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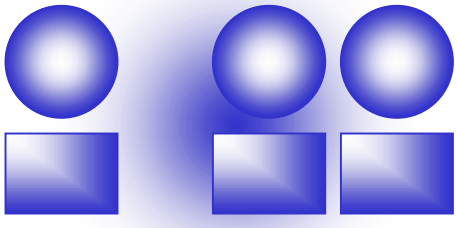
Sirii – Swedish Industrial Research Institutes' Initiative

SIRII SPINE documented and Quality Reviewed Environmental Data



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SIRII SPINE documented and quality reviewed environmental data

Sammanfattning/Summary

One of the most significant obstacles in working with LCA and other system analytical tools where enviromental data are used, is the availability of adequate and well-documented inventory (environmental) data. Furthermore, it is preferable if the quality data has been reviewed to some degree. Both process knowledge and environmental competence are needed in order to review environmental data. The Sirii Environmental Data Network holds this unique competence profile, which enables the network to review environmental data with respect to the correctness of documentation as well as the reasonableness of the numerical value. The routine for review of Sirii SPINE documented data is presented in this report.

Nyckelord/Keywords

SPINE, Sirii SPINE, documentation requirements, quality reviewed environmental data, Sirii Environmental Data Network, Life Cycle Management (LCM), System analytical tools, Life Cycle Assessment (LCA)

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Foreword

The Sirii Environmental Data Network (in short the Sirii ED Network) is a cooperation between the industrial research institutes in Sweden within the field of system analytical tools (e.g. LCA – Life Cycle Assessment). Amongst other things the Sirii ED Network has worked with coordination and structuring of environmental data and this report is a part of that work. The work has just started and is subject to development and improvement, this report should therefore be regarded as a living document that will be updated as experience reveals potential improvements. The appendix presents an indication of a possible development of the basis for judgement of quality aspects.

The foundation of what is described in this report is the result of a two days workshop in Lerum, Sweden (2001-11-26/ 27) where the following persons where present:

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IVL Swedish Environmental Research Institute has compiled the results. The report has been referred to the institutes of the Sirii Environmetal Data Network for consideration and has been approved of by all parties concerned. The undersigned would hereby like to thank the involved parties from the network for their contributions and comments. Without them this report would not have been published.

Stockolm August 2002

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Contents

1 Background

1.1 Who can guarantee environmental data?

One of the most significant obstacles in working with LCA and other system analytical tools where enviromental data are used, is the availability of adequate and well-documented inventory (environmental) data. Furthermore, it is preferable if the quality of data has been reviewed to some degree. Both process knowledge and environmental competence are needed in order to review environmental data. The Sirii Environmental Data Network holds this unique competence profile, which enables the network to review environmental data with respect to the correctness of documentation as well as the reasonableness of the numerical value.

1.2 Sirii Environmental Data Network

The Swedish Industrial Research Institutes co-operate on several common issues under the name IRIS (Industrial Research Institutes in Sweden). The Sirii Environmental Data Network (Swedish Industrial Research Institutes Initiative) is a part of the environmental branch of IRIS. It is made up of several institutes that perform research and consultation within different branches of the industrial world in Sweden and abroad. The Sirii Environmental Data Network group holds a broad competence on product-, material- and process-related issues of the entire Swedish industry. It also has long experience on product-related environmental information within the field of life cycle management, such as LCA. Environmental data that is highly relevant to use outside of the institutes are continuously being generated on the individual Sirii institutes. These data are now made available to the public in order to enable more efficient product-oriented environmental work within the industry, universities and research institutions.

1.3 The Sirii SPINE application

The Sirii Environmental Data Network has created the user-friendly Sirii SPINE Application, a database tool based on the specified Sirii SPINE documentation format (Erlandsson et al, 2001), in order to facilitate work that is related to lifecycle management within the industry. The Sirii SPINE documentation format is in turn based on CPM's interpretation (Pålsson 1999) of the SPINE documentation format for structure and documentation of environmental data (Steen et al 1995). The Sirii Environmental Data Network follows the development of the ISO 14 048 standard and will be compatible with it in the future.

The Sirii SPINE Application has been created with clear objectives to:

- Electronically store and document environmental data in an application that is independent of commercial software distributors.
- Make possible the import and export of Sirii SPINE documented environmental data in a standardised file format for data communication
- To create a common nomenclature that is linked to SPINE

The standardised file format for data communication facilitates an electronic use of environmental data in other software that is compatible with SPINE. This is an important function, as the Sirii SPINE application cannot be used for calculations. An updated list of Sirii SPINE compatible LCA software is found on www.sirii.org. The Sirii SPINE application is a free-ware that may be used successfully by individual companies to document environmental data. It should be seen as a complement to more advanced LCA software. The application is available for download at www.sirii.org.

1.4 Environmental data on www.sirii.org

The Sirii Network has established a portal – Sirii Environmental Data Portal (www.sirii.org) – where the main purpose is to communicate Sirii SPINE documented environmental data. Environmental data available at the portal have been generated either at the initiative of a Sirii institute or by an external party and subsequently quality reviewed by a Sirii institute.

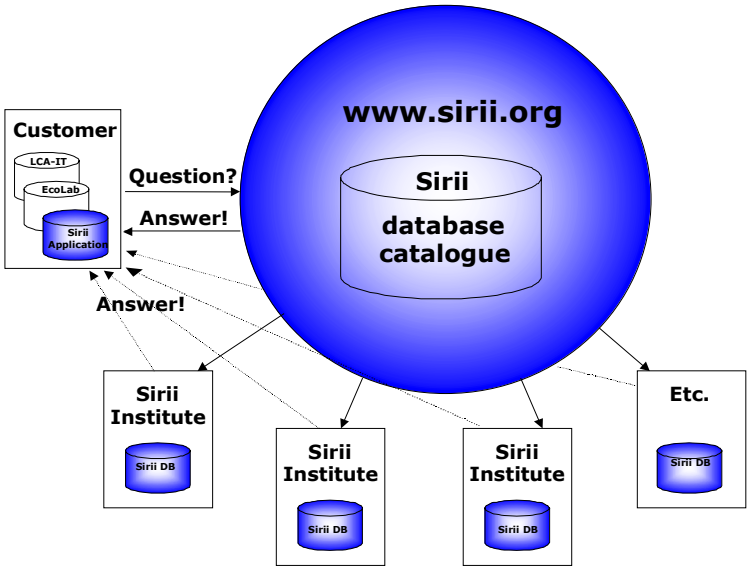

Figure 1 Information flow on www.sirii.org

The Sirii portal consists of a database catalogue of available environmental data and search engine. When searching for environmental data one is, when interesting findings have been made, linked to the website of the individual Sirii institute that has documented and/or reviewed the data. Data may subsequently be received from this individual institute (see figure 1). A limited amount of environmental data may be directly available on the common website. The Sirii Environmental Data Portal thus makes up the node for communicating environmental data from the different Sirii institutes.

1.4.1 Classification of Sirii SPINE environmental data

Environmental data available at www.sirii.org is classified in three categories that are presented in Table 1.

Table 1 Classification of environmental data on www.sirii.org

Category	Name	Description
C	**Unclassified references**	Data quality is unspecified. Requirements are set neither for the correctness of documentation of data nor for the reasonableness of its numerical value.
B	**Data documented in the Sirii SPINE format**	Data is documented in the Sirii SPINE documentation format. The requirements for this category are that the specified standard fields have been filled out actively. Answers like "not known" and "background information is missing" are accepted.
A	**Data documented in the Sirii SPINE format and quality reviewed**	Data is documented in the Sirii SPINE documentation format and in addition to this certain specific requirements for the specified standard fields of the documentation format have to be met. Data has subsequently been quality reviewed with respect to the following; ▪ The correctness of the Sirii SPINE documentation (including specific requirements which are specified in section 3.1) ▪ The reasonableness of numerical data values in the inventory profile (see section 3.2) ▪ The competence of the reviewer (see section 3.3)

All in all the quality review implies that Sirii SPINE documented environmental data always holds a certain quality that enhances its value of use.

1.4.2 Applied price policy

A free pricing of environmental data is applied within the Sirii Network. This implies that each individual Sirii institute sets its own prices on its documented data sets. The majority of the institutes will make their Sirii SPINE documented data (B-data) available free of charge as the work has been financed by other means. When it comes to quality reviewed Sirii SPINE data (A-data) these will most probably incur some kind of administrative cost.

2 Quality of Sirii SPINE B-data

In order for Sirii SPINE documented environmental data to be classified as B-data, the specified standard fields of documentation need to be filled out actively (see table 2). This implies that answers like “not known” and “background information is missing” are accepted.

Table 2 Sirii SPINE documentation format 2002. The standard fields are marked with an ”X”.

SIRII Id (field)	Standard field	SPINE id [table.column]	SIRII SPINE description	Short Explanation
1	X	[ObjectOfStudy.Name]	Name	Specify a short, relevant name of the technical system.
2	X	[ObjectOfStudy.Category]	Type of technical system	Specify the LCI scope of the technical systems that are studied.
3		[ObjectOfStudy.Sector]	Sector	Specify the sector within which the technical system operates.
4		[ObjectOfStudy.Site]	Geographical site location	Specify the geographical location where the system is situated, i.e. address or geographical area.
5		[ObjectOfStudy.Function]	Description of system content	Specify the detailed description of the system content and the scope of the technical systems that are studied.
6	X	[ObjectOfStudy.Function]	Description of system content	Specify a short description of the system content e.g. by specifying activities included.
7	X	[ObjectOfStudy.Function]	Significant system data gaps	Specify important activities not included in the technical system specified in Sirii-6.
8		[ObjectOfStudy.Owner]	Owner	Specify the owner of the technical system.
9		[Inventory.IntendedUser]	Intended user	Specify the initial intended target group for the information.
10		[Inventory.GeneralPurpose]	General purpose	Specify the background to why the data acquisition or the study was initiated.
11		Inventory.DetailedPurpose]	Detailed purpose	Specify the specific objective to why data was acquired or the study was performed.
12		[Inventory.Commissioner]	Commissioner	Specify the person or organisation responsible for initiating or commissioning the data acquisition or study.
13	X	[Inventory.Practitioner]	Original practitioner	Specify the organisation or person/-s responsible for modelling the presented information.
14	X	[Inventory.Reviewer]	LCI/LCA reviewer	Specify the external organisation or person/-s responsible for reviewing the data or the data acquisition.

Table 2 Continued

15	X	[Inventory.FunctionalUnit]	Functional unit, short description	Specify the functional unit that is the reference to which all numerical data on inflows and outflows are presented.
16		[Inventory.FuExplanation]	Functional unit motivation and explanation	Specify the explanation and motivation of the choice of the functional unit.
17	X	[Inventory.NatureBoundary]	System boundaries to the environmental system	Specify the description of system boundaries to the environmental system.
18	X	[Inventory.TimeBoundary]	System boundaries in time	Specify the system boundaries in time. Describe different time related aspects of the studied system.
19	X	[Inventory.GeographicalBoundary]	Geographical coverage	Specify the actual geographical extent of the studied process or system.
20		[Inventory.Allocations]	Description of allocations	Specify the description of allocations that have been performed to obtain the numerical data.
21	X	[Inventory.Allocations]	Allocation rules for material recycling (open loop recycling)	Specify practised allocation procedure (or mixtures) applied for material recycling (open loop recycling).
22	X	[Inventory.Allocations]	Description of allocations at a unit process	Specify allocation procedure when "functional" multi input or output flow occurs in a unit operation.
23	X	[Inventory.LateralExpansion]	Description of system expansions	Specify if a system expansion or system enlargement has been done the motives for the expansion.
24	X	[Inventory.OtherBoundaries]	Other system boundaries	Specify description of other system boundaries or other limitations not mentioned above.
25	X	[Qmetadata.DateConceived]	Time period during which data was acquired	Specify the time period during which the data and the numerical basis for the data was acquired.
26		[Qmetadata.DataType]	Type of method	Specify the type of method that has been used to obtain the data, e.g. derived, unspecified, literature.
27		[Qmetadata.Method]	Description of method	Specify assumptions, methods etc used in order to obtain the numerical data.
28		[Qmetadata.Represents]	What represents data	Specify if data from a similar technical system is used to represent the studied technical system.
29		[Qmetadata.LitteratureRef]	References	Specify references used in the data acquisition and referred to in Method or Represents.
30		[Qmetadata.Notes]	Further notes	Specify further information of how the numerical data for the flows was acquired.
31		[Qmetadata.DataQuality]	Data quality	If wanted for internal use, specify a summarised quality measure 1 (poor data) to 5 (excellent data).

Table 2 Continued

32		[Inventory.Applicability]	Applicability	Specify a description of an assumed area of application for how data can be used.
33		[Inventory.Data]	Data	Specify the general description of numerical and other qualities for the data.
34	X	[Inventory.Applicability]	Data representativeness	Specify a description of how the greater part of the data reprecents site, process specific or generic data.
35	X	[Inventory.Data]	Data completeness	Specify a assessment of the data completeness concerning LCI substances included.
36	X	[Inventory.Applicability]	Data technology coverage	Specify an assessment of production technology in relation to current praxis (sector knowledge required).
37	X	[Inventory.Data]	Data precision	Specify the general assessment of data concerning its summarised precision.
38	X	[Inventory.Notes]	Further notes are available here	Specify other relevant information about data that are not appropriate in any of the other fields.
39		[Inventory.DateCompleted]	When data was completed	—
40	X	[Inventory.Publication]	Original publication(s)	Specify literature reference to where the complete data set or the study has been published.
41	X	[Inventory.SIRIIReviewer]	SIRII documentation performed by	Specify organisation, person etc responsible for carrying out the SIRII SPINE documentation.
42		[Inventory.Reviewer]	SIRII review	Specify SIRII reviewer. This field is reserved for ”SIRII SPINE A-data” and locked for users outside of the SIRII Network.
43	X	[Inventory.Availability]	Availability	Specify conditions or agreements regarding how data may be distributed.
44		[Inventory.Copyright]	Copyright	Specify holder of copyright. This is only applicable when data is received under licence agreements.

Keys for interpretation

Documentation fields that are based on SPINE as interpreted by CPM (these fields are currently not shown in the Sirii SPINE application)

Documentation fields that further quantify the fields described above into one or several SPINE subfields.

Documentation fields that are not included in SPINE (Steen et al 1995)

3 Quality of Sirii SPINE A-data

In order for Sirii SPINE documented environmental data to be classified as A-data, they have to be reviewed with respect to both the correctness of the documentation and the reasonableness of the numerical values in the inventory profile.

3.1 Requirements on the documentation

The first requirement for Sirii SPINE documented A-data is that all specified standard fields have been filled out (according to Quality of Sirii SPINE B-data

In order for Sirii SPINE documented environmental data to be classified as B-data, the specified standard fields of documentation need to be filled out actively (see table 2). This implies that answers like “not known” and “background information is missing” are accepted.

Table 2) with substantial information (as opposed to B-data). Answers of the type “not known” and “background data is missing” are thus not accepted for this category. Table 3 clarifies relevant documentation fields. Only the fields that need to be clarified are found in Table 3.

Table 3 Clarification of the requirements, for relevant documentation fields, that need to be met in order for Sirii SPINE documented environmental data to be classified as A-data

Field	Name	Clarification
Sirii-7	**Significant System Data Gaps**	The importance of the activities for which data is lacking needs to be specified and estimated. Data for substituting activities that highly under- or overestimates the environmental impact of the actual activity may not be used to complete the inventory profile for A-data.
Sirii-14	**External Reviewer**	The external reviewer of environmental data (including the Sirii reviewer of underlying data) shall be documented. It is assumed that environmental data is always reviewed internally. The performer of the quality review of Sirii SPINE A-data is documented in field Sirii-42.
Sirii-18	**Time Coverage**	The time period for which the environmental data are relevant (retrospectively). It is also desirable to give an estimation of the relevance of data in a futuristic perspective, but it is not a requirement. The validity of data may be given as an estimation of the technological development within the field of study. For example according to the following; ▪ 1 yr because the sector involves intense technological development ▪ 2-4 yrs because technological development is expected within the sector in a near future ▪ 5-8 yrs because technology is far developed at present and there is no need for further development within the near future
Sirii-25	**Time Period**	Time period implies the period under which the inventory has been performed. An average estimation of the whole system is accepted.
Sirii- 34-37	**Representativity, Completeness, Technology Coverage Precision**	The requirements that need to be met for these characteristics in order for data to be classified as A-data are presented in table 4 below. Note: in the future the criteria for assessment of these characteristics may be further developed and used. A short discussion on how data quality is viewed upon within the Sirii Network is presented in the attachment (1).
Sirii-40	**Original Publications**	The definition of publication includes making data publicly assessible in a database, like the Sirii SPINE database catalogue.
Sirii-42	**SIRII Reviewer**	This field may only be used and changed by a Sirii institute. The institute that is responsible for the quality review, when it has been performed and what version of routine for review has been used should be documented in this field.

The answers that are accepted for the quality aspects representativeness, completeness, technology coverage and precisision, of A-data, are given in Table 4.

Table 4 Accepted answers for quality aspects of A-data

Quality aspect	**Accepted answers**
Representativeness	1. Primarily site specific data is used 2. Other data representative for the own process are utilised
Completeness	1. Data covering all known types of emissions 2. Data covering all of emissions that represent the most frequent impact categories
Technology coverage	1. Best available practise 2. Common practice (sector standard) 3. Inferior practice (poor standard)
Precision	1. Data based on accurate measurements or calculations 2. Data based on very few uncertain measurements or calculations 3. Data based on emission factors et c. or other rough estimations

3.2 Requirements on the inventory profile

The second requirement for Sirii SPINE documented A-data is that data in the inventory profile is logically correct, according to the requirements of the Sirii SPINE documentation, and that the numerical values are reasonable.

3.2.1 Logical correctness of documentation

Knowledge of the requirements for the Sirii SPINE documentation is needed to evaluate the logical correctness of the documentation. It is a minimum requirement that the following are reviewed:

- That there are no new global or substance names for a substance that already exists
- That the correct information is documented under the correct flow type, e g that “plastic waste” is documented as “residue to treatment” and not as “emission to soil”.

3.2.2 The reasonableness of the numerical value

Sector knowledge is required in order to review the reasonableness of data’s numerical value. According to the standard ISO 14040 the review of environmental data comprises the following:

- Evaluation of data quality
- Management of missing data

The Sirii Network routine for review of the reasonableness of the numerical value is given in Table 5. The routine may be made more comprehensive and completed with an internal, interpretative document for data quality in order to guarantee that the routine is followed in a uniform and stringent manner, irrespective of who performs the review. This type of routine is best kept confidential, as data may otherwise be optimised in relation to the routine if, for example, the routine for a spot test is shown openly.

Table 5 Routine for review of the reasonableness of the numerical value of data (Erlandsson 1999)

No	Comprehension	Requirement
1	Reliability of data	Draw up one of the following types of control: ▪ Mass balance ▪ Energy balance ▪ Comparing analysis of emission factors ▪ Comparing analysis of other references
2a	Source of data	It must be controlled that the used source of information is properly referred to in the documentation.
2b		It must be controlled that changes, which have been made in relation to the original source of data, are well documented.
3	Agreement of methodology in literature reference and case study	It must be controlled that corrections in relation to the methodology used in literature have been made. And that there exists relevant documentation concerning ▪ Choice of allocating routine; ▪ The way in with energy is accounted for; ▪ The way in which certain emissions, like carbohydrates, are accounted for; ▪ The way in which stocked resources like material content in products and stored energy are accounted for.
4a	Completeness versus lacking of data	It must be controlled that the lack of data has been documented in accordance with Sirii-7. When a complementary addition has been made to data by the LCA-practitioner it must be controlled that these changes have been properly documented (2b).
4b	Evaluation of the data quality	The documentation of the qualitative aspects of data - representativeness, completeness, technology coverage and precision – need to be reviewed in accordance with the applied classification routine, see Table 5 below.

Assess to underlying data on which inventory data is based is needed in order to make an objective estimate of the reasonableness of the numerical value. Underlying data is most preferrably low aggregated basic data, often unallocated process data for the most significant process steps. In order to review the quality aspects of data correctly, the routine in Table 5 should be followed.

3.2.3 The reasonableness of the numerical value in relation to the Sirii SPINE documentation

Sector knowledge is needed in order to determine whether the documented numerical value of data is reasonable in relation to the Sirii SPINE documentation. Aspects that need to be considered in the review are given in Table 6.

Table 6 Fields of documentation that need to be considered when reviewing the quality aspects of data's numerical value.

Moment	**Comment**	**SIRII SPINE field of documentation**
Completeness	Are all emissions to significant environmental impact categories included? Consider the documented information in the following Sirii SPINE documentation fields when performing the review;	▪ Sirii-7 – significant system data gaps ▪ Sirii-35 – completeness (the first or second alternative should be chosen)
Technical system	▪ Does the system generate the right products? ▪ Are the different processes added in a way that represents reality? ▪ Is documentation for significant process steps lacking?	
Technology coverage	Is the chosen level of technology relevant in relation to the time period and geografical location that data represents (alternative 2 is "common practice, alternative 1 and 3 are worse and better than "common practice", respectively). Consider the information in the following Sirii-fields;	▪ Sirii-6 – description of system content ▪ Sirii-18 – time coverage ▪ Sirii-19 – geographical coverage ▪ Sirii-36 – technology coverage
Representativeness	If alternative data have been used for an activity, controll the reasonableness of these data needs to be done in order to assure that a best case has not been used. Consider the information in the following Sirii-fields;	▪ Sirii-6 – description of system content ▪ Sirii-7 – significant system data gaps ▪ Sirii-18 – time coverage ▪ Sirii-19 – geographical coverage

3.3 Competence profile of the reviewer

The appropriate competence profile of the reviewer is found either at the own institute and/ or partly or fully at another Sirii institute. Sirii SPINE A-data is reviewed according to the following procedure;

- An individual (with LCA- and/ or sector knowledge) that is independent of the study in which data has been compiled performs the review internal review)
- Reviewed data is referred to the institutes of the Sirii Network for consideration under full secrecy. Reservation over the classification of A-data should be made within a period of 15 days.
- Any reservations expressed made will be adressed.

3.4 A log-book for reviewed requirements on documentation

A logbook, that is confidential outside of the Sirii Network, is kept alongside the review.

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Appendix 1 – Further development of the basis for judgement of quality aspects

The purpose of this appendix is to present a possible future basis for judgement when classifying environmental data according to the quality aspects representativeness, completeness, technology coverage and precision. As the system is further developed this document will be updated with more detailed instructions. The example that is presented here may be refined, adapted or further developed by the individual user.

Different categories for a quality aspect

Inventory data is, in general, in the context of LCA not regarded as being of good or bad quality; the quality of data is rather dependent on the application. Even so the Sirii Network classifies data with respect to the following aspects of quality; representativeness, technology coverage, completeness and precision. The classification is based on a qualitative judgement. The purpose is to give an indication of data quality in relation to a certain aspect.

Depending on the aim of the study a certain quality level of a quality aspect may be preferable. In other words one may not generalize to say that quality level 1 is always better than quality level 2 or 3, even though this is often the case. However data of quality level 4 always implies inferior quality. If, for example, an LCA is performed on a certain product and it is impossible to determine the exact supplier it is more preferable to let data be represented by generic data rather than other site specific data.

The classification of data quality involves four quality levels that may be used for a rough judgement of inventory data. Keep in mind that what may be considered data of good quality in a specific study is subject to a more nuanced analysis that, amongst others, considers unique prerequisites and expected conclusions of the study.

Table 7 Classification of quality aspects (Sirii 34-37) of Sirii SPINE environmental data on four levels of quality (characteristics)

Quality aspects	**Quality characteristics**
Representativeness	1 Primarily site specific data is used.
	2 Other data representative for the own process is used.
	3 Other data, which is assumed to be a conservative estimation of the actual data, is used.
	4 Data from quite other processes is used or classification information is lacking.
Completeness	1 Data covering all known types of emissions.
	2 Data covering all emissions to cover the most frequent impact categories.
	3 Data only covering few impact categories.
	4 Very poor data or classification information is lacking.
Technology coverage	1 Best available practice
	2 Common practice (average sector standard)
	3 Inferior practice (poor standard)
	4 Unknown or classification information is lacking.
Precision	1 Data based on accurate measurements or calculations.
	2 Data based on very few or uncertain measurings or calculations.
	3 Data based on emission factors etc. or other rough estimations.
	4 Classification information is lacking.

Apart from the quality aspects given in Table 7 the ISO standard (EN ISO 14 041) also includes the following:

- Reproducibility
- Consistency

Reproducability includes several factors such as description of inventory methodology and delimitations etc. A simple way to make a quick control calculation is to use data from another database than the own. In order to do this a reference flow needs to be specified (ISO requirement). The reference flow describes what is needed of each activity in order to meet the functional unit. It does however not indicate the relation between the different activities. It would therefore be suitable to require a specification of the reference flow, however since most LCA-software do not include this finesse the Sirii Network has, at present, concluded this to be an unreasonable requirement.

Consistency demands a thourough investigation and it be therefore concluded that this is not a realistic requirement for the Sirii SPINE documentation format.

Representativeness

Primarily site specific data is used

This alternative implies that the significant processes of the system studied are represented by inventory data from the processes that are actually used. In order to justify this alternative inventory data from the most significant processes (represented by site-specific inventory data) need to contribute more than 90 % to the total environmental impact.

Other data that are representative for the specific process are used

It needs to be determined for each process whether inventory data may represent the processes that are actually used. This alternative may be used for example when two material suppliers use similar resources, similar processes and similar cleaning equipment. In order to justify this alternative at least 50 % of the contributions to the total environmental impact needs to be represented by site-specific data and 40 % by other data that are representative for the used process.

Other data, which is assumed to be a conservative estimation of actual data, is used (generic data)

This alternative is relevant when site-specific or other data representative for the process used are lacking or may not be determined because the study is performed at a conceptual stage of a product development process. Under these circumstances it is common to use data that corresponds to sector standard, or conservative data. To choose best available technology to correspond to generic data as a general approach is therefore not acceptable. In order for this alternative to be justified a maximum of 10 % of the total environmental impact may be represented by other “rough” data and 90 % should be represented by generic data.

Other data from quite other processes is used or classification information is lacking

If data that originates from other, but similar processes than the used process is lacking, if generic data does not meet the requirements in section 1.2.3 or if the data documentation is insufficient, inventory data should be classified as “rough” and of inferior quality.

Completeness

Data covering all known types of emissions

In a best case the inventory profile comprises all significant emissions to cover the most significant enviromental impact categories that are relevant for the studied system. In order to make an environmental impact assessment all significant environmental aspects of the most significant processes must be represented in the inventory profile. For example inventory profiles for paper, wood products et c. must contain inventory data to assess the environmental impact on biological diversity. The inventory profiles for the extraction of uranium or the use of biocides need to contain data to assess the impact on human- and ecotoxicity. In other words, even if the inventory profile is complete with data to cover the traditional environmental impact categories, data completeness may not be classified on quality level 1 if other environmental impact categories that are significant to the system are not a part of the quantitative LCA. This is a measure that forces the practitioner to consider the significance of factors that are difficult to quantify in an LCA at present and therefore are often forgotten or left out.

Data covering all emissions to cover the most frequent environmental impact categories

This alternative is relevant when the inventory profile comprises all emissions to cover the "most frequently used environmental impact categories" in an LCA. If data on an emission that contributes significantly to an environmental impact category is missing this alternative is not justified. This is the case when for example emissions of solvents in paint production are lacking or when leached metals from the users phase of galvanised steel is lacking etc.

Data covering only a few impact categories

This alternative is relevant if emissions contributing to only a few environmental impact categories are included in the inventory profile.

Very poor data or classification information is lacking

This alternative may be used when data is of a very simple character. For example when only a couple of chosen emissions are included in the inventory (e.g. CO_2, NO_x och SO_x) or if facts on classification is missing. This kind of data may only be used for rough estimations.

Technology coverage

An assessment of technology coverage generally requires sector knowledge. Technology coverage should in this case describe production technology and not performance of the studied products. Average sector data, which is needed to make a quantitative assessment of inventory data, is often missing. For this reason a qualitative assessment of data will often have to be made by someone with sector expertise. If in the future average sector data will be more readily available to the public, a more statistical routine for classification may be developed. The EU IPPC-directive (Integrated Pollution Prevention Control) is an example of development in this direction. The IPPC-directive implies that companies should present emission factors (in the environmental report) for some of their processes, in addition to the summarized emissions of the production unit as a whole. The purpose is to determine and follow up an average for a specific sector. Another issue in the assessment of technology coverage is that it is intimately related to the chosen geographical preferences. What may be considered sector standard in Sweden may be out-of-date in the rest of Europe for example.

Best available practice

In this context best available practice is also assumed to imply that inventory data represents a lower environmental impact than that which is common in the sector. If best available practice and sector standard should coincide the latter alternative (sector standard) should be used. In exceptional cases older technology may entail environmental benefits, for example if sawed wood products are sundried instead of dried in a modern industrial drier. Note that it is not the time period in which technology was discovered that is classified in this case, but rather the environmental performance of the technology.

Common practice (sector standard)

Common practice covers technology that may be regarded as sector standard. Common practice does not imply a given amount of produced units, but is rather dependent on the variation of technology within the sector.

Inferior practice (poor standard)

Inferior practice is assumed to have an environmental performance that falls far below average sector standard. Note that if common practice within a sector does not coincide with best technology that is economically available, the technology should be classified as inferior technology. This was for example the case in the extraction of gas and oil in the beginning of the 90’s. The most common way to take care of the excess gas that

resulted from the extraction was to burn it, even though better ways were applied in e.g. Norway. If this situation was the case today in extraction of gas and oil, data would be classified as either “best available practice” (the Norway case) or “inferior practice” (common sector standard) according to this classification.

Unknown or classification information is lacking

Inventory data that lacks necessary information for classification or that has insufficient documentation on the processes included is classified as quality level 4.

Precision

In theory it is possible to document precision for each individual numerical value of inventory data. However this degree of detail is far too costly and is usually not applied in LCA. It is therefore assumed that the assessment of data precision is an assessment of the data set as a whole. If quantitative data on the issue would prove to become more common in the future a more statistical routine for classification may be developed.

Data based on accurate measurings or calculations

For this alternative it is assumed that the most significant inventory data are based on adequate and accurate measurings or calculations.

Data based on very few, uncertain measurings or calculations

For this alternative it is assumed that inventory data is based on either few or uncertain measurings or calculations.

Data based on emission factors etc. or other rough estimations.

For this alternative it is assumed that inventory data is based on literature references, emission factors and rough estimations of reasonableness.

Classification information is lacking

Inventory data that lacks necessary information for classification or that has insufficient documentation on the included processes is classified on quality level 4.