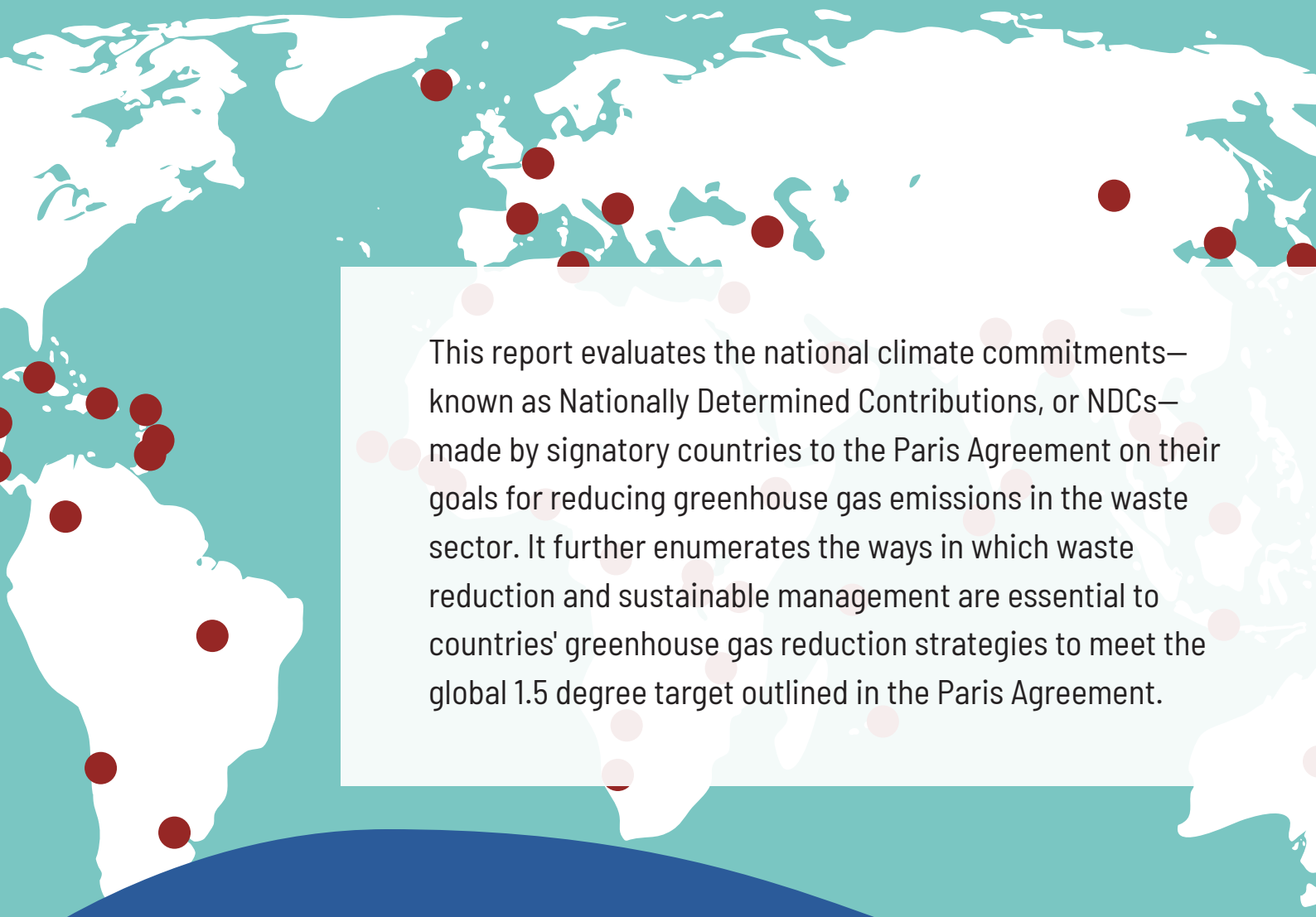
Wasted Opportunities:

A review of international commitments for reducing plastic- and waste-sector GHG emissions



This report evaluates the national climate commitments—known as Nationally Determined Contributions, or NDCs—made by signatory countries to the Paris Agreement on their goals for reducing greenhouse gas emissions in the waste sector. It further enumerates the ways in which waste reduction and sustainable management are essential to countries' greenhouse gas reduction strategies to meet the global 1.5 degree target outlined in the Paris Agreement.

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The Importance of Waste to Climate Change

The solid waste sector is a significant source of greenhouse gas (GHG) emissions, particularly methane (CH_4), which it emits at rates comparable to the oil and gas sector.[1] **The Intergovernmental Panel on Climate Change (IPCC) identifies waste management as one of three sectors with the greatest potential to reduce surface temperature rise in the next 10-20 years.**[2] Methane emissions overwhelmingly derive from organic waste buried in landfills and dumps. In addition, the incineration and open burning of waste emits carbon dioxide (CO_2) and nitrous oxide, another powerful, short-term greenhouse gas (GHG).

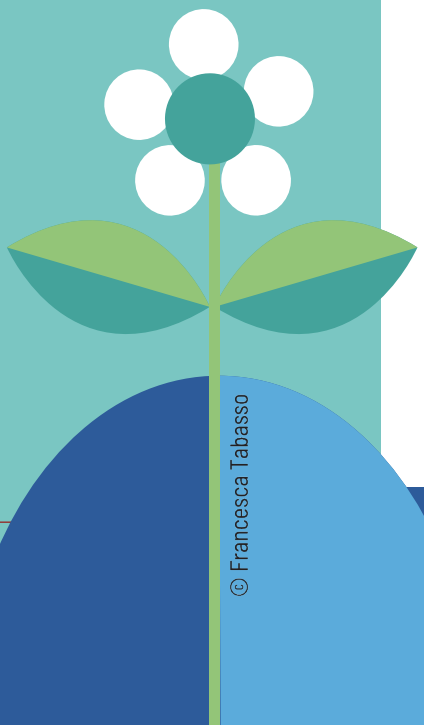
The fastest-rising constituent of waste streams is plastic, a fossil fuel derivative that has no good end-of-life management options. Plastic production is currently growing at 3.5-4% per year. At this rate, plastic will consume 13% of the 1.5°C carbon budget by 2050.[3] If plastic were a country, it would already be the fifth-largest emitter in the world.[4] **The 1.5 degree target outlined in the Paris Agreement will not be achievable without significant reductions in plastic production.** Countries with plastic production facilities should target these industries for phaseout, along with the rest of the fossil fuel sector. Countries without a plastic industry can help to reduce demand for plastic through bans and by promoting alternative business models.[5,6,7] This is an example of how interventions in the waste sector create a ripple effect reducing emissions in other sectors like industry and land use.

Waste Sector Solutions for the Climate

Through good organics management, intensive recycling, and source reduction of plastic, waste management is one of the few sectors that has the potential to generate net negative emissions.[8,9] These waste management practices, collectively known as zero waste, are practical, affordable, and already being implemented in diverse cities around the world.[10] **Diverting organic waste away from landfills and toward useful ends like compost, animal feed, or anaerobic digestion is highly effective at reducing CH_4 emissions.**[11,12,13,14,15,16,17] These approaches not only avoid CH_4 emissions but also produce valuable goods and services. Recycling of paper, metals, and glass reduces emissions in the forestry, mining, and manufacturing sectors by displacing emissions-intensive raw materials.[18,19,20,21,22,23]

Zero waste offers important opportunities to address poverty, environmental and social injustices, and structural inequalities. Recycling and composting generate as much as 50 times as many jobs as waste disposal (landfill and incineration).[24] Zero waste offers the opportunity to fully include the informal sector, which already constitutes the backbone of the recycling system in most developing countries. Meanwhile, closing waste disposal sites can alleviate the problems of negative health impacts, shortened lifespans, and poor quality of life in host communities, which are generally low-income and marginalized.[25]

Countries should stay away from counterproductive waste management technologies like incineration and refuse-derived fuel production. Incinerators, which propose to convert solid waste into energy, emit more GHGs than the energy sources they displace, while also destroying material that could be usefully composted or recycled.[26,27] The co-incineration of waste, in the form of refuse-derived fuel (RDF) or plastic in cement kilns, is particularly problematic because of the lack of emissions control equipment and monitoring at cement kilns.



Nationally Determined Contributions (NDCs)

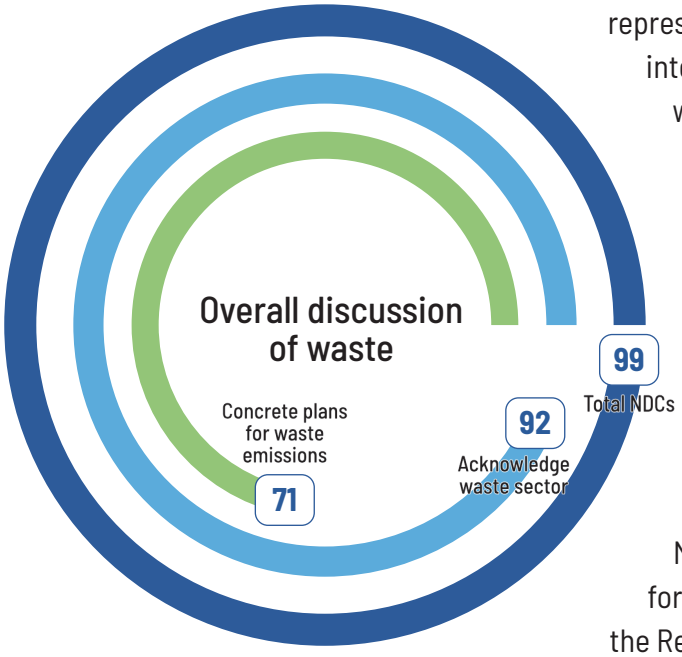
As part of the 2015 Paris Agreement, national governments agreed to submit plans that describe what they are doing to address climate change. These plans are called Nationally Determined Contributions, or NDCs, and include any relevant policies, infrastructure changes, or financial investments that will help a country reduce its greenhouse gas emissions. The Paris Agreement requires that countries submit new NDCs every five years, showing a progression compared to the previous NDC, reflecting its highest possible ambition. COP26 is the deadline for the first update since 2015.

How the NDCs Were Rated in This Analysis

NDCs were reviewed for their overall discussion of waste, the specific waste management strategies they proposed, and their consideration for social and environmental justice issues in the waste sector. For plastic, which cannot be adequately managed through waste-sector interventions alone, we looked for restrictions on production and use. NDCs were given a green (positive), yellow (mixed), or red (negative) rating for each category based on the scoring criteria described in the methodology section. Individual country ratings can be found on page 13.

Our analysis was restricted to the text of the NDCs; we did not compare NDCs with existing waste plans, programs, or laws. NDCs are forward-looking documents, indicating a country's plans and intentions for the next five years rather than its existing policies. In some cases, the plans in NDCs are conditional upon the receipt of climate finance. For these and other reasons, there may be large discrepancies between what countries outline in their NDCs, and what they currently practice. For example, Chile's NDC includes an Extended Producer Responsibility law that is supposed to "improve working conditions and the standards of living for informal recyclers," but has been criticized for incentivizing competition from private companies with better access to loans, capital, and equipment, harming the livelihoods of many informal recyclers.[28] Comparing NDCs with current conditions was not feasible for every country, and the results of this analysis should be considered with that in mind.

Results



Taken together, the 99 NDCs reviewed in this analysis represent many missed opportunities for the international community to rigorously address waste sector emissions in the coming years. **Most NDCs (92) acknowledge the waste sector to some extent**, but **only 71 have concrete plans to address waste-related emissions**.

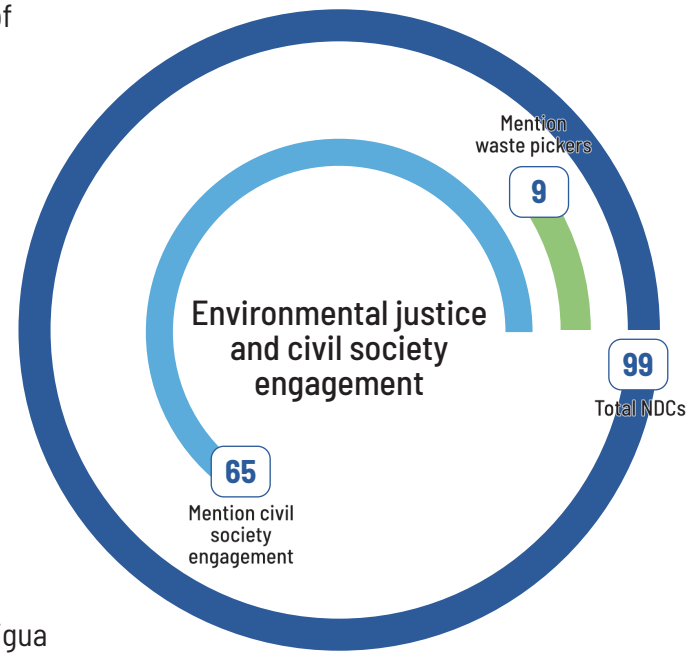
Similarly, reducing plastic production and waste is essential for achieving the international emission targets laid out in the Paris Agreement, and yet only Cambodia's NDC discusses the link between plastic generation and its impact on the global carbon budget.

Many countries do not include emission targets for their waste sectors, and of those that do, only the Republic of the Congo proposes a zero emissions goal for the waste sector.*

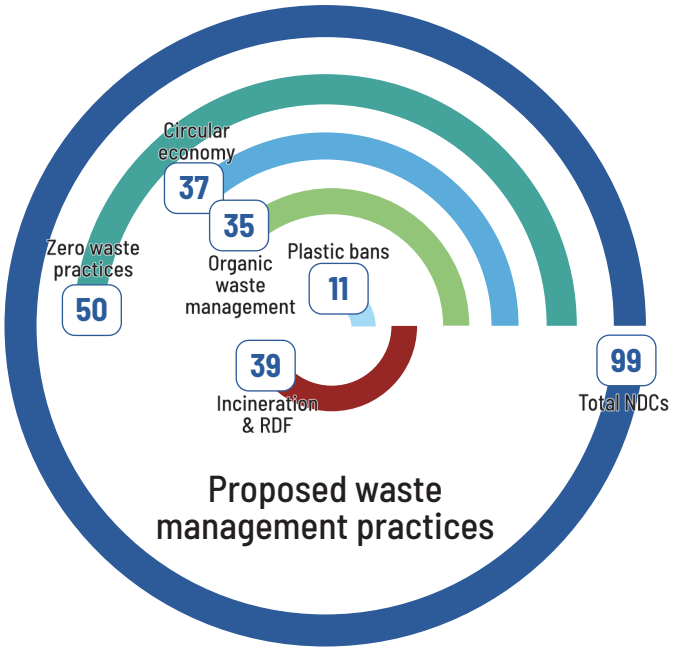
* Namibia has set a goal of net zero methane emissions in the waste sector by 2050.

The NDCs reveal a similar lack of consideration for social and environmental justice issues related to the waste sector. Despite the fact that landfills, open dumps, and incinerators tend to be concentrated in marginalized communities,[29,30] only Myanmar's NDC acknowledges the disproportionate exposure of said communities to waste-related pollution.

Similarly, over 20 million people globally earn their living as informal waste workers and are responsible for a large part of recycling worldwide.[31] However, **only 9 NDCs mention the informal sector** (Cambodia, Chile, Colombia, Dominican Republic, Honduras, Liberia, Morocco, Myanmar, Panama). One way for countries to avoid blind spots like this is through stakeholder engagement in the NDC planning process. However, while **65 NDCs mention multi-stakeholder processes**, only two NDCs describe a concrete structure for civil society or community engagement in the waste sector (Antigua and Barbuda, Tanzania).



Other concerning trends arise within the NDCs that actually propose specific practices for their waste sectors. Though **half of the NDCs (50)** propose **common and effective strategies for reducing waste-related emissions**, such as better separate collection of waste, recycling, and composting, **39** of them also include **waste incineration or refuse-derived fuel use** in their plans. These carbon-intensive practices undercut the benefits of the zero waste strategies proposed in the same NDCs. Furthermore, a majority of countries fail to prioritize the best waste management practices for eliminating waste sector methane emissions: organic waste recovery and composting. Only **35 countries** propose **better separate collection for organic waste and/or composting** in their NDCs.



Beyond these "downstream" waste management strategies, **37** of the NDCs include some discussion of **creating circular economies or employing circular economic principles** as part of their waste management strategies. Such practices, like Extended Producer Responsibility programs, encourage "upstream" management of waste by promoting reuse, repair, and design changes that help prevent waste generation in the first place.

Finally, although only one NDC discusses the need to reduce plastic production, **11 address plastic waste** through existing or proposed **bans or phase-outs of different types of single-use plastics** (Cabo Verde, Fiji, Jamaica, Maldives, Monaco, Panama, Qatar, São Tomé and Príncipe, Sri Lanka, Tonga, United Arab Emirates). Such bans are critical for a successful transition away from plastic and fossil fuel dependence, and other countries should follow suit.

All in all, the international community missed an opportunity to take effective action for their waste sectors with this round of NDCs. A failure to meaningfully discuss the links between waste, plastic generation, and climate was followed up in many cases by proposals for counterproductive waste emission interventions like incineration, or a lack of specific plans altogether. The prevalence of circular economic goals, single-use plastic bans, composting, and other effective emission-reducing strategies, however, is encouraging, and such proposals provide important examples of what all countries will need to do in order to eliminate waste sector emissions and achieve the global goals set out in the Paris Agreement.

Key Findings

28

- More than a quarter of countries fail to recognize the waste sector's contribution to GHG emissions, with 21 NDCs lacking specific plans to address waste-related emissions, and 7 missing any mention of waste at all.

50

- Most of the NDCs that do address waste—50 of 71—propose appropriate actions such as increased recycling that will lower GHG emissions.

39

- 39 NDCs propose combustion technologies that will undermine GHG reduction efforts. Paradoxically, 32 NDCs combine combustion technologies with zero-waste strategies, suggesting that many governments lack a systems-level understanding of waste and its potential contribution to climate change mitigation.

11

- Plastic waste generation is an under-addressed topic, with only 11 NDCs proposing strategies to directly tackle plastic waste, and only one NDC discussing the link between plastic production and fossil fuel dependence.

35

- A majority of countries fail to prioritize the waste management practices that could rapidly draw down waste sector methane emissions: organic waste recovery and composting. Only 35 countries propose a better separate collection system for organic waste and/or composting in their NDCs.

12

- Only 12 countries discuss environmental justice, gender and equity, informal workers, or civil society engagement in the waste sector in a concrete and substantial way.

POSITIVE PLANS

Circular economy

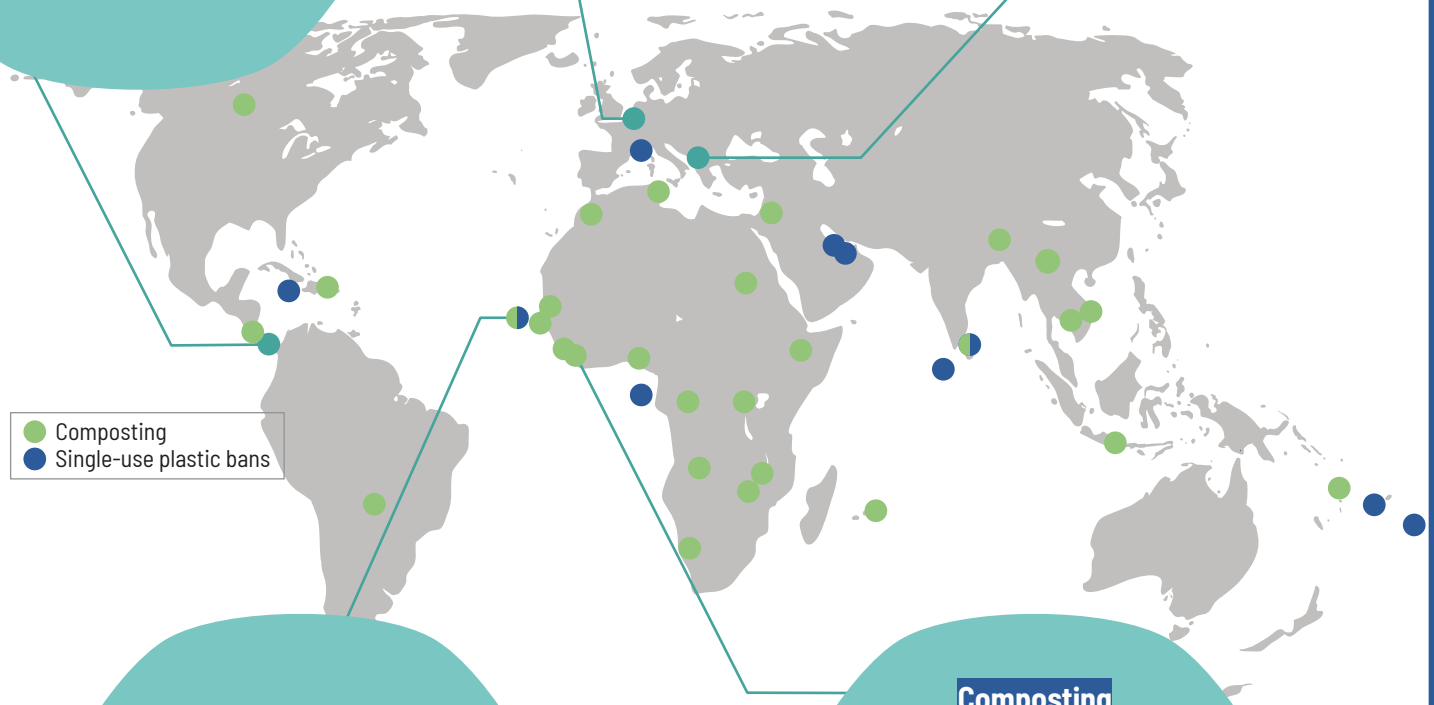
Panama's government states that it has partnered with organized labor and the private sector to create a national Circular Economy Center.

Recycling

The European Union has set strong recycling goals, requiring that 70% of all packaging waste be recycled by 2030, and 65% of all municipal waste be recycled by 2035.

Better separate collection

Source separation of organic waste, planned by **Montenegro**, will allow the country to reduce the share of organic municipal waste disposed of in landfills to 35% of its 2010 levels by 2033.



Single-use plastic bans

Cabo Verde's planned roadmap for "responsible tourism in the circular economy" will include a ban on single-use plastics.

Composting

Through composting of agricultural and market waste, **Liberia** plans to decrease its GHG emissions, increase circularity in the agricultural economy, and reduce the risk of fires at its landfills.

DETRIMENTAL PLANS

Incineration

Guinea is currently planning for a large-scale waste-to-energy incineration plant at the cost of USD11-17M that could otherwise be spent on strategies that eliminate rather than generate GHG emissions.

"Chemical recycling"

Japan is planning for "more chemical recycling of waste plastic at steel plants," a technologically challenged process that generates new GHG emissions while often failing to produce new plastic.

NDCs that include waste incineration or/and use of refuse-derived fuel in cement plants (39)

Andorra, Angola, Antigua and Barbuda, Argentina, Bangladesh, Barbados, Bhutan, Burundi, Cabo Verde, Cambodia, Colombia, Dominican Republic, Gambia, Guinea, Indonesia, Japan, Malawi, Maldives, Mauritius, Mongolia, Morocco, Myanmar, Namibia, Nepal, Nigeria, Palestine, Republic of the Congo, Rwanda, Senegal, Seychelles, Sri Lanka, Tanzania, Thailand, Tonga, Tunisia, United Arab Emirates, United States of America, Vanuatu, Vietnam

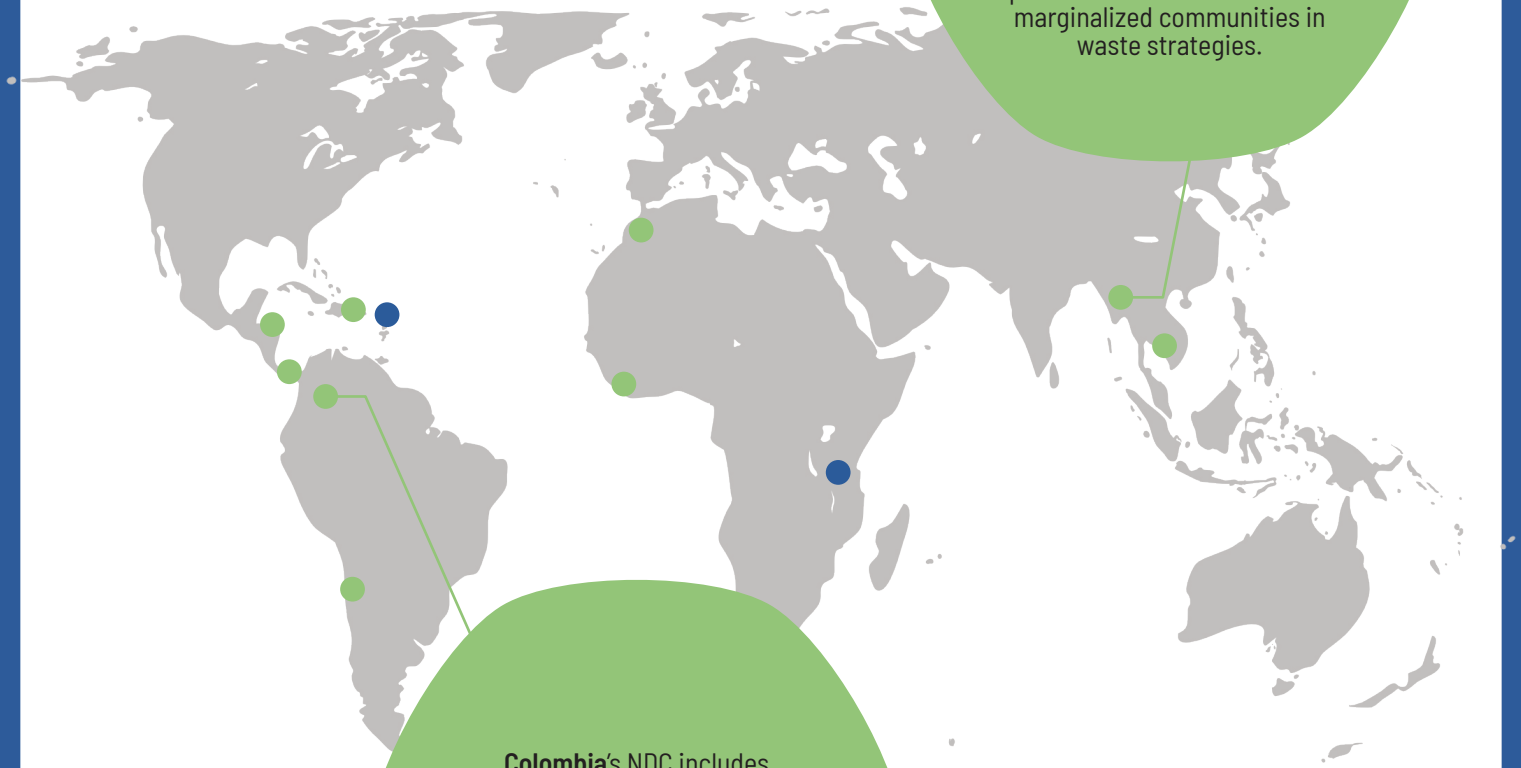
Refuse-derived fuel in cement plants

Indonesia plans to ramp-up refuse-derived fuel use to account for 5% of total waste volume by 2030.

ENVIRONMENTAL JUSTICE AND CIVIL SOCIETY ENGAGEMENT

NDCs that include consideration for waste pickers (9)
Cambodia, Chile, Colombia, Dominican Republic, Honduras, Liberia, Morocco, Myanmar, Panama

NDCs that include civil society or community engagement in the waste sector (2)
Antigua and Barbuda, Tanzania



Myanmar's NDC includes inclusiveness, climate justice and equity, and gender equality as guiding principles; it states that the country will take into account specific vulnerabilities of formal and informal waste workers and exposure to pollutants for low-income and marginalized communities in waste strategies.

Colombia's NDC includes plans to support informal waste workers by creating 38 new waste picker organizations, in addition to supporting 25 existing ones.

Methodology

All updated NDCs submitted before October 11, 2021 as well as six original NDCs submitted after January 2020 were searched for keywords related to municipal solid waste production and management.* In order to best represent the most recent and relevant commitments of the UN countries, original NDCs submitted before January 2020 were excluded. This resulted in a total of 99 NDCs representing 125 countries.† The NDCs were rated on their overall discussion of the connections between the waste sector and climate, the types of waste management strategies or technologies proposed, and their discussion of environmental justice and civil society engagement measures in the waste sector. We did not compare NDCs with current policies or practices in each country; NDCs are forward-looking documents that indicate countries' plans and intentions and were analyzed at face value. Similarly, this analysis is based solely on the text of the NDCs, and does not fully reflect other national waste policies or plans. For each category, NDCs received a green, yellow, or red score, based on the following criteria:

* Waste water management policies, technologies, and strategies were not evaluated.

†The European Union submits a single NDC on behalf of all 27 of its member countries.

Scoring Criteria for NDCs

	Overall discussion of waste	Proposed waste management practices	Environmental justice and civil society engagement
Green (positive)	Clear discussion of waste sector with concrete plans for waste emission management	More positive than negative practices, without combustion-based interventions	Clear discussion of environmental justice issues, gender and equity, or informal workers in the waste sector, OR clear process for waste sector stakeholder engagement
Yellow (mixed)	NDC mentions waste but does not discuss the topic in depth or fails to propose concrete actions	Equal numbers of positive and negative practices OR more positive than negative practices, but includes combustion-based interventions	Simple/vague reference to environmental justice, gender and equity, or informal workers in the waste sector, OR multi-stakeholder engagement process that does not address the waste sector specifically
Red (negative)	NDC does not mention waste at all	More negative than positive practices	No discussion of environmental justice issues, gender and equity, or informal workers in the waste sector, and no stakeholder engagement process
Gray (no data available)	Not used	No specific practices proposed	NDC does not mention waste at all

CATEGORY 1 **Overall discussion of waste and climate.** As described in the introduction, the waste sector has an important role to play in managing global emissions, and this category aims to score NDCs based on the level of commitment and detail with which each country addresses the waste sector. As such, NDCs were scored based on whether or not they discussed the link between waste and climate, and if so, if they proposed specific policies, technologies, or strategies for achieving emission reductions in the sector.

CATEGORY 2 **Proposed waste management practices.** Each NDC that proposed specific plans for the waste sector was assessed based on whether the proposed policies, technologies, and strategies were positive, ambiguous, or detrimental to achieving international climate goals.

- **Positive practices** include upstream interventions that reduce the need for new material production and waste management in the first place. These lead to the greatest reduction in GHG emissions, and include single-use plastic bans, extended producer responsibility (EPR) programs, and circular economy practices like promoting reuse and repair over new purchases. Best practice interventions to reduce landfill methane emissions include separate collection of waste and composting. Other positive interventions that reduce the need for new material production include recycling.

- **Ambiguous practices** are those such as landfill gas capture and new sanitary landfill construction, which can provide some climate benefits relative to current practice, but are less impactful than the best-in-class interventions described above. While landfill gas capture is an appropriate intervention to reduce methane emissions from existing landfills, for example, continuing to landfill organics, with or without landfill gas capture, leads to greater methane emissions; separate collection and treatment of organic waste is a far better approach. Many NDCs that mentioned landfill gas capture did not specify whether these would be for existing landfills or new construction. These interventions should be used with caution, as they run the risk of supplanting the most impactful waste management practices.

- **Finally, detrimental practices** include incineration (with and without energy generation), refuse-derived fuel production, and burning waste in cement kilns. These combustion-based approaches have a negative impact on climate by turning solid waste into greenhouse gas emissions and toxic air pollution. Energy generated from waste also increasingly displaces energy from renewable sources.

NDCs receive one point for each positive intervention proposed, zero points for each ambiguous intervention, and lose one point for each detrimental intervention. They are then given an overall rating for this category based on whether they propose more positive or negative practices. Given the significant drawbacks of combustion-based treatments, NDCs that propose combustion-based interventions receive, at best, a yellow rating for this category.

NDCs that do not propose any specific policies or technologies do not receive a rating for this category and are highlighted in gray. See the Appendix for a quick description of each intervention, and why it has the point value that it does.

Rating system for proposed waste managementpractices

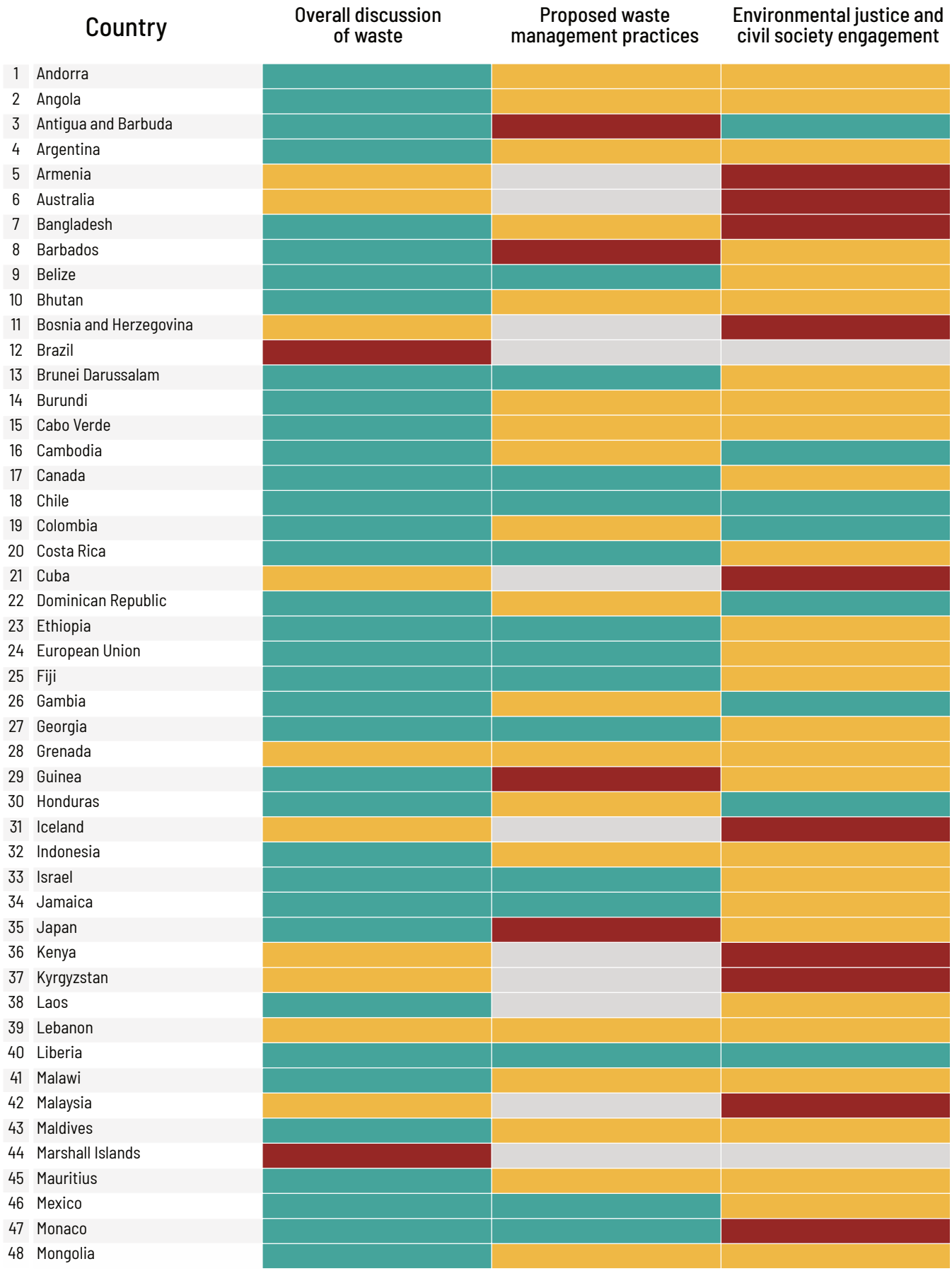
Positive practices (+1)	Ambiguous practices to be used with caution (+0)	Detrimental practices (-1)
Better separate collection	Landfill gas capture and/or use	"Waste to energy" incineration
Recycling	New sanitary landfills	Refuse-derived fuel in cement plants
Composting		"Green hydrogen" from waste*
Single-use plastic bans		"Chemical plastic recycling" †
Extended Producer Responsibility Programs/Laws		
Reuse programs		
Circular economy goals (must include specific laws, targets, or programs)		
"3R's" principle		

* Only one NDC (USA) mentions waste-derived green hydrogen. This implies using waste to generate electricity, labeling that electricity renewable or low-carbon, and using it to produce hydrogen. However, electricity derived from waste has very high emissions; this is not truly green hydrogen.

† Only one NDC (Japan) mentions chemical recycling of plastics. Chemical recycling refers to a set of technologies, usually pyrolysis-based, that convert plastic, usually into fuel. These are high-energy processes with high levels of GHG emissions. See www.no-burn.org/chemical-recycling-resources for more information.

CATEGORY 3 **Environmental justice and civil society engagement.** NDCs were rated on the social dimensions of their waste sector climate plans. This includes discussion of waste-related environmental justice issues such as the disproportionate impact of waste pollution on low-income communities, gender and equity considerations in the waste sector, or recognition of informal waste workers. Ratings for this section also include any participatory processes that countries engaged in to better include civil society and workers, particularly the informal sector, in the development of waste sector goals discussed in their NDCs.

COUNTRY RATINGS



	Country	Overall discussion of waste	Proposed waste management practices	Environmental justice and civil society engagement
1	Andorra			
2	Angola			
3	Antigua and Barbuda			
4	Argentina			
5	Armenia			
6	Australia			
7	Bangladesh			
8	Barbados			
9	Belize			
10	Bhutan			
11	Bosnia and Herzegovina			
12	Brazil			
13	Brunei Darussalam			
14	Burundi			
15	Cabo Verde			
16	Cambodia			
17	Canada			
18	Chile			
19	Colombia			
20	Costa Rica			
21	Cuba			
22	Dominican Republic			
23	Ethiopia			
24	European Union			
25	Fiji			
26	Gambia			
27	Georgia			
28	Grenada			
29	Guinea			
30	Honduras			
31	Iceland			
32	Indonesia			
33	Israel			
34	Jamaica			
35	Japan			
36	Kenya			
37	Kyrgyzstan			
38	Laos			
39	Lebanon			
40	Liberia			
41	Malawi			
42	Malaysia			
43	Maldives			
44	Marshall Islands			
45	Mauritius			
46	Mexico			
47	Monaco			
48	Mongolia			

	Country	Overall discussion of waste	Proposed waste management practices	Environmental justice and civil society engagement
49	Montenegro			
50	Morocco			
51	Myanmar			
52	Namibia			
53	Nepal			
54	New Zealand			
55	Nicaragua			
56	Nigeria			
57	North Korea			
58	North Macedonia			
59	Norway			
60	Oman			
61	Palestine			
62	Panama			
63	Papua New Guinea			
64	Paraguay			
65	Peru			
66	Philippines			
67	Qatar			
68	Republic of Moldova			
69	Republic of the Congo			
70	Russia			
71	Rwanda			
72	Saint Lucia			
73	Samoa			
74	São Tomé and Príncipe			
75	Senegal			
76	Seychelles			
77	Sierra Leone			
78	Singapore			
79	Solomon Islands			
80	Somalia			
81	South Africa			
82	South Korea			
83	South Sudan			
84	Sri Lanka			
85	Sudan			
86	Suriname			
87	Switzerland			
88	Tanzania			
89	Thailand			
90	Tonga			
91	Tunisia			
92	Ukraine			
93	United Arab Emirates			
94	United Kingdom			
95	United States of America			
96	Vanuatu			
97	Viet Nam			
98	Zambia			
99	Zimbabwe			

See more detailed analysis of each NDC at: www.no-burn.org/cop26-NDCs

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Appendix

Positive interventions in the waste sector

Better separate collection: Separate collection is key to successful waste diversion from disposal. In particular, separate collection is critical to implementing treatment solutions for organic waste, which produces large quantities of methane when landfilled. According to the Global Methane Assessment, ending the landfilling of organic waste is a priority intervention to rapidly reduce global methane emissions and stabilize global temperatures.[32] Treatment solutions for organic waste include composting, animal feed, and anaerobic digestion. Separate collection also facilitates recycling which reduces the need for more raw material production and associated emissions.

Recycling: Metal, paper, and glass recycling is effective at recovering raw material to replace virgin materials that would otherwise have to be mined or logged, saving energy, resources, and carbon emissions. While plastic recycling faces economic competition from cheap virgin plastic and the technical challenge of recycling a wide variety of commercial plastics, it is still preferable to landfilling.

Composting: Because the majority of waste-related emissions are due to anaerobic decomposition of organic matter in landfills or wastewater, separating out and composting organic material is one of the most effective ways to reduce GHG emissions in the waste sector. Composting is also affordable, generates more jobs than landfilling, and turns organic waste into a useful product that can be sold to offset its operational costs and benefit local economies.

Reuse: Material reuse (e.g., using mugs instead of single-use coffee cups) is an effective "upstream" management practice that reduces the need for new material production in the first place, saving resources, energy, and carbon emissions.

Plastic bans: As an "upstream" waste intervention, bans on plastic, particularly single-use plastic items, avoid the fossil fuels, energy, and associated carbon emissions required to produce new plastic. A transition away from fossil fuels must include a reduction in the society's dependence on plastic, and plastic bans are an important step towards that goal.

Extended Producer Responsibility (EPR): Extended producer responsibility laws require producers of consumer goods to take full lifecycle responsibility for their products or packaging, either by directly managing their products once they have reached the end of their useful lives, or by redesigning products so that they can be better suited for reuse, repair, or recycling. The ultimate goal of EPR is to reduce the need for new material production, saving raw resources, energy, and greenhouse gas emissions.

Circular economy: In a "circular economy," consumer products are designed for durability, reuse, remanufacturing, and recycling, in an effort to generate value from materials that would be discarded in traditional waste systems, with the ultimate aim of eliminating waste completely. This reduces the need for resource extraction, new material production, and downstream waste management, saving energy and greenhouse gas emissions at every step. NDCs only received credit for this topic if their plan included specific goals, laws, campaigns, or programs for circular economy development. NDCs that simply stated the development of a circular economy as a goal did not receive credit.

3R's: The "3R's" of waste management (reduce, reuse, recycle) are a collection of upstream and downstream interventions that reduce the need for new material production, saving energy, natural resources, and greenhouse gas emissions. NDCs that discuss plans to better implement "the 3R's," but do not provide specific details on what those plans include, receive only one point, rather than a point for each "R" separately.

Ambiguous interventions/interventions to use with caution

Landfill gas capture and burning: Landfill gas contains about 50% methane from the decomposition of organic matter buried in landfills. Globally, landfills are one of the largest sources of anthropogenic methane emissions. While greenhouse gas emissions from landfills can be reduced by capturing and burning the methane released from landfills, forward-looking NDCs should ultimately rely on measures that eliminate organic waste in landfills or prevent waste in the first place, rather than strategies that simply mitigate the negative consequences of poor organic waste management.

While landfill gas capture does reduce GHG emissions relative to current practice, deeper cuts are possible through better interventions.

New sanitary landfill construction: With extensive composting, recycling, and circular economic policies, the need for landfills should be greatly reduced, and countries should be focusing on these more sustainable, less carbon-intensive management strategies. However, in many countries without adequate waste management systems or infrastructure, sanitary landfills may be preferable to current practices like open dumping or burning of waste. As zero waste measures take hold, the need for sanitary landfills will decrease dramatically, necesitating closure and restoration.

Detrimental interventions

"Waste-to-energy" incineration: Incinerators are a major source of greenhouse gas emissions, displace renewable energy sources, and destroy resources that could otherwise be recovered through repair, composting, or recycling. Incinerators are expensive and rely on a continuous stream of waste to cover operational costs, disincentivizing waste reduction and creating the need for new materials to be extracted and produced, all of which generates more, not fewer, greenhouse gas emissions. The electricity generated by "waste-to-energy" facilities is more carbon-intensive than the energy it displaces, which is increasingly generated from renewable sources.

Refuse-derived fuel: Refuse-derived fuel, like incineration, turns waste that could otherwise be reused, composted, or recycled, into air pollution and greenhouse gas emissions through a polluting and energy intensive production process. It is frequently labeled "alternative fuel" and burned in cement kilns.

Chemical "recycling" and other thermal treatments: The heating process required to break down plastic waste in chemical recycling and other high-temperature treatments demands large amounts of energy, and results in toxic air pollutants, greenhouse gas emissions, and toxic waste. Furthermore, much of the plastic material in chemical "recycling" processes is lost due to technological challenges, and very little new plastic is actually produced. In this way, chemical recycling does little to offset the need for new plastic production, and perpetuates dependence on fossil fuels.

"Green hydrogen" from waste: "Green hydrogen" refers to hydrogen fuel made from water and a renewable electricity source. Waste-to-energy is not a renewable or low-carbon source of electricity, so "waste-derived green hydrogen" is not in fact green hydrogen at all, but a high-emissions means of making hydrogen.

Endnotes

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