

FLEXIBLE PACKAGING:

MOVE AWAY FROM SINGLE-USE FLEXIBLES:

Direct Elimination



Deepdive

This document is a strategy deepdive with detailed insights, analysis and actions. For a high-level overview of the work, see the executive summary.

WEBSITE

Easily digestible overview of the different strategies for flexible packaging, and the key insights and actions for each.

[Click here](#)

EXECUTIVE SUMMARY

Short, high-level strategy document. Doesn't contain any analysis, reasoning or details for the key actions.



STRATEGY DEEPLIVES

Detailed insights and analysis, and detailed key actions for the different strategy options.



SUPPLEMENTARY INFORMATION

Supporting data and references.



OVERARCHING STRATEGY

(this deepdive relates to only one part of this overall flexible packaging strategy)

[Click here for the executive summary.](#)

CONTEXT

Flexible packaging is the fastest-growing plastic packaging category. Because it is almost uniformly single-use, with very low recycling and high leakage rates, it is also by far the most challenging market segment to address on the journey towards a circular economy for plastics.

OVERARCHING STRATEGY

Eliminating and innovating away from single-use flexible packaging must be the first and foremost part of any flexible packaging strategy — because as soon as single-use flexible waste is generated, regardless of material or geography, it is very hard to deal with. Current efforts are only just scratching the surface and a step-change in the level of commitment and effort across direct elimination of unnecessary packaging and exploration of upstream innovation solutions, such as reuse, is required from ALL stakeholders.

For the single-use flexible packaging items that cannot currently be eliminated without unintended consequences, unprecedented efforts are required to ensure they can be circulated. This can include staying with a conventional plastic and scaling recycling systems, or substitution to a different material (such as paper or compostable plastics where relevant) and then scaling those systems. Either way, what is clear is that unless simultaneous, unprecedented efforts across packaging design, infrastructure, and policy are begun immediately — efforts that push far beyond the level of activity we are currently seeing — the circulation of flexible packaging in practice and at scale is unlikely to happen in the foreseeable future.

While they are currently a necessary part of the solution, the inherent quality and yield limitations of recycling and substitution strategies mean that staying with single-use flexible packaging will always present a challenge from a circular economy perspective. This is why we need to keep driving a strong upstream innovation agenda (in line with the first part of the overarching strategy) in order to find ways to eliminate ever-increasing single-use flexible packaging over time.

URGENT ACTIONS

This work has identified 21 specific and urgent actions for flexible packaging that need to be commenced immediately by businesses and policymakers in order to make significant progress towards 2025 targets and beyond.



KEY ACTIONS FOR DIRECT ELIMINATION

DIRECT ELIMINATION: flexibles that do not serve an essential function are removed (without replacement or substitution), eliminating the need for any after-use infrastructure.

DIRECT ELIMINATION KEY ACTIONS

Businesses to:

Exhaustively identify and action opportunities for direct elimination (on average estimated at ~5-10% of flexibles portfolios), taking inspiration from existing case examples

Embed a critical assessment of the need for flexible packaging in all new product development processes (~5-10% of those considered are likely to be unnecessary)

[See page 6 for details](#)

Policymakers, collaborative cross-sector initiatives, and businesses (through advocacy) to:

Align on priority items to eliminate within sectors (e.g. Personal care, clothing, and fruit and vegetables) to drive up the ambition level across the entire industry

[See page 7 for details](#)

Businesses to:

Exhaustively identify and action opportunities for direct elimination (on average estimated at ~5-10% of flexibles portfolios), taking inspiration from existing case examples

All businesses (e.g. retailers and FMCGs) to thoroughly map their entire flexibles portfolios, application-by-application, and:

- Make an inventory of the flexible packaging formats that can be directly eliminated without significant changes to product or infrastructure design — inspiration should be taken from relevant examples that have already been proven.* Include the initial list in procurement guidelines by 2023 and remove these packaging items from own-brand products by 2025. Ideally this process would be publicly communicated.
- Make an inventory of flexible packaging formats that could be candidates for direct elimination, but where the potential impacts of direct elimination are still unknown (for example, it is unknown whether there would be significant infrastructure redesign requirements, increases in product damage, etc.). Trial direct elimination of these formats by 2025, and share the outcomes (through, for example, the forum of Plastics Pacts) so that others can follow the lead.

*For specific examples: see key insight 2 in the below pages, the [Upstream Innovation Guide](#) pg 23, and "[Eliminating Problem Plastics](#)" document by WRAP and the UK Plastics Pact.

Embed a critical assessment of the need for flexible packaging in all new product development processes (~5-10% of those considered are likely to be unnecessary)

All businesses (e.g. retailers and FMCGs) to ensure that a critical assessment of the need for flexible packaging is embedded in new product development processes to avoid placing unnecessary flexibles on the market from the design stage. As a first step, ensuring that the mindset and tools of upstream innovation are embedded in new product development processes could be helpful (see the [Upstream Innovation Guide](#)).

Policymakers, collaborative cross-sector initiatives, and businesses (through advocacy) to:

Align on priority items to eliminate within sectors (e.g. personal care, clothing, and fruit and vegetables) to drive up the ambition level across the entire industry

Relevant voluntary initiatives (for example, Plastics Pacts), industry associations, and policymakers to publish sector-relevant, granular lists of flexible packaging applications that can be considered unnecessary based on existing case studies/examples and can be directly eliminated. The aim is to support the entire industry to follow best-practice examples of leading players. Where possible, these lists should be accompanied by an overview of geographically relevant, best-practice examples. These lists should be regularly reviewed.



DIRECT ELIMINATION SECTORS AND GEOGRAPHIES OF PARTICULAR RELEVANCE

While not all flexibles can be directly removed without unintended consequences, significantly underexplored opportunities for direct elimination exist within almost all sectors — particularly sectors with large amounts of multibuys, overwraps, and non-food items.

For example:



**PERSONAL CARE -
BEAUTY**

secondary/tertiary plastic
film wrapping



CLOTHING

plastic covers/polybags



FRUIT & VEG

multibuy wrapping



HOME & OFFICE

overwraps and multibuy
wrapping

Direct elimination is of key importance across all geographic archetypes. Wherever flexibles can be eliminated without replacement and without unintended consequences, this is the most direct way to avoid waste from being created, and should be prioritised.

Geographic Archetype 1: Geographies with low volumes of mismanaged packaging waste, and advanced waste management systems.

For example: Established recycling systems producing high-quality recyclate; mandatory EPR.

Proxy geography: Europe

Geographic Archetype 2: Geographies with low volumes of mismanaged packaging waste, but less advanced waste management systems.

For example: Recycling systems are limited in scale or have considerable loss of material quality; emerging, limited or voluntary EPR.

Proxy geography: USA

Geographic Archetype 3: Geographies with high volumes of mismanaged packaging waste and limited/no waste management systems.

For example: Limited systems even for collection; No/limited EPR

Proxy geography: South and South-East Asia



3 KEY INSIGHTS SUPPORTING THE KEY ACTIONS

DIRECT ELIMINATION

3 KEY INSIGHTS

1

Current direct elimination efforts are only just scratching the surface and need to be urgently scaled.

2

Direct elimination is the fastest way to progress on 2025 targets.

3

Direct elimination is particularly necessary for flexibles due to the inherent limitations of substitution and recycling.



DIRECT ELIMINATION

3 KEY INSIGHTS

1

Current direct elimination efforts are only just scratching the surface and need to be urgently scaled

There are millions of tonnes of unnecessary flexibles on the market that could be, but aren't being, eliminated. While not all flexibles are unnecessary and can be directly eliminated without unintended consequences, the opportunity is much broader than what is being acted upon. It is estimated that the potential for direct elimination could be as large as **5-10%** of the flexibles market. Specifically, removing unnecessary flexible packaging across the EU and the USA for just three product categories would eliminate **40x** more material than current efforts have achieved.

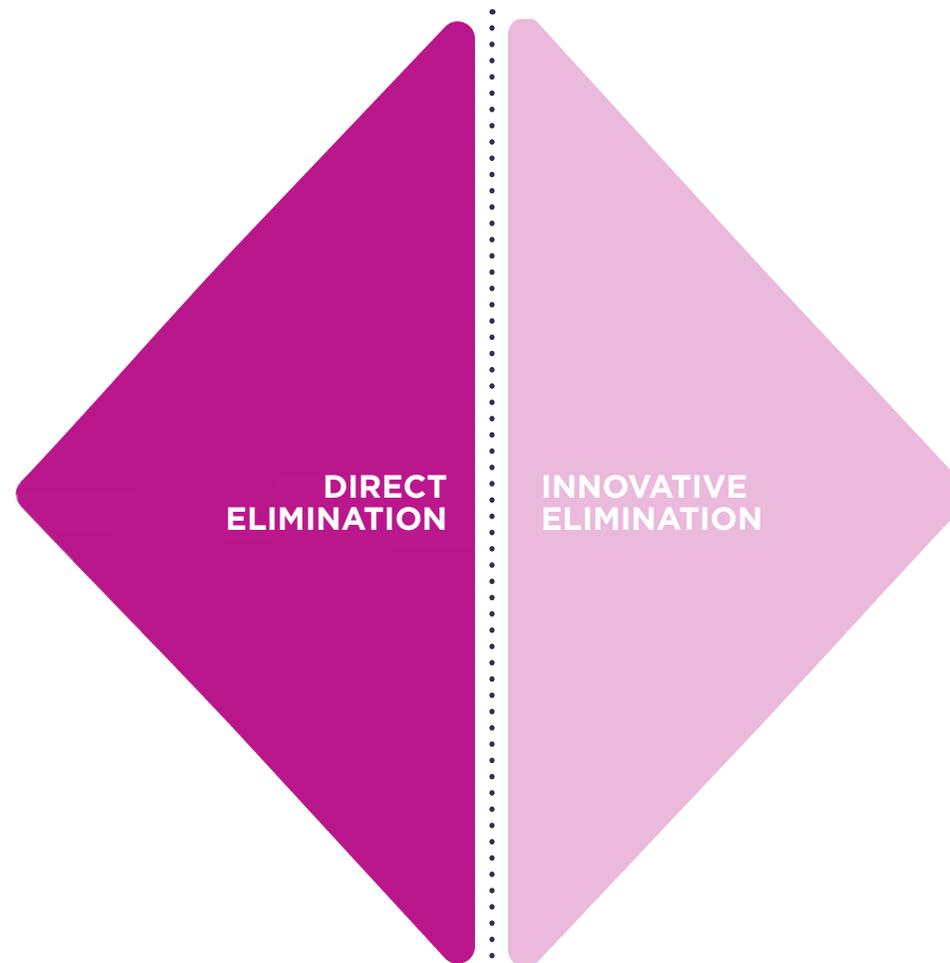
See following page for details and references

Direct elimination of a plastic flexible does not mean substitution to another material. It means **elimination of that item of packaging altogether**.

It applies for packaging that does not serve an essential function (for example, does not serve a *necessary* protection, containment, convenience, communication, or efficiency function) and can therefore be eliminated without any significant adjustments, innovation, or loss of product value.

What can be considered unnecessary packaging will differ from industry to industry, however, examples of opportunities for direct elimination can be seen across a broad range of categories from fresh fruit and vegetables, to overwraps, to multipacks, to tear-offs, to single-portion wrappers.

Assessing opportunities for direct elimination of flexibles should be done critically and on an ongoing basis, but should keep the entire product and packaging system in mind to avoid unintended consequences (i.e. overall increases in food waste, substantially higher carbon footprint, etc.).



For packaging that **does not** serve an essential function

For packaging that **does** serve an essential function

• See [Innovative elimination & reuse](#)

See the [Upstream Innovation Guide](#) for more details, examples, and inspiration!

There are still millions of tonnes of unnecessary flexibles on the market that could be eliminated with minimal effect on product or supply chain design and without unintended consequences for the product.

It is estimated that the potential for direct elimination could be as large as **5-10%**¹ by mass of the B2C flexibles market (millions of tonnes).*

Specifically, removing unnecessary flexible packaging across the EU and USA for just three product categories would eliminate **40x** more material than current efforts have achieved.*



Currently reported efforts**

1,100 tonnes*

Direct elimination potential for just three specific applications in EU & USA

45,000 tonnes*

- Multi-pack wrapping for cans
- Plastic covers for clothes
- Wrapping for six fruit & veg types (cabbages, cauliflowers, onions, broccoli, pepper, bananas)

Elimination potential by 2040 if looking worldwide and across many different sectors

5-10%¹ of B2C flexibles market*

- Plastic nets from multi-packed fruit and veg, such as lemons and oranges.
- Plastic covers from magazines.
- Plastic covers from bed sheets and pillow cases.
- Plastic tear-offs from jars, bottles, etc.
- Multi-pack wrapping from chewing gum, chocolate bars, biscuits, etc.
- Pouches for hardware products such as hammers, spanners, fittings, etc.
- Plastic film wrapping from board games, playing cards, around individual toys, lotions and perfumes, greeting cards, etc.

...and many, many more

*For additional information and references, see the [Supplementary Information: Direct Elimination - "What is the opportunity to work towards?"](#)

**As reported in the 2021 reporting cycle for the Global Commitment.

¹ The **PEW Charitable Trust and Systemiq**, "Breaking the Plastic Wave: A comprehensive assessment of pathways towards stopping ocean plastic pollution", 2020.

DIRECT ELIMINATION

3 KEY INSIGHTS

2

Direct elimination is the fastest way to progress on 2025 targets

The fastest way a company can make progress towards 2025 targets is to eliminate their unnecessary flexibles. Any flexibles strategy that does not involve a rapid and true elimination effort of unnecessary packaging is not good enough. Many opportunities for direct elimination of unnecessary packaging were estimated by our panel of experts to be possible within a **1-3 year time frame** — well in time to contribute to meeting a 2025 timeline. In many cases, direct elimination requires significantly fewer infrastructure changes and lower levels of collaboration compared to other solutions.

See following page for details and references

The fastest way a company can make progress towards 2025 targets is to eliminate their unnecessary flexibles. Any flexible packaging strategy that does not involve a rapid and true elimination effort is not good enough.

Many of the direct elimination examples* featured below have been estimated by our expert panel to be **achievable within a 1-3 year timespan**:

See the [Upstream Innovation Guide](#) for more details, examples, and inspiration!



Removing plastic wrapping from bell peppers

Shown to be possible by:**
Walmart (Canada)



Removing plastic film wrapping from board games, playing cards, around individual toys, etc.

Shown to be possible by:
Hasbro



Removing plastic film wrapping from broccoli or cabbages

Shown to be possible by:

- Morrisons (UK)
- Sainsbury's (UK)
- Marks & Spencer (UK)



Removing plastic tear-offs from jars, water bottles, sauce bottles, cosmetic products, etc.

Shown to be possible by:
Sonae MC (Portugal)
Nestle (Egypt, Malaysia, Vietnam)
L'Oréal



Removing plastic covers from magazines

Shown to be possible by:
Conde Nast
TC Transcontinental



Removing plastic bags from bananas

Shown to be possible by:

- Walmart (Canada)
- Albert Heijn (The Netherlands)
- Sainsbury's (UK)



Removing plastic film wrapping from greeting cards

Shown to be possible by:
ASDA (UK)



Removing plastic covers from clothes

Shown to be possible by:
Marks & Spencer (UK)



Removing multipack plastic film wrapping from canned goods

Shown to be possible by:

- Tesco (UK)
- Waitrose & Partners (UK)



Removing plastic covers from bed sheets and pillow cases

Shown to be possible by:
ASDA (UK)



Removing plastic film wrapping from lotions, perfumes, and various cosmetics products in cardboard boxes

Shown to be possible by:
L'Oréal
L'Occitane (Global)

*These examples stem from just a few geographies. We know there are many more case studies out there, across a broad range of geographies and we would welcome these being identified and shared by geographically relevant initiatives.

**For additional information and references, see the [Supplementary Information: Direct Elimination - "What is the opportunity to work towards?"](#)

DIRECT ELIMINATION

3 KEY INSIGHTS

3

Direct elimination is particularly necessary for flexibles due to the inherent limitations of substitution and recycling

The fact that there are millions of tonnes of unnecessary flexibles still on the market matters because as soon as flexible waste is generated, regardless of material choice, it is just very hard to deal with.

Both recycling and substitution, while needed, have inherent limitations and will always present a challenge from a circular economy perspective.

See following page for details and references



Even in a maximally optimised recycling scenario for B2C flexibles, there will be significant unavoidable material quality and quantity losses, and therefore considerable virgin input requirements.

MECHANICAL RECYCLING comes with significant and inherent QUALITY losses:

- Even if radical design changes are made across all flexibles, a mechanical recycling process will always produce non-virgin quality recyclate.
- Given the material properties required to produce high-performance flexibles, it was broadly agreed by our expert panel that an average of 30% mechanically recycled content is pushing the upper limit for B2C flexibles.
- **This quality loss thus limits the amount of mechanically recycled content that can go back into B2C flexibles.**

CHEMICAL RECYCLING comes with significant and inherent YIELD losses:

- Even if radical design changes are made across all flexibles, a chemical recycling process will always have significant yield losses.
- Polymer yield from a chemical recycling process (i.e. the amount of polymer obtained after polymerisation relative to the amount of polymer going into the pyrolysis unit) is generally found to be between 30-50%, (i.e. there is a 50-70% loss of material from the plastic packaging system).
- While it is technically possible to make a food contact B2C flexible from 100% chemically recycled plastics, to do so across all B2C flexibles would require significant chemically recycled content to be brought in from other sectors/industries, simply transferring rather than solving the issue of 'yield losses'.

Even in a maximally optimised recycling scenario for B2C flexibles, there will be significant unavoidable material quality and quantity losses, and therefore considerable virgin input requirements.

Maximally optimised recycling system for plastic B2C flexibles**

What the global flows for plastic B2C flexibles would look like assuming:

- All B2C flexibles are collected and recycled via highly optimised mechanical and chemical recycling processes.
- The amount of plastics going back into B2C flexibles is maximised.

NOTES

**What the global flows for plastic B2C flexibles would look like assuming:

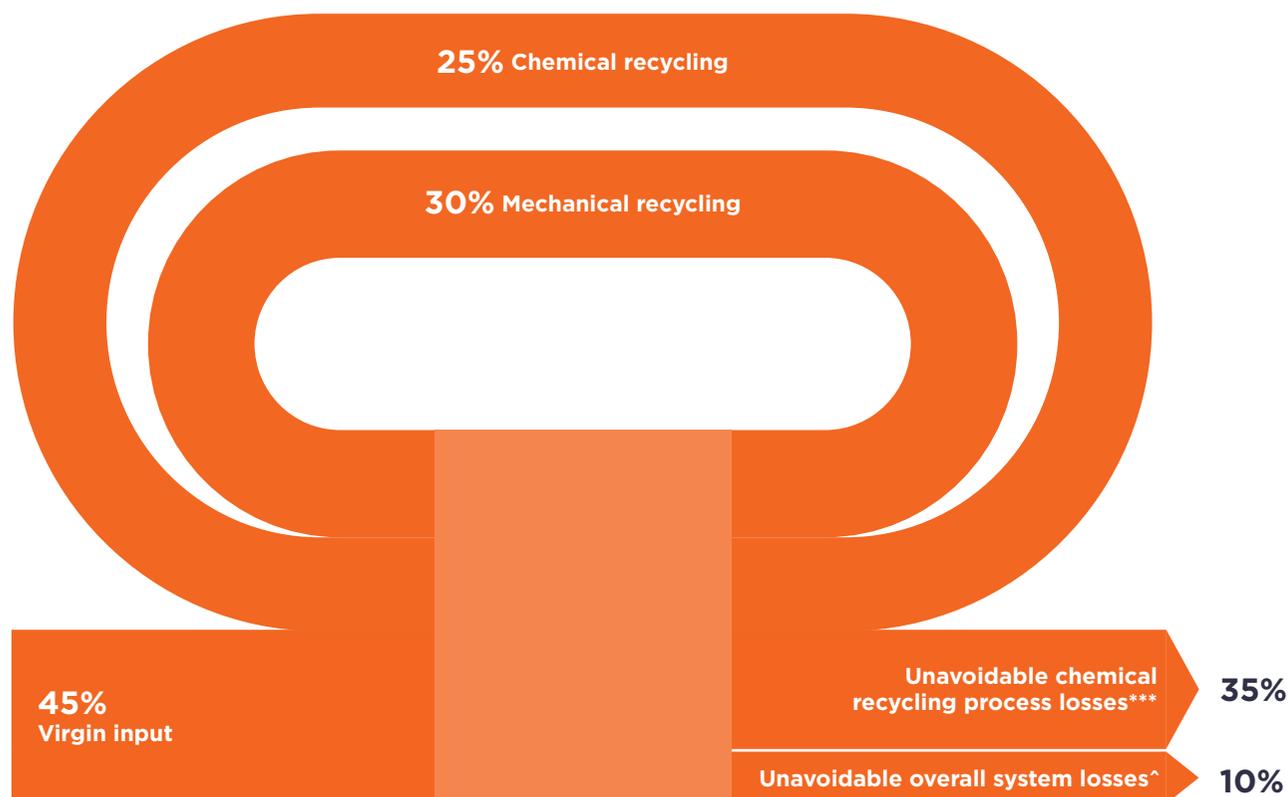
a) All B2C flexibles are collected and recycled via highly optimised mechanical and chemical recycling processes; b) The amount of plastics going back into B2C flexibles is maximised; c) All flexible packaging (including food packaging) would contain 30% mechanically recycled content; d) The average yield for chemical recycling was 40%.

***Assuming a 60% loss of material from the plastic packaging system (as gasses and waxes) in a chemical recycling process, as per yield discussion above.

^Losses such as those that occur through collection and sorting processes as well as packaging production processes. 10% is highly conservative.

NOTE: Here chemical recycling refers to pyrolysis of polyolefins, this being the predominant technology in use/being considered for scale-up.

For additional information and references see the Deepdive: [Plastic B2C flexibles: Design and recycling in the formal sector](#)



For paper recycling systems and composting systems (plastic or paper) there is also significant unavoidable material quality and quantity losses, and therefore considerable virgin input requirements.

PAPER RECYCLING for flexibles: Significant and inherent quality losses

- Mechanically recycled fibres have reduced fibre strength compared to virgin fibres.
- Given the material properties required to produce high-performance paper flexibles, an average of 10-50% mechanically recycled content is generally agreed to be the upper limit for paper B2C flexibles.
- In addition, many use cases for paper B2C flexibles require virgin content for safety (such as in food-grade).
- **As is the case for plastics, loss of quality within a mechanical recycling process limits the amount of mechanically recycled content that can be used in paper B2C flexibles and means that substitution to paper comes with significant, unavoidable virgin input requirements (e.g. between 50-100% of the fibres used in paper B2C flexibles will need to come from virgin sources).**

COMPOSTING SYSTEMS for flexibles: Inherent loss of the packaging material from the packaging system

- Composting a material involves breaking it all the way down into fundamental building blocks — for the most part, carbon dioxide and water.
- This means that for any packaging that is composted, the equivalent amount of virgin material is then required to make new packaging.
- Compostable packaging is most often designed as single-use.
- **Shifting to compostable packaging, while relevant in some applications, means shifting towards 100% virgin input requirements and is still ‘single-use’ in the same way that conventional Plastic and Paper B2C flexibles are.**

This work has been developed in collaboration with an expert panel consisting of more than **100 organisations** including relevant expert organisations and NGOs, [Plastics Pact](#) lead organisations, and members of the [New Plastics Economy](#) initiative (which includes many of the leading producers of packaged goods, and many of the largest retailers and packaging producers).

We are deeply grateful to all collaborators and contributors for the time and expertise they have dedicated to this project.

These organisations are not responsible for any of the recommendations presented in this work. This report is the work of, and solely reflects the views of, the Ellen MacArthur Foundation. The Foundation's views have been formed on the bases of existing literature, expert interviews, workshops with the expert panel, and in-house analysis.

Disclaimer

This publication has been produced by the Ellen MacArthur Foundation (the "Foundation"). Although the Foundation has exercised care and diligence in preparing this publication, based on information it believes to be reliable, the Foundation makes no representations and gives no warranties, assurances or undertakings (express or implied) in connection with it or any of its content (as to its accuracy, completeness, quality, fitness for any purpose, compliance with law, or otherwise). The Foundation does not monitor or moderate any external websites or resources linked or referred to in this publication. This publication does not purport to be comprehensive and none of its contents shall be construed as advice of any kind. Any reliance on it is at reader's own discretion and risk.

ELLEN MACARTHUR FOUNDATION PROJECT TEAM

CORE PROJECT TEAM

Leela Dilkes-Hoffman

Programme Manager –
Plastics Research and Innovation

Sara Wingstrand

External Consultant – Plastics Research and Innovation

George McLoughlin

Research Analyst – Plastics Research and Innovation

Josephine Moe Christoffersen

Senior Research Analyst –
Plastics Research and Innovation

Sander Defruyt

Lead – Plastics Initiative

Rob Opsomer

Executive Lead – Systemic Initiatives

PROJECT SUPPORT

The broader Plastics Initiative team

DESIGN

James Wrightson

Creative Design Lead – Design

Matt Barber

Graphic Designer – Design

EDITORIAL

Lena Gravis

Senior Expert – Editorial

Ross Findon

Media and Messaging Lead –
Communications & Marketing

Lou Waldegrave

Senior Writer – Communications & Marketing

COMMUNICATIONS

Iulia Strat

Communications Manager –
Finance, Plastics, and Policy

Anna Sheehan

Senior Communications Executive –
Finance, Plastics, and Policy

DIGITAL

**Dan Baldwin, Mark Buckley, Yunus Tunak,
James Woolven**, and the broader digital team.

ABOUT THE ELLEN MACARTHUR FOUNDATION

The Ellen MacArthur Foundation develops and promotes the idea of a circular economy.

The Ellen MacArthur Foundation is committed to the creation of a circular economy that tackles global challenges, such as climate change, biodiversity loss, waste, and pollution.

The Ellen MacArthur Foundation is an international charity that develops and promotes the circular economy in order to tackle some of the biggest challenges of our time, such as climate change, biodiversity loss, waste, and pollution. We work with our network of private and public sector decision-makers, as well as academia, to build capacity, explore collaborative opportunities, and design and develop circular economy initiatives and solutions. Increasingly based on renewable energy, a circular economy is driven by design to eliminate waste, circulate products and materials, and regenerate nature, to create resilience and prosperity for business, the environment, and society.

Further information:

www.ellenmacarthurfoundation.org | [@circulareconomy](https://twitter.com/circulareconomy)

ABOUT THE PLASTICS INITIATIVE

Since 2016, the Ellen MacArthur Foundation's New Plastics Economy initiative has rallied businesses, governments, and other organisations behind the vision of a circular economy for plastic, in which it never becomes waste or pollution.

Focused on ambitious targets for 2025, the Global Commitment addresses plastic waste and pollution at its source, beginning with plastic packaging, while the Plastics Pact network of local and regional (cross-border) initiatives, endorses and implements circular economy solutions that work towards the vision.

Further information:

www.emf.org/plastics | [@circulareconomy](https://twitter.com/circulareconomy)

[Explore the vision for a circular economy for plastic](#)



© COPYRIGHT 2022
ELLEN MACARTHUR FOUNDATION
www.ellenmacarthurfoundation.org
Charity Registration No.: 1130306
OSCR Registration No.: SC043120
Company No.: 6897785