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CRADLE-TO-CRADLE ENVIRONMENTAL LCA OF A LIGHT ELECTRIC VEHICLE PROTOTYPE

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Summary: The Agenda Be.Neutral is a R&D project, funded by the European Union to develop, industrialise and operate new products and services in order to create the first European Carbon Neutral Region. Within the project, a light electric vehicle (BEN) is being developed. It is a micro mobility vehicle that can be seen as a cyber-physical product (seamlessly connected to data science platforms using 5G technology), with a simple and low-cost architecture, consisting of a skateboard (lower body) configurable to different motors and batteries. All the design, production and use stage of the prototype have been organized in order to quantify in detail the respective LCA.To the best of the author's knowledge, no studies were found reporting the environmental assessment of a light electric vehicle with similar dynamic characteristics. The objective of this study is to quantify and assess the environmental impacts of BEN vehicle throughout its life cycle and enhance its performance in comparison to market competitors. For that, the design team was based on scientific information on multicriteria decision-making processes (crossing performance, costs and environmental impacts).Life Cycle Assessment (LCA) is a commonly accepted and well-established methodological tool which allows to determine the potential environmental impacts of BEN over its life cycle including the design development phase. Although no studies were found for similar micro vehicles' environmental life cycle, considering a mass proportion criterion, the impacts of BEN's production stage are in line with other LCA references, namely LCA studies and Ecoinvent datasets for electric cars. The benefits of BEN's use stage strongly depend on the service model in use including use intensity, replacing vehicles / solutions and the energy sources used. Preliminary results of the BEN´s LCA indicate that, in a fifteen-year lifespan (assuming a referenced average lifetime mileage from literature of 7.000km/year), the production stage is the most relevant contributor to BEN's global warming potential (GWP) impacts, followed by the use stage (energy consumption and vehicle maintenance). Within the production stage, the glider and the battery pack are responsible for the majority of the GWP impacts. When comparing with a small petrol car, the use of BEN for a three-year period can compensate the CO2 emissions from its production stage.

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