

Environmental Report

BMW X3 20dA

Abstract

Goal and scope:

The scope of the study is the life cycle assessment of the BMW X3 20dA with start of production in 2017. Its purpose is to assess the environmental impacts of the entire vehicle and its components according to the product responsibility strategy of the BMW Group. The comparison of the previous and the new model clearly states the improvements in terms of environmental impact reduction. These results are important for the further development and optimization of the next BMW X3 series generation as well as for the next set of targets.

System boundaries:

The system boundaries consist of all material and energy flows, input and output collected according to ISO 14040 with the following level of detail:

- From sourcing and production of raw materials to production, to use phase, to recycling (incl. transport logistic).
- Use phase: assumed mileage 200.000 km (new European driving cycle)
- Software and database GaBi 6©.
- Material data from material balance of the BMW X3 20dA.
- The impact assessment is based on the CML-method (2016) developed at Leiden University in the Netherlands (Guinée and Lindeijer 2002).
- A critical review of the environmental report is done by an external auditor.
- The compilation and assessment process was verified by TÜV Rheinland assessing compliance with the internal process description as well as verifying data and environmental information used (validation attached).

The functional unit and the reference flow are defined as the BMW X3 20dA vehicle, at SOP (start of production) in 2017, 2014 and 2010, with a 4-cylinder diesel engine as an ECE-basis version with a use phase of 200.000 km according to the new European driving cycle.

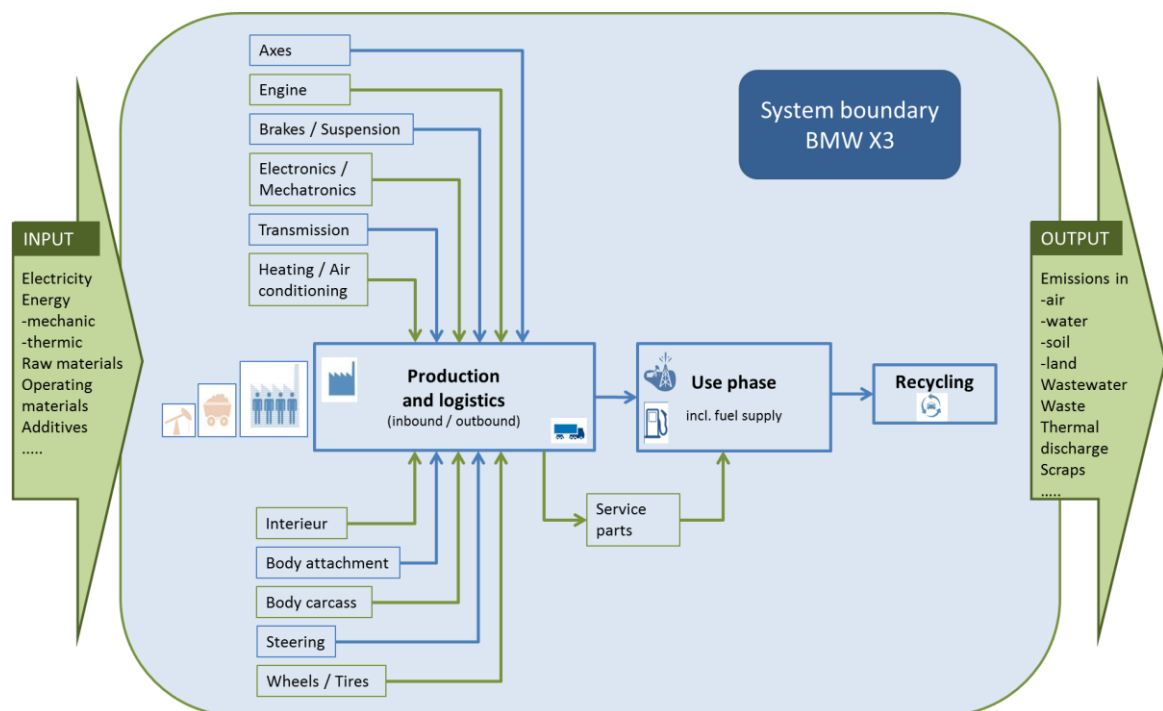


Fig. 1: Flowchart input / output data of the BMW X3

The LCA according to ISO 14040/44 refers to environmental aspects and potential environmental impacts along the life cycle of a product from the raw material extraction to the manufacturing process, to the use phase, and to the recycling at the end of the vehicle's life.

Facts:

The life cycle assessment (LCA) of the BMW X3 20dA and its predecessor shows the following environmental impacts across the whole life cycle in terms of Global Warming Potential (GWP) (fig. 2). The environmental impacts determined by the LCA are measured in different units. The GWP, for example, is stated in kilogram CO₂-equivalents (kg CO₂e).

Sustainability targets have been already defined at the earliest strategic development phase and further monitored until the Start-of-Production of the vehicle throughout the LCA. Renewable source for the electricity have been established in the BMW production plants and energy efficiency has been increased. Materials for the X3 are chosen by considering the sustainability targets, this is one of the reasons for using 50% secondary aluminum and 10% recycled thermoplastics in the BMW X3 20dA.

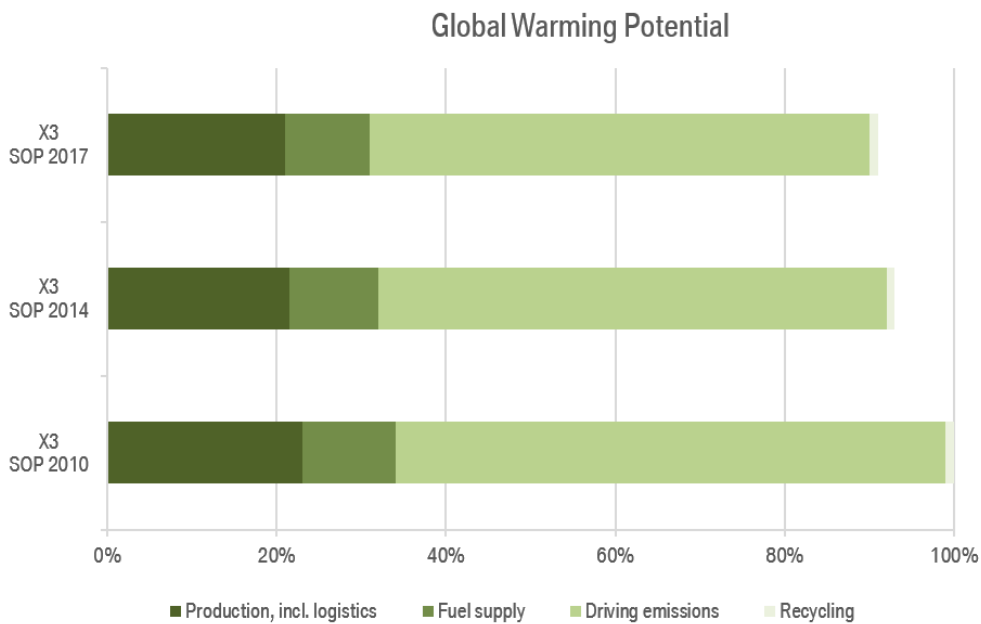


Fig. 2: Distribution of global warming potential over life cycle of BMW X3

Sensitivity analysis:

A sensitivity analysis of different scenarios was carried out for estimating the effect of the choices made regarding methods and data on the results of the study.

Examples of the scenarios considered in the sensitivity analysis are:

- Influence of the data robustness on the life cycle assessment results.
- Influence of the different consumption scenarios during use phase.

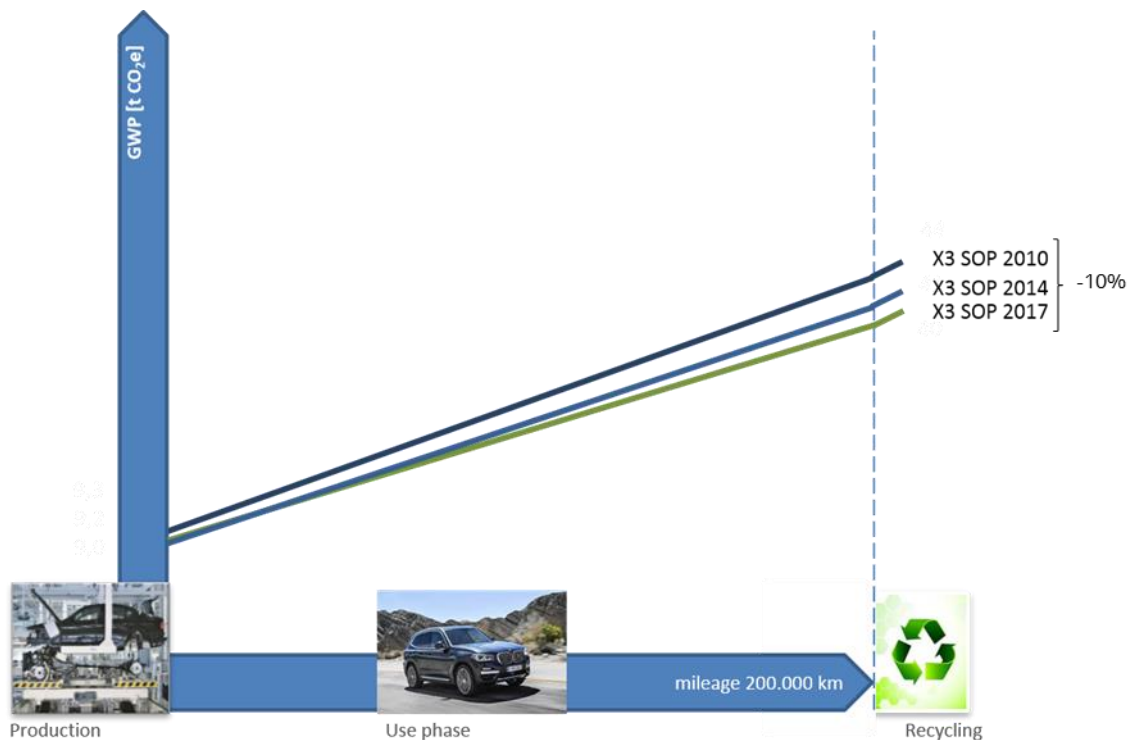


Fig. 3: Global warming potential of BMW X3 20dA along the life cycle 2010-2017

We succeeded to produce the new BMW X3 20dA with Global Warming Potential around 10% less than its previous model (SOP in 2010) by establishing sustainability measures and actions in the entire supply chain. Though the improvement of the BMW X3 20dA is not significant compared to the development status of 2014, a deterioration due to an increased use of lightweight materials could be prevented (fig. 3).

Validation

TÜV Rheinland LGA Products GmbH confirms that a critical review of the life cycle assessment (LCA) study of **BMW AG, Petuelring 130, 80788 München** for the following passenger car

BMW X3 20dA – 2017 model year

was performed.

Proof has been provided that the requirements of the international standards

- ISO 14040:2006: Environmental management – life cycle assessment – principles and framework
- ISO 14044:2006: Environmental management – life cycle assessment – requirements and guidelines
- ISO/TS 14071:2014: Environmental management – life cycle assessment – critical review processes and reviewer competencies: additional requirements and guidelines to ISO 14044:2006

are fulfilled.

Results:


- The LCA study was carried out according to the international standards ISO 14040:2006 and ISO 14044:2006. The methods used and the modelling of the product system correspond to the state of the art. They are suitable to fulfill the goals stated in the study. The report is comprehensive and provides a transparent description of the framework of the LCA study.
- The assumptions used in the LCA study, especially fuel consumption based on the current NEDC (New European Driving Cycle) and RDE (Real Driving Emissions), were verified and discussed.
- The assessed samples of data and environmental information included in the LCA study are plausible.

Review process and level of detail:

Verification of input data and environmental information as well as the check of the LCA process was performed in course of a critical data review. The data review considered the following aspects:

- Check of the applied methods and the product model,
- Inspection of technical documents (e.g. type approval documents, parts lists, supplier information, measurement results, etc.) and
- Check of LCA input data (e.g. weights, materials, fuel consumption, emissions, etc.).

Cologne, 25th January 2018



Guido Volberg
Director TCC

Responsibilities:

Sole liability for the content of the LCA rests with BMW AG. TÜV Rheinland LGA Products GmbH was commissioned to review said LCA study for compliance with the methodical requirements, and to verify and validate the correctness and credibility of the information included therein.