Zurich University
of Applied Sciences

Life Sciences and
Facility Management

Institute of
Natural Resource Sciences

Validation report

Crude and mineral oil life cycle inventory datasets

On behalf of the Federal Office for the Environment

Prepared by:

Matthias Stucki & René Itten

Institute of Natural Resource Sciences

Zurich University of Applied Sciences

Wädenswil, 8. November 2018

Content

1 GOAL AND PROCEDURE OF THE VALIDATION

ESU-services Ltd. has updated the life cycle inventory (LCI) data for crude and mineral oil products. This update following the methodological guidelines of ecoinvent v2 (Frischknecht et al., 2007) was commissioned by the Erdöl-Vereinigung Switzerland, the Federal Office for the Environment (FOEN) and the Swiss Federal Office of Energy (SFOE). The data will be implemented in the KBOB database v2.2:2016 (KBOB DQRv2, 2016) used for LCA work on behalf of the Swiss authorities.

The updated LCIs for crude and mineral oil products include about 120 data sets documented in five reports (Jungbluth et al., 2018a; Jungbluth et al., 2018b; Jungbluth & Meili, 2018; Meili & Jungbluth, 2018a; Meili & Jungbluth, 2018b) with a total of about 280 pages. The FOEN commissioned René Itten and Matthias Stucki from the Life Cycle Assessment Research Group at the Zurich University of Applied Sciences for a validation of these 140 LCI data sets and five reports.

Goal of the validation was to check the documentation and the SimaPro data sets of the updated LCI models for the updated crude and mineral oil supply chain according to the ecoinvent v2 quality guidelines and data quality requirements (Frischknecht et al., 2007).

The validation process started on July 9th 2018 with the provided documentation, Life Cycle Inventory (LCI) data and Life Cycle Impact Assessment (LCIA) results in SimaPro. On September 13th 2018 the validators sent a first validation report with validation feedback to the authors and customers of the LCI update. The validation feedback was discussed on September 18th in a meeting of the ZHAW validators with ESU-services Ltd., FOEN, SFOE, and the Erdöl-Vereinigung. The discussion focussed on the topics of emissions from venting, allocation, and documentation. Based on the validation feedback and the discussions, ESU-services revised the LCI update and prepared the final inventory datasets and documentation. The final validation statement was sent to ESU-services Ltd. and FOEN on November 8th 2018.

2 GENERAL COMMENTS

The validators appreciated the open and constructive validation process with the authors of the Life Cycle Inventory datasets. The necessary information was provided transparently by ESU-services Ltd.

Completeness of the documentation

The life cycle inventory data was compiled carefully and the documentation is transparent and structured in a meaningful way. The reports prepared by ESU-services Ltd. give a comprehensive and detailed description of the inventory data. The original sources can be identified and the meta information of the datasets in SimaPro is complete.

Consistency with the quality guidelines

The inventory modelling is consistent with the ecoinvent v2 quality guidelines (Frischknecht et al., 2007) with exception of the carbon credit for biogenic carbon content of fossil and biofuel mixtures. Other than that, no major conflicts with the guidelines were identified. A suggestion how to address the issue of the carbon credit for biofuel mixtures as described in section 5.2 of Jungbluth & Meili (2018) is provided in section 3.

Plausibility and completeness of the input and output flows

The life cycle inventory data was verified and checked for plausibility. The validation showed that the life cycle inventory data is very detailed and contains all relevant inputs and outputs for crude oil production, transport, refining, distribution and combustion in heating systems. Changes to the previous version as for example for the emissions to air are transparently documented and justified.

Mathematical correctness of the calculations

Important changes with this update of the crude oil supply chain were inspected and considered as meaningful and explainable. The life cycle impact assessment results were compared with existing results and the calculations are correct.

3 CARBON CREDIT FOR BIOFUELS

The carbon credit on the level of the fuel in order to account for biofuel and fossil fuel mixtures does not meet the requirement in the ecoinvent v2.2 quality guidelines. We suggest to remove this corrections for fossil carbon emissions and to update the emission profiles of the vehicle operation and other affected LCI datasets in future.

4 VALIDATION STATEMENT

The updated Life Cycle Inventories for crude oil extraction, long distance transport of crude oil, oil refinery processing and products, oil products distribution, and oil heating systems are detailed, consistent and cover all relevant inputs and outputs.

The independent validators confirm that the established LCI models and documentation are scientifically sound as well as consistent with the methodological guidelines of ecoinvent v2 except for the carbon credit for biofuel and fossil fuel mixtures. The emission profiles of the vehicles should be adjusted to reflect the fuel mixtures with the next update of the vehicle LCI models and the carbon credit for the fuel mixtures should be removed.

The authors from ESU-serviced Ltd. supported the validation process with transparent access to the full calculations and documentation as well as their openness for validation feedback in order to improve of the LCI update.

Wädenswil, 1. November 2018

René Itten

Research Associate
Research Group Life Cycle Assessment
Institute of Natural Resource Sciences
Zurich University of Applied Sciences
P.O. Box, CH-8820 Wädenswil, Switzerland

Phone: +41 58 934 52 32
Email: rene.itten@zhaw.ch
Internet: www.zhaw.ch/iunr/lca/

Matthias Stucki

Head of the Research Group Research Group Life Cycle Assessment
Institute of Natural Resource Sciences
Zurich University of Applied Sciences
P.O. Box, CH-8820 Wädenswil, Switzerland

Phone: +41 58 934 57 19
Email: matthias.stucki@zhaw.ch
Internet: www.zhaw.ch/iunr/lca/

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