A Single-Use Plastic LCA Policy Brief

FEDERAL TEAM POLICY BRIEF

This policy brief builds on the previous research publication, which conducted a Life Cycle Assessment (LCA) of SUP PP and PS cutlery. This policy brief uses Life Cycle Assessment (LCA) to propose a tax on these products, with environmental costs in mind. Furthermore, this brief proposes legislation and action that will allow this type of work to be conducted on more products.

Prepared by: Michael Aaron, Nadelina Agopoglu, and Shant Ispendjian

Date: May 18, 2026

Published by the Saving the Sea Organization

A Single-Use Plastic LCA Policy Brief

I. Executive Summary

Due to their relatively simple production process and lower costs, single-use plastics (SUPs) have become widespread in commercial use. However, they also pose significant harm to the environment throughout multiple phases of their life cycle. Often tracked in terms of carbon emissions, SUPs consistently impose higher environmental costs at each stage of their use. Specifically, this paper tracks the costs associated with plastic cutlery, a commonly consumed and widely retailed good, particularly by big corporations that can bear the associated taxes.

This paper serves as a policy brief based on research that calculates and compares the ecological detriments of SUP polypropylene (PP) and polystyrene (PS) with more sustainable alternatives. It advocates for a tax-based resolution that leads corporations to produce with these costs in mind, proposes further life-cycle assessments of plastics, and recommends classifying SUPs as a toxic substance to support further legislation.

fWith this change in production, the environmental costs of SUPs will be significantly reduced.

II. Background

In contrast to PLA cutlery, a commonly used alternative to SUP cutlery, PP and PS degrade the environment to a much greater extent across key phases of their life cycle, such as raw material extraction, production pollution, and end-of-life costs (Fact Sheet: Single Use Plastics). These contrasts have been calculated largely in terms of CO2 emissions and demonstrate how an economy based around SUPs is unsustainable in the long term.

Based on analyses done by the American Chemistry Council, the raw material extraction of SUPs, an intensive process that involves drilling and processing oil, carries a cradle-to-gate carbon footprint of 1.275 kg CO2 eq per kg of PP plastic (LCA of Polypropylene) and 2.722 kg CO2 eq per kg of PS plastic (LCA of Polystyrene). This contrasts with PLA, which is composed of natural materials such as corn, cassava, sugarcane, or sugar beet pulp (PLA Plastic).

During the production phase, the creation of the product using the harvested materials, the differences persist, further highlighting the harmful effects of SUPs. For cutlery, PP emissions stand at 0.273 kg CO2 eq per kg plastic, and PS emissions are 0.184 kg CO2 eq per kg plastic. In contrast to these numbers, PLA cutlery has a carbon footprint of around 0.009 kg CO2e per kg of production phase.

Given the low recycling rates of SUPs and the unique challenges of recycling cutlery due to its size, we can assume that the two end-of-life pathways for SUPs are landfills and incineration, with rates of 76 percent and 15 percent, respectively. Incineration practices emit 2.9 kg of CO2e for every kg of plastic burned. On the other hand, landfills present a different form of harm to the environment: microplastics. Research indicates that 55,000 to 60,000 particles are released from one kilogram of waste. In a landfill, it is impossible to determine to what extent each type of waste contributes to microplastic release, so we must estimate that PP and PS cutlery would release microplastics to the same extent.

III. Problem Statement

Given the widespread harm SUPs cause to the environment, there needs to be a transition to the widespread use of more sustainable plastics. However, the producers of SUPs have an incentive to minimize costs, favoring SUPs as a cheaper alternative.

IV. Policy Analysis

Since there exists a misalignment in the incentive structures of corporations that produce SUP cutlery between maximizing profits and optimizing consumer benefit, it is imperative to restructure the incentive systems of large producers so they operate with the public good in mind. To do so, using the calculated costs of PP and PS SUPs, the government can implement an excise tax that holds producers accountable for the ecological harms of their goods, creating a more comprehensive incentive structure for them.

V. Policy Recommendations

Given the evident need for a change in how firms operate, this brief proposes a tax system to alter this behavior, as well as a classification of SUPs to enable more productive regulation and further research.

The US federal government should implement an excise tax on SUP PP and PS cutlery, meaning that a certain dollar amount per unit sold should be charged to the producers. This amount can be found in the research conducted for the life cycle assessment of PP and PS. Throughout their lifetime, these forms of cutlery impose a set cost on the

environment, and that cost has been calculated in terms of carbon emissions. Using the social cost of carbon model, this can be translated into a monetary value that is included in the product's cost. PP and PS plastics are often cheaper due to their efficient production process. Yet when one factors in all the costs that society—not just producers—incurs, the total cost rises, causing buyers to shift away from such harmful goods. This study concludes that PP cutlery produces 1.974 kg CO2 eq per kg more than PLA, while PS cutlery produces 3.332 kg CO2 eq per kg more than PLA. Using the social cost of carbon model, these emissions can be converted into a tax of $0.49 per kg of PP cutlery and $0.82 per kg of PS plastic.

Since the LCA conducted on PP and PS cutlery proved strong environmental harm, this paper recommends classifying PP and PS as toxic substances to be regulated under the Toxic Substances Control Act of 1976, which limits the new production of these substances and requires specific reporting on the production of these substances (Toxic Substances Control Act). This will lead to a better public understanding of how much plastic is being produced, laying the foundation for more effective federal regulations and enabling further LCA research.

The life cycle assessment of PP and PS led to a conclusive framework for understanding the environmental harm caused by SUPs and what to do about them. Further assessments in this field would continue to give the US public a clearer picture of how much these plastics harm the environment, motivating them to support policy solutions. Furthermore, LCAs can provide the economic basis for imposing excise taxes on harmful plastics, helping the United States shift towards more sustainable production practices. This brief recommends increasing funding and providing federal organizations like CENRS with clearer direction to conduct more LCA research on SUPs and on the specific harms of microplastics, which would help determine the exact detriments they pose.

VI. Implementation Plan

A plan that shifts firms' incentive structures and the widespread production of SUP cutlery will require extensive time to implement the necessary changes. Therefore, the implementation of this tax system will be carried out gradually.

Classification and Research (Months 1-24). As stated above, the United States should reclassify SUPs as toxic substances to allow for more specific reporting and regulation on their use. After said classification, LCA research on types of plastic goods can be conducted in the following years to

produce more policy proposals like this on SUPs.

Tax-Based Incentives (Months 1-36). The tax-based policy proposal aims to completely shift the way firms operate, and therefore, it needs to give companies time to change their production processes. Within three years, firms should be able to make the necessary changes to their production process to optimize profit with these new incentives in mind, such as favoring more sustainable plastics.

VII. Conclusion

By further grasping the harms of SUPs, specifically PP and PS cutlery, the United States can make strong strides against the ecological detriments of SUPs. With a plan to increase research on the harms of SUPs and to implement policies with those costs in mind, significant progress can be made toward sustainable production. In a world where success is tied to ecological well-being, firms' operations can see drastic improvements, leading the way towards a greener future. This newly realized world of revised incentive structures aligned with sustainability can halt the environmental meltdown currently underway.

References

"Cradle-to-Gate Life Cycle Analysis of High Impact Polystyrene (HIPS) Resin." American Chemistry Council, September 6, 2022. https://www.americanchemistry.com/better-policy-regulation/plastics/resources/cradle-to-gate-life-cycle-analysis-of-high-impact-polystyrene-hips-resin.

"Cradle-to-Gate Life Cycle Analysis of Polypropylene (PP) Resin." American Chemistry Council, September 6, 2022. https://www.americanchemistry.com/better-policy-regulation/plastics/resources/cradle-to-gate-life-cycle-analysis-of-polypropylene-pp-resin.

Staff, EDN. "Fact Sheet: Single Use Plastics." Earth Day, March 4, 2025. https://www.earthday.org/fact-sheet-single-use-plastics/.

"Summary of the Toxic Substances Control Act." EPA, Environmental Protection Agency, 25 Aug. 2025, www.epa.gov/laws-regulations/summary-toxic-substances-control-act.

Team, BioPak. "What Is PLA Plastic?" What Is PLA Plastic, June 25, 2024. https://www.biopak.com/uk/resources/what-is-pla.

Publication Team

Michael Aaron

AUTHOR

Federal Team Policy Analyst

Nadelina Agopoglu

EDITOR

Local Team Policy Director

Shant Ispendjian

SENIOR EDITOR

President