INSTITUT FÜR ENERGIE- UND UMWELTFORSCHUNG HEIDELBERG

Review statement on European Database for Corrugated Board Life Cycle Studies 2015

Dataset owners: CEPI Containerboard & FEFCO corrugated packaging

Dataset developer: Angeline de Beaufort-Langeveld

Reviewer: Frank Wellenreuther

Heidelberg, February 2016

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1 Background and Goal

CEPI ContainerBoard (CCB) and the European Federation of Corrugated Board Manufacturers (FEFCO) collected data from the industry to document the environmental impact of corrugated board.

The result is a European database for life cycle studies that includes data for the production of:

- Corrugated base papers from primary fibres: Kraftliner, White Top Kraftliner and Semichemical Fluting (data from CCB)
- Corrugated base papers from recovered papers: Testliner, White Top Testliner and Wellenstoff (data from CCB)
- Corrugated board (data from FEFCO).

The data is the eight edition of the database and represents averages of the inputs and outputs form the production sites per tonne paper and corrugated board for the year 2014.

The updated database was presented to ifeu GmbH for a critical review.

The goal of the review presented here is to ensure that:

- the methods used to compile the database are scientifically and technically valid,
- the data used are appropriate and reasonable
- the database report is transparent and consistent

2 Review procedure

This review has been conducted in two steps. The first step was a meeting between the dataset developer and the reviewer in Heidelberg on the 12th of August, Germany to present and discuss the ongoing data collection and modelling assumptions, the second step was the preparation of this review statement by the reviewer after provision of the final draft of the database report (status 18th of January 2016).

2.1 Documents provided and reviewed

The dataset developer provided the reviewer with several documents relevant for a clear understanding of the data compilation process. Those documents were as follows:

Data collection questionnaires

At the meeting in Heidelberg on the 12th of August 2015 the original questionnaires with site-specific production data were made accessible to the reviewer.

- The questionnaires follow a top-down approach to data collection consistently.
- Information about all annual inputs and outputs was requested.
- As no allocation was made for by-products the inputs and outputs include the production of these by-products
- The questionnaires have a built-in consistency check procedure for Carbon, energy, water and mass balances.

    ⇨ The questionnaires are considered to be well-suited to their purpose to collect all relevant gate-to-gate data. The reviewer emphasises especially the built-in balance checks. Particularly the carbon balance check is very helpful to ensure a consistent inventory of fossil and non-fossil carbon inputs and outputs.

Database report 2015 v 2.1 for review

This final draft of the database report has been sent to the reviewer on the 18th of January 2016.

- The report contains a single European average inventory dataset covering corrugated board production including the production of the four main paper grades used.
- It contains a very detailed section describing the production processes.
- The dataset for the corrugated board is calculated by multiplying the average paper grade composition data from CCB with 1.1 (as on average 1.1 tonne of paper is used for 1 tonne corrugated board) and adding the corrugated board data from FEFCO.

⇨ The detailed section describing production processes is well written and very much appreciated as it will help non-professionals to understand and therefore use this dataset correctly.

⇨ This calculation approach is transparently presented in the report and considered suitable for the generating of one average dataset.

- The underlying datasets differ in their representativeness. The data for Semi-chemical Fluting and Kraftliner represent more than 90% of the total annual production of corrugated base papers from primary fibres in Europe. The data for the production of Testliners and Wellenstoff represent about 66% of the total annual production of corrugated base papers from recovered paper in Europe. The data on corrugated board production represents 40% the total annual production of corrugated board in Europe.

  ⇨ The resulting dataset is considered to be representative of the European production of corrugated board and the reference year 2014.

- Allocation of inputs and outputs was not necessary in all cases of data collection. At some sites only one grade of product is produced, at some the mills were able to assign inputs of raw materials to the different products. In remaining cases allocation between co-products has been based on mass for material inputs and outputs as well as for emissions to water. For energy inputs and outputs as well emissions to air allocation has been based on energy or mass.
- Inputs and outputs allocated to other products (not by-products) and sold energy have been excluded from the inventory data.
- No allocation was made to by-products, so the reported inventory includes the production of these by-products.

  ⇨ The allocation procedure is considered suitable to deliver the most valid results possible.

- A description of material inputs and outputs like raw material, chemicals, packaging and residues is given in the report.
- Additional information about the average fate of waste and residues is also presented.
- Regarding inputs and outputs of packaging, collected data on the use of pallets has been unsuitable to derive an average figure.

  ⇨ The material inputs and outputs are presented in a transparent manner.
  ⇨ Slight data gaps regarding the reporting of residues at some mills as well as the use of pallets are also presented in a transparent manner.
  ⇨ Data on residues can still be considered as representative.
  ⇨ The lack of a figure for pallets is unfortunate but does not impair the dataset considerably as the influence of pallet use can be considered as almost insignificant regarding the overall inventory results.

- Energy inputs and outputs were collected in a top-down approach. Energy recovered through the internal burning of black liquor, bark and rejects is not included.
- Energy produced on-site and sold externally is considered as a co-product. Therefore the fuel consumption and emissions to air do not include its production. All the energy used on site is allocated to the paper production.
    - ⇨ The exclusion of internal energy flows and sold energy is considered to be a valid approach.

- Transport distances for the transport of wood raw materials and recovered paper are presented and reported separately for different means of transport.
- Transport of residues is reported as it is considered to be part of the residue treatment.
- Transport distances and means of transport of raw paper materials to corrugating plants are calculated on basis of average distances of the paper mills to their customers.

    - ⇨ Transport distances of all relevant transports and means are presented transparently in two tables in the report.
    - ⇨ The calculation of transport distances and means for raw paper materials is considered to be a valid approach.

- Emissions to air were mostly measured.
- CO_2 emissions are calculated using IPCC factors for fossil fuels. The factors are presented in the report.
- CO_2 emissions are reported separately for fossil and biomass origin.
- For corrugated board plants all emissions to air are calculated form reported figures for consumption of fuels. This calculation uses the presented IPCC factors.
- Heavy metal emissions to air were collected form only a few mills. Estimates of these emissions are given in Table 4 of the report but are not included in the dataset's inventory list in chapter 4.

    - ⇨ Biogenic and fossil based CO_2 is reported transparently
    - ⇨ The reviewer appreciates the consideration of peat as fossil fuel regarding the quality of CO_2 emissions.
    - ⇨ The approach to add estimated heavy metal emissions to air in a separate table is considered to be valid and useful. For future dataset updates a focus on collecting measured data regarding these emissions is recommended, though.

- Emissions to water are reported after final treatment.
- Only data for the emissions to the recipient are given, without taking into account the substances in the incoming water as only a few mills analyse and reported their incoming water.
- Only very few plants reported data on some of the following emissions: metals (Cadmium, Chromium, Lead, Nickel, Iron, Boron, Aluminium), AOX, Chlorine and Phosphorus. Therefore and due to its very low amounts in the few cases

reported, these emissions are not calculated into averages for inclusion in the dataset inventory.

⇨ The level of detail of emissions to water, that were collected at most sites is sufficient. For future dataset updates a reporting of metal emissions to water from more mills would be preferable though.

- The report also includes a glossary of LCA and industry specific terms.

⇨ The inclusion of detailed definitions of the terms used is appreciated as it helps non-professional readers to understand and therefore use this dataset correctly.

Inventory table in pdf-document "data report final v 2.1 for review Chapter 4.pdf" listing the Inputs and Outputs of the European average dataset.

This file containing the inventory data was sent to the reviewer along with the report on the 18th of January 2016.

- It includes the inputs and outputs per ton net saleable product.
- The list of material inputs includes packaging material.
- The list of material outputs includes residues.
- Total sums for some material or energy inputs are additionally presented.
- Apart from material and energy flows also transport parameters for wood, recovered paper and also paper to corrugating plants are listed.

⇨ The list of inputs and outputs is considered comprehensive.
⇨ Mass and water balances have been checked by the reviewer and are found to be sufficiently closed (f.e. water input vs. output: 13.3 m^3/t vs 11.4 m^3/t; this difference is also reported in the inventory)

Inventory table in pdf-document "data report final v 2.1 for review Annex.pdf" listing the Inputs and Outputs of the different paper grade production processes as well as the corrugating process.

This file containing the inventory data was sent to the reviewer along with the report on the 18th of January 2016.

- It includes the inputs and outputs per ton net saleable product.
- The list of material inputs includes packaging material.
- The list of material outputs includes residues.
- Total sums for some material or energy inputs are additionally presented.
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3 Conclusion

The presented documentation of the dataset is considered transparent and correct, clearly describing how the dataset has been built up and what it represents in terms of production, technology, geography and time. This is considered appropriate for the intended application: gate-to-gate LCI dataset for production of corrugated board for use in LCI/LCA studies.

The input and output flows have been cross-checked by the reviewer with other paper sector datasets and have been found to have a high level of completeness including all relevant flows of inputs of raw materials and energy.

There are few data gaps for the elementary flows that are not measured by the mills. The choice of calculation of some of these (f.e. CO_2, transport distances to corrugating plants) by the dataset developer is considered to be valid.

Limitations

The data set refers to European industry average. This review does not apply to any individual datasets collected at single mills or corrugated board plants.

Heidelberg, 04.02.2016

Frank Wellenreuther, ifeu GmbH