

The Bornewables™ : a sustainable alternative to virgin polyolefins

Borealis' portfolio of circular polyolefins
reduces carbon footprint while offering
equally high material performance



 **BOREALIS**

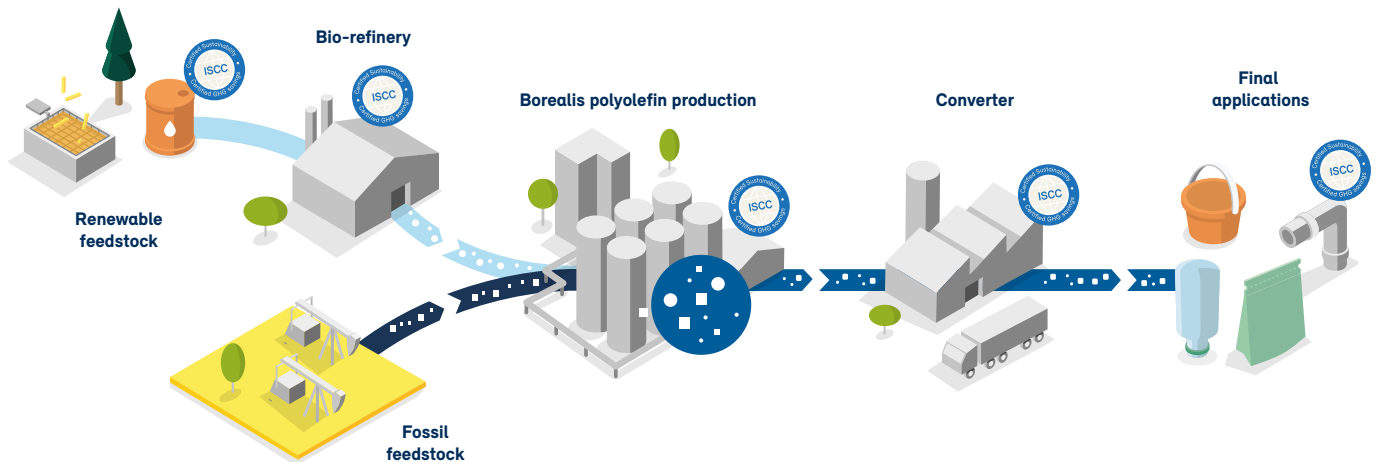
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The Borneables are ISCC PLUS certified polyolefins with reduced carbon footprint, enabling our customers to meet their sustainability targets while maintaining existing quality standards

Borneables products are made using sustainably sourced renewable feedstocks derived solely from waste and residue vegetable oils, such as used cooking oil and residues from vegetable oil processing. The residue from vegetable oil processing consists of rancid fat that has to be removed to produce food-grade oil. The used cooking oil, entirely waste and residues in origin, is a waste stream collected from restaurants and the food industry. These waste and residues are still good raw materials to be processed into our feedstock, helping to reduce

waste and wastewater pollution, for example. These waste and residue streams are traceable back to their point of origin, following the ISCC PLUS chain of custody.

The waste and residue raw materials that are used to produce our feedstock are no longer fit for human consumption, and as such, do not impact food security. Their use provides a reduced carbon footprint to the end-product compared to conventional plastics, and contributes to the circular economy by helping to decouple plastics from the use of fossil feedstocks.



The Borneables are based on the mass balance approach

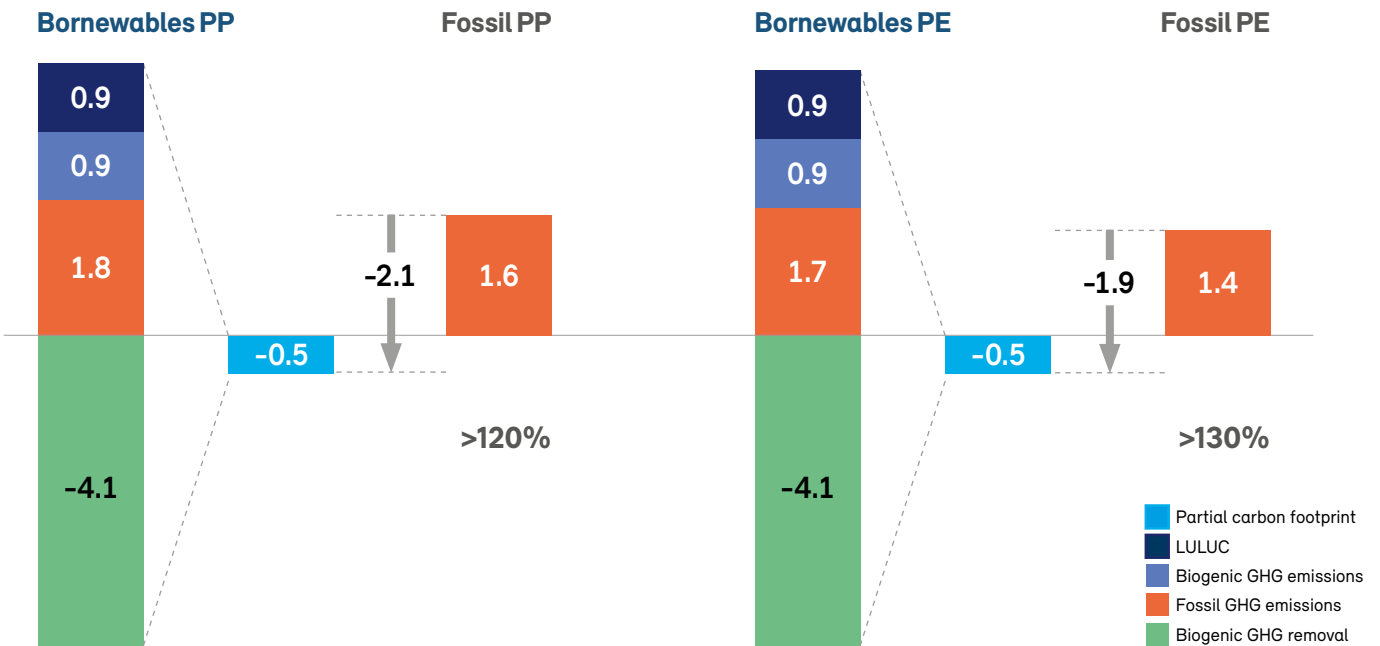
- All Borneables polyolefins are **ISCC PLUS certified**
- Raw materials used to produce the renewable feedstock for the Borneables are traceable to their point of origin
- In the production of the Borneables, the mass balance approach is used to save an identical volume of fossil feedstock by replacing it with sustainable feedstock
- By choosing the Borneables, you contribute to the sustainable sourcing of renewable materials from carefully selected suppliers committed to sustainability

Bornewables are proven to reduce greenhouse gas emissions

Life-cycle assessment (LCA) has shown that the Bornewables contribute towards the mitigation of climate change by providing significantly lower greenhouse gas emissions compared to polyolefins made from fossil-based feedstock. The LCA was carried out by ifeu on Bornewables polypropylene (PP) and polyethylene (PE) produced at Borealis' sites using steam cracker or propane dehydrogenation (PDH) and PP and PE polymerisation with renewable feedstock. For Bornewables polypropylene, when compared to PP manufactured with fossil-based feedstock via Borealis' processes, it revealed that from cradle-to-gate, the partial carbon footprint is reduced by at least 2.1 kgCO₂eq/kg polymer, from 1.6 to -0.5 kgCO₂eq/kg (3.14 kg biogenic CO₂ stored in 1kg PP polymer) – a reduction of at least 120%. For Bornewables polyethylene compared to polyethylene manufactured with fossil-based feedstock via Borealis' processes, the partial carbon footprint (cradle-to-gate) is reduced by at least 1.9 kgCO₂eq/kg polymer, from 1.4 to -0.5

kgCO₂eq/kg. (3.14 kg biogenic CO₂ stored in 1kg PE polymer) – a reduction of more than 130%. Furthermore, the Bornewables are a lower-emissions alternative to fossil-based PP or PE no matter which end-of-life option is chosen. Even in case of energy recovery, when the carbon stored in the product is released during incineration, the carbon footprint reduction still amounts to 44% compared to PP from fossil-based feedstock and 42% compared to PE from fossil-based feedstock. The analysis also revealed that in the production of the Bornewables, sustainably sourced renewable feedstock reduces reliance on fossil feedstock by at least 73%.

The study also showed that compared to fossil PP, the upstream burdens from cultivation and processing the waste and residue streams into the raw materials of our feedstock, cause higher impacts in acidification and eutrophication. The environmental impacts on photochemical ozone creation potential are at the same order of magnitude as with the fossil comparator.



Unit: kg CO₂ eq./kg polypropylene
 Note: Biogenic GHG removal includes sequestered carbon from the atmosphere (3.14 kg CO₂ eq./kg)

Impact category	Bornewables PP	Fossil-PP	Bornewables PE	Fossil-PE
GWP (kg of CO ₂ eq./kg PP)	-0.5	1.6	-0.5	1.4
Abiotic resource depletion, fossil (MJ)	18	70	15	67

Comparison of carbon footprint reduction. When replacing one tonne of conventional PP with Bornewables, you save 2.1 tonnes of CO₂-eq

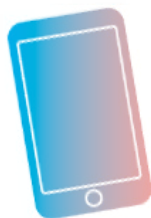
This is comparable to the greenhouse gas emissions of:



95% of average European household's annual energy usage¹

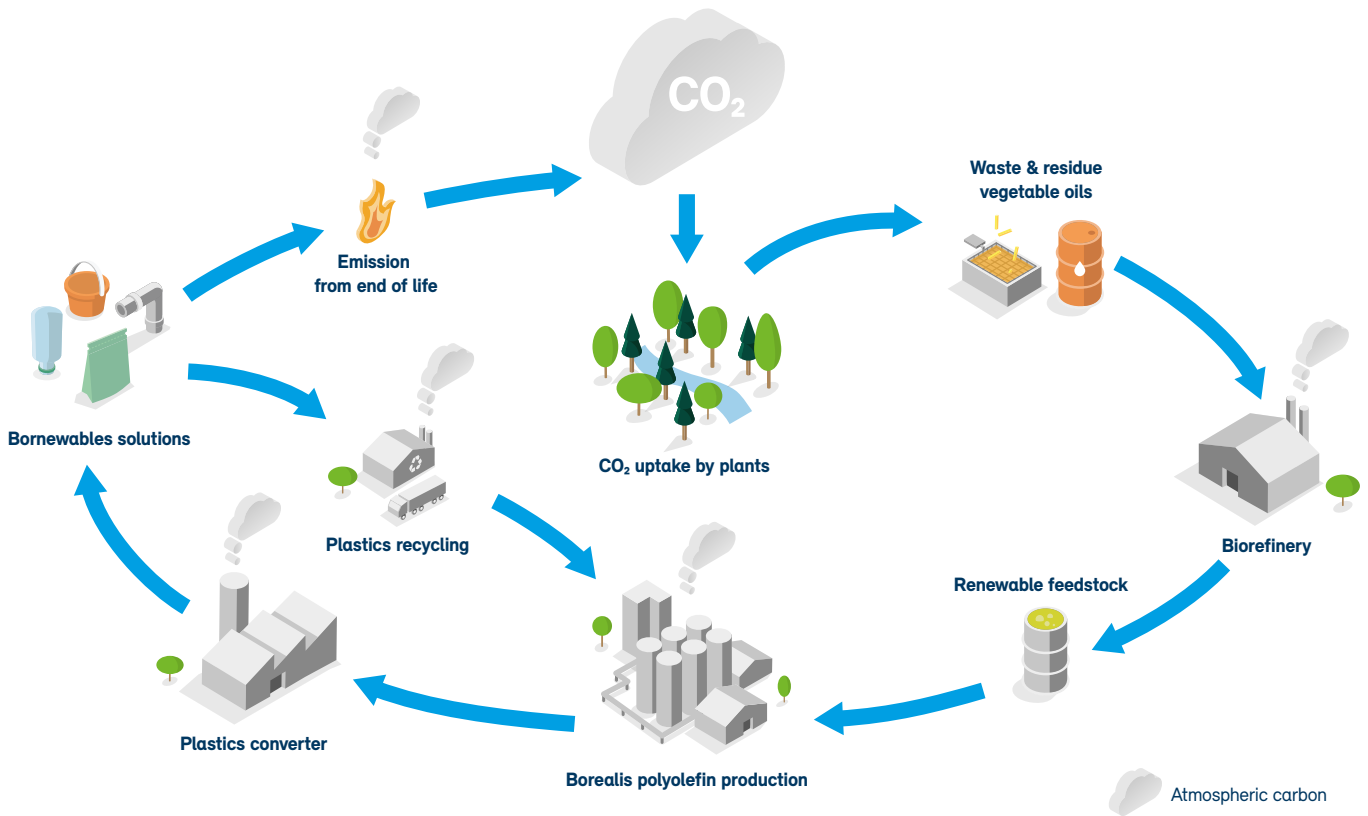


20 meat-lovers going vegetarian for a month²



charging **2,100** smartphones for a year³

Reduced carbon footprint is due to the stored carbon in a plant's biomass, which it takes from the atmosphere during the plant's growth phase



During the growth phase of the plant it uptakes CO₂ from the atmosphere and stores it in the biomass of the plant.



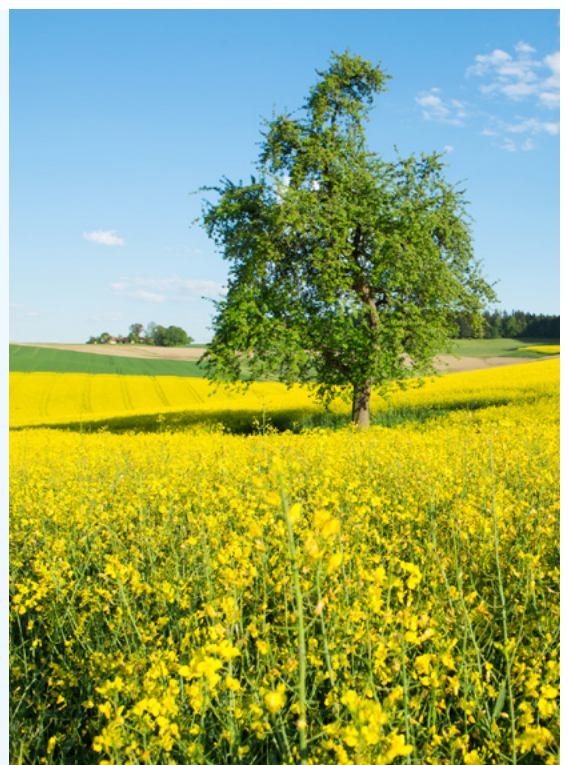
This biomass is then used to produce the feedstock for the production of our plastics.



As the carbon is first uptaken from the air, the biomass is regarded as a carbon storage, which is reflected as emission savings in LCA.



When recycling or reusing the plastic, carbon will be kept in the loop instead of being released into the atmosphere at the End of Life (EoL).



Accelerating the transition to a circular economy

The Borneables, produced by replacing fossil-based feedstock with an identical volume of sustainably sourced renewable feedstock, help our customers decouple from fossil resources.

And by offering the same portfolio, customers avoid switching costs and benefit from the same product quality and

safety needed by most demanding applications, such as food packaging, automotive and healthcare.

In line with Borealis' EverMinds™ platform, which seeks to promote circularity through innovation, the Borneables offer brand owners and converters the opportunity to:



Show their own customers that they care about sustainability and help contribute to a better future.



Contribute to the sourcing of renewable raw materials from carefully selected suppliers who are committed to sustainability.



Manufacture fully recyclable packaging solutions with a lower carbon footprint, but equally high performance, helping to meet their sustainability targets.



Trace renewable raw materials to their point of origin, and ensure their sustainability, thanks to ISCC PLUS mass balance certification.



To find out how the Borneables can help reduce your carbon footprint, please visit borealisgroup.com/borneables

date of issue: **November 2021**

Borealis is one of the world's leading providers of advanced and circular polyolefin solutions and a European market leader in base chemicals, fertilizers and the mechanical recycling of plastics. We leverage our polymers expertise and decades of experience to offer value adding, innovative and circular material solutions for key industries. In re-inventing for more sustainable living, we build on our commitment to safety, our people and excellence as we accelerate the transformation to a circular economy and expand our geographical footprint.

With head offices in Vienna, Austria, Borealis employs 6,900 employees and operates in over 120 countries. In 2020, Borealis generated EUR 6.8 billion in sales revenue and a net profit of EUR 589 million. OMV, the Austria-based international oil and gas company, owns 75% of Borealis, while the remaining 25% is owned by a holding company of the Abu-Dhabi based Mubadala. We supply services and products to customers around the globe through Borealis and two important joint ventures: Borouge (with the Abu Dhabi National Oil Company, or ADNOC, based in UAE); and Baystar™ (with TotalEnergies, based in the US).

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