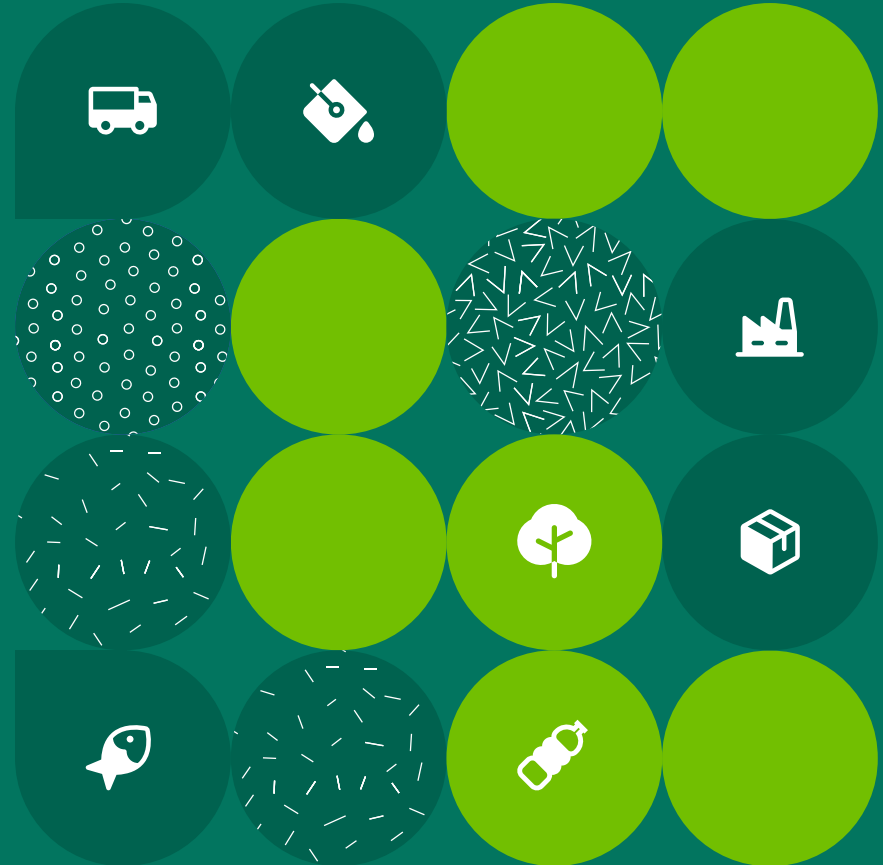


Plastic Footprint Guidelines

Introduction to plastic footprinting

Version 1. November 2023

Convened by EA - Earth Action · www.plasticfootprint.earth



Introduction to the Plastic Footprint Network

Leading organizations have united within the Plastic Footprint Network to chart a new, more effective **path toward plastic pollution mitigation.**

The network's first priority was **unifying the framework** for measuring plastic leakage into a **single, science-based methodology** for organizations to accurately assess the environmental impact of their plastic use. **Over 100 professionals from 35 organizations** worked to establish the resulting methodology, which consists of 11 modules, all optimized for usability and **delivery of actionable results.**



Objectives

Unifying the methodologies and perspectives of leading scientists, experts, and global practitioners, PFN enables organizations to understand the full impact, or footprint, from the use of plastic in their companies, products, and services.

1

Update and unify plastic footprinting methodologies

2

Ensure the methodology is used consistently by practitioners

3

Disseminate and scale the use of plastic footprinting


4

Explore link with plastic credit schemes, and how to prevent greenwashing claims

What will you find in this module?

The objective of this module is to introduce the concept of plastic footprinting, to give a clear answer to the question of what constitutes a plastic footprint. In pursuit of this goal, we will address the following key questions:

- 1 What is a footprint ?
- 2 What are the goals of a plastic footprint? How do we assess it?
- 3 What do we assess with a plastic footprint? Which metrics are significant?
- 4 How can we effectively utilize the insights gained from a plastic footprint?



At the end of this module, users will understand what a plastic footprint is, the metrics involved, and how to effectively use this knowledge.

Where does this module fit in the PFN landscape?

Guidance

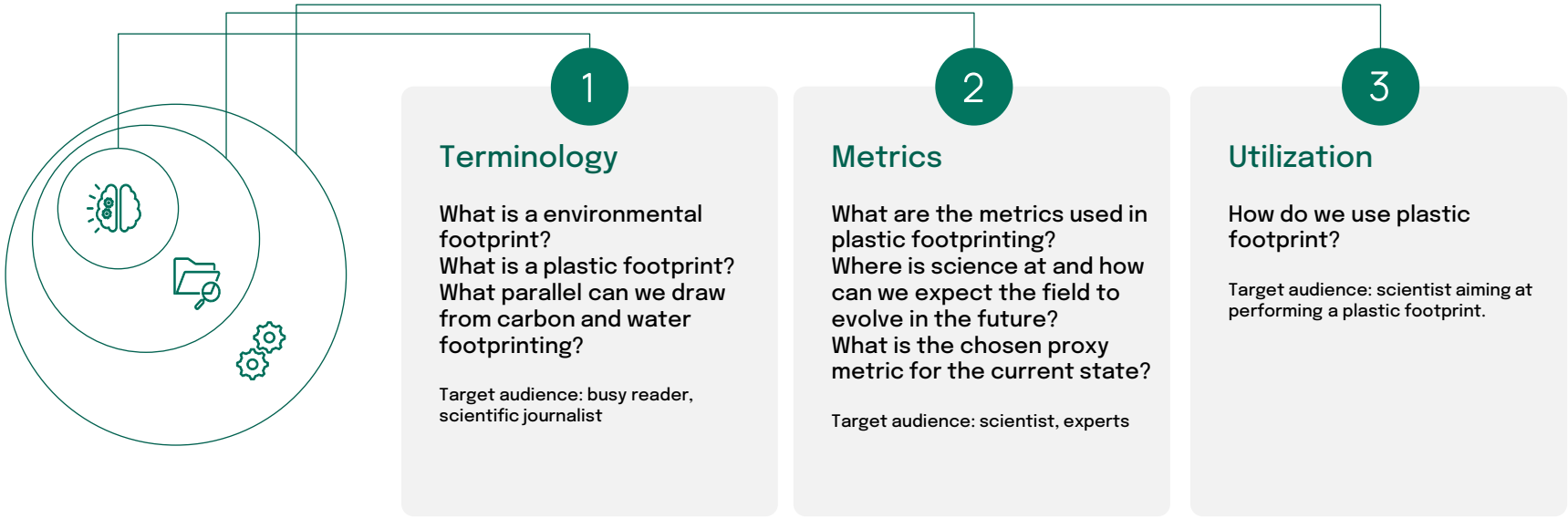
Strategic | Cross-cutting or specific issue

- Current module** Introduction to plastic footprinting
- Scopes and boundaries
Alignment with environmental reporting standards
- new Data governance
- 2024 Target setting and mitigation

Technical

- Technical introduction to plastic leakage
- Glossary
- Inventory: Macroplastics**
 - Packaging
 - Textile
 - new Fishing gears
 - new Leakage from export
 - new Release rates
 - 2024 Automotive
 - 2024 Construction
- Inventory: Microplastics**
 - Micro tire dust
 - Micro textile fibres
 - 2024 Micro pellets
 - 2024 Micro paint
 - 2024 Micro agriculture
- Impact**
 - new Impact MariLCA

Structure of the module



1

Terminology

What is an environmental footprint?
 What is a plastic footprint?
 What parallel can we draw from carbon and water footprinting?

Target audience: busy reader, scientific journalist

2

Metrics

What are the metrics used in plastic footprinting?
 Where is science at and how can we expect the field to evolve in the future?
 What is the chosen proxy metric for the current state?

Target audience: scientist, experts

3

Utilization

How do we use plastic footprint?

Target audience: scientist aiming at performing a plastic footprint.

Reading keys:



Main take away



Supporting information



Key warning

Part. 1

Terminology

What is a footprint?

What is a plastic footprint?

What parallel can we draw from
carbon and water footprinting?



Definition of an environmental footprint

The underlying principle of the 'footprint' concept lies in its ability to evaluate diverse activities using a standardized measure.

For instance, while directly comparing 1kg of paper to 1kg of plastic presents challenges, we can effectively assess their environmental impact by evaluating their environmental footprint, either specific to a concern, such as climate (carbon footprint), water or plastic, or complete, with an "environmental footprint", i.e. a Life Cycle Assessment (LCA) covering all potential environmental impacts.

The footprinting process includes data collection, material and energy flows, inventory of the emissions, and the impact characterization with regards to a specific area of concern, on all relevant areas of protection.



It is crucial to emphasize that 'Circularity' is not a parameter employed in footprint analysis.

A footprint is an **assessment of the effect** that a product / company or activity has on the environment and on human health over its life cycle.

The effect associated with this **area of concern** (water, plastics, climate, or the environment as a whole) is relative to the main **areas of protection** such as human health or biodiversity.

A footprint is **not** the measure of a consumption of material nor of the waste generated by a product/company or activity.

The footprints of plastic

Various aspects of plastic pollution can be examined using a footprint analysis. These aspects may encompass climate change impacts, primary resource usage, and effects on ecosystem quality, among others.

The specific focus, or area of concern, of the assessment dictates the nature of the footprint analysis being conducted.

In the case of an environmental **footprint of plastics**, the focus would be on assessing the impacts on both human health, ecosystem quality and resource depletion of plastics over their entire life cycle.

Vs the plastic footprint

In the plastic context, while Life Cycle Assessment (LCA) methodologies already covered several aspects, they lacked a thorough examination of plastic leakage. Hence, the current emphasis and focus of this **plastic footprint** methodology is to rectify this gap by including what was so far missing, specifically, the assessment of plastic leakage.

Definition of a plastic footprint

When talking about plastics, we want to understand how this material affects the environment and human health once leaked into the environment. This is connected to its improper use, mismanagement and the unfavorable chemical processes associated with the material.

This is why the focus of a plastic footprint is not the plastic consumption per se, but the plastic waste mismanagement and leakage, and their impact.

Plastic footprints considers both macro plastics and primary and secondary microplastics.

The term **plastic footprint** refers to the assessment of the effect that plastic leakage associated with a product / company / activity / country has on the environment and on human health.

Plastic footprinting is the **process** of assessing the plastic footprint of a product / company / activity / country / action / project. It can be used to assess the baseline, track relative progress, assess and compare mitigation actions.

Useful definitions

Area of Protection (AoP)

An AoP refers to a specific aspect/subject that helps specify the goals and scope of an environmental assessment. It allows the grouping of impacts of different sources, ensures that the assessment is relevant to the specific goals and simplifies its interpretation.

Common areas of protection in LCA include Climate Change, Human Health, Ecosystem Quality, Resource Depletion.

Area of concern

An AoC is an environmental topic defined by the interest of society.

Macroplastics

Macroplastics are large plastic waste readily visible and with dimensions larger than 5 mm, typically plastic packaging, synthetic textile or fishing nets.

Microplastics

Microplastics are small plastic particulates below 5 mm in size and above 1 mm. Two types of microplastics are contaminating the world's oceans: primary and secondary microplastics.

Primary Microplastic

Primary microplastics are plastics directly released into the environment in the form of small particulates. They may be intentionally added to products such as scrubbing agents in toiletries and cosmetics (e.g., shower gels) or they may originate from the abrasion of large plastic objects during manufacturing, use or maintenance such as the erosion of tyres when driving or of the abrasion of synthetic textiles during washing.

Secondary Microplastic

Secondary microplastics originate from the fragmentation of larger plastic items into smaller plastic fragments once exposed to the environment. This happens through photodegradation and other weathering processes of mismanaged waste such as discarded plastic bags, or from unintentional losses such as fishing nets.

Exploring other environmental footprints

Carbon footprint

Corporate carbon footprinting aims to understand an organization's total greenhouse gas (GHG) emissions across its value chain. Some activities emit significantly more GHG than others. For example, the carbon footprint of a kilowatt-hour of electricity varies by energy source, such as solar, wind, nuclear, gas, or coal.

While companies monitor energy consumption, the key metric remains absolute GHG emissions (measured in tCO₂e). GHG impacts are global, regardless of their source, ultimately affecting the atmosphere.

In climate science, a specific carbon budget (measured in tCO₂e) guides our effort to limit global warming to 1.5 degrees above pre-industrial levels. This framework sets reductions for all entities, regardless of location or past emissions:

- A 50% reduction in absolute GHG emissions by 2030.
- Carbon neutrality by 2050.

Natural carbon sinks play a crucial role in capturing and storing carbon, supporting the carbon neutrality goal post-reductions. However, credible opportunities for companies to progress toward carbon neutrality are still emerging.

Water footprint

The concept of a "water footprint" helps to understand the broader impact of water usage in various activities and industries. It uses the volume of water consumed as well as a water scarcity index specific to the region in which the consumption occurs.

Much like the carbon footprint, the water footprint varies significantly across different activities and products. The water scarcity index, which assesses the water availability and demand in a particular region, plays a vital role in determining the environmental and social consequences of water use.

In regions with abundant water resources, consumption of water may be less concerning. However, in water-scarce areas, even relatively modest water use can have significant consequences. The water footprint helps us understand not only the local but also the global implications of water consumption.

Water footprint analysis is guided by the recognition that freshwater is a finite and shared resource, and its management must consider both local sustainability and the global interconnectedness of water use.

Drawing a parallel with carbon and water footprint

	Carbon footprint	Plastic footprint	Water footprint
Inventory	Inventory of all GHG emissions (CO2, CH4, N2O)	Volume of plastic used (waste generated)	Volume of water used (water consumed)
	X	X	X
Proxy metric for problem assessment via regionalization		Waste Mismanagement Index (typically, per country / per polymer) X Release rate	Water Scarcity Index
		X	X
Impact on AoP	Global Warming Potential (GWP) Factors per type of emission <small>(relative impact on global warming compared to CO2 over a specific time frame)</small> = Carbon footprint in CO2e <small>footprint</small>	Characterization factor as defined by MariLCA = Plastic footprint impact on human health and ecosystems <small>footprint</small>	Characterization factor = Water (scarcity) footprint impacts on human health and ecosystems <small>footprint</small>

plastic leakage

Part. 2

Metrics

What are the metrics used in plastic footprinting?

Where is science at and how can we expect the field to evolve in the future?

What is the chosen proxy metric for the current state?



What metrics does plastic footprint evaluate?

The term plastic footprint refers to the assessment of the effect that plastic leakage associated with a product / company / activity / country has on the environment, including human health, over its life cycle.

This effect can be quantified through a variety of metrics, with our primary aim being to assess the ecological and human health impact associated with the leakage of plastic in the environment, and eventually to put them in perspective with the complete life cycle environmental impacts.

Accurately evaluating the environmental effect of plastics in natural ecosystems is an intricate endeavor due to its dependence on a multitude of variables. Notably, these variables encompass physical attributes like material size and characteristics, as well as chemical attributes such as polymer type and the presence of additives, including their toxicity.

Until science further advances in this field, the proxy metric to represent this potential impact is the **leakage metric**.

This metric measures the volume of plastic material that ultimately finds its way into the environment, including oceans, water bodies, soil, and terrestrial compartments, manifesting as both macroplastics and microplastics. In its computation, a range of supplementary metrics are considered, including total plastic production, waste generation, and the proportion of waste that is mismanaged, for example.

What is plastic pollution?

'Plastic pollution is defined broadly as the negative effects and emissions resulting from the production and consumption of plastic materials and products across their entire life cycle. This definition includes plastic waste that is mismanaged (e.g., open-burned and dumped in uncontrolled dumpsites) and leakage and accumulation of plastic objects and particles that can adversely affect humans and the living and non-living environment.'

Source: The United Nations Environment Programme (UNEP), 'Terms used in Environment Assembly resolution 5/14 that do not have definitions adopted or endorsed by an intergovernmental process but that may be relevant to the development of the instrument'. UNEP/PP/INC.1/6.

Plastic pollution can affect the following four different areas of protection:

-  Human health
-  Ecosystems quality
-  Primary resources
-  Climate change



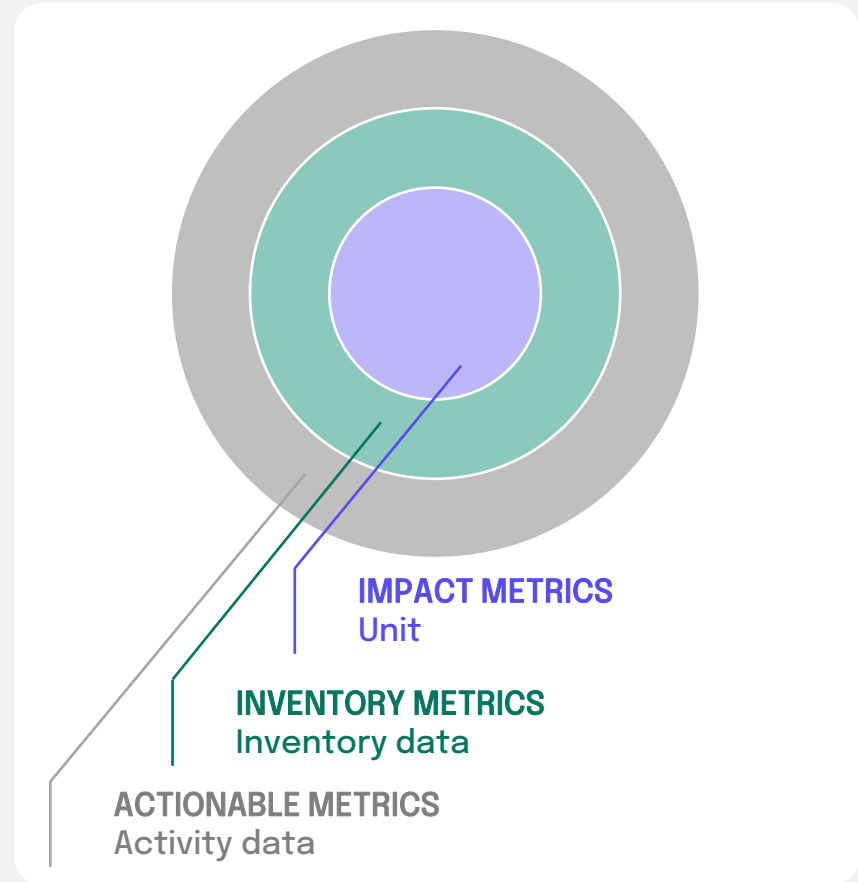
Different type of footprints can assess these effects. A carbon footprint will assess the effect on climate change, a circularity assessment the effect on primary resources, and a plastic footprint the effect on Human Health and Ecosystems Quality.

What metrics does plastic footprint evaluate?

Each area of protection is evaluated with **impact metrics**.

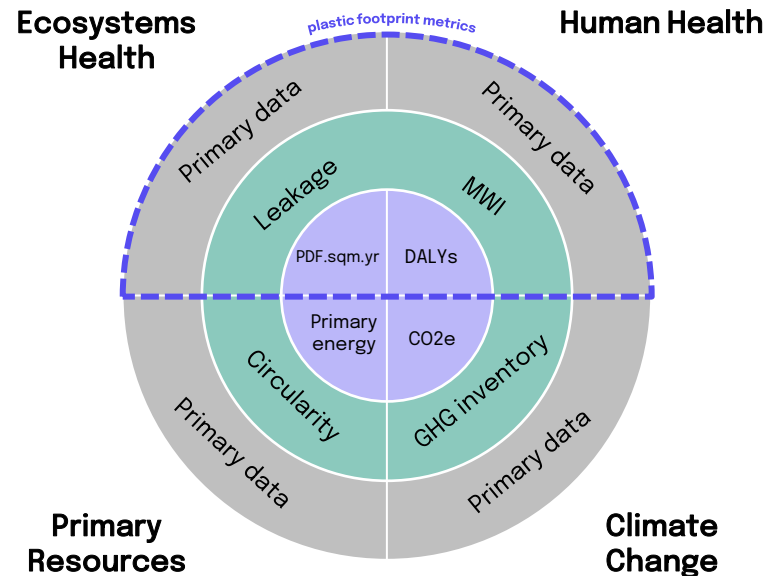
These impact metrics are calculated from inventory data of different natures, that we call **inventory metrics**.

The primary activity metrics are assessed from activity data, called **actionable metrics**. In the case of plastic footprint, activity data are typically primary data.



Plastic footprint metrics and complementary ones

Area of protection	Actionable metric (primary data)	Inventory metric	Impact metric
Human Health	Plastic waste generated (tons), recycled input (%), recyclable input (%), etc.	MWI (mismanaged waste index)	DALYs (Disability-Adjusted Life Years)
Ecosystem Quality		Leakage	PDF.sqm.yr (Percentage Disappeared Fraction)
Primary Resources	Total energy content of non-renewable resources	Circularity (MCI, CTI)	GJ (Gigajoule)
Climate Change		GHG inventory	CO2e



Impact metrics - Inventory metrics - Actionable metrics

Based on our definition of plastic footprint, the metrics to consider for plastic footprinting are represented at the top but in order to encompass all aspects of plastic pollution, the other areas of protection must also be assessed, using the existing state of the art methodologies.

Why do we focus on leakage in a plastic footprint analysis?

While considering the total quantities of plastic involved is undeniably important, stopping our assessments at this level may inadvertently imply a general condemnation of plastic. The core issue truly lies in the generation of waste, especially when mismanagement is prevalent. Keeping in mind that the ultimate objective is to minimize impact, delving into the metric of leakage gives the necessary precision, conveys a more accurate message and gives a perspective on the relative magnitude of those impacts with other causes (e.g. climate change). However, despite its consistency and alignment with our message, this metric may not offer actionable insights on its own. Hence, it's crucial to recognize the importance of other metrics, which can be utilized in diverse ways depending on the specific goals of our plastic footprint analysis.

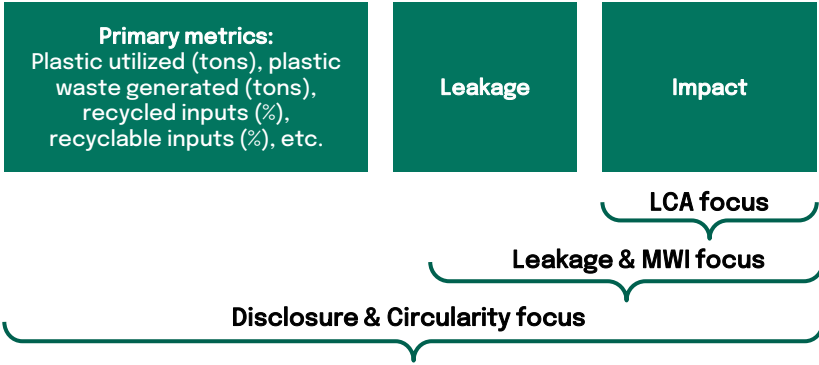


Plastic footprint should ultimately be about leakage and its impact, but all the other metrics are important. The focus shifts based on the intended purpose of the plastic footprint analysis, allowing us to prioritize different aspects accordingly.



Why leakage is the current best proxy :

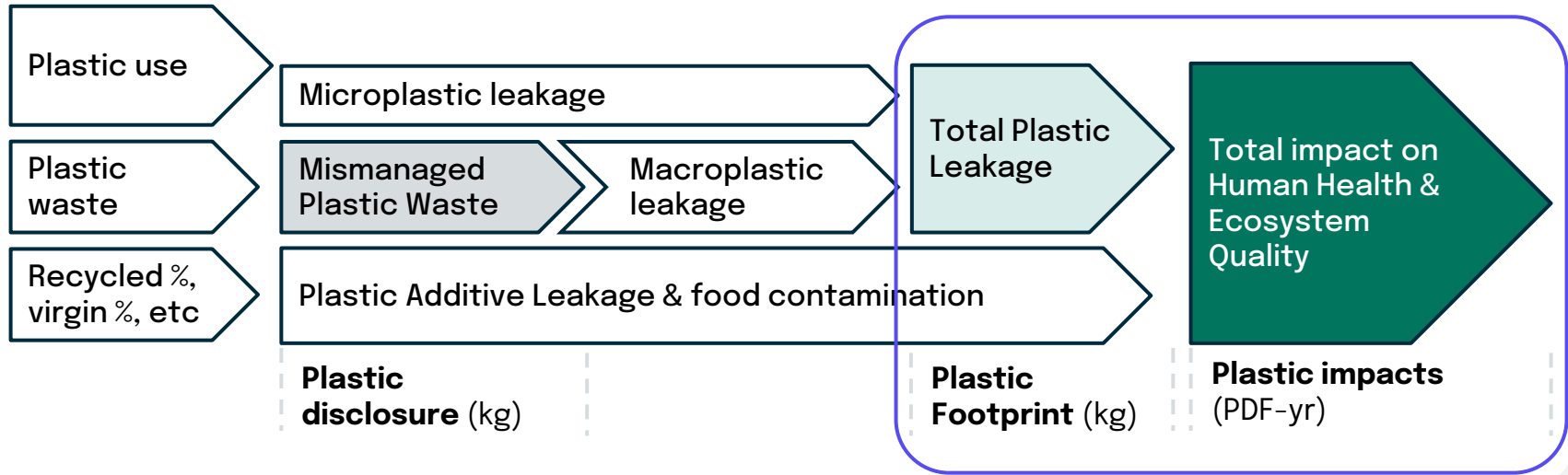
	Pros	Cons
Impact	The best in theory as different plastic might have different impacts, LCA compatible and allows to compare impacts from leakage with other sources of impacts (e.g. climate change).	Relies on impact model which is more uncertain and for the moment only includes impact on certain microplastics and only in marine ecosystems. It will evolve in future.
Leakage	Single metric, allows to integrate both microplastic and macroplastic. Complete, as the model exists both for aquatic and terrestrial environments.	Does not reflect real impact (for example microtextile leakage is very small in mass, but consists of many fibers, it has potentially a very big impact).
Primary metrics	More actionable, speaks to companies, less uncertainty (as it does not rely too much on a theoretical model).	Many different metrics, difficult to establish where to stop. No unified approach. Not encompassing microplastics.



Plastic footprint in a nutshell

Leakage and impacts BUT it relies on the other primary metrics to be calculated.

It provides metrics to assess plastic mismanagement, leakage into environment , (i.e. oceans, land and other compartments) and finally, its impacts.



Part. 3

Utilization

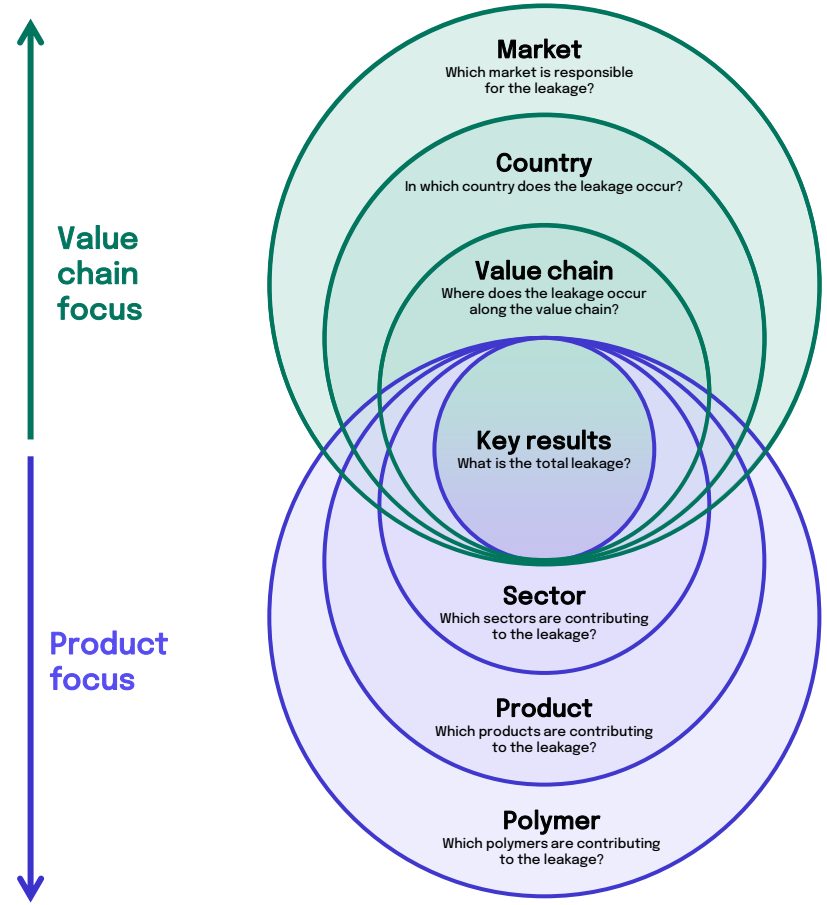
How do we use plastic footprint?



The questions we are answering

A plastic leakage assessment answers the following question.

Answering these questions help identify hotspots and implement the most effective interventions at a systemic level.

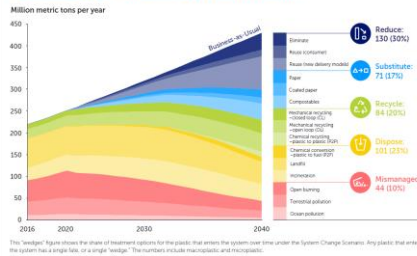


How are the result of a plastic footprint used?

Mitigation strategies

As a baseline for the implementation of measures aimed at reducing the plastic footprint. These strategies may involve promoting recycling, ecodesign, reducing single-use consumption, or implementing proper waste management systems to minimize plastic pollution in oceans and land.

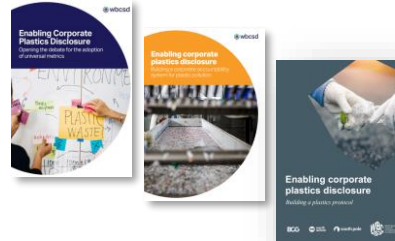
Figure 1: Plastic fate in the System Change Scenario: a 'wedges' analysis
There is a credible path to significantly reduce plastic leakage to the ocean but only if all solutions are implemented concurrently, ambitiously, and starting immediately



Source: Systemiq, The Pew Charitable Trust (2020). Breaking the plastic wave.

Disclosure and reporting

To transparently disclose information related to an organization's plastic usage, waste management, and efforts to reduce plastic pollution. Plastics disclosure involves the collection and dissemination of data on plastic consumption, plastic waste production and management, plastic leakage, and initiatives taken to address plastic-related environmental concerns, fostering accountability and encouraging sustainable practices.



19 April 2023 (London): Nearly 7,000 (6,743) companies can, from today, disclose their plastic-related impacts for the first time, as CDP's global environmental disclosure platform opens for 2023 reporting. Through CDP's online disclosure platform, companies will disclose information on the production and use of the most problematic plastics, i.e. plastic polymers, durable plastics, and plastic packaging [1] and this data, where publicly disclosed, will be made available from September. High-impact plastic sectors invited to disclose include:

Credits

As a baseline to implement plastic credits, a market-based mechanism designed to incentivize and reward organizations or individuals for reducing their plastic usage, waste generation and leakage. Similar to carbon credits, plastic credits represent a quantifiable unit of plastic waste reduction, which can be bought or sold to support and finance plastic pollution reduction efforts and initiatives.

Future use

When impact metrics are ready, the plastic footprint can be used to put those impacts in perspective with impacts from the rest of the life cycle impacts to truly assess their magnitude and focus efforts where it matters most.



Depending on the intended application of the plastic footprint, varying levels of precision may be necessary. For instance, when utilizing the plastic footprint for credit purposes, it becomes crucial for the user to ensure that all data is of high quality, enabling precise calculations. The guidelines outlining such requirements is available in the 'Data governance' module of the Plastic Footprint Network (PFN).

Acknowledgment

References

1. The United Nations Environment Programme (UNEP), 'Terms used in Environment Assembly resolution 5/14 that do not have definitions adopted or endorsed by an intergovernmental process but that may be relevant to the development of the instrument'. UNEP/PP/INC.1/6.
2. Systemiq, The Pew Charitable Trust (2020). Breaking the Plastic Wave.
3. Peano, L., et al. (2020). Plastic Leak Project - Methodological Guidelines, Quantis and EA. v1.3.
4. Ridoutt et al. (2015). Area of concern: a new paradigm in life cycle assessment for the development of footprint metrics.

Our commitment to continuous improvement

The Plastic Footprint Network's successful collaboration is built on pillars of:

- Open
- Non-competitive and productive dialog
- Leveraging science and supporting ongoing research
- Broadly empowering global stakeholders (product manufacturers, brand owners, treaty negotiators, regulators, consultants, NGOs, etc) to effectively do their part to address the plastic pollution crisis.

Given corresponding commitments to transparency and continuous improvement, we welcome and encourage your feedback and input on this document so that the methodology can continue to be enhanced and refined.

Thank you for supporting the work of the Plastic Footprint Network.

Contact us at: contact@plasticfootprint.earth

Our mission is to continuously advance Plastic Footprint Methodology, ensuring it remains at the forefront of sustainable practices and promoting its widespread adoption. By empowering companies to rigorously assess, enhance, and transparently report their plastic footprints, we aim to make significant strides in mitigating the plastic pollution crisis.

Plastic Footprint Network

The Plastic Footprint Network is convened by EA – Earth Action



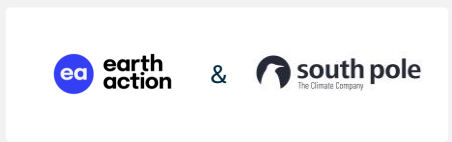
This working group was led by:



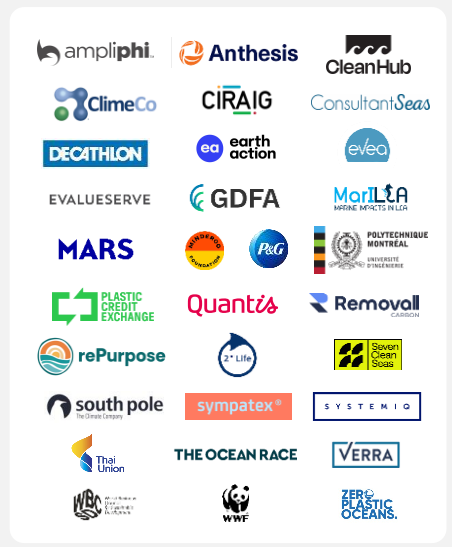
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