Summary Report - Lomi CO_2e Impact and Organic Waste Scenarios

Updated July 04, 2022,

Overview

GreenStep has calculated an impact analysis of Pela's Lomi over various scenarios. This assessment aims to compare carbon impact from each scenario to identify which scenario generates the lowest impact. The impacts were assessed on a kg CO2e/Lomi basis, where "CO2e" is carbon dioxide equivalent, and "per Lomi" is equal to 365 kg of organics, generated through the below-listed scenarios, and processed using Lomi (running seven times per week, and 52 weeks per year, each time treats one kg of organic).

Pela's Lomi is an electronic device that helps turn food scraps, organic waste, and certified compostable packaging and home bioplastics into compost (at the push of a button). This report summarizes the methodology used to estimate the CO2e emissions from different scenarios and presents the results.

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Inputs and Scope of Analysis

Boundary

The boundary used for this report includes the life cycle of Lomi before it arrives at the consumer's home and all the emissions from the time organic waste is generated at home until it is landfilled or applied as compost.

Baseline

The baseline scenario from which all other scenarios are based assumes that no Lomi is involved and that organic waste is hauled from home to the landfill. This scenario also assumes that there is no methane capture at the landfill.

Scenarios

Nine scenarios have been generated:

1. Baseline: food wastes are sent directly to the landfill, no Lomi is used, and no green bin is used

2. Compost (no Lomi): food wastes are directly transported to a composting facility (using a green bin), then applied to land as compost, no Lomi is used

3. Yard (no Lomi): food wastes are composted and used at home, no Lomi is used
4. Lomi with REC + Landfill: food wastes are treated by Lomi at home, powered by 100% low-impact renewable energy certificates (RECs), then sent to a landfill
5. Lomi + Landfill: food wastes are treated by Lomi at home, powered by a region-specific electricity grid mix, then sent to landfill
6. Lomi with REC + Compost: food wastes are treated by Lomi at home, powered by 100% low-impact renewable energy certificates (RECs), then transported to a composting facility, then applied to land as compost
7. Lomi + Compost: food wastes are treated by Lomi at home, powered by a region-specific electricity grid mix, then transported to a composting facility, then applied to land as compost
8. Lomi with REC + Yard: food wastes are treated by Lomi at home, powered by 100% low-impact renewable energy certificates (RECs), then used at home

9. Lomi + Yard: food wastes are treated by Lomi at home, powered by a region-specific electricity grid mix, then used at home

Scenarios 1-2 involved the following stages:

1. Organic waste produced
2. Transport to landfill (scenario 1) / Transport to composting facility (scenario 2)
3. Landfilling (scenario 1) / Commercial composting (scenario 2)
4. Land application (scenario 2)

Scenarios 3 and 8-9 involved the following stages:

1. Organic waste produced
2. Lomi processing (scenarios 8-9)
3. Land application of compost at home yard

Each further scenario that included the Lomi (4 through 7) involved the following stages:

1. Lomi processing
2. Transport to landfill (scenarios 4-5) / Transport to composting facility (scenarios 6-7)
3. Landfilling (scenarios 4-5)
4. Commercial composting (scenarios 6-7)
5. Land application of Lomi product (compost) (scenarios 5-6)

Assumptions

The following assumptions have been made in the calculation of the impacts for each scenario:

1. Lomi is cycled seven times per week, using 0.8kWh per cycle
2. Lomi treats 1 kg of organic waste per cycle (i.e., 7 kg of organic waste per week, which equals 356 kg per year)
3. During a cycle, Lomi reduces the mass of organic waste by 70%
4. Landfill impact from sending Lomi-treated organics to landfill is the same as sending non-treated organics to waste, on a per MT basis
5. Since the 70% reduction in mass through the Lomi process comes from evaporated water and because the emissions from landfilling are calculated based on the weight of organic content of wastes, the landfill emissions for the scenarios with Lomi (scenarios 4-5) are assumed to be the same as the baseline scenario (i.e., 0.48 MtCO2e/Mt).

6. The impact of using the Lomi soil amendment is the same as applying compost to land
7. Transportation impact from composting facility to land is the same as from home to landfill
8. The impacts of LomiPods and filters have not been considered in this report
9. See Appendix A for assumptions from the US EPA's Waste Reduction Model (WARM)

Stages & Methodology

All calculations are based on 365 kg of organic waste generated per year (the actual Lomi outputs that an average consumer might produce). To calculate the emissions resulting from the electricity required to run Lomi in the US states, US National Average Grid Emissions data were used, and pounds of CO2e/kWh were converted to kg CO2e/kWh. National Inventory Report from Environment Canada was used to calculate the emissions from electricity use in Canadian Provinces.

Lomi Processing

- For Scenarios 5, 7, and 9 (where Lomi is used to process organic waste, but no RECs are used), GreenStep calculated that one Lomi emits **112.6 kg CO2e/Lomi at the Lomi processing stage (i.e., 0.3084 kg CO2e/kg organics)**. To obtain this value, GreenStep calculated the following:

= 365 kg organics/Lomi x 0.3084 kg CO2e/kg organics

Where 0.3084 kg CO2e/kg organics = 0.8 kWh/kg organics x 0.386 kg CO2e/kWh (CO2e/kWh based on US National Average Grid Emissions data)

- For Scenarios 4, 6 and 8, GreenStep calculated that one Lomi emits **0.000 kg CO2e/Lomi at the Lomi processing stage**. To obtain this value, GreenStep calculated the following:

= 365 kg x 0.000 kg CO2e/kg organics

Where 0.000 kg CO2e/kg organics = 0.79781 kWh/kg organics x 0.000 kg CO2e/kWh *(investment in RECs brings this value to zero)*

Transport to landfill / Transport to organics

- For Scenarios 1 and 2 GreenStep calculated that transportation of 365 kg of food waste (the actual Lomi outputs that an average consumer might produce) emits

6.622 kg CO_2e (i.e., 0.0181 kg CO_2e/kg organics) at the transport to landfill/organic stage. To obtain this value, GreenStep calculated the following:

=365 kg x 0.0181kg CO_2e/kg organics

Where 0.0181kg CO_2e/kg (MT CO_2e/MT) = (0.0200 MT CO_2e/Short Ton organics x 0.9072 (MT/Short Ton conversion factor)) x 1 MT

- For Scenarios 4-7, GreenStep calculated that one Lomi emits **1.987 kg CO_2e (i.e., 0.0054 kg CO_2e/kg organics) at the transport to landfill/organics stage**. To obtain this value, GreenStep calculated the following:

= 365 kg x 0.0054 kg CO_2e/kg organics

Where 0.0054 kg CO_2e/kg organics (MT CO_2e/MT organics) = 0.0181 kg CO_2e/kg organics x 0.3 *(0.0181 kg has been multiplied by 0.3 as there is a 70% reduction in mass through the Lomi process. This calculation is looking at the CO_2e impact of transporting 1 kg of what starts as wet organic waste and is now dry organic waste during the transportation to the farm stage).*

- For Scenarios 3, and 8-9, no transportation was accounted for as it was assumed that the organic output from Lomi stays on the customer's premises.

Landfill

- For Scenario 1, GreenStep calculated that processing 365 kg of food waste (the actual Lomi outputs that an average consumer might produce) emits **175.495 kg CO_2e (i.e., 0.4808 kg CO_2e/kg organics) at the landfilling stage**. Since the 70% reduction in mass through the Lomi process comes from evaporated water, for Scenarios 4-5, GreenStep calculated that one Lomi emits **175.495 kg CO_2e (i.e., 0.4808 kg CO_2e/kg organics) at the landfilling stage, as well**. To obtain this value, GreenStep calculated the following:

=365 kg x 0.4808 kg CO_2e/kg

Where 0.4808 kg CO_2e/kg (MT CO_2e/ MT) = 0.5300 MT CO_2e/Short Ton* x 0.9072MT/Short Ton conversion factor

**Sums Landfill CH_4 and Landfill Carbon Storage from: the US EPA Waste Reduction Model (WARM), page 1-32, Exhibit 1-46.*

- For Scenarios 2, 3, and 6-9, no landfilling was accounted for as these scenarios all included composting (either commercial or at home).

Commercial Compost

- For Scenarios 2, and 6-7, GreenStep calculated that one Lomi emits **9.934 kg CO2e (i.e., 0.0272 kg CO2e/kg organics) at the commercial composting stage** *(accounting for transport of compost to the facility, turning of compost, and transport to land for application)*. To obtain this value, GreenStep calculated the following:

  =365 kg x 0.0272 kg CO2e/kg organics (for transport and turning of compost)

Where 0.0272 kg CO2e/kg (MT CO2e/MT) = 0.0300MT CO2e/Short Ton organics x 0.9072 (MT/Short Ton conversion factor)

Transport to the Land

- For Scenarios 2, and 6-7, to obtain the emissions from the transportation of treated compost to the land value, GreenStep calculated the following:

=365 kg x 0.0054 kg CO2e/kg organics* (transport to land)

**Transportation to the farm from the composting facility is not included in the EPA LCA data. We have assumed that this impact is the same as the transport to the landfill. The value is then multiplied by 0.3 as there is a 70% reduction in mass through the Lomi process (and assuming the same reduction happens during the composting treatment of wet organics). This calculation is looking at the CO2e impact of transporting 1 kg of what starts as wet organic waste and is now dry organic waste during the transportation to the farm stage.*

Land application of Lomi product

This stage assumes that the sequestration rate of the Lomi compost is the same as other types of compost.

- For Scenarios 2-3*, and 6-9, GreenStep calculated that one Lomi has a net positive impact of **-49.668 kg CO2e at the land application of the Lomi product stage**. To obtain this value, GreenStep calculated the following:

= 365 kg x -0.1361 kg CO2e/kg organics

Where -0.1361 kg CO2e/ kg (MT CO2e/ MT) = -0.1500 MT CO2e/Short Ton** x 0.9072 (MT/Short Ton conversion factor)

**Scenarios 2-3 do not include Lomi processing. This value is emissions from land application of 365 kg of organics.*

***This value sums fugitive emissions, fertilizer offset and soil carbon storage from the [US EPA Waste Reduction Model (WARM)](), pg. 1-29, Exhibit 1-43*

Life Cycle Assessment of Lomi

The upstream emissions (kg CO2e) from the production of Lomi were collected from the 2021 LCA report on Pela products. The LCA results show that a Lomi emits 70.55 kg CO2e, which includes emissions from the manufacturing, transportation, warehousing, distribution*, and end of life of the Lomi. It should be noted that Pela offsets its carbon footprint, so the emissions from Lomi production are set as zero.

* It was assumed that the average distance from the warehouse to the user's home is 500 km.

Break Even Point

The concept of environmental payback period (break even point) has been used to estimate the comparative environmental impact of multiple conventional and emerging technologies, specifically in energy applications. Here, the carbon break even point is calculated as the number of cycles required to run the Lomi to save the CO2e equivalent to the CO2e generated from the electricity used to run the Lomi. For this calculation, the emissions from each stage of the Lomi use phase were calculated per cycle (kg CO2e/cycle). This calculation was applied using different scenarios and based on the electricity use in different Canadian Provinces and different States of the US to show the range in electricity grid emissions based on the province/state.

Summary of Impacts

Based on the calculations above, GreenStep has estimated the following avoided impacts per each scenario listed (6 scenarios including Lomi and 3 scenarios with no Lomi) (Table 1 and Figure 1). The most significant impact for Scenarios 4-9 occurs at the Lomi Processing stage, a result of electricity consumption. For its calculations, GreenStep assumed average US energy grid figures. The majority of power in the US is still derived from non-renewable fossil fuel sources, such as coal, resulting in high electricity emissions. A sensitivity analysis was applied to see the results of using Lomi in different locations across the US and Canada.

As is demonstrated in the data (Table 1), the **best-case scenario** resulting in the **lowest impact** is a Lomi offset by renewable energy certificates (RECs) with the resulting organics used in the backyard of the home where the Lomi is contained; or backyard composting, without a Lomi.

Table 1. Avoided impact of using Lomi per scenario

Scenario	Avoided Impact (kg CO2e/Lomi)
Landfill (Baseline)	-
Compost (no Lomi)	-219.9
Yard (no Lomi)	-231.8
Lomi with REC + Landfill	-4.6
Lomi + Landfill	107.9
Lomi with REC + Compost	-219.9
Lomi + Compost	-107.3
Lomi with REC + Yard	-231.8
Lomi + Yard	-119.2

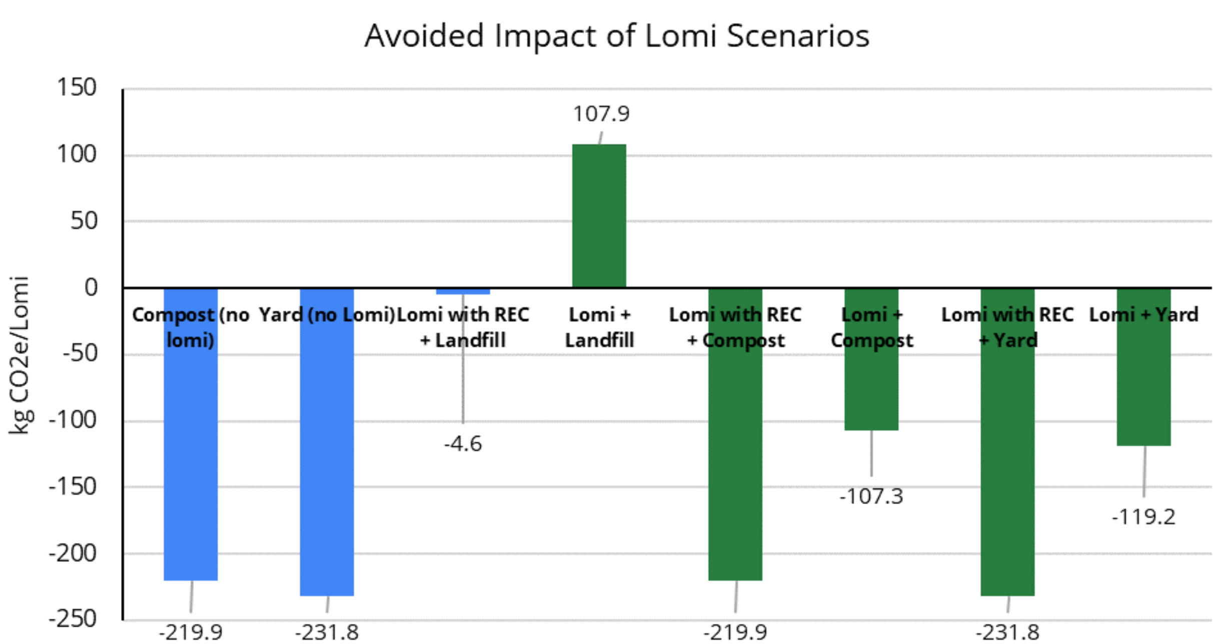

Figure 1. Avoided impact of using Lomi per scenario

Based on the results of avoided impacts, GreenStep calculated the percentage reduction of CO2e of Lomi scenarios, from baseline (the higher the percentage, the better) (Table 2, and Figure 2).

Table 2. Reduction (%) of CO2e of Lomi scenarios, from baseline

Scenario	% Reduction in CO2e
Landfill (Baseline)	-
Compost (no Lomi)	121%
Yard (no Lomi)	127%
Lomi with REC + Landfill	3%
Lomi + Landfill	-59%
Lomi with REC + Compost	121%
Lomi + Compost	59%
Lomi with REC + Yard	127%
Lomi + Yard	65%

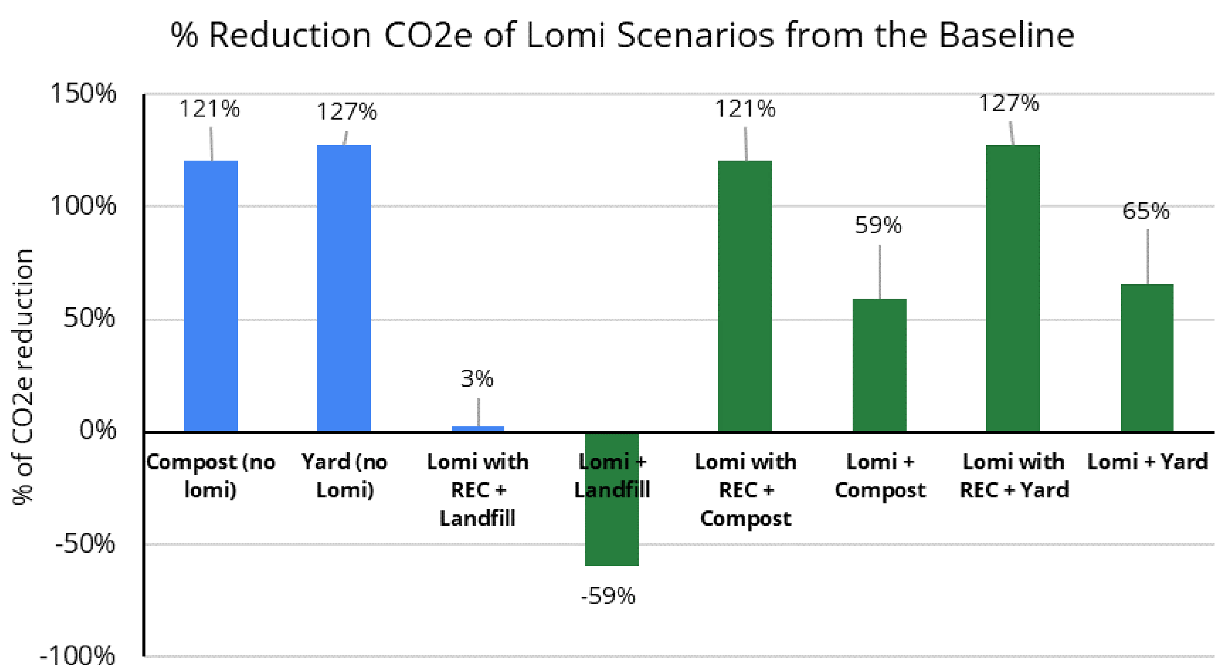

Figure 2. Reduction (%) of CO2e of Lomi scenarios, from baseline

Sensitivity Analysis

A sensitivity analysis was applied to show the avoided impacts of using Lomi in different regions across Canada and the US, using different electricity grid mixes. For this analysis, scenario 7 (Lomi + Compost) was selected. Scenario 7 assumes that organics are treated by Lomi at home, powered by a region-specific electricity grid mix, then transported to a composting facility, and then applied to land as compost. Table 3 and Figure 3 show the results:

Table 3. Results of sensitivity analysis for scenario 7

Scenario: Lomi + Compost	**Avoided* impact (kg CO2e/Lomi)****
US-Average	-107.28
Washington- US	-189.95
California- US	-146.28
Texas- US	-62.19
Florida- US	-74.24
New York- US	-150.48
Canada-Average	-176.07
British Columbia- CA	-217.15
Alberta- CA	12.77
Ontario- CA	-214.35
Quebec- CA	-219.48

* Avoided Impact refers to the difference between the impact of each scenario and the baseline scenario.

** The assumptions are: Lomi treats 1 kg of organic waste per cycle (i.e., 7 kg of organic waste per week, which equals 356 kg per year), and it uses 0.8 kWh electricity/cycle.

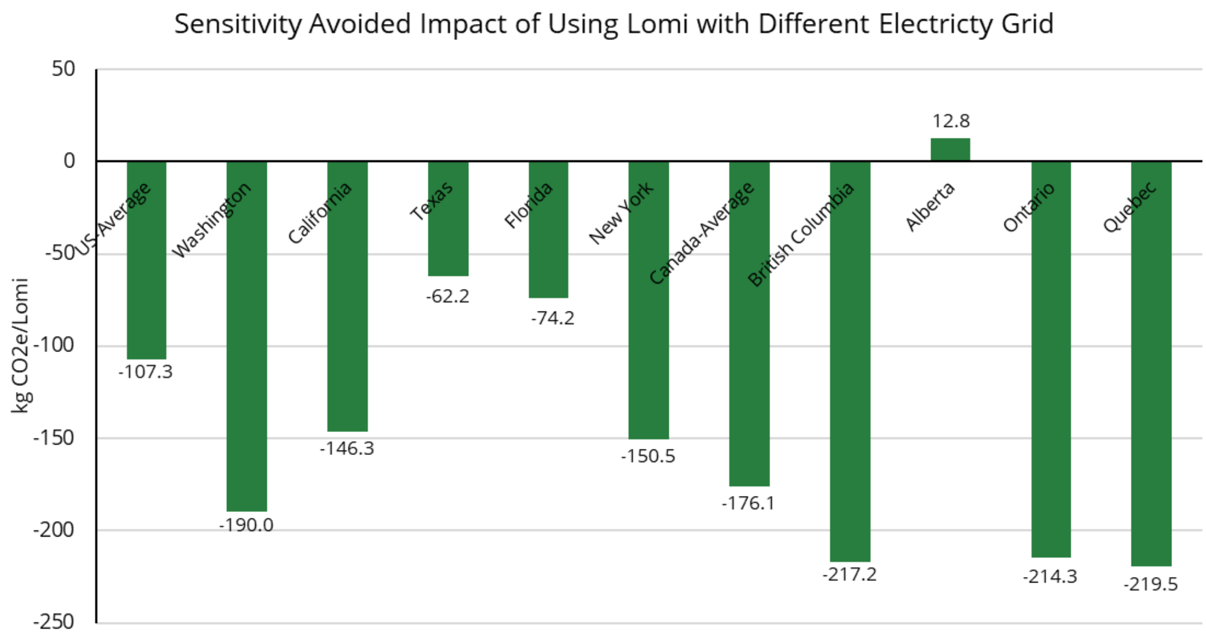

Figure 3. Results of sensitivity analysis for scenario 7

The assumptions are: Lomi treats 1 kg of organic waste per cycle (i.e., 7 kg of organic waste per week, which equals 356 kg per year), and it uses 0.8 kWh electricity/cycle.

Considering that Lomi is cycled seven times per week, using 0.8kWh per cycle, and it treats 1 kg of organic waste per cycle (i.e., 7 kg of organic waste per week, which equals 356 kg per year), and it reduces the mass of organic waste by 70% after each cycle, the avoided impact of scenario 7 (Lomi + compost) varies between -219.48 CO2e/Lomi and 12.77 CO2e/Lomi, based on running the Lomi in different locations. The developed calculator allows the user to apply the sensitivity analysis by changing these options:

- Country of using Lomi
- Province of using Lomi
- Amount of food waste treated by Lomi per cycle (kg/cycle)
- How many times is the Lomi used per week (cycle/week)
- Lomi electricity use per use (kWh/cycle) (if its electricity usage differs in the future versions)
- Weight reduction, using Lomi (the value used in this report is 70%)

Including the LCA Results

The calculator allows the user to choose the lifetime (year) of Lomi, using the drop-down list. Based on the choice of the user, the calculator estimates the share of Lomi's LCA per cycle. For example, if Lomi is used for 10 years, the share of each cycle is 0.0194 kg CO2e/cycle:

= 70.55 kg CO2e/Lomi ÷ (10 years × 52 weeks/year × 7 cycle/week)

As previously mentioned, Pela offset the emissions from the LCA of Lomi, so the emissions from the manufacturing, transportation, and distribution of Lomi are set as zero.

Break Even Point Results

Table 4 shows the breakdown of the impact (kg CO2e) per cycle of running Lomi. The assumptions are:

- Lomi treats 1 kg of organic waste per cycle, and it uses 0.8 kWh electricity/cycle;.
- The US national average electricity grid (0.386 kg CO2e/kWh) was used to estimate these scenarios; and,
- Carbon credits are purchased by Pela to offset the carbon emission to manufacture and distribute Lomi so Lomi is Climate (Carbon) Neutral certified when it arrives at a customer's home.

Table 4. Breakdown of the impact (kg CO2e) per cycle of running Lomi

Scenario	kg CO2e/cycle				
	Lomi processing	Transportation	Landfilling or Land application	Impact	Avoided Impact
Lomi with REC + Landfill	0.00	0.01	0.48	0.49	-0.01
Lomi + Landfill	0.31	0.01	0.48	0.79	0.30
Lomi with REC + Compost	0.00	0.03	-0.14	-0.10	-0.60
Lomi + Compost	0.31	0.03	-0.14	0.21	-0.29
Lomi with REC + Yard	0.00	0.00	-0.14	-0.14	-0.64
Lomi + Yard	0.31	0.00	-0.14	0.17	-0.33

Considering the avoided impact from each scenario (comparing each scenario with the baseline scenario), **all scenarios that use the Lomi (except Scenario 5) offset the emissions from Lomi processing (i.e., emissions from electricity use) at the first run of the Lomi**. So, the breakeven point of these scenarios is the first cycle. Figure 4 shows the avoided impact of using Lomi in different scenarios over time.

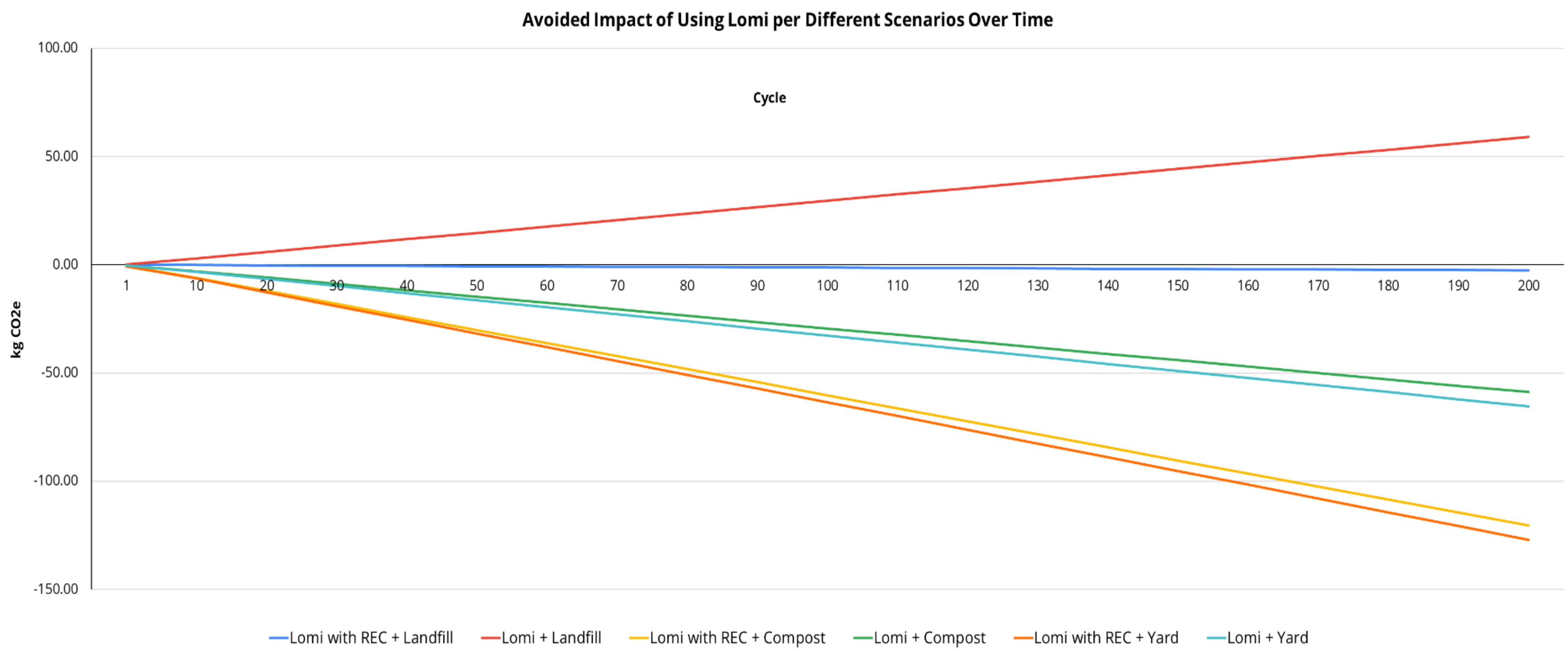

Figure 4. Avoided impact of using Lomi in different scenarios over time

The assumptions for this chart are: Lomi treats 1 kg of organic waste per cycle, and it uses 0.8 kWh electricity/cycle. The US national average electricity grid (0.386 kg CO2e/kWh) was used to estimate these scenarios.

As it is mentioned in the assumptions for the breakeven point analysis, the US national average electricity grid (0.386 kg CO2e/kWh) was used to estimate these scenarios. Using different electricity grid mixes will change the impact of each scenario and the avoided impact of the scenarios over time. The developed calculator enables the user to change the following options and see the sensitivity of the results:

- Country of using Lomi
- Province of using Lomi
- Amount of food waste treated by Lomi per cycle (kg/cycle)
- How many times is the Lomi used per week (cycle/week)
- Lomi electricity use per use (kWh/cycle) (if its electricity usage differs in the future versions)
- Weight reduction, using Lomi (the value used in this report is 70%)

Applying APEX Gap Assessment

APEX conducted a gap assessment of GHG emissions data from Lomi scenarios and provided a set of recommendations. GreenStep reviewed the recommendations and employed the following items, based on the availability of required data (Table 5):

Table 5. APEX recommendations and GreenStep actions

Recommendation (APEX)	**Action (GreenStep)**
Consider evaluating more recent emissions factors for U.S. electricity use, as well as evaluating which countries the Lomi is being sold in (and their appropriate electricity emissions factors) when making emissions claims. The eGrid factors published for U.S. emissions are generally up to date.	This version of the calculator uses the emission factors from different states of the US and different Canadian Provinces. The user has the option to change the location of using Lomi and see the difference between the results. An example of this option has been provided in the Sensitivity Analysis section.
Consider estimating sales for Canada, and other countries to more accurately	This version of the calculator added the emission factors from different Canadian Provinces.

estimate based on locations of use, if this is material.	
Data from actual Lomi use could be incorporated into estimates once available, giving a more accurate picture of GHG emissions.	This version of the calculator has the option to change different variables (number of cycles/weeks, kg/cycle, location of use) based on customer behaviour.
Estimations for GHG emissions for the Lomi before consumer purchase and at end-of-life could be calculated to meet general LCA methodologies. GHG Product Life Cycle Accounting Reporting Standard is a potential reference.	The results of the LCA of Lomi have been added to this report.

Considerations & Recommendations

Based on the above data and outputs, GreenStep offers the following questions and recommendations for further consideration:

- Gather more robust primary data to inform energy consumption per Lomi “mode”
- Consider Renewable Energy Certificates (RECs) Options for Customers
    - Renewable energy certificates (RECs) are *“a market-based instrument that represents the property rights to the environmental, social and other non-power attributes of renewable electricity generation. RECs are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy source.”* (EPA) In essence, a REC offsets electricity consumption with 100% low impact, renewable energy.
    - The cost of RECs per one Lomi cycle may vary, but would be approximately $0.02/cycle (based on information provided by Bullfrog Power); on a per-year basis, this amounts to $7.30.
- Conduct further research into methane and other emissions produced from Lomi-treated food waste going to the landfill versus compost to better understand if there is a reduction in emissions from Lomi-generated organic matter versus raw food waste going to landfill or compost facilities.
- Will the Lomi output **reduce or increase** the landfill emissions that are associated with wet organic waste, or is the impact neutral?

- ❏ Conduct further research on the impact of LomiPods and filters, and include them in the calculations.
- ❏ The main recommendations based on the gap assessment of AEPX were applied to this report. However, it is recommended to conduct research and apply the remaining recommendations.

Conclusions

Pela's Lomi kitchen appliance is an electronic device that turns food scraps, organic waste, and certified compostable packaging and home bioplastics into organic matter (at the push of a button). With roughly 17% of the global food supply going to waste, Lomi provides a service to many consumers who have no other option but to throw their food scraps in the garbage.

At the same time, because the Lomi is powered by electricity, it is not without its impacts, particularly where carbon emissions are concerned. As can be seen in the above data, the best-case scenario for a Lomi to lower its carbon footprint is a combined approach using renewable energy power sources as well as pre-purchased renewable energy certificates (RECs). Because the majority of the world is still reliant upon fossil-fuel-based energy sources, the energy grid overall has a higher impact versus a grid that is powered by renewable energy sources such as solar, wind, or hydroelectricity. This speaks to a larger question about energy consumption and energy sources; an issue that Pela has an opportunity to address, through the Lomi.

Considering the avoided impact from each scenario (comparing each scenario with the baseline scenario), all scenarios that use the Lomi (except Scenario 5) offset the emissions from Lomi processing (i.e., emissions from electricity use) at the first run of the Lomi. So, the breakeven point of these scenarios is the first cycle.

Pela should, through its Lomi campaign, communicate the many benefits of compost as a carbon sink. Whether produced through a Lomi or in a backyard composter, the science is clear that compost provides numerous benefits to soil, including increased biodiversity, enhanced soil structure, and more nutrient-dense food. According to research, through the act of composting, biogenic carbon is given the ability to be held in soil for a significant period (upwards of 15 years by some estimates (Silver, et al, 2018)). As well, emissions are avoided by using compost as opposed to industrial inputs (chemical fertilizers, pesticides, herbicides ([Favoino and Hogg, 2008])).

As well, Pela has the unique opportunity to address and further the discussion of a global shift toward a renewable energy future, through its Lomi platform. Being transparent about the Lomi impact will lend credibility to and build trust with Pela's customer base, particularly among the 18,736 backers of its Lomi IndieGoGo campaign.

References:

Favoino E, Hogg D. The potential role of compost in reducing greenhouse gases. *Waste Management & Research*. 2008;26(1):61-69. doi:10.1177/0734242X08088584

Silver, Whendee, Sintana Vergara, Allegra Mayer. (University of California, Berkeley). 2018. Carbon Sequestration and Greenhouse Gas Mitigation Potential of Composting and Soil Amendments on California's Rangelands. California's Fourth Climate Change Assessment, California Natural Resources Agency. Publication number: CCCA4-CNRA2018-002.

US Environmental Protection Agency (EPA) Waste Reduction Model (WARM). Accessed May 2021. epa.gov/warm

US Energy Information Administration. https://www.eia.gov/tools/faqs/

Appendix A

1.4.3 Composting

1.4.3.1 Developing the Emissions Factor for the Composting of Food Waste

Composting food waste results in increased carbon storage when compost is applied to soils. The net composting emission factor is calculated as the sum of emissions from transportation, processing of compost, a fertilizer offset from the avoided use of a synthetic fertilizer, the carbon storage resulting from compost application, and the fugitive emissions of methane (CH_4) and nitrous oxide (N_2O) produced during decomposition.[12]

- *Nonbiogenic CO_2 emissions from collection and transportation*: Transportation of yard trimmings and food scraps to the central composting site results in nonbiogenic CO_2 emissions.[13] In addition, during the composting process the compost is mechanically turned, and the operation of this equipment also results in nonbiogenic CO_2 emissions.
- *Fertilizer Offset*: Compost made from food waste feed stock that is applied directly to soil allows for approximately 25% of synthetic fertilizer use to be avoided (Oregon DEQ 2014). This emissions offset accounts for the emissions associated with generating the fertilizer that is replaced by compost.
- *Carbon Storage*: When compost is applied to the soil, some of the carbon contained in the compost does not decompose for many years and therefore acts as a carbon sink.
- *Fugitive CH_4 and N_2O emissions*: microbial activity during composting decomposes waste into a variety of compounds, which generates small amounts of CH_4 and N_2O gas, a net contributor to the GHG emissions associated with the composting pathway.

WARM currently assumes that carbon dioxide (CO_2) emissions that occur as a result of the composting process are biogenic and are not counted (for further explanation, see the text box on biogenic carbon in the Introduction and Background chapter). Exhibit 1-43 details these components for food waste and mixed organics. For additional information on composting in WARM, see the Composting chapter.