BIOVOX

Life Cycle Assessment

PLA-based MedEco Types: ICB, XCB, IGH, XGB & ICB C1

At BIOVOX we want to deliver reliable sustainability facts, to showcase the exact environmental impact of our MedEco Bioplastics. This LCA Factsheet provides exactly these verified insights. Enjoy reading – and feel free to ask us anything afterwards!

LCA Analysis in a Nutshell:

- ✓ ISO 14040/44 compliant
- ✓ Scope: cradle-to-gate (from raw material extraction to own production incl. packaging materials and transport)
- ✓ Functional Unit: 1 kg MedEco
- ✓ 16 Impact Categories were assessed
- ✓ The LCA study distinguishes between biogenic and fossil greenhouse gas emissions
- ✓ The carbon footprint of MedEco PLAs ranges from 0,53 to 0,69 kg CO2e depending on the grade
- ✓ Up to 85% lower climate impact compared to conventional fossil-based plastics

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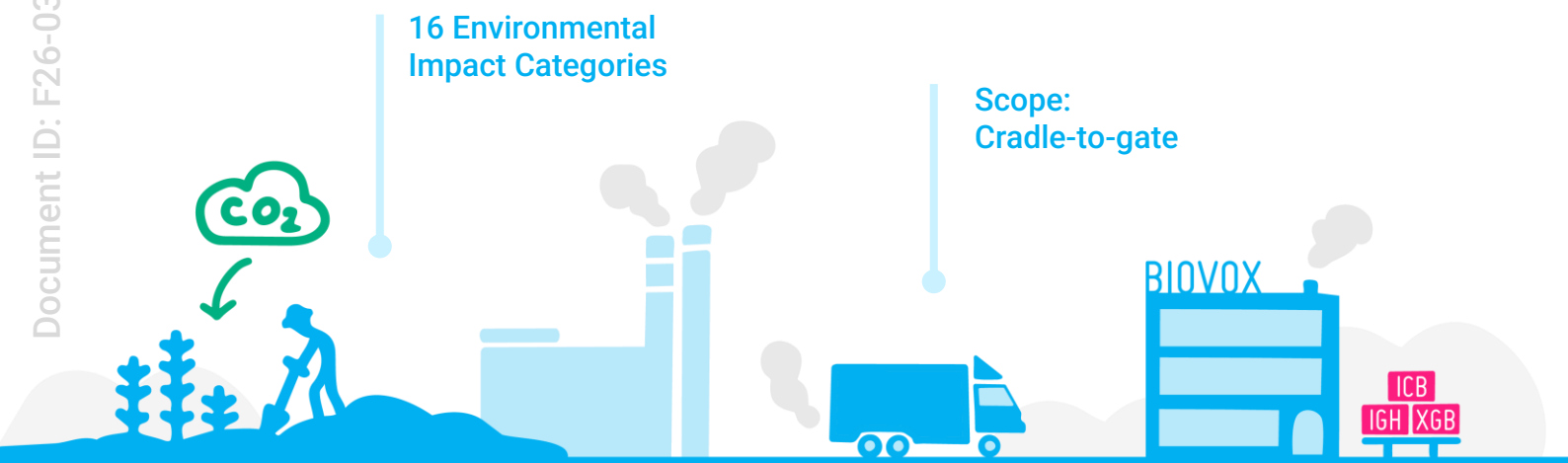


NEXT PAGE: KEY RESULTS

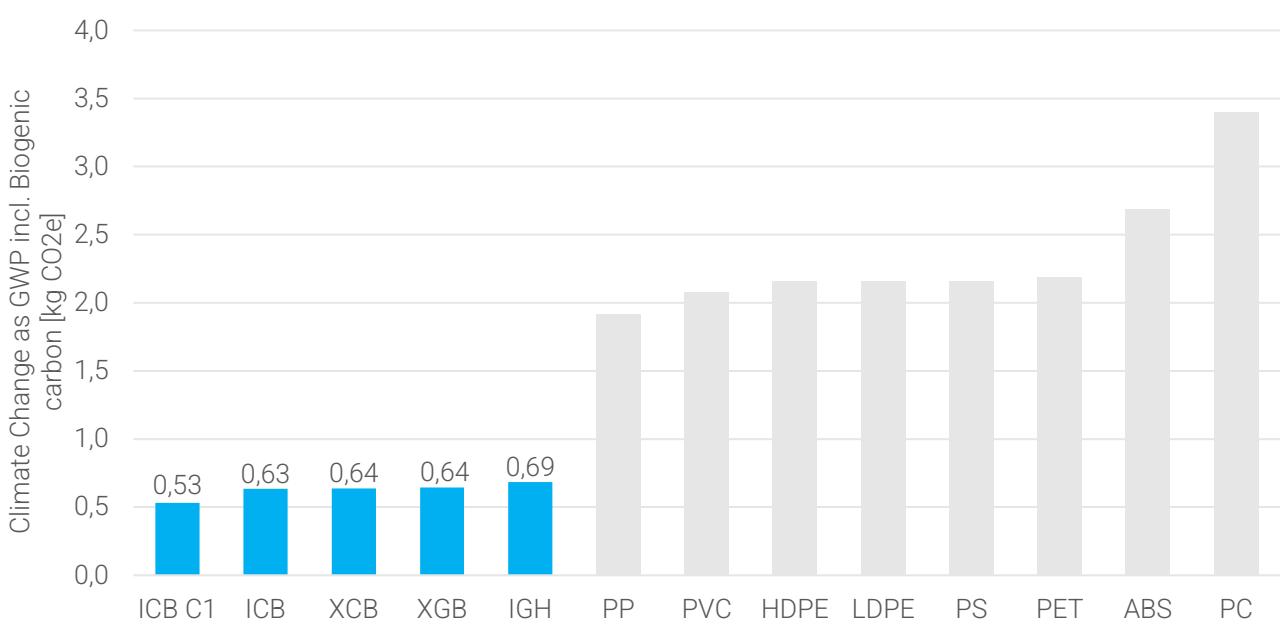
Overview

Below is a brief summary of the LCA Scope. For methodology details, please refer to >>page 3.

- **Objective:** Quantify the environmental impact across selected stages of the product life cycle
- **Products:** MedEco ICB, MedEco ICB C1, MedEco IGH, MedEco XCB, MedEco XGB
- **Approach**: ISO 14040/44 compliant
- **Scope:** Cradle-to-gate (from raw material extraction to the factory gate, **incl. packaging**)
- **Impact Categories:** 16 impact categories assessed through EF v3.1 no LT methodology
- **Functional Unit:** 1 kg MedEco
- **Data**: BIOVOX data from 2024 & 2025, Supplier LCAs (2020-2024), Literature, Ecoinvent 3.10.1
- **External Support:** *Procycons GmbH*, a management consultancy focused on the MedTech sector

Key Result: The Carbon Footprint of MedEco PLAs

Take a look at the chart below for the key LCA results of the climate change impact (kg CO_2e) across the life cycle stages from cradle to production gate at BIOVOX. For detailed results of other impact categories, please refer to >>page 4 & 5.

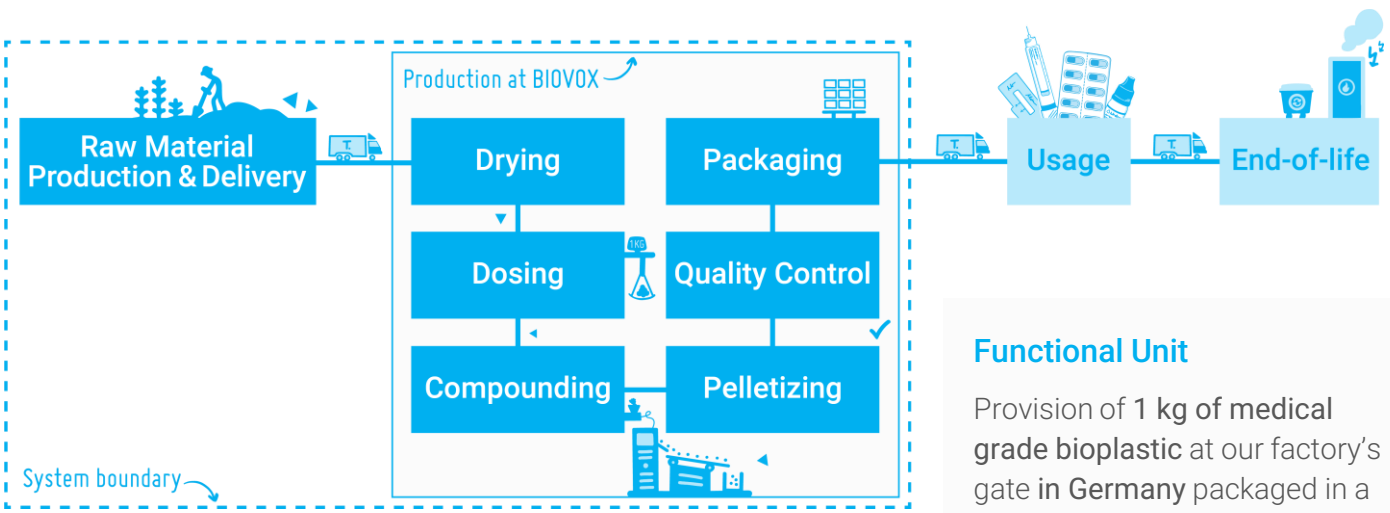


Data on carbon footprint for fossil-based plastics from PlasticsEurope's Eco-profiles and do not include compounding and packaging.

NEXT PAGE: METHODOLOGY

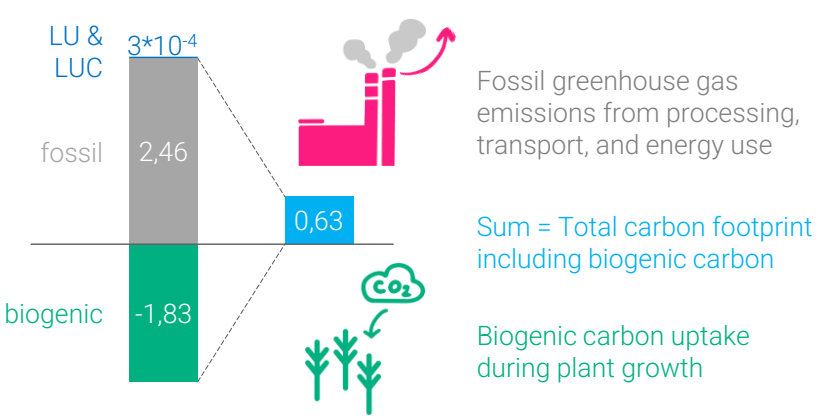
Methodology & Scope

The modeling approach chosen for conducting the LCA is based on the bottom-up method. Data collection was carried out in a multi-stage process in collaboration with internal and external stakeholders. Below, you can find more information about the scope:



Biogenic Carbon Accounting -1/+1

- This LCA study reports biogenic and fossil greenhouse gas flows separately, in accordance with ISO 14067.
- GHG emissions to the atmosphere are shown as positive flows; GHG removals as negative flows, accurately reflecting the temporary storage of carbon in the product.
- In a cradle-to-gate scope, fossil and biogenic carbon flows can only be aggregated into a total carbon footprint if clearly indicating "including biogenic carbon".
- In a cradle-to-grave scope, the net biogenic carbon balance is typically zero, as both removals and emissions are counted.



Example for biogenic accounting (MedEco ICB)

Functional Unit

Provision of **1 kg of medical grade bioplastic** at our factory's gate **in Germany** packaged in a **big bag**

In Scope

- Raw material production, incl. packaging and transport
- Energy production and consumption
- Production process at BIOVOX from drying to packaged MedEco pellets

Out of Scope

- Warehousing, distribution, conversion to and use of end products, EOL
- Raw materials and packaging components with <1% of the mass of the functional unit
- Life cycle of the machines, equipment, and buildings

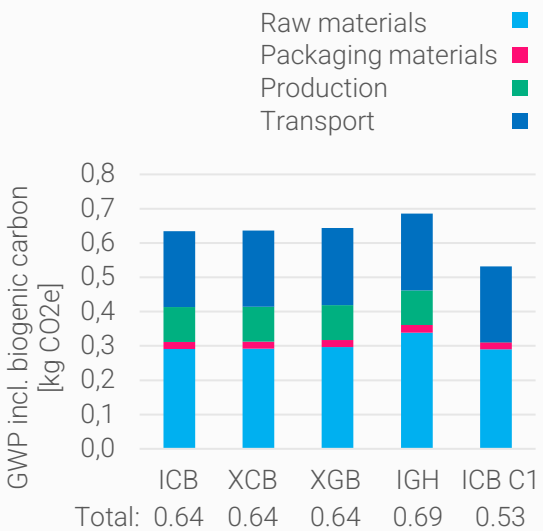
NEXT PAGES: DETAILED RESULTS

Detailed Results (1/2)

Here you can find detailed results for the most important and relevant impact categories: Climate change, land use and water use. They are broken down by the life cycle phases of raw material, operating and auxiliary materials, production process, and transport. The results serve to identify hotspots and communicate environmental impacts transparently.

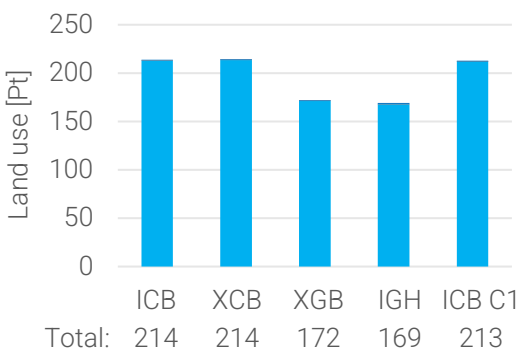
Impact Category: Climate Change (GWP including biogenic carbon)

- The differences between the carbon footprints of the product variants are mainly due to their raw material compositions.
- 46-55% from raw material, 33-42 % from transport emissions, 0-16 % production, 3-4 % operating and auxiliary materials and packaging.
- Emission values for transport data from *ecoinvent* are relatively conservative.



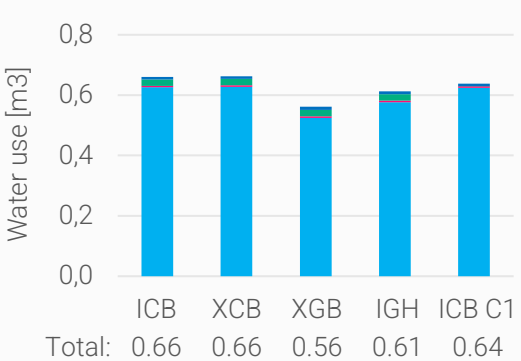
Impact category: Land Use (LU)

- MedEco IGH and MedEco XGB have the least impact on land use due to their mineral content.
- For all product variants, raw material production accounts for approximately 99% of land use mainly due to farming for the biobased polymer.



Impact category: Water Use (WU)

- MedEco XGB followed by MedEco IGH have the least impact water use due to their mineral content.
- For all product variants, raw material production accounts for >94% of water use primarily due to agricultural activities for the biobased polymer.



Detailed Results (2/2)

The aggregated results for all product variants for all impact categories including a break down of climate change into emissions from biogenic, fossil and land use.

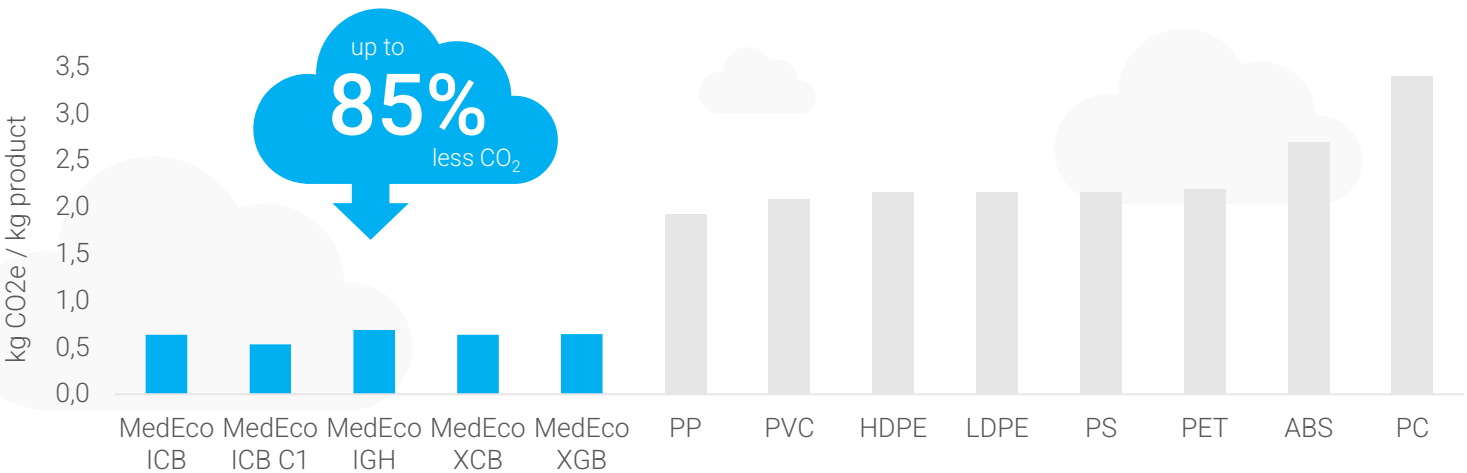
Impact Category		Unit per kg MedEco	MedEco ICB	MedEco XCB	MedEco XGB	MedEco IGH	MedEco ICB C1
Climate change	LU & LUC	kg CO2 eg	3.43E-04	3.43E-04	3.67E-04	4.04E-04	1.34E-04
	biogenic		-1.82	-1.83	-1.46	-1.43	-1.82
	fossil		2.46	2.47	2.11	2.13	2.35
	total		0.63	0.64	0.64	0.69	0.53
Ozone depletion		kg CFC11 eq	2.24E-07	2.24E-07	1.83E-07	1.80E-07	2.22E-07
Ionizing radiation: human health		kBqU-235 eq	0.02	0.02	0.02	0.02	0.02
Photochemical ozone formation: human health		kg NMVOC eq	0.01	0.01	0.01	0.01	0.01
Particulate matter		disease inc.	3.88E-07	3.89E-07	3.18E-07	3.17E-07	3.85E-07
Human toxicity, non-carcinogenic		CTUh	1.77E-08	1.78E-08	1.60E-08	1.63E-08	1.69E-08
Human toxicity, carcinogenic		CTUh	4.86E-09	4.87E-09	4.63E-09	4.78E-09	4.67E-09
Acidification		Mol H+ eq	0.05	0.05	0.04	0.04	0.05
Eutrophication, freshwater		kg P eq	6.90E-04	6.92E-04	5.59E-04	5.50E-04	6.74E-04
Eutrophication, marine		kg N eq	0.02	0.02	0.01	0.01	0.02
Eutrophication, terrestrial		mol N eq	0.14	0.14	0.12	0.11	0.14
Ecotoxicity, freshwater		CTUe	31.55	3164	25.89	26.18	31.10
Land use		Pt	213.74	214.38	172.17	169.09	212.84
Water use		m3depriv	0.66	0.66	0.56	0.61	0.64
Energy resources: non-renewable		MJ	23.60	23.66	21.13	21.46	21.94
Material resources: metals/minerals		kg Sb eq	1.17E-05	1.17E-05	1.12E-05	1.13E-05	1.14E-05

NEXT PAGE: CONCLUSION

Conclusion, Comparison & Outlook

Comparison

Compared to fossil-based plastics on a cradle-to-gate basis, our MedEco PLA types can achieve a reduction in carbon footprint of up to 85%. It should be noted, that the carbon footprint of BIOVOX **MedEco includes compounding, transport from the country of origin of the raw materials as well as packaging**, all of which are usually excluded in general material footprints. Consequently, the actual difference between the end product may be even greater.



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Conclusion

The LCA identifies raw materials, production, and transport as the main environmental hotspots. Biobased, circular materials—such as MedEco PLAs—can therefore represent an important element to advance low-carbon, future-proof solutions.

Outlook

Further reductions are possible through recycling at end of life and the use of circular raw materials such as circular lactic acid. We continuously work on improving our solutions and will keep you updated on future developments.

Questions? Feedback?
Interested to see the full LCA report?

Feel free to reach out using the contact details on the next page →

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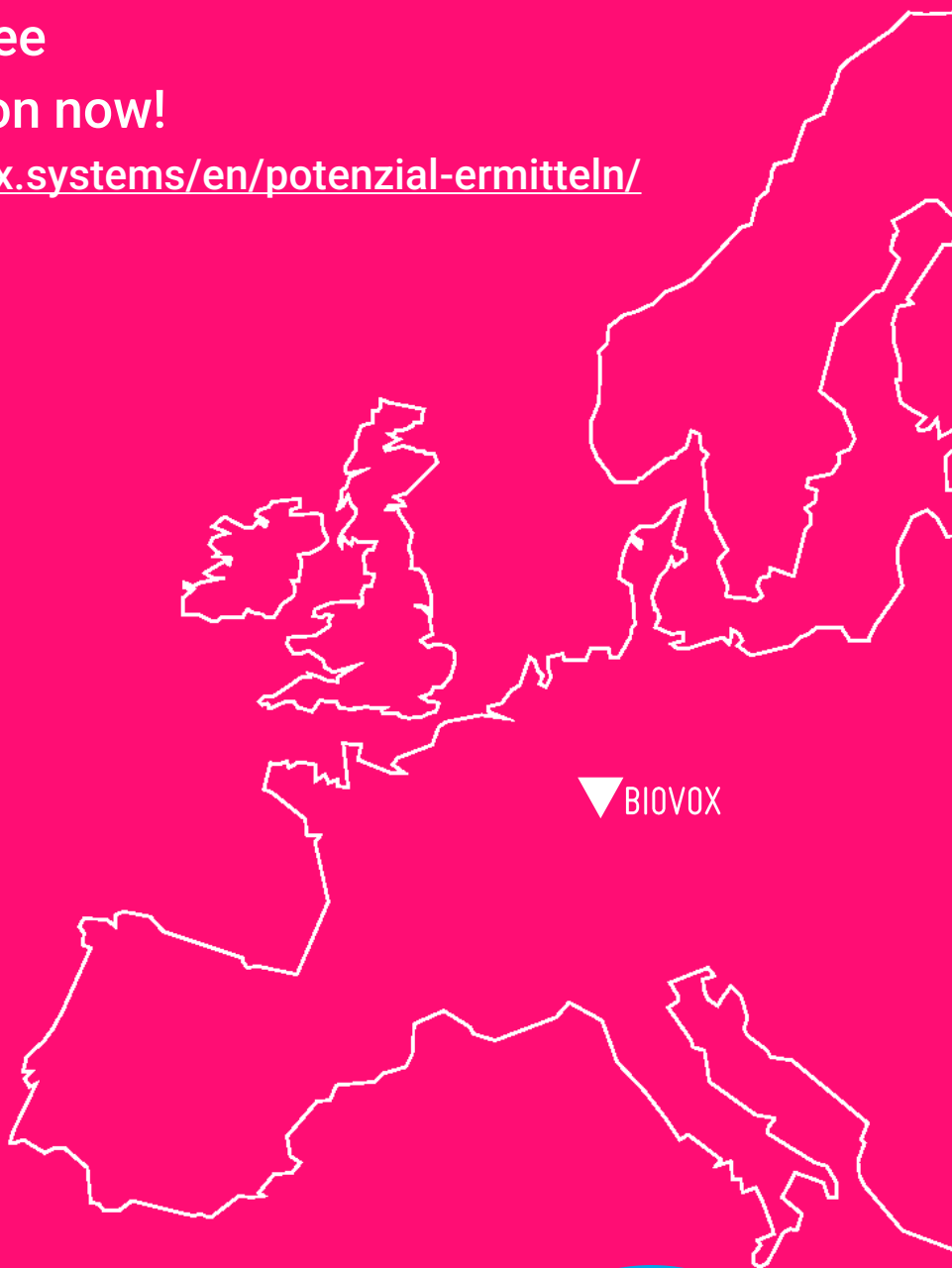

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