

GURIT PET LIFE CYCLE ASSESSMENT



This document provides a Life Cycle Assessment (LCA) for Gurit PET structural foam core, including considerations when conducting such an assessment.

THE CIRCULAR ECONOMY

The circular economy is a sustainable economic model designed to minimize waste and maximize resource efficiency. Instead of the traditional “take-make-dispose” approach, it focuses on keeping materials, products, and resources in use for as long as possible through practices like recycling, repairing, and reusing.

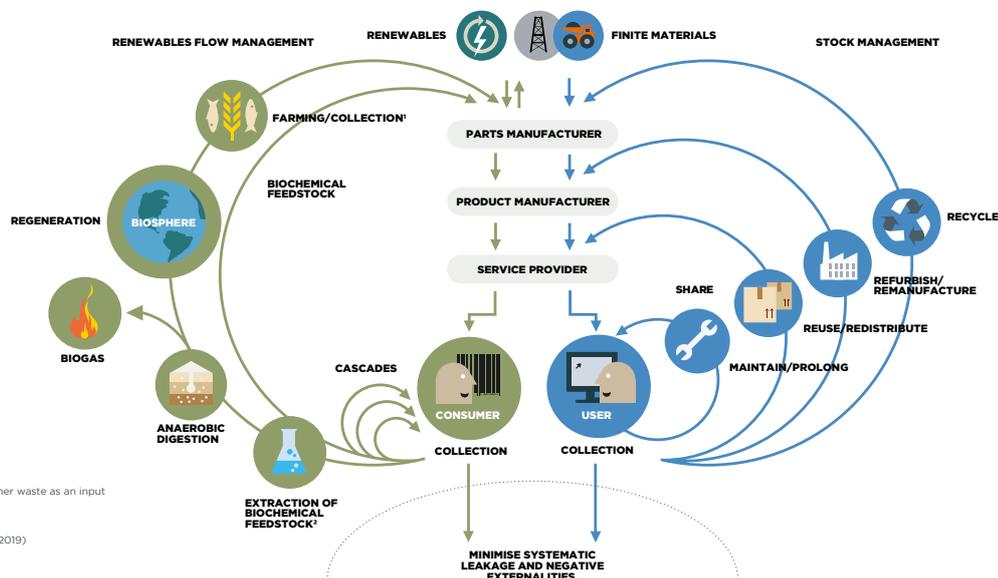
Products are designed and made to last longer, be repairable and recyclable. Materials can be recovered and transformed into new products with minimal energy input. Production processes are efficient and environmental impact is reduced.

The circular economy helps to reduce waste, lower emissions, and conserve natural resources while encouraging innovation and economic growth. Companies and governments worldwide are embracing circular economy principles to combat climate change and promote sustainable development.

THE IMPORTANCE OF KEEPING PLASTIC MATERIALS IN USE

Plastics play an important role in the circular economy because of their durability and versatility; they can be reused, recycled, and repurposed. However, they can pose environmental risks if not managed properly. If handled responsibly, several perceived wasteful items can be reclaimed, reused and reintegrated into new products that in themselves promote more sustainable lower-carbon processes.

Plastic products like Gurit PET foam can be made from PET derived from waste streams such as post-consumer plastic bottles and industrial PET waste. The processes used to manufacture Gurit PET foam are designed to be as energy-efficient as possible, resulting in reduced impacts from manufacture and recycling.



1 Hunting and fishing
2 Can take both post-harvest and post-consumer waste as an input

SOURCE
Ellen MacArthur Foundation
Circular economy systems diagram (February 2019)
www.ellenmacarthurfoundation.org
Drawing based on Braungart & McDonough,
Cradle to Cradle (C2C)

HOW DOES GURIT PET FIT INTO A CIRCULAR ECONOMY?

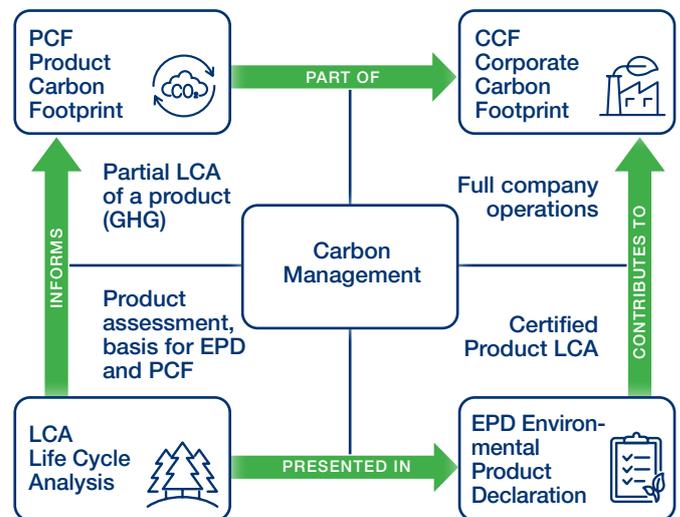
Gurit PET aligns with the aim of reducing a product's carbon footprint and reducing waste. It is a highly adaptable, recyclable, thermoplastic foam core material that can be used as an alternative to higher-footprint materials such as wood or metal.

Gurit PET contains a significant amount of recycled PET content, sourced from post-consumer PET bottles, industrial PET waste, or waste from our own production process. This greatly reduces our carbon cost of manufacture compared with using 100% virgin PET.



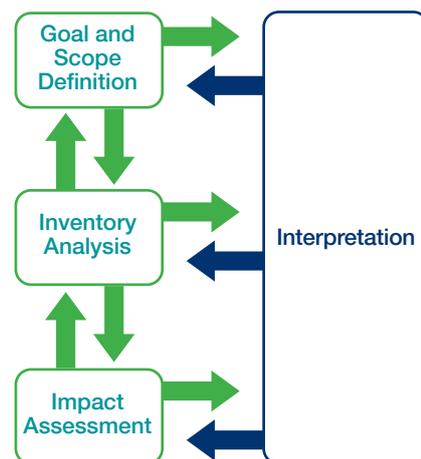
WHAT IS A LIFE CYCLE ASSESSMENT?

Life Cycle Assessment (LCA) is a structured method used to quantify the environmental impacts through all stages of a product's life cycle, from raw material extraction to production, use, and final disposal. Each LCA generates data which is modeled and translated into environmental impacts, which are then evaluated for significance and inform conclusions and recommendations. An LCA can inform a product carbon footprint and results can be presented in an LCA document such as this or an Environmental Product Declaration (EPD).



LCA follows the ISO 14040/44 standards, which define the iterative steps to be taken when conducting an LCA:

1. **Goal and Scope** – The methodological choices taken within the ISO framework to ensure a consistent and non-subjective approach.
2. **Life Cycle Inventory** – The collection of data relating to environmental inputs and outputs.
3. **Life Cycle Impact Assessment** – The modelling of data into environmental impacts such as global warming.
4. **Interpretation** – The identification of any significant issues and evaluation of sensitivity analysis, alongside conclusions, limitations and recommendations



A **functional unit** is the specific, quantified description of the product or service being analyzed and serves as the reference point for all environmental impacts measured in the assessment. A functional unit may be in kg, m³ or as a unit of product such as a single laptop or car. When comparing LCA or EPD it is important to ensure the functional unit is the same between datasets. The functional unit used in this analysis is 1m³ of material.

IMPACT CATEGORIES

Impact categories are the environmental impacts assessed in an LCA. They may vary depending on assessment method and so it is important to ensure any comparisons are made with like-for-like data.

GLOBAL WARMING POTENTIAL

GWP measures the impact of greenhouse gases on climate change, relative to carbon dioxide (CO₂), with higher values indicating stronger impacts.

HUMAN AND ENVIRONMENTAL TOXICITY

Human toxicity refers to the potential harm caused by chemicals or pollutants released during a product's life cycle, which may lead to health issues like respiratory diseases or cancer. Environmental toxicity assesses the impact of these substances on ecosystems, including water, soil, and air pollution, which can harm wildlife and disrupt biodiversity.

ACIDIFICATION & EUTROPHICATION

Acidification is the extent to which the marine or terrestrial environment acidifies leading to damage to soil health and terrestrial ecosystems.

Eutrophication occurs when nutrients are too plentiful in an ecosystem, such as nitrogen or phosphorus, which enter waterways and result in excessive algae growth. This leads to depleted oxygen levels for aquatic life and can lead to 'dead zones' in the environment.

RESOURCE DEPLETION AND LAND USE

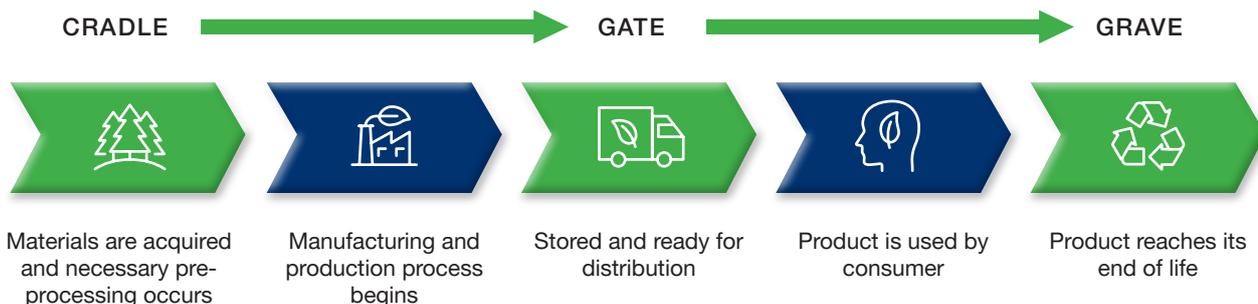
Resource depletion assesses the exhaustion of earth's resources due to raw material extraction.

Land use changes are assessed for their impact on biodiversity and soil quality. For example cutting down a forest to rear cattle.

LCA METHODOLOGY AND BOUNDARIES

There are several different methodologies that can be used when creating an LCA, with various impact categories and stages that may be assessed. The methodology may be specific to the industry served by the product. The method used in this report includes the ReCiPe Midpoint (H) method.

The system boundary of an LCA defines the scope of the study and determines which processes and activities are included in the evaluation. In this case, the LCA will examine the cradle-to-grave life cycle of the product. However, it will not consider the impacts associated with transporting the product to the user.



IMPACT OF END OF LIFE (EOL)

End of Life processes can impact the LCA significantly depending on the route of disposal. Landfill may cause uncontrolled decomposition, leading to leaching of chemicals into the environment and expulsion of gases such as methane which can have a high impact on the environment. Recycling will ensure any 'spent' carbon is retained within existing systems although this may include additional energy input to achieve. Also it is wise to be wary of the availability of recycling methods. Current theoretical methods may not yet be available at scale and cannot be included if not proven.



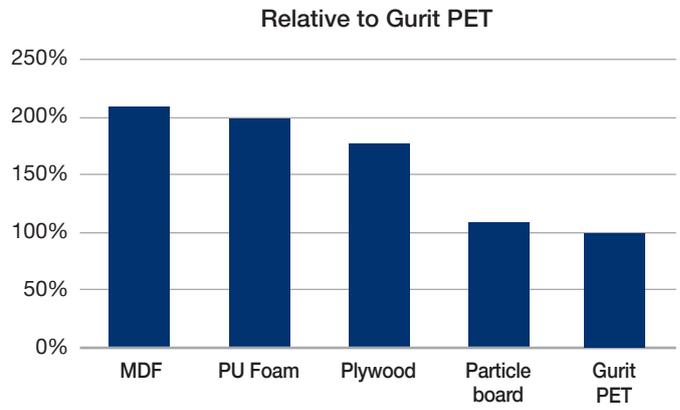
LCA RESULTS

The data displayed below provides full LCA impact references for Gurit PET as an average of production sites across each available density of product.

Impact Categories	Units	Gurit PET Density, kg/m ³								
		80	100	115	135	150	200	235	250	300
climate change - global warming potential (GWP100)	kg CO ₂ -Eq	242	251	258	268	275	300	316	355	392
acidification: terrestrial - terrestrial acidification potential (TAP)	kg SO ₂ -Eq	0.76	0.79	0.81	0.84	0.86	0.94	0.99	1.10	1.21
eutrophication: freshwater - freshwater eutrophication potential (FEP)	kg P-Eq	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09
eutrophication: marine - marine eutrophication potential (MEP)	kg N-Eq	0.19	0.20	0.21	0.23	0.24	0.27	0.29	0.35	0.40
ecotoxicity: freshwater - freshwater ecotoxicity potential (FETP)	kg 1,4-DCB-Eq	8.92	9.20	9.42	9.71	9.89	10.65	11.17	11.30	12.45
ecotoxicity: marine - marine ecotoxicity potential (METP)	kg 1,4-DCB-Eq	12.22	12.59	12.89	13.31	13.61	14.63	15.36	15.80	17.35
ecotoxicity: terrestrial - terrestrial ecotoxicity potential (TETP)	kg 1,4-DCB-Eq	1340	1415	1468	1541	1597	1790	1913	2235	2515
human toxicity: carcinogenic - human toxicity potential (HTPc)	kg 1,4-DCB-Eq	20.75	21.47	22.06	22.82	23.38	25.33	26.50	28.65	31.50
human toxicity: non-carcinogenic - human toxicity potential (HTPnc)	kg 1,4-DCB-Eq	218	223	228	234	239	255	265	269	292
ionising radiation - ionising radiation potential (IRP)	kBq Co-60-Eq	9.98	10.28	10.51	10.86	11.11	12.00	12.53	12.60	13.90
ozone depletion - ozone depletion potential (ODP _{infinite})	kg CFC-11-Eq	<0.00	<0.00	<0.00	<0.00	<0.00	<0.00	<0.00	<0.00	<0.00
particulate matter formation - particulate matter formation potential (PMFP)	kg PM _{2.5} -Eq	0.34	0.35	0.36	0.37	0.38	0.41	0.43	0.47	0.52
photochemical oxidant formation: human health - photochemical oxidant formation potential: humans (HOFP)	kg NO _x -Eq	0.57	0.59	0.61	0.64	0.66	0.72	0.76	0.88	0.98
photochemical oxidant formation: terrestrial ecosystems - photochemical oxidant formation potential: ecosystems (EOFP)	kg NO _x -Eq	0.60	0.63	0.65	0.67	0.69	0.76	0.81	0.93	1.04
energy resources: non-renewable, fossil - fossil fuel potential (FFP)	kg oil-Eq	87	91	94	98	101	112	119	139	155
land use - agricultural land occupation (LOP)	m ² a crop-Eq	12.74	12.90	13.03	13.23	13.36	13.81	14.15	18.69	19.39
material resources: metals/minerals - surplus ore potential (SOP)	kg Cu-Eq	1.77	1.84	1.83	1.97	2.00	2.24	2.36	2.60	2.90
water use - water consumption potential (WCP)	m ³	1.68	1.75	1.81	1.89	1.95	2.16	2.30	2.67	3.00

DATA COMPARISONS

When comparing a key climate indicator, Global Warming Potential (GWP), the data shows that a greatly reduced footprint is achieved by using PET compared with other materials.

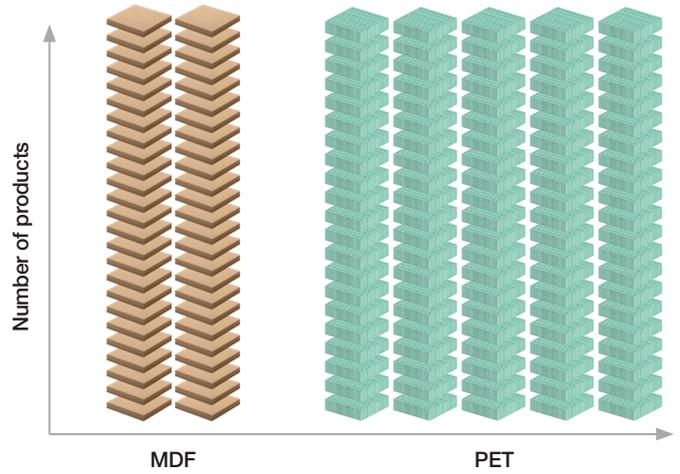


GWP EQUIVALENCIES

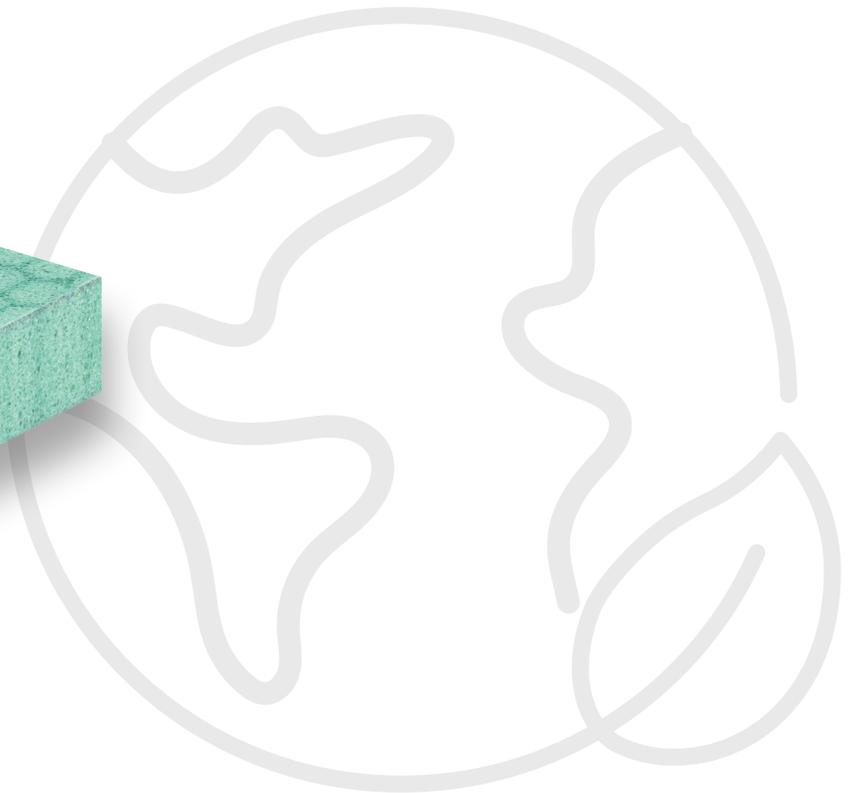
Manufacturing 1,000 sheets of PET instead of MDF saves the equivalent of:

- Driving 12,535 miles
- Charging 397,968 smartphones
- Or the equivalent carbon sequestered by 5 acres of forest in a year.

For the same environmental impact, twice as many PET core units can be manufactured vs. MDF units.



Data sources: Calculated values from publicly available data; International EPD System, <https://www.environdec.com/home>



MORE INFORMATION

www.gurit.com/sustainability

