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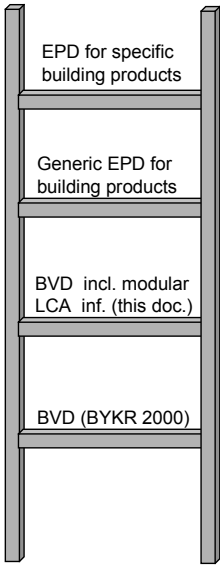
Complementary rules for introducing modular LCA data into the Swedish Building Product Declaration system

Kompletterande regler för införande av modulära LCA-data i det svenska systemet för byggvarudeklarationer (BVD)



Consultation report to the Ecocycle Council for the Building Sector's (BYKR) Building Product Declaration Committee

Martin Erlandsson

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Complementary rules for introducing LCA data into the Swedish Building Product Declaration System.
Kompletterande regler för införande av LCA-data i det svenska systemet för byggvarudeklarationer (BVD)

Sammanfattning/Summary

På den svenska marknaden finns det en ambition att samtliga byggprodukter skall dokumenteras med en "byggvarudeklaration" (BVD). En mall till denna BVD är framtagen av Byggsektorns Kretsloppsråd (BYKR 2000) och är nu över översyn. Föreliggande rapport är skriven som ett förslag på regler som borde finnas när livscykelanalys/LCA-information ingår i en BVD. Rapporten kommer överarbetas 2005 inom ramen för ett samarbete mellan BYKR och IVL. Grundkonceptet utgår ifrån är att det även i fortsättningen skall vara frivilligt att lämna LCA-information i en BVD, men om detta görs så skall de regler som tagits fram här följas, eller snarare reviderade sådana. De regler som saknas i byggvarudeklarationsmallen bör utgå ifrån kommande ISO standarden ISO 14025, samt det regelverk för byggvarudeklarationer kommer utarbetas av CEN.

Rapporten är finansierad av Naturvårdsverket, SBUF och Cementa. Raporten ingår som en del av vidareutveckling av systemet "*Hållbara Byggnader*", i syfte att starta en process för metodsamordning av inventeringsdata bland de nationella LCA-baserade systemen inom bygg- och fastighetsrelaterade. Ett sådant systemet som bl.a. använder LCA-metodik är "*Hållbara Byggnader", som är ett generellt* hjälpmedel att ställa miljö- och komfortrelaterade krav på och att klassificera olika byggnader. Miljökraven är uppdelade i resursbehovskrav, egenskapskrav och påverkanskrav (dvs LCA-baserade). Systemet finns beskrivet i ett antal rapporter som finns gratis tillgängliga på www.ivl.se/rapporter/ eller samlade på www.ivl.se/affar/foretagens_miljo_arb/funktionskrav_byggnader.asp.

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Foreword

Ecocycle Council for the Building Sector (BYKR) is the sector's common organisation on environmental issues in order to contribute to a sustainable future society. BYKR was found in 1997 to organise and facilitate contacts with the Ecocycle Commission concerning producer responsibility in the building and property sector. The Council organised itself into four single-interest groups, representing developers and property owners; architects and consultants; the building industry (i.e. entrepreneurs); and the building materials industry. The groups comprise representatives of around 40 organisations and companies. This Council collaboration is a unique forum that continues its work in environmental areas where a common, industry-wide interest exists.

In 1996 the Council established a "Building product declaration" (BVD) that was revised in 2000 that now is has become the national de fact standard within the sector. The objective is that the building product declarations shall be utilised as main information source concerning life cycle related issues of building products in business to business relations. This market based work concern about 45,000 to 50,000 different building products. The work to supply declarations for all these will take a long time and is a very substantial project for the building materials industry. So far about 5000 building product declarations (BVD) are on the market and cover the most frequent utilised building products.

Building products affect the environment and the consumption of resources at many stages, and environmental impact should be viewed against the backdrop of the benefit provided by the product over its entire life cycle. As a result, the Council will now start the process to voluntary integrate life cycle assessment (LCA) within the sector's building product declaration (BVD). This development will facilitate the possibility with a scientific found LCA methodology to compare individual products, composite products and whole building or construction systems in a justified way in a possible forthcoming work to comply with international standards for environmental declarations for building products.

This Consultation report to the 'Building product declaration Committee' is developed with the attempt to introduce LCA data into the Swedish Building Product Declaration system. The consultation report is now available for a public remittance, where all kind of comments and suggestions are welcomed. It should be noticed that this report is not supported by the Council, but will be regarded in the over all revision of the 'Building product declaration'.

Comments to the reports can be addressed to its editor via e-mail: martin.erlandsson@ivl.se.

Stockholm February 2004

Martin Erlandsson

1 Introduction

The objective with this document is to describe and specify the rules when introducing applicable data for life cycle assessments (LCA) in the Swedish Building Product Declaration (abbreviated in Swedish as "BVD") system. These rules are set up in accordance with existing ISO standards for LCA as a supplement to the general guidelines for Building Product Declaration (BVD) from the Ecocycle Council for the Building Sector (BYKR), where the current guidelines from 2000 are under revision. The current "BVD regulations" do not include any inventory rules or specifications that makes it possible to assess the content and the quality of the reported figures.

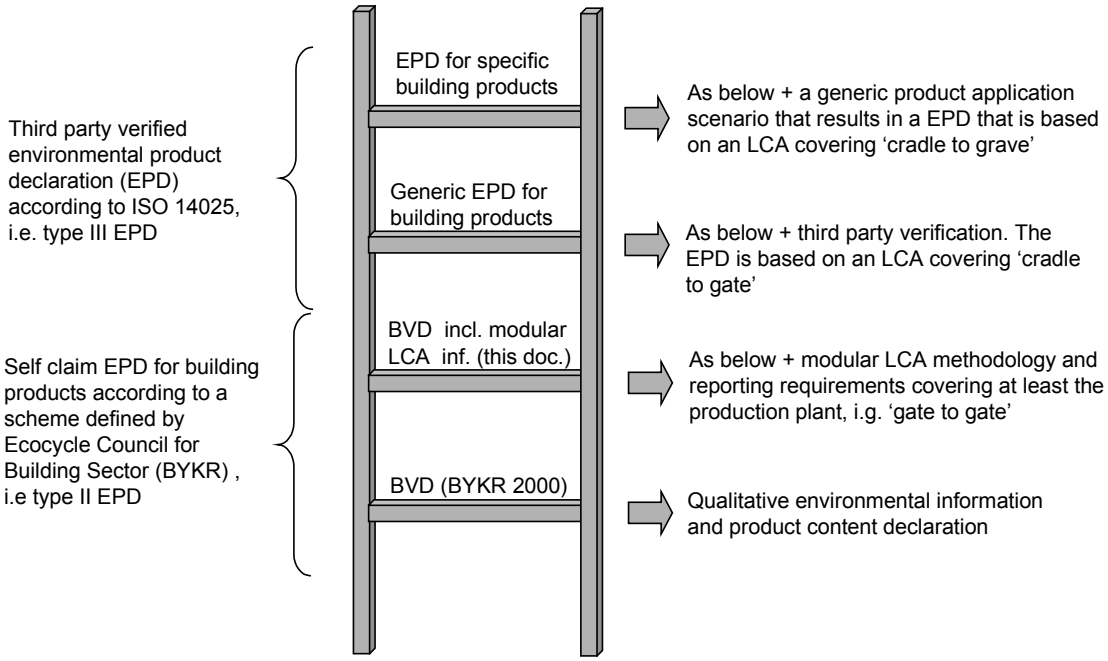

Figure 1 The modular structure suggested in order to achieve a harmonised set of standards that allow for a stepwise work to increase the ambition with the Building Product Declaration (BVD).

The rules developed here shall be regarded as a complement to the current BVD regulations (BYKR 2000) and *it is recommended that these rules be applied*, see Figure 1, *if a company wishes to include environmental information based on LCA in the Building Product Declaration (BVD).* The rules are intended to harmonise the applied methodological settings that allow a stepwise work to increase the ambition and add further information, making a type III declaration possible (see Figure 1). However, it shall be pointed out that the inclusion of environmental information based on LCA in a BVD will continue to be an optional element in the future. With these complementary rules developed here it is the intention that a BVD shall remain simple to fill out and

shall de facto be regarded as a mandatory information for all building products utilised on the Swedish market.

2 Applied standards

This document covers the relevant common procedures and specification for calculation, documentation and reporting LCA data to be a part of a Building Product Declaration (BVD). This implies to a qualitative life cycle boundary covering 'from cradle to gate' or (at a minimum) only the final manufacturing step from the building product producer's own manufacturing plant.

The LCA practitioner has to provide life cycle inventory data that fits into the context of different methodologies settings, why it is important that the applied methodology take this into account. In this respect, it is desirable that the aimed LCI data specifications described here also will be applicable in other environmental analysis-based systems. The following order of standards shall be followed when the LCA for the declaration is performed:

1) This document
2) ISO 14040-43[1]. Environmental management – Life cycle assessment –
   - /Principles and framework
   - /Goal and scope definition and inventory analysis
   - /Life cycle impact assessment
   - /Life cycle interpretation
3) ISO 14025. Environmental labels and declarations —Type III environmental declarations — Principles and procedures

3 Future work to comply with international standards for environmental declarations of building products

Currently a number of international activities are underway to harmonise and standardise so-called Type III environmental declarations in general and environmental declarations of building products in particular through the following work:

[1] These family of standards is now subject for revision within ISO TC 207, which mainly will result in that these standards will be overworked into one standard (eliminating conflicts, uncertainties etc)

- The forthcoming ISO 14025[2] Environmental labels and declarations —Type III environmental declarations — Principles and procedures (ISO 14025.1, dated 2003-12-29).
- The forthcoming ISO standard from TC 59 Environmental declarations of building products (CD 21930),
- Guideline for setting up product specific requirements for Type III environmental declarations of construction products in the AUB program Type III Declaration. AUB, English version No 3, 28.3.2003.
- A paper that search for a mandate for potential CEN standard on declaration of building material. Establishment for an EC mandate that request for the aimed standard is under preparation.

A Type III environmental declaration or an environmental declaration of a building product is characterised as quantitative life cycle-based information based on harmonised LCA-based calculation rules (so-called PCR – Product Category Rules) for identified product categories. Independent verification of the declaration is required, which could be carried out as third-party certification if communicated to consumers.

The ultimate goal to assess building products, applying an LCA, is when they are part of a building or construction system. Only in such a context is it possible to account for a holistic life cycle perspective and will then generate an adequate dissuasion support. However this will demand a large number of data why a streamlined method instead can be applied, where a comparison between available products within the same product group can be performed. This option is possible when a generic usage phase and end-of-life scenario is applied. This is possible if the generic PCR is further specified for identified product groups.

In order to comply with upcoming international standards for environmental declarations of building products, the following future work has to be initiated and carried out:

- Development of generic Product Category Rules (PCR) for all building products
- Development of PCR for specified products groups with the inclusion of the usage phase and also the end-of-life life cycle phase. This improves the true environmental impact reported from the specific product declaration as well as the possibility for a more justified product comparison.
- A procedure for independent verification of the declaration. If a third-party verification of the final product declaration is required this procedure is referred to a

[2] Where the ISO TR 14025:2000 is valid until the standard is ready.

certification and improves the quality and the accuracy of the specific product declaration.

Transferring Building Product Declarations (BVD) including LCA data into environmental product declarations according to the upcoming ISO standards are possible within the existing established EPD system in Sweden (MSR 2000), hosted by the Swedish Environmental Management Council (www.environdec.com). Such a procedure follow the various steps for future work indicated above and require a development of PSR for building products in general. In addition to this and in order to account for a full life cycle by adding aspects mainly related generic usage phase and the end-of-life scenario, an extension of the existing generic PSR for specific building products will be required. Both these alternatives generate an environmental declaration that follows the requirements specified in ISO 14025.

It should be emphasised that if Product-Specific Requirements (PSR) or Product Category Rules (PCR)[3] are developed in other countries by other organisations, it is recommendable to seek co-operation with these organisations to safeguard the overall international applicability of the work. In this aspect the international network for Type III environmental declarations (GEDnet) is an important body (www.environdec.com/gednet).

4 Product category requirements

4.1 Product description

This document defines the requirements on environmental parameters to be included in a building product declaration. The document covers all building products that include; building and construction materials; prefabricated building elements or other components; chemicals and including intermediates, which are utilised in buildings and constructions.

4.2 Product content declaration

Rules on reporting product content declaration are specified in the current building product rules by BYKR (2000) – which is under revision – and is reported in the self claim part of the building product declaration, why this information here is given for information only. The following rules are given by BYKR (2000) concerning product content declaration (quoted in Swedish):

[3] PSR and PCR are terms for the same type of document.

- 1,0 viktprocent för hälsoskadliga, frätande, irriterande, allergiframkallande, cancerframkallande (med farobeteckningen hälsoskadlig) samt mutagena (kategori 3) eller reproduktionstoxiska (kategori 3).
- 0,1 viktprocent för mycket giftiga, giftiga, cancerframkallande (med farobeteckningen giftig), mutagena (kategori 1 och 2) eller reproduktionstoxiska (kategori 1 och 2).
- 1,0 viktprocent för miljöfarliga ämnen.

Ange ämnen (inklusive CAS-nummer), som enligt KemI´s gällande författning om klassificering och märkning av kemiska produkter klassificeras som hälsofarliga samt om emissioner kan avges till inomhusluft eller om det föreligger risk för kontaktallergi. Se redovisningsprinciper sid 15. Ange även ämnen, där grund för misstanke föreligger.

Ingående material/ämnen	***CAS-nummer***	****Miljöklass-ning***	***Hälsoklass-ning***	***Vikt-%***

5 Building material LCA

5.1 Common goal and scope

The goal of this LCA is to calculate and report the environmental performance for a specific building product with the ‘cradle to gate’ scope.

5.2 Functional unit versus reference unit

Each process step in the inventory delivers some functional output, i.e., the products (which cover both services and goods). In LCA, it is compulsory to describe the functional output from the studied system in a so-called functional unit. The functional unit is intended to be utilised as a common reference unit in a complete LCA for comparison. Since this rules covers a ‘cradle to gate’ declaration a so-called *reference unit* is utilised instead, to differ from a declaration accounting for an entire life cycle.

Generally accepted SI units shall be used for the reference unit, e.g. kg, m^2, m^3 etc. Furthermore, when the building product is parts of a product mix the reference unit shall

preferably be given that make a scaling correct between the different products as correct as possible. For instance a ventilation pipe is better reported per 'kg' rather than per 'm', since the environmental performance per linear will differ very much between different ventilation pipes with different diameter, compared to the performance reported per kg ventilation pipe, independent of its actually diameter. It should be noticed that a reference unit per 'piece' is recommended when scaling between different products is not adequate at all.

5.3 LCI data flow categories — inventory profile

The applied data flow categories follow the Sirii SPINE specification found in Erlandsson et al. (2002b), which is developed, from Erixon (2000). The flow categories are grouped in a number of themes indicating their meaning. The possible flow types in each data category are found in Table 1. It should be noticed that the SPINE database format allows different specifications of flow type and specification of the environmental compartments (Steen et al. 1995). Furthermore, the flow category group themes given in Table 1 are not part of the SPINE nomenclature, but implemented in the Sirii SPINE application (see: www.sirii.org).

Table 1 Data categories applicable for LCI and its resulting inventory profile, according to Sirii SPINE.

Group theme	**Sirii SPINE Flow type**	**Possible specifications***
Deliverables	Product	*(Environment: technosphere)*
Resource use	Natural resource	*(Environment: nature)*
	Recycled material	Input/output *(Environment: technosphere)*
Stressors	Emission	Air, water, ground or intermediate
	Resource consumption	*(Environment: nature)*
	Explorative impact	*(Environment: nature)*
Incomplete inventory	Residue	Input/output *(Environment: technosphere)*
	Refined resource	*(Environment: technosphere)*

*Specifications given in brackets cannot be changes by the user, while the others may be changed.

The structure of the Table 1 also constitutes the headings for the *inventory profile* that are the result from the LCI step of an LCA. The short description and comments of the flow type are given below:

Products represent the functional output. It is possible to declare the products contents in the Sirii SPINE application. This specification is possible for all flows (except emissions) and is treated as a global variable.

Natural resources represent the resource extension of a resource as it is extracted from the earth. Natural resources consist of virgin material.

Recycled material appears in the inventory when a discarded product material is recovered and utilised for new products. The phenomenon is also known as open loop recycling.

Emissions are specified as air, water, soil or intermediate emission. These recipients could be subdivided according to the SPINE format in further specified recipients, which is needed in order to make the LCA site dependent.

The fact that a resource is transformed into an emission may also be accounted for as a **resource consumption**, which makes it possible to report from what materials/product system the emission originate. This enables "punishment" of products that are responsible for a material resource leaving the technosphere. Furthermore, this makes it also possible to calculate the energy consumption in an application by summing the contributions from the resources consumed that contains energy.

Explorative impact makes it possible to account for and report physical impact on the nature. This flow is also known as land use, and is still very much in its development. The word land use is not used here as it eliminates activities related to water area.

The group theme 'Incomplete inventory' indicate the fact that it represents a flow that should be connected with a receiving or delivering process, i.e., a process that has a matching **residue** and **refined resource**, respectively.

5.4 System boundaries

The provision of an inventory that models what actually happens in nature, avoiding value-based decisions, is here referred to as a natural scientific-based approach. This means that reported impacts of a process should comprise impacts that appear in respect to the actual temporal and spatial conditions. This implies that the emission from, e.g., a production site corresponds to what actually can be measured or reported. Therefore, it is not adequate to perform an evaluation of environmental burden or responsibility of the reported data in the LCI step[4], since this should lead to a value-based decision. Consequently, system expansion, for instance, will not be an adequate allocation

[4] This refers to background LCI data, since that is what this section is about.

procedure for a multi-output process, since this leads to an inventory profile that includes emission from another process step not occurring at that specific site (or at that time).

5.4.1 System boundaries to nature

System boundaries to nature correspond to Sirii SPINE flow data category natural resource and the stressors (emissions, resource consumption, and explorative impact) and are by ISO jointly called elementary flows. A studied flow should, according to the goal of the life cycle approach, be traced back to a natural recipient. A flow that is not traced back to a natural recipient will automatically be reported in accordance with a flow type that belongs to the group theme *Incomplete inventory* according to Sirii SPINE, or the technosphere flow types *Product* or *Recycled material*.

However, it can sometimes be difficult to decide which impacts should be included in the LCA and which consequences are due to nature itself rather than human activity. This kind of problems occurs when nature is part of the product system, which is relevant to all sea or land-based activities. In these cases it is possible to evaluate the concentration gradient of different substances in the soil or likewise that can be traced back to the utilisation of the natural system, which would not appear if the human activity not were present. For instance, following this definition, natural mineral decomposition is not an abiotic emission and therefore not included in the LCI. But the additional emissions originating from an accelerated decomposition due to a human activity will be accounted for in the LCI. To make it possible to evaluate these kinds of activities, it is found necessary to consider the time dependence of the activity, which can be modelled as:

- momentary
- time limited, or
- continuous.

In these cases, the studied process can be defined as momentary or time limited. In the applied analytic model, the occupied land will, after a surveyable time horizon, be part of the natural system again. Direct emissions from such activities during the surveyable time, before the land and its ecological system can be found in balance (not necessarily restored as it was originally), are accounted for as any emission from an ordinary process. However, after the surveyable time, any additional concentration of substances in the soil will be accounted for as emission to a specific location type, e.g., landfill. Emission scenarios and specification of the surveyable time relevant to landfill sites can be found in Sundqvist et al. (1997, 1999). In conclusion, this boundary setting procedure accounts for all emissions that are related to human activities, but require a prediction of the future. The setting of surveyable time will be important for the LCI. For transparency reasons, applied surveyable time factors should therefore be reported in the LCA documentation.

For continuous activities (in balance), e.g., forestry or agricultural, a steady state situation will be applicable in the analytic model. For a natural system utilised by humans, which system delivers renewable material (such as timber from the main parts of the boreal forestry), the ecosystem fixation of carbon will be reported in the inventory (negative emissions). However, if it is utilised as fuel, the carbon dioxide will in a life cycle perspective lead to an almost zero emission. In principal, this procedure covers all kinds of materials, renewable as non-renewable such as peat, for which current extension leads to a net climatic contribution, and for what reason Swedish peat must be regarded as semi-fossil (Uppenberg et al. 2001).

5.4.2 System boundaries of manufacturing of equipment and for employees

Below specifies system boundary (rules) concerning manufacturing equipment and employees. These system boundaries are *not* regarded to limiting the scope of the inventory or as an incomplete inventory that is described above (i.e. a cut-off).

Environmental impact from infrastructure, constructions, production equipment and tools that are not directly consumed in the production process, are not accounted for in the LCI. Personal transportation to and from work is also not accounted for. This information can however be reported in the LCI documentation as additional information, which facilitates the addition of LCI data related to these kinds of activities later on. This procedure renders modular LCI data that on case basis can be taken into account for the above aspects, if it is relevant to the goal and scope.

Exception from inventory of manufacturing equipment-related historical activities occurs for foreground data, i.e., such processes that are part of the main products system of an LCA study, as described below.

5.4.3 System boundaries to historical activities – foreground data

The historical activities that can be accounted for to follow the material recycling procedure must be allocated to the product function it was intended for. This problem appears typically for long-lived products. The environmental impact from the historical investment will have to be annualised based on a time span that can represent the initial utilisation purpose of, for instance, a building. This means that the time span of utilisation should not be regarded as a prediction of the actual service life. Instead a pre-set reasonable service life is utilised. Thus the service life is applicable to allocate the environmental investment cost to the initial purpose, without moving the environmental burden to a second user that maybe not will exist.

Consequently, in the inventory of an existing building, the old/existing construction should be regarded as a sunk cost, provided it is a rebuilding with a new purpose, or a

significant improvement of the building performance. This procedure for historical activities means that reuse of physical products or parts of them (e.g., a building frame) follows the material recycling procedure (which is indicated in the first sentence of this section).

5.5 Cut-off rules — limitations to system boundaries

A general cut-off that *limits the scope of the inventory* of a product system will be reported as *residue* and *refined resource*, respectively, according to the Sirii SPINE nomenclature. These flow types will be visible in the reported LCI profile, why no general cut-off rules are applied. This approach enables a receiver of such an LCI profile to add these missing process steps, if the data is available for this practitioner.

5.6 Allocation rules

5.6.1 Multi-output process allocation procedure

In a process step where more than one type of product is generated, in order to receive product-based inventory data instead of process-based; it is necessary to allocate the environmental stressors of the process to the different products. This implies that a subdividing of the product system into process phases must be proceeded before an allocation can be performed. ISO 14041 also recommends to initially dividing the analysed products system into sub-processes. Indeed this recommendation is applied here, but not in order to eliminate or reduce the allocation problem as stated by ISO 14041. On the contrary, as is illustrated for a sawmill by Erlandsson (1996), this initial procedure will not eliminate or reduce the allocation problem, but only improve the resolution.

A *process phase* constitutes the system boundary where a further allocation is needed. The routine given below defines the aimed different process phases (Erlandsson 1996):

- each time a product is generated and leaves the specific analysed product system,
- when product flows are treated in various ways in a process, or
- when a material recycling loop occurs outside the own process step.

The now subdivided product system into process phases is the basis for the performed allocation, as described below:

First procedure choice:

The following conducted allocation procedure follows the ISO 14041, which states that the allocation procedure should be performed in the following order, by using an allocation basis of:

1) Physical dependencies
2) Simplification of physical dependencies (often mass).

Second procedure choice:

If no such dependencies can be established, ISO makes it possible to allocate using other dependencies. This is relevant to overhead activities such as impact from an office situated on a production site, etc. In these cases an allocation can be performed in the reverse order, i.e., by using an allocation basis of:

1) Socio-economically-based allocation parameters
2) Physical parameters, e.g., mass, area.

Third (and final worst case) procedure choice:

A further situation may occur when no information of the process phases from, e.g., a production plan is available, typically caused by a confidentiality problem. In this case the entire plant must be regarded as a black box, for what reason an allocation for the entire product system and the overall representative environmental data should be made according to the following procedure:

- Perform an allocation based on physical properties or aspects, e.g., product content (relevant to use of refined resources), specific melting energy by assuming generic energy losses (relevant to energy use), etc., and
- Remaining environmental impact, which cannot be allocated to the products according to the above procedure, may be allocated on economically based allocation parameters.

5.6.2 Material recycling and technosphere system boundaries

Recycled material (also known as open loop recycling) is reported in the LCI as an input or output technosphere flow. If any allocation procedure applicable for open loop recycling should be applied, this would mean that the natural science approach would be lost in most cases (compare with methods included in; Ekvall & Tillman 1997). Nevertheless, a system boundary between the products in a material recycling cascade has to be defined.

When a product is discarded and its original function is lost, it can be processed further in a waste management system. Those parts of the product that are utilised in a new product will be accounted for as material recycling (which also accounts for the energyware that is used for energy recovery). The remaining parts from the waste management system that cannot be recycled will be processed further, and finally in the LCI accounted for as an emission. The boundary between the first and the next product (system) is here defined by the *willingness to pay* for the recycled material. This implies that from the moment the user of a secondary material pays for the material he (i.e. the new product system) will also be responsible for the environmental burden from that point on. In most cases this also follows the resourcefulness of the applied processes. In practice this means that if a recycling company pays for, e.g., discarded aluminium that also includes dismantling of cars, this company (the secondary user) is also responsible for the incurred environmental impact from that point on. This boundary definition is site dependent since the market situation can vary in both time and by location.

A flow can be accounted for as the flow type ‘material recycling’ even if the specific secondary material user is not known. In practice this is very often the situation, because specific origins and secondary users of waste streams are hard to trace to their source or their specific new application.

5.7 Data quality requirements

No general data quality requirements are applied. Instead a minimum set of data documentation requirements are mandatory, that makes it possible to evaluate the data applicability. This information shall then be combined with the reported flows in the inventory profiles under the theme ‘Incomplete inventory’.

5.8 Additional information — emissions from the building product

Rules on reporting emissions from the building products are specified in the current building product rules by BYKR (2000) – which is under revision – and is reported in the self claim part of the building product declaration, why this information here is

given for information only. The following rules are given by BYKR (2000) concerning emissions from building products:

Uppgifter om egenemissioner ger svar på vilka ämnen en enskild byggvara avger. Uppgifterna är behäftade med stora osäkerheter, eftersom förloppen ofta är dynamiska och förändras med olika betingelser i den färdiga byggnaden. Inom vissa branscher existerar standardiserade mätmetoder, men generellt finns det ett utvecklingsbehov. Emissionsuppgifter kommer att kunna användas för en redovisning av innemiljön. Emissioner som klingar av med tiden bör redovisas på ett sådant sätt att särskilda åtgärder kan vidtas, som minimerar påverkan på innemiljön.

Redovisa byggvarans egenemission (emissionshastighet $\mu g/m^2h$) av hälsopåverkande ämnen enligt 8.1. Ange även byggvarans luktintensitet och eventuell avklingning. Mätmetoder inklusive avklingning anges och dessa baseras i första hand på svensk standard eller aktuell branschstandard.

6 Reporting requirements

6.1 Declaration reporting format

6.1.1 Inventory profile specifications

The result from the inventory shall be reported as an inventory profile according to the headings given in Table 1. In order to streamline the extension of the parameters reported in the environmental product declaration a cut-of rule is accepted where < 3% of the emissions that contributes to the total of any impact category do net need to be reported in the public declaration.

6.1.2 Impact profile specifications

It is not recommended to report the environmental performance in the building product declaration as an impact profile, since the information is regarded as an input for an LCA covering the entirely life cycle. Furthermore, since data gaps is allowed the professional user will to have to ad relevant figures for these using typically applied software that means that the input data is just inventory data.

6.2 LCA interpretation

The reported environmental performance is aimed for professional users that mean mainly in business to business relations, which shall be included in the building product declaration. The information that is provided in the building product declaration is

applicable as data source, to conduct an LCA covering a complete life cycle. Only such LCA is relevant for a correct product comparison.

6.3 Documentation

The inventory profile is the most central documentation concerning environmental data. In order to give the inventory profile an adequate understanding, further data documentation (or meta-data) is required. The minimum documentation reported in the building product declaration is found in Table 2. It should be noticed that it is here recommended besides the mandatory Table 2 to perform additionally documentation following the Sirii SPINE data documentation format, or equivalent. It possible to supply the fixed 'Accepted answers' defined in Table 2 with short comments.

Table 2 Data quality related aspects for documentation, with reference to current in the Sirii SPINE format field No (Erlandsson & Carlsson 2002).

Documentation quality aspect	**Accepted answers**	**Sirii SPINE field No**
Representativeness	1. Primarily site specific data is used 2. Other data representative for the own process are utilised For *general upstream data* also the following is accepted: 3. Other data, which are assumed to be a conservative estimation of the actual data, is used	34
Completeness	1. Data covering all known types of emissions 2. Data covering all of emissions that represent the most frequent impact categories[5]	35
Technology coverage	1. Best available practise 2. Common practice (sector standard) 3. Inferior practice (poor standard)	36
Precision	1. Data mainly based on accurate measurements or calculations 2. Data mainly based on very few uncertain measurements or calculations 3. Data mainly based on emission factors etc. or other rough estimations	37

[5] In this case, the most frequent impact categories are climate change, ozone depletion, acidification, photochemical oxidant formation and eutrophication.

7 Optional independent verification

Independent verification of LCA data can be performed in order to meet verification rules specified in ISO 14025. This verification procedure shall be transparent and an independent verifier shall create a report covering its observations. This report shall be publicly available upon request. The verification procedure shall confirm whether the information given in the declaration is in line with the LCA underlying the declaration, and whether this information is valid and scientifically sound.

8 Illustrative example of declaration reporting format

Inventory profile					
Group theme	**Flow type**	**Specifications**	**Sub-stance**	**Amount**	**Unit**
Deliverables	Product, i.e. reference unit		*roof tile*	*1*	*kg (dry m.)*
Resource use	Natural resource		*clay* *natural gas*	*1,1* *2,5*	*kg (dry m.)* *MJ*
	Recycled material	input			
		output			
Stressors	Emission	air	CH_4	0,1	g
		water	BOD	0,01	g
		ground	Hg	0,001	g
		intermediate	radon	1	Bq
	Resource consumption		*clay* *natural gas*	*0,1* *2,5*	*kg (dry m.)* *MJ*
	Explorative impact				
Incomplete inventory	Residue	input			
		output	hydraulic oil	0,01	kg
	Refined resource		*wood*	*0,15*	*kg (dry m.)*

Inventory profile notes:
Specific emissions contributing less than 3% to any impact category is not included.

Interpretation

Reported LCA data are aimed at professional users, e.g. mainly in business to business relations. The LCA data reported in the inventory profile is applicable as data source, to conduct an LCA covering a complete life cycle.

Documentation

Quality meta-data	**Specification for foreground data**
Represen-tativeness	Primarily site specific data is used
Completeness	Data covering all of emissions that represent the most frequent impact categories
Technology coverage	Common practice (sector standard)
Precision	Data mainly based on accurate measurements or calculations

Third party verification

No third party verification is performed.

Declaration revision

Revision of this declaration is planned to be performed within 2006.

9 Acknowledgement

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- Ecocycle Council for the Building Sector's homepage at; http://www.kretsloppsradet.com/.
- BYKR 2000: Byggvarudeklarationer (also available in English "Building product declaration" and German "Baustoff- Umwelterklärung"). Byggsektorns Kretsloppsråd, Byggmaterialgruppens Service AB och AB Svensk Byggtjänst, Stockholm 2000.
- "A blueprint for sustainable consumption and design including performance requirements and a classification system — achieved by an extension of the life cycle assessment (LCA) methodology and elaborated for the life-supporting service (LSS) living". Erlandsson M, Royal Institute of Technology (KTH), Stockholm, January 2004.

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