

Carbon Footprint Assessment of UPM Formi

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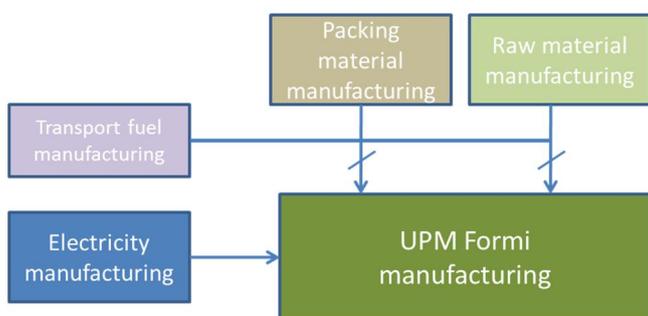
Carbon Footprint Assessment of UPM Formi biocomposite.
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Aim of the study

The goal of the study was to evaluate possible environmental impacts of UPM Formi by using life cycle impact assessment method. This handout presents the results for climate change impact category (a.k.a carbon footprint) from the cradle-to-gate perspective.

The study was made following the principles of ISO 14040 - 44 standards. ReCiPe LCIA method was applied.

Studied system



Carbon footprint of UPM Formi

Under the conditions and the made assumptions of this study, the cradle-to-gate carbon footprint of UPM Formi produced in Lahti in 2010 varies between **1187 - 1875 kg CO₂eq./tonne** in studied cases depending on the cellulose fibre content in the product. The cellulose fibre is Finnish wood pulp from sustainable sources produced by UPM. If glass fibre is used instead of cellulose fibre in the production of a composite the carbon footprint varies between **2346 – 2601 kg CO₂eq./tonne**.

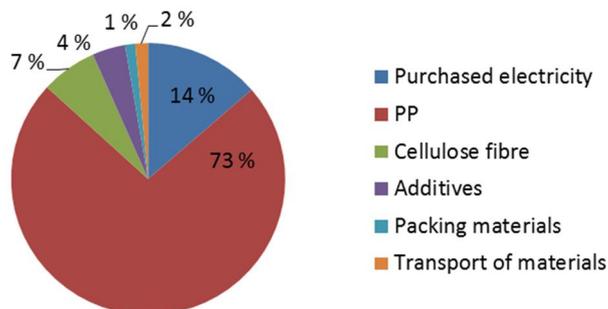
In this study acrylonitrile butadiene styrene (ABS) and polypropylene (PP) are used as reference materials. In the UPM Formi product the cellulose fibre compensates the use of fossil based plastics. In this case study it was assumed that the cellulose fibre and glass fibre compensates the PP. Carbon footprint results from the case studies are presented in the table below.

In the following chart the carbon footprint of an average UPM Formi product with cellulose fibre content of 40 % is presented in more detail. The figure shows that raw material manufacturing, especially production of PP, and purchased electricity have the biggest contribution to the carbon footprint of UPM Formi.

Calculation of carbon footprint

Carbon footprint of a product presents the life cycle greenhouse gas emissions that are released as part of the process of creating, modifying, transporting, storing, using, providing, recycling, or disposing of a product. Since this study concentrates on cradle-to-gate carbon footprint, the emissions occurring after final packaging are excluded from the study. All the greenhouse gas emissions according to the fourth assessment report of IPCC were included in the carbon footprint calculation when applicable. CO₂, CH₄ and N₂O emissions have the biggest contribution on carbon footprint. Greenhouse gas emissions were converted into carbon dioxide equivalents using global warming potentials of 100 years.

Carbon footprint of UPM Formi manufactured in Lahti (cellulose fibre content 40 %)



Carbon Footprint (kgCO ₂ /tonne)	REF 1 ABS 100%	REF 2 PP 100%	Portion of PP substituted with cellulose fibre or glass fibre				
			20 %	30 %	40 %	50 %	60 %
Cellulose fibre (Kaukas)	3941	2219	1875	1703	1531	1359	1187
Glass fibre*	3941	2219	2346	2410	2474	2537	2601

*The LCI data for the glass fibre production is sourced from Ecolinvent database.

Remarks

- The carbon footprint of 1 kg of UPM Formi depending on the pulp content corresponds to 7 - 10 km of driving with an average passenger car in Finland (av. emissions on the driving in 2011, 180 gCO₂/km)
- The main raw materials of UPM Formi are cellulose fibre and polypropylene plastic. By using cellulose fibre as raw material UPM Formi replaces the use of fossil based plastics with renewable raw material from sustainable and non-food sources with verifiable chain of custody. The proportion of the cellulose fibre and plastic varies depending on the product application.
- Wood used in UPM's products comes from sustainable managed forests and from legal sources