The 6th International Conference on Life Cycle Management in Gothenburg 2013

RELEVANCE AND UNCERTAINTY OF EPD DATA

Cornelia Stettler and Fredy Dinkel, Carbotech AG, Switzerland.*
Carbotech AG, Postfach, 4000 Basel, Switzerland c.stettler@carbotech.ch

Keywords: EPD, LCA, Relevance; Uncertainty; Transparency.

ABSTRACT

The goal of EPDs is to provide transparent information on relevant ecological impacts over the life cycle of a product or a service. Both criteria, transparency and relevance, are crucial for the use of EPDs and are the backbone for an ecological decision making. Existing EPDs and related PCRs were compared to evaluate if they fulfill the goal to give a sound basis for decision. The following provoking statement arose: "EPDs are often not useful for the decision making." The following reasons for this statement indicate an optimization demand. The relevance of impacts is often not analyzed and documented. Information of low relevance causes a loss of focus. The uncertainty of results is neglected and frequently higher than the ascertained difference between products.

INTRODUCTION

EPDs are today a relevant factor to obtain confidence of clients and have an advertising effect. The original aim of EPD to deliver transparent and relevant information for the comparison and the continuous improvement of products needs to be quality checked to guarantee an adequate use of the elaborated data. From our experience the following problems have to be considered for the improvement of PCRs and EPDs.

Because there is no indication of relevance within the EPD, it must be assumed that all included indicators are ecologically relevant. Consequently all differences between indicators have to be considered in the comparison of products. Often the results viewed separately lead to different conclusions. As a consequence a subjective choice of indicator is inevitable for the decision process. This leads to different conclusions depending from the point of view of the final user.

Every LCA is linked with uncertainties. This is especially important if results based on different data bases are compared. An interesting study on the robustness of CO_2 balances was presented at the 5th PCF world forum (Schmid H. and Kägi T., 2011). The same data on a defined product was evaluated by five leading LCA experts. The results for the GWP showed differences in magnitude up to a factor two. For the interpretation of results uncertainty information is crucial, but often not included in EPDs.

The following analysis was carried out to show the need for further information on the relevance and the uncertainty of impacts provided in EPDs.

MATERIALS AND METHODS

A random sample of registered EPDs on construction materials was tested on their helpfulness for an ecological decision making. The focus was given to construction materials due to the number of publications in this sector. The example of fiberboards was chosen for a detailed analysis. In a first step the declared impacts of products were compared to determine if this information is sufficient to make an ecological choice of product. The results were compared with the corresponding inventory from ecoinvent v2.2 (ecoinvent, 2010). In a second step the selection of indicators was assessed for the analyzed product. To do so the normalization step from CML for Western Europe (Guinée et al., 2001) and different aggregating methods were applied. Impacts were interpreted as emission of the used equivalents.

RESULTS

In the analyzed examples of EPDs impacts are declared mainly for the production of the fiberboards (cradle to gate). In some cases impacts of the end of life treatment are included. Table 1 gives an overview of the impacts provided in the analyzed declarations (see reference list). The corresponding EPDs are published online by IBU[1], EPD® International System and INIES [2]. Further information on the water consumption, waste amount, wood origin, laboratory results and the CO_2 balance are included in most of the EPDs.

Table 1. Ecological information provided in analyzed EPDs of medium density fiberboards

	Indicators provided in analyzed EPDs	**IBU**	**EPD®**	**INIES**
LCA impacts	Primary energy, non-renewable [MJ-eq.]	yes	yes	yes
	Primary energy, renewable [MJ-eq.]	yes	yes	yes
	Greenhouse warming potential [kg CO_2-eq]	yes	yes	yes
	Ozone depleting potential [kg R11-eq]	yes	yes	yes
	Acidification potential [kg SO_2-eq.]	yes	yes	yes
	Eutrophication potential [kg Phospate eq.]	yes	yes	no
	Photochemical oxidation potential [kg ethylene eq.]	yes	yes	yes
	Resources depletion [kg antimon Sb eq.]	no	no	yes

The following evaluations consider the information of the production only (cradle to gate). Data on the end of life treatment included in some of the EPDs is not adequate for the comparison of products for the following reason. An energetic use of biomass with heat and electricity cogeneration is recommended and analyzed, accounting benefits from the replacement of common heat and electricity products. The resulting CO_2 elimination over the life cycle of fiberboards is misleading. The benefits from the use of biomass would also remain if the biomass would be used for other purposes and depend on the location.

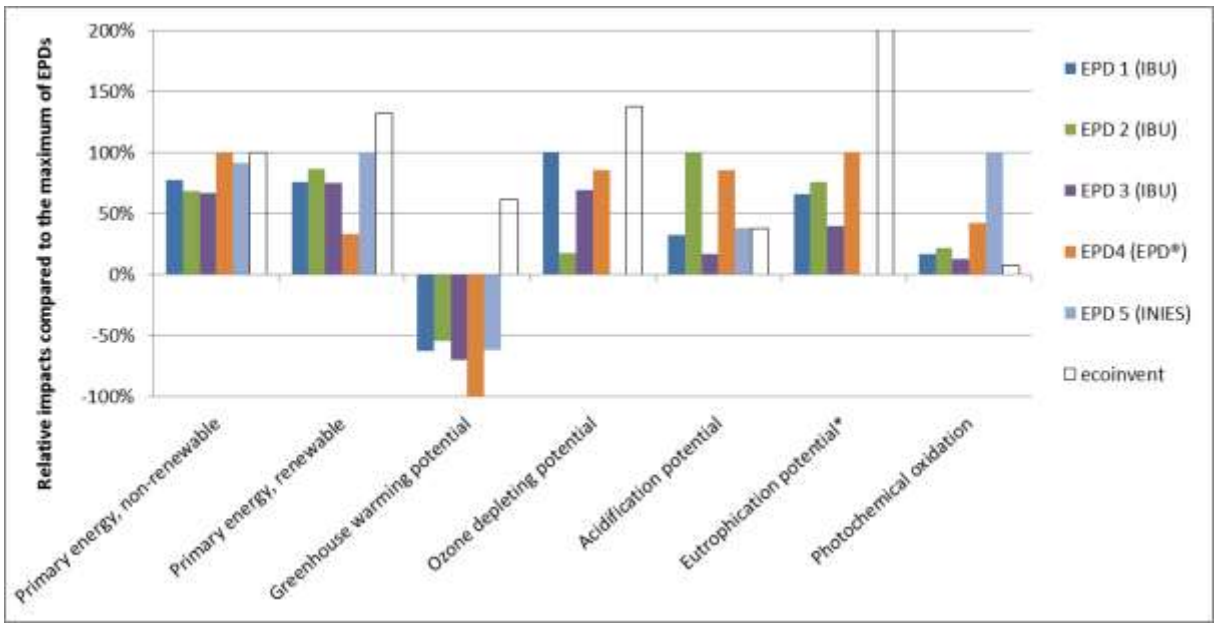
[1] IBU: German Institute Construction and Environment, http://bau-umwelt.de

[2] INIES: Base de données française de référence sur les caractéristiques environnementales et sanitaires des produits de construction, http://www.inies.fr

Comparison of EPD data (cradle to gate)

Figure 1 shows the impacts of the production of medium density fiberboards declared in the selected EPDs. The impacts are illustrated relative to the maximal value of analyzed EPDs. Additionally illustrated are the impacts from the corresponding LCI of ecoinvent.

Figure 1. Comparison of EPD results on the production of fiberboards of medium density (additional illustration of corresponding ecoinvent inventory v2.2, CO_2 uptake not accounted)



* The EPD5 from France does not include the eutrophication potential, but further not illustrated indicators

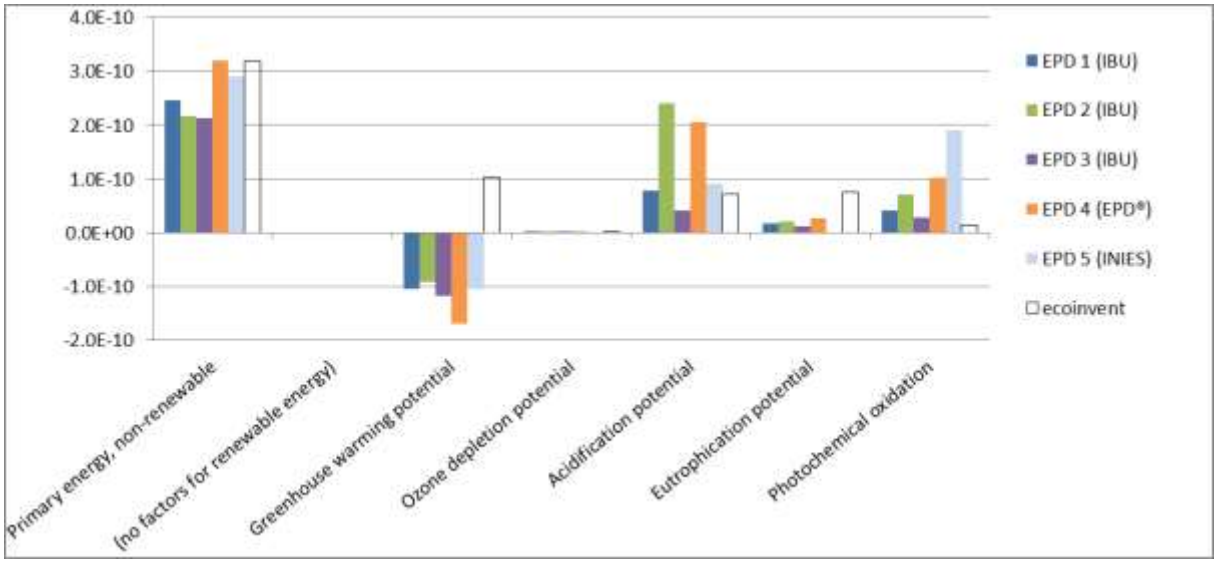
The different impacts do not lead to the same conclusion. An ecological choice of product is not possible without further information on the relevance and uncertainty of different impacts. Regional differences result from the applied land specific electricity supply. Contrary to the ecoinvent data set the short-term storage of CO_2 in biomass is included in all EPDs. For transparency reasons the biogen CO_2 should be declared separately.

Relevance and uncertainty of selected impacts

To assess the relevance of the declared impacts the normalization steps of CML and different aggregating methods were applied. The result illustrated for the normalization step of CML in Figure 2 leads to the conclusion that the primary, non-renewable energy (abiotic depletion) is the most relevant impact, followed by the climate change, acidification, photochemical oxidation and eutrophication. No relevance results for the ozone depletion. Land use, particulate matter formation and toxicity are further relevant aspects if the ecoinvent data set is analyzed with aggregating methods. Those aspects are not covered by the provided impacts in the EPD.

Uncertainty information for the interpretation of the results in figure 1 and 2 is not provided in the EPDs. From our experience lie most of the resulting differences within the uncertainty range.

Figure 2. Relevance of impact categories using the normalization step of CML



DISCUSSION AND CONCLUSIONS

Despite the ample information in EPDs, or perhaps because of the overflow of not relevant data in some EPDs, frequently no objective conclusion can been drawn. Information on the relevance and the uncertainty of provided impacts is desirable for an appropriate use of EPDs. The selection of impacts in the EPDs and PCRs should be quality checked and documented. We recommend for the relevance analysis the additional use of at least the normalization step or better full aggregating methods. The aggregation is excluded under ISO 14250, but more coherent and transparent than the subjective judgment by the final user. The weighting of impacts as an optional step that may support the interpretation of results is also included in the draft for the product environmental footprint guide (European Commission, 2013).

REFERENCES

Ecoinvent (2010). Ecoinvent Data v2.2, Swiss Center for Life Cycle Inventories, Dübendorf

EPD® (2010). Environmental products declaration for plain medium density fibreboards (MDF) and for melamine-coated medium density fibreboards *(EPD 237, FINSA Spain)*

European Commission (2013). Annex II: Product environmental footprint (PEF) Guide (*draft, xxx*)

INIES (2009). Déclaration environnementale et sanitaire conforme à la norme NF P 01-010, Panneau MDF Standard ou Panneau de fibres standard obtenues par voie sèche. (*N° d'enregistrement 05-019)*

IBU (2012/2013). Umwelt-Produktdeklaration nach ISO 14025, DHF/DFF Holzfaserplatte *(EPD-EHW-2008611-D),* AGEPAN® Holzfaserplatte *(EPD-GLU-2010111-D),* Kronotec WP50 *(EPD-KRO-2012311-D)*

Guinée et al. (2001). Handbook on life cycle assessment. Operational guide to the ISO standards (*Kluwer Academic Publishers, ISBN 1-4020-0228-9, Dordrecht, 2002, 692 pp.*")

Schmid H. and Kägi T. (2011): Robustness in Carbon Footprint Results: Evidence and Recommendations from a Comparative Study of Beer (*5th PCF World Summit, Zurich, 7-8 April 2011*)