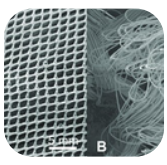
Lifecycle Analysis | Mosquito Nets

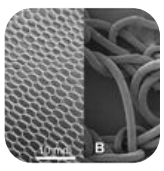
Presentation of items

Two types of Long-Lasting Insecticidal Nets (LLINs) and their variations are compared:



LLINs made from PET

- Assumed lifespan: 2 years
- Mass: 530 grams
  150 den
- Materials: Virgin PET



LLINs made from PE

- Assumed lifespan: 3 years
- Mass: 350 grams
  100 den
- Materials: Virgin PE

PET: Polyethylenterephthalat
PE: Polyethylen
den: Measure of density

Functional unit

To protect from mosquitoes for 3 years

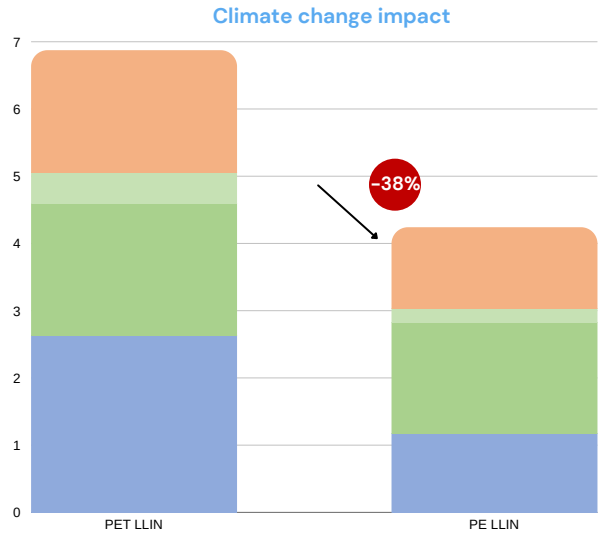
Item	Use life (years)	Reference Flows
PET LLIN	2	1.5
PE LLIN	3	1

Assumptions

Both products are manufactured in China using virgin materials, items are distributed by sea to the field (Kenya). No use phase considered. Assumption that nets are burnt in the open at their end-of-life stage. PE LLINs have a longer lifespan due to their thicker fibers, which help prevent hole formation.

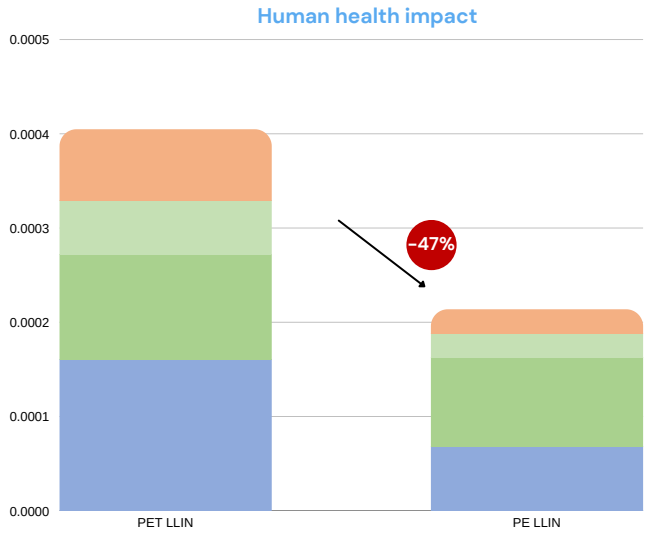
Results of the analysis

Climate change impact



Stage	kgCO₂e	
	PET LLIN	PE LLIN
Raw Material	2.63	1.18
Production	1.96	1.65
Transportation	0.47	0.21
Use	0	0
End-of-Life	1.82	1.21

Human health impact



Stage	Human Health	
	PET LLIN	PE LLIN
Raw Material	1.60E-04	6.80E-05
Production	1.12E-04	9.44E-05
Transportation	5.73E-05	2.59E-05
Use	0	0
End-of-Life	7.55E-05	2.55E-05

Variations (% from baseline figures presented above)

To use recycled materials

Computation made by considering 100% recycled plastics for products

Climate change		Human Health	
PET LLIN	PE LLIN	PET LLIN	PE LLIN
-23.7%	-17.2%	-20.3%	-10.0%

To use renewable energy for production

Computation made by considering 100% of renewable energy in factory mix

Climate change		Human Health	
PET LLIN	PE LLIN	PET LLIN	PE LLIN
-23.8%	-32.5%	-19.0%	-30.2%

To use air transport instead of sea transport

Computation made by replacing the sea routing by plane routing

Climate change		Human Health	
PET LLIN	PE LLIN	PET LLIN	PE LLIN
+46.4%	+47.4%	+29.4%	+30.7%

To send waste to Europe to be recycled

Computation made by considering waste send back to Europe by sea to be recycled there.

Climate change		Human Health	
PET LLIN	PE LLIN	PET LLIN	PE LLIN
-20.7%	-21.9%	-7.6%	-5.9%

Best Possible Scenario

Recycled material + Renewable energy in the production + Waste recycled

Climate change		Human Health	
PET LLIN	PE LLIN	PET LLIN	PE LLIN
-69.1%	-72.2%	-48.5%	-47.4%

Conclusion

Shifting from PET LLIN to PE LLIN can significantly reduce impacts on both climate change and human health. As a PE-based product already exists, this solution has the potential to be implemented rapidly. Choosing suppliers that manufacture using **renewable energy and incorporating recycled plastics** can further contribute to reducing climate change impacts; however, the use of recycled inputs should be approached carefully, as they often face limitations in terms of quality, cost, and availability. Waste management remains a major challenge, as few facilities exist for proper collection and treatment. This study did not consider the **diversity of end-of-life pathways** that exist for mosquito nets, as mosquito nets are frequently repurposed for uses such as fishing, fencing, or clothing before final disposal. While the scenario of sending waste to Europe for recycling is rather hypothetical, it underscores the need to prioritise local infrastructure development to address plastic waste sustainably. Some manufacturers have piloted take-back or circular programs that could be leveraged and scaled in the future. This study did not consider additional environmental or human health impacts of insecticides or dyeing processes.

Emission factors

The emission factors displayed are provided per item.

"Cradle to grave" covers a product's entire life cycle from raw material extraction to disposal, while "cradle to gate" ends the assessment at the point the product leaves the manufacturing facility.

Name	GHG Protocol Categories	kgCO₂e/unit	
		PET LLIN	PE LLIN
Cradle-to-grave	**N/A**	**4.58**	**4.24**
Cradle-to-gate	3.1 Purchased Goods	3.10	2.85
Distribution freight	3.4 and/or 3.9 Transportation	0.27	0.18
Use phase	3.11 Use of distributed product	0	0
End-of life	3.12 End of life of distributed product	1.21	1.20

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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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