LCA | Solar Lamps

Description of Items

Old Solar Lamp
- Lifespan: 3 years
- Mass: 670g

New Solar Lamp
- Lifespan: 6 years
- Mass: 564g

Functional unit

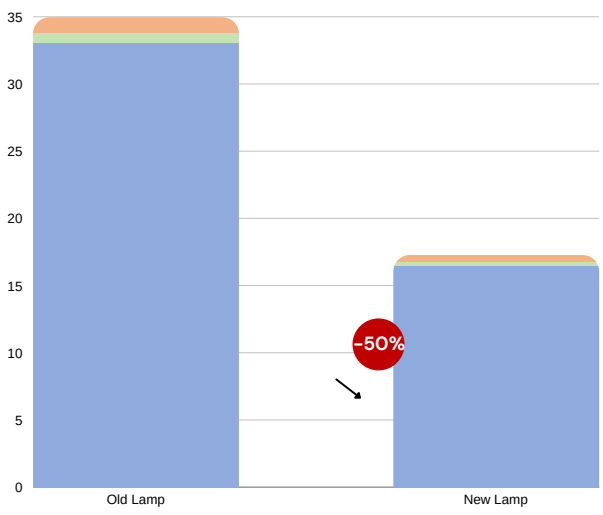
6 years use of a solar lamp

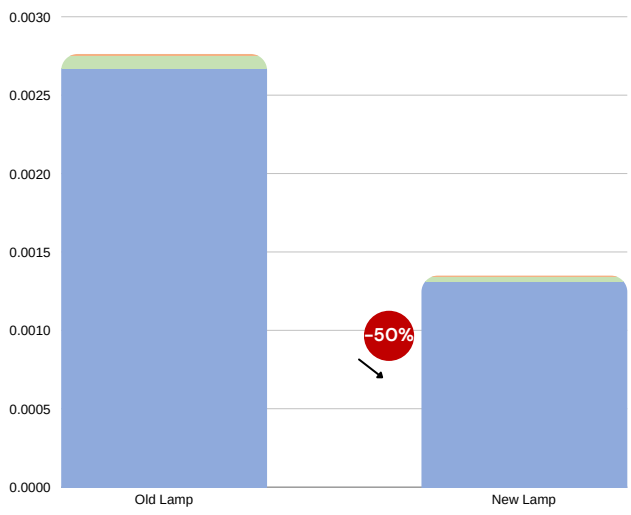
Item	Use life (years)	Reference Flows
Old Lamp	3	2
New Lamp	6	1

Assumptions

Both variations manufactured in China and containing components Li-ion battery, PV Panel, LED, PCB, Metal Frame, Wiring, with Cardboard box, paper wrapping. The comparison of the older and newer models of the lamp aim to study the environmental impacts of the reduced volume and weight that has been achieved with higher lifespan.

Results of the computation





Stage	kgCO₂e	
	Old Lamp	New Lamp
Raw Material	33.1	16.5
Production	0.0000	0
Transportation	7.00E-01	0.3000
Use	0	0.00E+00
End-of-Life	1.2	0.5

Stage	Human Health	
	Single Use	SmartPPE
Raw Material	2.67E-03	1.31E-03
Production	0.00E+00	0.00E+00
Transportation	8.50E-05	3.58E-05
Use	0.00E+00	0.00E+00
End-of-Life	7.49E-06	3.29E-06

Impact of Components

Raw materials account for 95% of the total GHG emissions and 97% of the total human health impact associated with the solar lamp.

Among these materials, **the LED component** contributes disproportionately to the impact—**68% of total climate change impact and 63% of human health impact**—despite weighing only 47g out of the total 564g. This is due to the impact-intensive production process of the LED.

The second-largest contributor is the **photovoltaic cell** of the solar panel, responsible for **19% of GHG emissions and 23% of the human health impact**.

As there was a very slight shift in net weight between the old and new lamp, the impacts remain very similar when compared without a function. When compared with a function, the **double lifetime linearly affects the impact**.

Analyses

By increasing the durability of the components and extending the lifespan of the solar lamp, the impact of the solar lamp reduces linearly as the durability is increased. In this case, doubling the lifespan results in reduction of

- ▼50% climate change
- ▼50% impact on human health

The impacts to local environment due to the disposal of the components must be further studied to expand on this result.

Emission factors

The values displayed here are not per functional unit but per item. These values can be used to compute a carbon footprint of an organisation and can be adapted to a specific case using the tool

Name	GHG Protocol Categories	kgCO2e/unit	
		Old Lamp	New Lamp
Cradle-to-grave	N/A	17.48	17.27
Cradle-to-gate	3.1 Purchased Goods	16.55	16.50

References

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Rajput, A., Tobin Greene, C. and Schmid, S. (no date) 'Life Cycle Assessment (LCA) Methodology'. Available at: https://climateactionaccelerator.org/wp-content/uploads/2025/06/EPFL_LCA_methodology_v1.0.pdf.

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About this project

Designing methodologies and performing life cycle analyses of high-impact items to build a GHG emission factor and environmental impact database adapted to the humanitarian sector with the goal of identifying key strategies to reduce environmental impacts.

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