

GRI Report PaperFoam

2023



Preface

In 2023 the world was again confronted with the effects of climate change. Many countries suffered from heavy storms, flooding, and forest fires. Millions of people were affected by the resulting damages: from ruined or damaged houses and infrastructure to injured or even killed family members.

The conscience that climate change is due to human activities has grown over the years. During the Covid pandemic, the carbon emission due to traveling decreased significantly. And it was hoped and predicted by many that the decrease would be continued. However it is clear by now, that the traveling emissions are rising again.

On the other hand many serious developments are going on to steer the rising of the world temperatures to the agreed Paris maxima of 1.5 or 2 °C. We mention here the ongoing debates in the yearly climate conferences (recently COP28 in Dubai), but also the strengthening of regulations. Important for the packaging industry is the upcoming Packaging and Packaging Waste Regulation (PPWR), which is heavily discussed in the EU in 2022/2023, and almost ready for signing. And also the CSRD which requires from large companies to report about their climate impact and the risks that are involved. As this reporting mechanism is not contained to the boundaries of the companies involved, effects will roll over to companies in the supply chain. Finally, several NGO's are worldwide using the legal systems to get companies and states more active to reduce their environmental impact. The judicial decisions against Shell¹ but also against the State of The Netherlands² are clear examples, as is the recent verdict of the European court of Human Rights against the State of Switzerland³.

PaperFoam's mission statement is 'Packaging for a sustainable future'. By introducing sustainable PaperFoam packaging trays to the market, and replacing or avoiding plastic and pulp packaging, the company has positive impact. PaperFoam trays have a low carbon footprint⁴ and are low weight due to the foamed structure. As a result PaperFoam packaging trays have an up to 90% lower carbon footprint than comparable plastic and pulp packaging trays.

In order to be able to reduce our footprint even more, PaperFoam keeps track of raw materials consumption, electricity, car fuels and gas usage, and relevant emissions. From

¹ Verdict of the court, May 26, 2021. NGO Milieudefensie and 6 other foundations and associations, as well as 17.000 individuals against Royal Dutch Shell.

² Verdict of the court of appeal, October 19th, 2018. NGO Urgenda and 900 citizens against the State of the Netherlands.

³ Verdict of the European court of Human Rights, April 9th, 2024.

⁴ PaperFoam has a carbon footprint of 1.2 kg CO₂-eq/kg. See LCA report by Pré Consultants, 2021 (for full reference see footnote 6, page 5).

2020 on, sustainability reports have been set up. In order to be as transparent as possible to customers and suppliers, the reporting format from the Global Reporting Initiative⁵ has been chosen. A lot of attention has been paid to data collection. Although after a couple of years the consistency of the data has improved, there is still work to be done. For example: not all differences in outcomes per production location can be clearly attributed to differences in local circumstances.

Materiality analysis

On a yearly basis, a materiality analysis is carried out to determine what are the relevant impact factors for PaperFoam’s business.

The present outcome is that below topics are material for PaperFoam. And these topics are dealt with in the main report.

Selected material topics		
Air (T)	Freely chosen employment	Recyclability
Bribery and corruption	General health and safety	Reporting
Child labor	Hazardous substances	Social responsibility
Commuting	Humane treatment	Wages and benefits
Disclosure of information	Intellectual property	Waste water
Emergency precautions	Noise	Working hours
Energy usage	Permits	Injury rate
Fair business	Privacy	Waste
Freedom of Association	Protection of ID and retaliation	

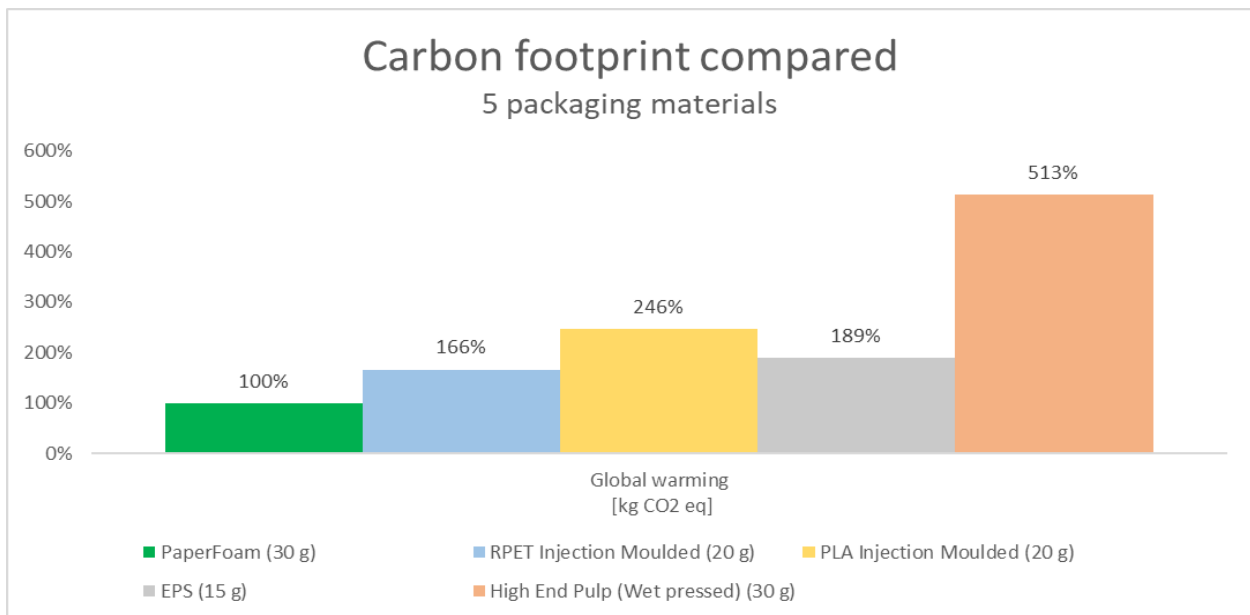
In the present brochure we focus on raw material usage, energy and water usage, and carbon emissions throughout our chain of production.

⁵ GRI: Global Reporting Initiative (www.globalreporting.com). The world standard for creating sustainability reports or integrated ESG report.

Sustainability in packaging

Packaging serves several roles: marketing of the packed products and supply of information to the customer. But also protection of the product against external influences like light and humidity, and protection of the product during transport and storage. PaperFoam is especially important for the reduction of damage during transport and storage, but also has in many cases a role in marketing (the unpacking experience).

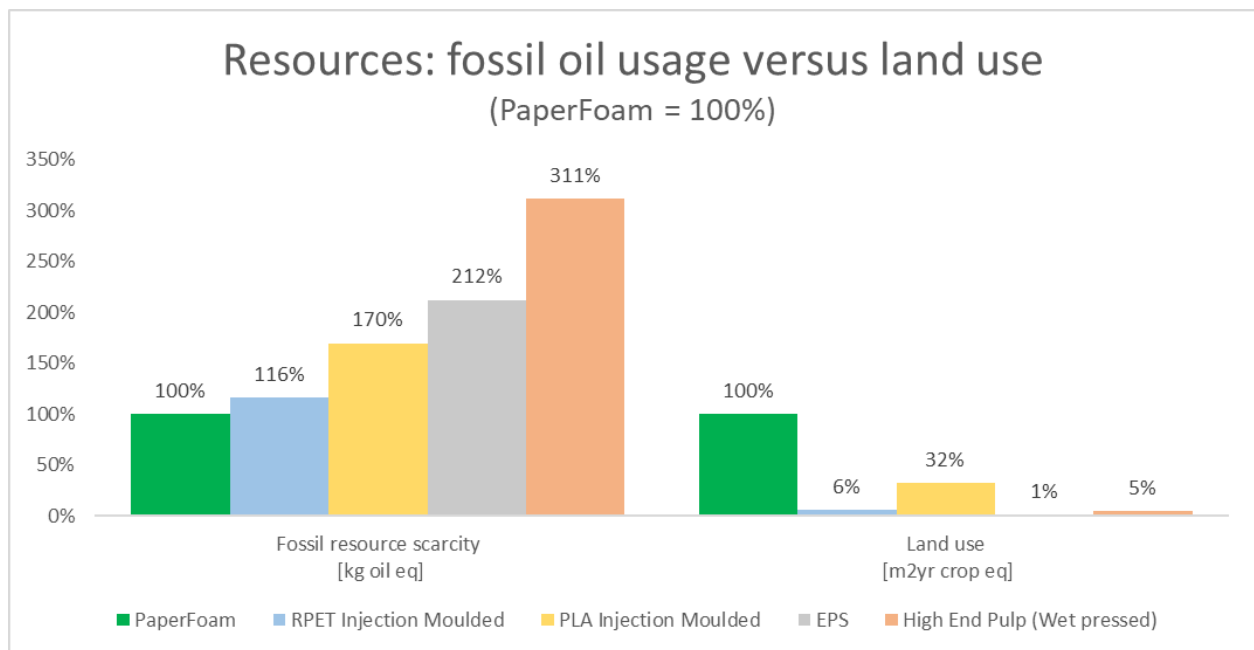
Compared to other packaging materials PaperFoam has a very low carbon footprint. In below graph the Global Warming effect (GWP100) is shown in kg CO₂-equivalents per packaging tray⁶ for 5 common packaging materials: rPET, PLA, EPS and High end Pulp. Assumed tray weights are 30 gram (PaperFoam and Pulp), 20 gram (rPET and PLA) and 15 gram (EPS)⁷.



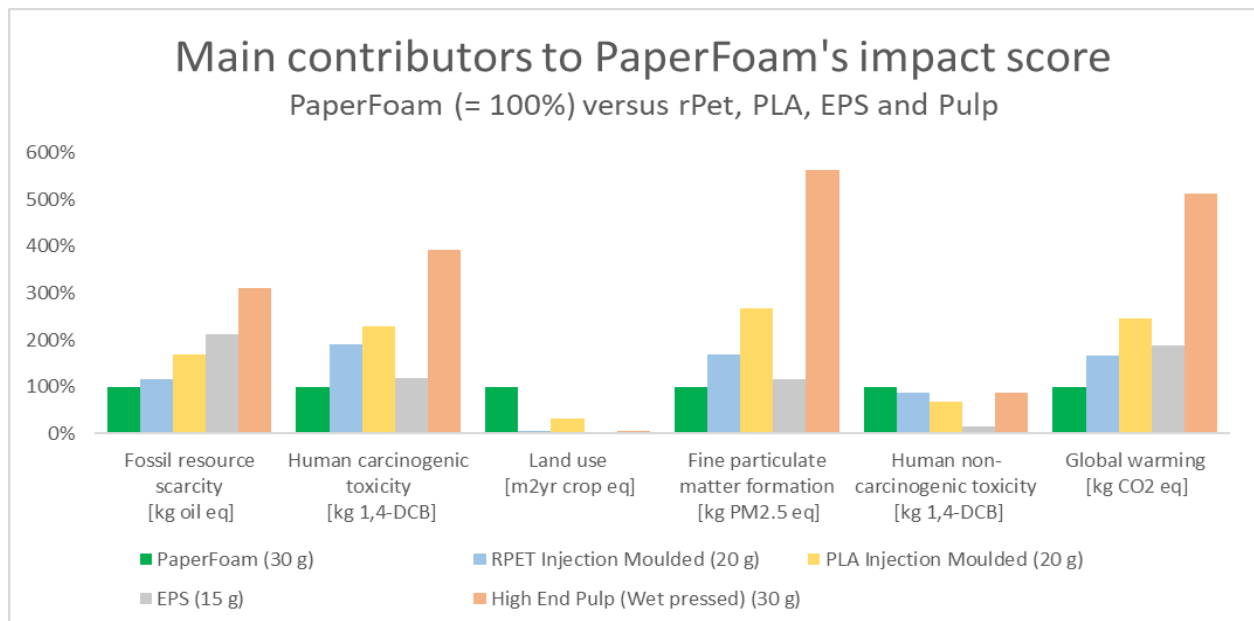
Looking at the impact category Fossil resource use, the impact of PaperFoam is also lower than the impact of fossil based materials. On the other hand, as PaperFoam is made out of potato starch and fibers, the land use impact category has of course a higher score (see below graph).

⁶ Data from Simapro 9.2: Pré Sustainability B.V. (2021) "Life cycle assessment of PaperFoam® - Conform ISO 14040/14044. Externally reviewed by Blonk Sustainability B.V. "

⁷ Tray weights are estimated weights, as seen in the market.



The main contributors to PaperFoam’s overall impact score are Fossil resource scarcity, Human and non-human carcinogenic toxicity, land use, Fine particular matter formation and Global warming. In all categories except land use, the score for pulp packaging is the worst. See below graph.



From the CEO

In 2023 we produced almost 40 million packaging trays which prevented 40 million devices from damage during transport and sales to end customers. But even more important, the usage of our packaging resulted in an estimated reduction of the carbon footprint of packaging by about 3.6 kton CO₂-equivalents, just by replacing conventional plastic or paper based packaging.

Internally we managed also to improve our footprint. In 2023 the first steps were set to introduce our new overflow less mold technology, resulting in a reduction of raw material and energy usage of about 15-20%. And we continued to reduce the scope 1 carbon footprint from travelling by converting our car fleet to electric vehicles, and restricting the number of flights. Scope 2 emissions will be reduced to zero in our Dutch and Czech locations. For 2024 and later we will cooperate with our suppliers to discuss options to reduce the scope 3 emissions.

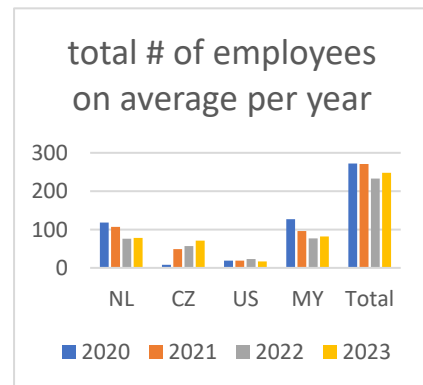


Willem Derkman, CEO.

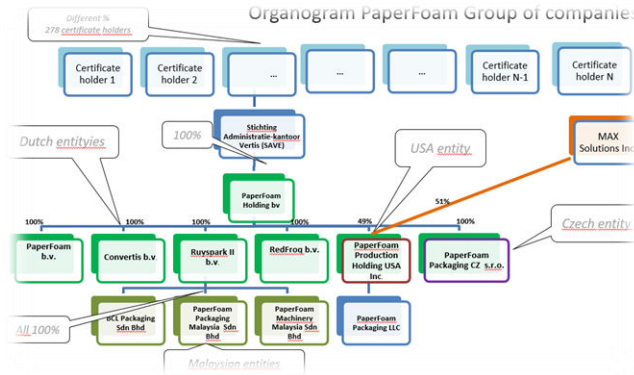
Organization

PaperFoam is based in the Netherlands and has production locations in the Netherlands, Czech republic, North Carolina and Malaysia. Financials and Logistics, the overall management, R&D activities and most of the the Sales and Design department is found at the headquarters in the Netherlands. Sales offices are found in Brooklyn and Berlin. In 2023 on average 248 employees were working in the company (2022: 233).

PaperFoam b.v. is owned by PaperFoam Holding b.v. Since March 2023, 30% of PaperFoam Holding b.v. is owned by Nissha Co. Ltd, a Japanese stocklisted company. The other 70% is owned by Sustainable Pioneers Holding b.v., a Dutch entity.



PaperFoam Holding is a Dutch private company (Besloten Vennootschap). All daughters are



identical private companies (in US: corporation and LLC; In Czech Republic: S.R.O.; In Malaysia: Sdn Bhd).

The ownership of Sustainable Pioneers Holding b.v. is with Stichting Administratiekantoor Vertis (a Dutch foundation). Certificates are held by current employees (20 %), former employees (4%) as well as a group of

external persons (73% of which the most (95%) are former employees of the former mother company of PaperFoam⁸.

All entities, except PaperFoam Packaging LLC are 100% owned by PaperFoam Holding and are (direct or indirect) fully included in the sustainability reporting. PaperFoam Packaging USA LLC is 49% owned by PaperFoam Production Holding USA Inc. since May 2022. From that moment figures for PaperFoam Packaging USA LLC are for 49% included in the sustainability reporting⁹.

⁸ PaperFoam was founded in 1998 by former IT company Vertis Holding. All shareholders (employees) of Vertis Holding became automatically shareholder of PaperFoam Holding.

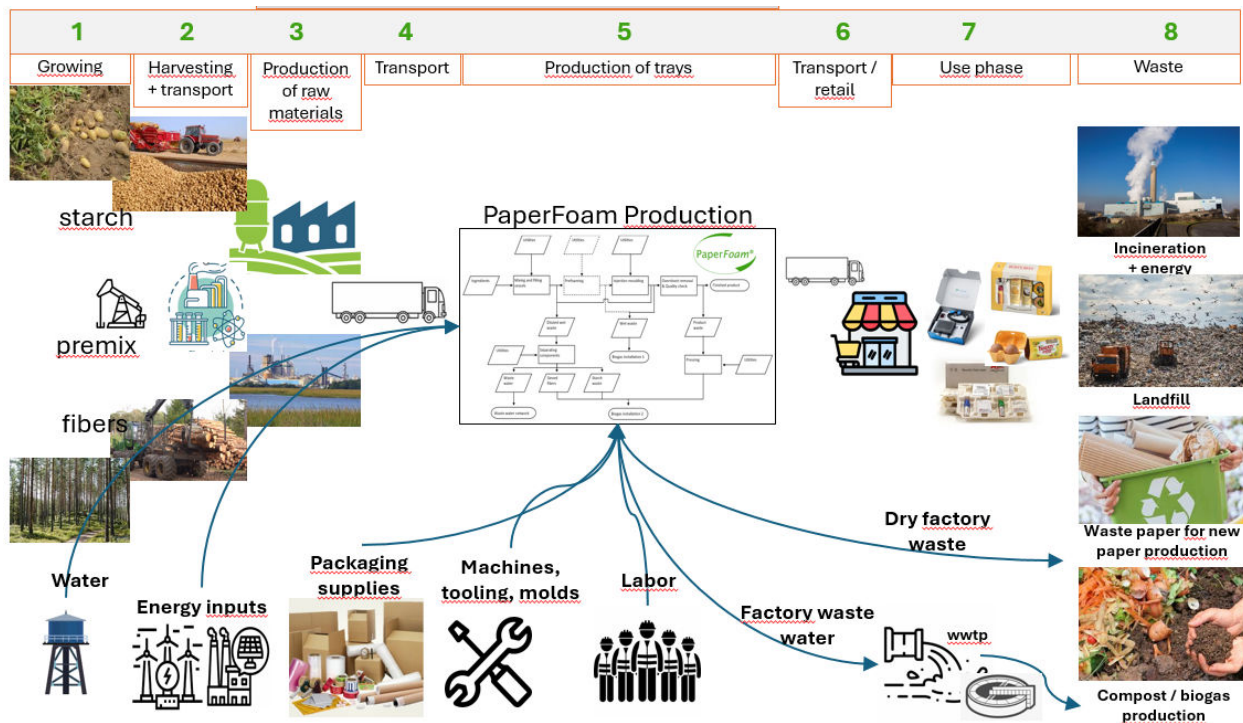
⁹ In this report, the 49% ownership of the US organization is taken into account in calculations where appropriate. In graphs this is shown with the remark "@ownership %".

Value chain

PaperFoam develops, produces and sells Biobased paper recyclable and compostable packaging trays. The protective trays are made by injection molding out of industrial starch and fibers.

PaperFoam packaging serves as a replacement for plastic packaging as well as carton or pulp packaging.

The value chain of PaperFoam starts with raw materials (potato growing and harvesting, starch industry, forestry and fiber industry, chemical production as well as packaging industry) and goes via transporting to the PaperFoam production process. The value chain for molds starts with aluminum producers and goes via tool shops, who make tooling based on designs by the PaperFoam design department, to the PaperFoam tool shop where molds are tested. Approved molds are sent to the PaperFoam production locations. Downstream there are packaging providers, design offices and product suppliers that assemble and use our packaging to pack products for the end consumers.



The use phase of our packaging is not in control by PaperFoam. PaperFoam advises our customers to place recycle logo's or recycle text on the packaging tray to inform the end users about the recycle options. Some of our customers inform their customers by adding text on their packaging or leaflets, and promoting the recycle options via their websites. But in many cases there is no advice, or the customer is not aware of the advice. Advised

options are recycling with paper (fibers can be reused to make paper), or recycling via the green bin (to produce biogas and compost).

PaperFoam works with a couple of design firms that offer complete packaging solutions to their customers including PaperFoam trays.

PaperFoam has long term relationships with both suppliers and customers. On average there are about 100 active suppliers (raw materials, supplies, utilities), and about 150 active customers.

PaperFoam® is the name of the material we produce, the brand name as well as the company name. See www.paperfoam.com.

PaperFoam egg cartons are sold under the brand name RedFroq®. See www.redfroq.com.

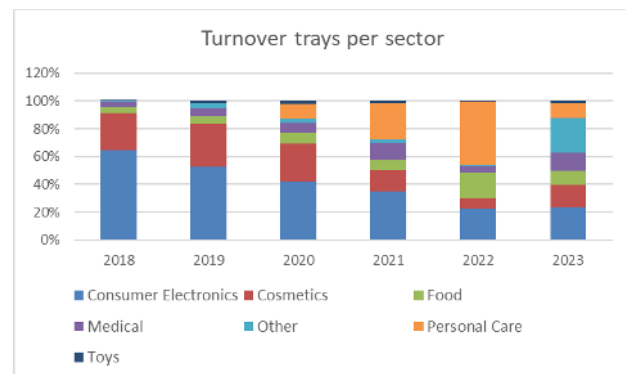
PaperFoam is active in 4 continents (Europe, America, Asia and Australia).

Markets served are:



- electronics;
- medical devices and pharmaceuticals;
- cosmetics;
- personal care;
- games and toys
- dry food

Customers are mainly large internationally stock listed

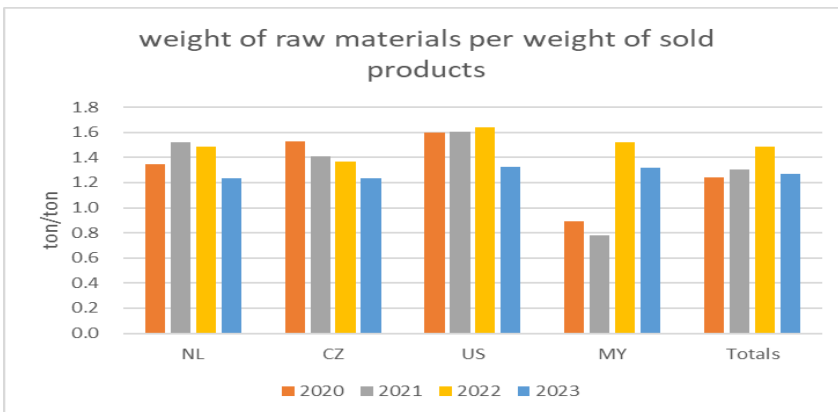


companies, but sometimes also smaller innovative start-up's. Several years ago, the most of our packaging was produced to pack electronic devices, which in general have a short life cycle. During recent years the mix is much more spread. Especially the amount of long lasting medical customers is growing.

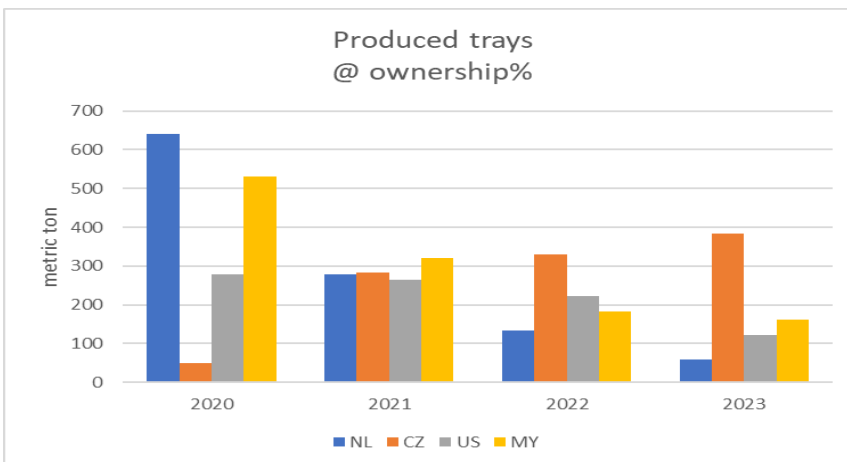
Raw materials usage

Recent year much attention has been given to improve the production yields in the factories. Partly by introduction of new technology: overflow less production saves around 15-20% of material. But also by giving more attention to the whole chain from sales to design to preparation of the molds as well as the maintenance of production machines and better control of the production process.

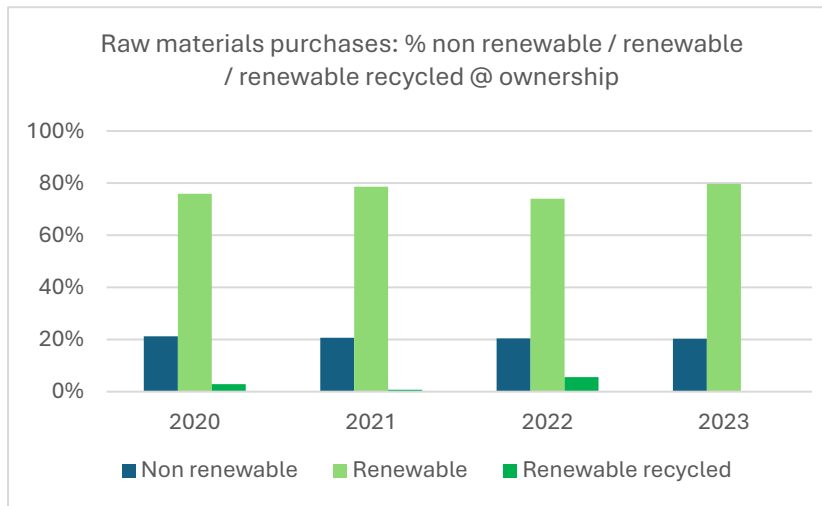
In below graph the amount of raw materials (in tons) is related to the mass of produced trays (in tons). In the second graph the mass of produced trays is shown. Clearly the Dutch location is phasing out the production to become a pilot plant. Czech production started in 2020 to reach the highest production values last year. And the Malaysian factory slowed down as did the US plant due to deferred orders.



Especially the Czech plant (highest production) shows tremendous improvements in material efficiency: down from 1.53 kg raw materials per kg of sold PaperFoam product, to 1.23 kg; a saving of almost 20%.



The data from Malaysia is more complex to understand. Especially in 2020 and 2021 a huge part of the sales coming out of stock; raw materials were used earlier. In 2022 and 2023, sales is in the same period as the raw material usage.



PaperFoam uses a high amount of renewable raw materials. Most of this is starch and fibers. And part of the renewable raw materials were even recycled materials. This applied to recycled starch coming from the French fries industries. Due to minor quality issues related to in stability in properties and the

occurrence of black stains the application of reused starch was only practical for low quality trays like egg cartons. But due to price increasements for side stream starch, it is from an economic point of vue not logical to use these streams any more.

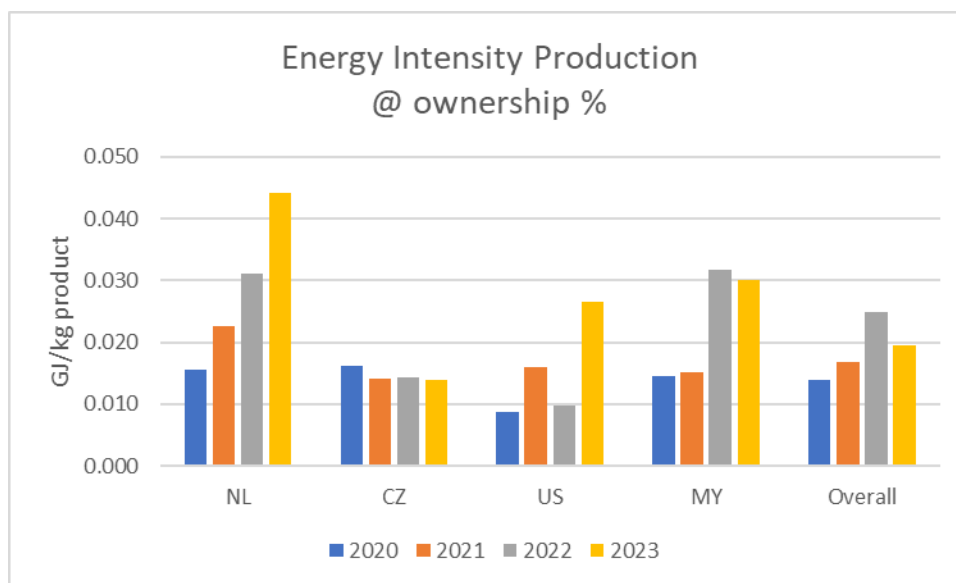
Energy consumption

The company uses energy for production (especially the heating of molds and the running of installed machines, mixers and conveyors) as well as for transport (leased and company cars) and lighting and heating of the buildings. Most of the energy is used as electricity. Up to 4.5% of the energy consumption is used for heating (natural gas) or transport (car fuels).

The Malaysian developments

Our Malaysian factory has solar panels installed for green energy. This helps to lower our electricity usage from the grid.

Also our waste water in Malaysia is fully regenerated to fresh water again before releasing.



Looking at the total energy consumption in GJ per kg sold product, big differences show up for the different production locations. See graph. The high usage in NL and MY as well as for 2023 for the US are

a result of the low production volumes. The Dutch location is converted to a pilot plant with low production. In US a new building has been in operation but with relatively small volumes compared to the size of the building. As a result the basic energy consumption of those buildings are high compared to the production.

The location with the highest production (the Czech factory) shows a nice decrease in the energy intensity.

The CZ developments

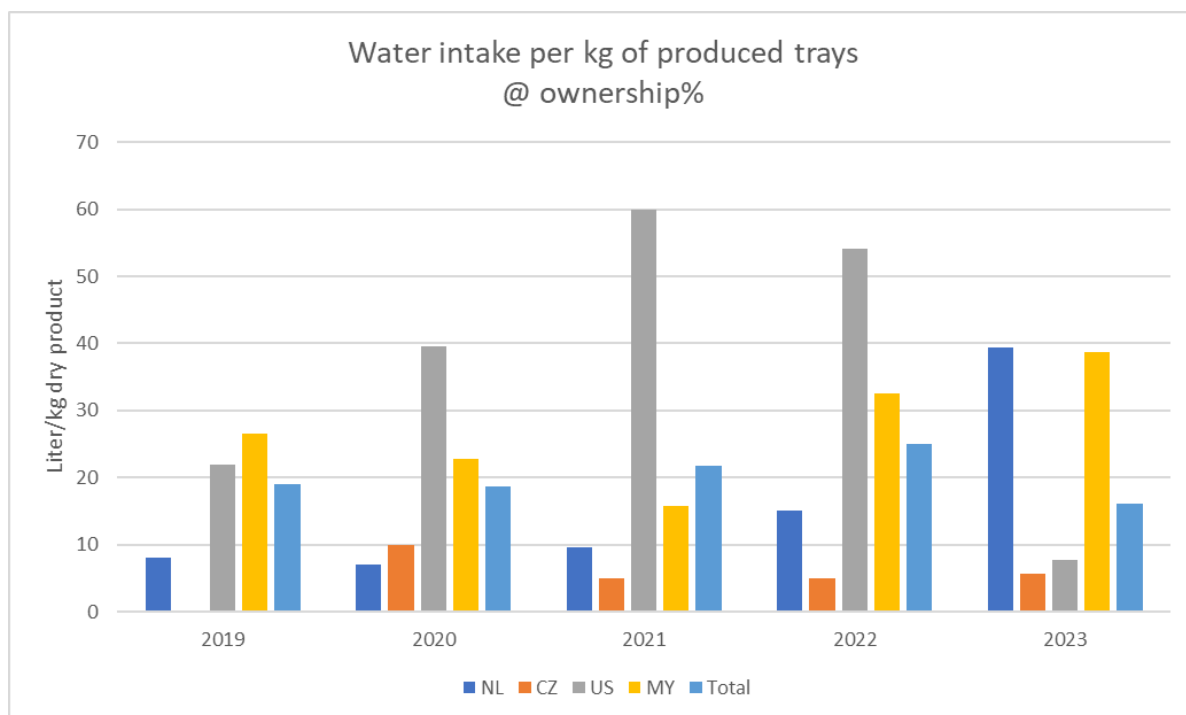
Our CZ facility has improved many processes to reduce our waste in production, and is the leading factory in introducing overflow less production.

Water consumption

PaperFoam uses water to make the mixes that are injected in the molds, and for cleaning devices like pumps. Occasionally water is used to cool the machines which is normally done via a closed loop cooling system. This was especially the case in the old building in the US. In the new building the cooling is done by close loop cooling.

To produce a kilogram of mix about 1.68 kilogram of water is needed. This water is evaporated as steam from the hot molds.

Also for water consumption, the size of the tray production has a huge influence on the water usage per kg of produced trays.



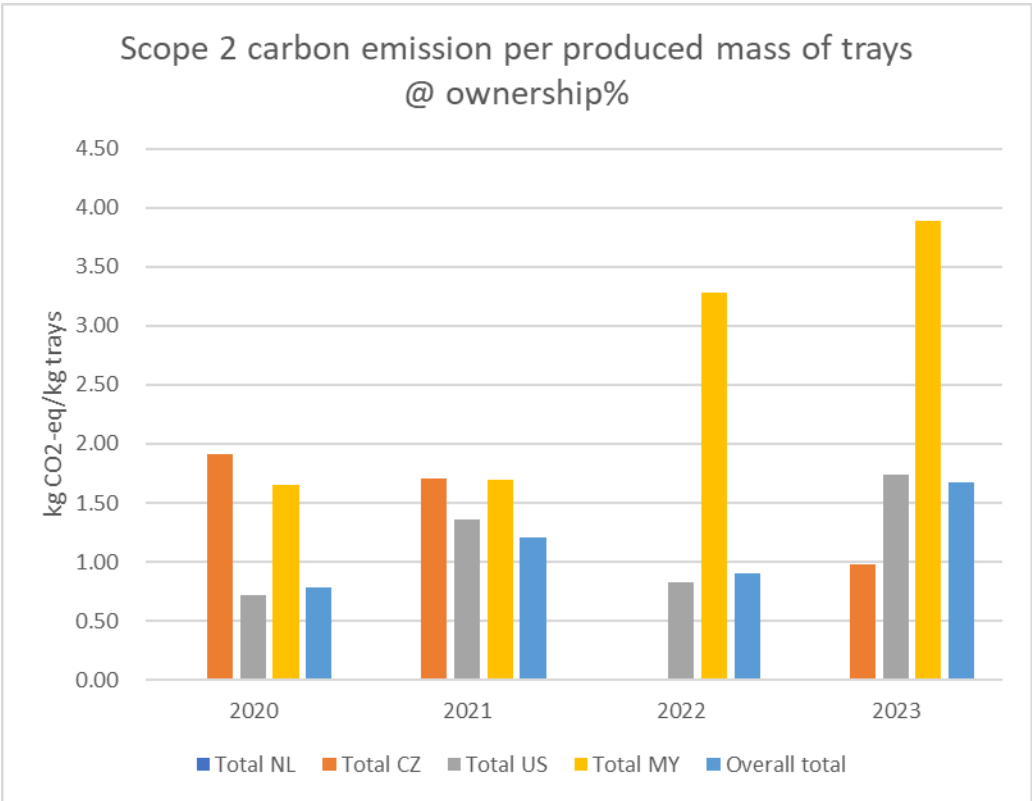
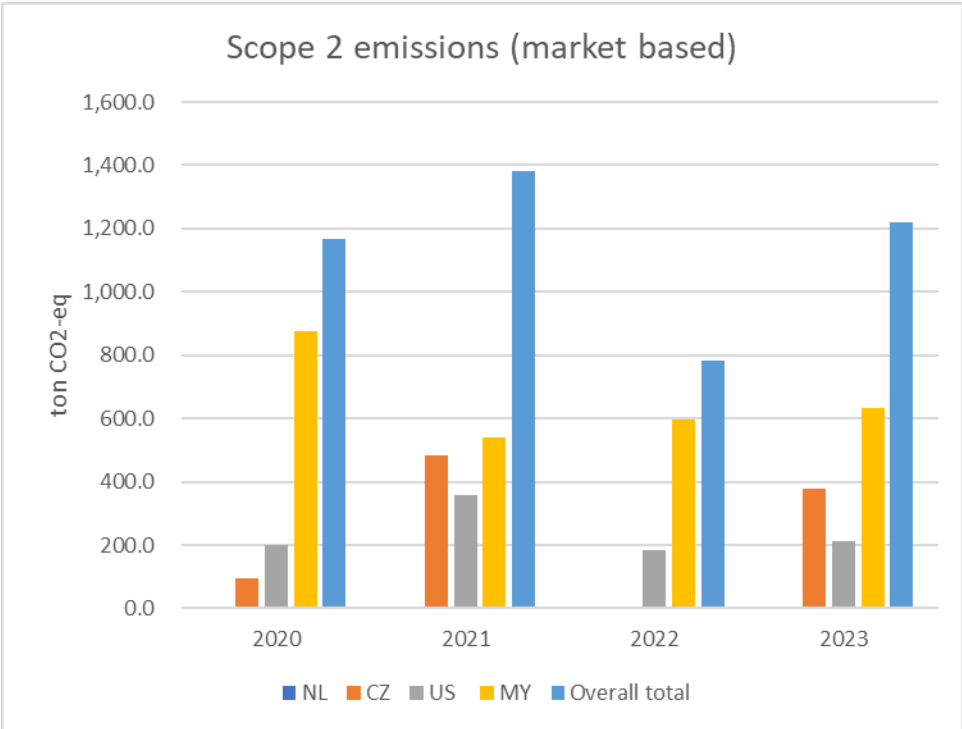
Carbon footprint

Scope 1

As PaperFoam has only a small amount of scope 1 energy consumption, the scope 1 carbon emissions are low. Except for the Netherlands and Malaysia, no company cars are operational. And larger amounts of gas usage are only present in the Netherlands and the new US-plant.

Scope 2

PaperFoam is using green electricity where possible. In practice that is the case in the Netherlands and the Czech republic. In Malaysia, part of the electricity consumption originates from solar panels on the roof of the building. The Czech factory is waiting for approval for the installation of solar panels by the land lord.



The above chart shows the total scope 2 carbon emission per kg of produced trays. The Netherlands is not pictured as the scope 2 emissions are zero (green electricity), as is the case for Czech republic in 2022. In 2023 part of the year non green electricity was contracted. The difference between Malaysia and the other locations is mainly attributable to the differences in the grid (more coal, less green energy sources and less nuclear power).

The Well to Wheel emission for Malaysia is 0.55 kg CO₂-eq per kWh¹⁰, compared to 0.305 kg CO₂-eq per kWh for the US (North Carolina¹¹).

Innovation



In 2023 a joint project with the University of Wageningen made clear that extrusion technology can be used to make thicker and thus stronger foamed material with identical environmental properties as standard PaperFoam. Based on the positive R&D results a lab extruder was bought to continue experiments and a 3 year innovation project was set up to develop starch based packaging material that can

replace fossil based EPS for packaging of heavier products like screens, fridges and furniture. It is assumed yearly savings of about 30 kton CO₂-eq. can be reached after introduction of the new material.

¹⁰ https://www.ema.gov.sg/statistic.aspx?sta_sid=20140729MPY03nTHx2a1

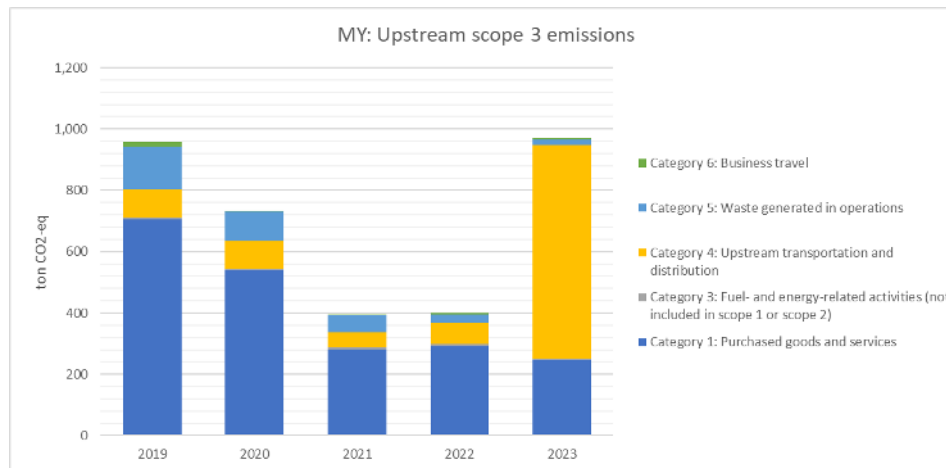
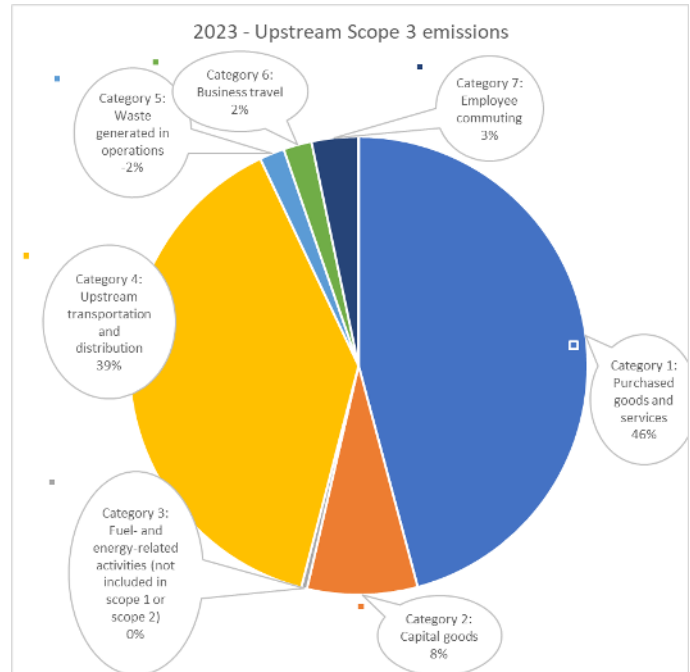
¹¹ <https://www.epa.gov/eGRID/data-explorer>

Scope 3

Two thirds of the total Scope 1, 2 and 3 emissions are attributed to Scope 3 emissions. And from the scope 3 emissions about 44% is originating from raw materials and about 37% is originating from upstream transport. In 2023 60% of this amount was a result of (ocean-)transport of finished goods from Malaysia to Europe; a result of producing a huge amount of trays for European customers in Malaysia due to capacity reasons. A small quarter of the transport emissions are due to transportation of molds to the production locations.

Transport of raw materials was accountable for 15% of the transport emissions.

Business travel and employee commuting contributes to respectively 2 and 3% of the total scope 3 emissions.



In 2023 the decision was taken to produce a lot of trays for the European market in the Malaysian plant. This was necessary due to capacity reasons. The trays were transported to Europe by container

ship (ocean transport). As a result the up-stream scope 3 emissions for the Malaysian plant have more than doubled. Note: normally a lot of the produced trays in Malaysia also are transported, but then as packed products, to Europe and/or the United States. But as these transports normally are carried out by our customers who pack their products in Asia and send the packed products to their US of EU destination, the related transport emissions are not accounted for by PaperFoam.

GRI Index

Statement of use	PaperFoam has reported in accordance with the GRI Standards for the period January 1st 2023 until December 31st 2023.
GRI 1 used	GRI 1: Foundation 2021
Applicable GRI Sector Standard(s)	No specific sector standard applicable

GRI STANDARD/ OTHER SOURCE	DISCLOSURE	LOCATION	OMISSION			GRI SECTOR STANDARD REF. NO.
			REQUIREME NT(S) OMITTED	REASON	EXPLAN ATION	
General disclosures						
GRI 2: General Disclosures 2021	2-1 Organizational details	GRIR + GRIB ¹²	A gray cell indicates that reasons for omission are not permitted for the disclosure or that a GRI Sector Standard reference number is not available.			
	2-2 Entities included in the organization's sustainability reporting	GRIR + GRIB				
	2-3 Reporting period, frequency and contact point	GRIR + GRIB				
	2-4 Restatements of information	GRIR + GRIB				
	2-5 External assurance	GRIR + GRIB				
	2-6 Activities, value chain and other business relationships	GRIR + GRIB				
	2-7 Employees	GRIR				
	2-8 Workers who are not employees	GRIR				
	2-9 Governance structure and composition	GRIR				
	2-10 Nomination and selection of the highest governance body	GRIR				
	2-11 Chair of the highest governance body	GRIR				
	2-12 Role of the highest governance body in overseeing the management of impacts	GRIR				
	2-13 Delegation of responsibility for managing impacts	GRIR				
	2-14 Role of the highest governance body in sustainability reporting	GRIR				
	2-15 Conflicts of interest	GRIR				
	2-16 Communication of critical concerns	GRIR				
	2-17 Collective knowledge of the highest governance body	GRIR				

¹² GRIR: GRI report PaperFoam 2022
GRIB: 2022 Sustainability report: this brochure

	2-18 Evaluation of the performance of the highest governance body	GRIR				
	2-19 Remuneration policies	GRIR				
	2-20 Process to determine remuneration	GRIR				
	2-21 Annual total compensation ratio	GRIR				
	2-22 Statement on sustainable development strategy	GRIR				
	2-23 Policy commitments	GRIR				
	2-24 Embedding policy commitments	GRIR				
	2-25 Processes to remediate negative impacts	GRIR				
	2-26 Mechanisms for seeking advice and raising concerns	GRIR				
	2-27 Compliance with laws and regulations	GRIR				
	2-28 Membership associations	GRIR				
	2-29 Approach to stakeholder engagement	GRIR				
	2-30 Collective bargaining agreements	GRIR				
Material topics						
GRI 3: Material Topics 2021	3-1 Process to determine material topics	GRIR	<i>A gray cell indicates that reasons for omission are not permitted for the disclosure or that a GRI Sector Standard reference number is not available.</i>			
	3-2 List of material topics	GRIR				
Materials						
GRI 3: Material Topics 2021	3-3 Management of material topics	GRIR				
GRI 301: Materials 2016	301-1 Materials used by weight or volume	GRIR				
	301-2 Recycled input materials used	GRIR + GRIB				
	301-3 Reclaimed products and their packaging materials	GRIR				
Energy						
GRI 3: Material Topics 2021	3-3 Management of material topics	GRIR				
GRI 302: Energy 2016	302-1 Energy consumption within the organization	GRIR + GRIB				
	302-2 Energy consumption outside of the organization	GRIR + GRIB				
	302-3 Energy intensity	GRIR + GRIB				

	302-4 Reduction of energy consumption	GRIR + GRIB				
	302-5 Reductions in energy requirements of products and services	GRIR + GRIB				
Water and effluents						
GRI 3: Material Topics 2021	3-3 Management of material topics	GRIR + GRIB				
GRI 303: Water and Effluents 2018	303-1 Interactions with water as a shared resource	GRIR + GRIB				
	303-2 Management of water discharge-related impacts	GRIR + GRIB				
	303-3 Water withdrawal	GRIR + GRIB				
	303-4 Water discharge	GRIR + GRIB				
	303-5 Water consumption	GRIR + GRIB				
Emissions						
GRI 3: Material Topics 2021	3-3 Management of material topics	GRIR + GRIB				
GRI 305: Emissions 2016	305-1 Direct (Scope 1) GHG emissions	GRIR + GRIB				
	305-2 Energy indirect (Scope 2) GHG emissions	GRIR + GRIB				
	305-3 Other indirect (Scope 3) GHG emissions	GRIR + GRIB				
	305-4 GHG emissions intensity	GRIR				
	305-5 Reduction of GHG emissions	GRIR + GRIB				
	305-6 Emissions of ozone-depleting substances (ODS)	GRIR				
	305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	GRIR				
Waste						
GRI 3: Material Topics 2021	3-3 Management of material topics	GRIR				
GRI 306: Waste 2020	306-1 Waste generation and significant waste-related impacts	GRIR				
	306-2 Management of significant waste-related impacts	GRIR				
	306-3 Waste generated	GRIR				
	306-4 Waste diverted from disposal	GRIR				
	306-5 Waste directed to disposal	GRIR				
Occupational health and safety						

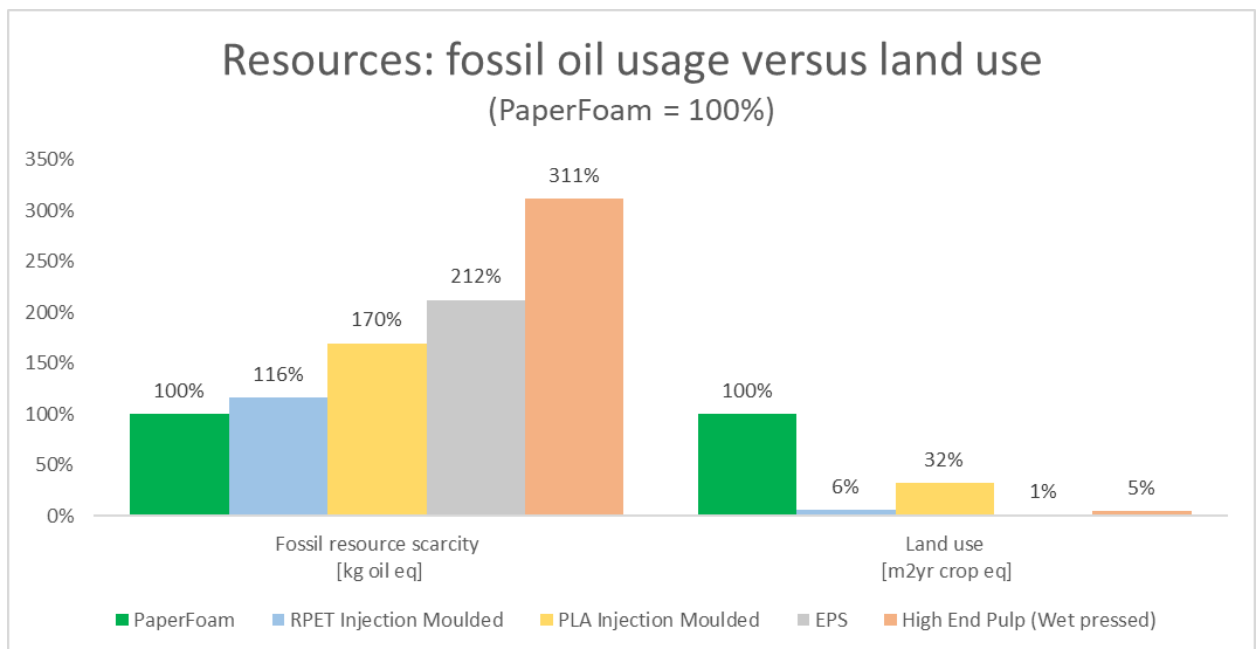
GRI 3: Material Topics 2021	3-3 Management of material topics	GRIR				
GRI 403: Occupational Health and Safety 2018	403-1 Occupational health and safety management system	GRIR				
	403-2 Hazard identification, risk assessment, and incident investigation	GRIR				
	403-3 Occupational health services	GRIR				
	403-4 Worker participation, consultation, and communication on occupational health and safety	GRIR				
	403-5 Worker training on occupational health and safety	GRIR				
	403-6 Promotion of worker health	GRIR				
	403-7 Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	GRIR				
	403-8 Workers covered by an occupational health and safety management system	GRIR				
	403-9 Work-related injuries	GRIR				
	403-10 Work-related ill health					

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<https://ourworldindata.org/co2-emissions>

https://www.oecd-ilibrary.org/sites/de747aef-en/1/2/2/index.html?itemId=/content/publication/de747aef-en&csp_ =e9020c542dd024467e760066b0abe328&itemIGO=oecd&itemContentType=book#section-d1e73

- Sustainability in protective packaging



- - Plastics
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 - PF alternative > LCA
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 - Improved data collection
 - Comparability?
- Organization
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- Organizational developments
 - Converting NL to pilot plant
 - 30% involvement Nissha

- New R&D developments (overflow less, PF+,
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 - Slowly increasing medical market
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+ LCA/footprint

+ Veiligheid / gezondheid
