increased by the prohibition of metallic coatings to plastic. The ecolabelling schemes also include requirements concerning material marking. In some cases, a documentation of the presence and location of all materials and components that require selective treatment intends to support professional end-of-life treatment. In addition to these requirements, the schemes address user instructions on recycling. This includes documentation on environmentally sound disposal at the end of the life cycle.

[17] As of February 26th, 2018, this approved draft version was the newest available version of the standard. The analysis is therefore based on the IEEE Draft standard, which was published in December 2017. The standard includes "required" and "optional" criteria, which are referenced as "shall" and "should" within this report.

[18] This is particularly relevant for raw materials not mined as by-product. With by-products (e.g. indium that is exclusively produced from other ores such as lead-zinc-ores), this nexus is much weaker and a reduced demand for primary material does not necessarily result in a reduction of mining activities.

Table 10: Recyclability criteria in ecolabelling schemes for notebooks

Ecolabelling scheme	Version & Validity	Recyclability criteria
Nordic Swan - Ecolabelling for Computers	Version 7.4 23 Oct 2013 - 30 June 2020	Disassembly ► A qualified person, working alone, must be able to disassemble the product. ► The manufacturer must ensure that disassembly of the unit is possible and compile disassembly instructions demonstrating that: ● connections are easy to locate and access and easily separable with generally available tools. ● connections are, where possible, standardized. ► It must be possible to separate the substances, preparations and components listed in ANNEX VII of the WEEE Directive (2012/19/EU). ► If labels are required, they shall be easily removable or integrated. This does not apply to safety labels according to CENELEC safety standard EN 60850 §1.7.2. ► Plastic parts heavier than 25 g may contain metallic inlays provided that these can easily be separated without the use of special tools. ► 90% by weight of plastics and metals in the enclosure and chassis must be technically suitable for material recovery. Take-back system ► Pertinent national producer responsibility regulations, legislation and/or agreements within the sector regarding the recycling systems for products and packaging shall be met in the Nordic countries in which the Nordic Ecolabelled computer is marketed.
Blue Angel - Computers and Keyboards DE UZ 78	Version 1.0 - January 2017	Structure and connection technology ► Easy disassembly for recycling purposes must be possible. Housing parts, chassis, batteries, display units and printed circuit boards should be separable. Manual disassembly by a single person using universal tools shall be possible. ► Batteries/accumulators must be easy to remove without the use of any tools or with the use of universal tools. ► Electrical/electronic components must be easy to remove from the housing. Material selection ► It shall not be permitted to apply metallic coatings to plastic housing parts. Exception: plastic housing parts of notebook computers may have a metallic coating provided that such coating is technically required. However, galvanic coatings of plastic housing parts shall not be permitted.

Ecolabelling scheme	Version & Validity	Recyclability criteria
		► 90% of the mass of plastics and of the metals of housing parts and chassis must be recyclable by material (this does not mean the recovery of thermal energy by incineration). Product documents ► Instructions for environmentally sound disposal at the end of the life cycle in accordance with the German Elektrogesetz (Electrical and Electronic Equipment Act) ► Information on manufacturer-operated product take-back programs to allow reuse (if any) ► Necessity to dispose the battery/accumulator at waste collection facility Battery/accumulator marking ► Indication of the metal with the greatest mass percentage (e.g. cobalt, manganese, nickel, iron) ► Indication of substances contained in the battery/accumulator that hinder the recycling process (e.g. tin, phosphorous). ► This information may also be provided in coded form, for example, in accordance with the marking system proposed by the Battery Association of Japan (BAJ)
EU Ecolabel for personal, notebook and tablet computers	(EC) No 2016/1371 of 10 August 2016	Improving the recyclability of plastic casings, enclosures and bezels ► Parts shall not contain molded-in or glued-on metal inserts unless they can be removed with commonly available tools. Disassembly instructions shall show how to remove them. ► For parts with a weight greater than 100 grams, the following treatments and additives shall not result in recycled resin with a > 25 % reduction in the notched izod impact when tested according to ISO 180: • Paints and coatings • Flame retardants and their synergists Design for disassembly and recycling ► For recycling purposes computers shall be designed so that target components and parts can be easily extracted from the product. A disassembly test shall be carried out, recording the number of steps required and the associated tools and actions required to extract the following target components and parts: • Printed Circuit Boards > 10 cm2 relating to computing functions • Rechargeable battery • Displays (Printed Circuit Boards > 10 cm2; Thin Film Transistor unit and film conductors in display units > 100 cm2; LED backlight units)

Ecolabelling scheme	Version & Validity	Recyclability criteria
		▶ Additionally, two of the following target components and parts, selected as applicable to the product, shall also be extracted during the test: ● HDD drive ● Optical drives (where included) ● Printed circuit boards ≤ 10 cm2 and > 5 cm2 ● Speaker units ● Polymethyl Methacrylate (PMMA) film light guide (where the screen size is > 100 cm2) User instructions on recycling ▶ End-of-life instructions for the proper disposal of computers, including separate instructions for the proper disposal of rechargeable batteries, at civic amenity sites or through retailer take-back schemes.
TCO Certified Notebooks 8.0	2019	Take back system ▶ The brand owner (or its representative, associated company or affiliate) shall offer their customers the option to return used products for environmentally acceptable recycling methods in at least one market where the product is sold and where electronics take back regulation is not in practice at the date of application.
IEEE Draft Standard[19] for Environmental and Social Responsibility Assessment of Computers and Displays	P1680.1™/D36 December 2017	▶ External enclosure shall be removable without causing damage that would hinder reuse or refurbishment, and with commonly available tools. ▶ Lithium-Ion Batteries should be easily removable, without hindering re-use or refurbishment of the product. ▶ Identification of material and component requiring selective treatment during reuse and recycling shall be made available ▶ Plastic parts shall be compatible with recycling. ▶ Discrete plastic parts >25 g shall be separable for recycling. ▶ The manufacturer shall provide a product take-back service. ▶ The manufacturer shall provide a take-back system for removable rechargeable batteries. ▶ The manufacturer shall make sure sound end-of-life processing is available for all equipment collected by the take-back scheme.

Source: Öko-Institut, based on Nordic Ecolabelling (2013), RAL gGmbH (2017), IEEE (2017) and European Commission (2016)

3.3.6.3 Further criteria

Besides a long lifetime and professional recovery of raw materials, further criteria support responsible sourcing, especially of so-called conflict minerals (see section 3.1.2). For this

[19] As of February 26th, 2018, this approved draft version was the newest available version of the standard. The analysis is therefore based on the IEEE Draft standard, which was published in December 2017. The standard includes "required" and "optional" criteria, which are referenced as "shall" and "should" within this report.

purpose, three out of five ecolabelling schemes include requests to conduct due diligence activities in accordance with the OECD guidance for responsible supply chains of minerals from conflict-affected and high-risk areas. A fourth scheme (Blue Angel) is considering the issue in the outlook on possible future requirements. Besides the publication of due diligence reports, a code of conduct and a public conflict minerals policy, manufacturers are (partly) requested to participate in in-region conflict responsible sourcing programs. In this context they are requested to provide a list of all initiatives, which are used or funded by the company. An overview of the corresponding criteria can be found in Table 11.

Table 11: Further criteria addressing the supply chain of raw materials in ecolabelling schemes for notebooks

Ecolabelling scheme	Version & Validity	Criteria
Nordic Swan - Ecolabelling for Computers	Version 7.4 23 Oct 2013 - 30 June 2020	Working conditions ► The license holder must have a code of conduct that shows how the license holder works to ensure that human rights, labor rights, environmental protection and anticorruption measures follow international guidelines such as the principles of the United Nations Global Compact, read more at http://www.unglobalcompact.org. ► The licensee shall ensure that all suppliers / subcontractors are aware of the code of conduct and urging that these apply a code of conduct. Traceability ► The licensee must have a traceability system to produce the Nordic Ecolabelled computer and describe the development and production units used to manufacture the computer. This applies also to suppliers that produce significant parts of the computer.
Blue Angel - Computers and Keyboards DE UZ 78	Version 1.0 - January 2017	Outlook on possible future requirements ► Requirements for the repairability of devices. ► Requirements for entrepreneurial diligence regarding the origin of raw materials used and the manufacture of devices.
EU Ecolabel for personal, notebook and tablet computers	(EC) No 2016/1371 of 10 August 2016	Sourcing of 'conflict-free' minerals ► The responsible sourcing of tin, tantalum, tungsten and their ores and gold from conflict- affected and high-risk areas shall be supported by: • Conducting due diligence in line with the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, and • Promoting responsible mineral production and trade within conflict-affected and high-risk areas for the identified minerals as used in components of the product and in accordance with OECD guidance.
TCO Certified Notebooks 8.0	2019	Supply chain responsibility

Ecolabelling scheme	Version & Validity	Criteria
		► Commitment: The Brand owner shall have a code of conduct that is considered consistent with the following in the manufacturing of TCO Certified products: ● ILO eight core conventions: 29, 87*, 98*, 100, 105, 111, 138 and 182. ● UN Convention on the Rights of the Child, Article 32. ● All applicable local and national health and safety and labor laws effective in ● the country of manufacture and a 60 hour working week including overtime*. *In situations with legal restrictions on the right to freedom of association and collective bargaining, non-management workers must be permitted to freely elect their own worker representative(s) (ILO Convention 135 and Recommendation 143). ► Structured work: ● The brand owner must report the final assembly factories for each certified product ● model in TCO Certified Portal in the application for a new certificate. ● For all factories listed in TCO Certified Portal that the brand owner is using, the brand owner must supervise the implementation of the code of conduct. ● In the final assembly factories and in the rest of the supply chain the Brand owner shall ensure that corrective action plans are developed and fulfilled within reasonable time for all non-conformity against their code of conduct that the Brand owner is made aware of. Supply Chain transparency ► The brand owner must appoint a Senior Management Representative (SMR) for supply chai responsibility, who reports directly to senior management. Irrespective of other duties, this person must have the authority to ensure that certified products meet the supply chain criteria in TCO Certified. The SMR must annually complete the TCO Certified self-assessment questionnaire (SAQ) and complete a follow-up interview with an approved verifier. Anti-corruption management system ► The brand owner must have internal processes and routines in place to prevent and respond to all forms of corruption that, at a minimum, aligns with the following: ● ICC Rules on Combating Corruption article 10 points a-p. ● ICC Guidelines on Whistleblowing.

Ecolabelling scheme	Version & Validity	Criteria
		Responsible sourced minerals ► The brand owner must: ● Have a strict supply chain policy for responsible minerals sourcing that can be considered to cover at least 3TG and cobalt. The policy must be both public and communicated to the supply chain. ● Have a process to identify smelters and refiners of at least 3TG and cobalt. ● Be a part of an established multi-stakeholder program that works at supporting responsible sourcing programs for at least 3TG and cobalt. Process chemicals ► Every final assembly factory manufacturing certified products: ● must have a structured health and safety management system in place, that is independently audited. ● must complete the process chemical data template provided by TCO Development ● must provide exposure controls and personal protective equipment as recommended in section 8 of the 16 section format safety data sheet.
IEEE Draft Standard[20] for Environmental and Social Responsibility Assessment of Computers and Displays	P1680.1™/D36 December 2017	► The manufacturer should document socially responsible supplier manufacturing. ► The manufacturer shall annually and publicly disclose information regarding conflict minerals in products. ► The manufacturer should participate in an in-region program that advances responsible sourcing of conflict minerals. ► The manufacturer should demonstrate that ≥90% of smelter and refiner dealing with conflict minerals participate in OECD-aligned third party mechanisms.

Source: Öko-Institut, based on Nordic Ecolabelling (2013), TCO Development AB (2019) ,RAL gGmbH (2017), IEEE (2017) and European Commission (2016)

3.4 Results from interviews with sector experts and IT-producers

The assessments presented in chapters 3.1 to 3.3 are based on the analysis of criteria documents of selected type-I ecolabels as well as on a general evaluation and observation of raw material sustainability debate of the last years. This part of the paper describes the main outcomes of interviews conducted with sector experts and producers of IT-equipment on the issue of integrating sustainability issues of raw material supply chains (protocols of the interviews can be seen in annexes C.1 and C.2in the annex). The aim of the interviews was to get a better

[20] As of February 26th, 2018, this approved draft version was the newest available version of the standard. The analysis is therefore based on the IEEE Draft standard, which was published in December 2017. The standard includes "required" and "optional" criteria, which are referenced as "shall" and "should" within this report.

understanding on the practicality and feasibility of potential criteria for ecolabels and to learn about the state of implementation of individual measures.

Altogether, three semi-structured interviews with raw material supply chain experts from different ICT companies were conducted. The companies were questioned about their current efforts for implementing sustainable raw material supply chains and their opinion on the integration of sustainability issues in ecolabelling schemes. Following questions served as the guideline for expert interviews with the companies:

Cluster 1: Due Diligence

3. Due diligence has developed into a widely applied company management tool to address human rights risks in the supply chain of mineral resources, in particular for the so-called 3TGs (tin, tantalum, tungsten and gold). Does your company apply this concept in-line with the relevant OECD Due Diligence Guidance?
4. If yes, has your company published a due diligence report covering all 5 steps of the due diligence concept?
5. What types of raw materials are covered by your company due diligence efforts? (e.g. 3TGs only, 3TGs + cobalt, also additional raw materials)
6. In case your company efforts on due diligence stretch beyond 3TGs: How did you identify the raw materials to be covered by your due diligence efforts?
7. Is your company supporting so-called “in-region initiatives” aiming at an improvement of mining on the ground? If yes, can you provide details?
8. What is your view on attempts to integrate human rights related supply chain due diligence in the criteria of ecolabelling schemes?

Cluster 2: Environmental issues

1. The Due Diligence concept as developed by OECD focuses on human rights. Does your company also address environmental issues in raw materials supply chains (either via some kind of environmental supply chain due diligence or by any other means)?
2. Could your company envisage to conduct something like an environmental risk assessment of raw materials (risk assessment as step 2 of the due diligence framework)?
3. Is your company supporting so-called “in-region initiatives” aiming at an improvement of environmental conditions of mining on the ground? If yes, can you provide details?
4. What is your view on attempts to integrate environment related supply chain due diligence in the criteria of ecolabelling schemes?

Cluster 3: Other issues

1. Does your company consider other means of reducing environmental impacts of raw material production (e.g. use of secondary raw materials, durable/ recyclable product designs)?
2. If yes, what means do you see to integrate related criteria in ecolabelling schemes?
3. What recommendations can you give to ecolabels aiming at integrating social and environmental issues of raw material production?

Furthermore, sector experts of two ecolabelling schemes provided their written feedback to the project team as well. One sector expert of the German Environment Agency was interviewed via telephone for an in-depth discussion.

For all three ICT companies, the OECD due diligence guidance has a high relevance for the implementation of due diligence processes. The guidance is evaluated as a useful instrument which allows taking specific company situations into account. Since the introduction of the Dodd

Frank Act, all interviewed companies conduct due diligence measures for the 3TGs. For the identification of further raw materials of high concern, different approaches are used. Two companies base their assessment on the evaluation of media and NGO reports in combination with own investigations. As a result, the supply chains of cobalt and in one case mica were included in the due diligence measures. The third company published a material scoping study, which is based on an assessment tool which uses the same twofold approach as the one also suggested by the project team of this study:

- evaluation of environmental and social risks based on a distinct set of criteria
- evaluation of the possible impact of the ICT sector by taking the consumption of the world market into account

The material scoping study, mentioned above, is freely available[21] and supposed to be used by other institutions as well. Other institutions have already shown interest and the approach is currently used by the Responsible Mineral Initiative and different car manufacturers to conduct a prioritization for due diligence measures. According to the responsible company, the practical experiences so far confirmed the utility of this methodology to identify risks as well as opportunities for improvement and to prioritize due diligence efforts.

Furthermore, all surveyed companies engage in the so-called "in-region-initiatives", mostly in well-known multi-stakeholder initiatives, as for example the Indonesia Tin Working Group or Solutions for Hope. One of the interviewed companies builds up direct supply chains and engages directly with the mining cooperatives in the mining regions. The engagement in in-region-initiatives is evaluated to be of very high importance for actual improvement, as risk assessment itself does not necessarily lead to improvements. According to one expert, a sole risk assessment carries the risk of avoidance, instead of the necessary improvement in (conflict affected) production countries. Ecolabel criteria should therefore not only address a risk assessment, but additionally promote a sustainable development in the regions.

So far due diligence measures and many initiatives focus mainly on social risks in supply chains. A step by step expansion aiming to include environmental issues was requested by one of the interviewed companies, considering the impact driven approach as for social issues.

Although due diligence is already widely applied in practice, the inclusion of corresponding criteria in ecolabelling schemes was evaluated as challenging. Whereas ecolabelling schemes address specific products, due diligence efforts along raw material supply chains are implemented throughout the company. According to one expert, it might be challenging to allocate the efforts to specific products, as they are a general (quality) feature of the company.

Overall, the proposed approach, a combination of risk assessments and in-region-initiatives, was found to be already conducted in practice and is evaluated to be useful by sector experts. To reduce bureaucratic burdens and to focus on the practical impact, it was suggested to align criteria in ecolabels with existing certification schemes.

In addition to the activities described above, all three companies consider other means of reducing environmental impacts of raw material production. Currently companies are searching for solutions to increase the share of recycled raw materials. In order to promote the use of recycled materials by ecolabelling schemes, an obligatory publication of recycled versus mined raw material share was suggested. Furthermore "material passporting" was named as one

[21] Fairphone (2018): Fairer materials – a list of the 10 we're focusing on; https://www.fairphone.com/en/2017/02/01/fairer-materials-a-list-of-the-next-10-were-taking-on/, Accessed on 19.07.2018

option to increase recyclability, which basically described the approach of documenting a product's material compositions to facilitate sound recycling

Product group specific criteria regarding the reparability are evaluated to be difficult, whereas more general criteria (e.g. the repair should be possible using standard tools) are evaluated to be more suitable.

3.5 Potential criteria for ecolabelling schemes

Building on the analysis in chapters 3.1 to 3.3 and feedback from the expert interviews in chapter 3.4, following issues need to be considered for developing potential criteria on sustainable raw material supply chains in ecolabels:

3.5.1 Considerations on supply chain due diligence

Various issues related to the supply chain of raw materials are already integral part of various ecolabelling schemes as well as are implemented by the IT companies. This is particularly the case for requirements related to supply chain due diligence according to the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-affected and High-risk Areas. These requirements refer to established approaches and definitions and mostly require the existence of a related corporate policy and/or a recent due diligence report as verification mechanism. While related criteria are quite innovative and address important issues, the following points should be considered:

- In many contexts, Due Diligence is applied to the so-called conflict materials tin, tantalum, tungsten and gold. Other raw materials which are quite relevant for notebooks such as cobalt (see section 3.3.5.2) are not necessarily covered by such requirements. Thus, producers / product models can comply with related criteria even if they have not taken any initiative on cobalt. In this context it is recommended to focus requirements related to supply chain due diligence on defined raw materials that have been found to have a high relevance for a defined product group. In the case of notebooks, this would be tantalum, cobalt and possibly also palladium that should at least be covered by related due diligence efforts.

- For verification the existence of a due diligence report is useful and deemed more appropriate than just the existence of a certain corporate policy. This is because supply chain due diligence is a process defined by the related OECD Due Diligence Guidance and involves five steps: While a corporate policy is part of the 1st due diligence step, reporting is the final step no. 5 and therefore involves the reporting over all other steps. With a recent due diligence report, a company proves that they have implemented all of the five steps.

- Although there is wide consensus that corporate supply chain due diligence on minerals from conflict-affected and high-risk areas is a suitable measure to address some of the most relevant human rights issues in mining (see section 3.1.2), it is also known that a wrong interpretation of due diligence can lead to boycotts of certain mining areas and subsequently to unintended negative socio-economic side effects (see section 3.1.4). In this context, ecolabels should additionally consider requiring active support of in-region initiatives aiming at a sustainable improvement of mining conditions on the ground and particularly in mining areas located in conflict-affected and high-risk areas. Related criteria have already

been developed by EPEAT/IEEE and partly by TCO Development. Additionally, many companies are already engaging in in-region initiatives, either within well-known multi-stakeholder initiatives or building direct supply chains and engaging directly with the mining cooperatives in the mining regions.

It must be emphasized that supply chain due diligence, as described in the related OECD guidance, only covers issues around conflict financing and human rights violations. Environmental issues and other social aspects (e.g. health & safety in mining, development aspects) are not necessarily addressed by corporate due diligence efforts. Theoretically, the due diligence requirements can be extended onto such other issues within the ecolabelling. However, such a step may involve a certain risk that producers find it difficult to fulfil this requirement. In addition, it is unclear whether the benefits of voluntary ecolabelling schemes are regarded as being enough by companies to motivate activities in this direction. In general, raw material related supply chain due diligence is a rather new concept and many companies still must familiarize with it and its practical implementation. To reduce the risk that companies are incapable or unwilling to implement related criteria, it is suggested to initially focus on two very specific core elements of due diligence schemes to derive **environmental due diligence criteria** that can either be used individually or in combination:

- Require producers to conduct a risk assessment with extended scope (step 2 of the supply chain due diligence process) related to key raw materials of a product group (e.g. tantalum, cobalt and palladium for notebooks). Thus, ecolabelling criteria would motivate producers to systematically assess environmental risks in their supply chains which is commonly seen as a first important step for corporate mitigation measures.

- Require producers to support in-region initiatives that have a scope beyond conflict-financing and human rights.

Additionally, it was recommended that producers demonstrate the implementation of supply chain due diligence for addressing conflict financing and human rights violations for most relevant raw materials according to the OECD due diligence guidance for responsible supply chains of minerals from conflict-affected and high-risk areas.

From this perspective, the following ecolabelling criteria are suggested:

- *The notebook producer shall demonstrate that he conducts supply chain due diligence for tin, tantalum, tungsten, gold and cobalt used in its notebooks. The applied due diligence process is conducted in-line with the OECD due diligence guidance for responsible supply chains of minerals from conflict-affected and high-risk areas.*

  Verification:

  - ✓ *The applicant provides a weblink to the published corporate due diligence report covering all 5 steps of the OECD Due Diligence framework. The report shall not be older than 2 years at the date of submission of the application.*
  - ✓ *The applicant shall provide a copy of this due diligence report where the headings of all 5 due diligence steps, as well as all materials addressed are graphically marked.*

- *The notebook producer shall demonstrate that his due diligence efforts for raw materials involve an assessment of environmental risks.*

Verification:

- ✓ *The applicant shall provide a copy of its due diligence report where the environmental risk assessment of raw materials is addressed and where relevant sections are marked.*

- ► *The notebook producer shall demonstrate that he actively supports in-region initiatives[22] that supporting sustainable production of primary raw materials in conflict affected and high-risk areas. In-regions initiatives should follow a holistic approach and encompass human rights as well as relevant other social and environmental issues.*

  Verification:

  - ✓ *The applicant shall list at least one in-region initiative he is actively supporting. He shall specify the type of support (e.g. annual financial support) and give a reference contact of each listed initiative to allow independent verification of the given information.*
  - ✓ *The applicant provides information on the type of initiative (organisation structure, aim, country, material scope, type of support…) and describes how the project leads to an improvement of human rights, as well as relevant social and environmental conditions in and around the mining site(s).*
  - ✓ *The applicant shall provide information on the monetary value of its support of in-region activities (yearly average) and shall specify how this support is granted (direct payment to initiative, financing of individual measures, in-kind contribution…)*

3.5.2 Considerations on recyclability

As indicated in section 3.3.6.2, there are already various ecolabelling criteria aiming to improve the recyclability of notebooks. Taking into account the findings from section 3.3.3 and major aspect of sections 3.3.4.2 and 3.3.5.2, it has to be stressed that rechargeable batteries (that contain significant amount of cobalt) play an important role in the overall recyclability of notebook computers. For sound recycling, the rechargeable batteries need to be extracted from the computers and given to special recycling. Although there are already criteria on battery removability (e.g. Blue Angel, European Ecolabel), the following points need to be considered:

- ► There are two major reasons to remove rechargeable batteries: 1) To exchange an old battery against a new one (repair operation), 2) to separate the battery from a computer to facilitate the recycling. Both processes have specific characteristics:
  - Battery extraction for repair has to be conducted without any damage to the notebook. Use of tools and a required working time of several minutes are acceptable.
  - Battery extraction during recycling can tolerate a certain level of damage as devices. In the other side, it is for economic reasons quite important to minimize (manual) labour input.
- ► The removal of batteries is also regulated in Article 11 of the Battery Directive (2013/56/EU amending Directive 2006/66/EC). The aim of this regulation is to improve the exchange of

[22] It is recommended to develop a positive list of in-region initiatives that are regarded as eligible for this criterion. This list might encompass (but might not necessarily be limited to) the Conflict-Free Tin Initiative (CFTI); Solutions for Hope (SfH); Fairtrade Gold; Fairmined Standard, the Responsible Cobalt Initiative (RCI)

batteries in the use-phase of products but does not necessarily affect end-of-life-removability.

- Although Annex VII of the European WEEE-Directive (2012/19/EU) requires that batteries "have to be removed from any separately collected WEEE", the Standard EN 50625-1 on Collection, logistics & Treatment requirements for WEEE requires that only "batteries that are accessible in the equipment without using tools shall be removed from WEEE before any treatment process that can cause damage to them". Thus, only product designs that allow the removal without tools can insure high-quality recycling.
- It is therefore recommended to introduce ecolabelling criteria that require product designs where rechargeable batteries can be removed without the use of tools and with manual labour input of only few seconds.

3.5.3 Consideration on the use of secondary raw materials

Some of the interviewed producers mentioned that a mandatory minimum share of secondary raw materials is another means of integrating sustainability issues of raw materials in ecolabelling schemes. This approach has been successfully applied to paper products and partly also to some products containing plastics (e.g. Blue Angel criteria for printer). The aim of such criteria is to stimulate market demand for secondary raw materials and support related recycling efforts. One producer of IT-equipment (Apple) publicly announced in November 2017 to aim for products being to 100% constructed from secondary raw materials (Whigham 20 Nov 2017). While this target is widely regarded as vision for product developments, there are service-providers who developed and offer independent verification of recycled content claims (e.g. Intertek, SCS global, UL Environment).

Regarding the environmental gains of secondary raw material use, there is a wide consensus that such strategies are particularly recommended for raw materials with downcycling problems and where secondary raw materials would otherwise have difficulties finding a market. This is particularly the case for secondary raw materials from waste paper and waste plastics. Other streams such as waste glass and waste aluminium also have downcycling issues so that related criteria can yield positive effects. The situation is more complex for materials that are already commonly recycled without loss of quality (e.g. copper). Here, the effects of a mandatory use of secondary raw materials are less clear and might also just lead to a re-direction of existing material streams rather than supporting recycling markets.

Furthermore, related criteria should consider the differences between pre- and post-consumer recycling. While pre-consumer recycling (recycling of production waste) often yields high material qualities suitable for immediate reintroduction into production processes, recycling of post-consumer waste is usually much more challenging. From this perspective, post-consumer recycling should be in the primary target of related ecolabelling criteria.

3.5.4 Further considerations

Generally, notebook models are manufactured for global markets, while ecolabelling schemes mostly address national or regional markets. In this context, a harmonization of criteria and verification mechanisms – also those relevant for raw materials and raw material supply chains – is recommended. It is thought that harmonized approaches are much more suited to provide a positive stimulus to manufacturers to consider related criteria in their product designs and business models. Besides issues on raw material supply chains, recyclability and the use of

secondary raw materials, this should also address criteria on durability of devices as well as batteries.

4 Measuring the performance of ecolabels

4.1 Why measure the performance of ecolabels?

The debate on the role of ecolabels in driving the sustainable consumption and production (SCP) has been going on for several years. In recent years, several questions have been raised on the effectiveness[23] of the ecolabels in terms of achieving the defined environmental goals and targets. For instance, the recently published Fitness Check on the EU-Ecolabel points towards the limited effectiveness of the EU ecolabel, predominantly due to the lack of awareness and market recognition. Such effects have led to a low uptake of the EU-Ecolabel by businesses. Furthermore, lack of recognition in public policy and compliance and verification costs were regarded as important factors for the limited uptake of the EU-Ecolabel (EU Commission 2017). Korteland (2007) went even further and concluded that low effectiveness of ecolabels can be attributed to the fact that the main underlying causes of environmental problems, i.e. international trade in targeted product categories and sectors, are outside the direct scope of ecolabel's influence.

On the other hand, a number of studies have highlighted the positive environmental effects of ecolabelling schemes (Gröger et al. 2013; Moon 2011). Furthermore, the evaluation of the Chinese Ecolabelling Programme in 2014 also demonstrated significant environmental benefits for the selected environmental parameters, such as air pollution, energy demand, resource consumption, water pollution and hazardous waste (Ministry of Environmental Protection 2014)[24]. It is noteworthy that evaluations of positive environmental effects of ecolabels have almost exclusively have been calculations based on potential environmental benefits and not real environmental gains.

As the debate on the effectiveness of ecolabels continues, the ecolabelling schemes worldwide face the uphill task of delivering solid empirical evidence to political decision-makers and other societal actors in terms of the impact of ecolabels in driving a market shift towards better performing products and services. Apart from the general interest in knowing the absolute impact of ecolabels on the environment, Thidell et al. (2015a) argue that continual measurement of the performance of ecolabels would help in tracking changes and progress over time, and enabling comparison with other ecolabelling systems and environmental information systems. At the same time, data on the performance and impact of ecolabels would be helpful in measuring the overall efficiency[25] of the ecolabelling schemes.

4.2 How to measure the performance of ecolabels

In the recent past, many studies have proposed indicator sets to measure and evaluate the performance of ecolabels (EU Commission 2017; Thidell et al. 2015a; 2015b; Rubik et al. 2008; Horne 2007; Korteland 2007; EU Commission 2005). While Thidell et al. (2015a) have proposed a very comprehensive set of performance indicators for monitoring and evaluating the internal performance and efficiency measures of the Nordic Swan (Figure 2), the current EU-Ecolabel Working Plan identifies relatively fewer parameters, as mentioned below, as key performance indicators (Evans et al. 2017):

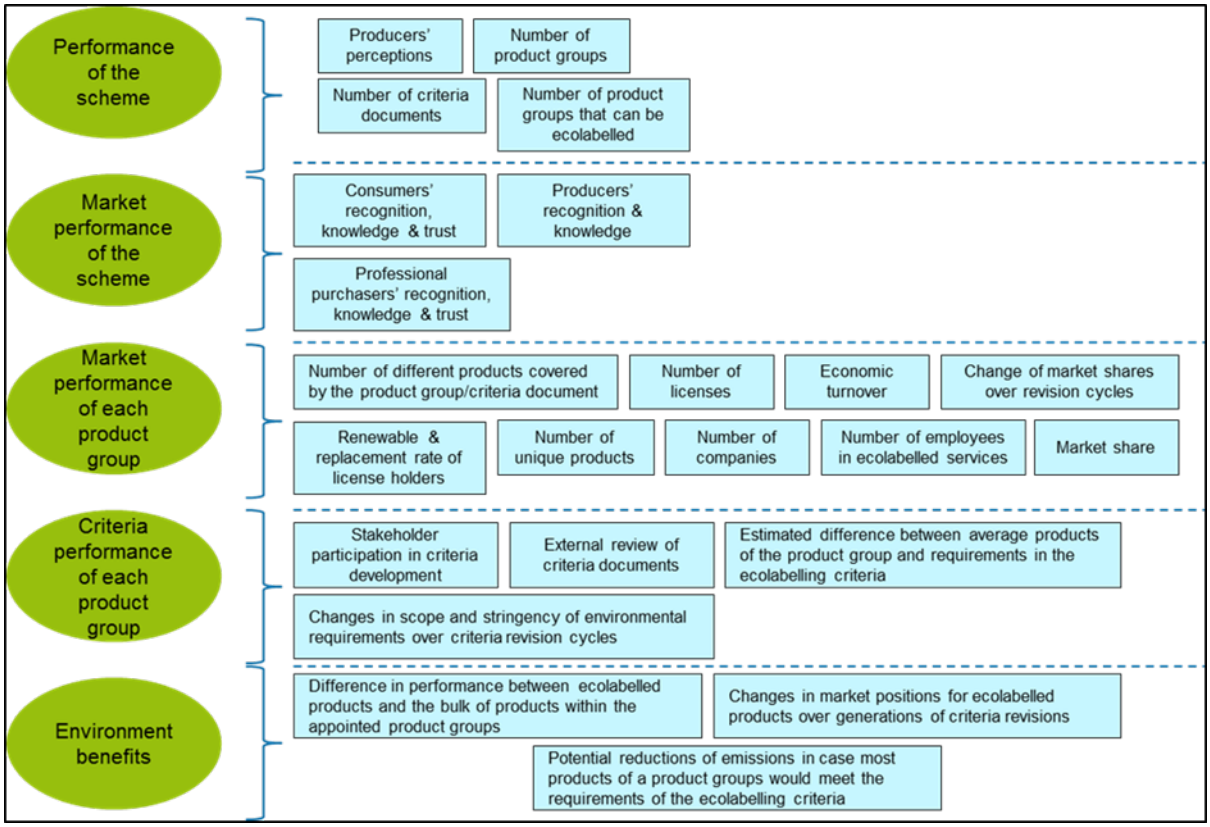
[23] Ecolabels are effective if they meet their objectives, i.e. promote products that have a high level of environmental performance. The environmental performance is measured as the product of ambitious environmental criteria, robust verification mechanisms and tangible market uptake of labelled products EU Commission (2017).

[24] Information taken from Thidell et al. (2015a)

[25] Efficiency can be judged by considering the return/ benefits (e.g. environmental impact)for a given level of financial or time investment EU Commission (2017).

- Number of EU-Ecolabel licences that companies hold
- Number of products for which these companies were awarded the EU-Ecolabel
- Number of people who have seen/heard/bought ecolabelled products

Figure 2: Performance indicators for the internal performance and efficiency measures of the Nordic Swan



Source: Thidell et al. (2015a), figure compiled by the authors

In another study, Thidell et al. (2015b) recommend a set pf proxy indicators for the Global Ecolabelling Network (GEN), which, according to the authors, could be feasible to implement (Table 12).

Table 12: Recommended set of proxy indicators for ecolabelling

Proxy indicators	Recommendations to GEN by Thidell et al. (2015b)
The number of sub-product groups that are covered by the scheme	In order to make the indicator useful and apt for benchmarking, GEN needs to establish a generic list of product groups and sub-product groups.
The number of licences that are valid for the scheme	In order to make this indicator useful for comparisons, GEN could promote common rules on how to define what constitutes a licence – preferably built on precise rules for various product groups based on the common principles
Percentage of the consumers that recognise the ecolabel, know its meaning and put trust in the scheme	If this indicator should be fully useful for benchmarking it may need more clear definition of how the question should be asked etc.

Proxy indicators	Recommendations to GEN by Thidell et al. (2015b)
Recognition and trust of the ecolabel among professional purchasers	As such studies are not known, there are good opportunities for GEN to find common approaches that would facilitate benchmarking
Market shares of ecolabelled products	In order to make this indicator useful for comparisons, GEN is recommended to identify product groups which would be most interesting for international benchmarking and share experiences on how to estimate market shares, without necessarily looking for all schemes to use the same approaches as considerable national differences could be expected and the choice of method would best be done on the national level.
Estimations of environmental benefits	GEN is recommended to critically analyse structured methods for such estimations in individual products groups

Source: Thidell et al. (2015b), table compiled by the authors

In general terms, it can be argued that consumer awareness and perception were the most commonly suggested indicators in most of the studies as these indicators are known to be reliable and comparatively easy to measure. Apart from that, several studies have proposed evaluating the market share of the ecolabelled products (Korteland 2007; Horne 2007) and the resultant improvement in the environment quality (Rubik et al. 2008; Horne 2007) for measuring the effectiveness of ecolabels.

Few ecolabelling schemes worldwide have already been working on tracking the development and effectiveness of their ecolabelled products. According to a survey of 340 ecolabels in 2010, it was reported that about 44% of those who completed the survey, had measured the environmental or social impacts of their labelling program and 21% planned to study them[26] (The World Resource Institute und Big Room Inc 2010).

In the following Table 13 an overview of the current state of performance measurement in selected ecolabelling programmes is provided:

Table 13: Performance measurement in ecolabelling schemes[27]

Indicator	Blue Angel	Nordic Swan	EU-Ecolabel	Thai Green Label	Korean Ecolabel
Environmental benefits	No	No	No	No	To some extent, or Not clear
Market share of the ecolabelled products	No	No	No	No	No
Number of licences	Yes	Yes	Yes	Yes	Yes
Number of licence holders (companies)	Yes	To some extent,	No	Yes	No

[26] It is noteworthy that only 33% completed the survey. Assuming that the ecolabelling programs who did not complete the survey do not measure the environmental or social impacts of their labelling programs, the overall share of the Ecolabelling programs measuring the environmental or social impacts would be much lower (i.e. about 15%).

[27] The assessment of the performance measurement indicators in selected Ecolabelling schemes was carried out using the publicly available information, mostly on the websites of the Ecolabelling schemes. Therefore, results of the assessments may deviate from existing performance measurement indicators in selected Ecolabelling schemes, if such information is used internally and is not available in the public domain.

Indicator	Blue Angel	Nordic Swan	EU-Ecolabel	Thai Green Label	Korean Ecolabel
		or Not clear			
Number of ecolabelled products	Yes	Yes	Yes	Yes	No
Number of criteria documents	Yes	Yes	To some extent, or Not clear	To some extent, or Not clear	Yes
Changes (over time), number of licences	Yes	No	Yes	No	No
Changes (over time), number of products	Yes	No	Yes	Yes	No
Changes (over time), number of companies	Yes	No	No	Yes	No
Consumer recognition and perception	Yes	Yes	No	Yes	Yes
Recognition among professional purchasers	No	No	No	No	No
Recognition among producers	No	No	No	To some extent, or Not clear	To some extent, or Not clear

Source: Öko-Institut, on the basis of the analysis of Thidell et al. (2015b; 2015a); www.blauer-engel.de; www.nordic-ecolabel.org/; http://el.keiti.re.kr/enservice/enindex.do; www.tei.or.th/greenlabel/

The assessment of the selected ecolabelling schemes in terms of using performance measurement indicators shows that the schemes use a varying degree of indicators to monitor and evaluate the performance of their ecolabels. While indicators, such as number of licences, ecolabelled products and criteria documents as well as consumer awareness and perception seem to have been adopted by several ecolabelling schemes, changes in number of licences, products and companies over time, market share of ecolabelled products and environmental benefits are covered by very few to none schemes. In the current debate on the effectiveness of ecolabels, information on the market share of ecolabelled products and achieved environmental benefits have been identified as key indicators (EU Commission 2017). These two indicators are considered to be important because they provide more reliable and quantifiable information on the performance of ecolabels in terms of achieving their key objective, i.e. contribution towards reducing the environmental impact of consumption and production.

4.3 Challenges in measuring the performance of ecolabels

Implementing a monitoring and evaluation system to measure the performance and effectiveness of ecolabels is not a trivial task. Thidell et al. (2015a) emphasize that only limited knowledge is available on how the performance of ecolabel programmes can be evaluated and what constitutes success of ecolabelling. Effectiveness of the ecolabels can best be measured if data on the uptake of ecolabels by the market and resultant environmental benefits is available (EU Commission 2017). According to Thidell et al. (2015b; 2015a) and EU Commission (2017), accessibility and/ or availability of data, absence of an appropriate methodology and resource constraints of the ecolabelling schemes are the major obstacles. The data is generally distributed among a number of actors, such as licence holders, licence awarding institutions, owners of ecolabels, market research institutions etc. For instance, data on market share of ecolabelled products is generally not available to the ecolabel institutions. Company data on the sales and market share of ecolabelled products is either confidential to companies' internal documents or

is sometimes available with business and market research institutions, who charge high fees for delivering the data. Recent experiences of the German ecolabel Blue Angel have highlighted other practical issues related to the data on market share. For instance, high costs of household panel data of market research institutions, which would generally help in estimating the market share, are also attributed to the European Article Number (EAN, now re-named as Global Trade Item Number, GTIN) which is unknown to the Blue Angel ecolabelling scheme. Furthermore, data collection with household panels does not work with highly diversified and segmented marketing channels, as is the case for wood products, printing paper etc. Here only subjective, expert estimations of retail personnel on sales volumes and market share are possible.

Related to the absence of market data on ecolabelled products is the problem associated with estimating actual environmental benefits of ecolabels. Although several standards on Life-Cycle Assessment (LCA) of products exist and serve as sound methodological framework to measure the environmental impacts, it is only possible to calculate environmental impacts based on potential (not real) market shares. For instance, Cadman und Dolley (2004) estimated the environmental impacts using potential market share values of 5%, 20%, and 50%. On the other hand, Gröger et al. (2013) calculated the potential environmental benefits of the Blue Angel for an average household and an average workplace. Prakash (2012) estimated that if all computers in Germany would fulfil the criteria of the Blue Angel, about 5 to 7 TWh of electricity would be saved, making about two medium-sized coal power plants obsolete. Such results are useful only so far in that they demonstrate the potential environmental impacts should those market share levels be reached (Thidell et al. 2015b).

According to Thidell et al. (2015b) and Cadman und Dolley (2004), a severe challenge exists especially in measuring the indirect positive effects of ecolabels in quantifiable terms. The indirect effects would include aspects related to the influence of ecolabels on policy, businesses and society. Few example are for instance, use of ecolabel criteria in Green Public Procurement, in defining minimum mandatory environmental standards, leading a societal discourse and transformation towards environmentally superior products and driving manufacturers or industry towards adapting the production-line according to the ecolabel criteria. Thidell et al. (2015b) acknowledge that the indirect benefits are significant, while the challenges to find any realistic approaches for systematic evaluations of indirect environmental benefits are overwhelming.

The need to monitor and evaluate the performance and effectiveness of ecolabels, against the background of poor data availability/ accessibility related to market shares, actual environmental benefits and indirect effects, have led to discussions on using alternative proxy indicators to give an indication on the potential benefits. As displayed in Table 4, data on indicators, such as number of products, criteria documents, licenses and license holders, is available with most of the schemes, and is generally used for the evaluation. However, Thidell et al. (2015a) warn about the risk associated with interpreting the effects of the indicators wrongly by giving the example of the indicator “number of licenses” used as a proxy for environmental benefits. According to Thidell et al. (2015a), “if performance is defined only as increase in number of licenses, the number of licenses may increase due to licensing existing products, while the market does not change at all. In other words, the number of licenses does not necessarily translate to environmental effects”. Moreover, data on number of products or product groups might also not be a useful indicator for measuring the effectiveness of ecolabels. For instance, a small number of extremely important products might lead to larger environmental benefits than many products with lesser environmental benefits. Hence the level of the ecolabel requirements and the difference between ecolabelled products and average products is an important aspect when evaluating the environmental benefits.

Furthermore, it is noteworthy that different ecolabelling schemes define key parameters, such as products, licences, licence holders and scope differently. Any attempt to use such indicators as proxy for performance monitoring would lead to results that are not comparable between different schemes. Thidell et al. (2015a) provide a good account of this challenge, as cited as follows: "*The ecolabelling organizations define product groups under their scheme in different ways. The Environmental Choice in Canada looks at the functionality of product and LC-based environmental impacts. The Environmental Choice in New Zealand uses general definitions. The Blue Angel in Germany has a case-by-case selected approach, and the Korean Ecolabel generally makes use of national standards and sometimes is steered by the environmental characteristics. For two of the organizations, there are cases in which several products groups are covered by one criteria document. For most of the organizations, it is also permitted for the producers to apply for a licence to cover a group of products (as opposed to applying for a licence for each product). A licence count may not indicate the number of producers participating in the scheme. Some ecolabelling organizations give the option of allowing producers to apply for a master licence that will cover a range of products or models of a product. Some producers may hold multiple licences while other holds just one*" (Thidell et al. 2015a); Page 72-73).

In the conclusion, it can be said that a lot of research has already gone into developing a set of indicators to measure the performance and effectiveness of ecolabels. According to the current state of knowledge, it does not seem legitimate to develop a totally new indicator set. Rather, it is recommended to support the ongoing discussion among the decision-makers in the ecolabel institutions when it comes to measuring the performance and effectiveness. One of the possible approaches would be that ecolabelling institutions select a common set of indicators with harmonized definitions and methodology for performance measurement.

4.4 Survey

In order to analyze the status quo of the identified main challenges within the ecolabelling schemes which participated in the working group "Measuring the performance of ecolabels" (see chapter 2 for details) and to develop possible strategies to overcome the addressed challenges, a questionnaire has been developed (see Annex D) that has been sent out to the participating ecolabelling schemes mentioned in Chapter 2).

In total, six ecolabelling schemes responded: TCO Development, Green Mark (Taiwan), GreenPro (India), Good Environmental Choice (Australia), Green Product Mark (TÜV-Rheinland) and the Blue Angel (Germany). Out of these, three schemes were selected for in depth phone interviews: Green Mark, Taiwan, Good Environmental Choice Australia and the Blue Angel.

4.4.1 Content of the questionnaire and the phone interviews

The questionnaire was structured in five areas:

1. Approaches for reporting on key indicators (number of licences, number of products, number of licence holders; as reference the approach of the EU-Ecolabel to count these indicators has been given; examples for a selected sample of product groups have been asked for);
2. Methods for collecting the information on market share;
3. Methods and approaches for estimating the indirect benefits of ecolabels (e.g. in public procurement);
4. Methods for calculating the environmental benefits;
5. Other questions (most successful products, further information).

In the phone interviews, the answers were discussed in a more detailed way. Additionally, two more general questions were asked:

- What would be the benefits of harmonizing the performance measurement of different Type I labels from your point of view?
- Does the harmonization of the key indicators (licences, products, licence holder etc.) make sense from your point of view? What would be the advantages?

The following sections report on the main findings of the survey (questionnaire and phone interviews) and provide preliminary conclusions.

4.4.2 Benefits of harmonizing the performance measurement of different Type I labels

- Internal benefits: learning from each other

A harmonization would make it easier to exchange data and information between the labelling schemes. Also, trends could be derived from time series. Thus, success factors could be identified which can help other schemes to improve. (What works well and why? Which products are successful and why?). In addition, mutual help with the development of requirements is seen as an advantage.

- Demonstrating the excellence of type-1 ecolabels

With harmonized performance measurement the achievements and positive environmental impacts of ecolabelling could be better quantified on an international basis (impacts of GEN network as a whole). This would help in the conversation with governments and companies. Also, a comparison to other labels (non-type-1) might be interesting. However, such an evaluation could also backfire, if the performance is not as good as expected.

All interviewed schemes were consistent in their opinion that the harmonization must not serve to compare the different schemes publicly or in a competitive way. Differences in e.g. the number of ecolabelled products or successful product groups might have many reasons that lie outside the direct sphere of influence of the ecolabelling scheme. Also, the levels of the requirements are very different depending also on the level of environmental regulation which varies to a great extent between the different countries and regions.

4.4.3 Approaches for reporting on key indicators

The approach for counting the following aspects, as a means to measure the performance, was asked:

- Number of licences
- Number of products
- Number of licence holder

The following product groups were selected as examples to explain the counting of the abovementioned indicators: paints & vanishes, paper, and furniture. Additionally, it was asked to describe the data reporting to GEN.

Additionally, in the interviews, it was asked if the harmonisation of the key indicators (licences, products, licence holder etc.) is feasible and has advantages.

4.4.3.1 Reference methodology: EU-Ecolabel approach

The approach of the EU-Ecolabel (DG Environment EU Commission 2016) was chosen as the reference methodology for comparing the approaches of the ecolabelling schemes for counting the abovementioned indicators. The methodology of the EU-Ecolabel is shortly explained in the following sections.

4.4.3.1.1 Number of licences

The main rule is: *one* EU-Ecolabel licence for *one* product group and *one* producer.

- Only one EU-Ecolabel licence shall be granted for each product group and producer (independently of the number of production sites).
- If a new application for the same product group and producer is made, the same licence number shall be issued (even if the number of products increases).
- For the same product (from the point of view of formulation/composition, design, etc.), a retailer can request a new EU-Ecolabel licence in order to offer an EU-Ecolabel product of its own brand. In this case, a separate application needs to be presented.
- The EU-Ecolabel licence is issued to a legal entity, which can be a manufacturer, importer, distributor or retailer. Each time a legal entity obtains an EU-Ecolabel licence for another product group (e.g., for tissue paper as well as for copying and graphic paper), then this new licence shall be counted separately.

4.4.3.1.2 Number of products with EU-Ecolabel

The principles to be applied for all product groups are:

- If the product is marketed under two or more different commercial names/brands, then each of them is counted as a separate product.
- When the same product is sold with slightly different names (due to e.g. translation to "x" national languages of the country where the product is placed on the market), then "x" products shall be re-ported.
- When the same product is sold with the same name, but the information given on the label is translated into "x" national languages of the country where the product is placed on the market, then "x" products shall be reported.
- When a retailer applies for the EU-Ecolabel in respect of a product already holding an EU-Ecolabel licence, but with another commercial name/brand, then those products will be counted separately.

4.4.3.2 Approaches for counting the number of licences

The methodology of the EU-Ecolabel to count the number of licences is given in the previous section (section 4.4.3.1): it is mainly one EU-Ecolabel licence for one product group and one producer. This approach results in a lower number of licences than certified products.

From the ecolabelling schemes that responded to the questionnaire only one scheme stated that it has the same approach as the EU-Ecolabel (1 licence per producer and product group). This means that one producer can have several licences (only) if its products are assigned to different product groups (e.g.: "all purpose cleaners" and "dishwashing detergents" are different product groups. If one producer offers two types of all purpose cleaners and three dishwashing detergents it needs two licences (one for its products in the product group "all purpose cleaner", one for its products in the product group "dishwashing detergent").

Three schemes indicated that they follow the approach "1 product = 1 licence", resulting in much more licences compared to the EU-Ecolabel approach. If e.g. one producer produces 5 different products within one product group this means that this producer holds 5 licences.

The remaining two schemes also in principle follow the approach "1 product = 1 licence". However, in certain cases one product can even have several licences: e.g. if the manufacturer sells a product under his own brand and also supplies it to distributors that sell the same product under different brand names or if a product is certified against several standards[28]. This means that the number of licences would be higher than the number of products. This approach corresponds to the approach of the EU-Ecolabel when counting the number of products (see section 4.4.3.1).

4.4.3.3 Approaches for counting the number of products

There are different levels of definition that have to be distinguished:

- Product group: e.g. paints & varnishes, paper, furniture, sometimes also referred to as „product category" or "broad category". For most ecolabel schemes, presumably similar categories are used. This was not asked in detail in the questionnaire.
- Product: Mostly "product" is defined as the category which is offered by the manufacturer/brand holder/retailer, and specified through brand or sales name and main product specifications like colour/tint, formulation/composition, grammage, design etc.
- Unit (offered, sold): single unit that can be bought by customer.

The most important category in this context is the "product" which is defined differently by the different schemes.

The approach of the EU-Ecolabel to count EU-Ecolabel products is outlined in section 4.4.3.1 The EU-Ecolabel has a very small-scaled product definition, i.e. not only (identical) products that are marketed under different names are different products but also different volumes/sizes or colours/tints count as different products.

From the ecolabelling schemes that responded to the questionnaire only one scheme stated that it has the same approach as the EU-Ecolabel for defining the product.

[28] GECA has some standards that are not specific for a certain product group but rather horizontal, e.g. "recycled product standards" or "environmental innovative product". This results in the fact that one product (e.g. a piece of furniture) can be certified against the furniture and the horizontal standard.

Four schemes seem to distinguish products mainly by the brand names and qualitative characteristics (e.g. wall thickness of paperboard containers, number of layers, formulation of products etc.). However, it is not clear what characteristic justifies the counting as a separate product: In most cases, difference in the size or volume does not lead to counting as different products. E.g. a certain paint (e.g. "Flat Emulsion Paints, General Series, Lily White") is counted as one product no matter if it is sold in 1 litre, 2 litre or 4 litre units. However, there are differences between the schemes if the colour (e.g. of paints) leads to counting as different product or not.

Several difficulties were mentioned when it comes to counting "products". Therefore, the number of products cannot be determined unambiguously:

For example, in case of "furniture", one contract/licence often covers a whole range or series. Such a range/series consists of several pieces of furniture. On the one hand, it is not clear how this then should be counted (one series = one product or several products?). On the other hand, this bears the risk that, if a certain range is certified and the pieces of furniture are not listed separately in the contract, the manufacturer could add further pieces to the range later on without a new application. The same applies to e.g. multifunctional devices (printers).

Also, in case of furniture, there is the possibility that manufacturers certify only parts. Thus, consumers can compile their piece of furniture according to their needs. Here also the question arises: What would be the number of products in this case?

4.4.3.4 Approaches for counting the number of licence holders

A licence holder is a company that has signed a licence agreement/contract and owns the licence. In general, a licence holder might be a brand owner (e.g. retailer) or an Original Equipment Manufacturer (OEM). In case of most ecolabelling schemes that responded to the questionnaire, one licence holder is one manufacturer or brand owner/retailer that holds licences/certificates for one or several products.

"Licence holder" seems to be defined quite similar amongst the ecolabelling schemes, even though the designation is different.

- TÜV Rheinland: legal entity, which can be a manufacturer, importer, distributor or retailer.
- TCO: brand owner instead of licence holder
- Taiwan Green Mark: „brand owner" or „sole distributor"
- India GreenPro manufacturer, that holds certificates
- GECA: licence holder = one per registered trading name
- Blue Angel: licence holder = manufacturer and retailer

4.4.3.5 Would the harmonization of the key indicators (licences, products, licence holder etc.) be helpful? What would be the advantages?

Advantages of a harmonization of the key indicators were mentioned to be similar to the general advantages of harmonizing the performance measurement approach: if GEN network wants to report on the indicators in a more reliable manner, a clear definition would be necessary.

One of the interviewed schemes emphasized that the effort of harmonization of indicators is too high, compared to the information value of the comparison as the levels of the requirements between the ecolabels are very different (see section 4.4.2). The ecolabelling scheme stressed

that awareness level and relevance for purchasing decision are indicators that are easier to be surveyed and better comparable.

4.4.4 Methods for collecting the information on market share

Out of the ecolabelling schemes that responded to the questionnaire, three schemes do not estimate market shares on a regular basis, mainly because the methodology is not (yet) available or market data is too expensive.

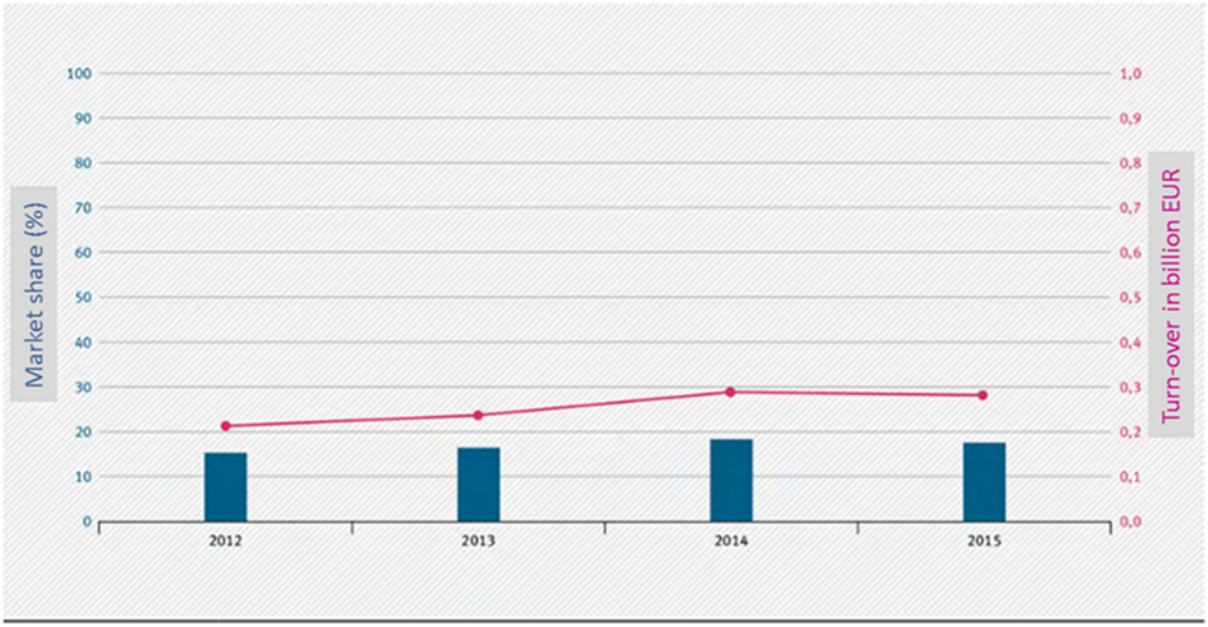
In one case, (GECA), the market share is estimated using the turnover of certified products declared by certified companies in relation to the total revenues in the category as listed in the national bureau of statistics. The turnover has to be declared by the licence holders to calculate the licence fee. Thus, the share of labelled products in the total turnover in that product category can be determined. The number of certified units is determined either through additional information to be submitted by the licence holders. In case companies do not reply to the request for additional information, average prices of the certified products are investigated to calculate the number of products from the turnover. The data is anonymized, and the contracts have strong confidentiality clauses. The information is mainly used for calculating the environmental benefits of the ecolabel. The way of communication depends also on the number of licence holders in a certain product category. If it would be possible to derive input data (e.g. turnover, as received from licence holder) from calculated values it would not be published on such a detailed level.

In another case (Taiwan Green Mark), it is mandatory for licence holders to report the production quantity of ecolabelled products to the labelling scheme. Thus, the market share (sold units) can be calculated with the help of (national) statistical data (total sales, considering imports and exports). Obviously, the data is handled confidentially and is not published as such or in a detailed way. The data is mainly used to calculate the environmental benefits. Licence holders are generally not reluctant to share this information.

In case of the German Blue Angel, licence holders do not have to declare the exact amount of their turnover but only declare the range (mainly for reason of calculating the ecolabelling fee). The market share is not collected on a regular basis as market data (e.g. from market research institutions) is too expensive. Some market data was collected for a selection of products (hygienic paper, paints) within the project “Green products in Germany” (Steinemann et al. 2017).

The following Figure 3 shows as example the market share and turnover of products with the Blue Angel in the market for hygiene paper products.

Figure 3: Market share and turnover of products with the Blue Angel in the market for hygiene paper products



Source: Steinemann et al. (2017), based on the unpublished data from GfK

4.4.5 Methods and approaches for estimating the indirect benefits of ecolabels

4.4.5.1 Green Public Procurement (GPP)

There is a large range regarding the relation of ecolabelling criteria and GPP: in case of Taiwan (Taiwan Green Mark), GPP is partly mandatory for many products, i.e. for many products the share of green products that have to be purchased is mandatory. As the Green Mark is included in the official procurement system, the purchasing body can easily choose from products with the ecolabel.

In the other cases, even though it is not mandatory, the criteria of the ecolabels are partly used for defining the GPP requirements or at least government agencies are encouraged to do so. As most ecolabelling schemes do not keep track of the use of their criteria for GPP, the extent to which they are used is unclear. Also, it is not clear if or to what extent GPP itself is mandatory for public procurement: public procurement is often regulated on a regional and local level and it is therefore difficult to keep track on the status of GPP in all communities and regions/provinces.

GECA and TCO try to evaluate the recognition and trust among professional purchasers continuously through personal meetings with their stakeholders (purchasers, brand owners, retailers, etc.) or through surveys (e.g. annual surveys of licensees and stakeholders). The communication with the licence holders serves to improve their system and thus help getting more manufacturers to apply for the label.

All interviewed schemes coincided in their assessment that GPP would be or already is an important incentive for manufacturers to apply for the ecolabel. Especially, as certification might be expensive (e.g. maybe changes at the product are necessary, licence fees), the interviewed schemes called for the GPP to be mandatory. ("A lot of managers won't approve an investment unless it is proven as business case. Government regulation for GPP would be the best business case for investment in ecolabel certification.") An example is Taiwan: as there are clear requirements to what extent green products must be purchased, there is a strong incentive for manufacturers to comply with the ecolabel requirements and apply for it.

One reason why GPP is so important for the success of ecolabels is seen in the fact that it is much more difficult to generate demand for green products among the private consumers, see also section 4.4.5.3.

4.4.5.2 Other processes influenced by the criteria developed by the ecolabelling schemes

Besides GPP, also other processes are influenced by the ecolabelling schemes. In several countries, labelling or rating schemes in the construction/building, infrastructure and transport sectors were mentioned to be influenced. Also, the chemical legislation was mentioned.

Partly the ecolabelling scheme influences other labelling schemes directly: for example, as the Taiwan Green Mark was the first governmentally owned label, it has been involved in the development of other labels and has helped to establish them (e.g. in criteria development etc.). The other label systems focus on different markets (e.g. private sector, construction sector). Sometimes other rating or labelling systems also have a positive effect on the ecolabelling scheme: e.g. in Australia the "Green Star"[29], a voluntary rating system for commercial buildings, recognizes the GECA ecolabel as proof to get the maximum number of stars for certain products. As in case of GPP, this serves as incentive for manufacturers to get the ecolabel for their products.

4.4.5.3 Evaluation of recognition and trust among consumers

Only one of the six ecolabel schemes that answered to the questionnaire regularly evaluates the recognition and trust of its scheme among consumers. This result is in contrast to the results of Thidell et al. (2015b), where all four ecolabelling schemes that were explored evaluated the consumer recognition and trust in the respective ecolabel.

As reasons for not evaluating the recognition and trust among consumers were mentioned:

- Label is rather a business-to-business label
- Evaluation / surveys would be too expensive
- Other organizations have already done similar market surveys

Even though the awareness level of many ecolabels is quite high it influences the purchase decisions of private consumers to a much lower extent. For example, in case of the German Blue Angel, which evaluates the consumer awareness and the influence on the purchase decision, it can be seen that both aspects seem to have stabilized on a certain level: around 90% of the respondents state they know the Blue Angel, however only less than 40% state that it influences their purchase decision (BMUB 2015). In Taiwan, 80% of the people know Green Mark as it is taught at schools but still the label is not really successful in the private sector. As explanation it was mentioned that most private consumers need a strong individual advantage as incentive for buying green products: low energy or water consumption and the corresponding savings in money or (presumed) positive health effects (the latter resulting in the fact that detergents, paints or products for personal care are comparatively successful product groups.

4.4.6 Methods for calculating the environmental benefits

The calculation of environmental benefits seems to be rather starting at the moment. First attempts have been carried out and methods have been or are being developed and tested.

[29] See https://new.gbca.org.au/green-star: Green Star is a national and voluntary rating system for buildings and communities in Australia. It assesses the sustainable design, construction and operation of buildings, fitouts and communities.

Partly only the *potential* benefits are considered, i.e. the savings per product without taking into account the market share/number of ecolabelled products.

To demonstrate and communicate the achievements of ecolabelled products and the ecolabelling scheme as a whole was mentioned to be the main reason for quantifying the environmental benefits (e.g. amount of reduced VOC emissions to improve indoor air quality).

To come to an estimation of the real environmental benefits, it is important to have data on both the absolute number of ecolabelled products sold or on their market share and the difference in environmental impact between certified products and non-certified ('reference') products.

Regarding the possibilities to collect data on the market share of ecolabelled products, see section 4.4.4.

Regarding the quantification of the difference between certified products and reference products, several possibilities were mentioned. A rather time consuming and costly possibility (though delivering the most accurate and detailed results) is to conduct a comparative Life-Cycle Assessment (LCA) of both ecolabelled and reference products. Another, less demanding approach is to base the comparison mainly on the level of the requirements level that have to be met by ecolabelled products on the one side and an "average" benchmark product on the other side. Data on the environmental performance of typical labelled product could also be asked for from the licence holders themselves. As information about average non-labelled products is difficult to be received, often mandatory legal requirements are taken as baseline.

The resulting difference between ecolabelled and reference products can then be multiplied by the number of ecolabelled products.

4.4.7 Other aspects

4.4.7.1 Most successful product groups

The most successful products groups that have been named can be grouped in only few areas:

- Information and communication technology (ICT): e.g. portables, router, routing switches, displays/monitors, computers and notebooks, multifunctional devices, toner cartridges, projectors, headsets, including paper products;
- Construction / Building sector (commercial level): cement, paints, construction blocks, construction chemicals, cleaning chemicals / cleaning products insulation, glass, tiles, indoor air quality solutions, furniture, panel boards, flooring, etc.
- passenger cars
- Private consumption: personal care products, paints & varnishes, paper products, furniture

Most schemes judge the "success" of the product groups based on the number of licences / certified products per product group. One scheme judges the success on the basis of the market share and total quantity of certified products.

The success of these products/product groups was traced back to several reasons:

- Green public procurement (GPP) as incentive (especially products in the ICT and the construction/building sector)

- Direct connection with other certification systems that target the private procurement sector (e.g. Green Star system in Australia)
- Historical reasons (green building industry in Australia; some product groups have requirements already for long time…)
- Health related advantages for users (mainly consumer products like personal care products, paints & varnishes, furniture, also detergents on the commercial level)
- Direct economic incentives: in case of passenger cars (Taiwan) manufacturers or importers have to pay a recycling fee. If the car has the ecolabel the fee is reduced.

In general, the interest of manufacturers to apply for an ecolabel is mostly driven by the demand of their customers (either public or private (commercial) purchasers or private consumers). There are also cases where the ecolabel suits well to the corporate strategy. Direct economic incentives obviously are a strong driver for manufacturers to apply for an ecolabel.

4.4.7.2 Further information

It was generally noted that the evaluation of the environmental benefit needs to be cost-effective as most labelling schemes do not have the resources (time and money) for elaborated assessments.

4.4.8 Conclusions

4.4.8.1 Harmonizing and reporting on key indicators

Currently there are partly significant differences in counting the number of products or licences.

Theoretically, the harmonization of the definition of certain indicators would be possible. However, the schemes would require substantial resources and time to adapt their systems to a common definition. This effort of harmonization of indicators seems very high, compared to the information value of the comparison as, for example, the levels of the requirements between the ecolabels are very different. The result of pure "adding up" e.g. the number of certified products of all GEN members would not be very meaningful.

4.4.8.2 Collection of information on the market share

Currently information on the market share of ecolabelled products is collected on a regular basis by only two of the six surveyed ecolabelling schemes.

The most convenient and cost-effective methodology for estimating the market share of labelled products seems to be to ask licence holders for data (turnover or number of sold units) and calculate the market share with (national) statistical data.

4.4.8.3 Indirect benefits

A strong relation between ecolabelling schemes and other processes (e.g. other ecolabelling systems focusing on different markets, Green public procurement (GPP) or private sector rating systems) through mutual acknowledgement is important in two directions:

1. GPP or other private sector procurement systems that are strongly connected to and rely on the ecolabelling scheme would be or already are an important incentive for manufacturers to apply for the ecolabel.

2. A functioning ecolabelling scheme also facilitates GPP (or similar systems) as these systems can rely on the criteria developed within the labelling scheme.

Therefore, the following guiding questions could serve to investigate the relation between the ecolabelling scheme and the GPP or other systems:

- Is it possible, from a legal point of view, to use environmental criteria in public procurement?
- Is it mandatory to use environmental criteria in public procurement?
- Is there a direct interlinking between ecolabel and GPP? (i.e. are ecolabel criteria used as requirements for GPP on a regular basis?)
- Are there other (private sector) procurement programs that are connected to the ecolabelling scheme?

However, an exact quantification of the indirect benefits seems not possible. Only in countries/ regions, where, for instance, GPP is mandatory for the authorities, and direct linkages between ecolabels and GPP exist, it may be possible to quantify the indirect benefits of the ecolabels.

4.4.8.4 Recognition and trust among consumers

The awareness level and stated relevance for purchasing decisions are indicators that seem to be surveyed rather easily. However, they do not give much information about the performance or the real environmental benefits of the ecolabelling scheme.

4.4.8.5 Calculating the environmental benefits

As outlined in section 4.4.6, information on the absolute number of ecolabelled products sold or on their market share and on the difference in environmental impact between certified products and non-certified ('reference') products is required to calculate the environmental benefits.

As for the market share, obviously, time and financial resources for the collection of market data differ greatly depending on the information source: whether information has to be declared by licence holders or if market data has to be purchased from market research organizations. Finally, also the experience makes a difference: setting-up a system for data collection and processing and gaining experience is more time-consuming than calculating the benefits, when, for instance, a (semi)-automated calculation system is already in place.

Regarding the information on the number of products sold/market share a convenient and cost-effective methodology seems to be to ask licence holders for data (turnover or number of sold units) and calculate the market share with (national) statistical data (see also section 4.4.4 and 4.4.8.2).

The effort for calculating the environmental impact of products depends on the level of detail of applied approaches, such as LCA. Conducting a full-scale LCA needs much more time than extracting information from available literature or performing calculations for a selected part of the product life-cycle (e.g. use-phase for many energy-relevant products). Although not absolutely accurate, calculation of differences between the products complying with the ecolabelling criteria and average products just complying with legal requirements can be performed using easy-to implement and low-cost approaches. Thereby, only few skills with respect to the interpretation of data from available LCA studies, the identification of hotspots in

the product life-cycle and the consequent calculation of the environmental benefits, are required.

Regarding the difference in environmental impact between certified products and non-certified ('reference') products, there are different methodological approaches possible:

- A robust and high-quality (fully ISO 14040 conform) LCA project for an average product may consume between 30 and 40 full working days for skilled LCA experts. Additionally, there might be further costs for software, data or external experts / reviewers.
- On the other side, it is possible to quantify an approximate difference between labelled and reference products by simplifying various aspects of an LCA, e g. by taking into account only the differences regarding the ecolabelling criteria (threshold value of the ecolabelling vs. legal requirements), by focusing in case of energy using products on the use phase, by focusing on only few environmental impact categories, instead of a full set of different ones, by relying on a few LCA data sets (e.g. for basic and recurring processes like country-specific electricity generation or paper production, depending on the products in focus) and/ or by identifying key indicators that may influence the environmental performance of products (e.g. product life-span, use-time etc.). Thus, the difference can be quantified in approximately **1 to 5 days per product group** (depending on its complexity).

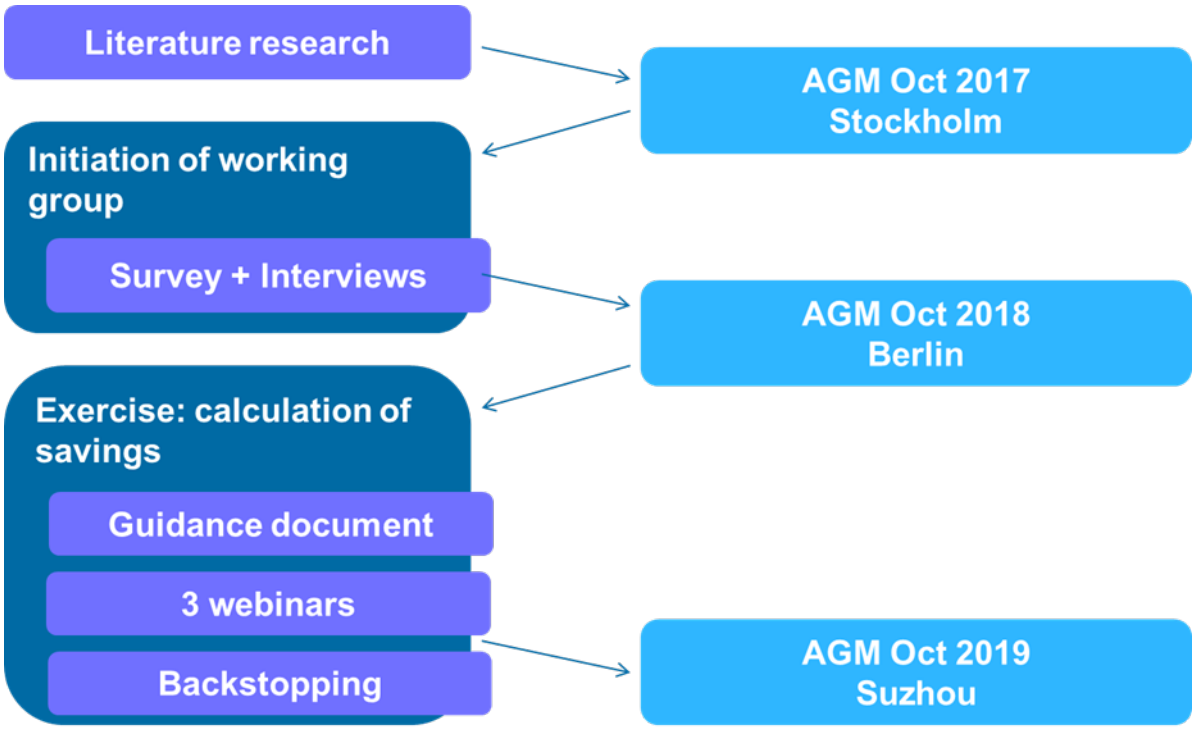
By multiplying the resulting difference between ecolabelled and reference products and the number of ecolabelled products, the environmental benefit of ecolabelled products compared to conventional ones can be calculated with a relatively less effort.

4.5 Pilot exercise on measuring the performance of ecolabels

At the annual GEN meeting in Berlin in October 2018, Öko-Institut proposed to support interested ecolabelling schemes in quantifying the environmental benefit of the three most successful products. The core of this exercise was the working group that was initiated in 2017 in Stockholm after the Annual GEN Meeting (please refer to chapter 2 for details). The working group consisted of eight ecolabelling schemes: Environmental Choice New Zealand, GreenPro India, Green Mark Taiwan, Green Label Thailand, Blue Angel Germany, Vitality Leaf Russia, Good Environmental Choice Australia and the China Environmental Labelling.

The main elements of the exercise are shown below in Figure 4).

Figure 4: Graphical description of the process on measuring the performance of ecolabels



Source: Öko-Institut

The fundament of conducting the calculations of environmental relief potentials of ecolabelled products was the methodological guidance document developed by the Öko-Institut (see annex A for the English version and annex B for the German version). The guidance document was designed primarily for the practitioners in ecolabelling institutions and considered their limitations in terms of financial and personnel resources. Thus, the guidance document sought to help the ecolabelling practitioners to understand and interpret existing Life-Cycle Assessment studies, collect few, but important primary data and calculate environmental savings through ecolabelled products.

The work of the ecolabelling schemes consisted of following four main steps, which are also described in detail in the methodological guidance document (see annex A for the English version and annex B for the German version):

1. Identification of the most successful product groups: each ecolabelling schemes selected three product groups that they considered as "most successful". Selection criteria were e.g. "High number of licence holders or certified products", "High environmental impact" or rather pragmatic reasons like "Data on the number of sold products available" or "Licence holders open for cooperation". Figure 5 shows the products that have been chosen by the participating ecolabelling schemes.
2. Calculation of the environmental savings per product: in a simplified multi-criteria life-cycle approach the environmental savings of ecolabelled products, compared to a conventional (reference) product were calculated on a per-product basis.
3. Determination of the number of sold units of ecolabelled products: depending on the availability of data there were several options to investigate the number of sold units. Most received direct data from the licence holders, however partly the number had to be calculated from the turnover which is collected to calculate the licence fees.

4. Calculation of overall environmental savings per product group: with the environmental savings per product and the number of sold units of ecolabelled products in a certain period the overall savings could be calculated.

Figure 5: Product groups selected for measuring the performance of ecolabels

Institution	Product Group 1	Product Group 2	Product Group 3
Green Label, Thailand	Tissue Paper	LED	Cars
Environmental Choice New Zealand	Paint	Toilet Paper	Detergents
GreenPro, India	Ready Mix Concrete	Cement	AAC blocks
Green Mark, Taiwan	Dual Flush Water-Saving Toilets	Light Motor Vehicles	Sanitary Paper
Blue Angel, Germany	Detergents and Cleaners	Printed matter	Rubbish dustbin, Garbage can
Vitality Leaf, Russia	Paint	PVC Floor Covering	Household Detergents
China Environmental Labelling	Water-based painting	Cement	Printer-based MFD

Source: Öko-Institut

Results were presented by four ecolabelling schemes at the annual GEN meeting in October 2019 in Suzhou, China. The results were discussed with other GEN members and their feedback was considered for the revision of the methodological guidance document.

Moreover, an evaluation was conducted to learn about the lessons learned and difficulties faced by the ecolabelling schemes during the exercise. The exercise showed that even with limited financial and personnel resources, it is possible to calculate the environmental savings through ecolabelled products. According to the feedback of the participating ecolabelling schemes, the exercise as well as the use of the methodological guidance provided several practical insights for the assessment of environmental impacts and savings of products. The ecolabelling schemes not only gained methodological experience for calculating the environmental benefits of their schemes, but also realized the importance of formulating quantifiable and measurable ecolabel criteria.

The exercise stimulated the exchange between the ecolabelling schemes within GEN. The ecolabelling schemes discussed their approaches, difficulties and results not only during the webinars, but also bilaterally, when for instance, they were working on similar product groups. This exchange and interaction were mentioned to have provided fresh perspectives and were found to be a valuable resource for further work within GEN.

Finally, the results of the environmental benefit analysis itself were impressive. Ecolabelling schemes mentioned that they intend to use the results for internal as well as external communication. This step was found to be necessary to demonstrate the benefits of the ecolabelled products and raise awareness among policy-makers, companies and consumers. Some examples of the estimated benefits are summarized below:

- Savings of 21,000 tonnes of CO_2 emissions annually can be attributed to the sale of ECNZ licenced toilet paper in New Zealand.

- Over 5 million litres of paint and about 332 tons of VOC content have been saved through the sale of paints with vitality leaf in Russia in 2018.
- Almost 10 TWh of electricity was saved in 2018 in China through the sale and use of printer-based multifunctional devices certified by the China Environmental Labelling.
- GreenPro labelled cement and concrete result in a reduction of almost 8 million tonnes of greenhouse gas emissions annually

Major difficulties mentioned by the ecolabelling schemes were related to finding data for reference products as well as for identifying & modelling most important environmental impact categories for certain product groups. For instance, it was mentioned that it was very difficult to get data on the CO_2 emission factor of titanium dioxide manufacturing and titanium dioxide content in reference products. Another challenge was mentioned to be the difficulty in dealing with the ecolabel requirements without numeric limits. For some ecolabelling schemes, the exercise was still costly and time consuming as they had to hire an external expert for the data collection and calculations.

The framework and external support provided by this project (e.g. methodological guidance document, organised exchange platforms, technical backstopping etc.) certainly helped in trouble-shooting and overcoming difficulties. In the absence of such a supporting framework, it might be more difficult for the ecolabelling schemes, especially those who were not part of the core working group, to carry out the measurements efficiently.

5 Discussion

In globalized markets, success and effectiveness of ecolabels as a voluntary environmental instrument depend to a large extent on their uptake by national and international companies. Thus, a strong positioning of ecolabels in global markets is indispensable. In this regard, ecolabels are required to send a clear signal to the private sector on their efforts to develop a joint approach for addressing common environmental challenges.

The main objective of this project was to strengthen the use and cooperation of type-I ecolabels worldwide. Thus, two main challenges facing ecolabels worldwide were identified, with the aim to support the ecolabels within the Global Ecolabelling Network (GEN) in developing and applying a common approach for addressing the challenges.

5.1 Integrating sustainability issues of raw materials supply chains in ecolabelling schemes

The first main challenge dealt with the integration of sustainability issues of raw material supply chains in ecolabelling schemes. The analysis showed that some ecolabelling schemes have started using criteria that aim at a reduction of primary raw material demand (e.g. use of secondary raw materials, recyclability, durability etc.). This is also the case for requirements related to supply chain due diligence according to the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-affected and High-risk Areas. However, raw material related ecolabel criteria continue to remain in the niche segment and are limited to only few ecolabelling schemes. Furthermore, it must be emphasized that supply chain due diligence, as described in the related OECD guidance, only covers issues on conflict financing and human rights violations. Environmental issues and other social aspects (e.g. health & safety in mining, development aspects) are not necessarily addressed by corporate due diligence efforts.

This project succeeded in creating a general awareness and need to integrate the principles of supply chain due diligence of raw materials in the ecolabel criteria. Thereby, Öko-Institut recommended to apply the due diligence concept not only for the so-called ‘conflict minerals’, but also for other relevant raw materials that have a high relevance for a defined product group. But unfortunately, willingness of the ecolabelling schemes to go a step further and discuss or implement the proposed criteria within their programmes continued to be low. The reason lies in the fact that the ecolabelling schemes find it hard to translate the process-based due diligence approach into measurable and verifiable ecolabel criteria. Moreover, ecolabelling schemes seem to get overwhelmed by the challenge of dealing with a large number of raw materials used in the products. As a result, there is a general skepticism with respect to the possibilities of verifying the compliance in a reliable manner.

On the other hand, supply chain due diligence is increasingly becoming an integral part of the corporate policy of many international brands. There are several international initiatives that are already dealing with this issue. While the focus of the due diligence efforts has been on addressing conflict financing and human rights violations, the concept can also be extended to be applied for severe environmental issues. In order to reduce the complexity of the due diligence concept for the ecolabelling schemes for environmental issues and build upon the ongoing processes in the industry, Öko-Institut proposed an innovative approach to prioritize the selection of and focus only on most relevant raw materials for specific product groups. Additionally, as companies do not yet perceive voluntary ecolabelling schemes as strong incentives for implementing a full-scale supply chain due diligence, Öko-Institut suggested to

initially focus on two core elements of due diligence schemes to derive environmental due diligence criteria that can either be used individually or in combination:

- Require producers to conduct a risk assessment with extended scope (step 2 of the supply chain due diligence process) for key raw materials of a product group (e.g. tantalum, cobalt and palladium for notebooks). Thus, ecolabelling criteria would require producers to systematically assess environmental risks in their supply chains which is expectedly a first important step for corporate mitigation measures.
- Require producers to support in-region initiatives that have a scope beyond conflict-financing and human rights.

Additionally, it was recommended that producers implement supply chain due diligence for most relevant raw materials according to the OECD due diligence guidance for responsible supply chains of minerals from conflict-affected and high-risk areas. This requirement should be verified by the producers by providing a weblink to the published corporate due diligence report that shall not be older than 2 years and covers all 5 steps of the OECD Due Diligence framework.

Such an approach would reduce the risk that companies are incapable or unwilling to implement related ecolabelled criteria. In general, it is expected that the impact of ecolabels in this field will increase only if many more ecolabelling schemes take up the concept of due diligence in their criteria. Few GEN members, such as the TCO Development and Blue Angel, are already doing a pioneering work in this regard and can be taken as good examples for knowledge dissemination.

5.2 Measuring the performance of ecolabels

In the second main topic on measuring the performance of ecolabels, it was shown that continuous technical & methodological support of the ecolabelling schemes over a longer time-period is a key for overcoming the inherent inhibitions related to dealing with complex problems. Moreover, it was demonstrated that a complex, methodological challenge can be addressed even by ecolabelling schemes with limited financial and personnel resources, if they are provided with some capacity building on methodological and technical aspects. Overall, cost and effort of implementing the pilot on measuring the environmental performance of ecolabels were low. The reason was the optimal use of internal and external resources in achieving the results. Theoretically, Öko-Institut, as an external technical expert organization, could have calculated the environmental savings on behalf of the ecolabelling schemes. Disadvantages of such an approach would have been high costs and continuous dependence of ecolabelling schemes on external support. Thus, Öko-Institut provided only some basic training and capacity building to the ecolabelling schemes, while most of the work on data collection, model calculations and interpretation of results was done by the ecolabelling schemes themselves. A long-term effect of this division of labour is the establishment of know-how and competencies within the ecolabelling schemes for handling this task more independently in the future.

However, there are some aspects that need to be considered when dealing with the performance measurement of ecolabels in the future. Expert knowledge and experience in conducting Life-Cycle Assessments (LCA) as well as access to (commercial) data bases and LCA-software are still very crucial when it comes to conducting calculations pertaining to environmental impacts and savings. Moreover, interpretation of a vast amount of LCA-data is not trivial and requires deep technical understanding of product systems. Therefore, even though ecolabelling institutions gained some first-hand experience with the calculations, they will not be able to substitute the vast LCA expertise generally required. The pilot exercise only helped in taking a first step in

calculating the environmental savings through ecolabelled products based on existing LCA studies. The exercise did not aim to establish comprehensive LCA expertise within the ecolabelling institutions. Therefore, it is advisable that ecolabelling institutions continue to consult LCA experts during the process of performance measurement. For instance, it will still be difficult for the ecolabelling schemes to judge the effectiveness of alternative modelling approaches, in case data and information required for the main environmental impact categories are not available. A good example in this regard could be the use of the Global Warming Potential (GWP) for modelling and communicating the results. Generally, GWP is the most commonly used impact category, but may not be sufficient on its own to adequately address overall environmental impacts. Here, it may be more appropriate to calculate the Cumulative Energy Demand (CED) too as it would represent the overall energy efficiency of the process. As low GWP values can also be generated by the increased use of renewable energies or in worst-cases by the use of nuclear power, there is a risk of neglecting the importance of implementing energy efficient processes if GWP is used as a stand-alone impact category. Hence, it has to be emphasized that the pilot exercise and the methodological guidance document were created primarily for the practitioners in eco-labelling institutions while considering their limitations in terms of financial and personnel resources. Therefore, the overall approach was very pragmatic and did not aim to establish comprehensive LCA expertise within the ecolabelling institutions.

Another important aspect that needs special mention is external communication of the calculation results to the public or decision-makers. Again, especially as a simplified approach is chosen, the results of the calculations may have to be dealt with carefully. This could be the case, if the communication of environmental benefits of an ecolabelled product against a reference product reveals any kind of sensitive information of a single company. In such cases, it is advised to mention specifically that calculations of environmental benefits are done only for average products and are not company or product-specific. Also, there might not be many LCA studies that were conducted specifically for ecolabelled and their corresponding reference products that can be used for the own calculations. Therefore, it is important to highlight in the external communication that the calculated environmental benefits are only reflecting a trend, are based on several assumptions of the ecolabelling scheme and are not specific to an exact product of a certain company (see chapter A.4.1 in annex A or chapter B.4.1 in annex B for more details on principles of external communication).

6 Recommendations and Outlook

As for the topic of raw material supply chains covered in this project, it is recommended to

- support GEN in spreading awareness on and developing concrete measures for mainstreaming the principles of due diligence of raw materials in ecolabels.

TCO Development and the Blue Angel could take the lead of such a working group as they have been working with the due diligence related criteria for some years now. As the issue of raw material consumption can also be dealt with criteria on durability, reuse, repair and recyclability, it is also recommended to:

- support GEN in spreading awareness on and developing concrete measures for integrating and mainstreaming the circular economy principles in ecolabels.

The success of the pilot exercise on performance measurement of ecolabels was to a great extent due to the initiative and high motivation of the participating ecolabelling schemes. Thereby, the framework given through the project and the external support (e.g. guidance document, backstopping, facilitation etc.) contributed to the successful accomplishment of the exercise. The workshop at the Annual GEN meeting in Suzhou in October 2019 clearly demonstrated the enormous interest among the ecolabelling schemes in continuing with the process. Therefore, it is recommended to:

- support the outreach of the pilot exercise to more GEN members and/ or more product groups

Furthermore, an important aspect could be to assign a responsible person (or a group) within GEN who drives the issue of performance measurement forward, for instance, by implementing a permanent exchange platform on this topic. The exchange platform could be in an online-format with up-to-date information on who is currently working on which product groups, presentations or reports on finalized assessments or other information material (e.g. the guidance document). This platform could be supported by organizing a regular session for the reporting of new results at the Annual GEN meetings. This would keep the topic alive and would facilitate direct exchange between members.

The project has shown that ecolabelling schemes worldwide face several common challenges. Thus, a joint and reconciled approach for addressing these challenges is not only efficient in terms of financial resources, but also increases the possibilities of triggering positive environmental impacts substantially. Furthermore, a joint effort of ecolabel schemes gives a clear message to the industry that ecolabels are increasingly addressing the global markets.

Thus, at a general level, it is recommended to:

- continue supporting the ecolabel schemes in their endeavor to developing and implementing common approaches for common environmental challenges.

In this regard, technical support in the development of award criteria and mutual recognition agreements between the ecolabels continue to be necessary in the future. Precisely, it is recommended to:

- support GEN in developing joint environmental requirements for one or two relevant key sectors.

For the selection of sectors, it is recommended to

- conduct an assessment of the overall and relative environmental impacts associated with consumption and production of goods and services in selected countries.

This approach would help in identifying focus sectoral areas for ecolabels and possible interventions at the level of criteria development. The advantage of such an approach would be to address the specific environmental impacts of an economy without necessarily having to go through a complete harmonization of criteria between various ecolabels. More importantly, it will help in contextualizing individual ecolabels in a much better way at the level of environmental impacts while leaving the freedom to develop criteria that are better suited for local conditions.

The selection of sectors can also be done on the basis of innovative and environmentally relevant product groups of the Blue Angel. Building on the experiences with the UBA-project on the international harmonization and dialogue on air-conditioners, it is recommended to

- cover one or more of the following product groups in the working groups within GEN: data centres, retail stores, textile products and reusable cup systems.

7 List of References

Amnesty International (ed.) (2016): "This is what we die for", Human rights abuses in the Democratic Republic of the Congo power the global trade in cobalt. London, 2016. Online available at https://www.amnesty.org/download/Documents/AFR6231832016ENGLISH.PDF, last accessed on 18 Feb 2016.

Blacksmith Institute & Green Cross Switzerland (ed.) (2013): The world's worst 2013: The top ten toxic threats, Cleanup, progress, and ongoing challenges. New York & Zürich, 2013. Online available at http://www.worstpolluted.org/docs/TopTenThreats2013.pdf, last accessed on 26 Feb 2016.

BMUB - Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (ed.) (2015): Umweltbewusstsein in Deutschland 2014, Ergebnisse einer repräsentativen Bevölkerungsumfrage, 2015. Online available at https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/umweltbewusstsein_in_deutschland_2014.pdf, last accessed on 31 Jan 2020.

Buchert, M.; Manhart, A.; Bleher, D.; Pingel, D. (2012): Recycling critical raw materials from waste electronic equipment. Oeko-Institut e.V. Darmstadt, 2012. Online available at http://www.oeko.de/oekodoc/1375/2012-010-en.pdf, last accessed on 20 Jan 2016.

Cadman, J.; Dolley, P. (2004): The direct and indirect benefits of the European Ecolabel. AEA Technology. DG Environment EU Commission (ed.), 2004. Online available at http://ec.europa.eu/environment/ecolabel/about_ecolabel/reports/benefitsfinalreport_1104.pdf.

CCCMC (2015): Chinese Due Diligence Guidelines for Responsible Mineral Supply Chains. Chinese Chamber of Commerce of Metals, Minerals & Chemicals Importers & Exporters. Beijing, 2015. Online available at http://www.cccmc.org.cn/docs/2016-05/20160503161408153738.pdf, last accessed on 25 Jul 2017.

Dehoust, G.; Auberger, A.; Dolega, P.; Manhart, A.; Priester, M.; Rechlin, A.; Rüttiger, L.; Scholl, C.; Vogt, R. (forthcominga): ÖkoRess II - Further development of policy options for an environmental raw materials policy. Umweltbundesamt (ed.), forthcoming.

Dehoust, G.; Manhart, A.; Dolega, P.; Vogt, R.; Kemper, C.; Auberger, A.; Becker, F.; Scholl, C.; Rechlin, A.; Priester, M. (forthcomingb): Environmental Criticality of Raw Materials – An assessment of environmental hazard potentials of raw materials from mining and recommendations for an ecological raw material policy, forthcoming.

Dehoust, G.; Manhart, A.; Vogt, R.; Kämper, C.; Giegrich, J.; Augberger, A.; Priester, M.; Dolega, P. (2017): Discussion of the environmental limits of primary raw material extraction and developments of a method for assessing the environmental availability of raw materials to further develop the criticality concept (ÖkoRess I), Summary. Umweltbundesamt (ed.). Dessau, 2017. Online available at https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2017-09-28_texte_87-2017_oekoress_summary_2.pdf, last accessed on 9 Feb 2018.

DG Environment EU Commission (ed.) (2016): Revised approach to report statistical information for EU Ecolabel products and services. e-mail, September 2016.

Doherty, B.; Blum, P.; Zihlmann, O. (5 Nov 2017): The inside story of Glencore's hiden dealings in DRC. In: *The Guardian*, 5 Nov 2017. Online available at https://www.theguardian.com/business/2017/nov/05/the-inside-story-of-glencore-hidden-dealings-in-drc, last accessed on 28 Feb 2018.

Dolega, P.; Degreif, S.; Buchert, M.; Schüler, D. (2016): Outlining Environmental Challenges in the Non-Fuel Mining Sector, STRADE Policy Brief No. 04/2016. Darmstadt, 2016. Online available at http://stradeproject.eu/fileadmin/user_upload/pdf/PolicyBrief_04-2016_Sep2016_FINAL.pdf, last accessed on 23 Dec 2016.

Edelen, A.; Ingwersen, W. (2016): Guidance on data quality assessment for life cycle inventory data. National Risk Management Research Laboratory, U.S. Environmental Protection Agency (ed.). Cincinnati, Ohio, 2016. Online available at https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=321834, last accessed on 31 Jan 2020.

EU Commission (2005): Evaluation of EMAS and Eco-label for their Revision. Report 1: Options and recommendations for the revision process. Part B: The EU Eco-label. European Commission, 2005.

EU Commission (2014): Report on critical raw materials for the EU, Report of the Ad hoc Working Group on defining critical raw materials, 2014.

EU Commission (2017): REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the review of implementation of Regulation (EC)No 122/2009 of the European Parliament and of the Council on 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) and the Regulation (EC) No 66/2010 of the parliament and of the Council of 25 November 2009 on the EU Ecolabel, Brussels, 30.6.2017, COM(2017) 355 final. EU Commission. EU Commission (ed.). Brussels, 30 Jun 2017. Online available at http://ec.europa.eu/environment/ecolabel/documents/Report_from_the_Commission.pdf.

European Commission (ed.) (2016): COMMISSION DECISION (EU) 2016/ 1371 - of 10 August 2016 - establishing the ecological criteria for the award of the EU Ecolabel for personal, notebook and tablet computers - (notified under document C(2016) 5010), 2016.

European Parliament and Council (ed.) (2009): Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast) (Official Journal of the European Union), 2009. Online available at https://eur-lex.europa.eu/legal-content/DE/TXT/?qid=1551880162813&uri=CELEX:32009L0125, last accessed on 31 Jan 2020.

Evans, L.; Nuttall, C.; Gandy, S.; Irlado, F.; Barberio, M.; Paglialunga, A.; Gasbarro, F.; Nucci, B. (2017): Project to support the evaluation of the implementation of the EU Ecolabel Regulation, Syntheses Report. Ricardo Energy & Environment; IEFE Bocconi University. European Commission (ed.). Brussels, 2017. Online available at https://publications.europa.eu/en/publication-detail/-/publication/67ba4716-5499-11e7-a5ca-01aa75ed71a1/language-en/format-PDF/source-31294743.

Frondel, M.; Grösche, P.; Huchtermann, D.; Oberheitmann, A.; Peters, J.; Vance, C.; Angerer, G.; Sartorius, C.; Buchholz, P.; Röhling, S.; Wagner, M. (2006): Trends der Angebots- und Nachfragesituation bei mineralischen Rohstoffen. RWI Essen, Fraunhofer ISI, BGR, 2006. Online available at http://www.bgr.bund.de/DE/Themen/Min_rohstoffe/Downloads/angebots-nachfragesituation-mineral-rohstoffe-endber2006.pdf?__blob=publicationFile&v=2, last accessed on 7 Apr 2017.

Graedel, T. E.; Barr, R.; Chandler, C.; Chase, T.; Choi, J.; Christofferson, L.; Friedlander, E.; Henly, C.: Jun, C.; Nassar, N. T.; Schechner, D.; Warren, S.; Yang, M.; Zhu, C. (2012): Methodology of Metal Criticality Determination. In: *Environmental Science & Technology* 46 (2), pp. 1063–1070.

Graedel, T. E.; Harper, E. M.; Nassar, N. T.; Nuss, P.; Reck, B. K. (2015): Criticality of metals and metalloids. In: *Proc Natl Acad Sci USA* 112 (14), pp. 4257–4262. DOI: 10.1073/pnas.1500415112.

Gröger, J.; Quack, D.; Gattermann, M.; Grießhammer, R. (2013): Top 100 – Umweltzeichen für klimarelevante Produkte. Oeko-Institut e.V. Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (ed.). Berlin, 2013.

Haig, S.; Morrish, L.; Morton, R.; Wilkinson, S. (2012): Electrical product material composition. WRAP (ed.), 2012. Online available at http://www.wrap.org.uk/sites/files/wrap/Electrical%20product%20material%20composition%20overview.pdf, last accessed on 6 Feb 2017.

Harvey, J. (2017): Metal recyclers prepare for electric car revolution, 2017. Online available at https://www.reuters.com/article/us-batteries-recycling-analysis/metal-recyclers-prepare-for-electric-car-revolution-idUSKBN1DH1DS, last accessed on 11 Jan 2018.

Hodge, R. A. (2011): Mining and Sustainability. In: Society for Mining, Metallurgy, and Exploration (ed.): SME Mining Engineering Handbook. Third Edition, pp. 1665–1688.

Horne, R. (2007): The roles of PELS for sound Life Cycle management pf Product Environmental impacts. Centre for Design, RMIT. Melbourne, 2007.

IEEE (ed.) (2017): Draft Standard for Environmental and Social Responsibility Assessment of Computers and Displays, P1680.1/D36, December 2017, 2017.

ISO - Internationale Organisation für Normung (ed.) (2006): ISO 14040:2006, Environmental management — Life cycle assessment — Principles and framework, 2006.

ISO - Internationale Organisation für Normung (ed.) (2009): ISO 14040:2009-11, Umweltmanagement - Ökobilanz - Grundsätze und Rahmenbedingungen, 2009.

ISO - Internationale Organisation für Normung (ed.) (2018): ISO 14044:2018, Environmental management - Life cycle assessment - Requirements and guidelines (+ Amd 1:2017), 2018.

Korteland, M. (2007): Eco-labelling: to be or not to be? Desirability of eco-labels from an environmental and poverty perspective (Publication number: 07.7479.17). CE Delft (ed.). Delft, the Netherlands, 2007.

Lovik, A. N.; Wäger, P.; Chanson, C.; Huisman, J.; Söderman, M. L.; Brechu, M. G.; Haarman, A.; Habib, H.; Mählitz, P.; Rösslein, M.; Ueberschaar, M. (n.d.): Report on consolidation of data into CRM database: Deliverable 2.5, Report of the H2020 ProSUM project, n.d.. Online available at http://www.prosumproject.eu/sites/default/files/170601%20ProSUM%20Deliverable%202.5%20Report%20FINAL.pdf, last accessed on 6 Feb 2018.

Manhart, A.; Blepp, M.; Fischer, C.; Graulich, K.; Prakash, S.; Priess, R.; Schleicher, T.; Tür, M. (2016): Resource Efficiency in the ICT Sector. Freiburg, 2016.

Manhart, A.; Gandenberger, C.; Bodenheimer, M.; Rüttiger, L.; Griestop, L. (2015): Ungewollte Verschiebungseffekte durch Standards und Zertifizierungen - Relevanz und Lösungsansätze für den Bereich der abiotischen Rohstoffe, 2015. Online available at https://www.umweltbundesamt.de/sites/default/files/medien/378/dokumente/rohpolress_kurzanalyse_5_verschiebungseffekte_07102015_final-ig.pdf, last accessed on 31 Jul 2017.

Manhart, A.; Grießhammer, R. (2006): Social impacts of the production of notebook PCs. Oeko-Institut e.V. Freiburg, 2006. Online available at http://www.prosa.org/fileadmin/user_upload/pdf/notebooksurvey_final_engl.pdf, last accessed on 24 Apr 2018.

Manhart, A.; Schleicher, T. (2013): Conflict minerals - An evaluation of the Dodd-Frank Act and other resource-related measures. Oeko-Institut e.V. Freiburg, 2013. Online available at http://www.oeko.de/oekodoc/1809/2013-483-en.pdf, last accessed on 26 Feb 2016.

Ministry of Environmental Protection (2014): Evaluation report of environmental performance of China environmental labelling on products (in Chinese). Department of science, technology and standards, Ministry of Environmental Protection (ed.), 2014.

Möller, M.; Baron, Y.; Manhart, A.; Moch, K.; Köhler, A.; Prakash, S.; Prieß, R. (2015): Background report for the development of an EMAS Sectoral Reference Document on Best Environmental Management Practice for the Electrical and Electronic Equipment manufacturing sector, Preparatory findings supporting the development of an EMAS Sectoral Reference Document. Freiburg, 2015. Online available at https://susproc.jrc.ec.europa.eu/activities/emas/documents/BEMP_EEE_BACKGROUND_REPORT_FINAL_April-2015.pdf, last accessed on 31 Jan 2020.

Moon, S. (2011): Korean Green Consumption and Production Policy for Transition into a Green Economy. Korean Environmental Industry & technology Institute (KEITI). Presentation (ed.), 2011. Online available at Presentation available at: http://www.neaspec.org/sites/default/files/Promotion%20Policy%20.

Mudd, G. M.; Jowitt, S. M. (2018): Global Resource Assessments of Primary Metals, An Optimistic Reality Check. In: *Nat Resour Res* 27 (2), pp. 229–240. DOI: 10.1007/s11053-017-9349-0.

National Research Council of the National Academies (ed.) (2008): Minerals, Critical Minerals, and the U.S. Economy. Washington D.C., 2008.

Nordic Ecolabelling (ed.) (2013): Nordic Ecolabelling of Computers, Version 7.4, 23 October 2013 - 30 June 2020, 2013.

Nuss, P.; Eckelman, M. J. (2014): Life Cycle Assessment of Metals: A Scientific Synthesis. In: *PLoS ONE* 9 (7), e101298. DOI: 10.1371/journal.pone.0101298.

OECD (ed.) (2012): OECD due diligence guidance for responsible supply chains of minerals from conflict-affected and high-risk areas. Paris, 2012. Online available at http://www.oecd.org/corporate/mne/GuidanceEdition2.pdf, last accessed on 29 Feb 2016.

OECD (ed.) (2015): Critical minerals today and in 2030: an analysis of OECD countries, Environment Working Paper No. 91. Paris, 2015. Online available at http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/11/OECD_minerals_paper_Coulomb_et_al.pdf, last accessed on 11 Apr 2017.

Pact (ed.) (2010): PROMINES Study, Artisanal Mining in the Democratic Republic of Congo, 2010. Online available at http://congomines.org/system/attachments/assets/000/000/349/original/PACT-2010-ProminesStudyArtisanalMiningDRC.pdf?1430928581, last accessed on 18 Feb 2016.

Prakash, S. (2012): Oeko-Institut verleiht Flügel Ein „Blauer Engel“ für Computer und Bildschirme, Hintergrundpapier des Öko - Instituts : grüne IT. Oeko-Institut. Freiburg, 2012. Online available at https://www.oeko.de/uploads/oeko/oekodoc/1495/2012-064-de.pdf.

Prakash, S.; Antony, F.; Graulich, K.; Köhler, A.; Liu, R. (2016a): Ökologische und ökonomische Aspekte beim Vergleich von Arbeitsplatzcomputern für den Einsatz in Behörden unter Einbeziehung des Nutzerverhaltens. In collaboration with Schlösser, A.; Proske, M.; Schischke, K.; Stobbe, L. and Zedel, H., 2016.

Prakash, S.; Dehoust, G.; Gsell, M.; Schleicher, T. (2016b): Einfluss der Nutzungsdauer von Produkten auf ihre Umweltwirkung: Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen „Obsoleszenz“. Umweltbundesamt (ed.), 2016. Online available at https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_11_2016_einfluss_der_nutzungsdauer_von_produkten_obsoleszenz.pdf, last accessed on 31 Jan 2020.

Priester, M.; Dolega, P. (2015): Bergbauliche Reststoffe - Teilbericht ÖkoRess. Berlin, 2015. Online available at http://www.umweltbundesamt.de/sites/default/files/medien/378/dokumente/bergbauliche_reststoffe_final_151106.pdf, last accessed on 19 Jan 2016.

RAL gGmbH (ed.) (2017): Basic Criteria for Award of the Environmental Label - Computers and Keyboards, RAL-UZ 78, Edition of January 2017, Version 1.0, 2017.

Ross, M. L. (2013): The Politics of the Resource Curse: a review, 2013. Online available at https://www.sscnet.ucla.edu/polisci/faculty/ross/papers/working/Ross%20-%20Politics%20of%20the%20resource%20curse.pdf, last accessed on 3 Aug 2016.

Rubik, F.; Scheer, D.; Iraldo, F. (2008): Eco-labelling and product development: potentials and experiences (Vol. 6, Nos. 3/4, Pages 393–419). Int. J. Product Development, 2008.

Sander, K.; Schilling, S.; Marscheider-Weidemann, F.; Wilts, H.; Gries, H. von; Hobohm, J. (2012): Abfallwirtschaftliche Produktverantwortung unter Ressourcenschutzaspekten, Meilensteinbericht August 2012, 2012. Online available at http://www.oekopol.de/archiv/material/603_RePro_Meilensteinbericht_1.pdf, last accessed on 6 Feb 2018.

Steinemann, M.; Schwegler, R.; Spescha, G. (2017): Grüne Produkte in Deutschland 2017, Marktbeobachtungen für die Umweltpolitik. In collaboration with Bilharz, M. INFRAS. Umweltbundesamt (ed.), 2017. Online available at https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/171206_uba_fb_gruneprodukte_bf_low.pdf, last accessed on 31 Jan 2020.

Stobbe, L. (2007): EuP Preparatory Studies “Imaging Equipment” (Lot 4). Final Report on Task 5 “Definition of Base Cases”. Fraunhofer IZM and PE Europe (ed.). Berlin, 2007.

TCO Development AB (ed.) (2019): TCO Certified, Generation 8, for notebooks, 2019.

The World Resource Institute; Big Room Inc (2010): 2010 Global Ecolabel Monitor. Big Room Inc; The World Resource Institute. Washington D.C., USA, 2010.

Thidell, Å.; Leire, C.; Lindhqvist, T. (2015a): The Nordic Swan 2015 – Performance indicators for ecolabelling (ISBN 978-92-893-4071-7). Nordic Council of Ministers 2015 (ed.). Denmark, 2015a.

Thidell, Å.; Leire, C.; Lindhqvist, T. (2015b): Indicators for Ecolabelling : Opportunities for GEN Members to demonstrate and benchmark advancements in performance and effects, Report prepared for the Global Ecolabelling Network (GEN) (ISBN: 978-91-87357-16-9). Lund University. The International Institute for Industrial Environmental Economic and Global Ecolabelling Network (ed.), 2015b.

TrendForce (2017): TrendForce Reports a 0.7% YoY Growth beyond Expectation for 2017 Notebook Shipments; Apple Exceeded ASUS to Rank No. 4. Online available at https://press.trendforce.com/press/20171115-3020.html, last updated on 15 Nov 2017, last accessed on 5 Feb 2018.

Tsurukawa, N.; Prakash, S.; Manhart, A. (2011): Social impacts of artisanal cobalt mining in Katanga, Democratic Republic of Congo. Oeko-Institut e.V. Freiburg, 2011. Online available at http://www.oeko.de/oekodoc/1294/2011-419-en.pdf, last accessed on 18 Feb 2016.

U.S. Geological Survey (ed.) (2015): Mineral Commodity Summaries 2015. Reston, 2015. Online available at http://minerals.usgs.gov/minerals/pubs/mcs/2015/mcs2015.pdf, last accessed on 27 Jan 2016.

UN (2002): Final report of the Panel of Experts on the Illegal Exploitation of Natural Resources and Other Forms of Wealth of the Democratic Republic of the Congo., United Nations Security Council Document S/2002/1146. New York, 2002.

UN (2003): Final report of the Panel of Experts on the Illegal Exploitation of Natural Resources and Other Forms of Wealth of the Democratic Republic of the Congo., United Nations Security Council Document S/2003/1027. New York, 2003.

UN Group of Experts on the Democratic Republic of the Congo (2015): Final report of the Group of Experts on the Democratic Republic of the Congo, UN Security Council document S/2015/19. New York, 2015. Online available at http://www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/s_2015_19.pdf, last accessed on 30 Oct 2015.

UNGoG (2010): Final report of the Group of Experts on the Democratic Republic of the Congo., United Nations Security Council Document S/2010/596. (United Nations Security Council Document S/2010/596.). New York, 2010.

USGS (2018): Mineral Commodity Summaries 2018. Reston, 2018. Online available at https://minerals.usgs.gov/minerals/pubs/mcs/2018/mcs2018.pdf, last accessed on 6 Feb 2018.

Whigham, N. (20 Nov 2017): Apple exec on making a completely green iPhone and tackling child labour concerns in supply chain. In: *news.com.au*, 20 Nov 2017. Online available at https://www.news.com.au/technology/gadgets/apple-exec-on-making-a-completely-green-iphone-and-tackling-child-labour-concerns-in-supply-chain/news-story/f6de8b8f40fdb2956df67868cf2e81ca, last accessed on 23 Jul 2018.

A Measuring the environmental performance of ecolabels - A guidance document for the type-I ecolabelling schemes

A.1 Background and goal of the guidance document

This guidance document has been developed by the Öko-Institut within the framework of the project "Methodological challenges for eco-labels in the Global Ecolabelling Network – Evaluation and traceability of critical raw materials and determination of quantitative environmental relief potentials" (Project no. 3717373160), commissioned by the German Environment Agency (UBA).

The main aim of the guidance document is to support participating ecolabelling institutions in getting first-hand experience and knowledge required for measuring the performance of their type-I eco-labels.

In the process leading to the guidance document, Öko-Institut conducted an analysis on the possible approaches, indicators and challenges related to the measurement of the performance of type-I ecolabels. Moreover, between March and July 2018, Öko-Institut carried out a survey and subsequently conducted interviews with representatives of selected ecolabelling schemes that also participated in the survey for the purpose of gaining information on the status quo of the performance measurement within the ecolabelling institutions. The results and conclusions of the survey were presented at the annual Global Ecolabelling Network (GEN) meeting in Berlin in October 2018.

One of the conclusions of the survey was that the calculation of the environmental savings/benefits through ecolabelled products could be a promising approach for measuring the performance of ecolabels. The calculation of these benefits can be conducted with a simplified approach of assessing the environmental benefits per product and multiply this directly with the number of sold products or with information on the market share of the ecolabelled products.

At the annual GEN meeting in October 2018, Öko-Institut offered to support the ecolabelling institutions in their endeavour to measure the performance of their type-I ecolabels. Therefore, it was proposed that Öko-Institut supports each ecolabelling scheme that indicated its interest to participate in the exercise to quantify the environmental benefits of its three most successful product groups.

The participating ecolabelling institutions were required to conduct the following steps in this process:

- Identify the three most important product groups of the ecolabelling scheme (see section A.4.2),
- Apply a simplified method to calculate the environmental savings per product of the chosen product groups (see section A.4.3),
- Investigate the market share and / or number of sold products of the chosen product groups in the geographical scope of the ecolabelling scheme (see section A.4.4),
- Calculate the environmental benefits of ecolabelled products in the selected product group (see section A.4.5).

Öko-Institut's support involved the development of the guidance document at hand as well as three training webinars to support the ecolabelling schemes in conducting this exercise. The webinars were held in April, June and September 2019. Results of the exercise were presented by the ecolabelling schemes during the annual GEN meeting in Suzhou, China, in October 2019. Finally, this guidance document was complemented and finalized on the basis of the discussion that took place during the GEN meeting in Suzhou.

It is noteworthy that in-depth calculations pertaining to environmental impacts and savings involve expert knowledge and experience in conducting Life-Cycle Assessments (LCA) as well as access to (commercial) data bases and LCA-software. Moreover, interpretation of a vast amount of LCA-data is not trivial and requires deep technical understanding of product systems. A consequence is a rather high time and resource effort to conduct in-depth environmental assessments, as also out-lined in section A.2. Hence, the guidance document is written primarily for the practitioners in eco-labelling institutions and considers their limitations in terms of financial and personnel resources.

Therefore, this guidance document is very pragmatic in its approach and seeks to help the eco-labelling practitioners to understand and interpret existing LCA studies and to take a first step in calculating the environmental savings through ecolabelled products. The guidance document does not aim to establish comprehensive LCA expertise within the ecolabelling institutions.

Examples are described in boxes with grey background.

A.2 Basic principles and terms of the assessment of the environmental impacts

Usually the systematic analysis and environmental assessment of products, technologies and services is conducted using the methodology of Life Cycle Assessment (LCA). The methodological framework of LCA is specified by international standards (ISO 2006; 2018). Sectorial standards facilitate the implementation of LCA for the specific needs of the respective sectors, such as ECMA-341 for the Information and Communication Technologies and Consumer Electronics.

As mentioned already in chapter A.1, conducting a full LCA requires vast specific competencies, know-how and access to databases, all of which are associated with costs. According to Möller et al. (2015, p. 246), the direct costs of an LCA can be separated into the following aspects:

- "costs of workforce (skilled staff is necessary to collect primary life cycle data and to undertake the data analysis and interpretation of results),
- costs of software licenses (license costs of € 5.000 to € 10.000 for full versions of commercial LCA software, free open source software is available as well),
- costs of secondary data sets (licence costs of € 2.000 to € 3.000 for commercial LCI[30] databases) (usually included in commercial LCA software),
- costs of external consultants (if any) and external reviewers (if any)".

Möller et al. (2015, p. 246) estimate that "at the upper end of the range, a robust and high-quality (fully ISO 14040 conform) LCA project for an average product may consume between 30 and 40 full working days for skilled LCA experts. As a rough estimate, the price range of

[30] Comment from the author: Life Cycle Inventory.

specialized LCA consultants ranges between € 13.000 (for a rough scoping study) and € 60.000 (for a comprehensive LCA project)".

Quite evidently, the method is far too complex and time consuming to be conducted on a full-scale basis for the vast diversity of product groups of ecolabels, which again consist of many subgroups or product types. According to Möller et al. (2015, p. 240), "there are numerous approaches and tools that help companies in overcoming the aforementioned difficulties of conducting a full-scale LCA. Practitioners can take advantage of simplified LCA screening tools and ready-made databases that mitigate the difficulties of full-scale LCAs". However, even the fast-track LCA methods for streamlined impact assessments of products, free LCA software and life cycle inventory databases may still overburden the capacities of ecolabelling schemes as experience related to an efficient and appropriate use of such tools is often lacking.

Thus, a more simplified approach on life-cycle thinking is required for the ecolabelling schemes in order to carry out the environmental benefits analysis without using any complex tool. **There are some general principles and terms though which are useful both for understanding and interpreting existing LCA studies and to be considered when quantifying the environmental savings through ecolabelled products.** These principles and terms are shortly described in the following sections (see also (ISO 2006) and (ISO 2018)).

A.2.1 Basic principles

Functional approach, functional unit

To calculate the environmental savings through ecolabelled products, the environmental impacts of ecolabelled products have to be compared to the impacts of so called "reference products" (see also section A.4.3).

The essential property of a product system[31] is characterized by its function and cannot be defined solely in terms of the final products. This means that it is important to ensure that the two alternatives fulfil the same function. To quantify the performance of a product or product system in an LCA, a functional unit is defined which is used as a reference unit. The primary purpose of a functional unit is to provide a reference to which the inputs and outputs of the investigated product system are related. The environmental impacts of two alternatives can only be compared when both fulfil the same functional unit.

For example, in case of lamps the function provided by a product is the brightness (measured in lumen). This means it is not possible to compare just two lamps that fit into the same luminaire but to first align the requested brightness. Depending on the type of lamp and its respective efficacy (in Watt/lumen) this results in a different power input necessary to provide this level of brightness through different types of lamps.

For example, in case of copy paper the functional unit could be expressed as per unit of reams. A ream of paper is a quantity of sheets of the same size and quality. International standards organisations define the ream as 500 identical sheets. This is also the typical sales unit.

[31] A product system is a collection of unit processes (smallest element considered in the life cycle inventory analysis for which input and output data are quantified) which models the life cycle of a product.

Life cycle approach

The environmental savings shall be analysed on a quantitative basis along the whole product life cycle. The life cycle of products or services consists of the consecutive and interlinked stages from raw material acquisition (or generation from natural resources) to final disposal (see Figure 6).

Figure 6: Life cycle stages of product systems

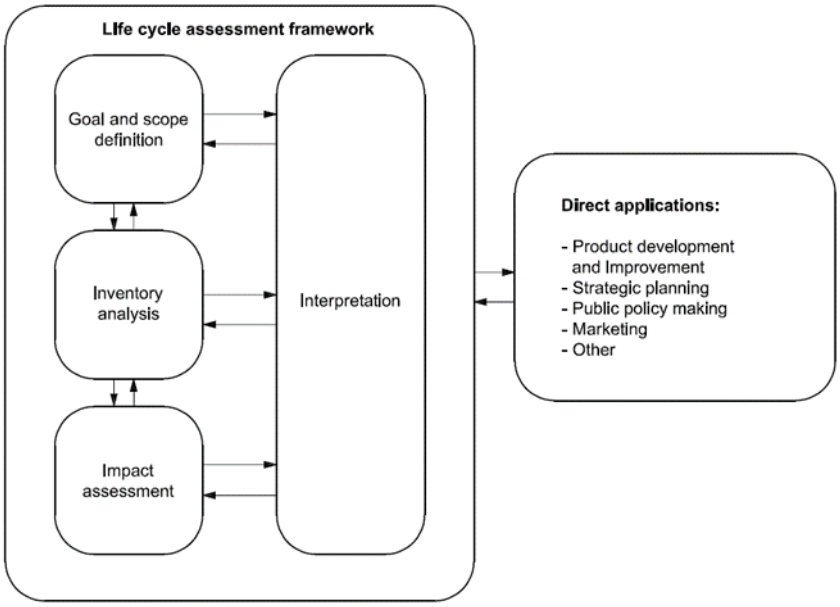
Source: Öko-Institut

In many cases it can be justified to simplify the calculations by concentrating on the most relevant life cycle stages, see further information in section A.4.3.

A.2.2 Terms

Figure 7 shows the general phases of an LCA according to the ISO standards. The following sections shortly outline the goal and main terms used in each of the phases.

Figure 7: Four phases of an LCA



Source: ISO 2009

Goal and scope definition

The goal of an LCA states the intended application, the reasons for carrying out the study, the intended audience, i.e. to whom the results of the study are intended to be communicated, and whether the results are intended to be used in comparative assertions intended to be disclosed to the public.

The definition of the scope includes for example the following items:

- Description of the product system(s) to be studied;

- Description of the functions of the product system(s) covered and definition of the functional unit;
- Definition of the system boundary, i.e. which processes are included in the analysis;
- Selection of impact categories and methodology of impact assessment;
- Data requirements and assumptions.

Life Cycle Inventory (LCI)

Life Cycle Inventory is the step of data collection of the LCA. In this step, all the inputs (e.g. raw materials, chemicals, energy etc.) and outputs (e.g. emissions to air, water etc.) of a product life cycle are analyzed. Depending on the product, this step can involve the collection of data for numerous processes (e.g. extraction and refining of raw materials, manufacturing of sub-components, assembly of final products, transportation etc.) with hundreds of substances.

Inputs and outputs: All product, material or energy flows that enter a product system are called inputs. All product, material or energy flows that leave a product system are called outputs. Products and materials include raw materials, intermediate products and co-products.

- Typical inputs are crude oil, iron ore, crops, electricity, natural gas, petrol, water etc.
- Typical outputs are emissions like CO_2, SO_x, NO_x, VOC, etc.

Life cycle impact assessment (LCIA)

In this step, the inventory results are used to understand environmental impacts. For instance, "global warming potential" as a result of the energy used for the production of high purity chemicals in electronics: through the use of energy, mainly fossil fuels, CO_2 and other substances are emitted that contribute to global warming (and other environmental impacts).

In the LCIA all inputs and outputs of a product system are usually assigned to impact categories. An impact category is a class representing environmental issues of concern. In order to receive a common impact category indicator, the inputs and outputs are converted by using a certain characterization factor.

For example, the impact category "global warming potential" (GWP) is measured in the unit "CO_2-equivalents". As methane has a much higher specific global warming potential than CO_2, methane emissions have to be multiplied by a certain factor (the characterization factor) to result in the global warming potential measured in CO_2-equivalents. For instance, the characterization factor for methane is 21 and that of N_2O is 310. Thus, the overall global warming potential resulting from different outputs can be given in one figure as CO_2 equivalents.

Key environmental impact categories are:

- Global Warming Potential (GWP)
- Ozone Depletion Potential (ODP)
- Human Toxicity – cancer effects
- Human Toxicity – non-cancer effects
- Ecotoxicity for aquatic fresh water

- Eutrophication Potential (terrestrial, freshwater, marine) (EP)
- Acidification Potential (AP)
- Resource Depletion (water)
- Resource Depletion (mineral, fossil)
- Photochemical Ozone Creation Potential (POCP)
- Land transformation
- Particulate Matter Formation Potential (PMFP)
- Ionizing Radiation

In many cases, it can be justified to simplify the calculations by concentrating on the most relevant impact categories, see further information in section A.3.

It has to be kept in mind that LCIA of two different studies are not always comparable because the methods to categorize and characterize the impacts may have been different. Furthermore, it is very important to understand the variables, such as system boundaries, functional unit and allocation procedures (e.g. allocation of impacts to products, by-products, etc.) appropriately before drawing conclusions on the results of LCIA. Sometimes sensitivity analyses are conducted to estimate the effects of choices made with regard to these variables.

Life cycle interpretation

During the interpretation, the findings from both the inventory analysis and the impact assessment are considered in order to draw conclusions, explain limitations and provide recommendations.

Embedded (or: embodied) emissions / impacts[32]

The environmental emissions or impacts caused by raw material acquisition, production and distribution are called the embedded (or: embodied) emissions or impacts, see Figure 8.

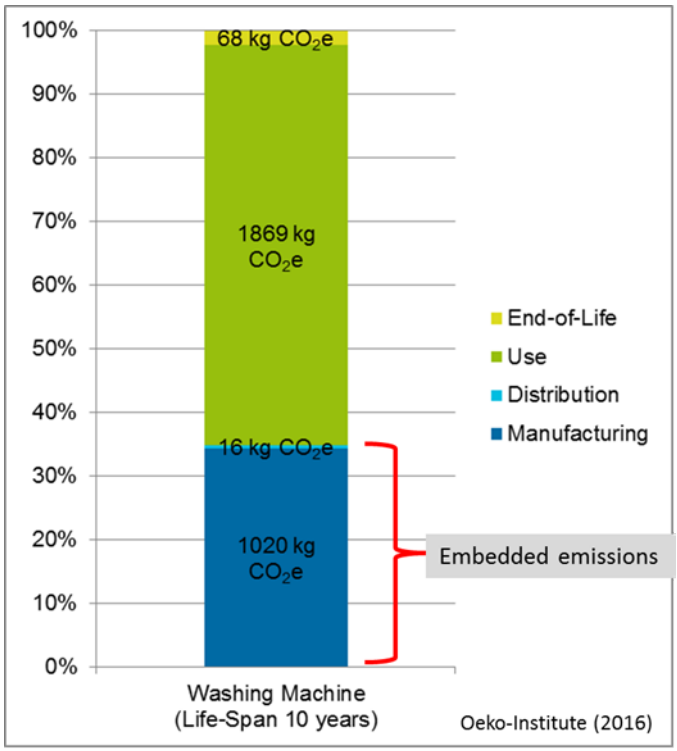
Figure 8: Life cycle stages covered by the embedded impacts

Source: Öko-Institut

Often existing data on the embedded emissions or impacts of certain input materials or parts can be used for the own analysis and calculations. Hence, it is not necessary to model these impacts from the scratch. Figure 9 shows the global warming potential of a washing machine and which parts of the overall impacts are called the “embedded emissions” of the appliance.

[32] The term “embedded” or “embodied” emissions or impacts is not directly related to conducting an LCA, as here the supply chain of the analysed product or product system is considered anyway (see section A.2.1 on the life cycle approach). The term is rather used in the context of the international discourse of greenhouse gas emission reduction, where the emissions are accounted for on the basis of the production location, i.e. the country that manufactures a certain product, and not on the basis of the place of consumption, i.e. the country where the consumption of this product takes place. If one country, for example, reduces its production capacity for a certain good, its greenhouse gas emissions will drop as well. In total, however, emissions might not decrease as the good might be produced somewhere else and then be imported. In this case, the emissions are “embedded” in the imports.

Figure 9: Global Warming Potential of a Washing Machine



Source: own figure derived from Prakash et al. (2016b)

Critical Review

A critical review is a process to verify whether the respective study has met the requirements for methodology, data, interpretation and reporting and whether it is consistent with the principles of LCA. A critical review enhances the credibility of LCA, for example by involving interested parties. Through the involvement of all interested parties it shall be excluded that only particular interests of certain parties are considered.

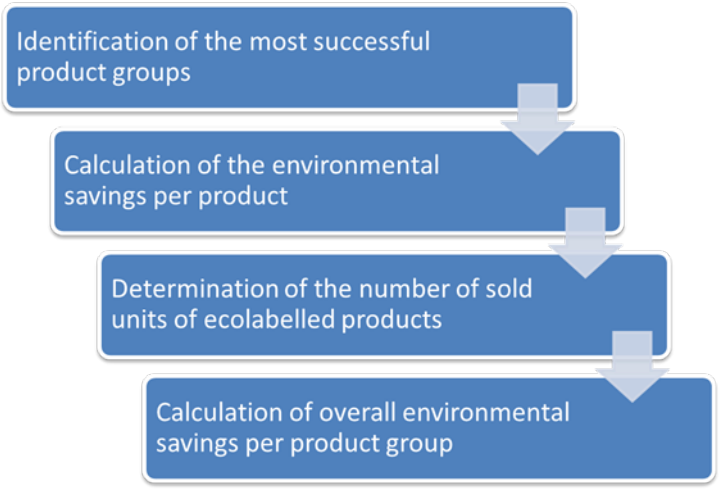
In case the LCA results shall support comparative assertions intended to be disclosed to the public a critical review is required. Depending on the goal and scope of the study there are different types of critical reviews (e.g. internal or external expert or review panel).

A.3 Overview of the proposed procedure

In the proposed exercise, the environmental benefit through ecolabelled products in the three most successful product groups shall be quantified in a simplified way by the participating ecolabelling schemes.

The following figure gives an overview of the proposed work steps.

Figure 10: Work steps for quantifying the benefits through ecolabelled products



Source: Öko-Institut

In order to quantify the environmental benefits, the three most successful product groups shall be identified in the first step (see section A.4.2). In the second step, the environmental impacts of the ecolabelled products shall be compared with the impacts of non-labelled, so called "reference" products. The quantification of the savings per product is described in more detail in section A.4.3. The calculated savings per product shall then be multiplied by the number of sold ecolabelled products (see section A.4.4 and A.4.5).

Section A.4.1 elaborates on some more general aspects that are important when quantifying the benefits.

A.4 The procedure in detail

A.4.1 General aspects

Target group and communication of the generated information

Before starting with the calculation, it is necessary to define the target group of the generated information. Generally, the calculation of the environmental benefits can be done for: (1) Internal communication, (2) External communication.

As for the internal communication, the results could be used to decide which product groups to focus on by the ecolabelling scheme. Moreover, the results could also be used to take a decision on the continuation or discontinuation of product groups, for instance, if a product group or its main environmental impacts are already well addressed by other political instruments. Furthermore, the results may also help in decision-making pertaining to the revision of the criteria, for instance, if the calculated savings are much lower than what could be expected regarding the performance of best-available products and technologies in the market.

As far as external communication is concerned, for instance to the public or decision-makers, the results of the calculations may have to be dealt with even more carefully. This could be the case, if the communication of environmental benefits of an ecolabelled product against a reference product reveals any kind of sensitive information of a single company. In such cases, it is advised to mention specifically that calculations of environmental benefits are done only for average products and are not company or product-specific. Additionally, it is also advised to use the

results of critically-reviewed LCA studies (see section A.2.2), if available, for the purpose of communicating the environmental benefits.

In reality, there might not be many LCA studies that were conducted specifically for ecolabelled and their corresponding reference products. Therefore, it is important to highlight in the external communication that the calculated environmental benefits are only reflecting a trend, are based on several assumptions of the ecolabelling scheme and are not specific to an exact product of a certain company.

In general, if the results shall be used for external communication, several relevant principles should be followed:

- **Be selective** and critical: Try to use data of as good quality as possible. For more information about data quality see section A.4.1.
- **Be sure**: Always perform an internal review or cross-check of your calculations and results, preferably through someone who is familiar with the methodology but not being involved in preparing the analysis to be checked (four-eyes principle). If possible, involve an LCA expert in doing a quality check of the calculations. Thus, possible mistakes, errors or weaknesses are likely to be revealed.
- **Be conservative**: To be on the safe side, the assumptions and specifications should be made in a conservative way, i.e. in favour of the non-ecolabelled product. By following such an approach, savings are rather underestimated and thus are more difficult to be questioned by other stakeholders.
- **Be transparent**: All assumptions and used data should be documented in a transparent way, for instance in a downloadable background document. Thus, the underlying data can be checked and understood by all interested parties. However, data should not be put in public domain if it leads to revealing any kind of sensitive company information. For instance, turnover as received from a licence holder for estimating the total number of sold ecolabelled products. In such cases, it is always safer to communicate with the respective company beforehand and get a "no-objection" certificate. Such a step might not be necessary for product groups that have a large number of license holders and if the data is published at a highly aggregated level.

Time period of the calculated savings

It has to be decided for which year the assessment shall be conducted as all information that is collected for the assessment shall refer to this time period. Usually one full year is chosen as time period. The year should be as close to the present as possible (i.e. the year 2018), however, data for the previous year usually is only available some months after the end of that year. It could therefore be necessary to choose the penultimate year (i.e. the year 2017).

In reality, not all relevant studies that are found will exactly refer to the chosen period of time. Whether the data can be used for the calculation of the environmental savings depends on its topicality, e.g. whether the covered technologies are still on the market. It is also possible that certain information can be used but not the final results as some data is not valid anymore; see also the following example.

For example, if a study on lamps is found that refers to another, earlier time period compared to the chosen one, assumptions regarding typical usage pattern might still be true as it can be

assumed that usage patterns do not change quickly. However, data on technological aspects (e.g. efficacy of certain types of lamps) might not be useful anymore as the technology has evolved. Information on the usage pattern can therefore be used for the own calculation whereas more up-to-date information on technological details has to be investigated through other means.

Data quality

It is important to use reliable data to receive credible results. The following aspects should be considered (see e.g. Edelen und Ingwersen (2016)):

- There are some generic characteristics that indicate a certain quality of the source, e.g. if a comprehensive LCA report is available, if there is a reference to the LCA-standards (ISO 14040 and 14044), if a critical-review was conducted, if the publication was peer-reviewed, if there is a comprehensive interpretation of the results or similar aspects.
- Source reliability: the source of the collected information should be reliable. The following sources can be considered as reliable sources of information: peer-reviewed journal articles, books, reputed websites (e.g. from national or regional authorities), government papers, conference papers or policy documents.
  Newspapers or private websites for example have a much lower degree of reliability. Information taken from such sources should therefore be used only in exceptional cases.
- Temporal correlation: the data should refer as close as possible to the time period chosen. See also section A.4.1.
- Geographic correlation: the collected information should refer to the geographical scope of the ecolabelling scheme. However, with regards to global supply chains and trade relations it might also be appropriate to use data from other regions or countries, i.e. the data should correspond to the assumed supply chain. This depends on the specific situation for the regarded product groups.

For example, if certain products are produced in China, for example, then the embedded impacts for production in China should be used, even if they are sold in Australia. It might also be possible to use information of another region and complement it with the own country-specific emission factors.

For example, if there is a study of country A with information on the electricity consumption of certain products, this information could be used by combining it with the country-specific emission factors of country B for electricity production.

- Technological correlation: the collected information should refer to the regarded product group or subgroup.

For example, in case of lamps it should be taken into account which types of lamps and lamp technology are covered by the study and if this correlates with the types and technologies covered by the own assessment.

A.4.2 Identification of the most successful product groups

There is no absolute definition what should be considered as "successful product group". This could be a product group with many license holders or many certified products. It could also be a product group with only few certified products that have a dominant market share and hence large environmental benefits. As information on the latter aspect is usually not available for all product groups covered by the ecolabelling schemes, it is proposed that the following criteria for the selection of the product groups are considered.

Possible criteria for selecting the most successful product groups are:

- High number of license holders in the product group,
- High number of certified products in the product group,
- High environmental impact of the product group,
- High significance of the product group for the public procurement,
- High consumer demand (B2C market),
- Small variety of sub-groups / product types in the product group,
- Data on the market share or the number of sold products available or easy to be gathered,
- Existing studies covering the environmental impacts of the product group available or known,
- Licence holders open for cooperation.

A.4.3 Calculation of environmental savings per product

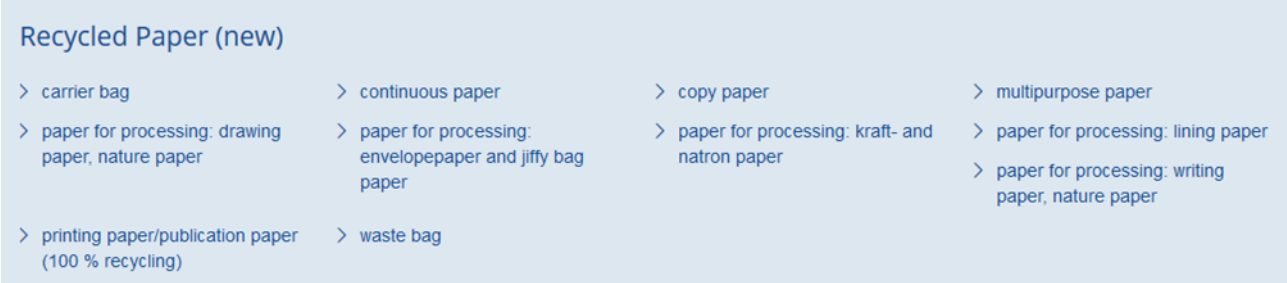
As outlined in section A.2, a full-scale life cycle assessment (LCA) of all products covered by an ecolabelling system (and its corresponding reference products) requires substantial resources. The following sections (section A.4.3), therefore, outline a simplified and pragmatic approach of the environmental assessment of the savings through ecolabelled products.

Selection of representative product type or subgroup

Each product group of an ecolabelling scheme usually consists of a variety of different product types.

For example, the product group "Recycled paper" of the German Blue Angel consists of 19 different subgroups, e.g. carrier bags, continuous paper, copy paper, multipurpose paper etc. (see Figure 11).

Figure 11: Subgroups of product group "recycled paper" of the Blue Angel



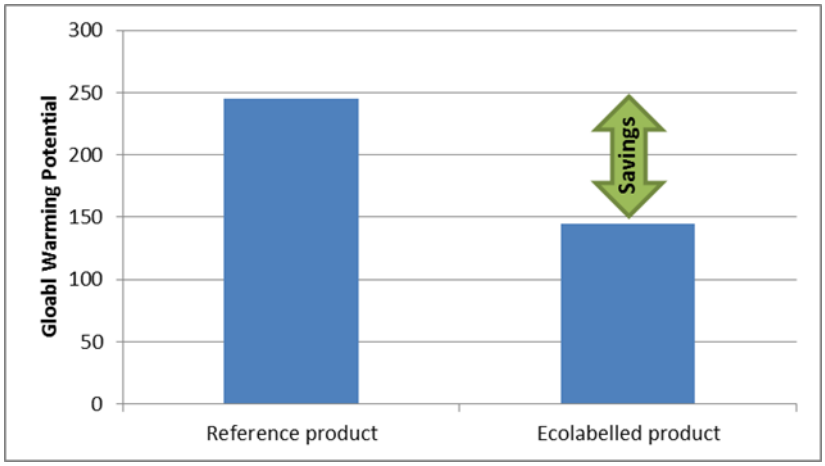
Source: Blauer Engel, https://www.blauer-engel.de/en/products/paper-printing (last visited at 10 March 2019)

It would be very complex and time consuming to gather data on all subgroups and calculate the respective environmental savings. To reduce the complexity one or several important or representative subgroups, representing a typical product, should be selected.

Definition of "ecolabel product" and "reference product"

To calculate the savings through ecolabelled products, it is necessary to define the properties of an ecolabelled as well as a reference (i.e. non-labelled) product. The benefits or savings is the difference between the impacts of the reference product and the ecolabelled product (see Figure 12).

Figure 12: Savings through ecolabelled products (with the example of global warming potential, GWP)



Source: Öko-Institut

Usually, a great variety of products exists in the market: in case of ecolabelled products, there might be products that just meet the criteria and others that are far better than the threshold values. In case of non-labelled products, the variety of products might be even higher. Nevertheless, two alternatives have to be defined that are representative of "ecolabelled" and "non-labelled" products.

One possibility to reduce the complexity of the real market is to assume that products with an ecolabel just meet the requirements.

For example, this is often the case for products regulated within the EU energy labelling framework (energy related products): usually products just meet the requirements necessary for a certain energy efficiency class. Products do not exceed the requirements unless another, better class can be reached. Then, these requirements are met but again not exceeded. This approach

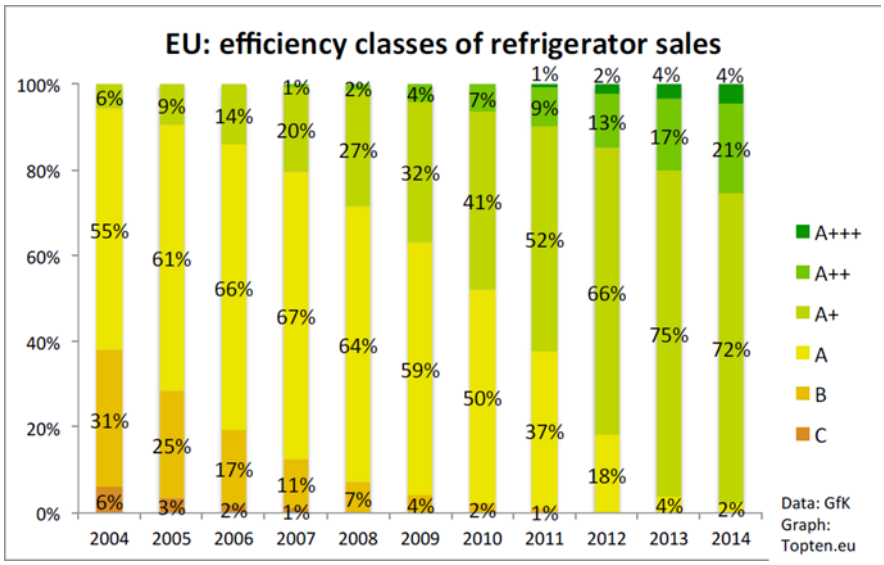
can also be considered as "conservative" as the benefits might also be higher, if the ecolabelled products are better than just meeting the threshold values.

Regarding the "reference" or "non-labelled" product, the situation is slightly more difficult and depends from product group to product group:

- One general possibility is to assume that non-labelled product groups just meet the legal requirements, e.g. the minimum requirements for electricity or fuel consumption.
- If there is a rating scheme in place, like the EU energy efficiency labelling, there might also be market data available which efficiency classes are the most important ones. Instead of the minimum requirements then the most populated class of the scheme could be taken as reference.

For example, the following figure shows the energy efficiency classes of the refrigerator sales in the European Union (EU). It can be seen that for the years 2013 and 2014 more than 70% of all sales belonged to energy efficiency class "A^{+}". Only 4% belonged to the best class "A^{+++}". In this case A^{+}-refrigerators could be chosen as conventional reference products.

Figure 13: EU efficiency classes of refrigerator sales



Source: Michel et al. (2016)

- In the preparatory studies for the European Ecodesign and energy labelling regulations usually a so called "base case" is defined representing the 'average' product at the time of preparation of the study. This can be used as conventional reference product.

For example in the EuP Preparatory Studies "Imaging Equipment" (Stobbe 2007) Base Case 3 is defined as a single function photocopier with a printing speed of 26 ipm (images per minute). The energy consumption of an average device with this specification is supposed to be 270 kWh per year, see the following figure.

Figure 14: Use phase assumptions of average single function photocopier with a printing speed of 26 ipm

Pos nr	USE PHASE Description		unit	Subtotals
211	Product Life in years	6	years	
	Electricity			
212	On-mode: Consumption per hour, cycle, setting, etc.	270	kWh	270
213	On-mode: No. Of hours, cycles, settings, etc. / year	1	#	
214	Standby-mode: Consumption per hour	0	kWh	0
215	Standby-mode: No. Of hours / year	0	#	
216	Off-mode: Consumption per hour	0	kWh	0
217	Off-mode: No. Of hours / year	0	#	
	TOTAL over Product Life	1,62	MWh (=000 kWh)	65

Source: Stobbe (2007)

- In case of "paper" products usually virgin paper is the basic reference alternative.

Selection of relevant life cycle stages

As outlined above, an LCA covers the whole life cycle of a product. In many cases, however, it can be justified to simplify the calculations by concentrating on the most important life cycle stages.

In case of energy-related products[33] usually the use phase is the most important life cycle stage (e.g. refrigerators, heat pumps etc.), even though there are energy-related products where the environmental impacts of the production are equally or even more important (e.g. computers, televisions, printers etc.).

In case of non-energy products (e.g. paper products), it is often sufficient to consider the "embedded" or the "cradle-to-gate" impacts as the environmental impacts during the use phase are often not that important or are rather assigned to other product groups.

For example, in case of copy paper, the impacts of the 'use phase' should rather be assigned to printers or multifunctional devices. However, there may be some exceptions, as for instance paints and varnishes that can cause health hazards to human beings during the emissions in the use-phase.

It can be assumed that the importance of the life cycle stages is known by the ecolabelling schemes as usually the criteria focus on such aspects and life cycle stages with high environmental relevance: e.g. the energy consumption during use phase, the resource consumption through the production or the emission of hazardous substances during use.

Two criteria should be taken into account when deciding which life cycle stages should be considered:

- The life cycle stage should have a high share at the overall environmental impacts, i.e. the contribution is (much) higher than that of other life cycle stages.
- There are relevant differences between ecolabelled products and non-labelled products in impacts of the life cycle stage.

[33] According to the European Commission an energy-related product is any energy-using product or energy-saving product "having an impact on energy consumption during use." European Parliament and Council (2009)

For example, in case of copy paper (non-energy product) it is usually sufficient to take the raw material acquisition and the production phase into account as these are the main cause of the environmental impacts. Regarding the distribution and use phase there is almost no difference between the alternatives (virgin and recycled paper), except in cases, where long-distance transportation of one of the alternatives may play a certain role.

In case of lamps (energy-related product), it is necessary to include the use phase in any case as the differences in efficacy cause differences in energy consumption during use. But the production phase is relevant in this case too, as lamp technologies have different durability. In case of lamp technologies with a high durability, fewer lamps have to be produced in the same period of time.

Selection of most important impact categories and indicators

In LCA, several impact categories can be selected and applied to quantify the impact of the regarded alternatives, e.g. global warming potential (GWP), acidification potential (AP), human toxicity, resource depletion, land use changes etc. (see also section A.2.2). Also, other indicators which are rather based on life cycle inventory data can be useful, e.g. amount of avoided virgin paper.

To reduce the complexity in the assessment at hand, it makes sense to focus on the most important impact categories and indicators. Which impact categories or indicators are important on the one hand depends on the regarded product group.

For example, the category 'ecotoxicity' is important for the assessment of detergents, however rather less important when considering refrigerators. The indicator "amount of avoided virgin paper" obviously only makes sense for paper products or multifunctional devices (printers, copiers), if the ecolabelled devices have duplex function and the conventional ones have none.

On the other hand, it also makes sense to select impact categories that are of general importance for the region covered by the ecolabel or worldwide. The climate crisis is surely one of the most important environmental challenges worldwide, therefore it is recommended to select the GWP in any case. In arid countries/regions, water scarcity might be a crucial issue and therefore a corresponding indicator might be chosen for all product groups.

To start with it is recommended to focus on the GWP as this is an indicator for which quantitative data is rather easy to be found. Depending on the regarded product group other indicators, not necessarily complex impact categories, might be chosen to illustrate the positive effects of ecolabelled products, e.g. the above-mentioned indicator on the amount of avoided virgin paper.

Specification of parameters for the use-phase

The intensity of usage of products can be based on average user behavior. Average user profiles in terms of usage time per day/ month/ year as well as average power and energy consumption for a wide range of energy-relevant equipment have been defined in the preparatory studies for the European Ecodesign and energy labelling regulations. Additionally, Energy Star specifications provide standardized user patterns for a wide-range of electrical and electronic appliances. Furthermore, Energy Star product database can be used to extract the energy consumption values for the certified products, if they are to be used as reference values. Thus, it is recommended to use the existing user profiles as they have been developed on the basis of a comprehensive market and consumer research and have been agreed upon with the industry. Of

course, if specific information on user profiles is available for a certain product group in your country, you can use it as reference. Make sure to communicate this underlying user pattern in a transparent manner.

In a study commissioned by the German Environment Agency (UBA), real measurements of the user behavior in a federal authority were conducted. The resultant user behavior for the notebook computers was developed as follows:

Table 14: User pattern – Notebooks in a federal authority in Germany

	Working days				Non-Working days
	Active (Hours)	Idle (Hours)	Sleep (Hours)	Off (Hours)	Off (Hours)
High use	3.5	2	2.5	14.0	24.0
Medium use	2.5	2	4.0	14.0	24.0
Limited use	1.5	2	5.5	14.0	24.0

Source: Prakash et al. (2016a)

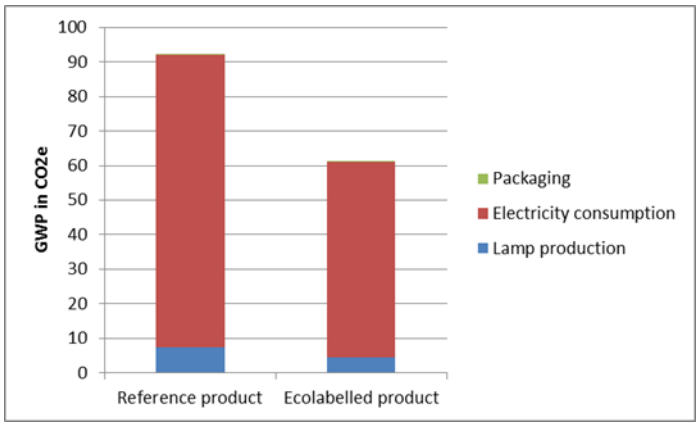
Quantification of the environmental impacts

After the previous steps, the environmental impacts of the ecolabelled and the reference products can be quantified. This means basically that the relevant environmental impacts in the relevant life cycle stages are added up for the two alternatives (ecolabelled vs. reference product of a selected representative product type).

For example, Figure 15Figure 15 shows the annual global warming potential (GWP) of the production and use of a conventional (reference product) and an ecolabelled product in the product groups “lamps”.

The largest contribution to the impacts is the electricity consumption during the use phase (red). The difference is caused by the different efficacy of halophosphor (reference product) versus triphosphor lamps. The production phase (blue) contributes to a much smaller extent and also the difference between the alternatives is smaller. The difference is caused by the different durability of the alternatives: the halophosphor lamp has a durability of approximately 8,000 hours whereas the triphosphor lamp one of 13,000 hours. With typical operating hours in the non-residential area (office) of 2,000 hours per year this means that the reference lamps have an average life span of 3.6 years whereas the triphosphor lamp on average lasts almost 5 years. This means that for the same period fewer triphosphor lamps would have to be produced compared to halophosphor lamps. The contribution of packaging is very small and could have been neglected.

Figure 15: Annual global warming potential "lamps" (example: T8 halophosphor versus triphosphor lamps)



Source: Öko-Institut

Sources of existing data

If no own LCA software or database is available, the impacts of products and processes have to be taken from existing assessments. The following subsections list some areas where existing data can be found.

Use of existing LCA or similar studies

Today LCA or similar studies that assess the environmental impacts of products, technologies and services exist. Also, background studies for the establishment of the criteria of ecolabels usually contain valuable information. For a streamlined approach, the information given in such studies can be used as input for own calculations. Examples of information that can be found in such studies are:

- Information on the importance of different life cycle stages,
- The impact of the production of the regarded product,
- The embedded impacts of input materials or relevant processes (e.g. country specific electricity generation)
- Information on the duration / life span of different types of products (e.g. compact fluorescent lamps vs. LEDs)
- Information on typical use parameters (e.g. typical daily usage of lamps, typical duration of different function modes of computers)
- Information on the energy consumption during the use-phase
- Etc.

Besides a general internet research, the following table gives some contexts where such studies can be found.

Table 15: Sources for existing LCA or similar studies

Type of information	Context	Source
Preparatory studies for energy-related products	In the context of the EU regulatory framework of Ecodesign or energy labelling for each product group to be regulated a preparatory study is conducted. The preparatory study all follow the same approach and have therefore a similar structure.	https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/energy-efficient-products_en
EU Ecolabel	Before criteria for the EU ecolabel are defined, background studies are conducted.	http://ec.europa.eu/environment/ecolabel/
'Case studies' (e.g. in Scientific Journals)	In the past, numerous LCA case studies on a wide variety of products and services have been published in scientific journals (increasingly open access) and/or by governmental organisations such as US EPA or the German Environment Agency (UBA)	e.g. Journal of Cleaner Production; International Journal of Life Cycle Assessment or https://www.epa.gov/, https://www.umweltbundesamt.de/
Green Public Procurement	The basic concept of GPP relies on having clear, verifiable, justifiable and ambitious environmental criteria for products and services, based on a life-cycle approach and scientific evidence base. The GPP criteria are based on data from an evidence base, on existing ecolabel criteria and on information collected from stakeholders of industry, civil society and Member States. The evidence base uses available scientific information and data, adopts a life-cycle approach and engages stakeholders who meet to discuss issues and develop consensus. The website links to background studies and projects on different product groups relevant for public procurement.	http://ec.europa.eu/environment/gpp/index_en.htm
Topten	Topten is a consumer-oriented online search tool, which presents the best appliances in various categories of products. It	http://www.topten.info/ and national websites, like China: https://www.top10.cn/?page=English Argentina: https://toptenargentina.org/ Chile: https://top-ten.cl/ France: https://www.guidetopten.fr/

Type of information	Context	Source
	is conducted by a network of national institutions that provide product lists. To derive the criteria usually background studies are conducted and available on the different national websites.	Norway: http://www.energismart.no/ Germany: https://www.ecotopten.de/ and more.

Source: own compilation

Use of existing LCA data sets

Usually, it is sufficient to have a few LCA data sets for recurring processes.

For instance, the country-specific electricity generation is important for most energy-related products. Furthermore, the impacts of the generation and use of petrol for vehicles or the production of paper or corrugated cardboard with different recycled content for various paper products or for packaging purposes are some key parameters.

Data on the impacts of such products and processes can either be found in existing studies (see previous section) or, if there is an access to an LCA database, the specific impact (e.g. per kg or per kWh) can be taken from there. Open access databases, as for example the database 'PROBAS' (available online via: http://www.probas.umweltbundesamt.de/php/index.php) are also available, but unfortunately still in limited number. Another source for possibly helpful LCA data might be found in the 'LCA 2 Go Tool' (http://www.lca2go.eu/tool.en.html) which has been developed in an EU research project of the same name and covers biobased-plastics, industrial machines, electronics, printed circuit boards, semiconductors, photovoltaic systems, sensors and smart textiles.

A.4.4 Determination of the number of sold units of ecolabelled products

The determination of the number of sold units of ecolabelled products is important to calculate the actual savings through ecolabelled products.

The *potential savings* are the savings on a per product basis or upscaled figures covering the whole market in a certain product group or subgroup. Thus, statements like "*If all conventional copy paper sold in Germany is replaced by copy paper labelled with the Blue Angel XYZ kg CO_2e could be saved*" can be valuable to show the potential of ecolabelled products and the importance of increasing their market share.

The *actual savings* through the replacement of conventional with ecolabelled products can only be calculated when the number of ecolabelled products which are actually sold is known. Then, the savings per product can be multiplied by this number to give the current savings. Instead of the number of units sold, the production quantity of a certain year may also be used.

There are several possibilities to determine the number of sold units of ecolabelled products:

- The most convenient and cost-effective alternative is to ask license holders for data. The following data is useful:
  - Number of sold units: it is most convenient if license holders provide direct information on the number of sold units (or: production quantity). Thus the data of the different

license holders just has to be summed up to give the overall number of sold units in a certain product group, see the following formula.

Total number of sold products $= \sum$ number of sold products (all licence holders)

- Turnover: if the license holders provide data on the turnover, they generate with their ecolabelled products (in a certain product group), this information can be converted into the number of sold products with the average price per unit. The average price per unit may be asked for from the license holder. If no such data is provided by the license holders, average prices can be investigated through desktop research (existing studies, sales portals, etc.). The following formulas show how the total number of sold products can be calculated.

(1) Number of sold products (licence holder) $= \frac{\text{turnover (licence holder)}}{\text{average price per unit}}$

(2) Total number of sold products $= \sum$ number of sold products (all licence holders)

- Market share: if the license holders provide data on the market share of their ecolabelled products (in a certain product group), this information can be converted into the number of sold products with information on the size of the whole market. Such data can be found in national production and trade statistics.

In Europe, for example, 'Prodcom' provides statistics on the production of manufactured goods[34]. The term comes from the French "PRODuction COMmunautaire" (Community Production) for mining, quarrying and manufacturing. The products are classified according to the NACE code, the classification of economic activities in the European Union (EU)[35] (NACE is derived from *Nomenclature statistique des activités économiques dans la Communauté européenne*).

The following formulas show how the total number of products can be calculated.

(1) Size of whole market (regarded country) $=$ Number of produced products $+$ number of imported products $-$ number of exported products

(2) Total number of sold products $=$ Size of whole market $*$ market share (licence holder)

(3) Total number of sold products $= \sum$ number of sold products (all licence holders)

If data is received by license holders, usually, strong confidentiality clauses in the contracts should be included, specifying how the collected data is used (e.g. reason for collection, use of data, date of deletion etc.). For example, the use of the information could be limited to the calculation of the environmental benefits of the ecolabel.

► Another possibility to gather market data is to buy this data from market research institutions. Depending on the type of data, it needs more time to collect the data as the information needed might be very specific and has to be collected by the research institution first. Furthermore, purchasing market data can be very costly.

[34] https://ec.europa.eu/eurostat/web/prodcom/overview

[35] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Statistical_classification_of_economic_activities_in_the_European_Community_(NACE)

A.4.5 Calculation of overall environmental savings per product group

The overall environmental savings per product group are finally calculated by multiplying the savings per product with the number of sold products in the regarded period of time:

$$\text{Total savings} = \text{Savings per product} * \text{Number of sold products (all licence holders)}$$

A.5 Participating ecolabelling schemes and time frame of the exercise

The following ecolabelling schemes have finally participated in the exercise:

- Thai Green Label, Thailand
- Green Mark, Taiwan
- Environmental Choice New Zealand
- Blauer Engel, Germany
- GreenPro, India
- China Environmental United Certification Center (CEC)
- Vitality Leaf / Ecological Union, Russia

Table 16 shows the schedule of the conducted exercise.

Table 16: Schedule of the exercise

Activity	Date	Comments
Preparation of the methodological guidance document by the Öko-Institut	March 2019	
1st Webinar on the training for "Measuring the Performance of Ecolabels"	April 2019	
Selection of three product groups by each participating institution	By 12 April 2019	Öko-Institut will support in identifying the product groups, if required
Participating institutions start to measure the performance of ecolabels using the methodological guidance document	April – June	Öko-Institut will support via e-mail, in case of major methodological issues
2nd Webinar on the training for "Measuring the Performance of Ecolabels", including exchange of experiences so far	June 2019	
Participating institutions finalise the measurement of the performance of ecolabels	June – September	Öko-Institut will support via e-mail, in case of major methodological issues
3rd Webinar on the results of the exercise + discussion on the presentation of results during AGM2019 in China	September 2019	
AGM 2019 – Workshop on "Measuring the Performance of Ecolabels"	October 2019	China

Source: own compilation

A.6 ANNEX: Recommended tools for calculating environmental savings

There are some existing tools for comparing the environmental impacts through several alternative product types. These tools were mostly established in the context of green or sustainable public procurement (GPP, SPP) and therefore not only contain the environmental assessment but also the analysis of the life cycle costs, i.e. the overall costs for the acquisition, use and disposal of products for a certain actor, here mostly the purchasing authority.

The following table lists

Table 17: Existing tools for comparing the environmental impacts of products and services

Name of the tool	Short description	Language	Source
Smart-SPP tool	The tool has been developed to help calculating the life cycle costs (LCC) and CO2e-emissions of different products and services to assist in procurement decision-making. Developed in 2011 by Öko-Institut and ICLEI within the SmartSPP project, supported by Intelligent Energy Europe	English	http://www.smart-spp.eu
UBA LCC tool	Excel-based tool to calculate the LCC and CO2e-emissions of different alternatives of the product groups: Computer, multifunctional devices, data centres, monitors, floor coverings, refrigerators and dishwashers. Developed by Öko-Institut for the German Federal Environmental Agency in 2015	German	https://www.umweltbundesamt.de/dokument/berechnungswerkzeug-fuer-lebenszykluskosten
LCC tool	Tool to calculate the life cycle costs and environmental impacts (impact categories: human health, ecosystem, resource availability, climate change using ReCiPe method (see http://www.lcia-recipe.net/)) for office IT equipment, indoor	English	http://ec.europa.eu/environment/gpp/pdf/09_06_2015/Life_cycle_costing_calculation_tool.pdf http://ec.europa.eu/environment/gpp/lcc.htm

Name of the tool	Short description	Language	Source
	lighting), white goods, vending machines, medical electrical equipment. Developed for the European Commission, finalization of tool planned for 2017		
Whole life costing + CO2-tool	Excel-based tool to calculate the total cost of a product from its purchase through to, and including, its end of life. This includes not only the traditional financial costs, but also the amount of CO2 emitted from that product during that time, and the financial cost of those emissions (to the organization directly, or society as a whole). It has been developed for procurement professionals by Forum for the Future in partnership with Fife Council (see http://www.forumforthefuture.org) in 2008/09.	English	Information can be received via the life cycle cost tool picker: https://www.koinno-bmwi.de/informationen/toolbox/detail/lebenszyklus-tool-picker-1/
LCCA Tool	Life Cycle Cost Assessment Tool covering to calculate the life cycle costs, the energy consumption and the CO2-emissions of products. Developed by ICLEI (Local Governments for Sustainability).	English	Information can be received via the life cycle cost tool picker: https://www.koinno-bmwi.de/informationen/toolbox/detail/lebenszyklus-tool-picker-1/

A.7 List of References

Edelen, A.; Ingwersen, W. (2016): Guidance on Data Quality Assessment for Life Cycle Inventory Data. National Risk Management Research Laboratory, U.S. Environmental Protection Agency (ed.). Cincinnati, Ohio, 2016. Online available at https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=321834.

European Parliament and Council (2009): Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast). In: Official Journal of the European Union (L 285), pp. 10–35. Online available at https://eur-

lex.europa.eu/legal-content/DE/TXT/?qid=1551880162813&uri=CELEX:32009L0125, last accessed on 6 Mar 2019.

ISO 14040:2009: Environmental management – Life cycle assessment – Principles and frame-work.

ISO 14044:2018: Environmental management – Life cycle assessment – Requirements and guide-lines (+ Amd 1:2017).

Michel, A.; Attali, S.; Bush, E. (2015): Energy efficiency of White Goods in Europe: monitoring the market with sales data, Changes and trends regarding energy efficiency, energy consumption, size and price in the markets of refrigerators, washing machines and tumble driers in the EU, France and Portugal, 2004 to 2014. Supported by ADEME and WWF. Topten International Ser-vices. Topten.eu (ed.). Zürich, 3 Jun 2015, last accessed on 15 Jul 2015.

Möller, M.; Baron, Y.; Manhart, A.; Moch, K.; Köhler, A. R.; Prakash S.; Prieß, R. (2015): Back-ground report for the development of an EMAS Sectoral Reference Document on Best Environmental Management Practice for the Electrical and Electronic Equipment manufacturing sec-tor., Preparatory findings supporting the development of an EMAS Sectoral Reference Document. Öko-Institut e.V. Freiburg, 2015.

Prakash, S.; Antony, F.; Dehoust, G.; Gensch, C.-O.; Graulich, K.; Gsell, M.; Köhler, A.; Schleicher, T.; Stamminger, R. (2016a): Einfluss der Nutzungsdauer von Produkten auf ihre Umwelt-wirkung: Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen „Obsoleszenz". Öko-Institut e.V. und Friedrich-Wilhelm-Universität Bonn im Auftrag des Umweltbundesamts (ed.). Dessau, 2016.

Prakash, S.; Antony, F.; Graulich, K.; Köhler, A. R.; Liu, R. (2016b): Ökologische und ökonomische Aspekte beim Vergleich von Arbeitsplatzcomputern für den Einsatz in Behörden unter Einbeziehung des Nutzerverhaltens. In collaboration with Schlösser, A.; Proske, M.; Schischke, K.; Stobbe, L. and Zedel, H., 2016.

Prakash, S.; Rüdenauer, I. (2018): Strengthening the international use of type-I eco-labels - Working Paper 2: Measuring the performance of ecolabels, Working Version September 2018. On behalf of the German Environment Agency. Öko-Institut e.V. Freiburg, 2018.

Stobbe, L. (2007): EuP Preparatory Studies “Imaging Equipment” (Lot 4), Final Report on Task 5 “Definition of Base Cases”. Fraunhofer IZM and PE Europe (ed.). Berlin, 12 Nov 2007, last accessed on 11 Mar 2019.

B Messung der Umweltleistung von Umweltzeichen - Ein Leitfaden für die Typ I-Umweltzeichensysteme

B.1 Hintergrund und Ziel des Leitfadens

Der vorliegende Leitfaden wurde vom Öko-Institut im Rahmen des vom Umweltbundesamt (UBA) beauftragten Projekts „Methodische Herausforderungen für Umweltzeichen im Global Ecolabelling Network – Bewertung und Rückverfolgbarkeit kritischer Rohstoffe und Bestimmung quantitativer Umweltentlastungspotenziale“ (Projektnr. 3717373160) erarbeitet.

Mit dem Leitfaden sollen Umweltzeichenprogramme bei der Messung der Umweltentlastungspotenziale ihrer Typ-I-Umweltzeichen unterstützt werden. Dabei sollten die Umweltzeicheninstitutionen Erfahrungen und Kenntnisse aus erster Hand sammeln, indem sie mit Hilfe fachlicher Begleitung lernen, die Messungen selber durchzuführen.

Vor der Ausarbeitung des Leitfadens analysierte das Öko-Institut mögliche Konzepte, Indikatoren und Herausforderungen im Zusammenhang mit der Messung der Umweltleistung von Typ-I-Umweltzeichen. Zudem führte das Öko-Institut zwischen März und Juli 2018 eine Umfrage sowie anschließend Interviews mit Vertretern ausgewählter Umweltzeichenprogramme durch, um so Informationen zum Status quo in diesen Institutionen zu erhalten. Die Ergebnisse und Erkenntnisse der Umfrage wurden im Oktober 2018 auf dem jährlichen Treffen des Global Ecolabelling Network (GEN) in Berlin vorgestellt.

Eine der Erkenntnisse der Vorarbeiten lautete, dass die Berechnung der Umweltentlastungen, die durch Produkte mit Umweltzeichen erreicht werden, ein vielversprechender Ansatz zur Messung der Leistung von Umweltzeichen sein könnte. Die Berechnung kann mit einem vereinfachten Ansatz erfolgen, bei dem die Umweltentlastungen zunächst pro Produkt bilanziert und anschließend mit der Zahl der verkauften Produkte bzw. mit deren Marktanteil multipliziert werden.

Auf dem jährlichen GEN-Treffen im Oktober 2018 bot das Öko-Institut an, die Umweltzeichenprogramme bei ihrem Bestreben zur Messung der Leistung ihrer Umweltzeichen zu unterstützen. Insbesondere sollten alle an einer Mitwirkung interessierten Umweltzeichenprogramme bei der Quantifizierung der Umweltvorteile ihrer drei erfolgreichsten Produktgruppen unterstützt werden.

Zur Messung der Umweltentlastungspotenziale sollten die teilnehmenden Institutionen folgende Schritte vornehmen, die in diesem Leitfaden genauer erläutert werden:

- Ermittlung der drei wichtigsten Produktgruppen des Umweltzeichenprogramms (siehe Abschnitt B.4.2)
- Anwendung einer vereinfachten Methode zur Berechnung der Umweltentlastungen pro Produkt der jeweils ausgewählten Produktgruppen (siehe Abschnitt B.4.3)
- Ermittlung des Marktanteils bzw. der Zahl der verkauften Produkte der jeweils ausgewählten Produktgruppen im geografischen Geltungsbereich des Umweltzeichenprogramms (siehe Abschnitt B.4.4)

- Berechnung der Umweltvorteile von Produkten mit Umweltzeichen in der jeweils ausgewählten Produktgruppe (siehe Abschnitt B.4.5)

Das Öko-Institut übernahm als Unterstützung die Ausarbeitung des vorliegenden Leitfadens sowie die Durchführung von drei Schulungswebinaren, um den teilnehmenden Umweltzeicheninstitutionen bei der Umsetzung dieser Aufgaben zu helfen. Die Webinare fanden im April, Juni und September 2019 statt. Im Oktober 2019 wurden die Ergebnisse dieser Übung von den teilnehmenden Umweltzeicheninstitutionen auf dem jährlichen GEN-Treffen in Suzhou, China vorgestellt. Schließlich wurde der vorliegende Leitfaden auf der Grundlage der auf dem GEN-Treffen in Suzhou geführten Diskussionen ergänzt und fertiggestellt.

Erwähnenswert ist, dass für die umfassenden Berechnungen zur Bestimmung der Umweltauswirkungen und -einsparungen Fachkenntnisse und Erfahrung bei der Erstellung von Ökobilanzen (Life Cycle Assessments, LCA) sowie Zugang zu (kommerziellen) Datenbanken und LCA-Software erforderlich sind. Zudem ist die Interpretation der enormen Menge an LCA-Daten keine einfache Aufgabe und erfordert weitreichende Fachkenntnisse im Bereich Produktsysteme. Infolgedessen ist die Durchführung umfassender Umweltbewertungen ein zeitlich aufwändiges Unterfangen, das viele Ressourcen bindet, wie auch in Abschnitt B.2 dargelegt wird. Der vorliegende Leitfaden wurde deshalb hauptsächlich für die Praktiker in den teilnehmenden Umweltzeicheninstitutionen geschrieben und berücksichtigt deren finanzielle und personaltechnische Einschränkungen.

Dementsprechend verfolgt der Leitfaden einen äußerst pragmatischen Ansatz und will den Praktikern in den Umweltzeicheninstitutionen beim Verstehen und Interpretieren vorhandener LCA-Studien helfen sowie ihnen bei der Berechnung der Umweltentlastungen, die Produkte mit Umweltzeichen bringen, behilflich sein. Mit dem Leitfaden sollten keine umfassenden LCA-Fachkenntnisse in den Umweltzeicheninstitutionen aufgebaut werden.

Beispiele werden in den grau hinterlegten Kästen beschrieben.

B.2 Prinzipien und Begriffe bei der Bewertung von Umweltauswirkungen

In der Regel erfolgen die systematische Analyse und Umweltbewertung von Produkten, Technologien und Dienstleistungen mithilfe der Ökobilanz-Methode (Life Cyle Assessment, LCA). Der
methodische Rahmen für die Ökobilanz wird in internationalen Normen (ISO 2006; 2018) vorgegeben. Sektorbezogene Normen regeln dabei die Erstellung der Ökobilanz gemäß den speziellen Bedürfnissen der jeweiligen Sektoren, beispielsweise die Norm ECMA-341 für den Bereich Informations- und Kommunikationstechnologien und Unterhaltungselektronik.

Wie bereits zuvor in Kapitel B.1 erwähnt, sind für die Durchführung einer vollständigen Ökobilanz viele spezielle Kompetenzen und Kenntnisse sowie der Zugang zu Datenbanken erforderlich – alles Anforderungen, die mit Kosten verbunden sind. Laut Möller et al. (2015, p. 246) können die unmittelbaren Kosten einer Ökobilanz wie folgt aufgeschlüsselt werden:

- „Personalkosten (für die Erfassung primärer Lebenszyklusdaten und die Vornahme der Datenanalyse und Interpretation der Ergebnisse werden qualifizierte Mitarbeiter benötigt)
- Kosten für Softwarelizenzen (Lizenzkosten von 5.000 € bis 10.000 € für Vollversionen kommerzieller LCA-Software, daneben ist auch kostenlose Open-Source-Software erhältlich)

- Kosten für sekundäre Daten (Lizenzkosten von 2.000 € bis 3.000 € für kommerzielle LCI[36]-Datenbanken) (in der Regel in der kommerziellen LCA-Software enthalten)
- Kosten für externe Berater (falls zutreffend) und externe Prüfer (falls zutreffend)“

Möller et al. (2015, p. 246) schätzen, dass „am oberen Ende des Spektrums ein belastbares und hochwertiges (vollständig ISO 14040-konformes) LCA-Projekt zwischen 30 und 40 volle Arbeitstage für qualifizierte LCA-Experten in Anspruch nehmen kann. Die Kosten für spezialisierte LCA-Berater bewegen sich grob geschätzt zwischen 13.000 € (für eine grobe Rahmenuntersuchung) und 60.000 € (für ein umfassendes LCA-Projekt).“

Es ist offensichtlich, dass diese Methode angesichts der Vielfalt an Produktgruppen mit Umweltzeichen, die wiederum aus vielen Untergruppen oder Produktarten bestehen, viel zu komplex und zeitaufwändig ist, um vollständig und umfassend angewendet werden zu können. Laut Möller et al. (2015, p. 240) aber „gibt es zahlreiche Ansätze und Instrumente, mit deren Hilfe Unternehmen die zuvor genannten Schwierigkeiten bei der Durchführung einer umfassenden Ökobilanz überwinden können. So können Praktiker vereinfachte Instrumente für Übersichtsökobilanzen und vorbereitete Datenbanken nutzen, mit welchen die Schwierigkeiten umfassender Ökobilanzen besser bewältigt werden können.“ Doch auch mit den schnellen LCA-Methoden für vereinfachte Wirkungsabschätzungen von Produkten, kostenloser LCA-Software und LCI-Datenbanken können Umweltzeichenprogramme immer noch überlastet sein, da häufig die Erfahrung im Zusammenhang mit einer effizienten und richtigen Nutzung dieser Instrumente fehlt.

Deshalb benötigen Umweltzeichenprogramme einen stärker vereinfachten Ansatz beim Lebenszykluskonzept, um so die Umweltvorteile ohne komplizierte Instrumente analysieren zu können. Gleichwohl gibt es einige allgemeine Prinzipien und Begriffe, die sowohl für das Verstehen als auch das Interpretieren vorhandener LCA-Studien nützlich sind und die berücksichtigt werden sollten, wenn die Umweltentlastungen, die durch Produkte mit Umweltzeichen erreicht werden, quantifiziert werden sollen. In den folgenden Abschnitten werden diese Prinzipien und Bedingungen kurz erläutert (siehe auch (ISO 2006) und (ISO 2018)).

B.2.1 Prinzipien

Funktionelle Einheit

Um die durch Produkte mit Umweltzeichen erzielten Umweltentlastungen berechnen zu können, müssen die Umweltauswirkungen der Produkte mit Umweltzeichen mit den Auswirkungen der sogenannten „Referenzprodukte“ verglichen werden (siehe auch Abschnitt B.4.3).

Die grundlegende Eigenschaft eines Produktsystems[37] wird durch dessen Funktion bestimmt und kann nicht ausschließlich über die Endprodukte definiert werden. Deshalb muss sichergestellt werden, dass die zwei Alternativen die gleiche Funktion erfüllen. Zur Quantifizierung der Leistung eines Produkts oder Produktsystems im Rahmen einer Ökobilanz wird eine funktionelle Einheit festgelegt, die als Referenzeinheit dient. Der Hauptzweck einer funktionellen Einheit besteht in der Bereitstellung einer Referenz, zu der die Inputs und Outputs des untersuchten Produktsystems in Beziehung gesetzt werden. Die Umweltauswirkungen

[36] Anmerkung des Autors: Life Cycle Inventory (Sachbilanz).

[37] Ein Produktsystem ist eine Zusammenstellung von Prozessmodulen mit Elementar- und Produktflüssen, die den Lebensweg eines Produktes modelliert und die eine oder mehrere festgelegte Funktionen erfüllt. Prozessmodul: kleinster in der Sachbilanz berücksichtigter Bestandteil, für den Input- und Outputdaten quantifiziert werden.

zweier Alternativen können nur miteinander verglichen werden, wenn sich beide auf die gleiche funktionelle Einheit beziehen.

Bei Lampen beispielsweise ist die durch ein Produkt wahrgenommene Funktion die *Helligkeit* (gemessen in Lumen). Das heißt, dass nicht einfach zwei Lampen verglichen werden können, die die gleiche Leuchte haben, sondern dass zunächst die erforderliche Helligkeit abgeglichen werden muss. Je nach Art der Lampe und ihrer jeweiligen Lichtausbeute (in Watt/Lumen) ergibt das eine unterschiedliche Leistungsaufnahme, die jeweils erforderlich ist, um die gewünschte Helligkeit mit den verschiedenen Lampenarten bereitzustellen.

Bei Druckpapier beispielsweise könnte die funktionelle Einheit mit Ries ausgedrückt werden. Ein Ries Papier ist eine bestimmte Menge an Papier der gleichen Größe und Qualität. Internationale Normenorganisationen definieren das Ries als 500 identische Blätter. Das ist auch die typische Verkaufseinheit.

Lebenszyklusansatz

Die Umweltentlastungen werden auf quantitativer Basis entlang des gesamten Produktlebenszyklus analysiert. Der Lebenszyklus von Produkten oder Dienstleistungen besteht aus aufeinanderfolgenden und miteinander verbundenen Phasen, von der Beschaffung der Rohstoffe (oder Herstellung aus natürlichen Ressourcen) bis hin zur endgültigen Entsorgung (siehe Figure 16).

Figure 16: Lebenszyklusphasen von Produktsystemen

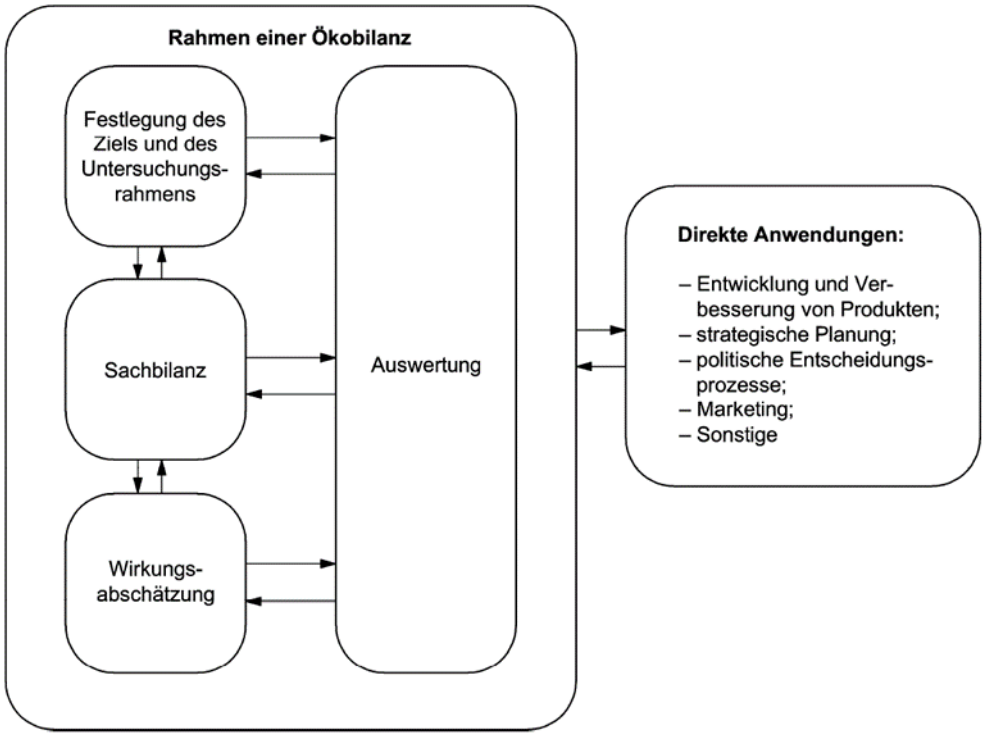
Quelle: Öko-Institut

In vielen Fällen kann es gerechtfertigt sein, die Berechnungen zu vereinfachen und sich nur auf die relevantesten Lebenszyklusphasen zu konzentrieren (weiterführende Informationen siehe Abschnitt B.4.3).

B.2.2 Begriffe

Figure 17 zeigt die allgemeinen Phasen einer Ökobilanz gemäß den ISO-Normen. In den folgenden Abschnitten werden das Ziel und die wichtigsten Begriffe, die in der jeweiligen Phase verwendet werden, kurz beschrieben.

Figure 17: Die vier Phasen einer Ökobilanz



Quelle: ISO (2009)

Festlegung des Ziels und des Untersuchungsrahmens

Beim Ziel einer Ökobilanz werden die beabsichtigte Anwendung, die Gründe für die Durchführung der Studie und die Zielgruppe, d. h. an wen sich die Ergebnisse der Studie richten sollen, dargelegt. Zudem wird angegeben, ob die Ergebnisse für die Verwendung in zur Veröffentlichung vorgesehenen vergleichenden Aussagen bestimmt sind.

Bei der Definition des Umfangs sind zum Beispiel die folgenden Punkte wichtig:

- Beschreibung der zu untersuchenden Produktsysteme,
- Beschreibung der Funktionen der Produktsysteme und Definition der funktionellen Einheit,
- Definition der Systemgrenze, d. h. welche Prozesse bei der Analyse berücksichtigt werden,
- Auswahl der Wirkungskategorien und der Methode zur Wirkungsabschätzung,
- Datenanforderungen und Annahmen.

Sachbilanz (Life Cycle Inventory, LCI)

Die Sachbilanz stellt den Schritt der Datenerfassung im Rahmen der Ökobilanz dar. In diesem Schritt werden alle Inputs (z. B. Rohstoffe, Chemikalien, Energie usw.) und Outputs (z. B. Emissionen in die Luft, ins Wasser usw.) eines Produktlebenszyklus analysiert. Je nach Produkt kann dieser Schritt die Erfassung von Daten zahlreicher Prozesse (z. B. Abbau und Veredelung von Rohstoffen, Herstellung von Teilkomponenten, Zusammenbau der Endprodukte, Transport usw.) mit Hunderten von Stoffen beinhalten.

Inputs und Outputs: Alle Produkt-, Stoff- oder Energieflüsse, die einem Produktsystem zugeführt werden, werden als Inputs bezeichnet. Alle Produkt-, Stoff- oder Energieflüsse, die von einem

Produktsystem abgegeben werden, werden als Outputs bezeichnet. Zu den Produkten und Stoffen gehören Rohstoffe, Zwischenprodukte und Nebenerzeugnisse.

- Zu den typischen Inputs zählen Rohöl, Eisenerz, Agrarerzeugnisse, Strom, Erdgas, Benzin, Wasser usw.
- Typische Outputs sind Emissionen wie CO_2, SO_x, NO_x, VOC usw.

Wirkungsabschätzung (Life Cycle Impact Assessment, LCIA)

In diesem Schritt werden mithilfe der Ergebnisse der Sachbilanz die Umweltwirkungen beurteilt. So zum Beispiel der Befund „Treibhauspotenzial" infolge des Energieeinsatzes für die Herstellung von hochreinen Chemikalien in Elektronik: Durch den Einsatz von Energie, vor allem von fossilen Brennstoffen, werden CO_2 und andere Stoffe abgegeben, die zur globalen Erwärmung beitragen (und weitere Umweltauswirkungen haben).

Bei der Wirkungsabschätzung werden in der Regel sämtliche Inputs und Outputs eines Produktsystems Wirkungskategorien zugeordnet. Eine Wirkungskategorie ist eine Klasse, die wichtige Umweltthemen repräsentiert. Um einen Wirkungskategorie-Indikator zu erhalten, werden die Inputs und Outputs unter Verwendung eines bestimmten Charakterisierungsfaktors umgewandelt.

Beispielsweise wird die Wirkungskategorie „Treibhauspotenzial" (Global Warming Potential, GWP) in der Einheit „CO_2-Äquivalente" gemessen. Da z. B. Methan ein deutlich höheres spezifisches Treibhauspotenzial als CO_2 hat, müssen Methanemissionen mit einem bestimmten Faktor (dem Charakterisierungsfaktor) multipliziert werden, um so das Treibhauspotenzial, gemessen in CO_2-Äquivalenten, ermitteln zu können. Der Charakterisierungsfaktor für Methan beispielsweise lautet 21, der von N_2O beträgt 310. Damit kann das aufsummierte Treibhauspotenzial verschiedener Outputs in einer Zahl als CO_2-Äquivalente angegeben werden.

Wichtigste Wirkungskategorien sind:

- Treibhauspotenzial (GWP)
- Ozonabbaupotenzial (ODP)
- Humantoxizität – karzinogene Wirkungen
- Humantoxizität – nicht karzinogene Wirkungen
- Aquatische Ökotoxizität für Süßwasser
- Eutrophierungspotenzial (Boden, Süßwasser, Salzwasser) (EP)
- Versauerungspotenzial (AP)
- Ressourcenverbrauch (Wasser)
- Ressourcenverbrauch (Minerale, fossile Brennstoffe)
- Photochemisches Ozonbildungspotenzial (POCP)
- Landtransformation
- Feinstaubbildungspotenzial (PMFP)

- Ionisierende Strahlung

In vielen Fällen kann es gerechtfertigt sein, die Berechnungen zu vereinfachen und sich nur auf die relevantesten Wirkungskategorien zu konzentrieren, siehe die weiteren Informationen in Abschnitt B.4.3.

Zu beachten ist, dass die Wirkungsabschätzungen zweier verschiedener Studien nicht immer vergleichbar sind, da die Methoden zur Zuordnung und Charakterisierung der Wirkungen unterschiedlich gewesen sein können. Zudem ist es sehr wichtig, die Variablen richtig zu verstehen – wie beispielsweise Systemgrenzen, funktionelle Einheit und Allokationsverfahren[38] – ehe aus den Ergebnissen der Wirkungsabschätzung Schlüsse gezogen werden. Manchmal werden auch Sensitivitätsanalysen durchgeführt, um die Folgen zu bewerten, die sich aus unterschiedlichen Annahmen bei diesen Variablen ergeben.

Auswertung der Ökobilanz (Interpretation)

Bei der Auswertung werden die Ergebnisse sowohl der Sachbilanz als auch der Wirkungsabschätzung berücksichtigt, um Schlüsse zu ziehen, Beschränkungen zu erklären und Empfehlungen abzugeben.

Indirekt verursachte (oder: graue) Emissionen/Wirkungen[39]

Jene Umweltemissionen bzw. -auswirkungen, die durch die Beschaffung von Rohstoffen, die Produktion und den Vertrieb verursacht werden, werden als indirekt verursachte (oder graue) Emissionen bzw. Auswirkungen bezeichnet, siehe Figure 18.

Figure 18: Lebenszyklusphasen mit indirekt verursachten Auswirkungen

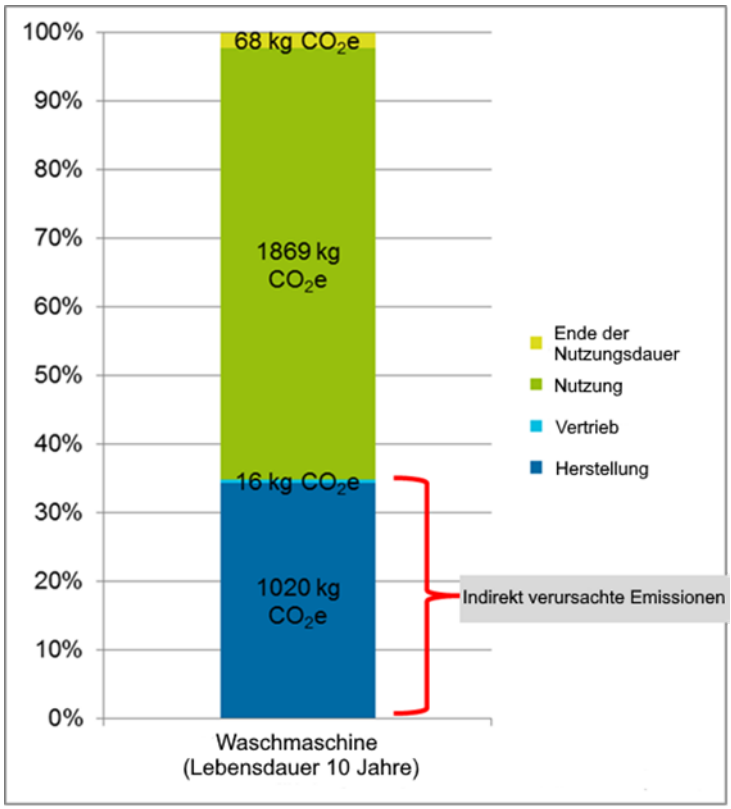
Quelle: Öko-Institut

Häufig können bereits vorhandene Daten zu den indirekt verursachten Emissionen bzw. Auswirkungen bestimmter Inputmaterialien oder -teile für die eigenen Analysen und Berechnungen verwendet werden. Diese müssen dann nicht von Grund auf modelliert werden. Figure 19 zeigt das Treibhauspotenzial einer Waschmaschine und welche Teile der Gesamtauswirkungen die „indirekt verursachten Emissionen“ des Geräts sind.

[38] z. B. Zuordnung von Wirkungen zu Produkten, Nebenprodukten usw.

[39] Der Begriff „indirekt verursachte“ oder „graue“ Emissionen bzw. Wirkungen steht nicht in direktem Zusammenhang mit der Durchführung einer Ökobilanz, da hier die Lieferkette des analysierten Produkts oder Produktsystems sowieso berücksichtigt wird (siehe Abschnitt B.2.1 zum Lebenszyklusansatz). Vielmehr wird der Begriff im internationalen Diskurs zum Thema Reduzierung von Treibhausgasemissionen verwendet, wo Emissionen anhand des Produktionsstandorts ermittelt werden, d. h. des Landes, das ein bestimmtes Produkt herstellt, und nicht anhand des Verbrauchsorts, d. h. des Landes, in dem der Konsum dieses Produkts erfolgt. Wenn beispielsweise ein Land seine Produktionskapazität für ein bestimmtes Produkt drosselt, nehmen auch seine Treibhausgasemissionen ab. Insgesamt kann es jedoch sein, dass die Emissionen trotzdem nicht sinken, da das Produkt eventuell anderswo produziert und dann importiert wird. In diesem Fall werden die Emissionen mit den Importen „indirekt verursacht“.

Figure 19: Das Treibhauspotenzial einer Waschmaschine



Quelle: eigene Abbildung in Anlehnung an Prakash et al. (2016b)

Kritische Prüfung (Critical Review)

Die kritische Prüfung ist ein Prozess, bei dem überprüft wird, ob die jeweilige Studie die Anforderungen an Methodik, Daten, Auswertung und Berichterstattung erfüllt und ob sie den Grundsätzen einer Ökobilanz entspricht. Mit einer kritischen Prüfung kann die Glaubwürdigkeit einer Ökobilanz erhöht werden, beispielsweise durch die Einbindung interessierter Kreise. Durch die Einbindung aller interessierten Kreise wird ausgeschlossen, dass nur Interessen bestimmter Parteien berücksichtigt werden.

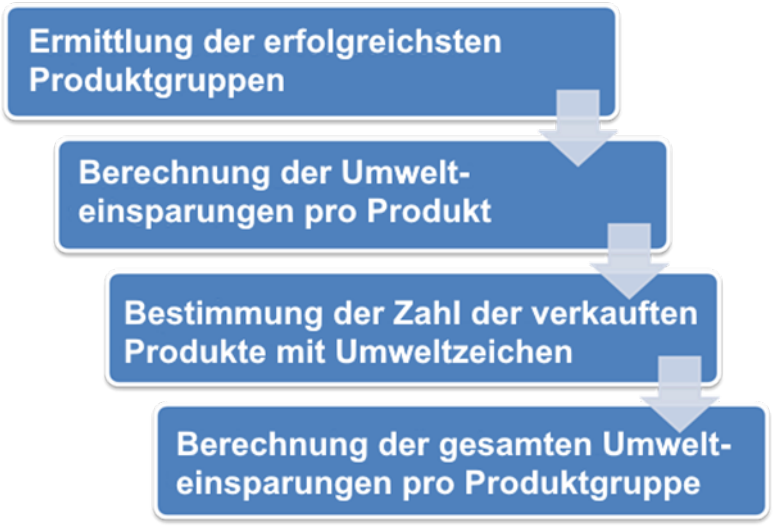
Wenn die Ergebnisse der Ökobilanz für vergleichende Aussagen herangezogen werden sollen und diese wiederum für die Öffentlichkeit bestimmt sind, ist eine kritische Prüfung erforderlich. Je nach Ziel und Umfang der Studie gibt es verschiedene Arten der kritischen Prüfung (z. B. interner oder externer Sachverständiger oder Prüfung durch einen Ausschuss interessierter Kreise).

B.3 Übersicht über das vorgeschlagene Verfahren

Bei dem vorgeschlagenen Vorgehen sollen die Umweltentlastungen, die durch Produkte mit Umweltzeichen erzielt wird, auf vereinfachte Art und Weise durch die teilnehmenden Umweltzeichenprogramme quantifiziert werden.

Die folgende Abbildung gibt einen Überblick über die angedachten Arbeitsschritte.

Figure 20: Arbeitsschritte für die Quantifizierung der durch Produkte mit Umweltzeichen erzielten Umweltentlastungen



Quelle: Öko-Institut

Zur Quantifizierung der Umweltentlastungen werden im ersten Schritt die drei erfolgreichsten Produktgruppen identifiziert (siehe Abschnitt B.4.2). Im zweiten Schritt werden die Umweltauswirkungen der Produkte mit Umweltzeichen mit den Auswirkungen der Produkte ohne Umweltzeichen, den sogenannten „Referenzprodukten", verglichen. Die Quantifizierung der Einsparungen pro Produkt wird in Abschnitt B.4.3 detaillierter beschrieben. Die berechneten Einsparungen werden dann mit der Zahl der verkauften Produkte mit Umweltzeichen multipliziert (siehe Abschnitt B.4.4 und B.4.5).

In Abschnitt B.4.1 werden einige allgemeinere Aspekte dargelegt, die bei der Quantifizierung der Umweltentlastungen wichtig sind.

B.4 Das Verfahren im Detail

B.4.1 Allgemeine Aspekte

Zielgruppe und Kommunikation der gewonnenen Informationen

Ehe mit der Berechnung begonnen wird, muss die Zielgruppe der gewonnenen Informationen definiert werden. In der Regel erfolgt die Berechnung der Umweltvorteile entweder für 1) die interne Kommunikation und/oder 2) für die externe Kommunikation.

Bei der internen Kommunikation könnten die Ergebnisse für die Entscheidung genutzt werden, auf welche Produktgruppen das Umweltzeichenprogramm fokussieren sollte. Zudem könnte mithilfe der Ergebnisse über die Fortsetzung oder Einstellung von Produktgruppen entschieden werden, beispielsweise wenn eine Produktgruppe bzw. ihre wichtigsten Umweltauswirkungen bereits von anderen politischen Instrumenten gut bzw. besser erfasst werden. Darüber hinaus können die Ergebnisse auch bei der Entscheidungsfindung zu einer etwaigen Überarbeitung der Kriterien hilfreich sein, beispielsweise wenn die berechneten Einsparungen weitaus geringer sind als mit Blick auf die Leistung der besten verfügbaren Produkte und Technologien auf dem Markt erwartet.

Was die externe Kommunikation betrifft, beispielsweise gegenüber der Öffentlichkeit oder Entscheidungsträgern, so sind die Ergebnisse der Berechnungen mit noch größerer Sorgfalt zu

behandeln. Beispielsweise wenn mit der Bekanntgabe der Umweltentlastungen eines Produkts mit Umweltzeichen im Vergleich zu einem Referenzprodukt gleichzeitig sensible Informationen eines einzelnen Unternehmens offengelegt würden. In solchen Fällen ist es ratsam, explizit zu erwähnen, dass die Berechnungen der Umweltvorteile ausschließlich für Durchschnittsprodukte erfolgen und nicht unternehmens- oder produktspezifischer Natur sind. Zusätzlich wird empfohlen, bei der Kommunikation der Umweltvorteile auf die Ergebnisse der kritisch nachgeprüften LCA-Studien (siehe Abschnitt B.2.2), sofern welche vorliegen, zurückzugreifen.

In der Praxis kann es durchaus sein, dass es nicht viele LCA-Studien gibt, die speziell für Produkte mit Umweltzeichen und deren entsprechende Referenzprodukte erstellt wurden. Deshalb muss in der externen Kommunikation hervorgehoben werden, dass die berechneten Umweltvorteile lediglich eine Entwicklung wiedergeben, auf mehreren Annahmen des Umweltzeichenprogramms beruhen und nicht speziell für ein bestimmtes Produkt eines bestimmten Unternehmens gelten.

In der Regel gilt, dass bei einer Verwendung der Ergebnisse in der externen Kommunikation die folgenden wichtigen Prinzipien berücksichtigt werden sollten:

Gezielte und kritische Herangehensweise: Versuchen Sie, nur Daten möglichst guter Qualität zu verwenden. Weitere Informationen zur Datenqualität finden Sie in Abschnitt Datenqualität.

- **Sichere Herangehensweise**: Nehmen Sie stets eine interne Überprüfung oder Gegenkontrolle Ihrer Berechnungen und Ergebnisse vor, am besten durch eine Person, die sich mit der Methodik auskennt, aber nicht an der Erstellung der zu überprüfenden Analyse beteiligt war (Vier-Augen-Prinzip). Wenn möglich, binden Sie einen LCA-Experten in den Qualitätscheck der Berechnungen ein. Damit können etwaige Fehler oder Schwachstellen eher erkannt werden.
- **Konservative Herangehensweise**: Um auf der sicheren Seite zu sein, sollten die Annahmen und Festlegungen konservativ getroffen werden, d. h. zugunsten des Produkts ohne Umweltzeichen. Bei diesem Vorgehen werden die Einsparungen eher unterschätzt und sind damit auch schwerer von anderen Stakeholdern in Frage zu stellen.
- **Transparente Herangehensweise**: Sämtliche Annahmen und verwendeten Daten sollten transparent dokumentiert werden, beispielsweise in einem Hintergrundbericht, der heruntergeladen werden kann. Damit können die zugrundeliegenden Daten von allen interessierten Parteien überprüft und nachvollzogen werden. Allerdings sollten die Daten nicht öffentlich zugänglich sein, wenn dadurch sensible Unternehmensinformationen offengelegt werden. Ein Beispiel für einen solchen Fall ist der Umsatz eines Lizenznehmers, der von diesem übermittelt wurde, damit die Gesamtzahl der verkauften Produkte mit Umweltzeichen geschätzt werden konnte. Hier ist es immer sicherer, sich im Vorfeld mit dem betreffenden Unternehmen in Verbindung zu setzen und eine Einwilligungsgenehmigung einzuholen. Dieser Schritt kann unter Umständen bei Produktgruppen entfallen, bei denen es eine große Zahl von Lizenzinhabern gibt und bei denen die Daten hochgradig aggregiert veröffentlicht werden.

Zeitraum der berechneten Einsparungen

Es muss entschieden werden, für welches Jahr die Analyse erfolgen soll, da alle für die Analyse erfassten Daten sich auf diesen Zeitraum beziehen müssen. In der Regel wird ein volles Jahr als Zeitraum gewählt. Das gewählte Jahr sollte dem aktuellen Jahr so nah wie möglich sein, auch wenn die Daten für das Vorjahr üblicherweise erst einige Monate nach dem Ende dieses Jahres zur Verfügung stehen. Aus diesem Grund könnte es auch erforderlich sein, das vorletzte Jahr zu nehmen.

In der Praxis werden sich nicht alle relevanten gefundenen Studien genau auf den gewählten Zeitraum beziehen. Ob die Daten für die Berechnung der Umweltentlastungen verwendet werden können, hängt von ihrer Aktualität ab, also ob beispielsweise die untersuchten Technologien noch auf dem Markt sind. Zudem ist es möglich, dass bestimmte Informationen zwar verwendet werden können, nicht aber die Endergebnisse, da einige Daten nicht mehr gültig sind; siehe hierzu auch das folgende Beispiel.

Wenn zum Beispiel eine Studie zu Lampen gefunden wird, die auf einen anderen, früheren Zeitraum verweist als den gewählten, können die Annahmen zum typischen Nutzungsverhalten dennoch weiterhin gültig sein, da davon ausgegangen werden kann, dass das Nutzungsverhalten sich nicht so schnell ändert. Daten zu technischen Aspekten hingegen (z. B. die Lichtausbeute bestimmter Lampenarten) sind eventuell nicht mehr brauchbar, da sich die Technik weiterentwickelt hat. Informationen zum Nutzungsverhalten können also für die eigene Berechnung verwendet werden, bei den technischen Details hingegen müssen aktuellere Angaben auf anderen Wegen recherchiert werden.

Datenqualität

Um glaubwürdige Ergebnisse zu erhalten, müssen zuverlässige Daten verwendet werden. Die folgenden Aspekte sollten berücksichtigt werden (siehe z. B. Edelen und Ingwersen (2016)):

- Es gibt einige allgemeine Merkmale, die auf eine gewisse Qualität der Quelle schließen lassen, zum Beispiel wenn:
  - ein umfassender LCA-Bericht vorliegt,
  - auf die LCA-Normen Bezug genommen wird (ISO 14040 und 14044)
  - eine kritische Prüfung stattgefunden hat,
  - die Veröffentlichung einen Begutachtungsprozess durchlaufen hat,
  - eine umfangreiche Auswertung vorliegt, usw.
- Verlässlichkeit der Quelle: Die Quelle der erfassten Informationen sollte verlässlich sein. Die folgenden Quellen können als verlässliche Informationsquellen gelten: von Gutachtern geprüfte (Peer-Review) Zeitschriftenartikel, Bücher, angesehene Websites (z. B. von nationalen oder regionalen Behörden), Regierungsunterlagen, Konferenzberichte oder Politikpapiere. Zeitungen oder private Websites hingegen sind weitaus weniger verlässlich. Informationen, die aus solchen Quellen stammen, sollten deshalb nur ausnahmsweise verwendet werden.

Zeitliche Korrelation: Die Daten sollten sich so eng wie möglich auf den gewählten Zeitraum beziehen. Siehe hierzu auch Abschnitt B.4.1.

- Geografische Korrelation: Die erfassten Informationen sollten sich auf den geografischen Geltungsbereich des Umweltzeichenprogramms beziehen. Nichtsdestotrotz kann es angesichts globaler Lieferketten und Handelsbeziehungen auch korrekt sein, Daten aus anderen Regionen oder Ländern zu verwenden, soweit die Daten der angenommenen Lieferkette entsprechen. Dies ist von der jeweiligen Situation der betrachteten Produktgruppen abhängig.

Wenn zum Beispiel bestimmte Produkte in China hergestellt werden, dann sollten die indirekt verursachten Auswirkungen für die Produktion in China herangezogen werden, auch wenn die Produkte in Australien verkauft werden.

Es kann ebenfalls möglich sein, Informationen einer anderen Region zu verwenden und diese mit den eigenen landesspezifischen Emissionen zu ergänzen. Wenn zum Beispiel eine Studie zu Land A mit Informationen zum Stromverbrauch bestimmter Produkte vorliegt, so könnten diese Informationen in Kombination mit den landesspezifischen Emissionsfaktoren von Land B für die Stromerzeugung verwendet werden.

- Technische Korrelation: Die erfassten Informationen sollten sich auf die betrachtete Produktgruppe oder Untergruppe beziehen.

Bei Lampen zum Beispiel sollte berücksichtigt werden, welche Arten von Lampen und Lampentechnologie von der Studie untersucht werden und ob dies mit denen übereinstimmt, die in der eigenen Analyse untersucht werden sollen.

B.4.2 Ermittlung der erfolgreichsten Produktgruppen

Es gibt keine absolute Definition davon, was als „erfolgreiche Produktgruppe“ gelten kann. Es könnte zum Beispiel eine Produktgruppe mit vielen Lizenznehmern oder vielen zertifizierten Produkten sein. Es könnte sich aber auch um eine Produktgruppe mit nur wenigen zertifizierten Produkten handeln, die eine beherrschende Marktstellung und damit große Umweltvorteile hat. Da Informationen zum letzten Punkt in der Regel nicht für alle Produktgruppen zur Verfügung stehen, die von den Umweltzeichenprogrammen abgedeckt werden, wird vorgeschlagen, die folgenden Kriterien bei der Auswahl der Produktgruppen zu berücksichtigen.

Mögliche Kriterien für die Auswahl der erfolgreichsten Produktgruppen sind:

- Hohe Zahl von Lizenznehmern
- Hohe Zahl von zertifizierten Produkten
- Hohe Umweltauswirkung
- Hohe Bedeutung der Produktgruppe für die öffentliche Beschaffung
- Hohe Verbrauchernachfrage (B2C-Markt)
- Wenige Untergruppen/Produktarten in der Produktgruppe

- Daten zum Marktanteil oder der Zahl der verkauften Produkte sind verfügbar oder leicht zu erheben
- Vorhandene Studien zu den Umweltauswirkungen der Produktgruppe sind verfügbar oder bekannt
- Lizenznehmer sind offen für eine Zusammenarbeit

B.4.3 Berechnung der Umweltentlastungen pro Produkt

Wie in Abschnitt B.2 dargelegt, sind für eine umfassende Ökobilanz (LCA) aller von einem Umweltzeichenprogramm berücksichtigten Produkte (und deren entsprechende Referenzprodukte) erhebliche Ressourcen erforderlich. In den folgenden Abschnitten wird deshalb ein vereinfachter und pragmatischer Ansatz für die Bilanzierung der Umweltentlastungen vorgestellt, die durch Produkte mit Umweltzeichen erzielt werden.

Auswahl einer repräsentativen Produktart oder Produktgruppe

Jede Produktgruppe eines Umweltzeichenprogramms besteht in der Regel aus einer Vielzahl von verschiedenen Produktarten.

Beispielsweise besteht die Produktgruppe „Recyclingpapier“ des Blauen Engel aus 19 verschiedenen Untergruppen, darunter Tragetaschen, Endlospapier, Kopierpapier, Mehrzweckpapier usw. (siehe Figure 21).

Figure 21: Untergruppen der Produktgruppe „Recyclingpapier“ des Blauen Engel

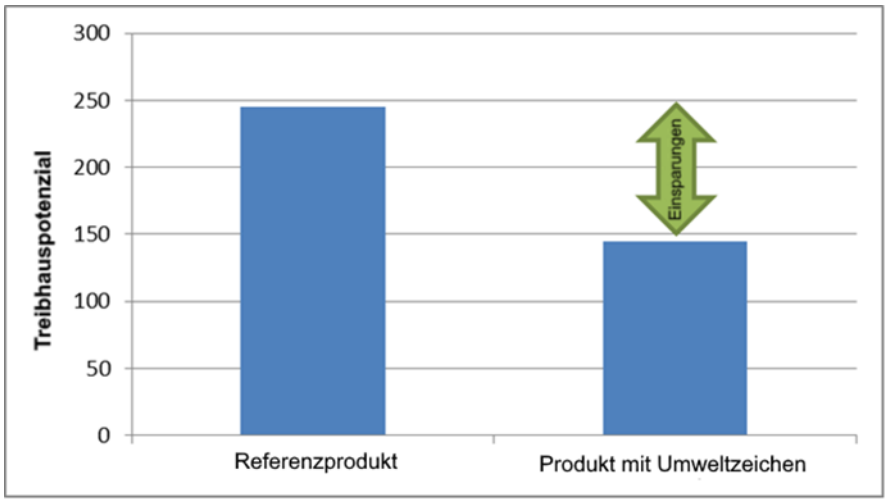
Quelle: Blauer Engel, https://www.blauer-engel.de/de/produktwelt/papier-druck (letzter Abruf am 10. März 2019)

Es wäre sehr kompliziert und zeitaufwändig, die Daten zu allen Untergruppen zusammenzutragen und die jeweiligen Umweltentlastungen zu berechnen. Zur Verringerung der Komplexität sollten deshalb eine oder mehrere wichtige oder repräsentative Untergruppen ausgewählt werden, die für ein typisches Produkt stehen.

Definition von „Umweltzeichenprodukt“ und „Referenzprodukt“

Um die durch Umweltzeichenprodukte erzielten Einsparungen berechnen zu können, müssen die Eigenschaften sowohl des Produkts mit Umweltzeichen als auch des Referenzprodukts (d. h. des Produkts ohne Kennzeichnung) definiert werden. Bei den Einsparungen handelt es sich um die Differenz zwischen den Auswirkungen des Referenzprodukts und des Produkts mit Umweltzeichen (siehe Figure 22).

Figure 22: Einsparungen durch Produkte mit Umweltzeichen (am Beispiel des Treibhauspotenzials [GWP])



Quelle: Öko-Institut

In der Regel gibt es eine enorme Vielfalt von Produkten auf dem Markt: So kann es bei Produkten mit Umweltzeichen Produkte geben, die einfach nur die Kriterien erfüllen, und andere, die deutlich über den Mindestanforderungen liegen. Bei Produkten ohne Kennzeichnung kann die Produktvielfalt sogar noch höher sein. Nichtsdestotrotz müssen zwei Alternativen festgelegt werden, die repräsentativ für Produkte mit und ohne Umweltzeichen stehen.

Eine Möglichkeit zur Reduzierung dieser Komplexität besteht darin, davon auszugehen, dass Produkte mit Umweltzeichen gerade die Anforderungen erfüllen.

Dies ist beispielsweise häufig bei Produkten der Fall, die der EU-Energieverbrauchskennzeichnung unterliegen (energieverbrauchsrelevante Produkte): In der Regel erfüllen die Produkte gerade die für eine bestimmte Energieeffizienzklasse notwendigen Anforderungen. Die Produkte übertreffen diese Anforderungen erst, wenn eine andere, bessere Klasse erreicht werden kann. Dann werden diese Anforderungen erfüllt, aber auch hier wieder nicht übertroffen. Dieser Ansatz kann auch als „konservativ“ bezeichnet werden, da die Vorteile unter Umständen auch höher sind, wenn die Produkte mit Umweltzeichen über den Mindestanforderungen liegen.

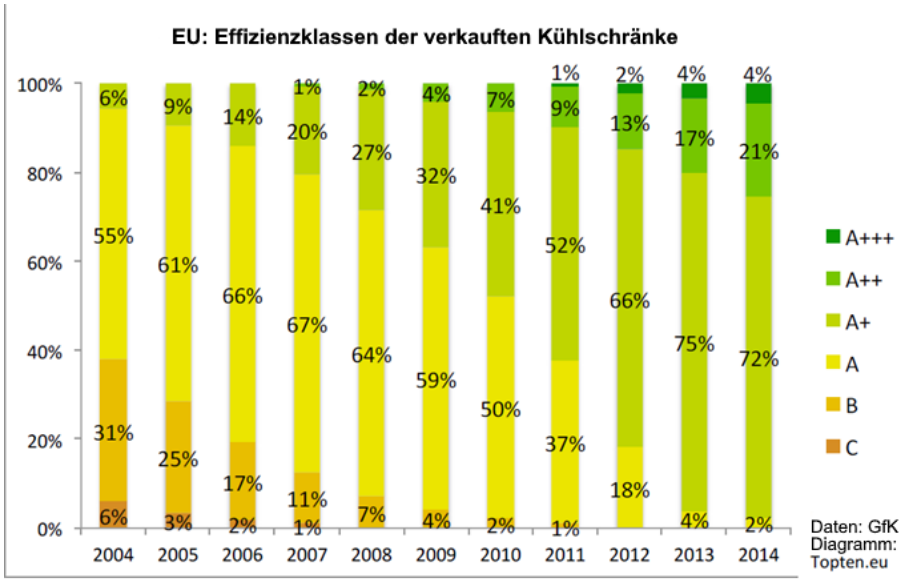
Bei dem Referenzprodukt bzw. Produkt ohne Kennzeichnung ist die Lage etwas schwieriger und hängt von der jeweiligen Produktgruppe ab:

- Eine Möglichkeit besteht darin, davon auszugehen, dass Produkte ohne Kennzeichnung einfach nur den gesetzlichen Anforderungen entsprechen, d. h. die Mindestvorgaben für den Strom- oder Kraftstoffverbrauch erfüllen.
- Wenn es ein Bewertungsschema wie die EU-Energieverbrauchskennzeichnung gibt, könnten auch Marktdaten vorhanden sein, aus denen hervorgeht, welche Effizienzklassen die wichtigsten sind. Dann könnte anstelle der Mindestanforderungen die am stärksten vertretene Klasse des Schemas als Referenz herangezogen werden.

Die folgende Abbildung zeigt beispielsweise die Energieeffizienzklassen der in der Europäischen Union (EU) verkauften Kühlschränke. Hier wird deutlich, dass in den Jahren 2013 und 2014 über 70% aller verkauften Kühlschränke zur Energieeffizienzklasse „A^+“ gehörten. Lediglich 4% gehörten

zu der besten Klasse „A^{+++}“. In diesem Fall könnten Kühlschränke der Klasse A^{+} als konventionelle Referenzprodukte genommen werden.

Figure 23: EU-Effizienzklassen der verkauften Kühlschränke



Quelle: angepasst aus (Michel et al. 2016)

- In den Vorbereitungsstudien für Regulierungen im Rahmen der EU-Ökodesign- und Energieverbrauchskennzeichnungsrichtlinien wird in der Regel ein sogenanntes „Basisszenario“ definiert, das das „Durchschnittsprodukt“ zum Zeitpunkt der Erstellung der Untersuchung repräsentiert. Dieses kann als konventionelles Referenzprodukt verwendet werden.

In der Vorbereitungsstudie für bildgebende Geräte (Stobbe 2007) wird zum Beispiel das Basisszenario 3 als einfacher Kopierer mit einer Druckgeschwindigkeit von 26 ipm (Bilder pro Minute) definiert. Der Energieverbrauch eines Durchschnittsgeräts mit dieser Spezifikation wird mit 270 kWh pro Jahr angenommen, siehe die folgende Abbildung.

Figure 24: Annahmen zur Nutzungsphase eines Durchschnittskopierers mit einfacher Funktion und einer Druckgeschwindigkeit von 26 ipm

Pos nr	NUTZUNGSPHASE Beschreibung		Einheit	Zwischensumme
211	Produktlebensdauer in Jahre	6	Jahre	
	Strom			
212	Eingeschaltet: Verbrauch pro Stunde, Zyk-lus, Einstellung usw.	270	kWh	270
213	Eingeschaltet: Anzahl der Stunden, Zyklen, Einstellungen usw./Jahre	1	#	
214	Standby-Modus: Verbrauch pro Stunde	0	kWh	0
215	Standby-Modus: Anzahl der Stunden/Jahre	0	#	
216	Ausgeschaltet: Verbrauch pro Stunden	0	kWh	0
217	Ausgeschaltet: Anzahl der Stunden/Jahre	0	#	
	GESAMT über Produktlebensdauer	1,62	MWh (=000 kWh)	65

Quelle: angepasst aus (Stobbe 2007)

- Bei dem Produkt „Papier“ ist in der Regel Papier aus Frischfasern die Referenzalternative.

Auswahl der relevantesten Lebenszyklusphasen

Wie oben bereits dargelegt wurde, berücksichtigt eine Ökobilanz den gesamten Lebenszyklus eines Produkts. In vielen Fällen kann es jedoch gerechtfertigt sein, die Berechnungen zu vereinfachen und sich nur auf die wichtigsten Lebenszyklusphasen zu konzentrieren.

Bei energieverbrauchsrelevanten Produkten[40] ist in der Regel die Nutzungsphase die wichtigste Lebenszyklusphase (z. B. Kühlschränke, Wärmepumpen usw.), auch wenn es energieverbrauchsrelevante Produkte gibt, bei denen die Umweltauswirkungen der Produktion genauso wichtig oder sogar noch wichtiger sind (z. B. Computer, Fernseher, Drucker usw.).

Bei nicht energieverbrauchsrelevanten Produkten (z. B. Papierprodukte) ist es häufig ausreichend, die indirekt verursachten Auswirkungen (vgl. Kapitel 0) bzw. die Auswirkungen von der Rohstoffgewinnung bis hin zur Auslieferung des fertigen Produkts zu berücksichtigen („cradle to gate“), da die Umweltauswirkungen während der Nutzungsphase häufig nicht so bedeutend sind bzw. anderen Produktgruppen zugeordnet werden.

Bei Kopierpapier beispielsweise sollten die Auswirkungen der Nutzungsphase besser den Druckern oder Multifunktionsgeräten zugeordnet werden. Gleichwohl kann es einige Ausnahmen geben, da zum Beispiel die Emissionen von Farben und Lacke während der Nutzungsphase ein Gesundheitsrisiko für die Menschen darstellen können.

Es kann davon ausgegangen werden, dass die Umweltzeichenprogramme die Bedeutung der jeweiligen Lebenszyklusphasen kennen, da ihre Kriterien sich in der Regel auf Aspekte und Lebenszyklusphasen mit hoher Umweltrelevanz konzentrieren: z. B. den Energieverbrauch während der Nutzungsphase, den Ressourcenverbrauch bei der Produktion oder die Emission gefährlicher Stoffe während der Nutzung.

Zwei Kriterien sollten berücksichtigt werden, wenn über die zu betrachtenden Lebenszyklusphasen entschieden wird:

- Die Lebenszyklusphase sollte einen hohen Anteil an den Gesamtumweltauswirkungen haben, d. h. der Beitrag ist (viel) höher als der der anderen Lebenszyklusphasen.
- Es sollte bei den Auswirkungen der jeweiligen Lebenszyklusphase relevante Unterschiede zwischen den Produkten mit Umweltzeichen und den Produkten ohne Kennzeichnung geben.

Bei Kopierpapier (nicht energieverbrauchsrelevantes Produkt) reicht es beispielsweise aus, die Rohstoffgewinnung und die Produktionsphase zu berücksichtigen, da hier die wichtigsten Ursachen für die Umweltauswirkungen liegen. Was hingegen den Vertrieb und die Nutzungsphase angeht, so gibt es nahezu keinen Unterschied zwischen Frischfaser- und Recyclingpapier), mit Ausnahme jener Fälle, bei denen ein Transport über weite Entfernungen hinweg für eine der Alternativen eine gewisse Rolle spielen mag.

Bei Lampen (energieverbrauchsrelevantes Produkt) muss in jedem Fall die Nutzungsphase einbezogen werden, da die Unterschiede bei der Lichtausbeute auch zu Unterschieden beim

[40] Laut der Europäischen Kommission ist ein energieverbrauchsrelevantes Produkt ein energieverbrauchendes Produkt oder ein energiesparendes Produkt, „dessen Nutzung den Verbrauch von Energie beeinflusst“. European Parliament and Council (2009)

Energieverbrauch während der Nutzung führen. Aber auch die Produktionsphase ist in diesem Fall wichtig, da die Lampentechnologien jeweils mit einer anderen Lebensdauer einhergehen. Bei Lampentechnologien mit längerer Lebensdauer müssen im gleichen Zeitraum weniger Lampen hergestellt werden.

Auswahl der wichtigsten Wirkungskategorien und Indikatoren

Bei einer Ökobilanz können mehrere Wirkungskategorien ausgewählt und angewandt werden, z. B. Treibhauspotenzial (GWP), Versauerungspotenzial (AP), Humantoxizität, Ressourcenverbrauch, Landnutzungsänderungen usw. (siehe auch Abschnitt B.2.2). Auch andere Indikatoren, die sich eher auf die Daten der Sachbilanz beziehen, können nützlich sein, zum Beispiel die Menge an vermiedenem Frischfaserpapier.

Um die Komplexität der Analyse zu reduzieren, ist es sinnvoll, sich auf die wichtigsten Wirkungskategorien und Indikatoren zu konzentrieren. Welche Wirkungskategorien bzw. Indikatoren wichtig sind, hängt wiederum von der betrachteten Produktgruppe ab.

Die Kategorie „Ökotoxizität“ zum Beispiel ist für die Bewertung von Waschmitteln wichtig, spielt aber bei Kühlschränken eine weitaus weniger bedeutende Rolle. Der Indikator „Menge an vermiedenem Frischfaserpapier“ ist offensichtlich nur bei Papierprodukten oder Multifunktionsgeräten (Drucker, Kopierer) sinnvoll und wenn die Geräte mit Umweltzeichen eine Duplexfunktion aufweisen und die herkömmlichen Geräte nicht.

Daneben ist es ratsam, auch Wirkungskategorien auszuwählen, die von allgemeiner Bedeutung für die von dem Umweltzeichen erfasste Region sind oder weltweit bedeutsam sind. Da die Klimakrise ohne Frage eine der weltweit wichtigsten Umweltherausforderungen darstellt, wird empfohlen, die Kategorie „Treibhauspotenzial“ in jedem Fall auszuwählen. In wasserarmen Ländern/Regionen kann Wasserknappheit ein zentrales Thema sein, weshalb ein entsprechender Indikator für alle Produktgruppen ausgewählt werden könnte.

Als Einstieg wird empfohlen, sich auf das Treibhauspotenzial zu konzentrieren, da es sich hierbei um einen Indikator handelt, für den relativ leicht quantitative Daten zu finden sind. Je nach untersuchter Produktgruppe können auch weitere Indikatoren – nicht unbedingt komplexe Wirkungskategorien – ausgewählt werden, um so die positiven Effekte von Produkten mit Umweltzeichen zu veranschaulichen, wie zum Beispiel der oben erwähnte Indikator zur Menge an vermiedenem Frischfaserpapier.

Spezifikation von Parametern für die Nutzungsphase

Die Nutzungsintensität von Produkten kann anhand des durchschnittlichen Nutzerverhaltens bestimmt werden. Durchschnittliche Nutzerprofile, z.B. Nutzungszeit pro Tag/Monat/ Jahr wurden für eine breite Palette an energieverbrauchsrelevanten Geräten beispielsweise in den Vorbereitungsstudien im Rahmen der EU-Ökodesign und Energieverbrauchskennzeichnungsrichtlinien definiert. Darüber hinaus liefern auch die Spezifikationen der Energy Star-Zertifizierung für eine Vielzahl von Elektro- und Elektronikgeräten standardisierte Nutzungsmuster. Zudem können mithilfe der Produktdatenbank des Energy Star die Energieverbrauchswerte für die zertifizierten Produkte aufgerufen werden, wenn diese als Referenzwerte verwendet werden sollen. Grundsätzlich wird empfohlen, bestehende Nutzerprofile zu verwenden, da diese in der Regel auf der Grundlage umfassender Markt- und Verbraucherforschung erstellt und mit der Industrie abgestimmt wurden. Wenn spezifische Informationen zu Nutzerprofilen für eine bestimmte Produktgruppe in Ihrem Land vorliegen, dann können diese natürlich verwendet werden. Die Verwendung dieser Nutzerprofile sollte transparent kommuniziert wird.

Im Rahmen einer vom Umweltbundesamt (UBA) beauftragten Studie wurden Messungen des Nutzerverhaltens in einer Bundesbehörde durchgeführt. Das resultierende Nutzerverhalten für Notebook-Rechner wurde wie folgt erarbeitet:

Table 18: Nutzungsmuster – Notebook-Rechner in einer deutschen Bundesbehörde

	Arbeitstage				**Arbeitsfreie Tage**
	Aktiv (Stunden)	Leerlauf (Stunden)	Schlafmodus (Stunden)	Ausgeschaltet (Stunden)	Ausgeschaltet (Stunden)
Intensive Nutzung	3,5	2	2,5	14,0	24,0
Mittelintensive Nutzung	2,5	2	4,0	14,0	24,0
Geringe Nutzung	1,5	2	5,5	14,0	24,0

Quelle: (Prakash et al. 2016a)

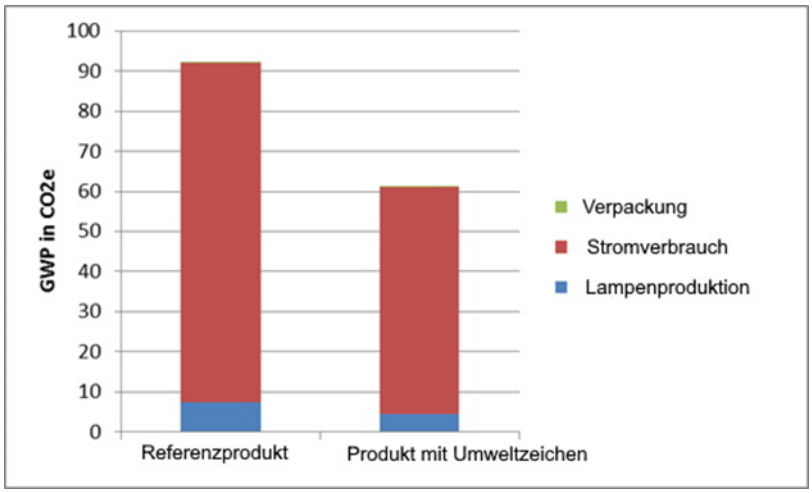
Quantifizierung der Umweltauswirkungen

Nach der Durchführung der bisher genannten Schritte können die Umweltauswirkungen der Produkte mit Umweltzeichen und der Referenzprodukte quantifiziert werden. Im Wesentlichen bedeutet das, dass die relevanten Umweltauswirkungen in den relevanten Lebenszyklusphasen für die zwei Alternativen jeweils zusammengerechnet werden.

Figure 25 beispielsweise zeigt das jährliche Treibhauspotenzial (GWP) der Produktion und Nutzung eines herkömmlichen Produkts und eines Produkts mit Umweltzeichen in der Produktgruppe „Lampen“.

Den größten Anteil an den Auswirkungen hat der Stromverbrauch während der Nutzungsphase (rot). Die Differenz entsteht durch die unterschiedliche Lichtausbeute der Halophosphorlampe (Referenzprodukt) und der Triphosphorlampe. Die Produktionsphase (blau) hat einen weitaus geringeren Anteil, und auch der Unterschied zwischen den Alternativen ist kleiner. Die Differenz ist auf die unterschiedliche Lebensdauer der Alternativen zurückzuführen: Die Halophosphorlampe hat eine Lebensdauer von etwa 8.000 Stunden, wohingegen die Triphosphorlampe eine Lebensdauer von 13.000 Stunden aufweist. Bei typischen Betriebsstunden im gewerblichen Bereich (Büro) im Umfang von 2.000 Stunden pro Jahr bedeutet das, dass die Referenzlampen eine durchschnittliche Lebensdauer von 3,6 Jahren haben, wohingegen die Triphosphorlampen im Durchschnitt knapp 5 Jahre halten. Im gleichen Zeitraum müssten gegenüber Halophosphorlampen also weniger Triphosphorlampen hergestellt werden. Der Anteil der Verpackung ist äußerst gering und hätte weggelassen werden können.

Figure 25: Jährliches Treibhauspotenzial für Lampen (Beispiel: T8-Halophosphor-lampen gegenüber Triphosphorlampen)



Quelle: Öko-Institut

Datenquellen

Wenn keine eigene LCA-Software oder -Datenbank vorhanden ist, müssen die Auswirkungen von Produkten und Prozessen bereits vorhandenen Analysen entnommen werden. In den folgenden Unterabschnitten werden einige Bereiche aufgeführt, in denen vorhandene Daten gefunden werden können.

Verwendung vorhandener Ökobilanzen oder ähnlicher Studien

In der Regel gibt es heutzutage bereits eine Vielzahl an Ökobilanzen oder ähnlichen Studien, welche die Umweltauswirkungen von Produkten, Technologien und Dienstleistungen analysieren. Auch Hintergrundstudien zur Festsetzung der Kriterien von Umweltzeichen enthalten in der Regel wertvolle Informationen. Im Rahmen eines vereinfachten Ansatzes können die Informationen aus solchen Studien als Datenmaterial für die eigenen Berechnungen verwendet werden. Zu den Informationen, die sich in derartigen Studien finden lassen, gehören beispielsweise:

- Informationen zur Bedeutung der verschiedenen Lebenszyklusphasen
- Die Auswirkung der Produktion des betrachteten Produkts
- Die indirekten Auswirkungen von Inputmaterialien oder relevanten Prozessen (z. B. landesspezifische Stromerzeugung)
- Informationen zur Lebensdauer der verschiedenen Produktarten (z. B. Kompaktleuchtstofflampen gegenüber LEDs)
- Informationen zu den typischen Nutzungsparametern (z. B. die typische tägliche Verwendung von Lampen, die typische Dauer der verschiedenen Funktionsmodi von Computern)
- Informationen zum Stromverbrauch während der Nutzungsphase
- usw.

Die folgende Tabelle gibt Hinweise dazu, in welchen Kontexten solche Studien gefunden werden können (neben einer allgemeinen Recherche im Internet).

Table 19: Quellen vorhandener Ökobilanzen oder ähnlicher Studien

Art der Information	Kontext	Quelle
Vorbereitungsstudien für energieverbrauchsrelevante Produkte	Im Zusammenhang mit den EU-Ökodesign- und Energieverbrauchskennzeichnungsrichtlinien wird für jede zu regulierende Produktgruppe eine Vorbereitungsstudie durchgeführt. Die Vorbereitungsstudien folgen alle dem gleichen Ansatz und weisen deshalb auch einen ähnlichen Aufbau auf.	https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/energy-efficient-products_en
EU-Umweltzeichen	Vor der Festlegung der Kriterien für das EU-Umweltzeichen werden Hintergrundstudien durchgeführt.	http://ec.europa.eu/environment/ecolabel/
„Fallstudien“ (z. B. in wissenschaftlichen Zeitschriften)	In der Vergangenheit wurden zahlreiche LCA-Fallstudien zu einer Vielzahl von Produkten und Dienstleistungen in wissenschaftlichen Zeitschriften (zunehmend mit freiem Zugang) und/oder von staatlichen Organisationen wie der US-amerikanischen EPA oder dem Umweltbundesamt (UBA) veröffentlicht.	z. B. Journal of Cleaner Production; International Journal of Life Cycle Assessment oder https://www.epa.gov/, https://www.umweltbundesamt.de/
Umweltfreundliche öffentliche Beschaffung (Green Public Procurement, GPP)	Das GPP-Grundkonzept stützt sich auf klare, überprüfbare, gerechtfertigte und ehrgeizige Umweltkriterien für Produkte und Dienstleistungen und beruft sich dabei auf Ökobilanzen und wissenschaftliche Beweise. GPP-Kriterien beruhen auf faktengestützten Daten, auf vorhandenen Kriterien für Umweltzeichen sowie auf Informationen von Stakeholdern aus Industrie, Zivilgesellschaft und EU-Mitgliedstaaten. Bei der faktengesicherten Grundlage sind wissenschaftliche Informationen und Daten, das Ökobilanzkonzept sowie die Einbindung von Stakeholdern, die Themen besprechen und einen Konsens herbeiführen, zentrale Elemente. Auf der Website finden sich Links zu Hintergrundstudien und Projekten	http://ec.europa.eu/environment/gpp/index_en.htm

Art der Information	Kontext	Quelle
	zu verschiedenen Produktgruppen, die für das öffentliche Beschaffungswesen von Bedeutung sind.	
Topten	Topten ist ein Online-Such-Tool, das sich an Verbraucher richtet und die besten Geräte in den jeweiligen Produktkategorien vorstellt. Es wird von einem Netzwerk nationaler Institutionen getragen, die Produktlisten bereitstellen. Die Kriterien werden in der Regel mithilfe von Hintergrundstudien festgelegt, welche auf den jeweiligen nationalen Websites aufgerufen werden können.	http://www.topten.info/ sowie nationale Websites wie China: https://www.top10.cn/?page=English Argentinien: https://toptenargentina.org/ Chile: https://top-ten.cl/ Frankreich: https://www.guidetopten.fr/ Norwegen: http://www.energismart.no/ Deutschland: https://www.ecotopten.de/ und andere

Quelle: eigene Zusammenstellung

Verwendung vorhandener LCA-Datensätze

In der Regel reichen einige wenige LCA-Datensätze für wiederkehrende Prozesse aus.

Die landesspezifische Stromerzeugung zum Beispiel ist für die meisten energieverbrauchsrelevanten Produkte von Bedeutung. Weitere zentrale Parameter sind die Auswirkungen des Benzinverbrauchs von Fahrzeugen oder die Herstellung von Papier oder Wellpappe mit unterschiedlich hohem Anteil an recyceltem Papier für die verschiedenen Papierprodukte oder zu Verpackungszwecken.

Daten zu den Auswirkungen solcher Produkte und Prozesse können vorhandenen Studien entnommen werden (siehe vorheriger Abschnitt); falls Zugang zu einer LCA-Datenbank besteht, kann die konkrete Auswirkung (z. B. pro kg oder pro kWh) auch aus dieser übernommen werden. Darüber hinaus gibt es auch offene Datenbanken, wie beispielsweise die Datenbank „PROBAS“ (online zugänglich über: http://www.probas.umweltbundesamt.de/php/index.php), deren Anzahl jedoch leider noch begrenzt ist. Eine weitere Quelle für möglicherweise hilfreiche LCA-Daten ist das „LCA 2 Go Tool“ (http://www.lca2go.eu/tool.en.html), das in dem gleichnamigen EU-Forschungsprojekt entwickelt wurde und die Bereiche biobasierte Kunststoffe, Werkzeugmaschinen, Elektronik, Leiterplatten, Halbleiter, Photovoltaik, Sensoren und smarte Textilien abdeckt.

B.4.4 Bestimmung der Zahl der verkauften Produkte mit Umweltzeichen

Die Bestimmung der Zahl der verkauften Produkte mit Umweltzeichen ist wichtig, um die tatsächlichen Einsparungen berechnen zu können, die durch Produkte mit Umweltzeichen erzielt werden.

Bei den *potenziellen Einsparungen* handelt es sich um die Einsparungen pro Produkt bzw. hochskalierte Zahlen für den gesamten Markt in einer bestimmten Produktgruppe oder Untergruppe. Aussagen wie „*Wenn sämtliches herkömmliches Kopierpapier, das in Deutschland verkauft wird, durch Kopierpapier ersetzt würde, das das Zeichen des Blauen Engels trägt, könnten XYZ kg CO_2e eingespart werden*“ können nützlich sein, um das Potenzial der Produkte mit Umweltzeichen und die Bedeutung einer Steigerung ihres Marktanteils zu verdeutlichen.

Die *tatsächlichen Einsparungen* durch den Ersatz herkömmlicher Produkte durch Produkte mit Umweltzeichen kann nur berechnet werden, wenn die Zahl der tatsächlich verkauften Produkte mit Umweltzeichen bekannt ist. Dann können die Einsparungen pro Produkt mit dieser Zahl multipliziert werden, um so die aktuellen Einsparungen benennen zu können. Anstelle der verkauften Einheiten kann auch die Produktionsmenge eines bestimmten Jahres herangezogen werden.

Es gibt zahlreiche Möglichkeiten, um die Zahl der verkauften Produkte mit Umweltzeichen zu bestimmen:

- Am einfachsten und kostengünstigsten ist es, die Lizenznehmer nach Daten zu fragen. Hierbei sind die folgenden Daten nützlich:
  - Zahl der verkauften Produkte: Am einfachsten ist es, wenn die Lizenznehmer direkt Informationen zur Anzahl der verkauften Produkte (oder der Produktionsmenge) bereitstellen. Hier müssen die Daten der verschiedenen Lizenznehmer einfach summiert werden, um so die Gesamtzahl der verkauften Produkte in einer bestimmten Produktgruppe zu erhalten, siehe die folgende Formel.

$$\text{Gesamtzahl der verkauften Produkte} = \sum \text{Zahl der verkauften Produkte (alle Lizenznehmer)}$$

  - Umsatz: Wenn die Lizenzinhaber Daten zu dem Umsatz bereitstellen, den sie mit ihren Produkten mit Umweltzeichen in einer bestimmten Produktgruppe erzielen, dann können diese Angaben mithilfe des Durchschnittspreises pro Produkt in die Zahl der verkauften Produkte umgerechnet werden. Der Durchschnittspreis pro Produkt kann dabei beim Lizenznehmer erfragt werden. Wenn solche Daten von den Lizenzinhabern nicht bereitgestellt werden, dann können die Durchschnittspreise durch Internetrecherche (vorhandene Studien, Verkaufsportale usw.) ermittelt werden. Die folgenden Formeln geben an, wie die Gesamtzahl der verkauften Produkte berechnet werden kann.

    (1) $$\text{Zahl der verkauften Produkte (Lizenznehmer)} = \frac{\text{Umsatz (Lizenznehmer)}}{\text{Durchschnittspreis pro Produkt}}$$

    (2) $$\text{Gesamtzahl der verkauften Produkte} = \sum \text{Zahl der verkauften Produkte (alle Lizenznehmer)}$$

  - Marktanteil: Wenn die Lizenzinhaber Daten zum Marktanteil bereitstellen, den sie mit ihren Produkten mit Umweltzeichen in einer bestimmten Produktgruppe erzielen, dann können diese Angaben mithilfe von Informationen zur Größe des Gesamtmarkts in die Zahl der verkauften Produkte umgerechnet werden. Solche Daten finden sich in den nationalen Produktions- und Handelsstatistiken.

In Europa zum Beispiel stellt „Prodcom“ Statistiken zur Produktion von Gütern bereit.[41] Der Name leitet sich von dem französischen „PRODuction COMmunautaire“ (Gemeinschaftserzeugung) für Bergbau und Herstellung ab. Die Produkte werden gemäß dem NACE-Code klassifiziert, der

[41] https://ec.europa.eu/eurostat/web/prodcom/overview

Klassifizierung wirtschaftlicher Aktivitäten in der Europäischen Union (EU)[42] (NACE ist abgeleitet von *Nomenclature statistique des activités économiques dans la Communauté européenne*).

Die folgenden Formeln geben an, wie die Gesamtzahl der Produkte berechnet werden kann.

(1) Größe des Gesamtmarkts (betrachtetes Land) = Zahl der produzierten Produkte + Zahl der importierten Produkte − Zahl der exportierten Produkte

(2) Gesamtzahl der verkauften Produkte = Größe des Gesamtmarkts ∗ Marktanteil (Lizenznehmer)

(3) Gesamtzahl der verkauften Produkte = ∑ Zahl der verkauften Produkte (alle Lizenznehmer)

Wenn Daten von Lizenzinhabern erhalten werden, sollten strenge Vertraulichkeitsklauseln in die Verträge aufgenommen werden, in denen die Verwendung der erfassten Daten festgelegt wird (z. B. Grund für die Erfassung, Verwendung der Daten, Tag der Löschung usw.). Die Verwendung der Informationen könnte beispielsweise auf die Berechnung der Umweltentlastungen durch das Umweltzeichen beschränkt werden.

- Eine andere Möglichkeit zur Erhebung von Marktdaten ist der Kauf dieser Daten von Marktforschungsinstitutionen. Je nach Art der Daten kann die Erfassung der Daten hier mehr Zeit erfordern, da die erforderlichen Informationen sehr speziell sein können und zunächst von der Forschungsinstitution erhoben werden müssen. Darüber hinaus kann der Kauf von Marktdaten sehr kostspielig sein.

B.4.5 Berechnung der gesamten Umweltentlastungen pro Produktgruppe

Die Berechnung der gesamten Umweltentlastungen pro Produktgruppe erfolgt schließlich durch das Multiplizieren der Einsparungen pro Produkt mit der Zahl der verkauften Produkte in dem betrachteten Zeitraum:

Gesamteinsparungen= Einsparungen pro Produkt * Zahl der verkauften Produkte (alle Lizenznehmer)

B.5 Teilnehmende Umweltzeichenprogramme und Zeitrahmen der Übung

Die folgenden Umweltzeichenprogramme nahmen an der Übung teil:

- Thai Green Label, Thailand
- Green Mark, Taiwan
- Environmental Choice New Zealand

[42] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Statistical_classification_of_economic_activities_in_the_European_Community_(NACE)

- Blauer Engel, Deutschland
- GreenPro, Indien
- China Environmental Labelling
- Vitality Leaf / Ecological Union, Russland

Table 20 gibt einen Überblick über den Zeitplan der durchgeführten Übung.

Table 20: Zeitplan Aufgabe

Aktivität	Zeitraum	Anmerkungen
Erstellung des methodischen Leitfadens durch das Öko-Institut	März 2019	
1. Schulungswebinar zur „Messung der Umweltleistung von Umweltzeichen“	April 2019	
Auswahl von drei Produktgruppen durch jede teilnehmende Institution	Bis 12. April 2019	Öko-Institut hilft bei Bedarf bei der Ermittlung der Produktgruppen
Die teilnehmenden Institutionen beginnen mit der Messung der Leistung der Umweltzeichen unter Verwendung des methodischen Leitfadens	April – Juni	Öko-Institut hilft im Falle größerer methodischer Probleme per E-Mail
2. Schulungswebinar zur „Messung der Umweltleistung von Umweltzeichen“, einschließlich eines Austauschs der bisher gemachten Erfahrungen	Juni 2019	
Die teilnehmenden Institutionen schließen die Bilanzierung der Umweltentlastung durch Umweltzeichen ab	Juni – September	Öko-Institut hilft im Falle größerer methodischer Probleme per E-Mail
3. Webinar zu den Ergebnissen der Aufgabe + Diskussion rund um die Vorstellung der Ergebnisse während des Jahrestreffens 2019 in China	September 2019	
GEN Jahrestreffen 2019 – Workshop zur „Messung der Umweltleistung von Umweltzeichen“	Oktober 2019	China

Quelle: eigene Zusammenstellung

B.6 Empfohlene Instrumente zur Berechnung der Umweltentlastungen

Es gibt bereits einige Instrumente, mit denen die durch verschiedene alternative Produktarten verursachten Umweltauswirkungen verglichen werden können. Diese Instrumente sind größtenteils im Rahmen des umweltorientierten oder nachhaltigen öffentlichen Beschaffungswesens (GPP, SPP) entstanden und bieten deshalb nicht nur eine Umweltbewertung, sondern auch eine Analyse der Lebenszykluskosten, d. h. der Gesamtkosten für den Erwerb, die Verwendung und den Vertrieb von Produkten für einen bestimmten Akteur, hier meist der Beschaffungsbehörde.

In der folgenden Tabelle werden die verschiedenen Instrumente aufgeführt.

Table 21: Vorhandene Instrumente zum Vergleich der Umweltauswirkungen von Produkten und Dienstleistungen

Name des Instruments	Kurzbeschreibung	Sprache	Quelle
Smart-SPP-Tool	Das Instrument wurde entwickelt, um bei der Berechnung der Lebenszykluskosten (Life Cycle Costs, LCC) und CO2e-Emissionen verschiedener Produkte und Dienstleistungen zu helfen und damit Orientierung beim Treffen von Beschaffungsentscheidungen zu bieten. Entwickelt 2011 vom Öko-Institut und ICLEI im Rahmen des SmartSPP-Projekts, mit Unterstützung durch das Programm Intelligente Energie – Europa	Englisch	http://www.smart-spp.eu
LCC-Tool des UBA	Excelbasiertes Instrument zur Berechnung der Lebenszykluskosten und CO2e-Emissionen verschiedener Alternativen der folgenden Produktgruppen: Computer, Multifunktionsgeräte, Rechenzentren, Monitore, Bodenbeläge, Kühlschränke und Geschirrspülmaschinen. Entwickelt 2015 vom Öko-Institut für das Umweltbundesamt	Deutsch	https://www.umweltbundesamt.de/dokument/berechnungswerkzeug-fuer-lebenszykluskosten
LCC-Tool	Instrument zur Berechnung der Lebenszykluskosten und Umweltauswirkungen (Wirkungskategorien: menschliche Gesundheit, Ökosystem, Ressourcenverfügbarkeit, Klimawandel unter Verwendung der ReCiPe-Methode (siehe www.lcia-recipe.net/))	Englisch	http://ec.europa.eu/environment/gpp/pdf/09_06_2015/Life_cycle_costing_calculation_tool.pdf http://ec.europa.eu/environment/gpp/lcc.htm

Name des Instruments	Kurzbeschreibung	Sprache	Quelle
	für Büro-IT-Bedarf, Innenbeleuchtung, weiße Ware, Verkaufsautomaten, medizinische elektrische Geräte. Entwickelt für die Europäische Kommission, Fertigstellung des Instruments geplant für 2017		
Whole Life Costing + CO2-Tool	Excelbasiertes Instrument zur Berechnung der Gesamtkosten eines Produkts von seinem Kauf bis hin zum Ende seiner Nutzungsdauer. Dazu gehören nicht nur die traditionellen finanziellen Kosten, sondern auch die Menge an CO2, die von diesem Produkt in diesem Zeitraum ausgestoßen wird, sowie die finanziellen Kosten dieser Emissionen (direkt für die Organisation oder für die Gesellschaft als Ganzes). Das Instrument wurde 2008/09 für Beschaf-fungsexperten vom Forum for the Future in Partnerschaft mit dem Fife Council entwickelt (siehe www.forumforthefuture.org).	Englisch	Informationen können über den Lebenszykluskosten-Tool-Picker empfangen werden: https://www.koinno-bmwi.de/informationen/toolbox/detail/lebenszyklus-tool-picker-1/
LCCA-Tool	Tool zur Analyse der Lebenszykluskosten, mit dem die Lebenszyklus-kosten, der Energiever-brauch und die CO2-Emissionen von Produkten berechnet werden können. Entwickelt von ICLEI (Local Governments for Sustainability).	Englisch	Informationen können über den Lebenszykluskosten-Tool-Picker empfangen werden: https://www.koinno-bmwi.de/informationen/toolbox/detail/lebenszyklus-tool-picker-1/

Quelle: eigene Zusammenstellung

B.7 Literaturangaben

Edelen, A.; Ingwersen, W. (2016): Guidance on Data Quality Assessment for Life Cycle Inventory Data. National Risk Management Research Laboratory, U.S. Environmental Protection Agency (ed.). Cincinnati, Ohio, 2016. Online available at https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=321834.

European Parliament and Council (2009): Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast). In: Official Journal of the European Union (L 285), pp. 10–35. Online available at https://eur-lex.europa.eu/legal-content/DE/TXT/?qid=1551880162813&uri=CELEX:32009L0125, last accessed on 6 Mar 2019.

ISO 14040:2009: Environmental management – Life cycle assessment – Principles and frame-work.

ISO 14044:2018: Environmental management – Life cycle assessment – Requirements and guide-lines (+ Amd 1:2017).

Michel, A.; Attali, S.; Bush, E. (2015): Energy efficiency of White Goods in Europe: monitoring the market with sales data, Changes and trends regarding energy efficiency, energy consumption, size and price in the markets of refrigerators, washing machines and tumble driers in the EU, France and Portugal, 2004 to 2014. Supported by ADEME and WWF. Topten International Ser-vices. Topten.eu (ed.). Zürich, 3 Jun 2015, last accessed on 15 Jul 2015.

Möller, M.; Baron, Y.; Manhart, A.; Moch, K.; Köhler, A. R.; Prakash S.; Prieß, R. (2015): Back-ground report for the development of an EMAS Sectoral Reference Document on Best Environmental Management Practice for the Electrical and Electronic Equipment manufacturing sec-tor., Preparatory findings supporting the development of an EMAS Sectoral Reference Document. Öko-Institut e.V. Freiburg, 2015.

Prakash, S.; Antony, F.; Dehoust, G.; Gensch, C.-O.; Graulich, K.; Gsell, M.; Köhler, A.; Schleicher, T.; Stamminger, R. (2016a): Einfluss der Nutzungsdauer von Produkten auf ihre Umwelt-wirkung: Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen „Obsoleszenz". Öko-Institut e.V. und Friedrich-Wilhelm-Universität Bonn im Auftrag des Umweltbun-desamts (ed.). Dessau, 2016.

Prakash, S.; Antony, F.; Graulich, K.; Köhler, A. R.; Liu, R. (2016b): Ökologische und ökonomische Aspekte beim Vergleich von Arbeitsplatzcomputern für den Einsatz in Behörden unter Einbeziehung des Nutzerverhaltens. In collaboration with Schlösser, A.; Proske, M.; Schischke, K.; Stobbe, L. and Zedel, H., 2016.

Prakash, S.; Rüdenauer, I. (2018): Strengthening the international use of type-I eco-labels - Work-ing Paper 2: Measuring the performance of ecolabels, Working Version September 2018. On behalf of the German Environment Agency. Öko-Institut e.V. Freiburg, 2018.

Stobbe, L. (2007): EuP Preparatory Studies “Imaging Equipment” (Lot 4), Final Report on Task 5 “Definition of Base Cases”. Fraunhofer IZM and PE Europe (ed.). Berlin, 12 Nov 2007, last accessed on 11 Mar 2019.

C Interviews with companies

C.1 Interview with Fairphone, 25.05.2018

Participants: Laura Gerritsen (Head of Value Chain Team Fairphone), Inga Hilbert (Öko-Institut)

C.1.1 Cluster 1: Due Diligence

- Due diligence has developed into a widely applied company management tool to address human rights risks in the supply chain of mineral resources, in particular for the so-called 3TGs (tin, tantalum, tungsten and gold). Does your company apply this concept in-line with the relevant OECD Due Diligence Guidance?
  - Yes, Fairphone does apply due diligence in-line with the relevant OECD Due Diligence Guidance.
- If yes, has your company published a due diligence report covering all 5 steps of the due diligence concept?
  - Fairphone has published a lot of reports regarding own supply chain efforts in the past and is focused on complete transparency; so far step 1-4 of the OECD guidance are covered, a report on step 5 is in the pipeline and supposed to be published soon.
- What types raw materials are covered by your company due diligence efforts?
  - Fairphone originally started by supporting / working together with the conflict-free tin initiative (DRC) and addressed the other conflict minerals tantalum (DRC), tungsten (Rwanda) and gold (first Peru, now East Africa, especially Uganda) afterwards; currently Fairphone is expanding the scope to cobalt, lithium, copper, neodymium (rare earths) and plastic.
- In case your company efforts on due diligence stretch beyond 3TGs: How did you identify the raw materials to be covered by your due diligence efforts?
  - The selection of further raw materials is based on a material scoping study[43] Fairphone conducted a few months ago; in this study social and environmental risks regarding the mining of 38 different raw materials are analyzed and used as basis for prioritization (10 materials were identified to be of very high concern); as a second step the possible impact of the ICT sector was evaluated by taking the consumption of the world market into account, which is how Fairphone decided to take further action regarding the above mentioned materials; the material scoping study is freely available and supposed to be used by other institutions as well; currently the Responsible Mineral Initiative and

[43] https://www.fairphone.com/wp-content/uploads/2017/05/MaterialScopingStudy_Feb2017.pdf

different car manufacturers are conducting a similar effort to conduct a prioritization with input from this study.

- The methodology used by Fairphone is very similar to the suggested approach by Öko-Institut; from Fairphones practical experiences this methodology is expedient to identify risks as well as opportunities for improvement (!) and to prioritize due diligence and especially improvement efforts.
- According to Fairphones experiences due diligence on additional materials is pretty difficult and needs to be phased (maybe separate intention from results/ achievements?) as there is no leverage or habit of sharing this info for other materials (even suppliers do not know often).
- Regarding Öko-Institut´s suggestion, to include Risk Assessment (OECD Due Diligence Guidance Step 2) and "in-region" initiatives as future criteria in Ecolabels, Fairphone stresses the importance of "in-region" initiatives, as from their point of view only these result in actual improvements; according to Fairphone, risk assessments alone could negatively affect the situation in mining regions, if sourcing there is only avoided, instead of improving the situation in these regions; When formulating additional criteria for Ecolabels, it should be taken into account that a sole risk assessment does not necessarily lead to improvements but that targeted action should be undertaken to foster improvements in high risk regions.

► Is your company supporting so-called "in-region initiatives" aiming at an improvement of mining on the ground? If yes, can you provide details?

- For tin and tungsten Fairphone has "direct" supply chains for specific components, knowing where the raw materials they use come from.
- Regarding tantalum Fairphone works together with Solutions for Hope.
- Gold was formerly sourced from a Fairtrade mine in Peru, currently Fairphone and other stakeholders[44] (Unicef, Solidaridad, Fairtrade foundation, Philips, Hivos/ Stop child labour) are developing ASM gold improvement programs[45] in East Africa.
- For cobalt and all the above mentioned materials improvement plans are being developed step by step.

► What is your view on attempts to integrate human rights related supply chain due diligence in the criteria of ecolabelling schemes?

- According to Fairphone it is important to broaden the scope beyond conflict minerals.

[44] See: https://www.fairphone.com/en/2017/06/21/fairphone-wants-to-increase-supply-of-fair-gold/

[45] Not fairtrade certified – but continuously improving along similar criteria

- The criteria should be designed in a way, that they do not only trigger bureaucratic due diligence processes, but instead promote action towards sustainable development in the regions (see above).

C.1.2 Cluster 2: Environmental issues

► The Due Diligence concept as developed by OECD focuses on human rights. Does your company also address environmental issues in raw materials supply chains?

- See above, environmental issues are addressed in the material scoping study as well.

► Could your company envisage to conduct something like an environmental risk assessment of raw materials?

- Yes (s.a.).

► Is your company supporting so-called "in-region initiatives" aiming at an improvement of environmental conditions of mining on the ground? If yes, can you provide details?

- Currently the initiatives in the DRC are addressing conflict and severe human rights violations; but according to Fairphone should be broadened to include more social and environmental issues in the future (but this is a development that can only happen step by step).
- The Fairtrade gold initiatives also addresses environmental issues, as for example the use of mercury.

► What is your view on attempts to integrate environment related supply chain due diligence in the criteria of ecolabelling schemes?

- Environmental issues should be addressed, but the same conditions as for human rights due diligence (s.a.) should be applied.

C.1.3 Cluster 3: Other issues

► Does your company consider other means of reducing environmental impacts of raw material production (e.g. use of secondary raw materials, durable/ recyclable product designs)?

- Fairphone is currently working on a strategy to use more secondary raw materials and is trying to find out which shares for different recycled materials are realistic; from their point of view a clear target should be defined.
- In order to improve recyclability, it is necessary to understand what materials different products contain; therefore "material passporting" would be an option.
- Fairphone has the vision to work in a 100% circular economy in the future; but as demand for products and therefore raw materials increases over time, mining of primary

raw materials will still play a role (and therefore the urgency to keep improving the mining sector simultaneous to growing recycled supply).

- Furthermore, longevity is a focus of Fairphone (participating initiative iFixit[46]); there is a suitable guideline by the EU commission concerning the repairability of products[47].

► If yes, what means do you see to integrate related criteria in ecolabelling schemes?

- Repairability guidelines could be included.
- Transparancy could be rewarded (on material composition/ material heatmaps).
- Transparency in demand for inclusion of recycled materials in supply chains (or at other levels in the supply chain such as the refiner level); promote publication of recycled vs mined share companies use.

► What recommendations can you give to ecolabels aiming at integrating social and environmental issues of raw material production?

- See above: focus on practical impact, reduction of bureaucratic burden.

C.2 Interview with HP, 05.07.2018

Participants: Siegfried Dewaldt (Sustainability Manager & RBA Lead Auditor, HP Inc.), Inga Hilbert (Öko-Institut)

Important notice: Since 2015 there are two independent companies: Hewlett Packard Enterprise and HP Inc.; information shared during the interview apply for HP Inc.

C.2.1 Cluster 1: Due Diligence

► Due diligence has developed into a widely applied company management tool to address human rights risks in the supply chain of mineral resources, in particular for the so-called 3TGs (tin, tantalum, tungsten and gold). Does your company apply this concept in-line with the relevant OECD Due Diligence Guidance?

- Yes, Due Diligence is applied according to OECD Due Diligence Guidance; HP representatives regularly participate corresponding OECD conferences (see below).
- HP has a supplier code of conduct, which addresses social and ecological aspects, health & safety and ethical aspects as well as related management systems aspects; this code of conduct is based on the RBA standard (see below).

► If yes, has your company published a due diligence report covering all 5 steps of the due diligence concept?

[46] https://de.ifixit.com/

[47] http://ec.europa.eu/growth/tools-databases/mandates/index.cfm?fuseaction=select_attachments.download&doc_id=1611

- Yes, the sustainability impact report (Nachhaltigkeitsbericht) of HP does contain the documentation of all due diligence steps suggested in the OECD guideline[48]. Also, specific to 3TG, HP publishes information about OECD-aligned due diligence in a Conflict Mineral Report [http://www8.hp.com/us/en/pdf/sustainability/conflictminerals.pdf – but this is reference/linked to in the SIR].

► What types raw materials are covered by your company due diligence efforts?

- HP´s due diligence covers the 3TGs (compulsory by Dodd Frank Act) and cobalt.

► In case your company efforts on due diligence stretch beyond 3TGs: How did you identify the raw materials to be covered by your due diligence efforts?

- HP's risk sensing inputs include stakeholders like NGOs, governments, and industry associations, credible 3rd-party reports, etc. For example, due diligence efforts concerning cobalt were included in 2016. The focus is on consistent respect of human rights (e.g. elimination of child labor). Cobalt was chosen based on publicly available reports about frequent violations of human rights in the cobalt supply chain and on the cooperation with NGOs.

► Is your company supporting so-called "in-region initiatives" aiming at an improvement of mining on the ground? If yes, can you provide details?

- Yes, HP is active in following initiatives ("on the ground"):
  - Indonesia Tin Working Group[49];
  - KEMET Partnership for Social and Economic Sustainability[50];
  - Public-Private Alliance for Responsible Minerals Trade[51];
  - Responsible Business Alliance (RBA)[52];
  - Responsible Sourcing Network (RSN)[53];
  - Solutions for Hope[54];
  - Responsible Minerals Initiative (RMI)[55];
  - European Partnership for Responsible Mineral Sourcing (EPRM).

[48] https://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c05968415

[49] http://www.responsiblemineralsinitiative.org/emerging-risks/indonesia-tin-working-group/

[50] http://www.kemet.com/conflictfree

[51] http://www.resolv.org/site-ppa/

[52] http://www.responsiblebusiness.org/

[53] https://www.sourcingnetwork.org/minerals/

[54] http://solutions-network.org/site-solutionsforhope/

[55] http://www.responsiblemineralsinitiative.org/

- According to Mr. Dewaldt, RMI is the most powerful and therefore most important initiative, as a lot of companies with significant market power are engaged in the initiative (including big automobile manufacturers).
- the RMI is currently working on implementing an audit standard to check the due diligence in the supply chain of cobalt; according to Mr. Dewaldt, it is very important that standards address the choke point along the supply chain (smelter / refiner) as there any control activities have the biggest effect.

► What is your view on attempts to integrate human rights related supply chain due diligence in the criteria of ecolabelling schemes?

- On the one hand, the integration of human rights issues in the criteria of ecolabelling schemes is evaluated positively for companies, which are already aiming to make their supply chains more sustainable. By the integration in existing schemes their commitment would be rewarded.
- On the other hand, the integration is perceived to be difficult, as ecolabelling schemes address specific products, whereas due diligence efforts along the supply chain are implemented throughout the company. The efforts cannot be allocated to specific products, but instead are a general (quality) feature of the company.

C.2.2 Cluster 2: Environmental issues

► The Due Diligence concept as developed by OECD focuses on human rights. Does your company also address environmental issues in raw materials supply chains?

- Yes, the mentioned supplier code of conduct of HP does also address environmental issues (Are necessary authorizations available? Program for the registration of GHG emissions, etc.); the code of conduct has to be met by all suppliers; HP´s suppliers again have to proof, that their suppliers comply as well (by checking audit protocols etc.); as there are a lot of different suppliers, a risk assessment is carried out in order to identified the ones who represent the highest risk in the company´s supply chain (the risk is evaluated by the supplier´s location, products, used chemicals, historic noncompliance, etc.).

► Could your company envisage to conduct something like an environmental risk assessment of raw materials?

- Currently HP is listing forbidden materials via GSE (General Specification for the Environment)[56]; an environmental risk assessment for materials, which are not forbidden, is not known.
- Furthermore, HP is promoting a Risk Readiness Assessment which got developed by the RMI. “The Risk Readiness Assessment (RRA) is a voluntary self-assessment and self-

[56] http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c05998906

reporting tool for minerals and metals producers and processors to communicate their environmental, social and governance practices and performance."[57]

- The application of an environmental risk assessment tool (as for example developed in the ÖkoRess project[58]) is evaluated positively by Mr. Dewaldt. The practical application within HP would have to be reviewed on the international level of the company.

► Is your company supporting so-called "in-region initiatives" aiming at an improvement of environmental conditions of mining on the ground? If yes, can you provide details?

- The HP code of conduct is based on the RBA standard; RBA addresses environmental risks as well. In-region initiatives are a possible measure (in regard to continued improvement), but not explicitly asked for.

► What is your view on attempts to integrate environment related supply chain due diligence in the criteria of ecolabelling schemes?

- See above (integration of social issues).

C.2.3 Cluster 3: Other issues

► Does your company consider other means of reducing environmental impacts of raw material production (e.g. use of secondary raw materials, durable/ recyclable product designs)?

- HP uses „Design for the environment" as a standard; this includes materials innovation, energy efficiency, product-as-a-service, durability and reparability as well as end-of-service options.

- Furthermore, some of the sold products are produced from recycled materials, for example (toner) cartridges; currently HP sells the first desk top printer which contains recycled materials.

- (Obligatory) take-back-systems could also decrease negative environmental and social issues; HP currently has an own take-back system for cartridges as well as for IT hardware.

- The use of 3D printers could revolutionize the system by increasing the reparability significantly (no criterion).

► If yes, what means do you see to integrate related criteria in ecolabelling schemes?

[57] http://www.responsiblemineralsinitiative.org/media/docs/RRA/RRA_Methodology_Summary.pdf

[58] https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2017-09-28_texte_87-2017_Ökoress_summary_2.pdf

- In general, this would be desirable; according to Mr. Dewaldt in practice it might be difficult to develop suitable criteria for single product groups (like they are available on the website "iFixit"[59]), as the details would have to be rather specific.
- General criteria (e.g. the repair should be possible using standard tools) seem to be more suitable.

► What recommendations can you give to ecolabels aiming at integrating social and environmental issues of raw material production?

- Whenever possible ecolabels should not include new sets of criteria but should be based on existing standards and initiatives (otherwise the bureaucratic burden might out weight the benefits).
- Ecolabels should encourage companies to constantly work on the improvement of their supply chains; maybe a criterion could support this constant improvement process.

[59] https://de.ifixit.com/

D Questionnaire - "Status quo of the measurement of the performance of selected type-I ecolabels"

This questionnaire is based on following documents and discussions on the topic of measuring the performance of ecolabels within the project "Strengthening the international use of type-I ecolabels" of the German Environment Agency (UBA)

- Working Paper 2: Measuring the performance of ecolabels. Author: Siddharth Prakash
- 1st Telephone conference of the Working Group 2, 25.01.2018
- Minutes of the 1st Telephone conference of the Working Group 2, 25.01.2018 (sent by email 29.01.2018, Siddharth Prakash)

Goal of this survey/data collection: to analysis the status quo of the identified main challenges within the ecolabelling schemes which participate in the working group 2 "Measuring the performance of ecolabels" and to prepare a draft version of possible strategies to overcome the addressed challenges:

The concept and data collection templates below involve four areas:

1. Approaches for reporting on key indicators (for a selected sample of product groups),
2. Methods for collecting the information on market share,
3. Methods and approaches for estimating the indirect benefits of ecolabels (e.g. in public procurement),
4. Methods for calculating the environmental benefits

Contact data

These data will not be shared or used for any other purpose than to contact you in the case of questions of understanding

Your company name:	
Your name:	
Your e-mail address:	
Your direct dialing:	

D.1 Approaches for reporting on key indicators

Please describe your approach for reporting on key indicators of your ecolabelling scheme for following product group categories:

- paints and varnishes
- paper
- furniture.

Please see following example from the EU-Ecolabel that could help you in describing your reporting approach (see Table 22):

D.1.1 Counting EU-Ecolabel licences

1 EU-Ecolabel license for 1 Product Group and 1 Producer

- Only one EU-Ecolabel license shall be granted for each product group and producer (independently of the number of production sites).
- If a new application for the same product group and producer is made, the same license number shall be issued (even if the number of products increases).
- For the same product (from the point of view of formulation/composition, design, etc.), a retailer can request a new EU-Ecolabel license in order to offer an EU-Ecolabel product of its own brand. In this case, a separate application needs to be presented.
- The EU-Ecolabel license is issued to a legal entity, which can be a manufacturer, importer, distributor or retailer. Each time a legal entity obtains an EU-Ecolabel license for another product group (e.g., for tissue paper as well as for copying and graphic paper), then this new license shall be counted separately.

D.1.2 Counting EU-Ecolabel products

The principles to be applied for all product groups are:

- If the product is marketed under two or more different commercial names/brands, then each of them is counted as a separate product.
- When the same product is sold with slightly different names (due to e.g. translation to "x" national languages of the country where the product is placed on the market), then "x" products shall be reported.
- When the same product is sold with the same name, but the information given on the label is translated into "x" national languages of the country where the product is placed on the market, then "x" products shall be reported.
- When a retailer applies for the EU-Ecolabel in respect of a product already holding an EU-Ecolabel license, but with another commercial name/brand, then those products will be counted separately.

Table 22: Example of the approach to report statistical information for EU-Ecolabel products & services

Product Group	Volume/Size	Colour	Shape / Design / Model	Packaging Design	Commercial Name/Brand	Other Features	Example
Indoor paints and varnishes Outdoor paints and varnishes	X	X (Number of tints referred in the application)			X		2 different volumes of 3 different tints each (6 products) For ‚tinting systems', 20 tints and 3 different bases (60 products)
Newsprint paper	X	X			X	Glossy/ matt, grammage	2 sizes of 2 colours in 2 different finishes (8 products)
Printed paper					X		2 commercial names with a monthly periodicity (24 products/year)
Copy and graphic paper	X	X			X		2 different sizes in 2 different grammages and 2 different finishes (8 products)
Tissue paper	X	X			X		2 different sizes in 2 different colours (4 products)
Wooden furniture	X	X	X		X		2 different sizes in 2 different colours and 2 different models (8 products)

Source: European Commission, Directorate-General for Environment; e-mail from Susanne Heutling, 25.01.2018

D.2 Questions on approaches for reporting on key indicators

► Is your approach similar to that of the EU-Ecolabel?

Answer:

► If your approach is not same as that of the EU-Ecolabel, please describe in detail your approach for counting the number of licenses for your ecolabelling scheme

Answer:

► Please give examples for counting the number of licenses for the following product groups

- Paints & varnishes

Answer:

- Paper[60]

Answer:

- Furniture[61]

Answer:

► Please describe your approach for counting the number of products for your ecolabelling scheme. How are "*products*" defined under your ecolabelling scheme?

Answer:

► Please give examples for counting the number of products for the following product groups

- Paints & varnishes

If available, please insert a table or refer to and attach a corresponding document to your reply mail.
Otherwise, please answer in words

Answer:

[60] If applicable, you may give examples of few sub-product groups that you define within the product group paper. In doing so, please add the definition of different sub-product groups.

[61] If applicable, you may give examples of few sub-product groups that you define within the product group furniture. In doing so, please add the definition of different sub-product groups.

- Paper

If available, please insert a table or refer to and attach a corresponding document to your reply mail.
Otherwise, please answer in words

Answer:

- Furniture

If available, please insert a table or refer to and attach a corresponding document to your reply mail.
Otherwise, please answer in words

Answer:

► Please describe your approach for counting the number of license holders for your eco-labelling scheme. Please explain and describe how you count the license holders, if the ecolabelled products from one manufacturer are traded under different product names by different trading companies.

Answer:

► Please give examples for counting the number of license holders for the following product groups

- Paints & varnishes

Answer:

- Paper

Answer:

- Furniture

Answer:

► Which kind of data do you report to GEN?

Answer:

D.3 Questions of methods for collecting the information on market share

► Do you estimate market shares of ecolabelled products of selected product groups [yes/no]?

Answer:

► If no, please list the reasons for not estimating the market shares

Answer:

► If yes, please name the product groups

Answer:

► Please describe briefly the method used for collecting the information and data on market share of the abovementioned products

(e.g. by commissioning a market survey, by commissioning a consultant, by using the information provided by producers, by using the information of professional purchasers, others)

Answer:

► Please provide information on the costs of collecting the information and data on market share of the abovementioned products

Answer:

D.4 Questions of methods and approaches for estimating the indirect benefits of ecolabels

► Do you keep track of the use of the criteria of your ecolabelled products in requirements for green public procurement? [yes/no]

Answer:

► If yes, please name the product groups whose criteria is being used in requirements for green public procurement. If no, please provide reasons

Answer:

► Please describe the process of tracking the use of the criteria of your ecolabelled products in requirements for green public procurement

Answer:

- Do you try to evaluate the recognition and trust of the ecolabel among professional purchasers? How do you try to evaluate this aspect, how often do you conduct such an evaluation and what are the associated costs?

Answer:

- Are you aware of any reports/ studies from other ecolabelling schemes that measure and report on the use of ecolabel criteria in public procurement? If yes, please mention the schemes

Answer:

- Please name any other processes in your country that are influenced by the criteria developed by your ecolabelling schemes

(e.g. legal developments, innovation programmes, etc.)

Answer:

- Do you measure and communicate the influence of your scheme on the above named processes? If yes, how?

Answer:

- Do you try to evaluate the recognition and trust of the ecolabel among consumers? If so, how do you try to evaluate this aspect, how often do you conduct such an evaluation and what are the associated costs?

Answer:

D.5 Questions on methods for calculating the environmental benefits

- Do you estimate the environmental benefit of ecolabelled products in individual product groups?

Answer:

- If yes, please name the product groups and briefly describe the used approach

(e.g. by commissioning a consultant, by adapting the results of existing LCA studies to your country situation, others)

Answer:

- Please provide information on the costs of measuring the environmental benefits of ecolabelled products

Answer:

D.6 Other Questions

- Which are the most successful products groups of your scheme (if possible, list at least five most successful product groups)?

Answer:

- On what basis do you consider these product groups to be successful?

Answer:

- Please name the reasons(s) for the success of these product groups?

Answer:

- Please name the reasons(s) for the success of these product groups?

Answer:

- Please feel free share any further information

Answer:

Thank you very much for your kind support!

Please return this questionnaire (including any possible corresponding document) to

Siddharth Prakash, Senior Researcher, Öko-Institut e.V., Germany **s.prakash@Öko.de**	**Dr. Jenny Teufel, Senior Researcher, Öko-Institut e.V., Germany** **j.teufel@Öko.de**