TECHNICAL SPECIFICATION

ISO/TS 14048

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Environmental management — Life cycle assessment — Data documentation format

Management environnemental — Analyse du cycle de vie — Format de documentation de données

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committee is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years with a view to deciding whether it should be confirmed for a further three years, revised to become an International Standard, or withdrawn. In the case of a confirmed ISO/PAS or ISO/TS, it is reviewed again after six years at which time it has to be either transformed into an International Standard or withdrawn.

Attention is drawn to the possibility that some of the elements of this Technical Specification may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 14048 was prepared by Technical Committee ISO/TC 207, *Environmental management*, Subcommittee SC 5, *Life cycle assessment*.

Annex A forms a normative part of this Technical Specification. Annex B is for information only.

Introduction

This Technical Specification provides a framework and requirements for the unambiguous documentation of Life Cycle Inventory analysis (LCI) data. Following the general framework for Life Cycle Assessment (LCA), laid down in ISO 14040, and the requirements and guidance on LCI, provided in ISO 14041, this specification intends to support a transparent reporting, interpretation and review of data collection, data calculation, data quality and data reporting, as well as facilitating data exchange. This Technical Specification supports LCA use and development, and is aimed primarily for data suppliers, LCA practitioners and LCA information system developers.

The data documentation format facilitates the reporting of LCI data and compliance with the requirements from ISO 14040 and ISO 14041 on data collection, data documentation and data quality. It also facilitates interpretation of LCI data as described in ISO 14043. In addition, the data documentation format allows the documentation and use of important information for Life Cycle Impact Assessment (LCIA), ISO 14042, including environmental information, environment condition and location.

The data documentation format is also intended to facilitate the exchange of LCI data without loss of transparency. This specification does not provide specific requirements for implementation of data exchange. However, the specification allows the flexibility to design different data exchange and data communication formats, as well as software tools that are fully consistent with the data documentation requirements herein.

Although primarily intended for documentation of life cycle data, the data documentation format can also be used for the management of environmental data, e.g. for reporting, performance assessment and benchmarking.

As practice emerges or needs for a broader use of data documentation format arise, the contained format and structure may be expanded to include additional information, such as from environmental performance evaluation, health and safety, and life cycle costing.

This Technical Specification contains a comprehensive list of requirements, rather than a procedural specification. The document specifies how the general documentation requirements for LCI data, as expressed in the ISO 14040 standards, is divided into data fields. Each data field holds text, in some cases selected from a specific nomenclature, or quantitative data. The meaning of each data field is specified in a short descriptive text. The structure of the document itself specifies the relationship between the data fields.

The specification, explanation and implementation of the data documentation format is described in different parts of the document as follows:

— clause 5 covers the specification and structure of the data documentation format and the names of all of the data fields;

— clause 6 covers the specification of the data types used in the data documentation format;

— clause 7 covers the specification of nomenclatures used in the data documentation format;

— annex A contains formatting requirements and explanatory descriptions of each data field to help the user understand which information to place in each data field;

— annex B contains a detailed example of the use of the data documentation format.

Environmental management — Life cycle assessment — Data documentation format

1 Scope

This Technical Specification provides the requirements and a structure for a data documentation format, to be used for transparent and unambiguous documentation and exchange of Life Cycle Assessment (LCA) and Life Cycle Inventory (LCI) data, thus permitting consistent documentation of data, reporting of data collection, data calculation and data quality, by specifying and structuring relevant information.

The data documentation format specifies requirements on division of data documentation into data fields, each with an explanatory description. The description of each data field is further specified by the structure of the data documentation format.

This Technical Specification is applicable to the specification and structuring of questionnaire forms and information systems. However, it can also be applied to other aspects of the management of environmental data.

This Technical Specification does not include requirements on completeness of data documentation. The data documentation format is independent of any software or database platform for implementation.

This Technical Specification does not require any specific sequential, graphic or procedural solutions for the presentation or treatment of data, nor does it describe specific modelling methodologies for LCI and LCA data.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Technical Specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this Technical Specification are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 8601:2000, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO 9000:2000, *Quality management systems — Fundamentals and vocabulary*

ISO 14040:1997, *Environmental management — Life cycle assessment — Principles and framework*

ISO 14041:1998, *Environmental management — Life cycle assessment — Goal and scope definition and inventory analysis*

ISO 14042:2000, *Environmental management — Life cycle assessment — Life cycle impact assessment*

ISO 14043:2000, *Environmental management — Life cycle assessment — Life cycle interpretation*

3 Terms and definitions

For the purposes of this Technical Specification, the terms and definitions given in ISO 14040, ISO 14041, ISO 14042 and ISO 14043 and the following apply.

3.1
data source
origin of data

3.2
data type
nature of the data

EXAMPLES Units, quantitative, short string, free text, numerical, logical.

3.3
data field
container for specified data with a specified data type

3.4
data documentation format
structure of documentation of data

NOTE This includes data fields, sets of data fields and their relationship.

3.5
representativeness
qualitative assessment of degree to which the data reflect the true population of interest

NOTE 1 Considerations could include e.g. geographical, time period and technology coverages.

NOTE 2 See ISO 14041:1998, 5.3.6.

3.6
nomenclature
set of rules to name and classify data in a consistent and unique way

3.7
data quality
characteristic of data that bears on their ability to satisfy stated requirements

[ISO 14041:1998]

3.8
unit process
smallest portion of a product system for which data are collected when performing a life cycle assessment

[ISO 14040:1997]

3.9
process
set of interrelated or interacting activities which transforms inputs into outputs

[ISO 9000:2000]

3.10
product system
collection of materially and energetically connected unit processes which performs one or more defined functions

[ISO 14040:1997]

NOTE For the purposes of this Technical Specification, the term “product” used alone includes not only product systems but can also include service systems.

3.11
life cycle
consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to the final disposal

[ISO 14040:1997]

3.12
reference flow
measure of the needed outputs from processes in a given product system required to fulfil the function expressed by the functional unit

[ISO 14041:1998]

3.13
data commissioner
person(s) or organization(s) which commissions the data collection and documentation

3.14
data generator
person(s) or organization(s) responsible for the modelling of the process and the compilation or the updating of the data

3.15
data documentor
person(s) or organization(s) responsible for entering the data into the data documentation format in use

4 Formatting and reporting

4.1 Formatting

The assignment of information into the data fields of a data documentation format is referred to here as formatting. Formatting includes

— interpretation and assessment of the original information in terms of the scope of the data documentation format,

— structuring the original information into the data documentation format,

— entering the structured information into the data fields of the data documentation format.

The following requirements apply to formatting.

— The information shall be entered into the appropriate data fields of the data documentation format.

— The data documentor shall ensure that all data related to the relevant process in the unformatted document that are of environmental importance are adequately transferred and that no bias is generated. Justification and documentation shall be made regarding information that has been neglected or modified.

— Clear distinction shall be made between a zero value and a void (an empty data field).

— Documentation of different processes, updates, etc. shall be characterized by a unique combination of identification number and version number.

4.2 Reporting

The formatting of information about a process into the data documentation format described in this Technical Specification results in a structured document, i.e. a report.

The example provided in annex B may serve as an example for a report. No mention is necessary of data fields with voids.

This Technical Specification does not include requirements on completeness of documentation. This enables the data documentation format to be used to define different types of summary reports, i.e. reports which only include a subset of a full documentation. Such summary reports can serve to inform users of the documented data on the suitability of the respective data set for a given application. If applicable, an indication that a subset of the data documentation format has been used shall be included in the report.

5 Specification of the data documentation format

5.1 General

This clause presents the general organization of the data documentation format, and is meant to be read as a list of separate and detailed requirements.

This clause specifies the division of the data documentation format into distinct data fields. Each data field holds text, in some cases selected from a specific nomenclature, or quantitative data. The interpretation of each data field is specified in a short descriptive text in annex A. The structure of this clause specifies the relationship between the separate data fields. The requirements necessary for electronic implementation are listed in annex A.

An example of the use of the data documentation format is provided in annex B as an example of paper-based data handling.

The corresponding reference number in the tables of the annexes is indicated after each data field presented in this clause, e.g. **Operating conditions** (*1.1.6.5*). In addition, a reference to defined nomenclature as presented in clause 7 is included when applicable, e.g. nomenclature 7.3.

The data documentation format shall consist of three parts, namely:

— one part covering the process, including the process description and inputs and outputs;

— one part covering the modelling and validation;

— one part covering the administrative information.

The data documentation of a process is illustrated in Figure 1.

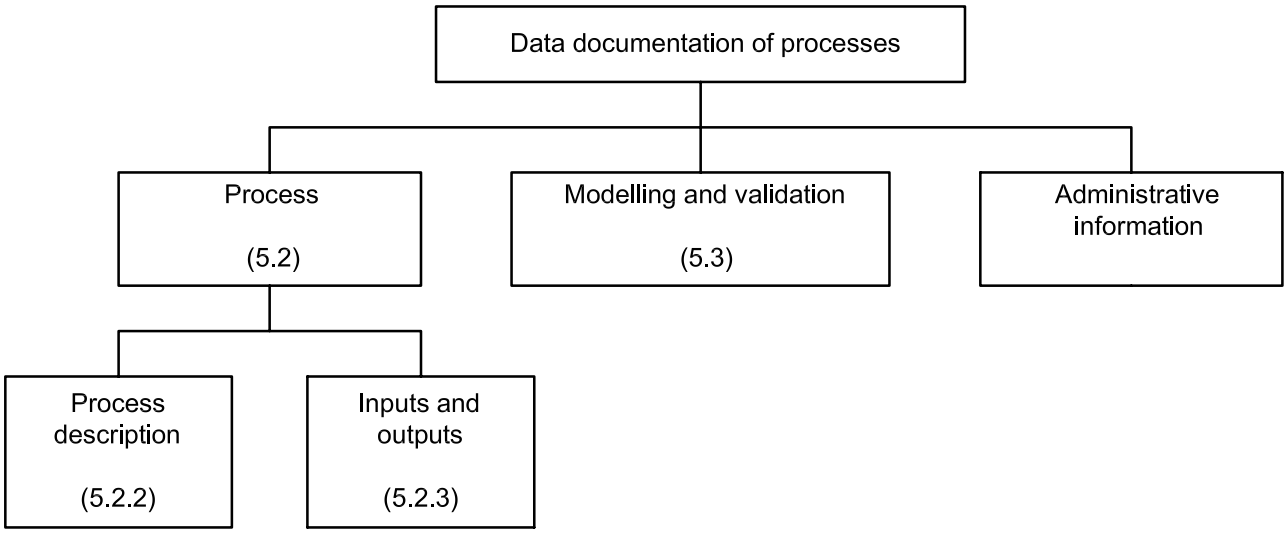

Figure 1 — Concepts of the data documentation format

5.2 Process

5.2.1 General

The set of data fields named process holds data and documentation that describe the properties of the modelled process, including documentation of the technical details and its quantitative parameters, together with a description of the relevant circumstances for which the model is valid.

Process (*1*) shall consist of two parts, namely:

— one set of data fields for the **Process description** (*1.1*);

— unlimited number of sets of data fields for **Inputs and outputs** (*1.2*).

5.2.2 Process description

The process description describes the unit process or a combination of unit processes. It includes the name, function, technical scope, etc.

Examples of processes are:

— a unit process;

— any combination of unit processes;

— technological scenarios, e.g. models of unit processes describing worst-case, best available or future technology.

The process description is independent of the chosen allocation procedures. The allocation procedures are described in the modelling and validation.

The process description shall consist of the following:

a) one data field for the **Name** (*1.1.1*) of the process;

b) unlimited number of sets of data fields for the **Class** (*1.1.2*) of the process expressed by:

   — one data field for the unambiguous **Name** (*1.1.2.1*, nomenclature 7.1 user-defined);

   — one data field for the **Reference to nomenclature** (*1.1.2.2*);

c) one set of data fields for **Quantitative reference** (*1.1.3*) to which all of the data relates, for example the functional unit or reference flow, expressed by:

- one data field for the **Type** (*1.1.3.1*, nomenclature 7.3):
- one data field for the **Name** (*1.1.3.2*);
- one data field for the **Unit** (*1.1.3.3*, nomenclature 7.3);
- one data field for the **Amount** (*1.1.3.4*);

d) one data field for the short description of the **Technical scope** (*1.1.4*, nomenclature 7.3) of the process;

e) one data field for the **Aggregation type** (*1.1.5*, nomenclature 7.2);

f) one set of data fields for **Technology** (*1.1.6*) describing the intended technological applicability of the process, expressed by:

- one data field for the **Short technology descriptor** (*1.1.6.1*);
- one data field for the **Technical content and functionality** (*1.1.6.2*);
- one data field for the **Technology picture** (*1.1.6.3*) (should not be used for the detailed representation of a product system);
- one data field for **Process contents** (*1.1.6.4*) (used when the process is documented as a combination of separately documented processes), expressed by:
  - unlimited number of data fields for the description of **Included processes** (*1.1.6.4.1*);
  - unlimited number of data fields for the **Intermediate product flows** (*1.1.6.4.2*), expressed by:
    I) one data field for the **Source process** (*1.1.6.4.2.1*), from which the intermediate product comes;
    II) one data field for the **Input and output source** *(1.1.6.4.2.2)*, giving the name of intermediate product at the source process;
    III) one data field for the **Input and output destination** *(1.1.6.4.2.3)*, giving the name of the intermediate product at the destination process;
    IV) one data field for the **Destination process** *(1.1.6.4.2.4)*, to which the intermediate product goes;
- one data field for the description of the **Operating conditions** (*1.1.6.5*);
- one set of data fields for **Mathematical model** (*1.1.6.6*), expressed by:
  - unlimited number of data fields for the **Formulae** (*1.1.6.6.1*);
  - unlimited number of data fields for the **Name of variable** (*1.1.6.6.2*);
  - unlimited number of data fields for the **Value of variable** (*1.1.6.6.3*);

g) one set of data fields for **Valid time span** (*1.1.7*) as information used to describe the time-related coverage of the data (see ISO 14041:1998, 5.3.6), expressed by:

   — one data field for the **Start date** (*1.1.7.1*);

   — one data field for the **End date** (*1.1.7.2*);

   — one data field for the **Time span description** (*1.1.7.3*);

h) one set of data fields for **Valid geography** (*1.1.8*) as information used to describe the geographical coverage of the data (see ISO 14041:1998, 5.3.6), expressed by:

   — unlimited number of data fields for the **Area name** (*1.1.8.1*, nomenclature 7.3);

   — one data field for the **Area description** (*1.1.8.2*);

   — unlimited number of data fields for the **Sites** (*1.1.8.3*);

   — unlimited number of data fields for the **Geographical Information System (GIS) reference** (*1.1.8.4*, nomenclature 7.3);

i) one set of data fields for **Data acquisition** (*1.1.9*) with information used to describe the technology coverage of the data (see ISO 14041:1998, 5.3.6), expressed by:

   — one data field for the **Sampling procedure** (*1.1.9.1*) describing the way the process has been selected from the population for which the data is valid;

   — unlimited number of data fields for the **Sampling sites** (*1.1.9.2*);

   — one data field for the **Number of sites** (*1.1.9.3*);

   — one set of data fields for **Sample volume** (*1.1.9.4*), expressed by:

      — one data field for **Absolute** (*1.1.9.4.1*);

      — one data field for **Relative** (*1.1.9.4.2*).

5.2.3 Inputs and outputs

Collected data, either measured, calculated or estimated, are utilized to quantify the inputs and outputs of a process. The major headings under which data can be classified include

— energy inputs, raw material inputs, ancillary inputs, other physical inputs,

— products,

— emissions to air, emissions to water, emissions to land, other environmental aspects.

Within these headings, individual inputs and outputs shall be further detailed to satisfy the goal of the study (ISO 14041:1998, 4.4).

The documentation of inputs and outputs shall include the following:

a) one data field for the **Identification number** (*1.2.1*);

b) one data field for the **Direction** (*1.2.2*, nomenclature 7.2);

c) one data field for the **Group** (*1.2.3*, nomenclature 7.3);

d) one data field for the **Receiving environment** (*1.2.4*, nomenclature 7.2);

e) one data field for the **Receiving environment specification** (*1.2.5*, nomenclature 7.3);

f) one data field for the **Environment condition** (*1.2.6*);

g) one data field for the **Geographical location** (*1.2.7*).

h) one set of data fields for the **Related external system** (*1.2.8*) indicating the origin of an input or destination of an output, expressed by:

- one data field for the **Origin or destination** (*1.2.8.1*);
- one data field for the **Transport type** (*1.2.8.2*);
- one data field for the **Information reference** (*1.2.8.3*);

i) one data field for the **Internal location** (*1.2.9*) including a brief description of the internal use of an input or output*;*

j) one set of data fields for the **Name** (*1.2.10*) of the input or output, expressed by:

- one data field for the **Name text** (*1.2.10.1*);
- one data field for the **Reference to nomenclature** (*1.2.10.2,* nomenclature 7.3);
- one data field for the **Specification of name** (*1.2.10.3*);

k) unlimited number of sets of data fields for the **Property** (*1.2.11*), expressed by:

- one data field for the **Name** (*1.2.11.1*);
- one data field for the **Unit** (*1.2.11.2*, nomenclature 7.3);
- one data field for the **Amount** (*1.2.11.3*);

l) unlimited number of sets of data fields for the **Amount** (*1.2.12*), expressed by:

- one data field for the **Name** (*1.2.12.1*, nomenclature 7.3);
- one set of data fields for the **Unit** (*1.2.12.2*), expressed by:
  - one data field for the **Symbol or name** (*1.2.12.2.1*, nomenclature 7.3);
  - one data field for the **Explanation** (*1.2.12.2.2*);
- unlimited number of sets of data fields for the **Parameter** (*1.2.12.3*), expressed by:
  - one data field for the **Name** (*1.2.12.3.1*, nomenclature 7.3);
  - one data field for the **Value** (*1.2.12.3.2*);

m) one set of data fields for the **Mathematical relations** (*1.2.13*), expressed by:

- unlimited number of data fields for the **Formulae** (*1.2.13.1*);
- unlimited number of data fields for the **Name of variable** (*1.2.13.2*);
- unlimited number of data fields for the **Value of variable** (*1.2.13.3*);

n) unlimited number of sets of data fields for the **Documentation** (*1.2.14*), which may address more than one input and output, expressed by:

- one data field for the **Data collection** (*1.2.14.1*);
- one data field for the **Collection date** (*1.2.14.2*);
- one data field for the **Data treatment** (*1.2.14.3*);
- unlimited number of data fields for the **Reference to data source** (*1.2.14.4*).

5.3 Modelling and validation

The concept of modelling and validation describes the prerequisites for the modelling of a process as well as the validation of the resulting model. It does not describe any properties or aspects of the process itself. During the modelling of a process different choices are made, e.g. which principles to use and what assumptions and exclusions to make. The relevance and the general quality of the data are based on these choices. Therefore, this documentation is valuable for a data user when interpreting the relevance and quality of the data for a specific goal and scope definition.

Modelling and validation (*2*) shall consist of

a) one data field for the **Intended application** (*2.1*);

b) unlimited number of data fields for the **Information sources** (*2.2*);

c) one set of data fields for the **Modelling principles** (*2.3*), expressed by:

- one data field for the **Data selection principle** (*2.3.1*);
- one data field for the **Adaptation principles** (*2.3.2*);
- unlimited number of sets of data fields for the **Modelling constants** (*2.3.3*), expressed by:
  - one data field for the **Name** (*2.3.3.1*, nomenclature 7.3);
  - one data field for the **Value** (*2.3.3.2*);

d) one set of data fields for the **Modelling choices** (*2.4*), expressed by:

- one data field for the **Criteria for excluding elementary flows** (*2.4.1*);
- one data field for the **Criteria for excluding intermediate product flows** (*2.4.2*);
- one data field for the **Criteria for externalizing processes** (*2.4.3*);
- one set of data fields for the **Allocations performed** (*2.4.4*), expressed by:
  - one data field for the **Allocated co-products** (*2.4.4.1*);
  - one data field for the **Allocation explanation** (*2.4.4.2*);

- one set of data fields for the **Process expansion** (*2.4.5*), expressed by:
  - one data field for the **Process included in expansion** (*2.4.5.1*);
  - one data field for the **Process expansion explanation** (*2.4.5.2*);

e) one data field for the **Data quality statement** (*2.5*);

f) unlimited number of sets of data fields for the **Validation** (*2.6*), expressed by:

- one data field for the **Method** (*2.6.1*, nomenclature 7.3);
- one data field for the **Procedure** (*2.6.2*);
- one data field for the **Result** (*2.6.3*);
- one data field for the **Validator** (*2.6.4*);

g) one data field for **Other information** (*2.7*) such as recommendations to the user of data or applicability of data.

5.4 Administrative information

The concept of administrative information describes properties of the documentation of a process that is not directly related to the model, but to the administration of its documentation.

The **Administrative information** (*3*) shall consist of

a) one data field for **Identification number** (*3.1*),

b) one data field for **Registration authority** (*3.2*),

c) one data field for **Version number** (*3.3*),

d) one data field for the **Data commissioner** (*3.4*),

e) one data field for the **Data generator** (*3.5*),

f) one data field for the **Data documentor** (*3.6*),

g) one data field for the **Date completed** (*3.7*),

h) one data field for the **Publication** (*3.8*),

i) one data field for the **Copyright** (*3.9*);

j) one data field for the **Access restrictions** (*3.10*).

6 Data types

Each data field in the data documentation format is a placeholder for data. The data may be of different types, such as a short text, a date, a long text, a number. To avoid that the type of data in a data field, i.e. the data type, is understood differently by different users, the data type of each data field is specified.

A data type defines the general characteristics of the data in the data field. Examples of data types are integer (a whole or natural number, not a fractional number, positive or negative in value), character (a symbol, including the letters of a particular language's alphabet, the numerals in the decimal number system, and certain special symbols), string (a set of consecutive characters), and real (a number that is rational or irrational, not imaginary).

For a given data type, a range of its allowed values can be specified, e.g. the allowed length of a string of characters, and a requirement on its formatting can be specified, e.g. dates as strings of 10 characters formatted as CCYY-MM-DD. Data types guide users to enter data consistently into, e.g., data forms and software, and are required for software to function consistently.

Table 1 lists the data types defined in this Technical Specification.

Table 1 — Specification of data types

Name	Type	Specification
Date format	STRING	10 characters; e.g. CCYY-MM-DD as specified in ISO 8601:2000, 5.2.1
Date interval	STRING	17 characters; e.g. CCYYMMDD/CCYYMMDD as specified in ISO 8601:2000, 5.5
Direction	STRING	Max. 24 characters
Free text	STRING	Length not specified
Integer	INTEGER	—
Label	STRING	Max. 150 characters
Mathematical rule	STRING	Length not specified, format specified by agreement
Mathematical variable	STRING	Max. 150 characters
Picture	STRING	Max. 350 characters. The string addresses a location of a picture file
Real	REAL	—
Short text	STRING	Max. 350 characters

7 Choice of nomenclature

7.1 General

In many data fields free text is used, but for some data fields there is a need for a defined nomenclature.

Nomenclatures within the data documentation format are used in cases where

a) terms are so well defined, that they may be expressed with one or a few words, without ambiguity,

EXAMPLE Inputs and outputs — Amount — Unit, such as SI-unit.

b) terms indicate an interpretation, which may help to distinguish between data sets,

EXAMPLE Inputs and outputs — Group such as “Emission”, “Product”, etc.

c) terms or codes unambiguously referencing an explanation or interpretation of the word or code.

EXAMPLE CAS numbers or country codes.

Three types of nomenclature are used in the data documentation format, namely:

— the exclusive nomenclature;

— the inclusive nomenclature;

— the user-defined nomenclature.

The exclusive nomenclatures shall not be expanded by the user; only the specified terms are valid.

The inclusive nomenclatures may be expanded by the user of the data documentation format if this is necessary for a specific application.

User-defined nomenclatures may be used for any other data field in the data documentation format where the user finds it necessary.

7.2 Exclusive nomenclature

The following exclusive nomenclatures are mandatory:

a) **Process description — Aggregation type**

EXAMPLES Non-aggregated, Horizontally aggregated, Vertically aggregated, Both horizontally and vertically aggregated, Unknown.

b) **Inputs and outputs — Direction**

EXAMPLES Inputs, Outputs, Non-flow-related aspects.

c) **Inputs and outputs — Receiving environment**

EXAMPLES Air[1)], Water[1)], Ground[1)], Technosphere[2)].

7.3 Inclusive nomenclature

The following inclusive nomenclatures are recommended:

a) **Process description — Quantitative reference — Type**

EXAMPLES Reference flow of process, outgoing product flow, incoming product flow, other flow, production period, Other parameter, Functional Unit.

b) **Process description — Technical scope**

EXAMPLES Cradle-to-gate, cradle-to-grave, Gate-to-gate, gate-to-grave.

The nomenclature for different types of process is made according to the different processes that are studied in life cycle assessment. A description of the nomenclatures of the technical scope is given below.

1) Cradle-to-gate: a process starting with resource extraction, which may include some manufacturing or service operations but excluding all subsequent stages.

2) Cradle-to-grave: a process starting with resource extraction to the final disposal of the product.

3) Gate-to-gate: a process where all production stages occur within one site. The site may be geographically specified, or in the case of e.g. average data, the geographical specification may be more general. Processes outside the defined gates are NOT included.

4) Gate-to-grave: a process that includes the distribution, the use and the final disposal of the product.

NOTE Processes where recycled material is used or material leaves the system are not covered by this nomenclature.

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1) Referred to as elementary flow.

2) Referred to as non-elementary flow.

c) **Process description — Valid geography — Area name**

See ISO 3166-1 for Alpha-2 (two letter) codes.

d) **Process description — Valid geography — GIS reference**

See ISO 6709.

e) **Inputs and outputs — Group**

EXAMPLES Resource, Raw material, Energy, Ancillary, Emission, Residues, Co-product, Product.

A description of the Group categories is given below:

1) Resource: Resources from nature, including energy and mineral reserves;

2) Raw material: Raw material inputs from technosphere including intermediary products, semi-finished goods, etc.;

3) Energy: Energy inputs from technosphere;

4) Ancillary: Including ancillary materials, transport flows and other services;

5) Emission: Emission to nature;

6) Residues: Solid, liquid or gaseous flow, e.g. to a treatment process;

7) Co-product: A co-product of a system (co-product includes service, transport, etc.);

8) Product: The product of a system (product includes service, transport, etc.).

f) **Inputs and outputs — Receiving environment specification**

EXAMPLES Agricultural air, Forest air, High altitudes (> 1 000 m), Indoor air, Rural air, Urban air, Agricultural ground, Forest ground, Grassland ground, Impediment ground, Industrial ground, Landfill ground, Rural ground, Urban ground, Creek, Fossil water, Ground water, Lake, Marsh, Ocean, Pond, Rapid, River, Coastal waters, Coastal ground, Surface water, Swamp, Waterfall, Technosphere.

g) **Inputs and outputs — Name — Reference to nomenclature**

EXAMPLES CAS numbers, SETAC nomenclature.

h) **Inputs and outputs — Amount — Name**

EXAMPLES Mean, Mode, Range, Single Point.

i) **Inputs and outputs — Amount — Unit — Symbol or name**

EXAMPLES The International System of units (SI) as set out in ISO 31.

j) **Inputs and outputs — Amount — Parameter — Name**

EXAMPLES Coefficient of variance, Maximum value, Mean, Median, Minimum value, Sample size, Standard deviation, Estimated error.

k) **Modelling and validation — Modelling principles — Modelling constants — Name**

EXAMPLES Net calorific value, Gross calorific value, Recycling rate, Process efficiency, Yield rate, Cut-off ratio, Transportation distance.

l) **Modelling and validation — Validation — Method**

EXAMPLES On-site validation, Recalculation, Mass balance, Cross-check with other source, Proof-reading of data entries.

m) **Units** (appears in several places)

EXAMPLES The International System of units (SI) as set out in ISO 31.

It is recommended to use SI units wherever possible. It is recommended to avoid units including “are”, “barrel”, “bushel”, “gallon”, “grain”, “mile”, “pound”, “ton” and “btu”, since these are not SI units.

Annex A
(normative)

Detailed specification of the data documentation format

A.1 General

This annex includes a detailed specification of the data documentation format, including formatting requirements for the different data fields and explanations of the concepts used. In addition, requirements for the implementation of electronic data exchange formats based on this Technical Specification are listed in A.3.

Tables A.1 and A.2 include the name of the data field and a description of the data to be included. The data type for each term is specified in a separate column. The specification of the data types is found in clause 6. The column nomenclature is used to indicate when a nomenclature is defined for the data field. The nomenclatures are defined in clause 7. It is possible to provide user-defined nomenclatures for the other data fields. For each data field the number of allowed occurrences is described, giving its relation to the concept to which it belongs. The cells containing dashes in the tables indicate that the cell is not applicable.

A.2 Specification of the data documentation format

A.2.1 General

The data documentation format consist of three parts:

— **Process:** Contains the description of properties of the modelled process with regard to technology, time-related and geographical coverage, etc. (Process description), and its quantitative parameters (Inputs and outputs);

— **Modelling and validation:** Contains the description of prerequisites for the modelling and the validation of the process;

— **Administrative information:** Contains information related to the administration of the documentation of the process.

A.2.2 Process

The specification of **Process** is found in 5.2.

Table A.1 — Process

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
1	**Process**		—	—	One
1.1	**Process description**	A first indication of what the process describes may be given by a descriptive name, its position in a classification system, the quantitative reference that the data refer to, and the technical scope and aggregation level of the process. It is important to include the technology of the process, its operating conditions, the time span and geography for which the data is valid and details on the data acquisition. Specification of the process description is described in 5.2.2.	—	—	One
1.1.1	**Name**	Descriptive name for the process, e.g. “Combined heat and power plant with support system” or “Long distance transportation by heavy truck”.	Label	No	One
1.1.2	**Class**	A class makes it easy to search and identify the data. Compared to a name, a class gives an unambiguous structure, allowing easy access for users to all data within an area of interest. For any given process, several classes can be used, but within each class the process can only belong to one name in the class. (The rules for classification are not developed within this document.) Thus, the class has two terms, given in 1.1.2.1 and 1.1.2.2.	—	—	Un-limited
1.1.2.1	**Name**	Specification of the name to which the process belongs in a class taken from a documented user-defined nomenclature.	Label	Yes	One
1.1.2.2	**Reference to nomenclature**	Specification of the nomenclature from which the name is chosen.	Short text	No	One
1.1.3	**Quantitative reference**	Description of the quantitative reference for the process, i.e. the reference to which the size of the inputs and outputs in the process relate. This is for example the functional unit (e.g. 1 ton·km) or reference flow (e.g. 1 kW·h electricity), which can be the input or output of another process. This may or may not be equal to one of the inputs and outputs of the process. The Quantitative reference consists of the terms given in 1.1.3.1 to 1.1.3.4.	—	—	One
1.1.3.1	**Type**	The type of quantitative reference, i.e. Functional unit, Reference flow of process or Other flow.	Short text	Yes	One
1.1.3.2	**Name**	The name of the quantitative reference.	Short text	No	One
1.1.3.3	**Unit**	The unit of the quantitative reference.	Short text	Yes	One
1.1.3.4	**Amount**	The amount of the quantitative reference.	Real	No	One

Table A.1 (*continued*)

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
1.1.4	**Technical scope**	A short general description of the technical scope of the process in terms of the operation(s) included in the data, using a nomenclature. This may be one single operation or several operations covering the full lifecycle of a product, e.g. gate-to-gate or cradle-to-grave.	Short text	Yes	One
1.1.5	**Aggregation type**	This is used to indicate aggregated unit processes, i.e. representing averages of several processes providing the same function (horizontal) or the sum of several interconnected processes (vertical), represented by a nomenclature.	Label	Yes	One
1.1.6	**Technology**	Documentation of the intended technological applicability of the process. This is useful in order to aid the data user when assessing the technical relevance for the model. The documentation may be given as in 1.1.6.1 to 1.1.6.4.	—	—	One
1.1.6.1	**Short technology descriptor**	Short descriptor for the included technology. NOTE A full description of the technology is given in the data field 1.1.6.2 **Technical content and functionality**.	Short text	No	One
1.1.6.2	**Technical content and functionality**	Detailed description of the individual included operations and how they are technically and materially related. When data are aggregated, and the process within the aggregation is not presented, a description of the process within the aggregation should be given here. An aggregated process is, e.g., a result from data aggregation as described in ISO 14041:1998, 6.4.4.	Free text	No	One
1.1.6.3	**Technology picture**	Graphical representation of the technology, e.g. a graphical flowchart of the process. This may further supplement the description of the technology in the data field 1.1.6.2 **Technical content and functionality**.	Picture	—	One
1.1.6.4	**Process contents**	Relevant for processes that consist of a combination of unit processes and where documentation is provided for each process included with the aggregate. An aggregated process is, e.g., a result from data aggregation as described in ISO 14041:1998, 6.4.4. The process contents can be used for transparent presentation of, e.g., product system flowcharts. This data field should not be used where processes within the aggregation are not provided with the aggregated process. (In this case technical content and functionality should be used to describe the processes within the aggregation.) The process contents are described by 1.1.6.4.1 and/or 1.1.6.4.2.	—	—	One
1.1.6.4.1	**Included processes**	Unambiguous reference to the Identification number in **Administrative information** of each of the included processes.	Label	No	Unlimited
1.1.6.4.2	**Intermediate product flows**	Unambiguous references to the input and outputs between two included processes. The references consists of 1.1.6.4.2.1 to 1.1.6.4.2.4.	—	—	Unlimited

Table A.1 (*continued*)

Refer-ence No.	Data field	Description	Data type	Nomencla-ture	Allowed occur-rences
1.1.6.4.2.1	**Source process**	Reference to the Identification number in **Administrative information** of an included process as source.	Label	No	One
1.1.6.4.2.2	**Input and output source**	Reference to a process input or output as a source flow (specified by the Identification number of the Input or output in **Process**).	Integer	No	One
1.1.6.4.2.3	**Input and output destination**	Reference to a process input or output as a destination flow (specified by the Identification number of the Input and output in **Process**).	Integer	No	One
1.1.6.4.2.4	**Destination process**	Reference to the Identification number in **Administrative information** of an included process as destination.	Label	No	One
1.1.6.5	**Operating conditions**	Explanation of the operating conditions for the process, i.e. actual (possibly non-linear) relations between inputs and outputs.	Free text	No	One
1.1.6.6	**Mathematical model**	For mathematically modelled processes, the operating conditions may be documented as a mathematical model of the relations between inputs and outputs. The mathematical model consists of the terms given in 1.1.6.6.1 to 1.1.6.3.	—	—	One
1.1.6.6.1	**Formulae**	Specification of the formulae in the mathematical model. One or several formulae may be supplied.	Math-ematical rule	No	Un-limited
1.1.6.6.2	**Name of variable**	Name of variables used in the formulae. One or several variables may be defined.	Math-ematical variable	No	Un-limited
1.1.6.6.3	**Value of variable**	The value of the variables used in the formulae. A value should be supplied for each defined variable.	Real	No	Un-limited
1.1.7	**Valid time span**	Description of the time span during which the model of the process may be valid. Unless projections or other forecasts have been applied, the valid time span is identical to the time of the data collection. Limitations for the validity in time may be set by, e.g., future technology shifts, planned measurement improvements, or specific seasons. NOTE The valid time span is not the time of publication of the data. The time span can be reported as a range between 1.1.7.1 and 1.1.7.2, and/or 1.1.7.3.	—	—	One
1.1.7.1	**Start date**	The start date of the valid time span.	Date format	No	One
1.1.7.2	**End date**	The end date of the valid time span.	Date format	No	One
1.1.7.3	**Time-span description**	A free time-span description, i.e. as a description of the valid time span for the model of the process.	Free text	No	One
1.1.8	**Valid geography**	Description of the geographical area or location for which the process and data are valid. This is identical to the area or location of the data collection, unless extrapolations from other areas have been performed. The geographical coverage may be documented in any or all of the terms in 1.1.8.1 to 1.1.8.4.	—	—	One

Table A.1 (*continued*)

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
1.1.8.1	**Area name**	One or more names of the area or location.	Short text	Yes	Unlimited
1.1.8.2	**Area description**	General description of the valid geographical area, e.g. if the data is only valid for certain states, counties or municipalities, or if certain areas are exempted.	Free text	No	One
1.1.8.3	**Sites**	One or more addresses to specified included sites.	Short text	No	Unlimited
1.1.8.4	**Geographical Information System (GIS) reference**	One or more GIS references identifiable in a geographical information system. The GIS reference can refer to a geographically positioned zone such as a circle or rectangle or a point.	Label	Yes	Unlimited
1.1.9	**Data acquisition**	Documentation of the data collection and treatment at the process level, in terms of 1.1.9.1 to 1.1.9.4.	—	—	One
1.1.9.1	**Sampling procedure**	Description of the way the included processes have been selected from the population for which the data are valid, including notes of any bias in the procedure.	Free text	No	One
1.1.9.2	**Sampling sites**	The addresses of the sampled sites.	Short text	No	Unlimited
1.1.9.3	**Number of sites**	The number of included sampled sites, which is relevant information for the interpretation of the uncertainty on the presented data.	Real	No	One
1.1.9.4	**Sample volume**	The production volume of the process, expressed by 1.1.9.4.1 and 1.1.9.4.2.	—	—	One
1.1.9.4.1	**Absolute**	The total production volume of the sampled sites.	Short text	No	One
1.1.9.4.2	**Relative**	The percentage of the total volume of the population for which the data is valid. NOTE In ISO 14041:1998 (5.3.6) the term completeness is used for the percentage of locations reporting primary data, but the same term is also used with a different meaning in ISO 14043; therefore the term sample volume is used within this document.	Real	No	One
1.2	**Inputs and outputs**	The specification of inputs and outputs is found in 5.2.3.	—	—	Unlimited
1.2.1	**Identification number**	A unique number within a local data storage or data transfer media to identify the specific input or output.	Integer	No	One
1.2.2	**Direction**	The direction of the input or output, i.e. input to or output from a process. Direction is a nomenclature.	Direction	Yes	One
1.2.3	**Group**	The group to which the input or output belongs, e.g. Resource, Raw material, Emission, Product. The specification of group facilitates identification of the role of different inputs and outputs in the process. Group is a nomenclature.	Label	Yes	One

Table A.1 (*continued*)

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
1.2.4	**Receiving environment**	Exclusive nomenclature indicating how outputs and inputs are delivered from or to a process. For non-elementary inputs and outputs, the receiving environment is "Technosphere", indicating that the input or output connects with another process. For elementary inputs and outputs, a simple nomenclature describes the type of environment that a resource is extracted from, or an emission is let out through; e.g. air, water, ground. For elementary flows, this nomenclature gives information valuable for calculation of concentrations, doses, etc. for an impact assessment, as described in ISO 14042.	Label	Yes	One
1.2.5	**Receiving environment specification**	Inclusive nomenclature indicating the type of environment that an input or output impacts. For non-elementary inputs and outputs, the Receiving environment specification is "**Technosphere**", indicating that the input or output is not subject to impact assessment. For elementary inputs and outputs, the inclusive nomenclature distinguishes between environment conditions at the start of a characterization modelling. This information may enhance a subsequent impact assessment, as described in ISO 14042.	Label	Yes	One
1.2.6	**Environment condition**	A free-text description of the environmental conditions indicated in Receiving environment and Receiving environment specification.	Free text	No	One
1.2.7	**Geographical location**	Information on the geographical location where processes, inputs and outputs occur. The description is useful since the environment has a different sensitivity to different combinations and amounts of inputs and outputs, at different geographical locations.	Short text	No	One
1.2.8	**Related external system**	Information on related external systems, e.g. to identify upstream and downstream processes when the process described in the current document is used in an LCA study. For example, the name and location of a supplier of raw material, possibly allowing calculation of transport distances when the transports are not reported as separate processes, or the type of sewage plant receiving wastewater. NOTE External systems are systems that are not included in the process. The description may be given by 1.2.8.1 to 1.2.8.3.	—	—	One
1.2.8.1	**Origin or destination**	Textual and/or geographical identification of delivering or receiving processes (upstream or downstream processes) for intermediate product flows.	Short text	No	One
1.2.8.2	**Transport type**	The name of the transport supplier or the type of transport.	Short text	No	One
1.2.8.3	**Information reference**	References to contact persons or other documents where information on the described related external systems may be found.	Short text	No	One
1.2.9	**Internal location**	Information about the use of an input or output within a process, e.g. the use of steam for a specific application within the process.	Free text	No	One

Table A.1 (*continued*)

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
1.2.10	**Name**	The name of the input or output. In order to identify the substance of an input or output or the type of other environmental aspect, it needs to be unambiguously named. This is crucial in order for the name to be identified by the data receiver when communicating or reporting data. The name may be specified as in 1.2.10.1 to 1.2.10.3.	—	—	One
1.2.10.1	**Name text**	The name of the substance.	Label	Yes	One
1.2.10.2	**Reference to nomenclature**	The nomenclature from which the name of the substance is chosen, such as CAS-numbers, SETAC nomenclatures.	Short text	Yes	One
1.2.10.3	**Specification of name**	Further specification of the name to facilitate the understanding of the name.	Short text	No	One
1.2.11	**Property**	Relevant properties for the input and output. There may be quantitative or qualitative properties of the input and output that are important in order for a data user to correctly carry out an LCI study or an LCIA. For example, in order to estimate the energy capacity of steam, it is important to also know the pressure and the temperature if the steam is described in terms of mass flow. Another example is the relative economical values of the different products of a multi-product process. Documentation of these is needed in order to perform an economically based allocation. The description may be expressed in terms of 1.2.11.1 to 1.2.11.3.	—	—	Un-limited
1.2.11.1	**Name**	The name of the property, such as density, temperature, price.	Label	No	One
1.2.11.2	**Unit**	The unit of the property.	Label	Yes	One
1.2.11.3	**Amount**	The amount of the property for the documented input and output.	Real	No	One
1.2.12	**Amount**	The amount of the input and output, in relation to the Quantitative reference specified in **Process**. Quantitative information shall be given for each input and output. The amount should be documented in terms of statistical properties, i.e. the name of a distribution function, unit of the amount, names of parameters of the distribution function and quantitative values on each parameter.	—	—	Un-limited
1.2.12.1	**Name**	The distribution function used to describe an amount shall be identified by a commonly understood name, e.g. range, mean. Each distribution function requires a specific set of parameters.	Label	Yes	One
1.2.12.2	**Unit**	For a value to be meaningful, it shall be supplied with a relevant unit.	—	—	One
1.2.12.2.1	**Symbol or name**	The symbol or name representing the unit; SI units are recommended.	Label	Yes	One
1.2.12.2.2	**Explanation**	If the unit, symbol or name is not expressed in terms of SI units, an explanation should be supplied.	Short text	No	One

Table A.1 (*continued*)

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
1.2.12.3	**Parameter**	For any specified distribution function, a set of parameters sufficient to fully describe it should be supplied. For example, in practice, data are often available in the form of ranges expressed by the parameter's minimum value and maximum value. If, in addition, the sample size and the mode (the most likely value) are known, the coefficient of variance can easily be calculated. Each parameter can be expressed in terms of 1.2.12.3.1 and 1.2.12.3.2.	—	—	Unlimited
1.2.12.3.1	**Name**	The name of a parameter of the specified distribution function. For practical purposes, it may be adequate to report the mean and coefficient of variance.	Label	Yes	One
1.2.12.3.2	**Value**	The quantitative value of the parameter.	Real	No	One
1.2.13	**Mathematical relations**	The relations between inputs and outputs may be expressed by mathematical formulae.	—	—	One
1.2.13.1	**Formulae**	Specification of the formulae. One or several formulae may be supplied.	Mathematical rule	No	Unlimited
1.2.13.2	**Name of variable**	Name of variables used in the formulae. One or several variables may be defined.	Mathematical variable	No	Unlimited
1.2.13.3	**Value of variable**	The value of the variables used in the formulae. A value should be supplied for each defined variable.	Real	No	Unlimited
1.2.14	**Documentation**	Description of relevant aspects of the methods for data collection and data treatment. Documentation may be given for a specific input or output and/or for a set of inputs and outputs. The relevant aspects are 1.2.14.1 to 1.2.14.4.	—	—	Each documentation may address an unlimited number of inputs and outputs.
1.2.14.1	**Data collection**	Short specification of the methods that have been used for the data collection, e.g. derived from continuous measurements, modelled from data describing a similar system, estimated.	Label	No	One
1.2.14.2	**Collection date**	The date or time period during which the data were collected.	Date interval	No	One
1.2.14.3	**Data treatment**	Description of the methods, sources and assumptions used to generate, recalculate and reformat the presented amounts.	Free text	No	One
1.2.14.4	**Reference to data source**	References that have been used in the data collection and data treatment.	Short text	No	Unlimited

A.2.3 Modelling and validation

The specification of Modelling and validation is found in 5.3.

Table A.2 — Modelling and validation

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
2	**Modelling and validation**		—	—	
2.1	**Intended application**	Documentation of the intended application and a general description of the task. This may also include an explanatory documentation of the function of the process. Depending on the intended application of the process, the modelling is made with a certain level of detail and quality ambition. Examples of different intended applications with inherently different detail and quality ambitions are processes made to analyse the environmental performance of an in-house production line, for which a very detailed model is needed, industrial averages for general LCA use, for which a general level of detail is needed, or rough estimates made when better data cannot be found, for which details may be roughly ignored.	Free text	No	One
2.2	**Information sources**	Description of sources that have been used for the process. Data may be from primary sources, e.g. measurements on site, personal communication, oral or in writing, or questionnaires, or from secondary (previously published) sources, such as databases, journals, reports or books. In both cases, detailed information on the sources may allow the user of the data to judge the quality of the data and, if desired, to retrieve and check the original sources. For example for horizontal averages describing a type of industrial process, data may have been gathered from a number of sites.	Short text	No	Un-limited
2.3	**Modelling principles**	General principles that have been used in the modelling of the process. The principles may be described using 2.3.1 to 2.3.3.	—	—	One
2.3.1	**Data selection principle**	Description of the principle by which sites have been included in the average should be documented. For vertical aggregations data selection principle describes whether the data should be primarily based on data from, e.g., specific site measurements, best available literature, or from a database included with, e.g., an LCA software. The systematic or methodological principle for switching between different types of source may also be described.	Free text	No	One
2.3.2	**Adaptation principles**	Description of the extrapolations and adjustments that may have been applied to remodel the acquired data into a unit process suited for LCI. Extrapolations may be needed if the acquired data represent a time frame, a country or, e.g., a process or product different than that needed for a specific study. The principle for such adaptations can be documented generally for the whole process. Another type of adaptation is when the uncertainty of numerical data on inputs and outputs have been estimated to take into account the uncertainty from a too small or biased sample.	Free text	No	One

Table A.2 (*continued*)

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
2.3.3	**Modelling constants**	Assumptions that have been held constant throughout the modelling of the process. Examples of such assumptions are whether energy values are based on net (or lower) calorific value (the heat released during combustion when H_2O in the combustion products is in its vapour form) or gross (or higher) calorific value (the heat released during combustion when the H_2O in the combustion products is in its liquid form), or whether the recycling rate for, e.g., paper or steel has been assumed constant regardless of geographical location. Modelling constants may be described in terms of 2.3.3.1 and 2.3.3.2.	—	—	Unlimited
2.3.3.1	**Name**	The name of the modelling constant.	Short text	Yes	One
2.3.3.2	**Value**	The value for the constant that has been used in the modelling.	Real	No	One
2.4	**Modelling choices**	Choices that have been made in the modelling of the process. The choices are described as in 2.4.1 to 2.4.5.	—	—	One
2.4.1	**Criteria for excluding elementary flows**	Description of the criteria used for selecting which elementary flows to include and, if deliberate and conscious, which to exclude. Generally not all elementary flows of an actual technical system are included when modelling it as a process. The criteria used for selecting which elementary flows to include and which to exclude are important information in order for a data user to assess the quality and the relevance of the process for a specific study.	Free text	No	One
2.4.2	**Criteria for excluding intermediate product flows**	Description of the criteria used for exclusion of intermediate product flows, i.e. inputs and outputs that are not elementary flows. Such information is useful, for example, when assessing data gaps in the process. For example, some minor inputs of raw materials for the process may have been neglected in the data acquisition, due to lack of raw data (compare with the data field Criteria for excluding elementary flows).	Free text	No	One
2.4.3	**Criteria for externalizing processes**	Description of the criteria or the principles that have been used for externalizing technical subsystems. This should include justifications and can include informative descriptions of the excluded systems. The description clarifies the technical boundaries of the process.	Free text	No	One
2.4.4	**Allocations performed**	Any allocation performed while modelling the process should be explained and justified. The allocations performed should be related to 2.4.4.1 and 2.4.4.2.	—	—	One
2.4.4.1	**Allocated co-products**	The co-products that have been allocated.	Short text	No	One
2.4.4.2	**Allocation explanation**	Description of the allocations that have been performed with regard to the choice of allocation method, allocation procedures, and information used in the allocation.	Free text	No	One
2.4.5	**Process expansion**	Any process expansions that have been performed should be explained and justified. This may be done using 2.4.5.1 and 2.4.5.2.	—	—	One
2.4.5.1	**Process included in expansion**	Specification of the systems that have been included in the process expansion.	Short text	No	One
2.4.5.2	**Process expansion explanation**	Description of the process expansions that have been performed with regard to choices made, information used, etc.	Free text	No	One

Table A.2 (*continued*)

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
2.5	**Data quality statement**	Description of known general and specific quality strengths and weaknesses in the process. After having compiled a process, the data generator may be well aware of strengths and weaknesses of the model and the data used to describe it. Such information may however be difficult to detect in the overall documentation of the process. Examples are numerical data that were especially difficult to validate, ambiguity in regard to how to compile an industrial average, or difficulties interpreting data supplied from a site.	Free text	No	One
2.6	**Validation**	Documentation of any validations that have been performed on the process. Data describing a process may be validated in a number of ways (for example mass balance calculations, comparisons with data describing similar processes and expert judgements) by many different persons. The validation can be part of a critical review of an LCA study. Validation refers to checks made when entering the data, checks made by the data generator, and checks by a third party. Knowledge of each individual validation and its result is of great importance for a data user or reviewer when assessing the reliability of data. Each validation is described using the terms in 2.6.1 to 2.6.4.	—	—	Unlimited
2.6.1	**Method**	Short description of the nature of the validation method, e.g. “On-site validation”, “Recalculation”, “Mass balance”, “Cross-check with other source”, “Proofreading of data entries”.	Free text	Yes	One
2.6.2	**Procedure**	Description of the quality aspect that has been checked, e.g. “Mass balance of raw material and incoming package material checked to mass of outgoing waste and packaged products” or “Result benchmarked with expert having years of experience from measurements at similar sites.”	Free text	No	One
2.6.3	**Result**	Description of the result of the validation, e.g. “A deviation of 3 % was found on the raw material versus product and waste. This may be acceptable.” or “The value for SO_2 seems a little high, but that may be due to the quality of oil used for the heating.” Also, if errors or missing data were identified, but no corrections were made to the data, then the validation findings should be given here.	Free text	No	One
2.6.4	**Validator**	The identity, competence, name, organization and address of the person performing the validation.	Short text	No	One
2.7	**Other information**	In addition to the overall documentation of the process some other information may be supplied regarding for instance, advice on how to use the process, recommendations on the applicability of the process, known limitations, etc. This is useful to alert the user of data on certain aspects of the process that should be considered before using it in an LCA study.	Free text	No	One

A.2.4 Administrative information

The specification of Administrative information is found in 5.4.

Table A.3 — Administrative information

Reference No.	Data field	Description	Data type	Nomenclature	Allowed occurrences
3	**Administrative information**	To facilitate the administration of processes documented according to this Technical Specification, general administrative information is required since models of processes will be exchanged between data generators and data users, they will be stored in databases and they will be administrated within different information systems.	—	—	One
3.1	**Identification number**	A unique number, within the context of the registration authority, used to identify the process.	Label	No	One
3.2	**Registration authority**	Identification of the registration authority for the identification number of the process. The supplier of data shall be responsible for a registration procedure to identify the processes uniquely.	Label	No	One
3.3	**Version number**	Can be used to identify updates of data for a specified process.	Integer	No	One
3.4	**Data commissioner**	Identification of the commissioner of the data collection or updating of the data.	Short text	No	One
3.5	**Data generator**	Identification of the person or organization responsible for the modelling of the process and the compilation or the updating of the data.	Short text	No	One
3.6	**Data documentor**	Identification of the person responsible for entering the data into the current data documentation format.	Short text	No	One
3.7	**Date completed**	The date at which the data of the process were finally completed, edited or updated.	Date format	No	One
3.8	**Publication**	Reference to a printed or otherwise stable and published literature source where the original copy of this document may be found.	Short text	No	One
3.9	**Copyright**	Identification of the person or organization holding the copyright of the total documentation of the process.	Short text	No	One
3.10	**Access restrictions**	An unambiguous flag indicating how the document may be spread outside of the information system within which it is contained.	Short text	No	One

A.3 Requirements for the implementation of electronic data exchange formats

A specification sufficient for implementation of electronic data exchange shall be expressed in an unambiguous form suitable for computer interpretation, i.e. in a data definition language developed for this specific purpose. There are a number of data definition languages to choose from, such as EXPRESS, XML, SGML, SQL. No specific language has been favoured for this Technical Specification.

To implement this Technical Specification in the form of a data definition language, the following principles shall be applied:

a) Formal requirements

- The data fields and the structuring of the tables in A.2 shall be translated into the chosen formal data definition language without any changes in interpretation of the data fields.
- The syntax of files used for the exchange shall follow a syntax specification appropriate for the purpose.

b) Requirements on data structures

- Sets of data fields shall be translated into e.g. elements, entities, tables or objects, depending on actual choice of data definition language. In this clause those are referred to as *entities*.
- Data fields shall be translated into e.g. attributes, data fields or properties having a data type as specified in Tables A.1, A.2 and A.3 and as described in clause 6. In this clause these are referred to as *attributes*.
- Most references between related entities are only implicit in A.2. Therefore references shall be added explicitly as referencing attributes or entity pointers. For example, in some choices of implementation a reference between “Inputs and outputs” and “Process” shall be manually inserted to maintain data consistency.

c) Requirements on naming

- Names of attributes and entities shall use only lower-case characters; e.g. “Process” shall be “process”.
- Names consisting of more than one word shall be translated into one continuous string by using the character “_” (underscore or ASCII character number 95) between the words. For example, the name “Technology descriptor” shall be named “technology _ descriptor”.
- Names of referencing data fields shall be a combination of the name of the referenced element(s) and the referenced data field within the element(s). The combination of names shall be translated into one continuous string by using the character “.” (full stop or ASCII character number 46) between the names. For example, when referencing process from inputs_and_outputs the referencing attribute shall be named “data_documentation_of_process.administrative_information.identification_number”.

d) Requirements on public electronic data exchange

- When exchanging data publicly, a specification for the exchange file, expressed in the data definition language, shall be publicly available, together with a description of the file syntax. This is required to facilitate translation between different choices of data exchange implementations.

An example of the specification for the implementation of data exchange is the data definition and the file syntax described in a report from the Centre for Environmental Assessment of Product and Material Systems [5].

Annex B
(informative)

Example of application of the data documentation format

B.1 General

This annex provides a detailed example of the application of the data documentation format to a process. Additional examples on application to different kinds of processes can be found in [6].

This annex can also be used as a paper-based data form illustrating application of this Technical Specification (after removal of the sample data).

Different types of LCI data are used within an LCA study. The type of data to be used in the LCA study is determined in the goal and scope phase. This clause gives some guidance on how the data documentation format provides the possibility to distinguish between the different processes. (See ISO/TR 14049 for examples of the different types of unit process.) Two approaches to documentation are:

— processes representing specific unit processes, i.e. original collected data. For these data, it is not necessary to provide documentation for the aggregation type and sampling within the process description;

— processes representing aggregated unit processes, i.e. representing averages of several processes providing the same function or the sum of several interconnected processes. The type of aggregation and method used can be documented using the aggregation type and sampling within the process description.

B.2 Data documentation of a combination of unit processes

The structure for documenting a process that represents a combination of unit processes is basically the same as that for documenting of a single unit process, but with a means to describe the components of the included processes.

The differences at the combined level are:

— each included component of the process may be documented separately;

— if the processes contained in the aggregated format are documented separately, material and energy flows between included processes are indicated as references between the inputs and outputs of the included processes (Table B.1, 1.1.6.4.2).

The differences between documentation of a combination of unit processes and a single unit process is the use of the data fields *Included processes* (Table B.1, 1.1.6.4.1) and *Intermediate product flows* (Table B.1, 1.1.6.4.2) of the data documentation format. In the term *Included processes*, an unambiguous reference shall be supplied referencing the documentation of each of the components of the included processes. In the term *Intermediate product flows*, unambiguous references shall be given to the inputs and outputs between two included processes.

If an aggregated process is provided **without** providing details of the included processes within the aggregation (as separately documented processes using this data documentation format), then a general description of these included processes should be entered under *Technical content and functionality* (Table B.1, 1.1.6.2), and the data fields *Included processes* (Table B.1, 1.1.6.4.1) and *Intermediate product flows* (Table B.1, 1.1.6.4.2) should remain empty.

B.3 Documented example

The following example is entirely fictitious in both a factual sense and in modelling principles. It is produced here only to illustrate the types of information required in different data fields of the data documentation format.

Table B.1 — Process

1	**Process**	
1.1	**Process description**	
1.1.1	**Name**	**Coal-fired electricity production plant with co-generation of steam**
1.1.2	**Class**	
1.1.2.1	**Name**	**Electricity supply (3601)**
1.1.2.2	**Reference to nomenclature**	**Australian Industry Classification Scheme (AICS)**
1.1.3	**Quantitative reference**	
1.1.3.1	**Type**	**Functional unit**
1.1.3.2	**Name**	**Net production of electricity**
1.1.3.3	**Unit**	**kW·h**
1.1.3.4	**Amount**	**1**
1.1.4	**Technical scope**	**Gate-to-gate**
1.1.5	**Aggregation type**	**Other**
1.1.6	**Technology**	
1.1.6.1	**Short technology descriptor**	**CFB coal-based power plants**
1.1.6.2	**Technical content and functionality**	The studied system includes all processes, from washed coal delivery through to power generation, including treatment of cooling water, of a combined heat and power plant with conventional steam cycle within a circulating fluidized bed. The fuel is 100 % washed black coal extracted from mines located within 200 km of the plant. Technical data assumed for the studied plant: Annual time of operation (hours): 4 000 Normal annual electricity production (GW·h): 40 Annual steam production (TJ): 30 Assumed lifetime (years): 40 Electricity production, net during 40 years (TW·h): 1,6

Table B.1 (*continued*)

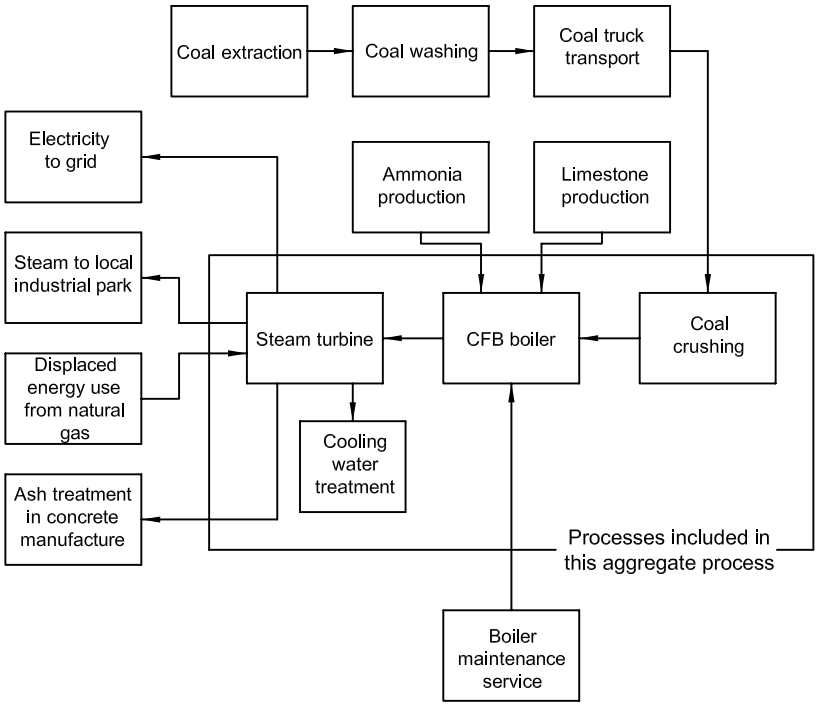
1	Process	
1.1.6.3	**Technology picture**	
1.1.6.4	**Process contents**	
1.1.6.4.1	**Included processes**	(Intentionally left blank — no separate documentation provided on processes included in the aggregate process — for example for use of this data field, see [6])
1.1.6.4.2	**Intermediate product flows**	(Intentionally left blank — no separate documentation provided on processes included in the aggregate process — for example for use of this data field, see [6])
1.1.6.4.2.1	**Source process**	
1.1.6.4.2.2	**Input and output source**	
1.1.6.4.2.3	**Input and output destination**	
1.1.6.4.2.4	**Destination process**	
1.1.6.5	**Operating conditions**	Normal (see data field Technical content and functionality)
1.1.6.6	**Mathematical model**	Specific mathematical formulae provided for individual input/output flows.
1.1.7	**Valid time span**	
1.1.7.1	**Start date**	1995-01-01
1.1.7.2	**End date**	2015-01-01
1.1.7.3	**Time-span description**	The combined heat and power plant is assumed to have an operation lifetime of 40 years, starting 20 years before above start date.
1.1.8	**Valid geography**	
1.1.8.1	**Area name**	Au
1.1.8.2	**Area description**	The plant is located in Australia and all its support systems are calculated in relation to Queensland.

Table B.1 (*continued*)

1	**Process**	
1.1.8.3	**Sites**	Maidstone
1.1.8.4	**GIS reference**	Easting_301230 Northing_6263230
1.1.9	**Data acquisition**	
1.1.9.1	**Sampling procedure**	The inventory relates to a single site, so no sampling procedure was necessary.
1.1.9.2	**Sampling sites**	(No sampling undertaken)
1.1.9.3	**Number of sites**	(No sampling undertaken)
1.1.9.4	**Sample volume**	(No sampling undertaken)
1.1.9.4.1	**Absolute**	
1.1.9.4.2	**Relative**	

Table B.2 —

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	1.2.7
Identification number	**Direction**	**Group**	**Receiving environment**	**Receiving environment specification**	**Environment condition**	**Geographical location**
1	Input	Raw material	Technosphere	—	—	Queensland
2	Input	Ancillary	Technosphere	—	—	Queensland
3	Input	Ancillary	Technosphere	—	—	Queensland

Inputs/Outputs

1.2.8	1.2.9	1.2.10	1.2.11	1.2.12	1.2.13	1.2.14
Related external system	**Internal location**	**Name**	**Property**	**Amount**	**Mathematical relations**	**Documentation**
Origin or destination Coal washery plant **Transport type** Truck, long distance **Information reference** Company internal report	Coal is delivered to crushing unit on power plant site.	**Name text** Washed coal **Reference to nomenclature** Company-specific **Specification of name** Raw coal with low grade material removed	**Name** Energy content **Unit** MJ/kg **Amount** 22,3	**Name** Range **Unit** *Symbol or name:* g *Explanation:* SI unit **Parameter** *Name*: max. *Value*: 450 *Name*: min. *Value:* 420	**Formulae** **Name of variable** **Value of variable**	**Data collection** Coal purchase data **Collection date** 1995/1996 **Data treatment** Annual coal purchases were divided by annual electricity generation **Reference to data source** CIR 1995:4 Company internal report
Origin or destination Ammonia producer **Transport type** Truck, long distance **Information reference** Company internal report	Ammonia is used for reduction of NO_x in the flue gas.	**Name text** Ammonia **Reference to nomenclature** Company-specific **Specification of name**	**Name** Density **Unit** kg/m^3 **Amount** 0,85	**Name** Point value **Unit** *Symbol or name:* g *Explanation:* SI unit **Parameter** *Name*: Single point *Value*: 3	**Formulae** **Name of variable** **Value of variable**	**Data collection** Measured, discrete **Collection date** 1995/1996 **Data treatment** The value is derived from the use of ammonia in the CFB-KVV plant (CIR 1995:4) **Reference to data source** CIR 1995:4 Company internal report
Origin or destination Limestone mining **Transport type** Truck **Information reference** Comment from company		**Name text** Limestone **Reference to nomenclature** Company-specific **Specification of name**	**Name** — **Unit** — **Amount** —	**Name** Average **Unit** *Symbol or name:* g *Explanation:* SI unit **Parameter** *Name:* Average *Value*: 0,25	**Formulae** **Name of variable** **Value of variable**	**Data collection** Modelled **Collection date** Unknown **Data treatment** None **Reference to data source** —

Table B.2

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	1.2.7
Identification number	**Direction**	**Group**	**Receiving environment**	**Receiving environment specification**	**Environment condition**	**Geographical location**
4	Output	Emission	Air	Global air		Queensland
5	Output	Emission	Air	Rural air	Low background concentration of NO_x and no recorded photochemical smog events. Nitrogen-sensitive water catchment	Queensland
6	Output	Residue	Technosphere			Queensland

(*continued*)

1.2.8	1.2.9	1.2.10	1.2.11	1.2.12	1.2.13	1.2.14
Related external system	**Internal location**	**Name**	**Property**	**Amount**	**Mathematical relations**	**Documentation**
Origin or destination — **Transport Type** — **Information reference** —		**Name text** CO_2 **Reference to nomenclature** Company-specific **Specification of name**	**Name** Greenhouse characterization factor **Unit** kg CO_2-eq **Amount** 1	**Name** Range **Unit** *Symbol or name:* g *Explanation:* SI unit **Parameter** *Name*: max. *Value*: 920 *Name*: min. *Value*: 857	**Formulae** M (CO_2) = M(coal) × Ef(CO_2) **Name of variable** M(coal) maximum **Value of variable** 450 **Name of variable** M(coal) minimum **Value of variable** 420 **Name of variable** Ef(CO_2) **Value of variable** 2,04	**Data collection** Derived, unspecified **Collection date** Not known **Data treatment** Derived from emission factors for combustion of fuels used in the production system National Greenhouse Gas Inventory for Australia in 1998 **Reference to data source** NGGI 2000 http://www.greenhouse.gov.au/inventory
Origin or destination — **Transport type** — **Information reference** —	Emitted from stack	**Name text** NO_x **Reference to nomenclature** Company-specific **Specification of name**	**Name** Eutrophication characterization factor **Unit** kg PO_4-eq **Amount** 0,13 **Name** Acidification characterization factor **Unit** kg SO_4-eq **Amount** 0,7	**Name** Single value **Unit** *Symbol or name:* g *Explanation:* SI unit **Parameter** *Name*: Single point *Value*: 4	**Formulae** **Name of variable** **Value of variable**	**Data collection** Derived, unspecified **Collection date** Not known **Data treatment** — **Reference to data source** —
Origin or destination Concrete manufacture in Brisbane **Transport type** Truck **Information reference** —		**Name text** Ash **Reference to nomenclature** Company specific **Specification of name**	**Name** Density **Unit** kg/m^3 **Amount** 237	**Name** Average **Unit** *Symbol or name:* g *Explanation:* SI unit **Parameter** *Name:* Average *Value*: 60	**Formulae** **Name of variable** **Value of variable**	**Data collection** Company records **Collection date** Not known **Data treatment** — **Reference to data source** —

Table B.2

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	1.2.7
Identification number	**Direction**	**Group**	**Receiving environment**	**Receiving environment specification**	**Environment condition**	**Geographical location**
7	Input	Ancillary	Technosphere			Queensland
8	Output	Product	Technosphere	—	—	Queensland
9	Output	Co-product	Technosphere	—	—	Queensland
10	Input	Avoided Product	Technosphere	—	—	Queensland

(*continued*)

1.2.8	1.2.9	1.2.10	1.2.11	1.2.12	1.2.13	1.2.14
Related external system	**Internal location**	**Name**	**Property**	**Amount**	**Mathematical relations**	**Documentation**
Origin or destination Boiler maintenance service **Transport type** — **Information reference** —	Main CFB boiler	**Name text** Boiler cleanout and repair **Reference to nomenclature** Company-specific **Specification of name**	**Name** **Unit** **Amount**	**Name** Single value **Unit** *Symbol or name:* Service occurrence *Explanation:* **Parameter** *Name*: Single point *Value*: 0,000 04	**Formulae** **Name of variable** **Value of variable**	**Data collection** **Collection date** 1998 **Data treatment** Calculated from specifications in maintenance contract **Reference to data source** Maintenance contract – confidential company document
Origin or destination Electricity distribution network **Transport type** — **Information reference** —		**Name text** Electricity **Reference to nomenclature** Company-specific **Specification of name**	**Name** — **Unit** — **Amount** —	**Name** Absolute **Unit** *Symbol or name:* kW·h *Explanation:* SI unit **Parameter** *Name*: Numerical value *Value*: 1	**Formulae** **Name of variable** **Value of variable**	**Data collection** **Collection date** 1998 **Data treatment** The flow is the functional unit for the studied unit process. **Reference to data source** —
Origin or destination Industrial park steam supply **Transport type** Pipeline **Information reference** —		**Name text** Low pressure steam **Reference nomenclature** Company-specific **Specification of name**	**Name** Temperature **Unit** Degrees **Amount** 400 **Name** Pressure **Unit** kPa **Amount** 980	**Name** Absolute **Unit** *Symbol or name:* kg *Explanation:* SI unit **Parameter** *Name*: Numerical value *Value*: 0,25	**Formulae** **Name of variable** **Value of variable**	**Data collection** — **Collection date** Not known **Data treatment** **Reference to data source** —
Origin or destination Industrial park steam supply **Transport type** — **Information reference** —		**Name text** Energy from natural gas **Reference to nomenclature** Company-specific **Specification of name**	**Name** — **Unit** — **Amount** —	**Name** Absolute **Unit** *Symbol or name:* MJ *Explanation:* SI unit **Parameter** *Name:* Numerical value *Value*: – 0,7	**Formulae** **Name of variable** **Value of variable**	**Data collection** — **Collection date** Not known **Data treatment** Calculated based on historical data prior to steam sharing arrangement with industrial park **Reference to data source** Company report —

Table B.3 — Modelling and validation

2	**Modelling and validation**				
2.1	**Intended application**	The purpose was to obtain a reliable basis to be able to perform life-cycle assessment of different local power supply plant, taking into account additional steam utilization, and ash treatment. The work with life cycle assessment is also expected to contribute to reinforcement and structuring of the environmental work within the Company, and provide a deeper knowledge on the use of resources and emissions to the environment. This inventory is part of a large set of inventories covering upstream and downstream processes. See *Clean Coal Technologies LCA* profile report 234, 2000.			
2.2	**Information sources**	The information used in the assessment is largely based on Company internal reports. Regarding methodology for life cycle assessment, International Standard ISO 14040 (1) and the SETAC guidelines (2) were used. (1) ISO 14040:1997, *Environmental management — Life cycle assessment — Principles and framework*. (2) SETAC, *Guidelines for Life-Cycle Assessment: A Code of Practice*.			
2.3	**Modelling principles**				
2.3.1	**Data selection principle**	The following priorities have been followed. (1) Site data have been used only when continuous measurement data have been found. (2) Modelling from similarity has been used whenever site data have not been found.			
2.3.2	**Adaptation principles**	No numerical adaptation is made. Both numerical data and process information used for modelling of the included processes are referred to in the original report. Other adaptations are addressed as allocations. No numerical adaptations are made.			
2.3.3	**Modelling constants**				
2.3.3.1	**Name**	Reinvestments and reconstruction, as percentage of the use of resources and emissions during the building phase.			
2.3.3.2	**Value**	1 % per year			
2.4	**Modelling choices**				
2.4.1	**Criteria for excluding elementary flows**	The parameters that are presented are chosen because they have a general interest and because the basis for these parameters is relatively good. The following aspects have been excluded: — the risk of major accidents and rare breakdowns and environmental consequences from these; — work environment. Trace metal and hydrocarbons have been excluded due to a lack of data and will be investigated as part of National Pollutant Inventory over the next 2 years.			
2.4.2	**Criteria for excluding intermediate product flows**	Known use of chemicals is accounted for. In the cases where it was possible to obtain data, resource use and emissions for the production of these chemicals are included. Fuels and materials used in site landscaping and ponding are not included in the study.			

Table B.3 (*continued*)

2	**Modelling and validation**			
2.4.3	**Criteria for externalizing processes**	The following processes have been externalized from this documented process: — transmission and distribution losses; — coal extraction, washing and delivery; — ammonia production; — limestone production; — boiler service impacts; — stream supply and corresponding credit for energy from natural gas; — ash treatment in concrete manufacture.		
2.4.4	**Allocations performed**			
2.4.4.1	**Allocated co-products**	No allocations performed [for examples of how to use the allocation section of the data documentation format, see CPM report 2001:8].		
2.4.4.2	**Allocation explanation**			
2.4.5	**Process expansion**			
2.4.5.1	**Process included in expansion**	Not applied in the study.		
2.4.5.2	**Process expansion explanation**			
2.5	**Data quality statement**	Data concerning the power plant are based on data for one specific power plant owned by Company. The parameters that are presented are chosen because they have a general interest and because the bases for these parameters are relatively good. All values are reported to three significant figures; the data are however seldom that accurate.		
2.6	**Validation**			
2.6.1	**Method**	Inventory method reviewed	Data checks	
2.6.2	**Procedure**	Critical review	Client review	
2.6.3	**Result**	No significant discrepancies with ISO 14040 or ISO 14041	Corrections made to ash generation values	
2.6.4	**Validator**	Jim Stynes CIM	Clean Coal Power Company P/L	
2.7	**Other information**	The fuel chain and combustion of coal-based electricity production in a CFB-boiler should be applicable on current coal-fired plants. Transmission and distribution losses are not included. When the result is used to study different types of electricity use, these losses should be included. A rough estimate is that the distribution losses for a large industry customer are approximately 5 % of the bought electricity, i.e. to obtain data for the use of electricity the data should be multiplied by 1,05. For an average household customer, the transmission losses are approximately 10 % of the bought electricity, i.e. the data should be multiplied by 1,10. Throughout the calculations, the CFB-boiler is assumed to be equipped with flue-gas condensing equipment. If the results are applied to a existing combined heat and power plant without flue-gas condensing equipment, the use of resources and emissions per produced kW·h electricity will be higher. This is because a plant without flue-gas condensing equipment has a lower total degree of efficiency.		

Table B.4 — Administrative information

3	**Administrative information**	
3.1	**Identification number**	CIM-AUSDATA0000234
3.2	**Registration authority**	CIM International P/L- http://www.cimint.com
3.3	**Version number**	1
3.4	**Data commissioner**	Clean Coal Power Company P/L 35 Station Road Maidstone 8452, Queensland, Australia
3.5	**Data generator**	Clean Coal Power Company P/L
3.6	**Data documentor**	Alex Jamison Energy LC Consultants P/L
3.7	**Date completed**	2000-02-22
3.8	**Publication**	Not published
3.9	**Copyright**	Public
3.10	**Access restrictions**	None

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