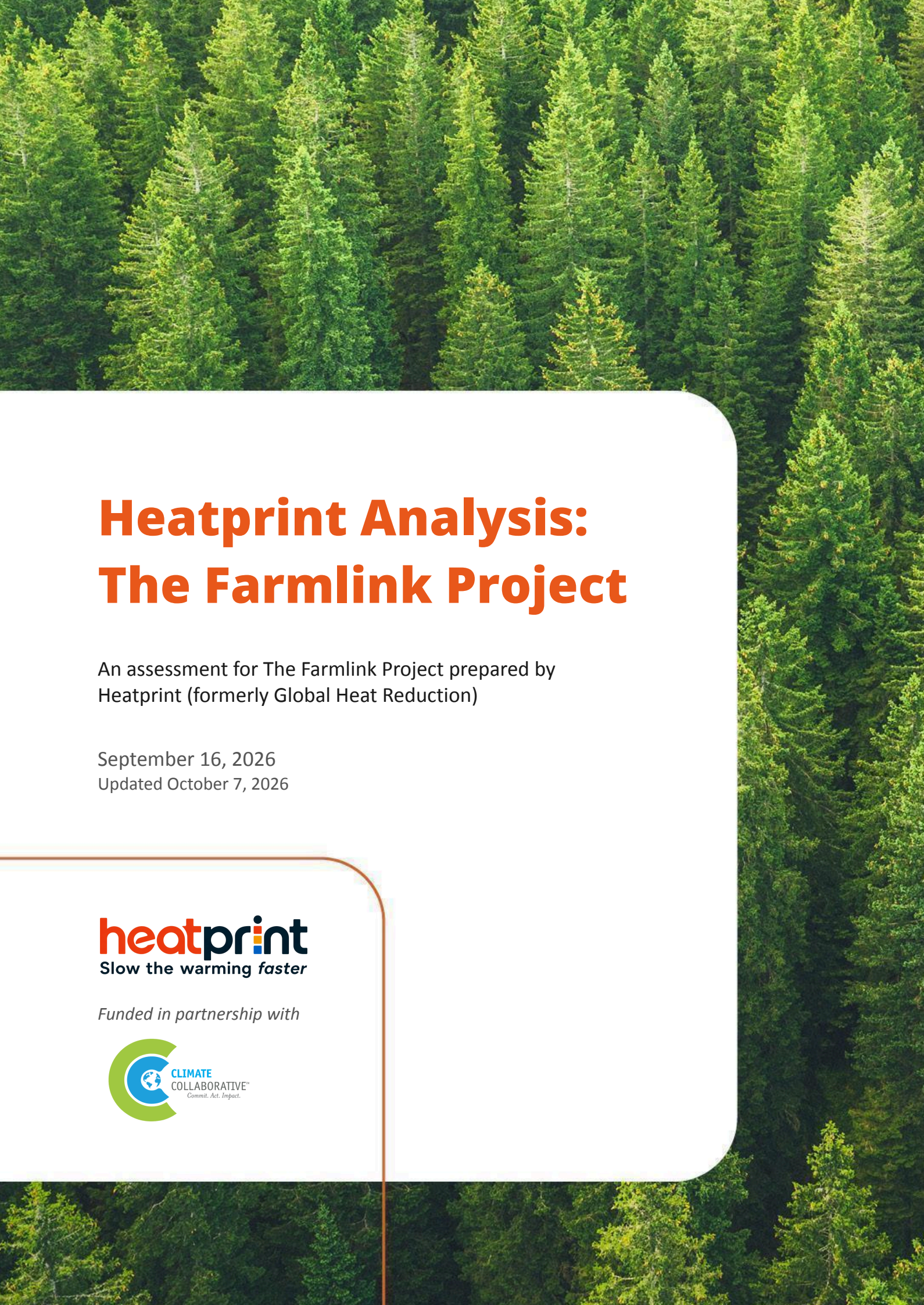


Heatprint Analysis: The Farmlink Project

An assessment for The Farmlink Project prepared by Heatprint (formerly Global Heat Reduction)

September 16, 2026
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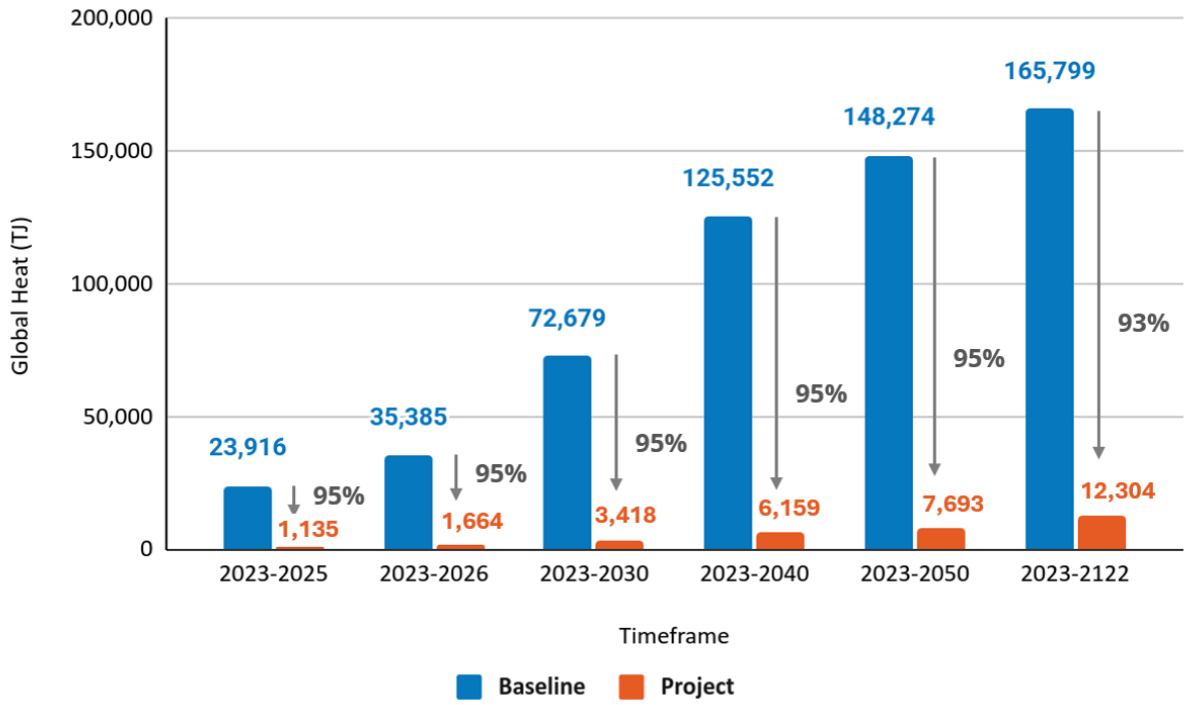
1. Executive Summary

A Heatprint™ analysis was conducted to quantify the atmospheric heat avoided through The Farmlink Project's food rescue operations encompassing three years from 2023 through 2025. Key takeaways from the analysis include:

- Farmlink's operations (the "project" scenario) reduce between 93% and 95% of heat impacts compared to the baseline scenario, as illustrated in Figure ES-1.
- The atmospheric heat avoided by Farmlink's interventions compared to BAU during the years 2023-2025 has a legacy that extends well into the future. The impacts of these three years of avoided emissions, calculated over 100 years, results in over 165,800 terajoules (TJ) of avoided atmospheric heat, with methane (CH_4) contributing 99.4% of this reduction.
- Due to methane's short atmospheric lifetime, the impact is concentrated in the near-term, with 44% of the 100-year total heat reduction achieved by 2030, 76% achieved by 2040, and 92% achieved by 2050. To put this in perspective, the heat avoided by 2050 is equivalent to the energy savings of removing 3.62 million average American households from the electrical grid for one year.
- Farmlink's operations demonstrate immediate, measurable near-term climate benefits, providing a dual-impact model that addresses both urgent food insecurity and critical near-term atmospheric warming.

Figure ES-1: Cumulative Heat Impacts of the Baseline and Project Scenarios over Six Timeframes

Farmlink's intervention to prevent food waste reduces between 93%-95% of the heat impacts associated with the baseline scenario over every time horizon analyzed.



2. Introduction

The Farmlink Project is a nonprofit organization dedicated to eliminating food waste by connecting farmers, transporters, and communities to deliver surplus fresh produce to families in need across the United States. We were engaged to conduct a Heatprint analysis, quantifying the atmospheric heat avoided as a direct result of Farmlink's operations during the 2023 to 2025 period, and providing a rigorous, data-driven account of the organization's atmospheric heat reduction impact alongside its humanitarian mission. This analysis was funded in partnership with the Climate Collaborative.

To conduct this analysis, we translated greenhouse gas emission reductions into terajoules (TJ) of avoided atmospheric heat across both near- and long-term timeframes. The baseline and project-level emissions were quantified using Farmlink's third-party validated methodology, ensuring data integrity and analytical credibility. This analysis matters because it moves beyond traditional carbon accounting to reveal the real-world atmospheric heat consequences of avoided emissions, offering Farmlink and its stakeholders a more complete and compelling picture of the climate value generated through its operations.

The Heatprint analysis is rooted in Total Climate Accounting™, a framework which complements and extends beyond conventional climate accounting systems. Total Climate Accounting is a direct application of the consensus science summarized in the Intergovernmental Panel on Climate Change (IPCC) synthesis and special reports of the past decade, described in the Radiative Forcing Protocol (see Appendix A), which was reviewed by selected members of the Scientific Advisory Panel of the international Climate and Clean Air Coalition, a United Nations convened organization.

Total Climate Accounting covers a wider range of emissions and non-emission drivers of climate change ("climate forcers") than conventional carbon accounting. Additionally, this accounting approach analyzes the resultant radiative forcing (i.e., atmospheric heat impacts) over any timeframe of interest, tracking the relative contribution of each driver contributing to warming or cooling the planet.

3. Methodology

3.1 Guiding Principles

The quantification and reporting of atmospheric heat impact was conducted in accordance with the following principles, consistent with the Radiative Forcing Protocol and ISO 14064-1:

1. Relevance: Radiative Forcing (RF)-related information, data, and methodologies were applicable to the intended user and the scope of assessment.

2. Completeness: Known information and data pertaining to RF sources and reduction were included in analyses, as well as known relevant information to support criteria and procedures.

3. Consistency: Information produced by analyses can support meaningful comparisons, wherein consistent methods can be used.

4. Accuracy: Bias and uncertainties were considered and minimized to the degree practical.

5. Transparency: Sufficient information are disclosed to support accurate interpretation by intended users with reasonable confidence.

6. Conservativeness: Conservative assumptions, values and procedures were applied.

7. Significance: The inclusion of climate forcers in the quantification was justified based on their relative contribution to the total footprint.

3.2 Boundary Conditions

The boundaries established for the Heatprint are consistent with Farmlink's operations and their 3rd-party validated GHG quantification methodology. Emission years analyzed: 2023, 2024, 2025.

Emissions of CO_2, CH_4, and N_2O were considered, as detailed below, across the entire analysis timeframe. This included all known emissions that cause direct RF, as well as those that affect RF indirectly, such as through chemical reactions in the atmosphere.

3.3 Emission Sources

Emissions in the baseline scenario come from food that degrades in landfills, agricultural fields, or other circumstances as determined by Farmlink's GHG quantification methodology.

Emissions in the project scenario come from Farmlink's operations.

The following pollutants were considered: CO_2, CH_4, N_2O. Note that CO_2 emissions were included only in the project scenario, and not in the baseline, per the data provided by Farmlink. Inclusion of CO_2 in the baseline (as relevant), or inclusion of additional pollutants such as HFCs for cold-chain operations, would be a valuable area of future assessment.

3.4 Data Availability, Sources, and Estimations

Emission data was provided by The Farmlink Project and entered directly into the Heatprint Calculator. Radiative forcing parameters are sourced from peer-reviewed IPCC assessment reports and the Radiative Forcing Protocol.

3.5 Exclusions

The following climate forcers were not feasible to assess, due to data availability or other restrictions:

- The impact of NOx and VOCs on the formation of tropospheric ozone;
- Aerosol emissions such as black carbon and organic carbon; and
- Difference in albedo from infrastructure modifications, albedo restoration, brightening, or other land use changes.

3.6 Calculation Methodology

Global heat impacts were calculated according to the methods presented in the Radiative Forcing Prococol and our Total Climate Accounting Framework in watts per square meter (W/m^2), then converted to terajoules (TJ) of global heat using the surface area of the Earth (5.1×10^{14} m^2).

3.7 Calculation Equations

Emissions from The Farmlink Project

Emissions for this assessment were calculated by The Farmlink Project based on their 3rd-party validated methodology. No additional emissions calculations were performed.

Energy Equivalencies

Equation 1. Average Electricity Consumption

Global Heat (TJ) / Electricity Use (kWh/house/year) × Unit Conversion (kWh/TJ) = # of avg. American households

Equation 2. Boiling Olympic-Sized Swimming Pools (OSPs)

*Global Heat (TJ) * Thermal Efficiency (%) / Heat to Boil 1 OSP (TJ) = # of OSPs Boiled Off*

Radiative Forcing

Radiative forcing is calculated per pollutant using its radiative efficiency ($W\ m^{-2}\ kg^{-1}$) and atmospheric decay function, integrated over the analysis timeframe.

3.8 Assumptions

- Emission data is representative of the emission years stated and reflects actual operational conditions.
- All calculations use IPCC AR6 radiative efficiency values where available.
- The average American household (residential customer) uses 10,791 kWh of electricity annually.
- Approximately 6.48 TJs are required to boil dry an olympic-sized swimming pool containing 2.5M kg of water starting at 22 °C (71.6 °F), assuming 100% thermal efficiency.
- The thermal efficiency is 70% (typical efficiency of a newer radiant electric range)

3.9 Limitations

- No specific source attribution is made in this report, as the data provided was aggregated by GHG and year in the baseline and project scenarios, per the agreed-upon scope of assessment.

3.10 Timeframes of Analysis

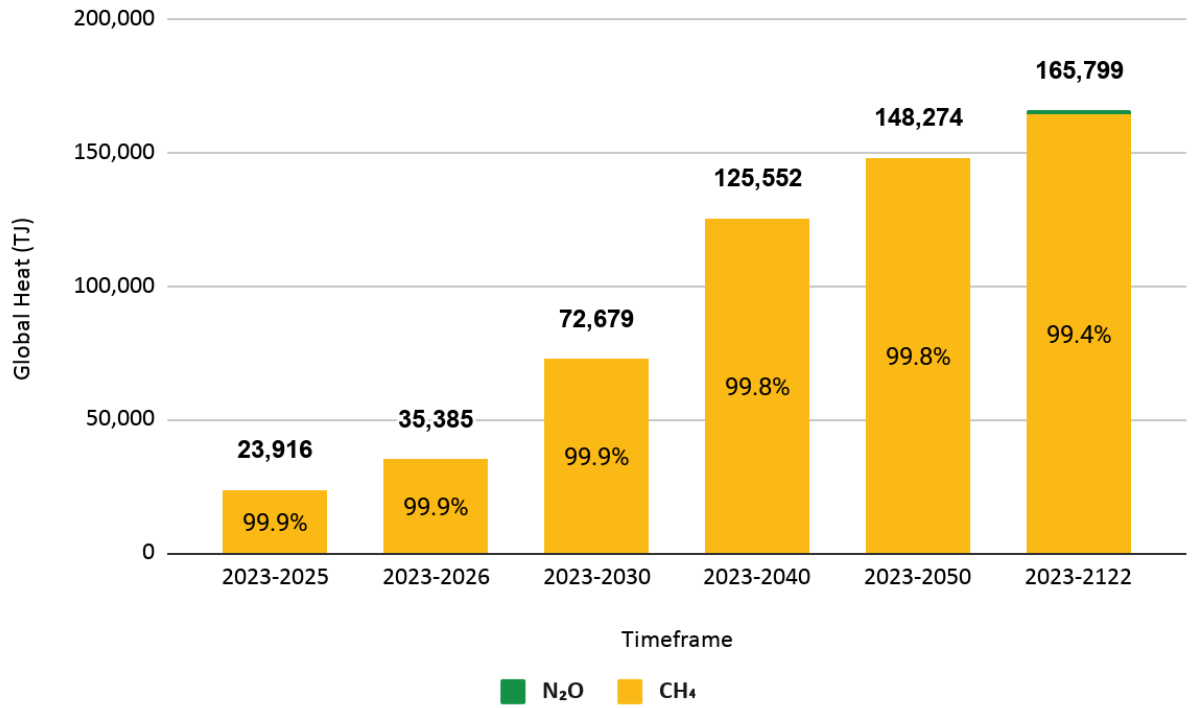
We analyzed Farmlink's heat reduction impact from operations in 2023-2025 for the following timeframes: 2023-2025, 2023-2026, 2023-2030, 2023-2040, 2023-2050, and 2023-2122 (100 years). This type of analysis crucially demonstrates how heat impacts are distributed over time, the cumulative heat impacts over years and decades, and how these heat impacts differ by emission type.

4. Results

In the baseline scenario of this analysis, salvageable food is landfilled, buried, burned, or otherwise degrades into methane and nitrous oxide emissions, per Farmlink's GHG quantification methodology. Calculations indicate that the baseline emissions for operational years 2023 through 2025 would have already added more than 20,000 TJ of heat to the atmosphere by the end of 2025, almost 150,000 TJ to the atmosphere by 2050, and more than 165,000 TJ over 100 years, as shown in Figure 1. These heat effects are almost exclusively (>99%) from methane, with nitrous oxide contributing only 0.6% of the cumulative 100-year total.

Figure 1: Cumulative Atmospheric Heat Impacts of the Baseline Scenario over Six Timeframes

Methane accounts for more than 99% of the heat impacts over all timeframes in the baseline scenario.



Heat impacts from the project scenario, which accounts for Farmlink's intervention to divert the food from becoming waste from 2023-2025, are notably lower, as shown in Figure 2. About 1,100 TJ were added to the atmosphere by the end of 2025, rising to 7,600 TJ by the end of 2050. Over 100 years, the emissions from operations in 2023-2025 are expected to add a little over 12,000 TJ to the atmosphere. In the near-term, the majority of the cumulative atmospheric heat impacts come from methane emissions (72-80%), while over longer timeframes, CO_2 also plays a significant role (approx. 50% over 100 years).

Figure 3 shows the comparison of the cumulative heat impacts from the baseline and project scenarios. The project scenario represents a 95% heat reduction in near-term timeframes, and a 93% heat reduction over 100 years.

Figure 2: Cumulative Atmospheric Heat Impacts of the Project Scenario over Six Timeframes

Methane dominates the near-term heat impacts, while CO_2 accounts for 50% of the heat impacts over 100 years.

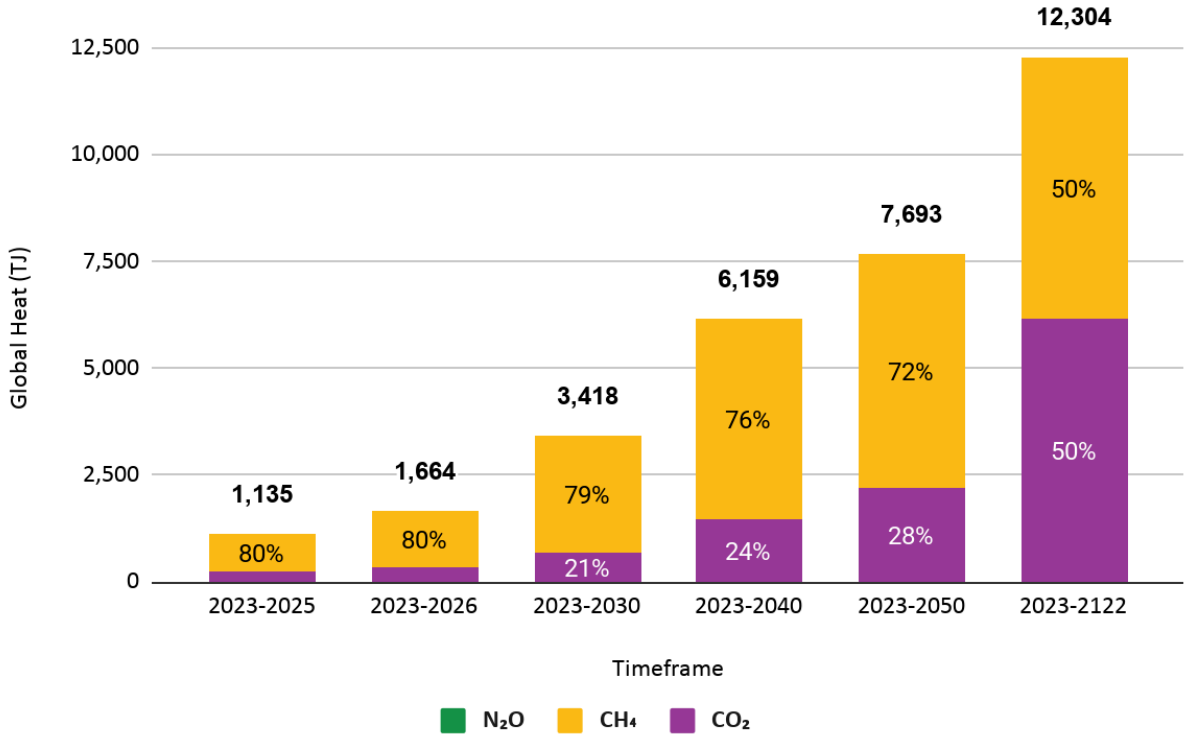
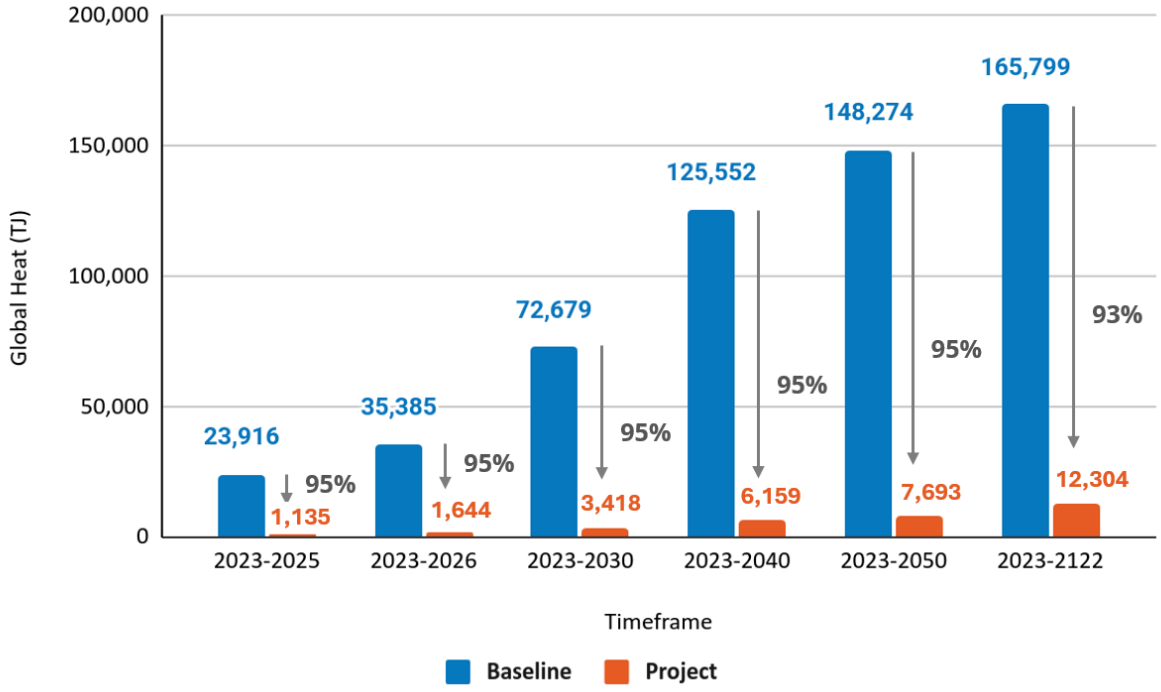


Figure 3: Cumulative Atmospheric Heat Impacts of the Baseline and Project Scenarios over Six Timeframes

Farmlink's intervention to prevent food waste reduces between 93%-95% of the heat impacts associated with the baseline scenario. Note that a copy of this chart appears in the Executive Summary.



From 2023 to 2025, Farmlink's interventions were associated with the avoidance of approximately 3,989 metric tons of methane, as well as 2.6 metric tons of nitrous oxide (N_2O). As shown in Figure 4, this has already resulted in more than 22,000 TJ of avoided atmospheric heat to date. By 2050, more than 140,000 TJ will have been avoided from the operations in those years, leading to more than 150,000 TJ avoided over 100 years. While the overwhelming heat trend is negative due to the avoided methane and N_2O emissions, there is a small increase in heat from CO_2 emissions, particularly in the 100-year timeframe due to CO_2's long atmospheric lifetime.

Figure 4: Net Heat Impacts by Pollutant

Methane (yellow) and nitrous oxide (green) show a net reduction, while carbon dioxide (purple) shows a small net increase over time. Data labels at the top of the chart represent the net heat reduction in TJ at each timeframe.

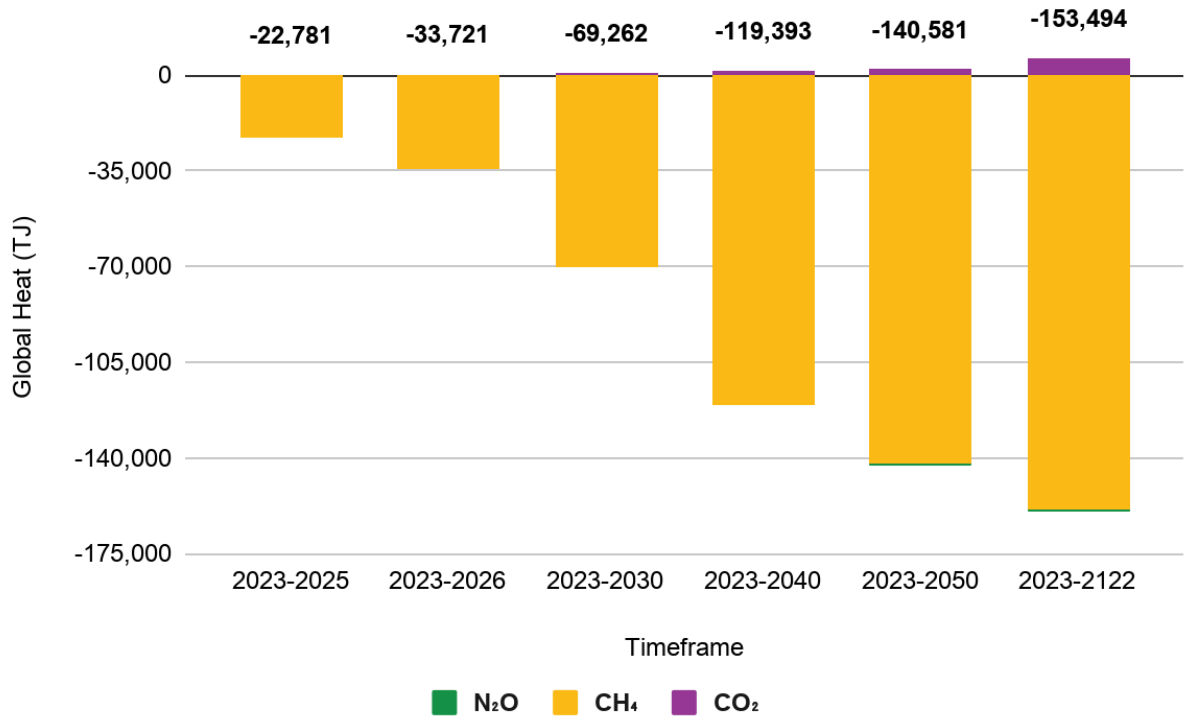
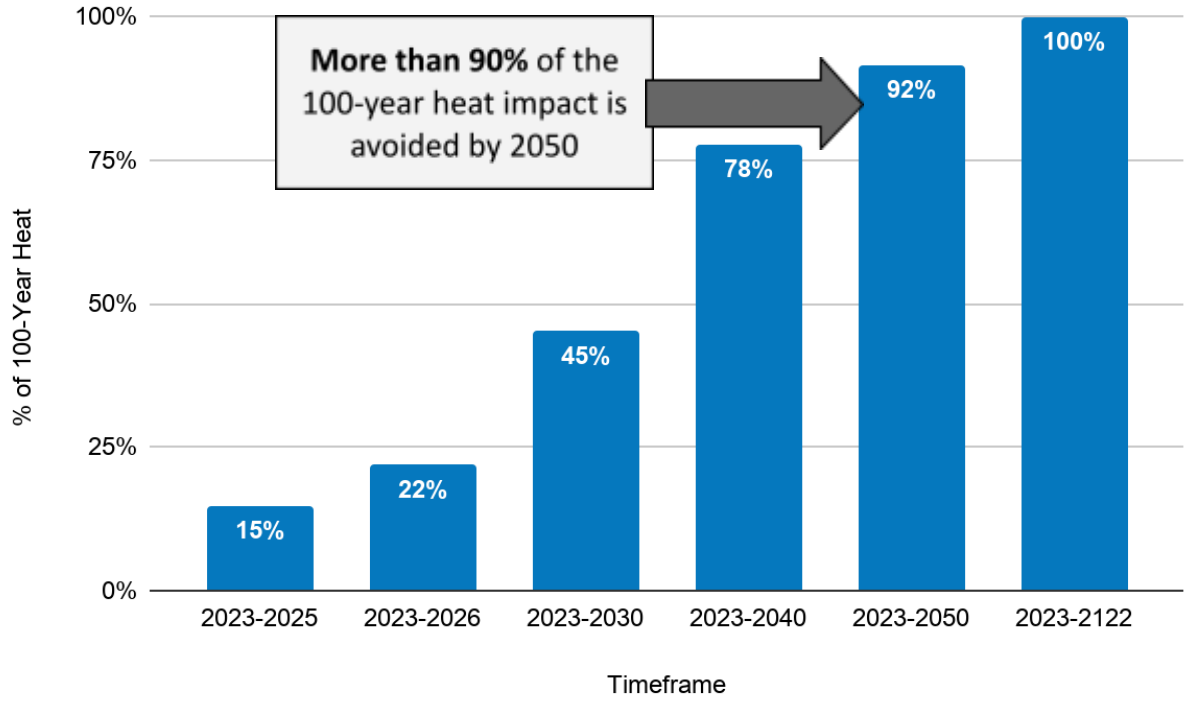


Figure 5 illustrates the timing of the heat reduction, as a percentage of the cumulative amount of heat expected over 100 years (chosen for its parity with the common GWP100 metric). Because most of the heat reduction comes from methane avoidance, and because methane has a relatively short atmospheric lifetime, the heat impacts are concentrated in near-term timeframes. More than 15% of the 100-year total heat has already been avoided, up to 22% by the end of this year. This increases to nearly half (45%) by the end of 2030. Further, more than 90% of the 100-year heat reduction will occur by the end of 2050, in the first 25-27 years after the avoided emissions. This means that Farmlink's operations are making a difference now and over the critical next decade when atmospheric heat must be reduced to promote human health and avoid environmental tipping points.

Figure 5: Timing of the 100-year Cumulative Heat Reduction

The heat reduction impacts are concentrated in the near-term due to methane's short atmospheric lifetime.



The heat avoided by Farmlink's operations can be translated into energy equivalencies to facilitate understanding and stakeholder communication. As shown in Table 1, based on the operations from 2023-2025, Farmlink has already prevented enough energy from going into the atmosphere to power over 586,000 average American homes for one year, or completely boil off more than 2,400 olympic-sized swimming pools. Between now and 2050, those values increase to 3.62M households removed from the grid for one year, and over 15,000 swimming pools boiled dry.

Table 1: Energy Equivalencies

Timeframe	Energy Saved (TJ)	Avg. American Houses	Boiled Swimming Pools
2023-2025	22,781	586,400	2,462
2023-2026	33,721	868,000	3,644
2023-2030	69,262	1.78M	7,484
2023-2040	119,393	3.07M	12,901
2023-2050	140,581	3.62M	15,191
2023-2122	153,494	3.95M	16,586

5. Conclusion

This Heatprint analysis demonstrates the scale and timeliness of the benefits that The Farmlink Project generates alongside its core humanitarian mission, with avoided methane emissions driving the vast majority of near-term and long-term atmospheric heat reduction. The avoided atmospheric heat associated with Farmlink's operations from 2023-2025 will continue to provide heat reduction benefits over time, resulting in more than 140,000 TJ of atmospheric heat avoided by 2050. This is equivalent to the energy savings of removing 3.62 million average American households off the grid for one year, or avoiding enough energy to boil over 15,000 olympic-sized swimming pools.

Due to methane's short atmospheric lifetime, the heat reduction from Farmlink's operations is fast-acting, with 22% of the 100-year heat reduction already realized by the end of this year, 45% by the end of 2030, and 92% achieved by the end of 2050, within 25-27 years of the emission reduction. This analysis demonstrates how food diversion is an important lever for addressing near term heat, which will lead to lasting benefits for human and environmental health.

Glossary

Albedo. Proportion of sunlight (solar radiation) reflected by a surface or object, often expressed as a percentage.

Climate forcer. Any external driver of climate change that causes a change in RF (e.g., an emission, substance, process, activity or change in state).

Terajoules (TJ). A unit of energy in the International System of Units, equaling one trillion (10^{12}) joules.

Greenhouse gas (GHG). Gaseous constituent of the atmosphere, either natural or anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds.

Non-emission climate forcer. Process or activity other than an emission source that leads to a change in RF.

Radiative forcing (RF). Change in the net, downward minus upward, radiative flux (expressed in W/m^2) at the top of the atmosphere due to an external driver not associated with climatic feedback loops.

Short-lived climate pollutants. Climate pollutants with atmospheric lifetimes of a few days, months, or years. (Also called 'short-lived climate forcers')

Acronyms and Abbreviations

GHG: Greenhouse Gas

IPCC: Intergovernmental Panel on Climate Change

Kg: Kilogram

RF: Radiative Forcing

TJ: Terajoules (trillion joules)

VOC: Volatile Organic Compound

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Appendix A: Radiative Forcing

The Common Underlying Measurement of a Climate Forcer's Warming or Cooling Influence

Radiative Forcing

Radiative forcing (RF) is the common, underlying metric by which all anthropogenic and biogenic factors influencing the climate system are evaluated. It is the basis upon which carbon dioxide equivalents are calculated when determining the relative potency of greenhouse gases compared to carbon dioxide over various timeframes. The IPCC uses RF as the basis for modeling or presenting various climate scenarios. The many drivers of increased RF include greenhouse gases, aerosols and particulates, and changes in albedo. Over time, sustained increases in RF result in higher global surface temperatures.

The quantification of RF will enable organizations to more effectively manage their contributions to climate change by identifying and implementing projects of sufficient scale and efficacy to reduce positive RF. Quantification of RF allows organizations to consider all climate forcers over any timeframe, including well-mixed GHGs, non-well mixed GHGs and other short-lived climate pollutants, and surface albedo, to gain a broader understanding of their climate impact and consider the advantages and disadvantages of specific mitigation projects for the climate, the environment, and human health.

Consistent with the use of RF as the backbone of the IPCC RCP and SSP scenarios, RF calculations involve determining an emission inventory, by climate pollutant, for each year over a given time horizon. The radiative efficiency and atmospheric lifetime of each of these pollutants are then taken into consideration to assess the resulting RF, by pollutant, in each year of the time horizon. The RF contributions, by pollutant, across all years of emission, are added to determine the total.

A full description of the RF Protocol, its quantifications and its applications can be found on GHR's website at www.heatreduction.com.

Appendix B: Additional Results

Baseline Cumulative Heatprint Results over all Timeframes — Global Heat (TJ)

Timeframe	CO_2	CH_4	N_2O	Total
2023-2025	0.00	23,882	34	23,916
2023-2026	0.00	35,336	49	35,385
2023-2030	0.00	72,573	106	72,679
2023-2040	0.00	125,311	241	125,552
2023-2050	0.00	147,909	364	148,274
2023-2122	0.00	164,815	983	165,799

Project Cumulative Heatprint Results over all Timeframes — Global Heat (TJ)

Timeframe	CO_2	CH_4	N_2O	Total
2023-2025	229.92	905	0.16	1,135
2023-2026	334.06	1,330	0.26	1,664
2023-2030	706.82	2,710	0.69	3,418
2023-2040	1,491.98	4,666	1.69	6,159
2023-2050	2,186.93	5,503	2.60	7,693
2023-2122	6,167.00	6,130	7.17	12,304

Net Cumulative Heatprint Results over all Timeframes — Global Heat (TJ)

Project - Baseline				
Timeframe	CO_2	CH_4	N_2O	Total
Cumulative Global Heat (TJ):				
2023-2025	230	-22,977	-34	-22,781
2023-2026	334	-34,006	-49	-33,721
2023-2030	707	-69,863	-106	-69,262
2023-2040	1,492	-120,645	-240	-119,393
2023-2050	2,187	-142,406	-362	-140,581
2023-2122	6,167	-158,685	-976	-153,494