PRODUCT A

Stand up pouch

Home compostable laminate
3.1" W x 5.1" H x 2" G

Plantmade

Compostable

TOTAL CARBON FOOTPRINT

18 kg CO_2

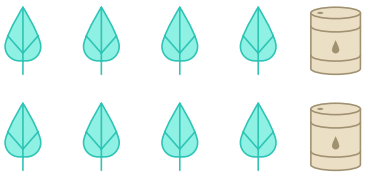
0.1

CARBON EMISSION EQUIVALENT

LA to NY flights

RENEWABLE MATERIALS

76%



MADE WITH RENEWABLE MATERIAL

MADE WITH RECYCLED MATERIAL

MADE WITH VIRGIN FOSSIL FUEL MATERIAL

RELIANCE ON VIRGIN FOSSIL FUEL

24%

0

BARRELS OF CRUDE OIL REQUIRED

CIRCULARITY SCORE

49%

TOTAL MATERIAL REQUIRED

6.94 lb

END-OF-LIFE

Compostable

PRODUCT B

Stand up pouch

Recyclable post-consumer recycled (PCR) LDPE laminate
3.1" W x 5.1" H x 2" G

Wastemade

Soft plastics recyclable

TOTAL CARBON FOOTPRINT

7.23 kg CO_2

0

CARBON EMISSION EQUIVALENT

LA to NY flights

RECYCLED MATERIALS

80%

MADE WITH RENEWABLE MATERIAL

MADE WITH RECYCLED MATERIAL

MADE WITH VIRGIN FOSSIL FUEL MATERIAL

RELIANCE ON VIRGIN FOSSIL FUEL

20%

0

BARRELS OF CRUDE OIL REQUIRED

CIRCULARITY SCORE

42%

TOTAL MATERIAL REQUIRED

8.16 lb

END-OF-LIFE

Soft Plastics Recyclable

PRODUCT C

Stand up pouch

Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G

Mono material

Soft plastics recyclable

TOTAL CARBON FOOTPRINT

13 kg CO_2

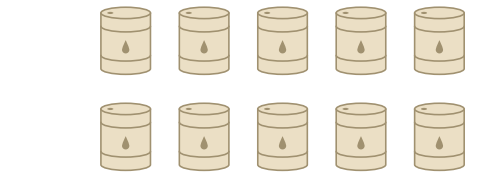
0.1

CARBON EMISSION EQUIVALENT

LA to NY flights

RECYCLED MATERIALS

0%



MADE WITH RENEWABLE MATERIAL

MADE WITH RECYCLED MATERIAL

MADE WITH VIRGIN FOSSIL FUEL MATERIAL

RELIANCE ON VIRGIN FOSSIL FUEL

100%

0

BARRELS OF CRUDE OIL REQUIRED

CIRCULARITY SCORE

12%

TOTAL MATERIAL REQUIRED

8.6 lb

END-OF-LIFE

Soft Plastics Recyclable

Material Usage

What is material usage?

Material usage refers to the amount of material required to produce the packaging of a product. In the past decade, the concept of an 'unboxing experience' has led to an increase of often unnecessary materials produced. In a world with finite resources, less material used is generally better.

How can we improve?

At the design stage of any packaging development process it is important to consider reducing the overall amount of material required, both in the context of a product to packaging ratio, but also the peripheral effects of extra material on carbon footprint from extraction and logistics.

Table of Material Usage data

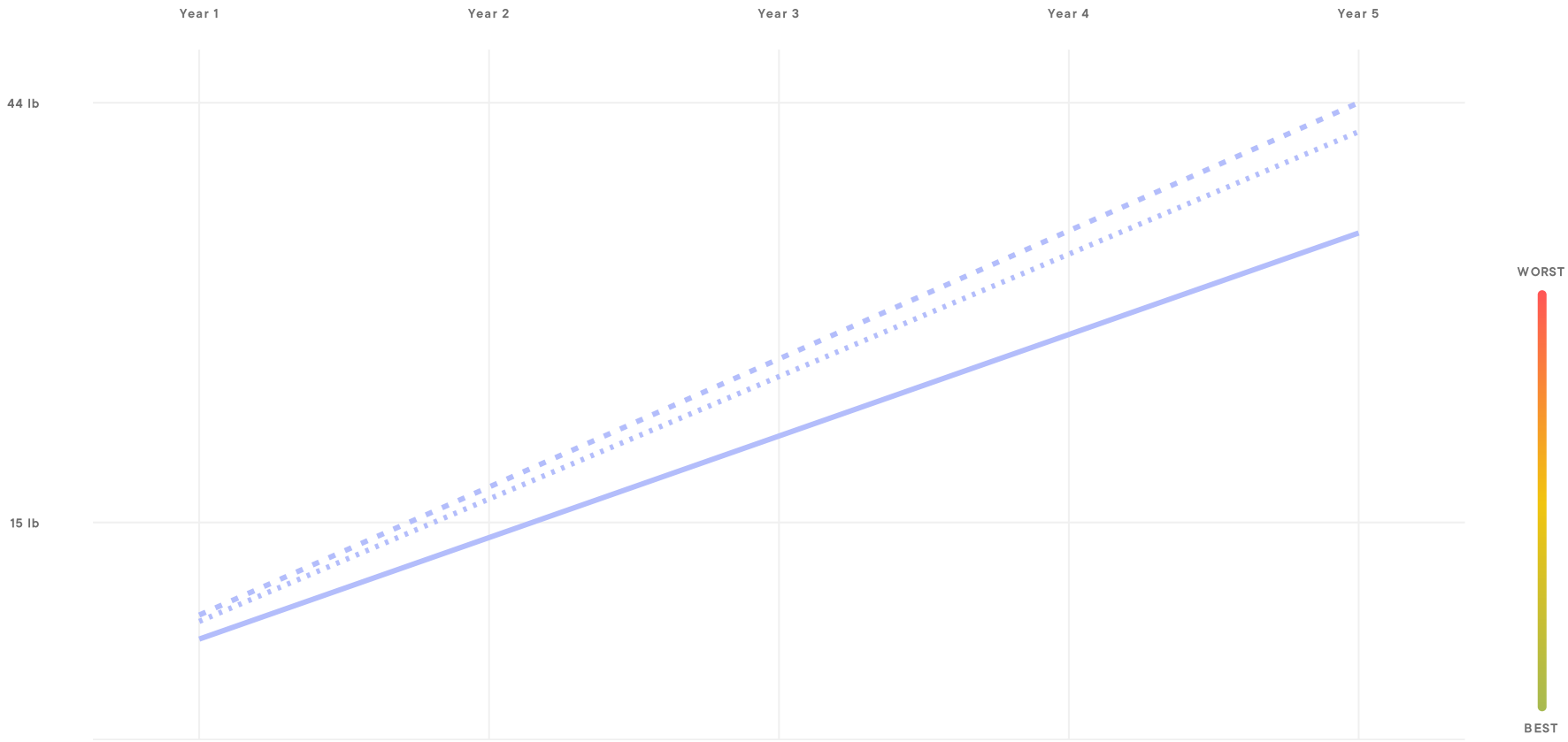
One of the most important considerations for sustainability in packaging relates to design. Packaging products need to be designed to use fewer components and less material overall. The total material used has a significant impact on carbon emissions, use of fossil fuels and treatment at end-of-life (recycling, landfilling etc).

Material usage simply refers to the amount of material required to produce the packaging of a product. In a world with finite resources, less material used is generally better. Material intensity is the ratio of the total amount of packaging to the product being packaged, again lower is generally better.

	USES THE LEAST MATERIAL		
	PRODUCT A	PRODUCT B	PRODUCT C
	Stand up pouch	**Stand up pouch**	**Stand up pouch**
	Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminate	Recyclable LDPE laminate
	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G
WEIGHT OF PACKAGING/UNIT	0.1 oz	0.1 oz	0.1 oz
ANNUAL USAGE	1,000	1,000	1,000
TOTAL MATERIAL REQUIRED/ANNUM	6.94 lb	8.16 lb	8.6 lb
WEIGHT OF PRODUCT/UNIT	3 g	3 g	3 g
TOTAL WEIGHT OF PRODUCT/ANNUM	6.61 lb	6.61 lb	6.61 lb
MATERIAL INTENSITY METRIC ⓘ	1.05	1.23	1.30
	25% LESS MATERIAL PER GRAM OF PACKAGING THAN PRODUCT C		

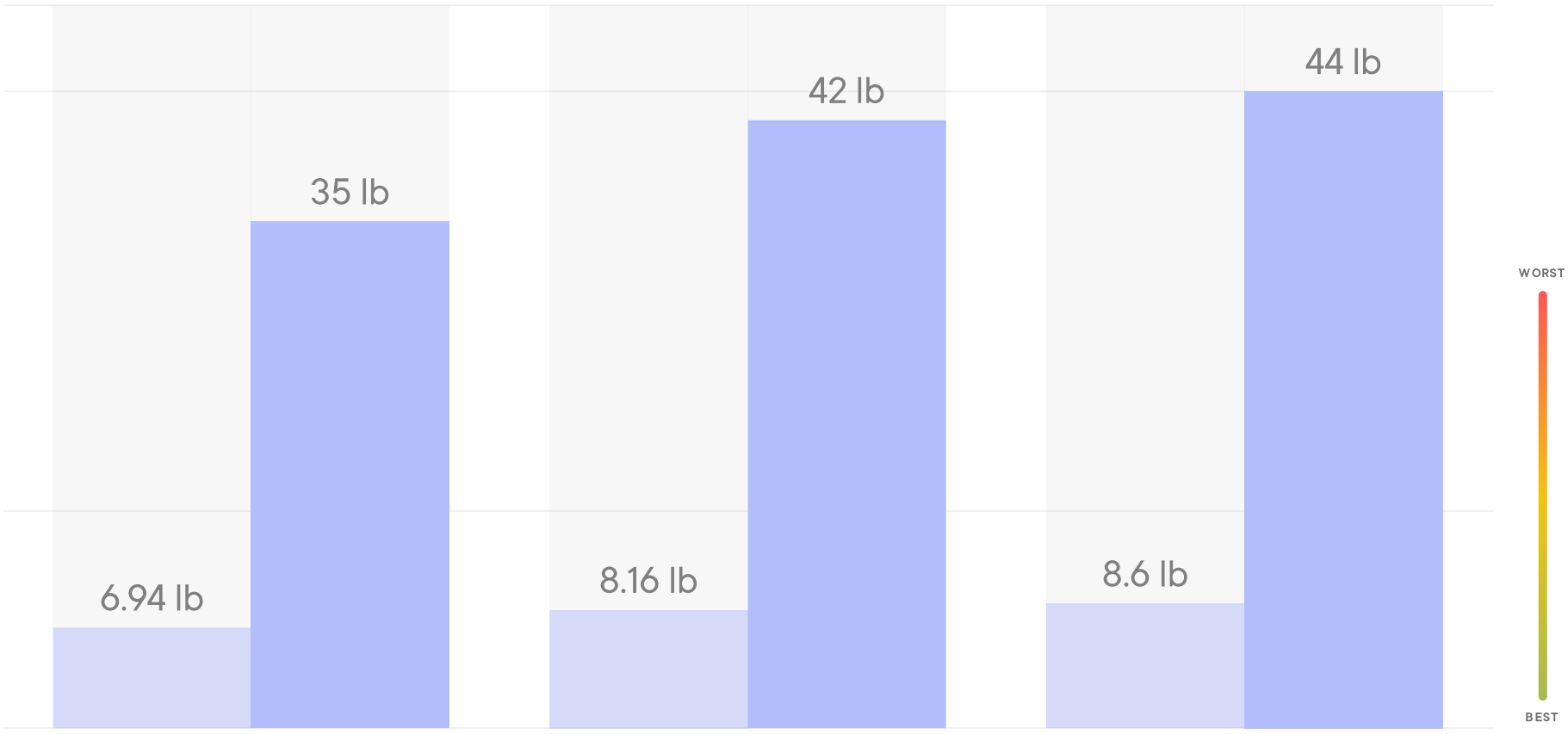
5 year cumulative line chart of Material Usage

Small changes can lead to significant results over longer periods of time. As such it is often useful to take a longer term view when evaluating different packaging alternatives



PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminate	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G

5 year cumulative line chart of Material Usage



PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminat	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G

Did you know?

STAND UP POUCH	STAND UP POUCH	STAND UP POUCH
Home compostable laminate 3.1" W x 5.1" H x 2" G	Recyclable post-consumer recycled (PCR) LDPE laminate 3.1" W x 5.1" H x 2" G	Recyclable LDPE laminate 3.1" W x 5.1" H x 2" G
16 NUMBER OF T-SHIRTS PRODUCED WITH SIMILAR AMOUNT OF MATERIALS	19 NUMBER OF T-SHIRTS PRODUCED WITH SIMILAR AMOUNT OF MATERIALS	20 NUMBER OF T-SHIRTS PRODUCED WITH SIMILAR AMOUNT OF MATERIALS
158 NUMBER OF BOTTLES PRODUCED WITH SIMILAR AMOUNT OF MATERIALS	186 NUMBER OF BOTTLES PRODUCED WITH SIMILAR AMOUNT OF MATERIALS	196 NUMBER OF BOTTLES PRODUCED WITH SIMILAR AMOUNT OF MATERIALS

Responsible Sourcing

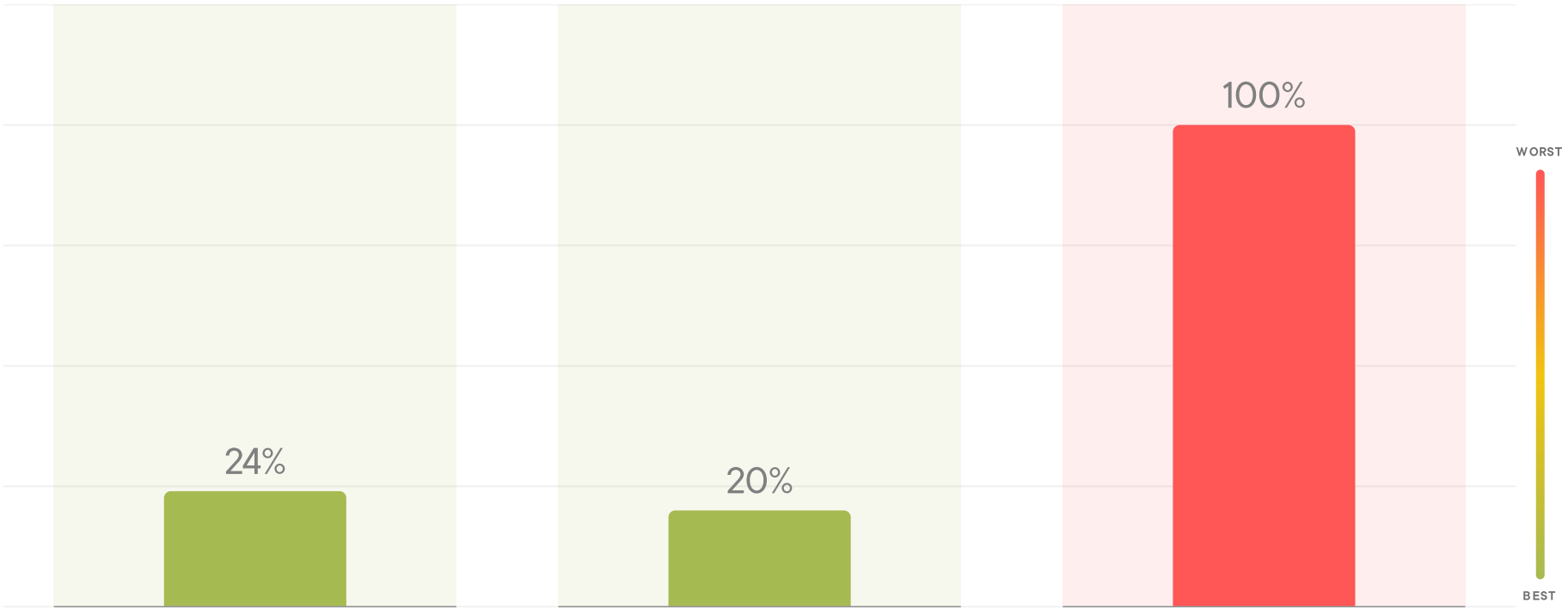
What are fossil fuels?

Fossil fuels are a non-renewable resource, extracted from the earth's crust, more commonly referred to as oil and gas. 99% of the world's plastics are made from materials derived from fossil fuels. The extraction and reliance on fossil fuels is the single largest driver of greenhouse gas emissions creating climate change.

How can we improve?

One of the most important changes the packaging industry needs to make is transitioning away from the use of virgin fossil fuels and towards using renewable and recycled materials.

Reliance on virgin fossil fuel (%)

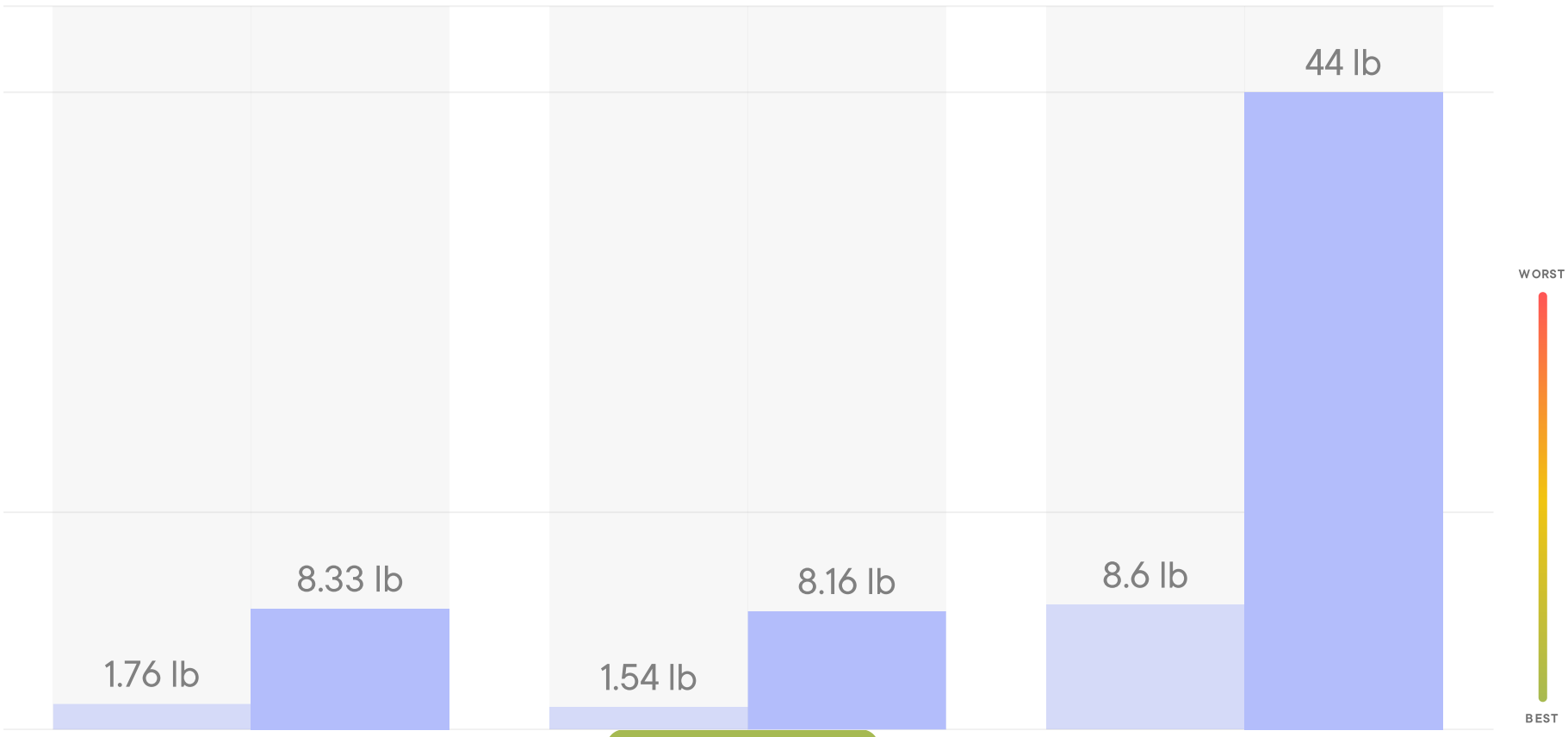


PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE lamina	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G

Total fossil fuel used in production

Fossil fuels are a non-renewable resource, extracted from the earth's crust, more commonly referred to as oil and gas. 99% of the world's plastics are made from materials derived from fossil fuels.

The extraction and reliance on fossil fuels is the single largest driver of greenhouse gas emissions creating climate change. Transitioning away from the use of virgin fossil fuel is a critical component of building a circular economy.



USES THE LEAST FOSSIL FUEL

PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminat	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G
PERCENTAGE REDUCTION 76%	PERCENTAGE REDUCTION 80%	PERCENTAGE REDUCTION 0%
TOTAL FOSSIL FUEL USED IN PRODUCTION - 1 YEAR 1.76 lb	TOTAL FOSSIL FUEL USED IN PRODUCTION - 1 YEAR 1.54 lb	TOTAL FOSSIL FUEL USED IN PRODUCTION - 1 YEAR 8.6 lb
TOTAL FOSSIL FUEL USED IN PRODUCTION - 5 YEARS 8.33 lb	TOTAL FOSSIL FUEL USED IN PRODUCTION - 5 YEARS 8.16 lb	TOTAL FOSSIL FUEL USED IN PRODUCTION - 5 YEARS 44 lb

Material composition

Packaging materials are often made from numerous different components blended together to create functional products. Broadly they fall into three main categories; virgin material, recycled material and renewable material.

PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminate	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G
76%	80%	0%
Renewable materials	Recycled materials	Recycled materials

MADE WITH RENEWABLE MATERIAL

MADE WITH RECYCLED MATERIAL

MADE WITH VIRGIN FOSSIL FUEL MATERIAL

Did you know?

STAND UP POUCH

Home compostable laminate
3.1" W x 5.1" H x 2" G

0
BARRELS OF CRUDE OIL REQUIRED

4.41 lb
AMOUNT OF MATERIALS SAVED FROM LANDFILL

STAND UP POUCH

Recyclable post-consumer recycled (PCR) LDPE laminate
3.1" W x 5.1" H x 2" G

0
BARRELS OF CRUDE OIL REQUIRED

6.61 lb
AMOUNT OF MATERIALS SAVED FROM LANDFILL

STAND UP POUCH

Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G

0
BARRELS OF CRUDE OIL REQUIRED

0 lb
AMOUNT OF MATERIALS SAVED FROM LANDFILL

Carbon Footprint

What is carbon footprint?

Carbon footprint refers to the overall greenhouse gas emissions associated with the production, logistics, distribution, and disposal of a particular product of material. It is commonly expressed as a CO_2 equivalent. One of the most important sustainability focuses for all businesses should be to reduce carbon footprint across the scope of all activities.

How can we improve?

There are many things to consider when looking to reduce carbon footprint. Moving towards recycled and/or renewable content, and also changing energy sources away from coal and other fossil fuels are often the best places to start.

Summary

Carbon footprint refers to the overall greenhouse gas emissions associated with a particular product or material. When looking at carbon footprint it is important to take into account the full 'life cycle' across raw materials, production, logistics, distribution, and then ultimately the disposal of a particular product or material. It is commonly expressed as a CO_2 equivalent.

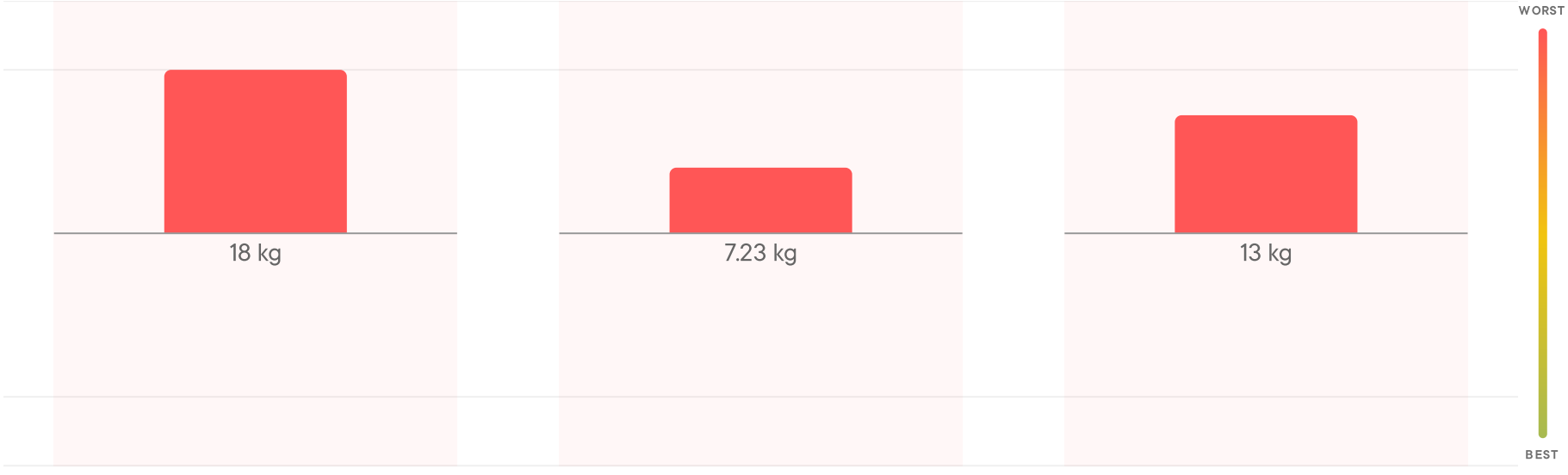
One of the most important sustainability focuses for all businesses should be to reduce carbon footprint across the scope of all activities.

	LOWEST CARBON FOOTPRINT	
PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminat	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G
RAW MATERIALS 2.37 kg CO_2-eq	RAW MATERIALS 3.45 kg CO_2-eq	RAW MATERIALS 8.69 kg CO_2-eq
MANUFACTURING 1.2 kg CO_2-eq	MANUFACTURING 1.41 kg CO_2-eq	MANUFACTURING 1.48 kg CO_2-eq
LOGISTICS 0.7 kg CO_2-eq	LOGISTICS 0.8 kg CO_2-eq	LOGISTICS 0.9 kg CO_2-eq
END-OF-LIFE 14 kg CO_2-eq	END-OF-LIFE 1.57 kg CO_2-eq	END-OF-LIFE 1.65 kg CO_2-eq
CARBON FOOTPRINT PER UNIT 0.018 kg CO_2-eq	CARBON FOOTPRINT PER UNIT 0.007 kg CO_2-eq	CARBON FOOTPRINT PER UNIT 0.013 kg CO_2-eq
TOTAL CARBON FOOTPRINT 18 kg CO_2-eq	TOTAL CARBON FOOTPRINT 7.23 kg CO_2-eq	TOTAL CARBON FOOTPRINT 13 kg CO_2-eq

60% LOWER CARBON FOOTPRINT THAN PRODUCT A

Total carbon footprint

Net carbon emissions based on 10k units. Lower carbon emissions indicate a lower environmental impact.

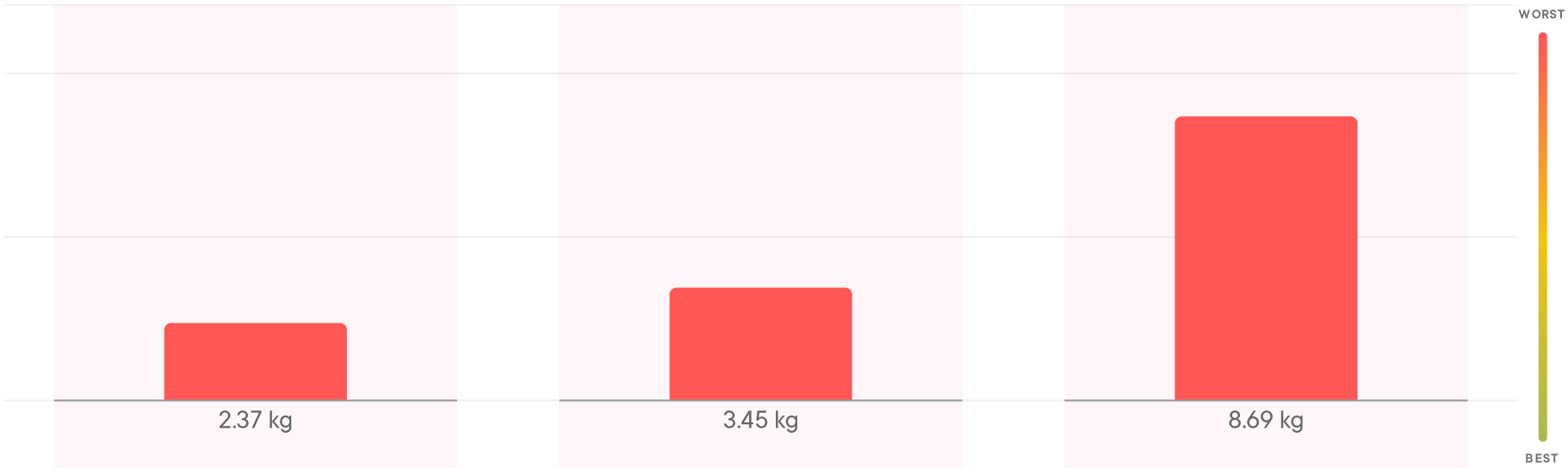


CARBON INTENSITY METRIC	CARBON INTENSITY METRIC	CARBON INTENSITY METRIC
5.71	1.95	3.33

Raw Material

The carbon footprint from raw materials considers a number of factors; firstly the extraction or harvesting of those materials, any manufacturing or processing associated with them, and also supply chain movements. Importantly it looks at the ‘embodied energy’, or the total energy consumed, associated with all of these factors.

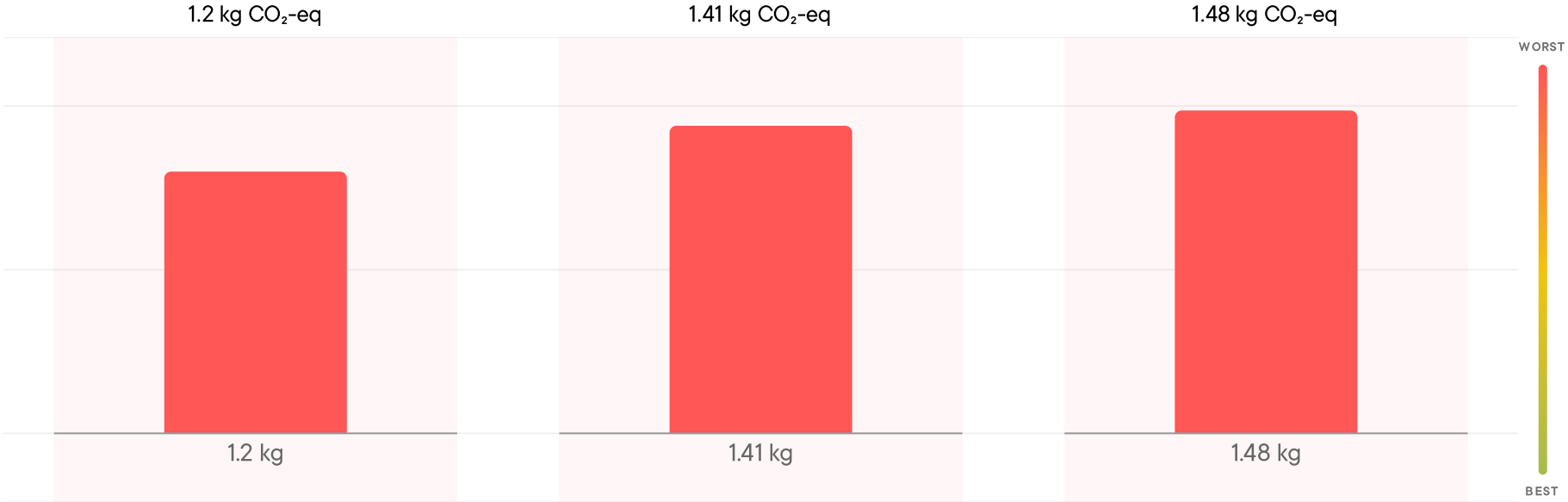
PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminat	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G
2.37 kg CO_2-eq	3.45 kg CO_2-eq	8.69 kg CO_2-eq



Manufacturing

The carbon footprint from manufacturing takes into consideration the manufacturing and production processes required to take a series of raw materials and turn them into a finished good. In this case it refers to creating packaging from various component materials.

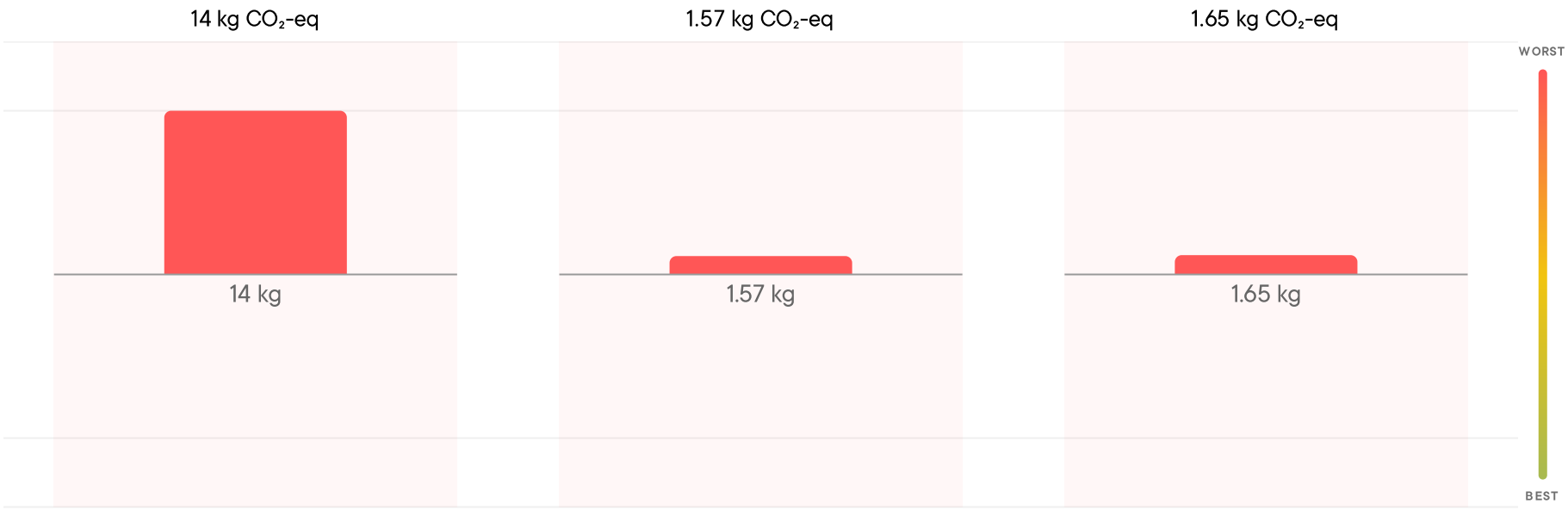
PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminat	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G



End-Of-Life

The carbon footprint from ‘end-of-life’ refers to the end destination for a particular product or material. Generally for packaging this includes incineration, landfilling, recycling, composting and re-use, all of which have different emissions profiles.

PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminat	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G



Did you know?

STAND UP POUCH

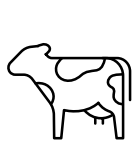
Home compostable laminate
3.1" W x 5.1" H x 2" G

0.1
CARBON EMISSION EQUIVALENT

LA to NY flights

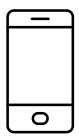
45 mi
CARBON EQUIVALENT TRAVELED BY A TYPICAL CAR

1.76 lb
CARBON EQUIVALENT OF PRODUCING 1.76 LB OF BEEF

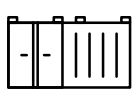


1
THE SAME AMOUNT OF CO_2 ABSORBED BY 1 TREE IN A YEAR

0
CARBON EQUIVALENT OF MANUFACTURING 0 SMART PHONES



0
NUMBER OF SHIPPING CONTAINERS THAT COULD BE FILLED WITH EQUIVALENT CO_2



STAND UP POUCH

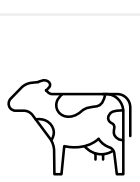
Recyclable post-consumer recycled (PCR) LDPE laminate
3.1" W x 5.1" H x 2" G

0
CARBON EMISSION EQUIVALENT

LA to NY flights

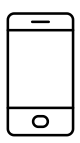
18 mi
CARBON EQUIVALENT TRAVELED BY A TYPICAL CAR

0.7 lb
CARBON EQUIVALENT OF PRODUCING 0.7 LB OF BEEF

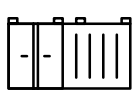


0
THE SAME AMOUNT OF CO_2 ABSORBED BY 0 TREES IN A YEAR

0
CARBON EQUIVALENT OF MANUFACTURING 0 SMART PHONES



0
NUMBER OF SHIPPING CONTAINERS THAT COULD BE FILLED WITH EQUIVALENT CO_2



STAND UP POUCH

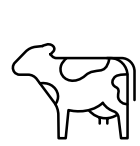
Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G

0.1
CARBON EMISSION EQUIVALENT

LA to NY flights

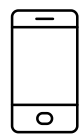
32 mi
CARBON EQUIVALENT TRAVELED BY A TYPICAL CAR

1.32 lb
CARBON EQUIVALENT OF PRODUCING 1.32 LB OF BEEF

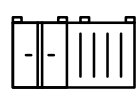


1
THE SAME AMOUNT OF CO_2 ABSORBED BY 1 TREE IN A YEAR

0
CARBON EQUIVALENT OF MANUFACTURING 0 SMART PHONES



0
NUMBER OF SHIPPING CONTAINERS THAT COULD BE FILLED WITH EQUIVALENT CO_2



Material Circularity

Material Circularity

The circular economy is a system that requires us to reconsider the entire lifecycle of our products and resources by designing out waste. That means making use of materials and technologies that extend the lifespans and potential reuse value of the things we produce, while minimising unintended waste.

The 'Material Circularity Indicator' (MCI), designed by the Ellen MacArthur Foundation, is a calculation measuring a product's 'circularity'. It takes into account many factors, including the amount of renewable or recycled content incorporated, it's utility, it's intended end-of-life destination, and the likelihood of it ending up in that intended destination. Grounded believes that MCI is the most important metric for sustainability in packaging.

The three components of material circularity

Sustainability data in packaging is poorly understood. Carbon, although important, only tells part of the story. Circularity tells a fuller story and sometimes that aligns with the carbon footprint, and others it doesn't.

The Material Circularity Indicator (MCI) is an indicator that measures the circularity of a product. Developed by the Ellen MacArthur Foundation, the MCI encompasses the entire life cycle of a good: from the extraction of raw materials, through processing and assembly, to the use and end-of-life phase.

1. Use of recycled and/or regenerative content for manufacturer

The first and often most important sustainability consideration for packaging is the 'upstream' profile of a material. Put simply this looks at the amount of recycled or renewable content as a proportion of the total material requirement.

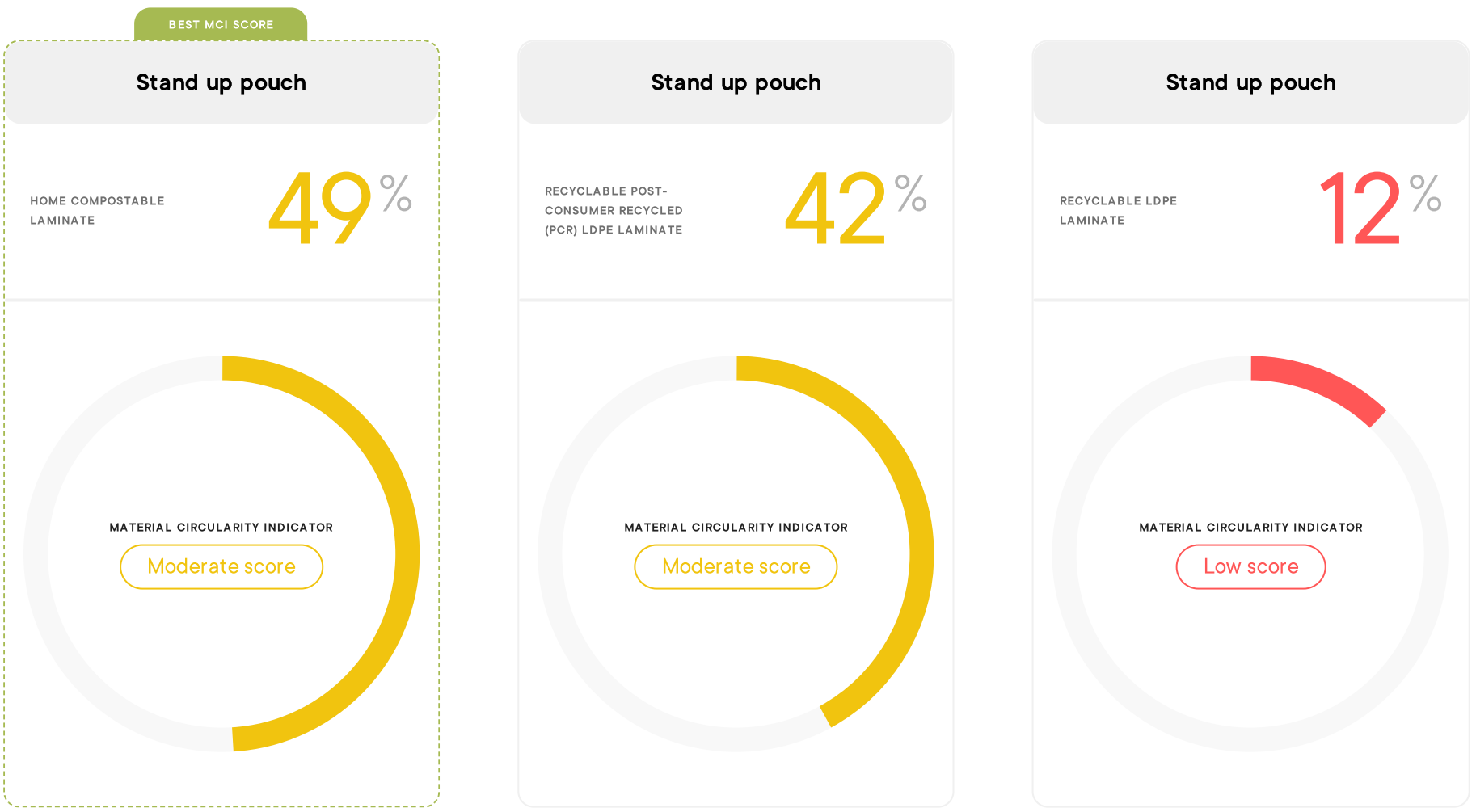
2. Utility / Usable life

The second part of the calculation looks at the ‘Utility’ of a certain product or material. When looking at packaging the best example is to think about whether it is a single-use item or has it been designed to be more durable and suitable for multiple-uses.

3. End-of-life - recycling, remanufacture

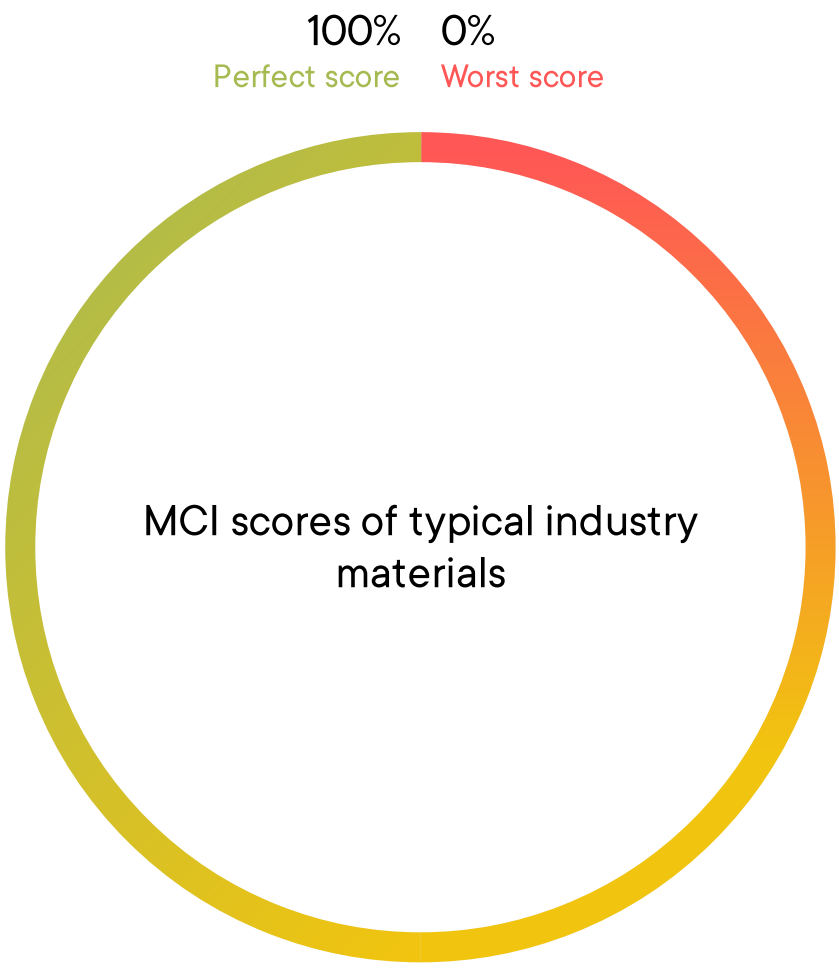
The final component of the calculation relates to end-of-life design. Critically it takes into consideration whether something has been designed to work within a particular system (recycling, composting etc) and then also the likelihood that it actually ends up there.

Material Circularity Indicator (MCI)



What is a good Material Circularity Indicator score?

A good circularity score for packaging would generally be considered to be anything over 50%. However some products are harder than others to achieve high MCI scores with and as such it is important to look at it in the context of whatever your product set is. Generally we recommend that a business picks a baseline circularity score that they want to achieve and then aims to meet or beat that across all of their packaging.



Scores of 75-100 would be considered exceptional. In order to achieve a score this high a product would not only have to be made of close to 100% recycled or renewable material, it would also need to have much higher utility i.e. be in use for multiple uses, and then at the end-of-life it would need to have a very high chance of being recycled or remanufactured.

e.g. a 100% recycled steel water bottle that can be used for many years and hundreds of uses, before eventually being recycled.

Scores of 50-75 would be considered very good for packaging in today's market.

Often scores in this range will be driven by very high use of recycled or renewable content for packaging products that have a clear pathway for effective end-of-life

e.g. 100% FSC recycled paper or 100% rPET in locations with high collection and recycling rates for those materials (which is most developed economies)

Scores of 1 - 25 are considered low and often are driven by the use of virgin materials that do not have a defined and clear end-of-life pathway.

e.g. multi-material packaging formats that cannot be recycled

Scores of 25 - 50 are a significant improvement and should be considered OK depending on exact material and format.

Often scores in this space will be reflective of packaging that is still considered single-use but incorporates a level of recycled and/or renewable content but may still have a challenging end-of-life pathway.

e.g. compostable packaging formats or packaging that uses recycled content but is still hard to recycle.

In many cases packaging has been designed to be single use. Particularly with food products the function of packaging has been designed to preserve shelf-life and prevent spoilage which is also very important from a sustainability perspective.

How to improve your MCI

1. Maximize the amount of recycled and/or renewable content that goes into manufacturing
2. Design that packaging product for end-of-life streams that actually work in the regions that your customers are located.
3. To try and move beyond single-use packaging products and into systems that are designed to be reusable or refillable

Did you know?

STAND UP POUCH

Home compostable laminate
3.1" W x 5.1" H x 2" G

1

THE SAME AMOUNT OF CO_2 ABSORBED BY 1 TREE IN A YEAR

STAND UP POUCH

Recyclable post-consumer recycled (PCR) LDPE laminate
3.1" W x 5.1" H x 2" G

0

THE SAME AMOUNT OF CO_2 ABSORBED BY 0 TREES IN A YEAR

STAND UP POUCH

Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G

1

THE SAME AMOUNT OF CO_2 ABSORBED BY 1 TREE IN A YEAR

End-of-Life

What is end-of-life?

End-of-life refers to what happens to a product once it's intended purpose has been fulfilled. For packaging that generally refers to landfill, recycling, composting or re-use, depending on the material. All of Grounded's products are designed for recycling, composting or re-use.

How can we improve?

The first and most important thing is to design your packaging so that it works within a defined end-of-life system. A surprising amount of packaging has not been designed to be recycled, composted or re-used. Considerations should be given to customer's local waste management systems as they vary by region.

Scenarios and breakdown

Waste management is a complicated field. Different regions have different infrastructure for collection and management, and different materials need to be treated distinctly in order to be recycled or composted properly. Different types of plastics for example have very different recycling rates.

It is important to understand these considerations at both a regional and material level in order to inform the best packaging decisions.

LEAST MATERIAL LANDFILLED/INCINERATED	LEAST MATERIAL LANDFILLED/INCINERATED	
PRODUCT A	PRODUCT B	PRODUCT C
Stand up pouch	**Stand up pouch**	**Stand up pouch**
Home compostable laminate	Recyclable post-consumer recycled (PCR) LDPE laminate	Recyclable LDPE laminate
3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G	3.1" W x 5.1" H x 2" G
Compostable	Soft Plastics Recyclable	Soft Plastics Recyclable
Annual packaging weight: 6.61 lb	Annual packaging weight: 8.82 lb	Annual packaging weight: 8.82 lb
Recycled 0 lb	Recycled 0 lb	Recycled 0 lb
Composted 0 lb	Composted 0 lb	Composted 0 lb
Landfilled 6.61 lb	Landfilled 6.61 lb	Landfilled 6.61 lb
Incinerated 0 lb	Incinerated 0 lb	Incinerated 2.2 lb
RECYCLING/COMPOSTING RATES IN YOUR REGION	RECYCLING/COMPOSTING RATES IN YOUR REGION	RECYCLING/COMPOSTING RATES IN YOUR REGION