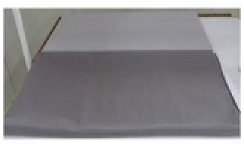
LCA | Plastic Mattress

EPFL EssentialTech Centre | ICRC | Climate Action Accelerator | LEURE

Description of Item



Polyurethane Foam Mattress

- Mass: 2.80 kg
- Contents: High density virgin polyurethane foam, polyester, nylon, etc
- Plastic packaging material: Plastic, wood, steel and cardboard

Functional unit

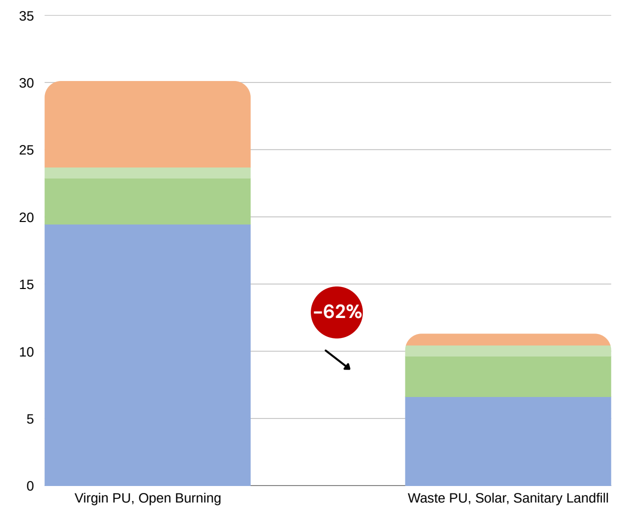
Use of 1 mattress for 10 years

Item	Use life	Reference Flows
Virgin PU	10	1
Good Quality, Recycled	10	1
Poor Quality, Recycled	8	1.25

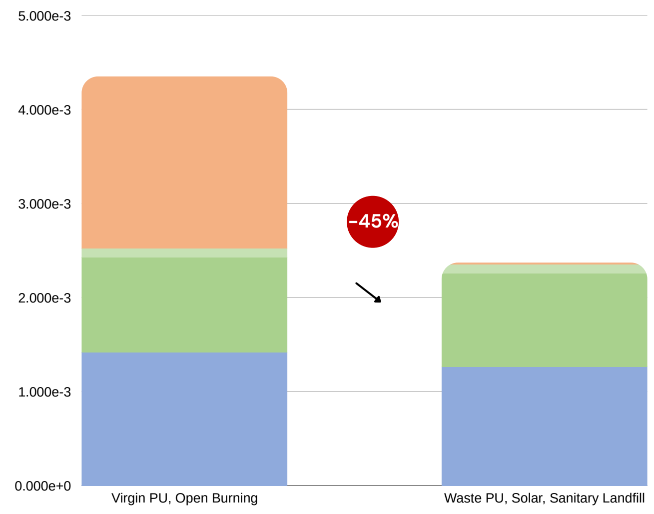
Assumptions

All variations are locally manufactured and sent to warehouse or distribution location via truck. Assumed not to be washed throughout its lifetime of 10 years. Assumed to be burnt in open pits at end-of-life.

Results of the computation



Stage		kgCO₂e Scenario 1	kgCO₂e Scenario 2
Raw Material		19.44	6.60
Production		3.43	3.03
Transportation		0.79	0.79
Use		0.00	0.00
End-of-Life		6.43	0.88



Stage		Human Health Scenario 1	Human Health Scenario 2
Raw Material		1.42E-03	1.26E-03
Production		1.01E-03	9.93E-04
Transportation		9.52E-05	9.52E-05
Use		0.00E+00	0.00E+00
End-of-Life		1.82E-03	1.96E-05

Variations (% from baseline figures presented above)

To use recycled material

Computation made by considering waste polyurethane – of good quality (10 years) & bad quality (8 years)

kgCO2e	
Good Quality	Bad Quality
-40%	-25%
Human Health	
Good Quality	Bad Quality
-3%	+21%

To use renewable energy during production

Computation made by considering 100% solar energy for electricity & heat

kgCO2e
Renewable Energy
-4%
Human Health
Renewable Energy
-1%

To switch to sanitary landfills

Computation made by considering sanitary landfill (moist infiltration class) at end-of-life

kgCO2e
Sanitary Landfill
-18
Human Health
Sanitary Landfill
-41

Best Possible Scenario

Computation made by considering waste PU produced with solar energy, disposed in a sanitary landfill

kgCO2e
Best Case
-3%
Human Health
Best Case
-2%

Analyses

Recycled materials and better waste management contribute the most to the impact reduction of the plastic mattress, with a strong dependence on quality and durability of the mattress.

For GHG emissions it is more pertinent to focus on reducing the impact on the primary raw material: virgin polyurethane foam. For impact on human health, the waste management methods make a much more significant impact on the overall impact of the mattress

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
Cradle-to-grave	**N/A**	**30.11**
Cradle-to-gate	3.1 Purchased Goods	22.89
Distribution freight	3.4 and/or 3.9 Transportation	0.79
Use phase	3.11 Use of distributed product	0
End-of life	3.12 End of life of distributed product	6.43

References

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. '*The ecoinvent database version 3 (part I): overview and methodology*'. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230. Available at: http://link.springer.com/10.1007/s11367-016-1087-8.

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.

Repository of life cycle assessments - Climate Action Accelerator (2025). Available at: https://climateactionaccelerator.org/repository-of-lifecycle-assessments/.

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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