Strategy for the Work on CPM's LCA Database

Raul Carlson, August 1997

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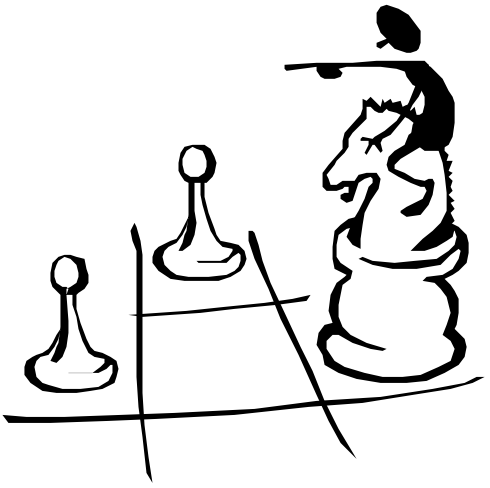

On 'Strategy for the Work on CPM's LCA Database'

Aim of this Paper

The work on CPM's database has now been in progress for one year. During the work, the interest in the database has increased and has spread outside an inner, actively working, circle, while this inner circle has been alone in acquiring increased knowledge about what the database involves.

The following has been written as an overview of the work of and co-ordination between the individual sub-projects and is intended to explain the link between the strategic objectives of the database, the work which is being carried out to obtain an initial adequately functional level for the database and the results which have been achieved so far.

Organisation and Target Groups

The Paper begins by briefly summarising the objective of CPM's database as described in CPM's activity plan (*The Objective of CPM's LCA Database*) and the objective of CPM's database project (*Objective of CPM's Database Project*). This is followed by a brief description of strategically significant project areas (*Project Areas of Strategic Importance*). The next section briefly outlines the tactical work in the project from a strategic point of view (*A Strategic Overview of the Project Work*). Finally, the Paper provides, from the point of view of the project, a summary description of the work which has been done, the work in progress and the plans for the rest of the year (*The Strategy Realised in Sub-projects*).

The intention is for anyone reading this Paper to be fairly familiar with what CPM, LCA and SPINE are and for them to have a general idea of what CPM's database is intended to be. The idea is that those who are not directly involved in the current sub-projects in the database project can benefit greatly from reading the first 4 sections. The last section is mainly intended as a supplement to be read by those who are involved in the database project or who are, in some other way, directly or indirectly affected by or interested in this work.

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Objective of CPM's LCA Database

According to the activity plan for CPM, the objectives for the area of databases and tools are '*to develop a structure for databases for LCA and fill it with relevant content*', '*to develop criteria for the quality requirements which should be made for data which is used in life cycle analyses*', and '*to further develop the experience from the Product Ecology Project*'. Furthermore, the objective is specified as being that '*The companies' concrete requirements for easy-to-use tools, databases with quality-assured data … must be safeguarded*' ([1] *CPM's Activity Plan,* page 7).

The reason why a database with quality-assured data is important to CPM's activities is that, on the one hand, LCA has been found to be a practical tool for analysing the environmental impact of products from a whole system perspective and that, on the other hand, LCA has been criticised because the studies are often very expensive and the results produce a vague decision-making basis on account of uncertainty in terms of the method and data. A national, joint, quality-assured database is expected to reduce the costs of individual LCA studies.

Objective of CPM's Database Project

For the database project, CPM's objective with the database was expressed as: '*The objective of the project is to increase the availability, usefulness and quality of LCA data.*' The implementation was described as follows: '*The objective is to be achieved by installing and managing a physical database for LCA data and by developing and managing the database's conceptual data model (SPINE) and working towards a standard LCA data communication format. The project also comprises the acquisition of LCA data and entering it in the physical database. As the usefulness of LCD data depends on the quality of the data being known, the data in the database is to be quality-inspected and quality-marked as well as managed over time. In order to increase the availability of LCA data, certain parts of this collected and inspected LCA data are to be published, while other parts are to be given publication restrictions at different levels. The levels of availability are to be defined in the project.*' ([2] *Two-year project plan: Establishment of CPM's LCA database,* page 1)

Project Areas of Strategic Importance

The overall strategy is to collect data on a broad front from CPM companies and other sources and, at the same time, to ensure long-term, self-propelling data supply in accordance with CPM's objectives for the database. This is to be done by means of

- a general enhancement of competence (data handling for LCA methods)
- various types of standardisation (quality, format, nomenclature)
- method development (rational LCA data handling)
- building up a data exchange network between various institutions and companies
- integration of data handling in other administrative activities (environmental management system, environmental reporting, product communication)
- building up long-term database management at CPM (organisational, technical).

A Strategic Overview of the Project Work

In the following, the project's strategic areas have been structured in eight tactical sub-areas, each of which is given a brief explanation, a brief description of objectives for 1997 and a brief status description. The order of the points below has been chosen on the basis of the chronological order and order of priority during the establishment phase of the database. In the next stage of CPM's activities, other chronological priorities will apply with a greater emphasis on data acquisition. (*NB: These tactical areas are not the same as the project's sub-projects, which were formulated on the basis of technical specialist content rather than for tactical reasons.*)

1. Define Quality

Define, disseminate and maintain a functional and practical data quality level (data quality criteria) which contributes to reducing the costs of the implementation of LCA studies and increasing the quality of the results.
Explanation of the choice of strategy: The term data quality is too vague to be used without first having been defined. Different data users can be expected to have different perceptions of quality. Harmonising the meaning of this term is essential. Reduced costs are achieved by the data in the database being self-descriptive, which means that the data user does not have to perform time-consuming studies of literature in order to decide the relevance of the data when it is used.
***Status**:*

- *Quality criteria defined. (Done 1996)* [3]
- *The basic structure for the nomenclatures for data has been drawn up. (Done 1996)* [4]

***Objectives for 1997**:*

- *Settled*

2. Apply the Quality Definition in Practice

Apply and further develop the above data quality criteria in order to improve and simplify them for practically applicable levels/forms.
Explanation of the choice of strategy: During the development of the quality criteria in accordance with point 1 above, there was no time for practical tests of these criteria. They need to be further developed in connection with their application.
***Status**:*

- *The quality criteria and nomenclatures have successfully been applied to about fifty data sets of various types. (1996 and spring + summer 1997)*
- *The quality grading of data, which is based on these criteria, has begun to be discussed. The intention is to achieve a formalised simplification of the data handling in order thus to be able to cover both existing data and a development in quality in the data work. This may mean that it will be possible, in a structured manner, to enter far more data faster in CPM's database. (Done October 1997)*

***Objectives for 1997**:*

- *A clearly formulated and practically satisfactory attitude to the quality criteria.*

3. Integrate the Quality Definition in Data Production in Practice

Integrate, in terms of quality and in a structured manner, LCA data handling/acquisition in the companies' internal (environmental management) organisations, in business relations (LCA data form, environmental specification) and in connection with report production/documentation (environmental reporting, environmental auditing, LCA reports).

Explanation of the choice of strategy: There are still not many people who produce original data which results in good quality. In order, in the long term, to reduce the costs of good data handling, methods are required which mean 'doing it right from the start'.

***Status**:*

- *Tested handling of the SPINE format in connection with the Nolato Plastteknik environmental report. (March-April1997)*
- *Supervised the project work which studied the County Administrative Board's environmental reporting from a CPM quality criteria perspective. (Spring 1997)*
- *Partially supervising the student workers who are studying the handling of environmental data in industrial environmental management systems. (Done December 1997)*
- *Initiated a national project which aims to produce methods for handling measurement data and environmental data reporting adapted to LCA data within the framework of EMAS and ISO 14000, with the objective of achieving ISO standardisation of the data format and handling. (Initiated June 1997, estimated to continue until roughly April1998)*
- *Have defined the content of an LCA data form, which is based on CPM's data quality criteria. (Done August 1997)*

Objectives for 1997:

- *A number of internal projects are to have been started up, the common objective of which is to find ways of practically integrating LCA data production in the companies' existing or newly-installed information handling routines.*
- *A joint, functioning LCA data form is to be found for the CPM companies, together with a description of the methods recommended for the use of this form.*

4. Manage the Database

Jointly within CPM prioritise which data is to be acquired and jointly manage this data and make it available for use directly from CPM's database via the Internet and on site at CTH.

Explanation of the choice of strategy: Finding available, interesting data for a joint database is not a trivial task. Secrecy, management costs and priorities are examples of obstacles which must be surmounted jointly. The management must be long-term and support the LCA work of the interested parties from a functional point of view.

***Status**:*

- *Important management functions have been identified. (Done January 1996)*
- *Have carefully identified many of the problems associated with starting a national LCA database. Secrecy internally at CPM, unwillingness to provide data for unrestricted use. Difficulties in finding joint priorities for a joint database. Insufficient data handling quality.*
- *Have started up a secure database which is managed externally. (Done November1996)*
- *Publishing a database on the Internet for interactive searches for LCA data. (Done January 1997)*
- *Have been able to identify a large quantity of data which can be prioritised jointly. (April 1997)*

Objectives for 1997:

- *A new management description will be ready at the end of 1997. This will contain, among other things:*
  - *a description of how the database is to be interpreted and used*
  - *a functional description concerning responsibility for data supply*
  - *functional rules for secrecy and openness based on, or in accordance with a further development of, the Board's previous decision (15/11/96).*

5. Acquire Data

Jointly within CPM acquire data for the joint database.
Explanation of the choice of strategy: No single organisation has the competence and resources to acquire and enter data which covers the majority of the data requirements of an industrial application of LCA. Joint national resource work is the key to building such a database and to building up the LCA data network on which this database is based.
***Status**:*

- *Have entered data in the database at CTH (Vattenfall electricity production from 1996, transport data from 1995). This is data with a well-defined quality.*
- *Have relations with NGM (Nätverket för Godstransporter och Miljö – the network for goods transports and the environment), from which large quantities of good transport data are on the way to CPM. (Expected to be done in September 1997)*
- *Have started 'Supervised Input', which involves acquiring five well-described data sets from each of the CPM companies, and training is being given in the use of the quality criteria. (Done during autumn 1997)*
- *Have started '48 unit processes', a quantitative, well-defined sub-project, in which most CPM companies are participating in order to acquire good data for CPM's database. (Done in November 1997)*
- *Have started structuring information on other databases for simple search and identification of externally available data sets for CPM's companies. (started autumn 1997, will form part of database management)*
- *See also Integrate the Quality Definition in Data Production in Practice, above.*

Objectives for 1997:

- *Data on approximately 150 technical production systems, completely described in accordance with CPM's quality criteria. Available via the Internet to CPM's companies and CTH institutions.*
- *Well-described information on approximately 25 externally available data collections. Available to the public.*

6. Develop Rational LCA Data Handling

Co-operate with system suppliers to produce computer solutions which simplify data handling and communication of data between, for example, the database at CTH and the companies' databases and calculation programs.
Explanation of the choice of strategy: In order to make the database efficient, a number of sub-system solutions are required. These should, in part, be formulated jointly at CPM.
***Status**:*

- *Developing freely available software for training and for internal handling of data at CTH in accordance with CPM's quality criteria. (Runnable April 1997, development continues for simple searches in the database via the Internet)*
- *Principles formulated for the data communication format for LCA data. (Done January 1997)*
- *Help in connection with supervising student workers at Nordic Port AB, which aims to produce the LCA data communication format and software. (Done autumn 1997)*
- *Continuous further development of the publication of the database on the Internet for user-friendly, efficient data handling. (In continuous progress. In order for this to become a strong tool, we are waiting for commercially produced data communication software which Nordic Port AB is developing and will market.)*

Objectives for 1997:

- *A user-friendly, functional interface for searching via the Internet in CPM's database and occasionally information on externally available data.*
- *The commercially available software is to be adapted to CPM's quality criteria as was shown possible in CPM's software.*
- *Commercially available software produced; they support automatic transfer of LCA data between various SPINE databases. Typically CPM to company and vice versa.*

(NB: The two latter objectives must be regarded as ambitions rather than objectives as meeting them lies beyond the administrative control of the CPM organisation.)

7. Build a National Competence Network For LCA Databases

Create ways of co-operating between the CPM companies and the institutes in order to develop methods for data handling (acquisition, processing) which result in increased availability of quality data for LCA use.
Explanation of the choice of strategy: It is not realistic to have the ambition of acquiring all data and all data competence from all possible sectors in and around one database. In the long run, no single organisation can afford the updating costs of managing a large database. Co-ordination of competence is more realistic.
Status:

- *Have initiated national project for the preparation of principles for environmental data handling and reporting (see 'Integrate the Quality Definition in Data Production in Practice' above)*
- *Within the framework of CPM's efforts to co-operate, contact has been sought with STFI, SIK, CIT, IVL. Nothing done, but a marked positive ambition is clear. Further structuring of these relations requires formulation of policies by CPM regarding the forms of CPM's relations with these institutes.*

Objectives for 1997:

- *To have a database which, through the quality of its content, its long-term management and its use-oriented functionality, gives weight to CPM as a national competence centre in this area.*

8. International Positioning and LCA Data Network

Co-operate with other database managers in Sweden and the rest of the world in order, in the long term, to make their data available for Swedish LCA requirements as well.
Explanation of the choice of strategy: As 'Build a National Competence Network For LCA Databases' above.
Status:

- *Strong participation in LCA-NET's formulation of proposals to the EU in the area of LCA databases and software.* [5]
- *Participation in SPOLD's formulation of the LCA data format.* [6]
- *Planning is in progress in the database project's sub-project 'An International LCA Data Compatibility Workshop' in order to create an international workshop which describes the work with data in Sweden. Aim: To invite a large number of LCA software producers and database owners to disseminate and acquire knowledge about data handling methods and to create international relations in this area.*

Objectives for 1997:

- *To have reached out internationally with the Swedish work on SPINE, partly through the workshop planned, partly through a clear, informative information site on the Internet on SPINE and CPM's work and results regarding the database.*
- *Like national network: Meeting CPM's quality-related and content-related objectives will give the activities internationally recognised weight.*

The Strategy Realised in the Sub-projects

The database project was originally divided into three stages; stage 1, the aim of which was to lay a foundation for the practical work, stage 2, the aim of which was to acquire data for the database, and stage 3, which was to run in parallel with stage 2 and the content of which was to be to establish the organisational and technical functions required by the database.

Stage 1 was completed in January 1996 as planned with virtually all defined objectives met. Stages 2 and 3 were merged into one stage 2, with the responsibility for data acquisition, quality inspection and co-ordination of data acquisition resting on Ann-Christin Pålsson and the responsibility for overall co-ordination of the organisational and technical development of the activity resting on Raul Carlson. These two areas of responsibility reflect the original plan for two parallel stages. The stages were merged because co-ordination, technology, organisation, quality inspection and data acquisition proved to be so strongly interdependent that a joint stage was the most natural approach.

In the following, the project will be described through sub-projects.

Stage 1

Stage 1 ran between August 1996 and January 1997 and consisted of 6 sub-projects, divided according to subject-matter.

Data Quality

Result: Quality criteria for data in CPM's database were formulated in the report '*CPM's Data Quality Criteria*' and mean in brief that data users will be able to decide how relevant a certain data set is for the study carried out. As a result of the realisation that the quality of a database depends on the quality of the managing organisation, ABB also had a quality assessment of CPM's organisation compiled.
Forms: 6 meetings were held at CTH in order to discuss, decide on and formulate the quality criteria which were to made the standard for CPM's database.
Sub-project Manager: Peter Arvidsson at Akzo Nobel.
Assessment: The interest and participation in this project were high. There was good agreement. The handling and interpretation of ABB's quality assessment took place outside the sub-project.

Nomenclatures and Hierarchies

Result: 5 nomenclatures were outlined and given contents. It was also clear that nomenclature issues are very difficult to settle from a national and general perspective. A further development will take place in connection with use. A central management of the nomenclatures should be set up.
Forms: 4 meetings were held at CTH, partly to discuss the problems in the area of nomenclatures, partly to decide on a joint basic outlook on these problems and on a joint basic structure for a number of nomenclatures.
Sub-project Manager: Göran Swan at STORA Corporate Research
Assessment: The interest and participation in this project were high. It was very difficult to gain a joint overview of different nomenclatures within different areas of activity and within different disciplines.

Data Acquisition/Input

Result: 10 LCA datasets from the report '*Life Cycle Analysis of Vattenfall's Electricity Production*' from 1996 and approximately 10 LCA data sets from Anne-Marie Tillman's report '*Goods transportation in life cycle assessment. Standard values for energy consumption and emissions*' from 1995. This data was converted at CTH into SPINE format in accordance with CPM's data quality criteria.
Forms: 6 joint meetings were held at various locations: The meetings concerned analysing available data supplies within the CPM companies and finding joint priorities with regard to data sources and data quality. Moreover, several of the parties involved in the sub-project met Ann-Christin Pålsson at CTH to hand over data sets which are used internally in the companies. It was recommended that all data sets be converted before they could be accepted for CPM's database. This was because data was not in a useable form (SPINE-adapted) and/or did not meet CPM's quality criteria. STFI's data sets were to be handed over via the forestry companies, but this has not yet been arranged organisationally. Moreover, STFI handles secrecy and data quality in a way which has meant that it has not yet been possible to handle this data.
Sub-project Manager: Lennart Karlson at ABB Corporate Research
Assessment: The interest and participation in this project were high. There were big problems agreeing on priorities. It was remarkably difficult to use the companies' contributions in kind for data input in the joint database.

Data Communication

Result: An outline of a method for standardising data communication. The STEP standard applies. Nordic Port's then almost finished software was chosen as an interim solution.
Forms: 4 meetings were held, partly to illustrate what LCA data communication involves, partly with invited data communication experts from Volvo Data.
Sub-project Manager: Luis Blanco at Volvo Data
Assessment: Knowledge of the importance of these issues does not yet extend outside the sphere of technicians. Communication software is extremely important, not only for this knowledge but mostly to ensure that it will be possible to use CPM's database and SPINE rationally and efficiently.

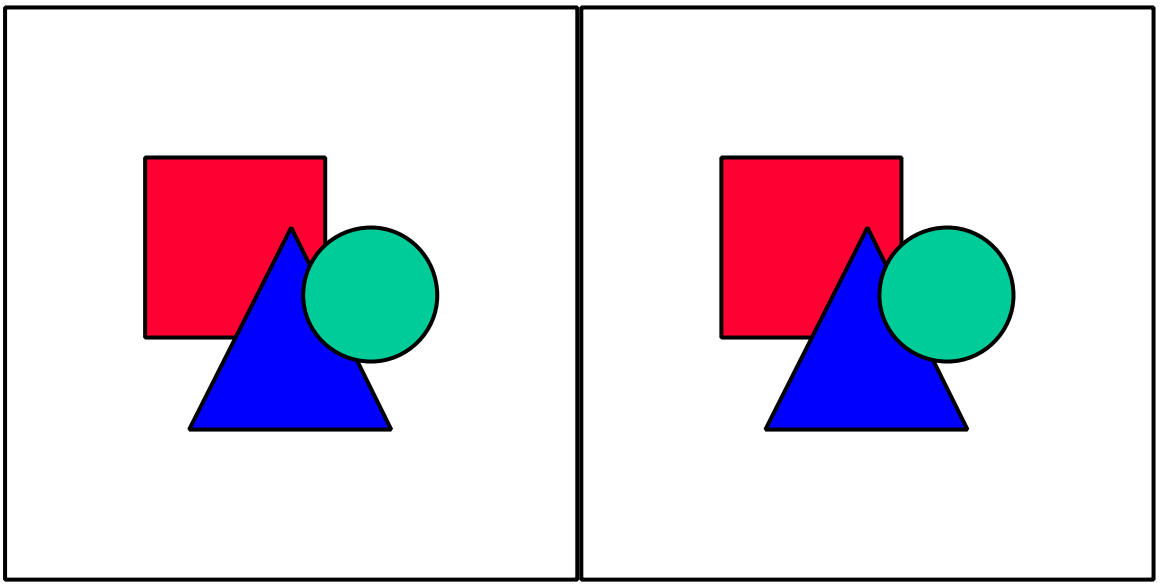
Technical Database Environment

Result: A well-protected database server started up at an external manager. Internet publication of current project information and of the fact that the database is working.
Forms: 1 meeting was held at CTH. The intention was for the sub-project to cover data-technical issues concerning the use of SPINE and concerning the choices made with regard to the technology for database servers, Internet technology, etc.
Sub-project Manager: Raul Carlson at CTH
Assessment: In spite of the need for technical solutions, knowledge of the importance of co-ordination and user control in these issues is relatively poor. The data-technical interpretation of the LCA method is best left to commercial system suppliers.

Database Organisation

Result: The sub-project was summed up as a list of a number of sub-areas which are important for the continued management of CPM's database.
Forms: 2 meetings were held at CTH. The following were analysed at these meetings: organisational difficulties concerning quality inspection, responsibility for input, policy regarding information providers and secrecy issues, etc. as well as technical management issues.
Sub-project Manager: Raul Carlson at CTH

Assessment: The interest and participation in this project were poor. A 'database' was still perceived as a way of accessing data rather than an organisational function within CPM. The organisation within CPM did not make it possible to discuss forms, rules and policies for a database organisation with long-term management.



Stage 2

The stage was started in February 1997 and is to continue until the end of 1997 when CPM's first stage is finished. The stage was divided into 4 sub-projects of which 2 are of a practical nature: '*48 Unit Processes*' and '*LCA Data Form*', one of a clearly strategic nature: '*International LCA Data Compatibility Workshop*' and one of which the intention is to develop the database activities in the long term: '*Activity Development*'.

48 Unit Processes

Expected result: LCA data on 48 unit processes, described in accordance with CPM's data quality criteria.
Forms: 2 prioritising and co-ordinating meetings have been held at CTH. The work is being carried out at the CPM companies. CTH is providing support regarding the interpretation and use of data quality criteria.
Sub-project Manager: Lennart Karlson at ABB Corporate Research
Comments: The number 48 was changed to 26 at one of the meetings, which means that there will be at least 26 data sets but that there may be more than 26.
Status: In progress.

Activity Development

Expected result: An organisational role and a 'list of contents' for CPM's database management. Within each CPM company, there is to be sufficient competence to be able to work with data in accordance with CPM's quality criteria. A long-term data supply is to be secured from measurement to input in a SPINE/LCA database.
Forms: Three sub-areas:

1. *Supervised LCA data input*, with the aim of providing practical supervision and interpretation of CPM's data quality criteria for persons in each CPM company in connection with the input of 5 LCA data sets.
   Status: In progress.
2. *Training and training material*, with the aim of providing training and producing a sufficient quantity of training material in order to teach how to work with data in CPM's database.
   Status: A manual for handling data in accordance with the quality criteria has been produced [4]. Software for training purposes exists [Available in a demo version via the project's homepage].
3. *System structure*, with originally loosely formulated contents, with the aim of analysing data handling from measurement to conversion of the data to LCA (SPINE) format.
   This proved to be of such great interest that it has now been formulated as a co-ordination project between SIS, SMS, SWEDAC, IVL and CPM, with the intention of finding forms of integrating LCA data handling in accordance with CPM's data quality criteria in ISO 14000 and the EMAS environmental management system.
   Brief information on this: SIK, Jernkontoret, CIT, IVL, SMS, SWEDAC, Nordic Port, Assess, STFI, among others, were invited to an initial meeting at CPM/CTH on 5/6/97 with the aim that various Swedish competence groups would be informed of the plans to attempt to standardise internal environmental information handling within companies and on this basis formulate their own roles. Forms and roles were discussed for the present and a working group for the preparation and co-ordination of a number of internal projects within companies will meet on 15th September, after which the kick-off will be held on 30th September. Jan Bresky at STORA has been appointed as the project manager for this activity. The sub-area has become known under a number of different names: "The Meta Data Project", "Emission Possible" or "ISO-standardising Environmental Data Handling"; when it is specified in further detail, the project will be given one specific name.
   Status: Initial meeting held in June. Planning starts in August 1997.

Sub-project Manager: Raul Carlson at CTH
Comments: This sub-project formulates the basis for CPM's long-term database management.

LCA Data Form

Expected result: A general LCA data form which can be used by all CPM companies when they request LCA data from subsuppliers. The form can also be used for other LCA data communication and is to be adapted to SPINE and SPOLD.
Forms: A fast working day to formulate what is to be included in the form. The form is being designed at ABB. The manual for filling in the form is being taken from *Manual For Work on Data Quality and SPINE*.
Sub-project Manager: Göran Brohammer at SCA Mölnlycke
Comments: The ambition was for the production of the form to be preceded by thorough studies of SPOLD's, the Product Technologists' and other LCA data forms. On account of a lack of resources and on account of the difficulties in disregarding the actual problems which arise in connection with communication via forms, we chose on the working day to settle for using the joint experience available within the project. The form is to be used in practical product data communication during autumn 1997. Any deficiencies in the design will be dealt with when it is evaluated.
Status: The contents of the form have been specified. The design, manual and rules of use are being prepared during August 1997.

International LCA Data Compatibility Workshop

Expected result: A workshop which offers the technical results of the work on SPINE to international database owners and software producers. Emphasis: How to achieve compatibility between SPINE and SPOLD and between different databases and software.
Forms: Being planned.
Sub-project Manager: Jörgen Wennsten at Volvo Teknisk Utveckling
Comments: SPOLD will publish an electronic data transfer format in September 1997. This may be of great importance to CPM's quality and compatibility ambitions, for which reason the design of this workshop must take this format into account.
Status: Interim agenda drawn up and sent out during August to any lecturers and other resources.

Raul Carlson, August 1997

References

[1] CPM's Activity Plan
[2] Two-year Project Plan: Establishment of CPM's LCA Database
[3] Data Quality Requirements in CPM's Database 1997, CPM Report 1:1997
[4] Manual For Work on Data Quality and SPINE, Ann-Christin Pålsson, CPM, CTH, 1997.
[5] A Strategic Research Programme for Life Cycle Assessment, Final Document for the Concerted Action LCANET, N. Wrisberg et al, Centre for Environmental Science, Leiden, 9-6 1997.
[6] Synthesis Report of Taormina Workshop on a Common Format for Life-Cycle Inventory Data, L. Grisel, B. Weidema, Society for Promotion of LCA Development, Status Report II, 1996.