PLASTIC LIFECYCLE ASSESSMENT CALCULATOR FOR THE ENVIRONMENT AND SOCIETY
FREQUENTLY ASKED QUESTIONS
OCTOBER 2025

The Circulate Initiative

GENERAL INFORMATION

1. What is the Plastic Lifecycle Assessment Calculator for the Environment and Society (PLACES)?

Developed by The Circulate Initiative, PLACES is the first tool of its kind offering users the ability to assess the climate impact of current waste management practices in ten countries across Latin America and the Caribbean (LAC), and South and Southeast Asia (SSEA): Brazil, Colombia, the Dominican Republic, India, Indonesia, Malaysia, Mexico, the Philippines, Thailand, and Viet Nam.

PLACES allows users to calculate greenhouse gas (GHG) emissions reductions, as well as energy and water savings from waste management and recycling solutions that prevent plastic pollution. Users can select from various plastic polymer types and different end-of-life (EOL) fates, namely:

- Recycling
- Sanitary landfill
- Incineration
- Co-processing at cement kilns
- Open dumps
- Open burning

PLACES was initially developed for India and Indonesia in 2021, and subsequently updated to include Malaysia, Thailand, the Philippines, and Viet Nam in 2023. The most recent update in 2025 expands the tool's coverage to include four countries in the LAC region: Brazil, Colombia, the Dominican Republic, and Mexico.

2. Why was PLACES developed?

Decision-makers need tools that help them to understand the climate impact of waste management. Tools, such as the U.S. Environmental Protection Agency's Waste Reduction Model (WARM), have provided useful guidance in developed markets, but none are based on assumptions appropriate for waste management in emerging markets.

For investors and project developers in emerging markets, there is insufficient research and data available at the local level (i.e., national, jurisdictional or project-specific) on emissions reductions and other environmental benefits of alternative waste management practices. This data gap indicated the need for a credible, accessible, and easy-to-use tool to shed light on the impact potential of different interventions in emerging markets, which led The Circulate Initiative to develop the PLACES tool.

3. Who developed PLACES?

PLACES was developed by The Circulate Initiative in partnership with the Singapore Institute of Manufacturing Technology (SIMTech), a research institute of the Agency for Science, Technology and Research (A*STAR), for the six SSEA countries, and with Mexico's Center for Life Cycle Analysis and Sustainable Design (CADIS) for the four LAC countries.

Ecoinvent is the source for and owner of Limited Life Cycle Impact Assessment (LCIA) scores.

4. Can I cite data from PLACES?

Yes, please attribute all data citations to "Source: The Circulate Initiative's Plastic Lifecycle Assessment Calculator for the Environment and Society (PLACES)," and direct audiences to the website.

FUNCTIONALITY

5. What is the scope of the tool?

PLACES and the associated study include downstream plastic waste treatment from collection of plastic waste to final EOL scenarios. The study accounted for the resulting environmental savings from by-products and avoided production of virgin plastic, as well as avoided fuel usage in cement kilns and avoided electricity production from the grid to power waste-to-energy (WtE) plants. Plastic waste flows were mapped using country-specific data. PLACES does not evaluate reuse or refill models.

6. Who is PLACES for, and how can it be used?

The intended audience for PLACES includes investors, policymakers, recyclers, and other stakeholders in the plastic waste ecosystem who seek to understand the environmental implications of recycling compared to other methods of managing plastic waste. Quantifying the environmental impact of the plastic waste treatment system in each of the ten countries included in this study provides a baseline to better understand the environmental savings of investment in plastic waste recycling and other waste management solutions. PLACES can be used to report on the potential environmental benefits of shifting to recycling versus other EOL fates.

7. What are the limitations of the tool?

PLACES evaluates GHG emissions, energy, and water but does not consider other impact areas (e.g., biodiversity). It compares recycling with other EOL fates but does not consider other circular economy solutions such as refill and reuse.

The EOL fates include recycling, open dumps, open burning, sanitary landfills, co-processing at cement kilns, and incineration (with or without WtE recovery). Chemical recycling and other advanced technologies are not considered, as there is little to no data on operational plants for these technologies in the ten countries. The impact of exported plastic waste is also not taken into account in the associated study and PLACES.

8. How user-friendly is this calculator? Do you need expertise in a specific area to use it?

The user interface has been simplified and designed for ease of use by all users. While basic knowledge of various polymer types and EOL fates is helpful, users do not need to be experts in Life Cycle Assessment (LCA) methodologies to interpret the results.

9. Can I use PLACES data for countries without available data but with similar EOL fates for plastic waste?

PLACES includes data specific to each of the ten countries covered in the tool. Each country has its own mix of polymer shares and EOL fates. Thus, PLACES should not be used to evaluate the environmental benefits of recycling in other countries.

10. Can I use PLACES to evaluate multi-layered plastic waste management?

Although multi-layered plastics have not been quantified specifically, their environmental impact can be estimated by using the “generic” plastic waste type in the calculator. “Generic” plastic waste refers to all plastic materials based on the waste composition for that country in the year of reference.

11. Can the tool be used to apply for carbon credits?

No, but PLACES can be used to estimate the potential GHG savings from recycling compared to other EOL fates. If a user wants to apply for carbon credits via a platform such as Verra or the American Carbon Registry, these platforms have prescribed approaches for generating carbon credits. For example, they specify how baseline GHG emissions and reductions must be measured, as well as how to ensure that the reductions are high quality (i.e., they are permanent and do not result in leakage elsewhere).

12. Can PLACES be used to develop comprehensive GHG inventories?

PLACES measures the GHG savings from plastic recycling compared to other EOL fates. However, it cannot be used to develop comprehensive GHG inventories for plastic recyclers. To do so, a recycler would need to conduct a comprehensive assessment of Scope 1, 2, and 3 emissions.

RESEARCH METHODOLOGY

13. What is the methodology behind PLACES?

The full methodology behind PLACES is detailed in the SSEA and LAC Methodology and Results documents.

PLACES was initially created for six SSEA countries during a study conducted between 2022 and 2023 in partnership with SIMTech, A*STAR using consequential LCA modeling developed with ISO 14040/14044 standards. A consequential approach refers to a system modeling method in which activities in a product system are linked, so that activities are included only to the extent that they are expected to change as a consequence of a change in demand for the functional unit.

A similar research methodology was then adopted to develop the tool for four LAC countries during the study conducted between 2024 and 2025, in partnership with CADIS.

Stakeholder consultations were also conducted with country experts on plastic waste management and recycling to validate the plastic waste management and recycling contexts in each country.

The results are based on the best data available at that time for each country.

14. What was the rationale behind selecting the ten countries?

These ten countries represent major emerging markets where plastic waste is significant. For example, 86% of the plastic released into the ocean is contributed by rivers in Asia,[1] while the LAC region contributed 3.7 million tonnes of plastic pollution entering the ocean in 2020.[2] Plastic waste in these countries is also expected to grow in the coming decades due to the expansion of the consumer class and increasing urbanization rates in medium-sized cities.

The differences in results across countries are due to variations in polymer share, assumptions (such as transport distances between plastic waste collection points and recycling or disposal facilities), EOL fates, and country-specific practices in plastic waste collection and processing. The electricity mix or energy grid of a country can also contribute to variations in the results.

15. What are the parameters for which global averages have been used in this LCA study, and how do they differ from local data sets?

The latest available local data sets have been used wherever possible. These include the plastic waste mix, EOL fates, and electricity mix for each country. For parameters where local data may not be available, global averages or assumptions have been applied. For example, in the case of WtE, polymer-specific ecoinvent entries for the treatment of plastic waste through municipal incineration for "Rest of World" (RoW) were used in the absence of country-specific data. The technology and geographic parameters are as reported by ecoinvent for RoW.

16. What types of plastic are covered by PLACES?

PLACES covers four plastic types: HDPE, LDPE, PET, and PP. These four categories represent the majority of plastic waste in the ten countries. The "generic" type in PLACES reflects all mixed plastic waste materials based on the status-quo composition for each country.

[1] Lebreton, L., Van der Zwet, J., Damsteeg, J. W., et al. (2017). *River plastic emissions to the world's oceans. Nat Commun 8, 15611* [online]. Available from: https://doi.org/10.1038/ncomms15611
[2] Brooks, A., Jambeck, J., and Mozo-Reyes, E. (2020). *Plastic Waste Management and Leakage in Latin America and the Caribbean* [online]. Available from: https://doi.org/10.18235/0002873

Term	Description
HDPE	High-density polyethylene, commonly used in milk bottles, detergent bottles, shampoo bottles, and juice bottles.
LDPE	Low-density polyethylene, commonly used in shopping and garbage bags, plastic wrapping, and packaging films.
PET	Polyethylene terephthalate, commonly used in clear soft drink bottles, cups, and cooking oil bottles.
PP	Polypropylene, commonly used in food containers, straws, automotive parts, and bottle caps.
Generic	All plastic materials based on the waste composition for that country in the year of reference.

INTERPRETATION OF THE RESULTS

17. What is “initial environmental impact,” and how is it calculated?

“Initial environmental impact” refers to the environmental impact of plastic waste going to its original EOL fate. It is obtained by calculating the environmental impact generated by the original EOL fate from which plastic waste would be diverted. The tonnes of polymer diverted are multiplied by the relevant environmental impact factors to obtain the result.

PLACES can calculate the avoided environmental impact by diverting the plastic waste from a particular EOL fate (the “initial environmental impact” figure). However, PLACES does not calculate the environmental impact of sending that waste to an alternative EOL fate, except in the case of recycling.

18. What is “recycling environmental impact,” and how is it calculated?

“Recycling environmental impact” refers to the environmental impact of recycling the plastic waste. This includes the impact from waste processing and transport, and savings from avoided production of virgin polymers and other products when plastics are recycled. The tonnes of polymer recycled are multiplied by the relevant environmental impact factors to obtain the result.

19. What is “environmental savings,” and how should the results be interpreted?

“Environmental savings” refers to the cumulative environmental impact of the avoided impact from diverting plastic waste from the original EOL fate and the recycling environmental impact. It is calculated by subtracting the “recycling environmental impact” values from the “initial environmental impact.” The calculations yield the resulting (net) GHG emissions, energy consumption, and water consumption for each polymer.

A negative result under “GHG emissions,” for example, indicates that the GHG emissions of recycling operations exceed the GHG benefit of diverting plastics from the original EOL fate.

20. Why might there be a negative value for GHG emissions, energy consumption, and water consumption in the initial environmental impact and recycling environmental impact?

The calculator accounts for sources of emissions (e.g., burning of plastic waste) and emission sinks (e.g., avoided consumption of electricity or fuel). A negative value indicates that the selected management practice results in the net reduction or avoidance of carbon emissions, energy use, and water consumption from a life-cycle perspective.

21. Is the environmental impact of virgin plastic production included in the output?

The embodied environmental impact of virgin plastic production is not included in the output. For this study, the upstream raw material extraction and production of plastics have been excluded, as these processes are common across all plastics, regardless of their EOL fates. This allows the study to focus solely on comparing the impact of waste collection and treatment.

22. Can I provide feedback on the tool?

Absolutely! We recognize that this is an initial attempt at quantifying a complex and difficult concept. We invite stakeholders to share their feedback and perspectives on this work to help us improve future versions. You can submit your feedback through this email: places@thecirculateinitiative.org.