



Pela Life Cycle Assessment Final Report

Updated on June 13, 2022

The report below provides the methodology, results, and data comprising Pela's 2021 Life Cycle Assessment, conducted by GreenStep Solutions.

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Executive Summary

The report below outlines the findings and recommendations from Pela's 2021 Life Cycle Assessment (LCA). The primary objective of this LCA was to provide the Pela team with an update to its 2020 database and add new product categories that have since been introduced, including Group 1 (iPad cases, card keep wallets, Airtag holders). The recently acquired Group 5 product line (Lomi), has been provided in a separate [report](#).

This LCA also included a desktop comparison of Pela products versus their conventional counterparts. "Conventional" is defined as containing the majority of petroleum-based plastics (in the case of smartphone cases and accessories) or plastic packaging and added water (in the case of Habitat Botanicals comparatives).

For the purposes of this assessment and to keep the project specific to Pela's stated goals, the focus was on areas of impact that are most relatable to consumers: global warming (carbon emissions), water consumption, and waste.

Considering the new product additions, Pela's overall impact has increased, mainly due to adding [Lomi](#), as demonstrated in the below data tables, showcasing Pela's cases and accessories, as well as its Habitat Botanicals line. Further analysis and complete data sets can be found under "Interpreting Results."

Table 1. Comparison of individual Pela products in Group 1 versus their conventional counterparts.

	kg CO2e	Litres Water	kg Waste
Pela Classic	1.39	5.67	0.03
Conventional	1.82	8.49	0.15
Pela Slim	1.10	5.61	0.03
Conventional	1.58	8.43	0.14
Pela iPad Cases	2.58	6.03	0.08
Conventional	3.57	8.92	0.43
Pela Airpod Holder	0.99	5.58	0.02



Conventional	1.48	8.43	0.14
Pela Grip	0.98	5.57	0.02
Conventional	1.44	8.41	0.14
Pela Vine	1.06	5.60	0.02
Conventional	1.55	8.44	0.14
Pela Card Keep Wallet	0.64	1.40	0.02
Conventional	1.80	8.63	0.38
Pela Airtag Holder	0.19	1.20	0.003
Conventional	0.99	8.36	0.10

Table 2. Comparison of individual Pela products in Group 4 versus their conventional counterparts.

	kg CO2e	Litres Water	kg Waste
Pela Shampoo Bar	1.72	5.59	0.01
Conventional	1.92	8.42	0.16
Pela Body Wash Bar	1.72	5.59	0.01
Conventional	2.32	8.43	0.63
Pela Deodorant	2.60	5.84	0.01
Conventional	2.82	8.66	0.17
Pela Lip Balm	1.03	5.57	0.01
Conventional	1.41	8.37	0.10

Notes: for the purposes of this LCA, GreenStep analyzed comparisons for conventional shampoo, body wash, deodorant, and lip balm. It was assumed that the conditioner bar would have similar impacts and was omitted from comparisons.



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Introduction

This report outlines the findings and recommendations from Pela's 2021 Life Cycle Assessment (LCA). The key objectives of this LCA were to:

- Update and add new calculations for CO₂e, water, and waste impacts for Pela's new products and life cycles in a way that customers can easily understand and relate to.
- Produce a report that identifies carbon, water, and waste impact of an agreed-upon list of products, compared to their conventional alternatives (please see "Product Groups" for a complete list)

Pela's stated goal is to keep one billion pounds of plastic from ever being created. To accomplish this goal, they "create everyday products without everyday waste." In 2020, this included its Classic Pela Smartphone case, accessories including Apple Airpod earbuds holders, the "Vine" (the Pela version of an Apple Watch Strap), a Grip device, sunglasses (Pela Vision), liquid screen protector (Canopy), and the Habitat Botanicals line of personal hygiene products, but since then, has grown to include a number of new cases as well as iPad cases, card keep wallets, Airtag holders and Lomi.

Notably, Pela is committed to reducing its plastic footprint by developing formulations that use alternatives to conventional plastics and packaging. Its products are all produced using plant-based ingredients, biobased or compostable bioplastics, and natural materials designed to be used repeatedly, or to break down in compost or landfill when they have reached the end of their usable life.

Many companies in the same categories as Pela make similar claims of sustainability but it is not often the case that these claims are backed up by credible sources or robust data. This LCA is an attempt to quantify Pela's true impact in the areas of carbon emissions, water, and waste, thereby providing a degree of transparency to its customer base and showcasing Pela's commitment to its stated mission.



What sets Pela apart?

Pela differentiates itself from its competitors in a number of ways, chief among them striving to create products that produce less waste, and that are safe and effective for humans and the environment. Several of these differentiating factors positively impact its LCA:

- Producing environmentally-friendly alternatives to every day, conventional products
- The use of proprietary bioplastics in all of its smartphone cases and accessories: 40% bio-based content and 60% non-renewable feedstock.
- Sourcing plant-based, toxin-free ingredients for personal hygiene products
- Working with regional suppliers and distributors to produce and ship products
- Diverting flax shive from the waste stream and giving it new life in the form of a durable good.
- Recycling plastic sprues during the manufacturing process, resulting in little to no manufacturing waste.
- Choosing to use FSC-certified and recycled paper content in all of its packaging.
- Members of 1% For the Planet; portions of a customer's purchase go to this organization, which funds global grassroots efforts aimed at protecting and preserving the planet.
- Educating customers on the impacts of plastic pollution in the ocean.
- Encouraging customers to compost their case at the end of its life.
- The Pela 360 take-back program wherein Pela sends each of its new cases or sunglasses to customers with a sleeve to return their old, conventional phone case or pair of sunglasses. Pela then takes these cases or sunglasses and grinds them down, to incorporate them into Pela products.
- Creating educational campaigns for each of its phone cases, including awareness-raising campaigns for climate change; mindfulness; bees, elephants, penguins, polar bears, sea turtles, sharks, and whales.

Goal & Scope

The goal and scope of the 2021 Pela LCA project were similar to that of Pela's 2020 LCA in that similar impacts were assessed, including carbon, water, and waste impacts for each



product; thus, the methodology remained relatively unchanged. Where differences occurred was with additional product lines added for the 2021 LCA, and a slightly different life cycle for Pela's classic product-line. As per the 2020 LCA, GreenStep undertook a desktop analysis of Pela products as compared to their conventional counterparts, to provide Pela with information as to the specific impacts their products have compared to conventional equivalents.

Product Groups

Group 1

- Classic Pela smartphone cases
- Slim case
- Airpod Case
- Grip (smartphone grip attachment)
- Vine (Apple watch strap)
- iPad Cases
- Card Keep Wallets
- Airtag Holders

Group 1A

- Clear smartphone case

Group 2

- Pela Vision (sunglasses)

Group 3

- Canopy (liquid screen protector)

Group 4:

- Habitat personal hygiene products
 - Deodorant
 - Bars: Shampoo, Conditioner, Body Wash
 - Lip Balm



Formulations

The formulation for Pela's classic smartphone case (Flaxstic V1, 40% biobased) has not changed and has now been applied to five of other Pela's products: the Vine (Apple Watch Strap), Airpod cases, iPad cases, card keep wallets, and Airtag holders.

The Slim Cases and Grip products are composed of Flaxstic V2, a 60% biobased, compostable bioplastic resin. Both Flaxstic V1 and Flaxstic V2 resins are produced in the USA.

The Clear Case is formulated similarly to the Classic Pela Smartphone case, but with the addition of a clear, 100% biobased, compostable plastic resin (Clear V1).

Pela Vision sunglasses are formulated from a landfill-biodegradable plastic resin formulation (Vision V2).

Pela's Canopy product is a liquid screen protector that is sold in a glass vial with a cork stopper. The customer rubs a small amount of the product onto their phone's screen with a soft cloth. The Canopy product is composed of silica and ethanol. There is enough liquid in each vial to cover approximately three phone screens.

The Habitat personal hygiene products contain several plant-based, natural cosmetic ingredients, chief among them sodium lauryl sulfoacetate (derived from coconut and palm oils, and considered by the industry to be a gentler alternative to sodium lauryl sulfate), plant oils, plant butter (including cocoa and shea), and essential oils as fragrance. Along with plant-based ingredients, the Habitat line is unique in its packaging: per Pela's mission to prevent 1 billion pounds of plastic from entering the waste stream, all of the Habitat products are packaged in paper, and thus are completely plastic-free.

Updates from 2020 LCA

- **Products:** this LCA accounts for Pela's new products, iPad cases, card keep wallets and Airtag holders.
- **Manufacturing locations** for Pela Habitat lines, it's manufacturing from Langley to Kelowna, BC.



A complete LCA identifies potential impacts from global warming, acidification, eutrophication, ozone depletion, photochemical ozone, and primary energy; however, for the purposes of this study and to keep the project specific to Pela's stated goals, the focus is on the aspects that are most relatable to consumers; global warming (carbon emissions), water consumption, and waste created.

Environmental Inputs & Outputs

- Inputs: raw materials, water, energy
- Outputs: kg CO₂e (carbon dioxide equivalent), litres water consumption, kg waste disposal/recycling

Impact Assessment

The life cycle impacts that GreenStep sought to measure were:

- Tonnes (kg) CO₂e
- Kilolitres (L) water
- Tonnes waste to landfill, recycled or composted

In order to establish a scope boundary for this methodology, the team at GreenStep met with Pela to identify primary product groups (see above) and the inputs, manufacturing, and processing data for each. In combination with primary data obtained from Pela, GreenStep also conducted secondary research to gather industry standards, relevant coefficients, and background primers on the various processes outlined below.

Following data collection, GreenStep built a case-specific excel-based tool to create new tables (or in some cases, update existing ones) to run the LCA calculations. GreenStep used this calculator, incorporating all inputs provided by Pela and/or researched by GreenStep. One of the key outputs is a series of values that rank the impact of each Pela product in the areas of carbon dioxide emissions, water usage, and waste. The "cradle" for each product began with raw materials and continued on from there with the "grave" being the end-of-life stage of each product (i.e., landfill, compost, or return to Pela).

In addition, this LCA accounts for end-of-life streams (landfill, compost, or take-back). Pela operates what it calls the Pela 360 Program, in order to capture used phone cases, and



sunglasses, and incorporate them back into its manufacturing process. By reclaiming old smartphone cases and sunglasses and reusing them as feedstock, Pela reduces its reliance on conventional, petroleum-based plastic and assists in reducing the overall waste profile of both the phone case and sunglasses industries.

Unique to Pela is the inclusion of plant material in all its smartphone cases and accessory products. The primary component is its proprietary Flaxstic™ material composed of a combination of flax shive and bioplastic resin. The flax component is derived from flax 'shive' and is considered a byproduct of a byproduct in the flax industry. Flax is typically grown for the flax oilseed market. What is left over after harvesting the seeds, flax straw, is used in the flax textile industry. The remaining material, after the straw is stripped away, is what is known as the shive and is typically discarded by the textile industry. As Pela has reclaimed what is waste material and incorporated it into the production of its cases, the impacts of flax farming were not included in the system boundary of this LCA.

Same as 2020's LCA, three bio-based and biodegradable bioplastics used in Pela's Slim case, Grip accessory, Clear case, and Pela Vision sunglasses: Flaxstic V2, Clear V1, and Vision V2 were included, as well. These plastics are also proprietary blends (see above for general formulations).

Two system boundaries were used: one for a single Pela product and one for a conventional alternative. The system boundaries were defined as follows:

System Boundary for Pela Smartphone Cases, Slim Cases, Airpod Cases, Grip, Vine, iPad Case, Airtag Holders, and Card Keep Wallets

The processes outlined below also appear in Pela's 2020 Final Report & Methodology.

Processes include:

Data from Pela Case, LCA Database Sources and Other Secondary LCA Research

- Raw material production, extraction and transit
 - Flax shive
 - Wheat starch resin



- Thermoplastic Polyurethane (TPU)
- Synthetic Silicone Rubber
- Raw material processing and input manufacturing
 - Thermoforming
- Product manufacturing
 - Injection moulding
- Packaging
- Transportation (from farm to bioplastic manufacturer, to smartphone case fabrication plant, to distribution centre)
- Product end-of-life

Processes not included:

- Flax farming

Functional Units

- 1 Pela Phone Case
- 1 Conventional Phone Case

System Boundary for Pela Clear Case

Data from Pela Case, LCA Database Sources and Other Secondary LCA Research

- Raw material production, extraction and transit
 - Flax shive
 - Wheat starch resin
 - Thermoplastic Polyurethane (TPU)
 - Synthetic Silicone Rubber
 - Clear V1
- Raw material processing and input manufacturing
 - Thermoforming
- Product manufacturing
 - Injection moulding
- Packaging
- Transportation (from farm to bioplastic manufacturer, to smartphone case fabrication plant, to distribution centre)

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- Product end-of-life

Processes not included:

- Flax farming

Functional Units

- 1 Pela Clear Case
- 1 Conventional Phone Case

System Boundary for Pela Canopy

Processes Include:

Data from Pela Case, LCA Database Sources and Other Secondary LCA Research

- Raw material production, extraction and transit
 - Ethanol (produced in Canada)
 - Silica (produced in the USA)
- Raw material processing and input manufacturing
 - Ethanol production
 - Silica production
- Packaging (glass vial, cork, and final product packaging)
- Transportation (from raw ingredients to product manufacturing, to distribution centre)
- Product end-of-life

Functional Units

- 1 vial Canopy liquid screen protector - protects up to three phone screens
- 3 conventional TPU screen protectors

System Boundary for Pela Vision

Processes Include:

Data from Pela Case, LCA Database Sources and Other Secondary LCA Research

- Raw material production, extraction and transit



- Plastic resin
- Organic-based additive
- Raw material processing and input manufacturing
 - Thermoforming
- Product manufacturing
 - Injection Moulding
- Packaging
- Transportation (from raw ingredients to product manufacturing, to distribution centre)
- Product end-of-life

Functional Units

- 1 pair Pela Vision sunglasses
- 1 pair conventional sunglasses

System Boundary for Habitat

Processes Include:

Data from Pela Case, LCA Database Sources and Other Secondary LCA Research

- Raw material production, extraction and transit to manufacturing
 - See Appendix A for the full raw material list
- Packaging
- Transportation (from raw ingredients to product manufacturing, to distribution centre)
- Product end-of-life

Functional Units

- 1 bar shampoo, 1 bar body wash, 1 stick deodorant
- 1 conventional bottle shampoo, 1 conventional bottle body wash, 1 conventional stick deodorant



Methodology

GreenStep has conducted cradle-to-grave LCAs for each Pela product identified above. For the purposes of this LCA, 'cradle' is defined as the raw material creation phase, with the exception of the flax shive component of Pela's formulation. 'Grave' is defined as the end-of-life phase, i.e. landfill, compost, or a take-back program (see assumptions for percentage breakdown).

The LCA for **Pela smartphone cases and accessories** consists of seven phases including raw material production, transportation of raw materials to plastic pellet manufacturer, plastic pellet manufacturing, transportation to case manufacturing plants, packaging, transportation to distribution centres, distribution, and end of life.

The LCA for Pela's **Canopy liquid screen protector** consists of seven phases including raw material production, transportation of raw materials to the bottling facility, packaging, transportation to distribution centres, distribution, and end of life.

The LCA for Pela's **Habitat personal hygiene products** consists of seven phases including raw material production, transportation of raw materials to the Habitat manufacturing facility, packaging, transportation to distribution centres, distribution, and end of life.

The LCA for **Pela Lomi** has been provided in a separate [report](#).

Pela provided GreenStep with information on its manufacturing processes, including the base ingredients for its case and accessories formulation, as well as locations for each phase of its manufacturing process. In the case of Pela's classic smartphone cases and accessories, this included raw flax shive procurement, bioplastic pellet production, manufacturing and distribution. For Pela's Canopy product, this included the production of ethanol and silica, along with inputs for the Canopy packaging (glass vial and cork), along with manufacturing and distributing processes. For Pela's Habitat personal hygiene products, these processes included inputs for raw ingredients of each product (see Appendix A) and packaging.



This information enabled GreenStep to determine carbon emissions, water and freshwater consumption values for the raw materials used in Pela's smartphone case, accessory, and Habitat products. Similar work has been done to construct a profile for a fully conventional alternative for each product category.

To compare Pela's products against a conventional counterpart, GreenStep used the same criteria: manufacturing, transportation, warehousing, and end-of-life were all included in the system boundary. To better understand the impact on a case-by-case basis, **the weight of each product was used as a differentiating factor**. Generally, there are four factors that distinguish Pela products from their conventional counterparts during the LCA process: Pela's inclusion of bio-based and plant-based content; its manufacturing facility in Kelowna, BC; the packaging of its products; and Pela's 360 take-back program. A graphical representation of each product group's process flow for Pela is presented in Figures 1 through 8, below.

Flow Charts

The below flow charts illustrate the process flow for each of Pela's product groupings, from raw ingredients to warehousing. Some products have been combined, as their process flows are identical (e.g., Pela's Airpod Cases and Vine products). For Habitat, the process flow was modelled after its Shampoo Bar product. It was assumed that conditioner, deodorant, body wash, and lip balm are all manufactured and warehoused at the same locations, the primary differences being raw ingredient inputs and manufacturing process.

A full list of conventional equivalent flow charts can be found in Appendix B.

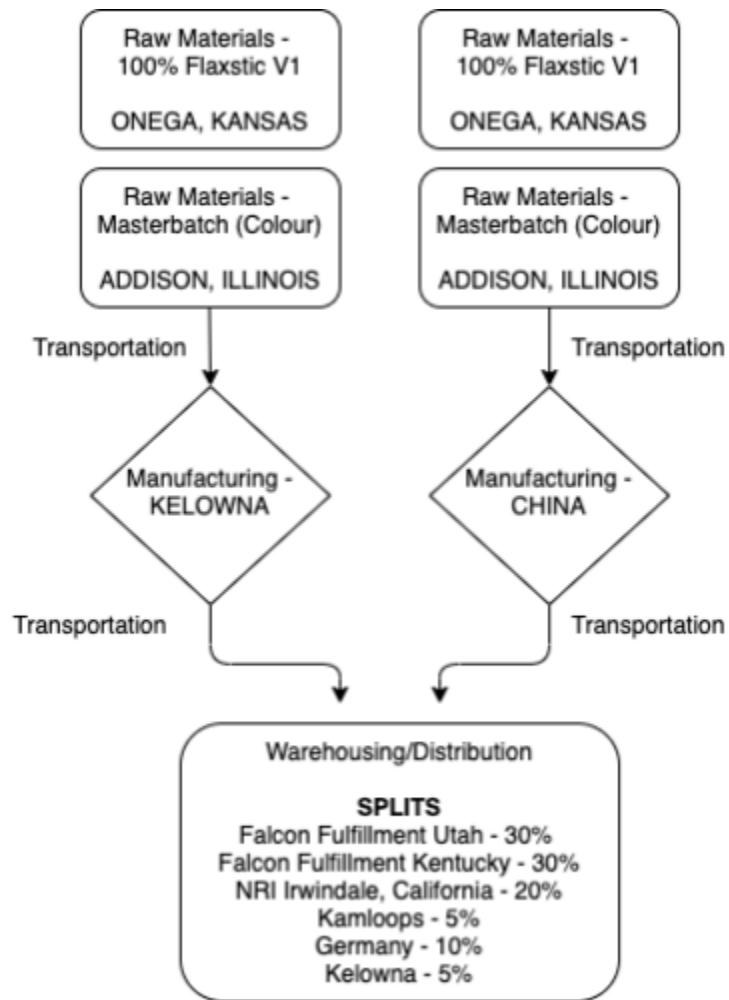


Figure 1: Pela Classic Smartphone Case

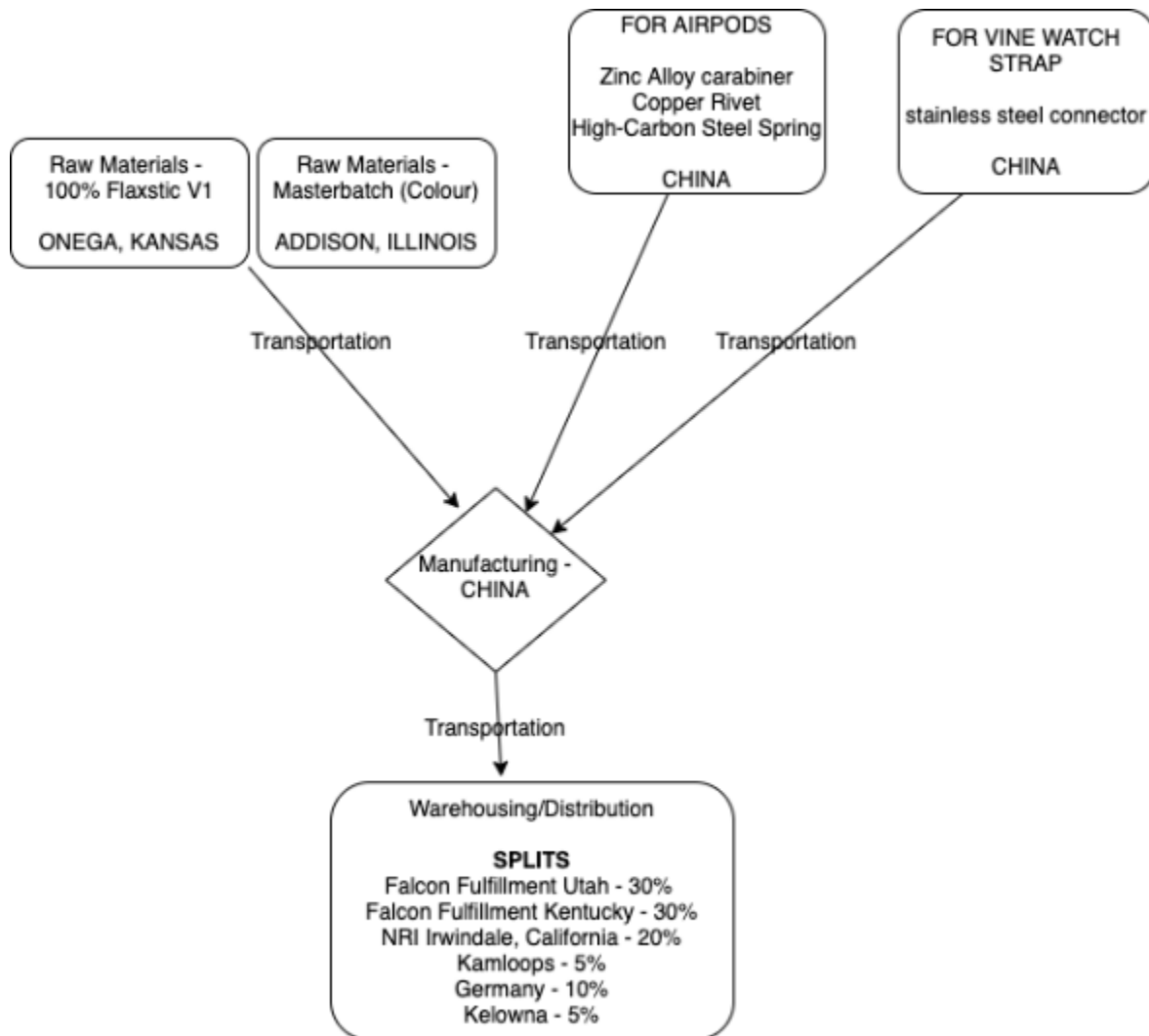


Figure 2: Pela Airpod Cases and Apple Watch Strap (“Vine”)

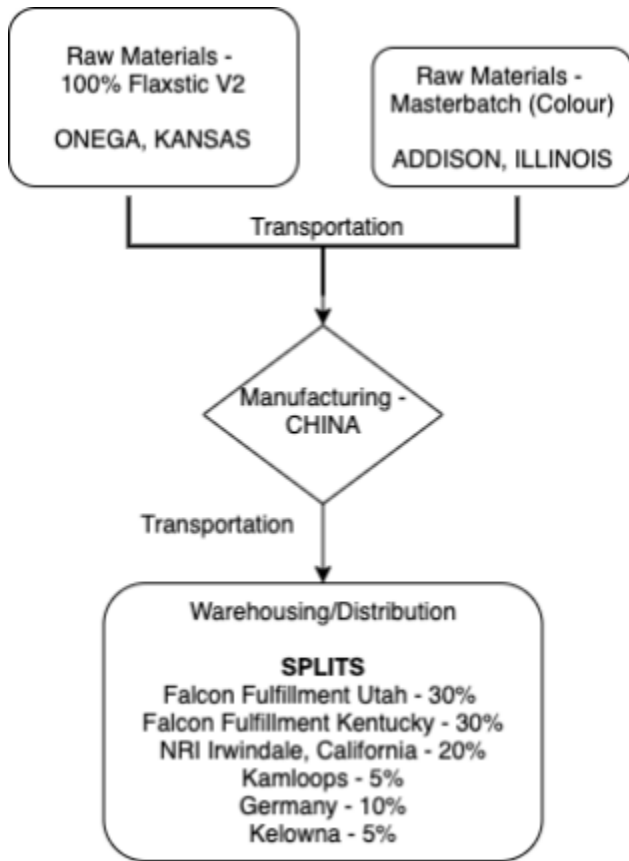


Figure 3: Pela Slim Smartphone Case, and Pela Grip Process Flow

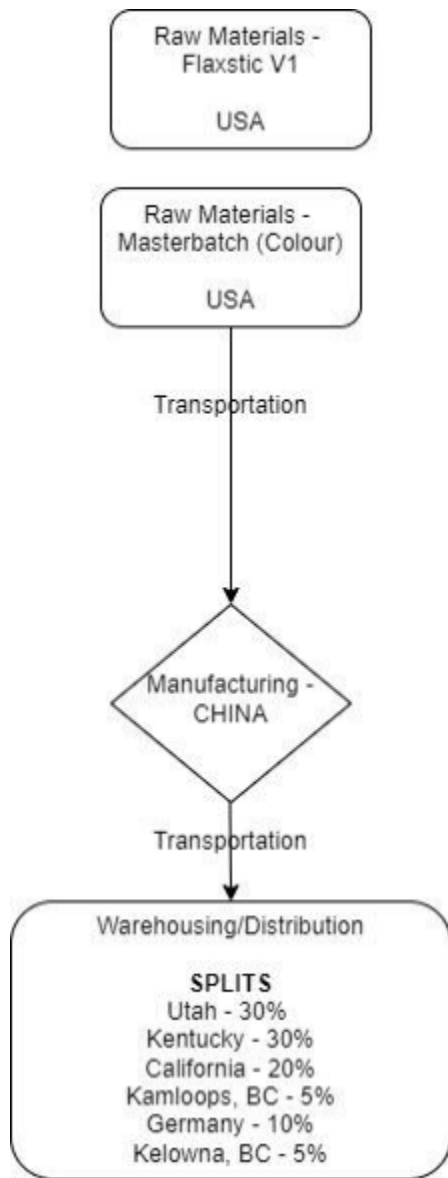


Figure 4: Pela iPad cases, Card keep wallets, Airtag holders Process Flow

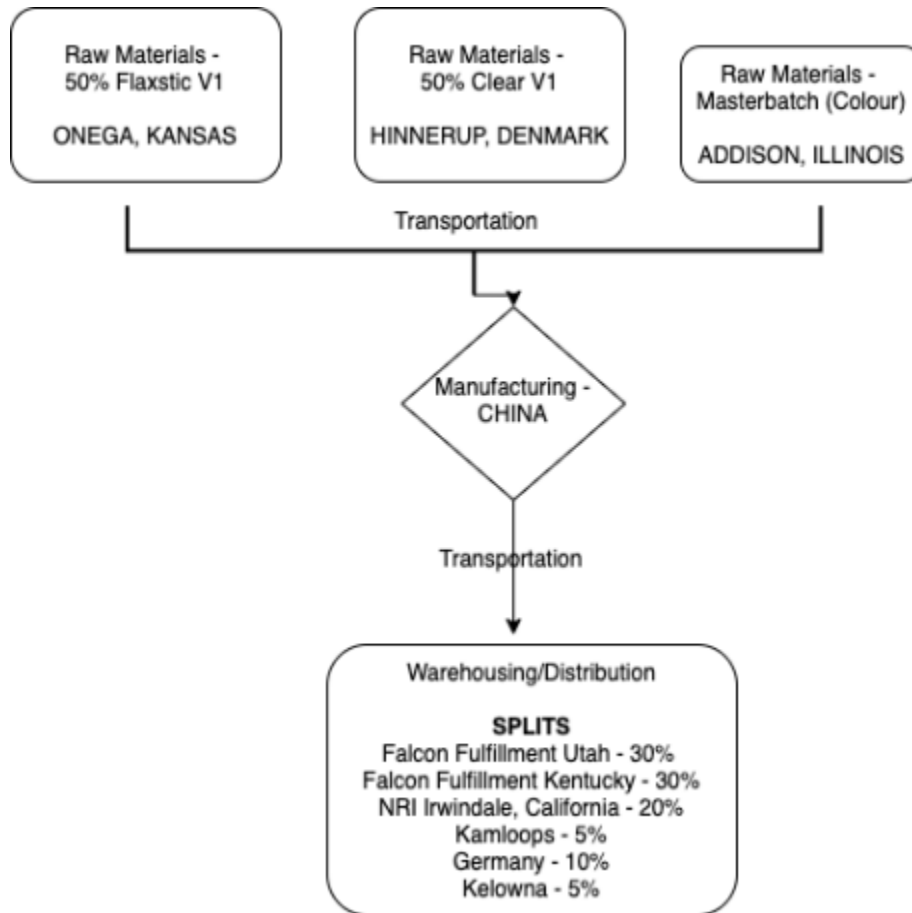


Figure 5: Pela Clear Case Process Flow

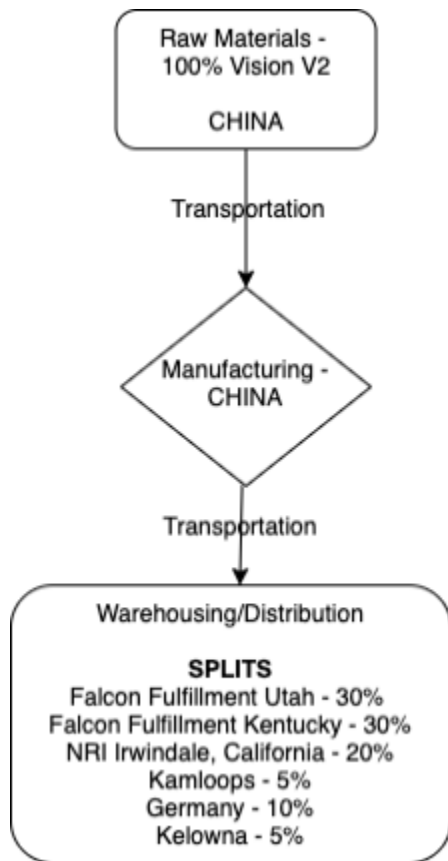


Figure 6: Pela Vision Process Flow

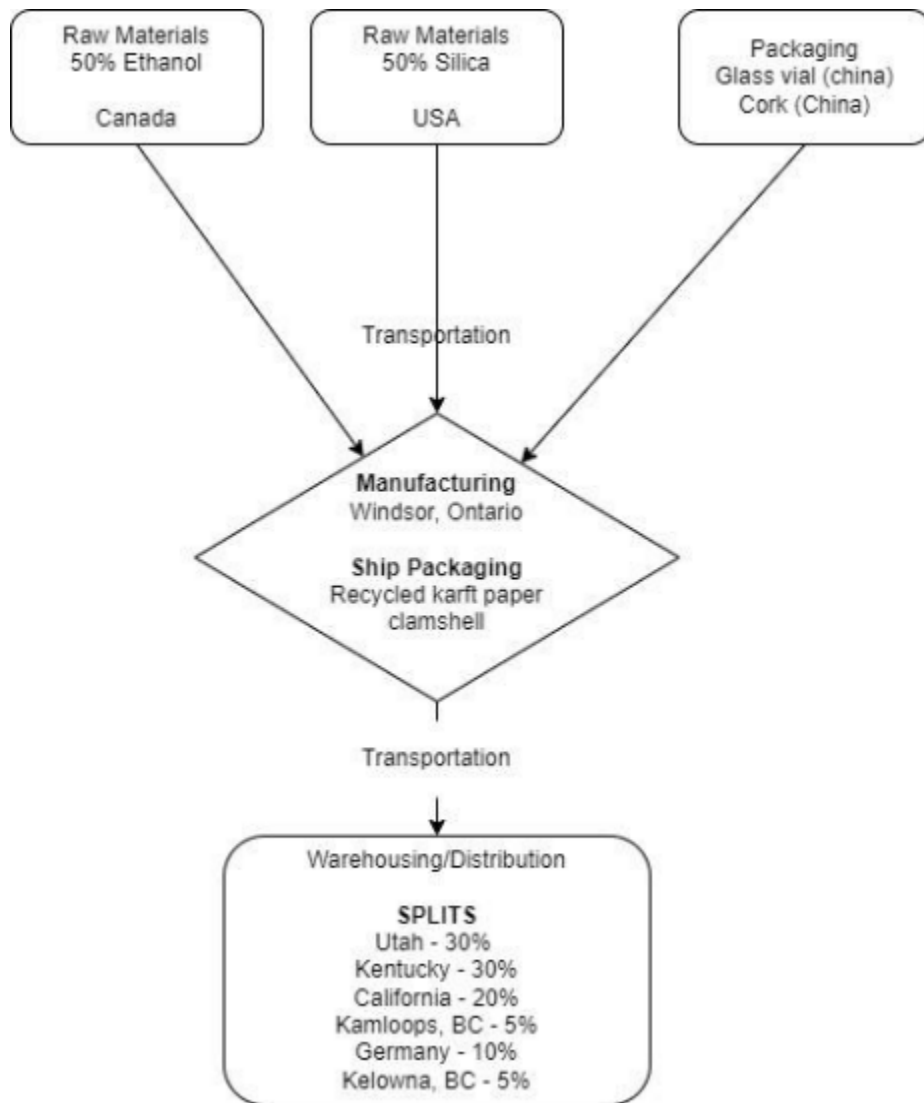


Figure 7: Pela Canopy Process Flow

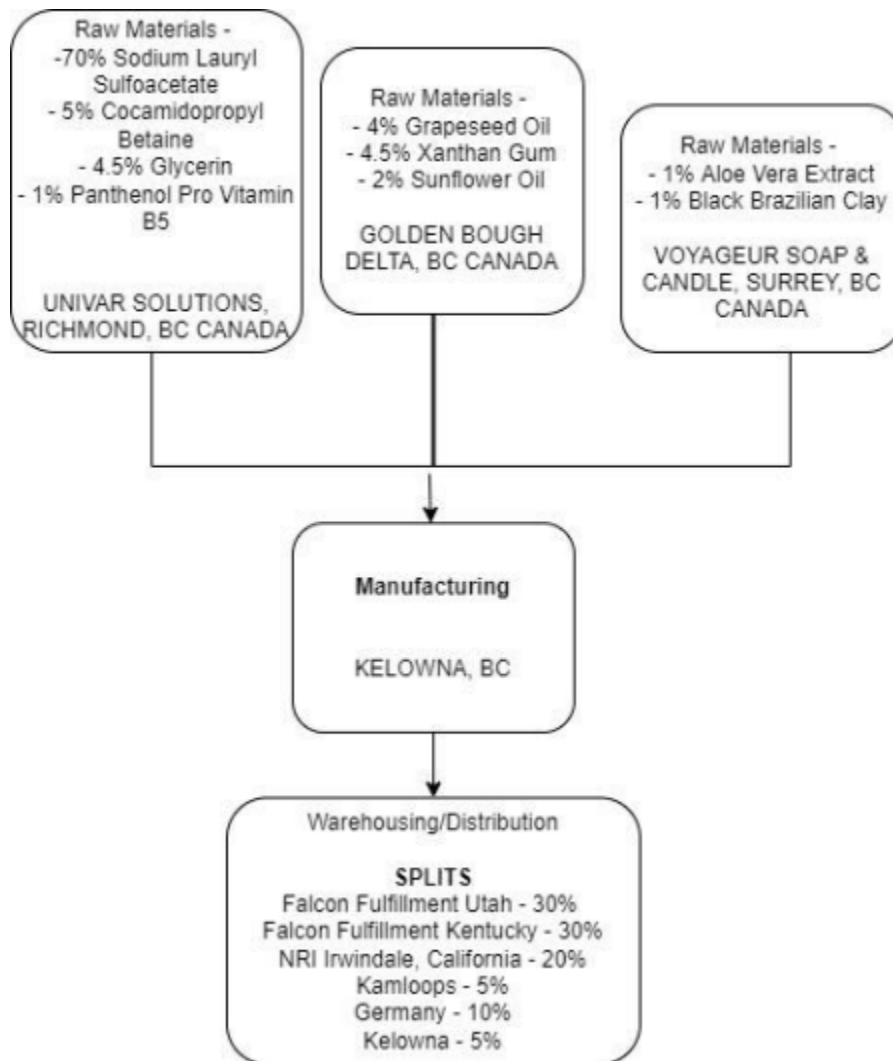


Figure 8: Pela Habitat (Shampoo) Process Flow

Limitations

This LCA calculator includes all aspects of the phone case production process including transportation between facilities and delivery to the warehouse. Because there is a wide variety of information on not only bioplastic manufacturing, but also plant-based cosmetic ingredients (both in alternative LCA calculators and peer-reviewed secondary sources), GreenStep has, where possible, worked to compare similar criteria.



In some instances, primary data was not obtainable (for proprietary purposes), in which case GreenStep sourced relevant, peer-reviewed literature and other reference materials. Additionally, other LCA data and databases were consulted, to round out the dataset that was provided to GreenStep for inclusion in the LCA calculations. With this in mind, GreenStep compiled a data set with the following limitations:

- Road, Ship and Air transportation were standardized to*:
 - Road 2,300 km
 - Ship 12,000 km
 - Air domestic 2,300 km
 - Air international 8,600 km

**for the primary source, manufacturing and distribution. This assumption was applied to all sources, Pela and conventional, as a conservative approach to standardizing global supply chain routes.*

- Pela ships the majority of its phone cases directly to the end-user, bypassing the retail phase of the supply chain.

Assumptions

Materials

For Pela Classic Case, Slim Case, and Accessories:

- Because Pela Case is using flax shive (for its smartphone cases and accessories), which is a byproduct of the flax oil and flax fibre manufacturing process, GreenStep has not included the production of flax in this LCA. The “cradle” in this case is the point at which the flax shive arrives at the biopolymer production facility in Kansas.
- Flaxstic V1 is 40% biobased
- Flaxstic V2 is 60% biobased and compostable
- Flaxstic V1 and Flaxstic V2 are similar enough in formulation, apply Flaxstic V1 coefficients to products containing Flaxstic V2 (*Flaxstic V2 is the biobased bioplastic used in Grip accessory and Slim cases*)
- Pela Classic Case, iPad Cases, Airtag Holders, Airpods, Card Keep Wallets, and Vine composition: 100% Flaxstic V1 material
- Pela Slim case composition: 100% Flaxstic V2 material
- Pela Grip accessory composition: 50% Flaxstic V1 material, 50% Flaxstic V2 material

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- Vine connector: stainless steel with no coating
- Airpod Carabiner: ring is zinc alloy without coating, rivet is copper, spring is high-carbon steel
- For conventional equivalents: raw materials include fossil fuel-derived thermoplastic polyurethane (TPU) and synthetic silicone rubber vs. plant-based equivalent

For Pela Clear Case:

- Clear V1 material is 100% biobased and compostable, composed of sugar cane, carbohydrates, and plant oil (majority sugar cane).
- Clear case composition: 50% Flaxstic V1 material, 50% Clear V1 material

For Pela Vision:

- For Pela Vision: composed of conventional plastic resin plus a generic organic-based additive
- Pela Vision composition: 100% Vision V2 material
- For conventional sunglasses alternative, 100% conventional plastic with no additives

For Canopy:

- Canopy composition: 50% ethanol, 50% silica
- Omit cork stopper from the LCA as quality data could not be obtained prior to the LCA and methodology completion
- Omit manufacturing process data as these specific data could not be obtained prior to the LCA and methodology completion
- For conventional comparison: 100% TPU screen protector (3-pack)

For Habitat:

- Apply Kaolin clay coefficients to Black Brazilian Clay (Black Brazilian Clay is a derivative of Kaolin Clay) and French Green Clay
- For conventional comparison: all raw ingredients are the same, with the differences being the addition of water as a raw ingredient and applying a factor to account for #2 HDPE plastic packaging
- For conventional shampoo composition: 85% water, 15% active ingredients
- One shampoo bar replaces up to 3 plastic bottles of shampoo (from Pela)
- For conventional body wash composition: 80% water, 20% active ingredients



- One body wash bar replaces up to 3 plastic bottles of body wash (from Pela)
- Omit certain ingredients (found in minimum quantities in Habitat formulations) from the LCA due to lack of substantial, quality data (e.g., Panthenol Pro-Vitamin B5; Cetyl Alcohol; Stearic Acid)
- Omit manufacturing process data as these specific terms and equivalent data could not be obtained proper to the LCA and methodology completion

Manufacturing/Packaging/Warehousing

For Pela Classic Cases:

- Manufacturing in Kelowna, BC and China
- Apply same packaging coefficients as in previous LCA
- For conventional equivalents, assume conventional packaging equivalents similar to 2020 LCA

For Pela iPad Cases, Airtag Holders, Card Keep Wallets, Pela accessories, Slim and Clear Cases, and Pela Vision:

- Manufacturing in China only
- Apply same packaging coefficients as standard Pela cases (100% recycled kraft paper)

For Canopy:

- Manufacturing in Windsor, Ontario
- Appropriate manufacturing process coefficients could not be obtained prior to submission of this methodology, and were omitted from the LCA.

For Habitat:

- Manufacturing Kelowna, BC
- Shampoo, conditioner, deodorant, body wash, and lip balm are all manufactured and warehoused at the same locations, the only differences being raw ingredient inputs and manufacturing process.
- Apply the same packaging coefficients as standard Pela cases (100% recycled kraft paper)
- Appropriate manufacturing process coefficients could not be obtained prior to submission of this methodology, and were omitted from the LCA.



For all Pela products analyzed:

- Assume product warehousing splits per Pela's data (Table 3):

Table 3: Share of each distribution location

Warehousing Location	Split (as a percentage)
Falcon SL (Utah, USA)	30%
Falcon KY (Kentucky, USA)	30%
NRI USA (California, USA)	20%
Byrd (Berlin, Germany)	10%
NRI Canada (Kamloops, BC)	5%
KSS (Kelowna, BC)	5%

Waste

- Assume, as per 2020 LCA, that
 - 45% of Pela Cases go to landfill
 - 50% are composted
 - 5% are returned via the Pela 360 Program
- 100% wastage at landfills was assumed for conventional counterparts.

LCA Output Tables

The below data illustrate the outputs from the 2021 Life Cycle Assessment. These data identify the impacts of Pela's product groups, in the areas of carbon emissions (kg CO₂e or carbon dioxide equivalent), water consumption (in Litres), and waste disposal/recycling (measured in kilograms or kg).

The data are broken down by manufacturing location and the specific products that are produced at each location. Impacts are assessed on a per-product basis and modelled individually: for example, the impacts identified in association with the Huawei P30 Pro Classic smartphone case are specific impacts for that product. Similarly, impacts identified



for an example iPhone (in this case, the iPhone 11) are the specific impacts for that product.

For Kelowna manufacturing, only Pela's classic smartphone cases and Habitat products were considered, as all accessories and Pela Vision are manufactured in China. Langley manufacturing was not considered in this report as the manufacturing of Habitat moved to Kelowna in late 2020. Similarly for Windsor manufacturing, only Pela's Canopy liquid screen protector was considered. Finally, all smartphone cases, iPad cases and Pela accessories (Airtag Holders, Card Keep Wallets, Grip, Vine, Slim and Clear cases, Pela Vision), were included for China manufacturing.

Because this LCA builds upon the 2020 LCA, the data below are for net new products only, i.e. products that were brought online following the conclusion of the 2020 LCA. In the instance of Pela's cases (Table 4), for example, the iPad case was the new product line and therefore its impacts are included below. The full product calculator will include updated impacts for all Pela product groups, including all of the smartphone case sizes for which it manufactures its Classic case.

Table 4: Carbon, Water, and Waste impacts for the full life cycle of Pela's China manufacturing.

Product	Pela China Manufacturing		
	Carbon kg CO2e	Water (L)	Waste (kg)
iPad Cases	2.58	6.03	0.08
Card Keep Wallets	0.64	1.40	0.02
Airtag Holders	0.19	1.20	0.00

Overall Impact

Based on the LCA calculations and comparing side-by-side, the impact of Pela Case products on the environment, when compared to their conventional equivalent, can be demonstrated in the below figures (four sets of data corresponding to each of the stated product groups).



Table 5: Impact comparison of 100,000 Pela units from each of the Group 1 product categories, as compared to 100,000 of their conventional counterparts.

	Tonnes CO2e	Kilolitres Water	Tonnes Waste
Pela Classic	139	567	3
Conventional	182	849	15
Pela Slim	111	561	3
Conventional	158	843	14
Pela iPad Cases	258	603	8
Conventional	357	892	43
Pela Card Keep Wallets	64	140	2
Conventional	180	863	38
Pela Airtag Holders	19	120	0
Conventional	99	836	10
Pela Airpod Holder	99	558	2
Conventional	148	843	14
Pela Grip	98	557	2
Conventional	144	841	14
Pela Vine	106	560	2
Conventional	155	844	14

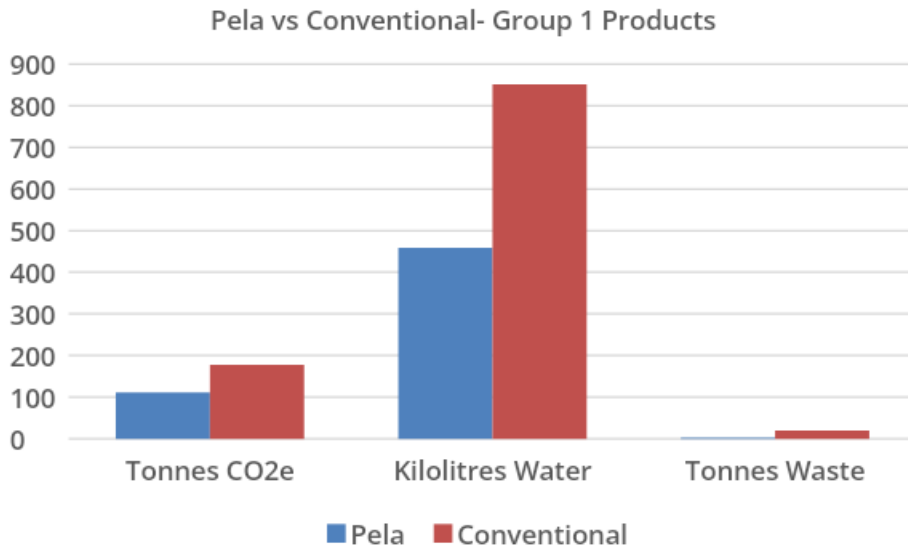


Figure 9: The average impact from Pela’s Group 1 Products compared to their conventional counterparts (head-to-head comparison of 100,000 units). **Note that impacts were generally similar across Group 1 products, so an average impact was assessed.*

Table 6: Impact comparison of 100,000 Pela units from the Group 1A product category, as compared to 100,000 of their conventional counterparts.

	Tonnes CO2e	Kilotres Water	Tonnes Waste
Pela Clear Case	123	564	3
Conventional	171	845	15

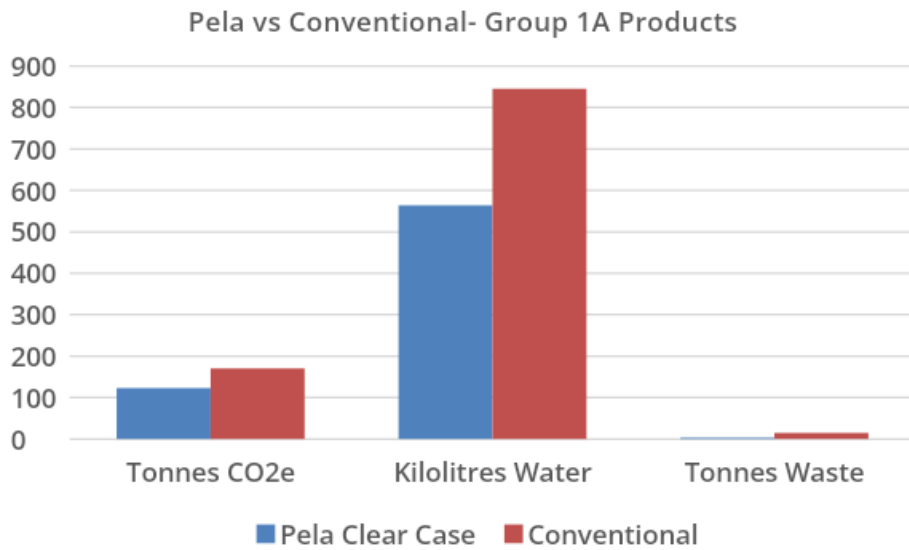


Figure 10: The impact from Pela’s Group 1A Product category, compared to its conventional counterpart (head-to-head comparison of 100,000 units).

Table 7: Impact comparison of 100,000 Pela units from the Group 2 product category, as compared to 100,000 of their conventional counterparts.

	Tonnes CO2e	Kilotres Water	Tonnes Waste
Pela Vision	89	555	2
Conventional Sunglasses	132	838	11

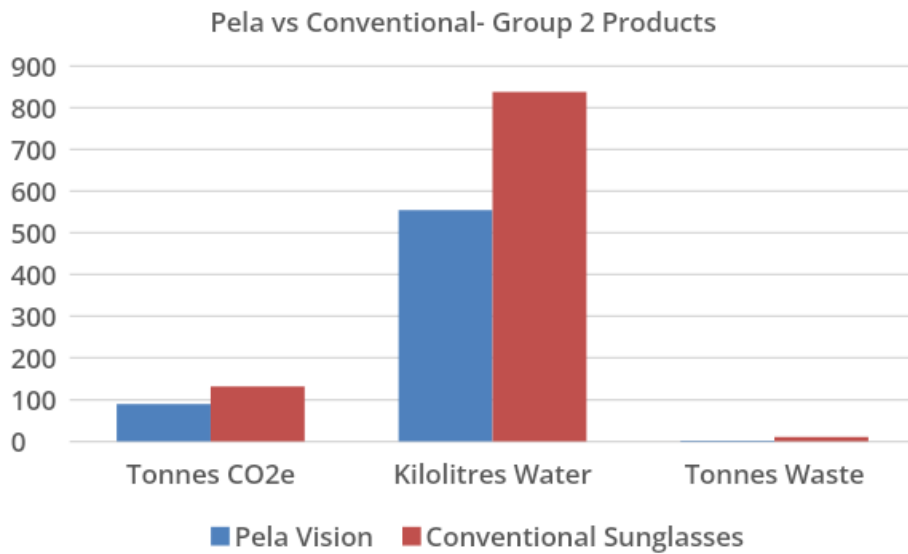


Figure 11: The impact from Pela’s Group 2 Product category, compared to its conventional counterpart (head-to-head comparison of 100,000 units).

Table 8: Impact comparison of 100,000 Pela units from the Group 3 product category, as compared to 100,000 of their conventional counterparts.

	Tonnes CO2e	Kilotres Water	Tonnes Waste
Pela Canopy	108	554	1
Conventional Screen Protector	135	837	10

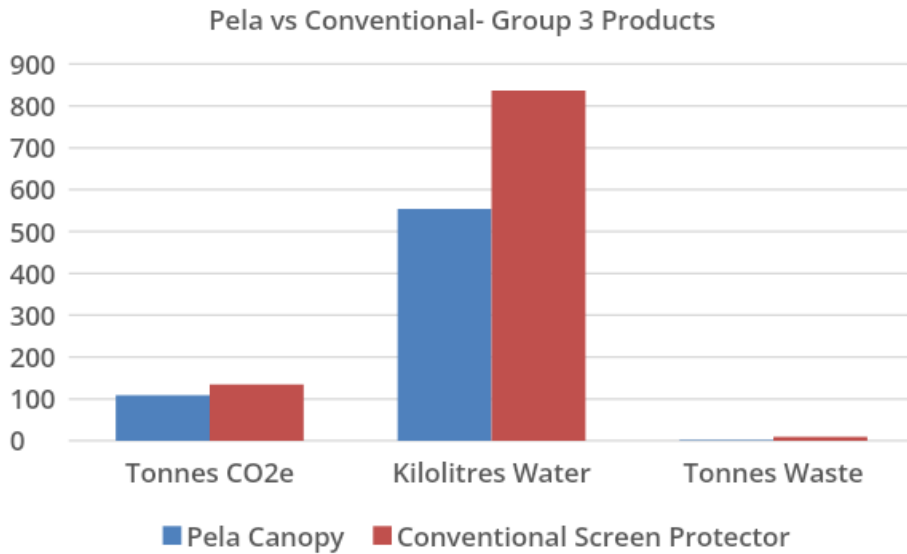


Figure 12: The impact from Pela’s Group 3 Product category, compared to its conventional counterpart (head-to-head comparison of 100,000 units).

Table 9: Impact comparison of 100,000 Pela units from the Group 4 product category, as compared to 100,000 of their conventional counterparts.

	Tonnes CO2e	Kilolitres Water	Tonnes Waste
Pela Shampoo Bar	172	559	1
Conventional	192	842	16
Pela Body Wash Bar	172	559	1
Conventional	232	843	63
Pela Deodorant*	260	584	1
Conventional	282	866	17
Pela Lip Balm	103	557	1
Conventional	140	837	10



Notes: for the purposes of this LCA, GreenStep analyzed comparisons for conventional shampoo, body wash, deodorant, and lip balm. It was assumed that the conditioner bar would have similar impacts and was omitted from comparisons. *Additionally, an average was taken for the deodorant values. Finally, packaging coefficients were assumed to be the same for all Pela Habitat products.

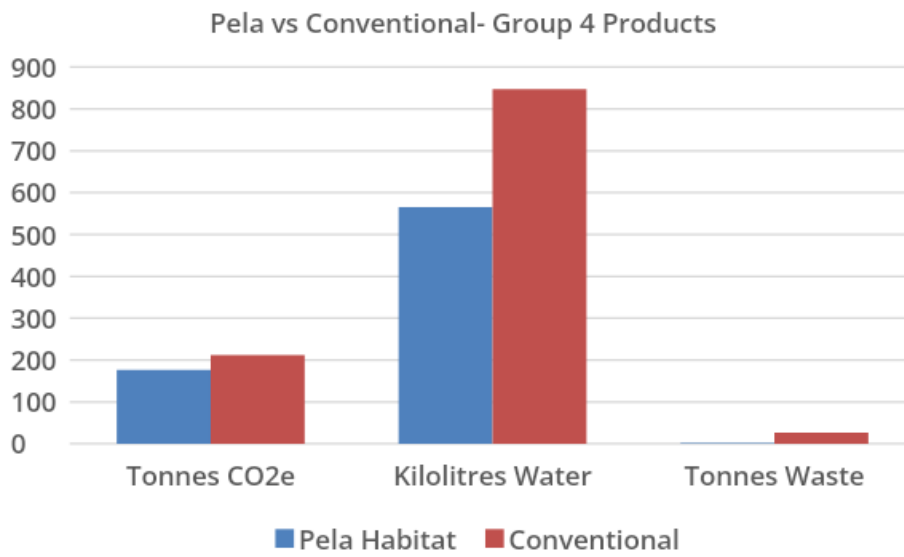


Figure 13: The average impact from Pela’s Group 4 Products compared to their conventional counterparts (head-to-head comparison of 100,000 units).

**Note that impacts were generally similar across Group 4 products, so an average impact was assessed.*

Contribution to Carbon Footprint by LCA Step

Similar to the 2020 LCA, the largest impact along the full life cycle for all of Pela’s products occurred at the transportation stage. For the purposes of this LCA, all upstream and downstream emissions from transportation were lumped together to achieve one transportation dataset (this includes transportation of raw goods to manufacturing facilities, as well as finished products to distribution centres, and from distribution centres to the customer).



As noted in the assumptions section, accurate manufacturing process information for Canopy, Vision, and Habitat products (as well as conventional, traditional equivalents through peer-reviewed secondary data) could not be obtained prior to the conclusion of this LCA and were therefore omitted from the below calculations.

Because carbon contributions were similar across all Group 1 and Group 4 products, average values were calculated to provide the below charts.

Table 10: Contribution to Carbon Footprint by LCA Step for Groups 1- 5* Products.

Group 1 Products	Raw Materials	Pre-Processing	Manufacturing	Transportation	Packaging	Distribution	Waste
Group 1	15%	3%	3%	41%	29%	7%	2%
Group 1A	10%	3%	2%	42%	33%	7%	2%
Group 2	4%	2%	1%	38%	46%	9%	0%
Group 3	4%	2%	1%	48%	38%	8%	0%
Group 4	24%	0%	0%	51%	21%	4%	0%
Group 5	74%	0%	9%	9%	6%	0%	2%

* The results from [LCA of Lomi](#) were used to show its contribution to the 2021 carbon footprint

Interpreting Results

The data above, and the tables below, show that Pela products, across the board, are categorically lower in impact across all three metrics as compared to their conventional counterparts. Moreover, and particularly with Pela's shampoo and body wash bars, significantly less waste is produced and water used as a result of concentrating the product into bar-form rather than traditional, liquid shampoo and body wash.

Pela Reduces Its Impact

Pela Group 1 products are shown on average to produce **40.47% less CO₂e**, consume **46.22% less water** and produce **85.90% less waste** than their conventional counterparts.



These reductions amount to saving 66 tonnes of CO₂e from being emitted into the atmosphere, 393 kilolitres of water and 17 tonnes of waste per 100,000 units.

Similar results were found for all Product Groups, as seen in the below tables:

Table 11: Percent reduction in impact from Group 1A, and total CO₂e, water, and waste saved, per 100,000 cases.

Pela Clear Case	Tonnes CO ₂ e	Kilolitres Water	Tonnes Waste
Percent Reduction	27.88%	33.32%	78.20%
Total Saved	48	282	12

Table 12: Percent reduction in impact from Group 2, and total CO₂e, water, and waste saved, per 100,000 sunglasses.

Pela Vision	Tonnes CO ₂ e	Kilolitres Water	Tonnes Waste
Percent Reduction	32.08%	33.84%	82.56%
Total Saved	42	284	9

Table 13: Percent reduction in impact from Group 3, and total CO₂e, water, and waste saved, per 100,000 screen protectors.

Pela Canopy	Tonnes CO ₂ e	Kilolitres Water	Tonnes Waste
Percent Reduction	19.70%	33.79%	85.75%
Total Saved	27	283	8

Pela Group 4 products (Habitat Botanicals) are shown on average to produce 17.67% less CO₂e, consume 33.30% less water and produce **91.65% less waste** than their conventional counterparts. These reductions amount to saving 35 tonnes of CO₂e from being emitted into the atmosphere, 282 kilolitres of water and 25 tonnes of waste per 100,000 units produced.



Positive Changes Pela Has Made

With the addition of Habitat to Pela's product offerings, Pela is well-positioned to shift the tide on the conventional personal hygiene products market. Traditional shampoo, conditioner, and body wash bottles (as well as deodorant and lip balm tubes) are typically composed of plastics whose recyclability is assumed, but not guaranteed. Pela's Habitat line is completely plastic-free, composed solely of recycled kraft paper, easily composted or recycled once empty. Additionally, by concentrating its shampoo, conditioner, and body wash products into "bar" form, Pela has eliminated the vast majority of water that is often the main ingredient in conventional equivalents.

Purchasing Pela Habitat Botanicals products reduces carbon emissions by 18%, water consumption by 33% and **waste production by 92%**, compared to conventional equivalents.

Recommendations

Plastic pollution continues to be a major hot topic in the realm of sustainability and consumerism and Pela is on the right track by eliminating as much packaging from its supply chain as possible. As of this writing, approximately 628,005 consumers have switched from conventional, petroleum-based smartphone cases to compostable ones.

Further, this LCA provides tangible evidence that by opting for plastic-free personal hygiene products, Pela **customers reduce their average waste generated by as much as 92%**, when compared to purchasing similar products packaged in plastic. Based on these findings, along with Pela's 2021 units sold, and combined with its claim that one bar of its shampoo, conditioner, and body wash replaces up to three plastic bottles of equivalent, conventional products, this means that on average, **Pela customers have saved upwards of 250,000 plastic bottles from entering waste streams globally.**

- ❑ Continue to communicate the message of plastic-free and provide customers with data from the LCA to back up claims.



With the Pela 360 program now expanding to include conventional sunglass take-backs, Pela is further reducing its impact and aligning with its mission to keep traditional plastic from ever being produced.

- ❑ Continue gathering robust data and metrics on the Pela 360 Program and verify the amounts of material that supplants primary petroleum-based plastics. Providing these data to the LCA database will result in a further reduction of impacts.
- ❑ Continue to conduct customer surveys to gain a better understanding of what percentage of cases, accessories, and Habitat product packaging are composted by customers at the end of their usable lives.

While much research has been done in the last several years on the efficacy of bioplastics, they continue to be a contentious issue, as both their material composition and ability to truly biodegrade have been called into question. It is therefore imperative that Pela remain open and transparent about its proprietary, Flaxstic material and subsequent new bio-based, landfill biodegradable, and compostable plastics. This LCA re-emphasizes that Pela is on the right track and that its bio-based content truly does have a lower impact than a similar, petroleum-based product.

- ❑ Investigate the potential for third-party laboratory testing of the biodegradability and off-gassing of raw materials used in bio-based, compostable- or landfill degradable plastic formulations used, under aerobic and anaerobic conditions.

The path to zero is well-trodden for Pela, and continued care and consideration at each step of the lifecycle is imperative, to remain relevant and transparent as customers demand truly sustainable alternatives to conventional products. Part of Pela's work involves maintaining relationships with several non-profit organizations such as the Save the Waves Coalition, and Surfrider Foundation. Pela is also a 1% For the Planet member, a certified B Corp, and certified through Climate Neutral.

As Pela continues to grow and diversify its product offerings, careful attention should be paid to confirm that each step along each product's life cycle is being accurately accounted for and that each step is working towards the goal of a fully-circular product.

- ❑ Several assumptions were made in order to finalize this LCA, including packaging materials for all Pela products and impact data for several of the raw ingredients for

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Pela's Habitat personal hygiene products (in many cases, there simply isn't peer-reviewed life cycle data available for many of the products used in personal hygiene products). GreenStep recommends that their team work with Pela to identify assumptions that can be confirmed with the addition of robust, primary data (e.g., specific packaging metrics for each product group in the LCA, or updated sources to confirm raw ingredient impacts).

- ❑ Provide updated manufacturing process data for Pela Canopy, Pela Vision, and Habitat product groups, which will provide enough data to support an updated Carbon Footprint per LCA Step analysis.
- ❑ Establish regular check-ins for LCA updates, to capture any important changes along the life cycle of Pela products
- ❑ Maintain relationships with key partners in the realms of plastic pollution advocacy, water production, and carbon accounting.
- ❑ Continue to set ambitious goals with timelines and targets for waste and carbon reduction, "the path to zero," as well as customer composting and recycling. Communicate these publicly.
- ❑ Explore neutralizing conventional plastic consumption through plastic offsets.
- ❑ Continue to work with foreign manufacturers on sustainable energy sourcing, to the degree that Pela is able.

This LCA clearly demonstrates the positive impact on the environment that results from replacing conventional, petroleum-based - and plastic-packaged components with plant-based and plastic-free alternatives, or eliminating them entirely. Given Pela's growing customer base, it is clear that the market for truly sustainable alternatives is on the rise. This will result in lower carbon emissions, less water consumption, and less waste in already overcrowded landfills. It also marks a transition in the way customers engage with reputable brands, consume material goods, and re-think their products and the waste that comes with them. The resulting impact from these efforts, as noted, is intrinsic and difficult to measure, but the result will be a more engaged, conscious consumer and, presumably, a less wasteful one.



Conclusions

Pela's stated goal is to keep one billion pounds of plastic from ever being created. To accomplish this goal, they "create everyday products without everyday waste." With the continued success of its Classic smartphone case, Pela has now grown its product offerings as mentioned previously to include numerous smartphone case designs, phone accessories that similarly replace conventional, petroleum-based equivalents, and personal hygiene products that eliminate plastic and water waste from daily hygiene routines. This wholesale reduction in traditional petroleum-based plastics across its product line has resulted in an LCA outcome that is very much in line with its goals.

While this LCA, similar to the 2020 findings, cannot fully estimate intrinsic positive impacts (for example the positive impacts that using natural, plant-based ingredients in personal hygiene products has on human, animal, and environmental health), it is clear that by purchasing Pela products (as opposed to the generic, conventional equivalent), a wholesale reduction in carbon emissions, water consumption, and waste production is achieved.

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Appendices

Appendix A: Habitat Raw Ingredients

Data provided by the Pela team

Product	Composition	%	Sourced from
Shampoo Bar	Sodium Lauryl Sulfoacetate	77%	Univar Solutions
	Cocamidopropyl Betaine	5%	Univar Solutions
	Grapeseed Oil	4%	Golden Bough
	Glycerin	4.5%	Univar Solutions
	Xanthan Gum	4.5%	Golden Bough
	Sunflower Oil	2%	Golden Bough
	Aloe Vera Extract	1%	Voyageur Soap & Candle
	Panthenol Pro Vitamin B5	1%	Univar Solutions
	Black Brazilian Clay	1%	Voyageur Soap & Candle
Body Wash Bar	Sodium Lauryl Sulfoacetate	76.2%	Univar Solutions
	Cocamidopropyl Betaine	4.95%	Univar Solutions
	Grapeseed Oil	3.96%	Golden Bough
	Glycerin	4.45%	Univar Solutions
	Xanthan Gum	4.45%	Golden Bough
	Sunflower Oil	1.98%	Golden Bough
	Aloe Vera Extract	0.99%	Voyageur Soap & Candle
	Panthenol Pro Vitamin B5	0.99%	Univar Solutions
	Tea Tree Essential Oil	0.99%	Golden Bough
	French Green Clay	0.99%	Voyageur Soap & Candle
Conditioner Bar	Incroquat Behenyl TMS-50	32.2%	Univar Solutions
	Cetyl Alcohol	23.7%	Univar Solutions
	Shea Butter	6.7%	Univar Solutions
	Cocoa Butter	16.9%	Univar Solutions
	Coconut Oil	8.47%	Univar Solutions
	Stearic Acid	6.77%	Univar Solutions

Conditioner Bar

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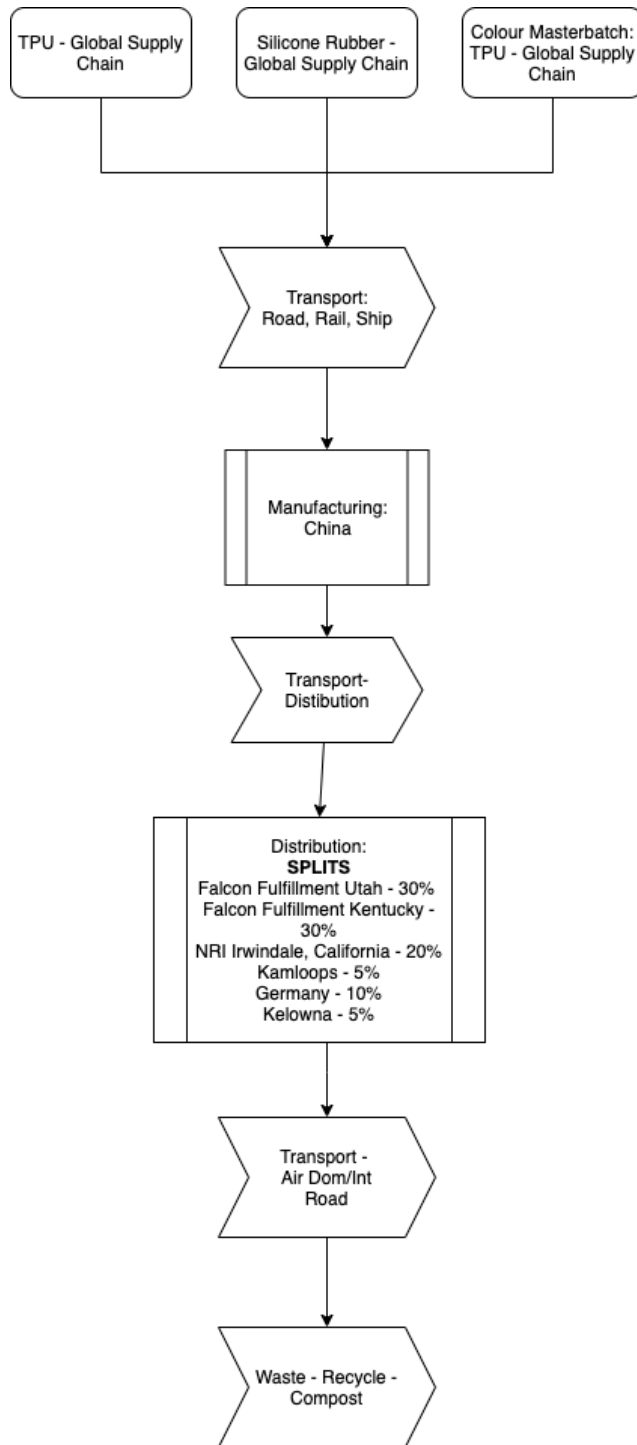
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	Aloe Vera Leaf Extract	1.69%	Voyageur Soap & Candle
	Glycerin	1.69%	Univar Solutions
	Panthenol Pro-Vitamin B5	1.01%	Univar Solutions
	Sunflower Oil	0.67%	Golden Bough
Deodorant - LAVENDER	Coconut Oil	24%	Univar Solutions
	Shea Butter	17.6%	Univar Solutions
	Arrowroot Powder	24%	Golden Bough
	Candelilla Wax	10.4%	Univar Solutions
	Kaolin Clay	7.2%	Univar Solutions
	Baking Soda	6.4%	Univar Solutions
	Grapeseed Oil	8%	Golden Bough
	Vitamin E Oil	1.2%	Univar Solutions
	Lavender Essential Oil	1.12%	Golden Bough
Deodorant - COCONUT VANILLA	Coconut Oil	24%	Univar Solutions
	Shea Butter	17.6%	Univar Solutions
	Arrowroot Powder	24%	Golden Bough
	Candelilla Wax	10.4%	Univar Solutions
	Kaolin Clay	7.2%	Univar Solutions
	Baking Soda	6.4%	Univar Solutions
	Grapeseed Oil	8%	Golden Bough
	Vitamin E Oil	1.2%	Univar Solutions
	Vanilla Oil	0.56%	Voyageur Soap & Candle
	Natural Coconut Fragrance	0.56%	Golden Bough
Lip Balm	Cocoa Butter	62.5%	Univar Solutions
	Candelilla Wax	16.2%	Univar Solutions
	Grapeseed Oil	12.1%	Golden Bough
	Avocado Oil	8.1%	Golden Bough
	Vanilla Oil	0.97%	Voyageur Soap & Candle

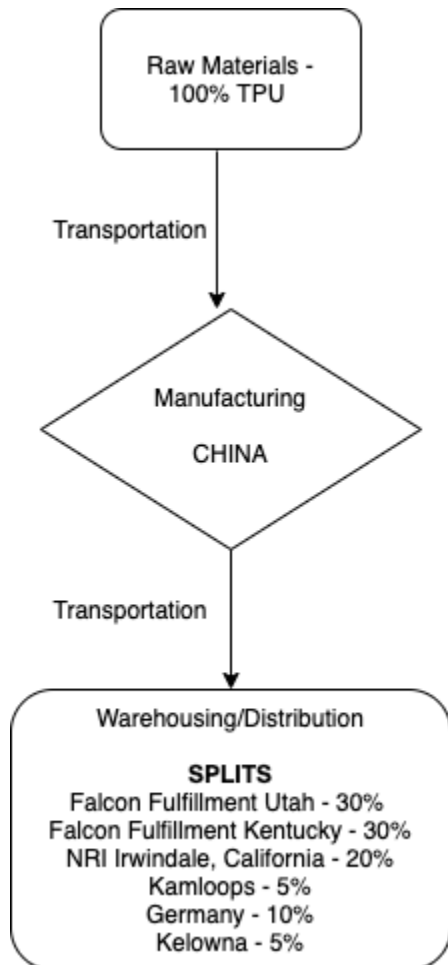


Appendix B: Conventional Flow Charts

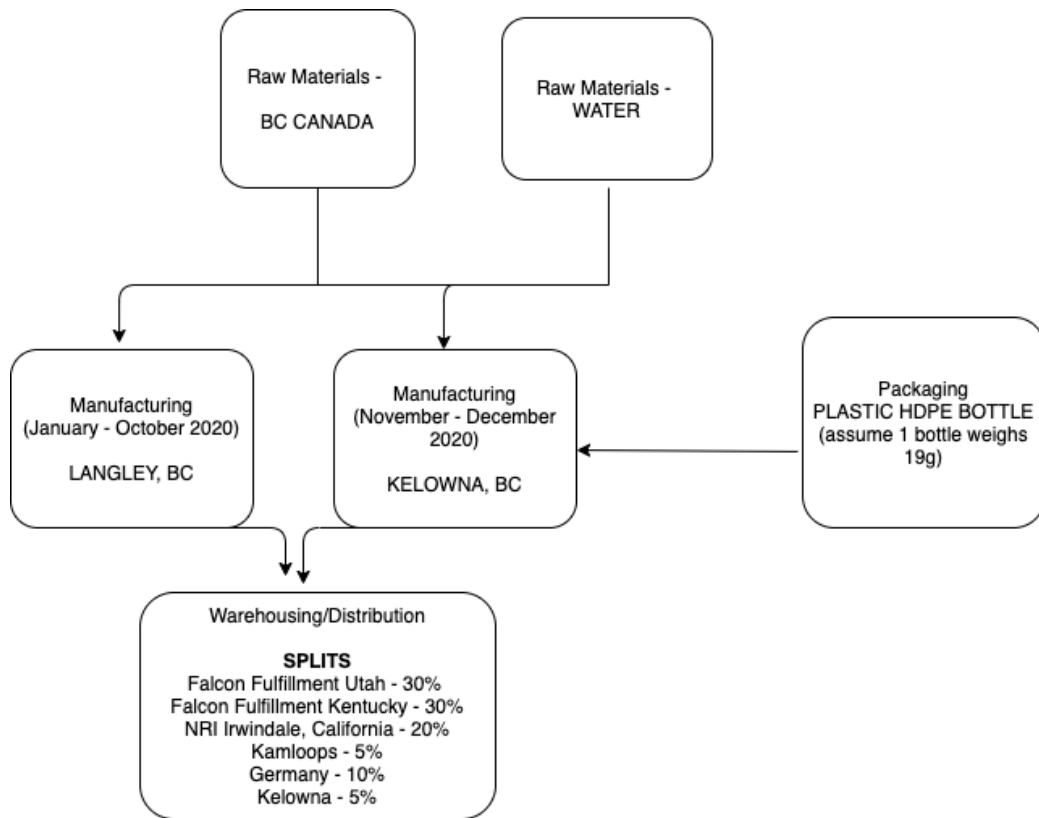




Conventional Smartphone Case Process Flow - note that this process flow can also be applied to conventional smartphone case accessories such as Apple Watch Strap, Grip, and Airpod Holder.



Conventional Screen Protector Process Flow - assume that conventional screen protectors are composed of 100% TPU. Assume similar transportation and warehousing as Pela.



Conventional Shampoo Process Flow - note that this process flow can also be applied to conditioner and body wash. Assume a ratio of 85% water to 15% active ingredients for conventional shampoo formulation (for body wash: 80% water, 20% active ingredients). Assumed same transportation/warehousing as Pela.