

Cross OEM LCA for EV vehicles, method applied by A2MAC1 and M@Air for the 2022 project.

The calculation of LCA was made to answer the questions of customer who has decided to buy a new car to replace its ICE model.

- Question 1: How much CO₂ emissions will this EV model produce for a standard usage ?
- Question 2: By selecting this EV model will I reduce my emissions by more or less than 5% per year for the next 10 years compared to using an ICE model of same category (-5% is the average target for all emissions to keep earth temperature increase limited to 2 °C)

The top 2022 sales EV models in Germany and France were considered.

The manufacturing impact was assessed by splitting the weight of the HV battery and the weight of the car without HV battery.

- For this second part a standard 5Kg CO₂ / Kg was used based on literature assuming a final assembly in low carbon emission electricity country (~100g CO₂eq/kwh) and no aluminum in the car body.

If car assembly was done in higher electricity carbon content, the impact was adjusted assuming 1 MWh electricity per car for final assembly.

Aluminum and steel shares in Body were measured from A2MAC1 data base. If some aluminum was included in Body structure, adjustment was also made considering regional aluminum source (Europe, USA, Asia).

- For battery: manufacturing of cells location and therefore electricity supply impact was considered while a standard value was used for cells inputs based on literature at 62kgCO₂/kwh.

For overseas transportation of vehicle, the standard emissions per vessel defined by French Ministry was used.

- For electricity CO₂ emissions, <https://app.electricitymaps.com/map> was used with adjustment of transportation losses per country of vehicle use (Germany 5% and France 8%) . For China, independent estimated figures per provinces are accessible in literature (Energy Procedia - China's electricity emission intensity in 2020 - an analysis at Provincial level, Xin Li, 2017)

The vehicle use case assumption was 12500 km/year during 10 years. The trend in case of higher or lower usage per year is highlighted.

The actual consumption of energy per model is provided by shared and public website (Spritmonitor).

The EV models were compared to ICE similar model (sistership) such as Twingo EV to Twingo ICE.

Carbon impact of ICE models were calculated based on same principles except battery. Upstream impact of Oil was taken into account as well as tailpipe emissions differentiating diesel and gasoline (ADEME).

For recycling and second life, standard impact was calculated from published comparative study including second life. Among the different sources, the Renault Study comparing CLIO V and Zoe was used as it applies the same method to EV and ICE. Our assumptions for Credit figures from recycling and second life are 0,8 Kg CO₂eq/ Kg for EV and 1,1 Kg CO₂eq/ Kg for ICE. We are using avoided burden allocation method.

Interested in discovering the entire rationale, data, and calculus supporting this project?
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