

The carbon footprint measurement toolkit for the EU Ecolabel

Gian Luca Baldo • Massimo Marino • Marco Montani • Sven-Olof Ryding

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Abstract

Background, aim and scope Established in 1992, the European Union Ecolabel, that is briefly called “the Flower” because of the mark, is a voluntary ecological product award issued by the 1980/2000 Regulation (EC 2000). Adopting the ISO classification, the EU Ecolabel belongs to the “Type I environmental labelling” (ISO 14024:1999). The possibility to include GreenHouse Gases (GHG) emissions (as of CO₂ equivalents) among the EU Ecolabel criteria is a news that is justified to the consideration that, in the last 30 years, their management and limitation assumed a relevant and strategic importance for greenhouse effect control. This paper introduces results of a project for the European Commission that aimed at developing and checking a carbon footprint calculator procedure suitable for the inclusion of the GHG emission issue in the EU Ecolabel criteria. The output tool is primarily aimed at the policy maker, i.e. the European Commission, the European Union Ecolabel Board and the

Ad Hoc Working Group (AHWG, created to develop a transparent and wide discussion with reference stakeholders, see Fig. 2 for more details), but, in this step, not directly to the applicant yet.

Materials and methods The project structure followed four main tasks: (1) a preliminary desk top research, (2) the toolkit development, (3) the organisation of workshops and (4) diffusion and dissemination activities. A number of dissemination activities has been carried out, such as participation in key events in order to present the project and preliminary results, consultations with key stakeholders to get their opinions and input to the project work, issuing newsletters, setting up an ad hoc website with on-line consultation services and the organisation of a European-wide workshop.

Results, discussion and conclusions The main outcomes of the project can be summarised in the availability of a simple, flexible Excel-based preliminary tool, which gives the possibility of a multilevel interpretation of the results for the different environmental parameters used, and in the definition of rules in order to provide the most suitable and scientifically correct approach that should be considered in general for the inclusion of carbon footprint criteria in the EU Ecolabel. The output tool has the unique scope to provide a basis for the AHWG in case the decision to include carbon footprint during the product group (PG) development criteria process is taken; the CO₂ figures that are provided in the database have the intention to support the execution of the five examples that are presented and included in the Excel file; it is a precise responsibility of the AHWG to verify/update/implement the data for the carbon footprint calculation of any PG under study. The dissemination activities have brought to some important decisions related to the possible use of the carbon footprint approach concerning the ‘EU Flower’ marketing and communication strategies.

Responsible editor: Matthias Finkbeiner

For the European Commission, the contact is: Mr. Benjamin Caspar, The European Commission, DG ENV/G2/EU Ecolabel, 1160 Brussels, Belgium; Benjamin.CASPAR@ec.europa.eu

Important note This paper describes the results of a project that considers the inclusion of carbon footprint in the EU Ecolabel and does not imply any definitive policy undertaking by the European Commission.

G. L. Baldo (✉) • M. Marino • M. Montani
Life Cycle Engineering (Studio LCE),
Via Livorno 60 c/o Environment Park,
10144 Torino, Italy
e-mail: info@studiolce.it

S.-O. Ryding
Swedish Environmental Management Council—SEMCo,
111 20 Stockholm, Sweden
e-mail: sven-olof@miljostyrning.se

Recommendations and perspectives The application of the life cycle thinking approach by means of the LCA methodology must always be strictly linked to the specific system (product group) under investigation. This means that the adaption of the rules and a creation of specific ‘calculation tool’ for certain product groups should be implemented during any process of criteria development or revision, where and if will be possible to define specific hurdles on carbon footprint.

Keywords European Ecolabel · Carbon footprint · CO₂ emissions

1 Background, aim and scope

The European Ecolabel is a voluntary market tool that promotes the environmental excellence of products and services at European level/scale by means of the 1980/2000 Regulation of the European Parliament (European Commission 2000). The EU Ecolabel is administered by the *European Ecolabelling Board* (EUEB) and receives the support of the European Commission, all Member States of the European Union and the European Economic Area. The Ecolabelling Board includes representatives such as industry, environment protection groups and consumer organisations. There are currently 23 different product groups (PGs), and already more than 250 licences have been awarded for several hundred products (www.eco-label.com).

According to ISO 14020 classification (ISO 14020:2000), the European Ecolabel belongs to the “Type I environmental labelling” (ISO 14024 1999), and it promotes the excellence of products through exclusion hurdle respect specifically developed for each PG.

Even if carbon footprinting (CF) may appear fashionable, not all that glitters is gold (Finkbeiner 2009). At the same time, it is important to recognise that a spread interest and market demand for such a calculation tool is real and that there is a growing number of international, national and sectorial initiatives underway to deal with CF.

In this scenario, the “EU Ecolabel—the Carbon Footprint Measurement Toolkit” (Service Contract N. 070307/220/486031/SER/G2) aimed at providing the Commission with a (software) toolkit suitable for the carbon footprint measurement (calculation) taking into account the consideration of the EU Ecolabel (‘the Flower’) regarding the possible inclusion of the carbon issue in the criteria development processes (European Commission 2008).

The project was developed by the European Commission (EC), DG ENV—“Ecolabel Unit” with the technical support of Life Cycle Engineering (LCE, the contractor) and the Swedish Environmental Management Council

(SEMCo, the sub-contractor). A brief description of the activities undertaken throughout the project and of the main results is now available; additional information and the official final deliverables can be found in the following sites:

1. The project mini-site: <http://www.msr.se/en/About-us/Projects/Project-carbon-footprint/>
2. The official EU Ecolabel website: http://ec.europa.eu/environment/ecolabel/carbon_en.htm

2 Materials and methods

The carbon footprint is the overall amount of carbon dioxide (CO₂) and other greenhouse gas (GHG) emissions (such as methane) associated with a product¹ along its supply chain, which includes its use phase as well as product end-of-life management. The CF is measured by converting all the GHG emissions to an aggregated value of ‘CO₂-equivalent’ (that represents the global warming potential—GWP)², thereby providing a value for the share that the product in question contributes to climate change.

The work was performed by means of four main tasks:

1. Literature review
2. Toolkit development
3. Expert and stakeholder consultation
4. Diffusion and dissemination

2.1 Task 1, literature review

Carbon footprint measurement methodologies can be classified into three different main groups:

- *General guidelines*, such as ISO standards, that represent the normative standard references for CO₂ calculation. Other standards may also be considered (for example, ISO 14040 for life cycle assessment (LCA) reference)
- *Specific guidelines*, such as PAS³ 2050, that contain ad hoc indication on GHG calculation and monitoring; the UNEP/SETAC Life-Cycle-Initiative with a project on CF can be included in this group as well

¹ ISO 14040 defines the term ‘product’ as both ‘goods’ (e.g. consumer goods, intermediate goods) and ‘services’ (even complex services like events, conferences and exhibitions).

² Any gaseous emission that is believed to contribute to global warming is assigned a value equal to the equivalent amount of CO₂ that would be needed to produce the same effect. Multiplying each gaseous emission by its CO₂ equivalent allows the separate effects of the different emissions to be summed to give an overall global warming potential parameter.

³ Public Available Specification made by British Standards (BSI 2008)

- *Calculation tools* that are aimed at calculating CO₂ emissions of specific activities (such as transportation or consumer behaviour)

Another specific group includes the CO₂ offset providers which calculate GHG emissions to air by employing the LCA approach and thereby turning the amount of CO₂ equivalents into a global carbon trade.

However, a customised calculation tool readily suitable for Ecolabel purposes is lacking. Certain tools may prove useful for toolkit implementation in various sections. A few examples are:

- PAS 2050 for the general rules (BSI 2008; Sinden 2009; Minx et al. 2007)
- GHG Protocol and Emission Trading Scheme for conversion factors (WRI 2004)

A specific life cycle CO₂ calculation toolkit has therefore been developed with an associated technical background manual.

2.2 Task 2, measurement toolkit development

2.3 The CF of a product to be ecolabelled can be described as the sum of two main types of GHG emissions

- *Direct/primary footprint*: mainly due to the combustion of fuels in the applicant plant and during the electricity generation⁴
- *Indirect/secondary footprint*: GHG generated from all the other sources

The measurement toolkit development followed the LCA approach, given that direct/indirect emissions to air measurement is a typical matter of the LCA methodology. The toolkit incorporated all standard procedures in compliance with existing international references and guidelines.

The Excel-based project output should be considered as a ‘starting basic version’ which can easily be modified/improved by the process of product group (PG) criteria development/revision.

The toolkit includes an exemplificative database, thereby providing the possibility for further development and integration by taking into account any new information available: i.e. new Life Cycle Data System (ILCD) Data Network (<http://lca.jrc.ec.europa.eu>), availability of a recent LCA study on a new PG, a more reliable data, etc. In other words, when a PG’ criteria development/revision process is going on, the Ad Hoc Working Group (AHWG), that is created to guide a transparent and wide discussion with reference stakeholders, is in charge to verify/update/implement and, finally, validate any single figure of the database in order to calculate the most reliable carbon footprint as additional criteria for the PG under study.

⁴ Even if electricity itself is not responsible for on-site emissions to air, here it is classified as a direct contributor.

The calculation tool delivered by this project operates with a selected number of Excel sheets with the goal of supporting the execution of five examples, based on:

- Readily and publicly available LCA data
- Production system technical knowledge
- The awareness that it is neither reasonable nor feasible to apply the toolkit to all production processes and product groups

Taking a look at the CF calculation, as said above, the combined environmental effect of any system can be expressed by a parameter known as GWP or carbon dioxide equivalent. As usual, the project has adopted the parameter dealing with a 100-year time span, the GWP₁₀₀ for the carbon footprint calculation.

For an example, see Table 1⁵ which includes the following case:

- Product group: “hard floor coverings” (HFC), for internal/external use, without any relevant structural function that includes agglomerated stones, ceramic tiles, clay tiles, concrete paving units, natural stones and terrazzo tiles. At present (2008–2009), this PG is under the revision process (Fig. 1).
- The sub-group that is considered for this example is: “processed fired products”, including clay tiles (defined by CEN 178) and ceramic tiles (defined by CEN/TC 67).

2.4 Task 3, experts and stakeholder consultation

Different consultation activities have been carried out during the project—the arrangement of a European-wide workshop and various diffusion and dissemination activities such as participation in key events to present both the project and the preliminary results; consultations with selected stakeholders to get their views and inputs on the project work; set-up of an ad hoc website with on-line consultation services and issuing of newsletters.

The European Commission arranged a special experts workshop together with the Ispra Joint Research Centre and LCE-SEMCo, with the objective of discussing technical issues related mainly to life cycle assessment, CO₂-calculations and toolkit design.

Sixty selected LCA experts were invited to a workshop on April 14, 2008 at the Joint Research Centre in Ispra, Italy.

An ad hoc questionnaire regarding the main issues related with the project was sent out to the participants prior to the meeting in order to list the key issues to be discussed, including carbon footprint in the EU Ecolabel.

⁵ For further details about the selected PG for this example see also an earlier paper—Baldo et al. 2002—that deals with the first development of Ecolabel criteria for this group.

Table 1 Details for the selected example

Functional unit	1 kg of final product ready to be delivered to the final consumer. Note: the functional unit of mass (kg) is appropriate for use as an eco-profile of the material. For any comparison with other hard floor coverings, this eco-profile has to be related to a functional unit addressing the floor area covered (m ²). In fact, in the first development of the criteria (April 2002) the functional unit was the m ² of finished tiles, but, with the aim of not penalising the present tendency of producing larger format tiles, the unit was now changed to the weight of fired products. This new trend of the ceramic/clay tiles industry has effects on the efficiency of the production processes, especially at the firing stage: larger formats could be not perfectly aligned in the kiln and this may cause a “virtual” increase in the energy consumption, considering a surface unit rather than the mass of the product.
Primary data	All the required data concern the most recent year of production; the “whole annual production” refers to the quantity of final product ready to be sold.
Raw materials	This field in the calculation tool includes the most common raw materials used for the production of the fired hard coverings. Additional raw materials can be eventually added in the tool.
Production processes	Energy consumption associated to the production processes must be included, with reference to the point 4.1 of the criteria document (European Commission 2002); note: the energy requirement for firing in the criteria is expressed in MJ per kg of final product ready to be sold. If the electricity is self-produced, fuels consumption should be added in the right field. The parameter includes the emissions generated by the heat processes at the firing stage and directly produced by the applicant activities. Process emissions should be calculated by using the ETS approach
Use phase	No GHG emissions have to be considered.
End of life	Since the expected average life time of the product is 20 years and over, only the end of life of packaging should be considered. Furthermore, due to most of the processes dealing with the disposal of the HFC and to the product composition itself, no GHG emissions are generated in this phase.

The sub-group “processed fired products” belonging to the “hard floor coverings” PG is here considered. The results of the calculation are given by each phase of the life cycle. The tool then offers further possibilities of results detail (Fig. 1)

2.5 Task 4, diffusion and dissemination

With the aim of obtaining views and feedback from key stakeholders and interested parties in relation to the project, its expected results and its deliverables. The main purpose of these activities was to discuss how to communicate carbon footprint information to consumers, specifically in relation to the incorporation of such information into the EU Ecolabel.

This was based on five different elements:

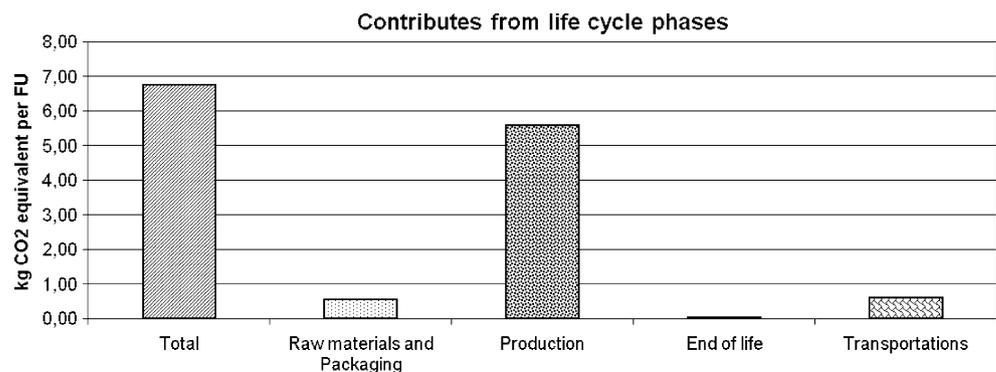
1. A specific web site providing all the necessary project information (such as consultation results, newsletters, etc)
2. Meetings with stakeholders and selected key organisations
3. Enabling internet stakeholder consultations to get feedback on outcome of stakeholder meeting results

4. Participation in EU meeting on the carbon footprint topic with presentations of the project work
5. Issuing and delivering four specific newsletters to over 1,000 stakeholders around the world with information on the project work

3 Results, discussion and conclusions

While the key goal of the project technical aspects dealt with the measurement toolkit implementation, the communication activities aimed at involving the key stakeholders in order to obtain their views and opinions relevant to the project. The latter was considered very important, especially

Fig. 1 Example of how results of the carbon footprint calculation tool are reported by the software. The case refers to the fired hard processed floor coverings, belonging to the Hard Floor Coverings Product Group



from a strategic point of view, to gain consensus, to receive back suggestions and, in perspective, to consolidate the approach to the issue.

The most significant experiences were: the workshop with experts (JRC-ISPRA, 04/14/08), the discussion concerning the strategic role of CO₂ in the Ecolabel within an ad hoc working group (03/04/08, 04/22/08: both encounters in Brussels) and an exchange of ideas with some relevant retailers in Europe (e.g. Tesco, UK and COOP Italia).

Following these consultations, it was possible to group the main topics and various open issues, as follows:

1. Main conclusions of the consultation phase are:

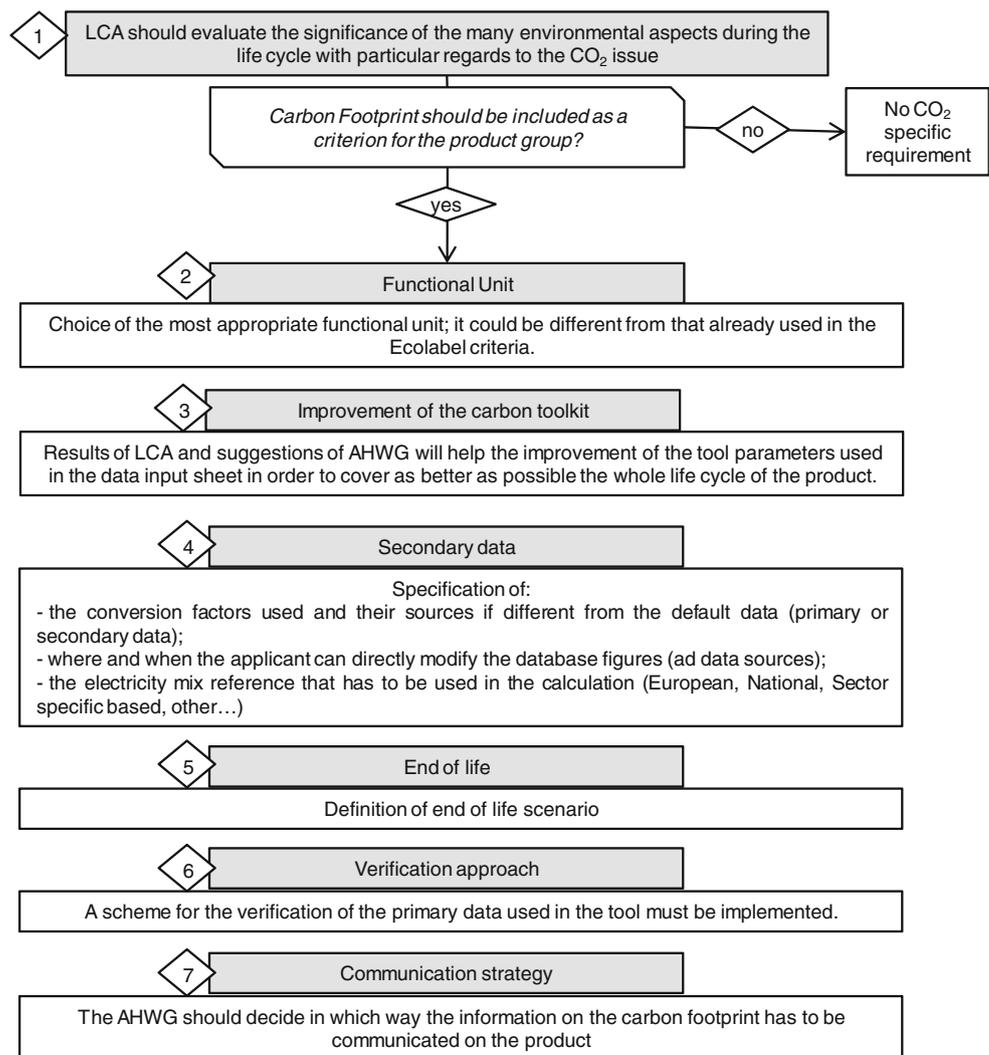
- the Flower may include criteria, with limits on life cycle GHG emissions, as for other specific issues
- carbon footprint criteria should not necessarily, however, be included in all flower product groups: the criteria implementation/revision process should decide on the use of inclusion of a specific carbon

footprint criterion or not at the same time, a figure concerning CO₂ emissions of product life cycle should not be displayed below the flower logo

- applicant participation in offset programmes during the flower procedure should not be considered as reduction of CO₂ emissions
2. Main specific technical aspects that emerged from the consultation phase are:

- biological CO₂ should be considered as both air emission and as carbon credit on the wood-based product
- the CF tool should rely on a specific database; although, the applicant should have the possibility to input their own data as appropriate; in other words, the applicant should have the possibility to input their own data in some cases, where such data can be properly verified
- the specific database should be based on publicly available data. Preference should be given to

Fig. 2 Flow chart of the main important decisions that have to be made during the revision of the EU Ecolabel criteria for the carbon footprint inclusion. Usually, the open-up activities for the development of a new or the revision of an existing product group (PG) deal with the necessity to actively involve all potentially interested parties by knowledge diffusion in order to build a sound team of experts, the so-called Ad Hoc Working Group (AHWG). The AHWG is therefore created in order to develop a transparent and wide discussion with reference stakeholders, concerned manufacturers, consumers and environmental associations at a European level, and has the goal of supporting the criteria definition with technical advice to the whole of the EUEB (European Union Ecolabel Board). This is done by giving regular feedback on work progress to the whole of the EUEB in three or four of their meetings during each PG criteria development



databases meeting the requirements of the ILCD, currently under development and coordinated in Europe by the JRC IES at Ispra. These data sources will include the European Life Cycle Database.

3. Some remaining open issues that should be taken into account by the Ad Hoc Working Group (see Fig. 2 for details) during the specific PG criteria revision are:
 - energy mixes: how to provide the applicant with the possibility to adopt their own country energy mix
 - end of life: how to provide the applicant with the possibility of integrating the carbon footprint calculations by means of end-of-life scenario data

It is clear that toolkit modification (with particular regard to the database content) will need to be left up to the Ecolabel criteria development/revision process to some extent, in accordance to the specific market trend and LCA analysis of the product group under study.

The carbon footprint measurement software produced for this project therefore consists of an open and accessible database as well as a ‘ready to use’ calculation toolkit that looks at the principle carbon impacts with no intention of providing any reference figure for the materials/processes that are cited.

4 Recommendations and perspectives

Since many of the product groups included in the Flower scheme are very different as far as their life cycles are concerned, it would be quite complicated to define a unique tool suitable for all of them at the same time. In other words, the application of the life cycle thinking approach by means of the LCA methodology must always be linked to the specific system (product group) under investigation.

The measurement toolkit that is provided as the main deliverable of this project has the aim of providing a common basis and a reliable tool for making the approach easy for any of the existing product groups. Therefore, during the process of revision/definition of existing/new criteria there will be the

necessity of adding those specific characteristics (such as the above-mentioned remaining open issues) to complete the carbon footprint tool for that specific product.

Finally, a scheme of the decision process that should be made during the revision of the EU Ecolabel criteria to evaluate the possible inclusion of a criterion on carbon footprint is shown in Fig. 2.

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