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Closing the "Plastics Gap" TO FIGHT CLIMATE CHANGE

The case for coastal nations to include plastics reduction in nationally determined contributions

REPORT AUTHOR
Aarthi Ananthanarayanan

RESEARCH TEAM
Anjel Iriaghomo, Anna Zivian, Aarthi Ananthanarayanan

REVIEWERS
Anna-Marie Laura, Luis Estevez-Salmeron, Felipe Victoria, Anja Brandon, Caroline Gentile, Jordana Lewis, Elizabeth Greener

CONTACT
Anna-Marie Laura, Senior Director, Climate, Ocean Conservancy | alaura@oceanconservancy.org

ABOUT OCEAN CONSERVANCY'S CLIMATE WORK
Ocean Conservancy supports a transition to 100% clean ocean energy by the year 2050. While oil drilling and plastic production were staples of the past, they do not have to be the future. By phasing down oil and gas and plastic production, while moving toward responsible, clean ocean energy and a circular economy, we can protect the ocean and coastal communities. Through science-based research, targeted policy changes, and international advocacy, Ocean Conservancy is boldly leading the sea change toward clean ocean energy.

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Executive Summary

The ocean is the planet's life support system, and every part is impacted by plastic pollution and climate change. While plastic pollution and climate change may seem like separate issues, they are both the consequence of the same root problem: fossil fuels. The science is clear—to protect the ocean and communities on the front lines of these crises, society must phase out fossil fuels, including dramatically reduce the production of fossil fuel-based plastics.

When it comes to addressing climate change, switching to renewable energy and ramping up energy efficiency can only address 55% of global greenhouse gas emissions needed to meet our climate goals; a circular economy holds the keys for accessing the remaining 45%.[1] Plastics, which are made from and powered by fossil fuels, are responsible for almost 5% of global GHG emissions,[2] a staggering 12% of global oil demand and 8.5% of global gas demand.[3] Continued buildout of plastic production facilities creates the major risk of locking in oil and gas demand and refinery infrastructure for decades to come.

The 2023 Global Stocktake, a status report on the world's progress toward meeting the goal of limiting global warming to 1.5 degrees Celsius, found that the world is dangerously off-track in reducing greenhouse gas emissions. As nations look to make renewed climate commitments or nationally determined contributions (NDCs) in 2025, they must be more ambitious than ever. Coastal nations, on the front lines of both the climate and the plastics pollution crises, can lead the way by harnessing plastics reduction—reduction of both plastics production and consumption—as a climate mitigation and adaptation tool.

Today

- Plastics drive nearly **5%** of global greenhouse gas (GHG) emissions and 12% of oil demand – more than global aviation.[4]
- **75%** of the emissions from plastics occur upstream, from fossil fuel extraction to resin production.

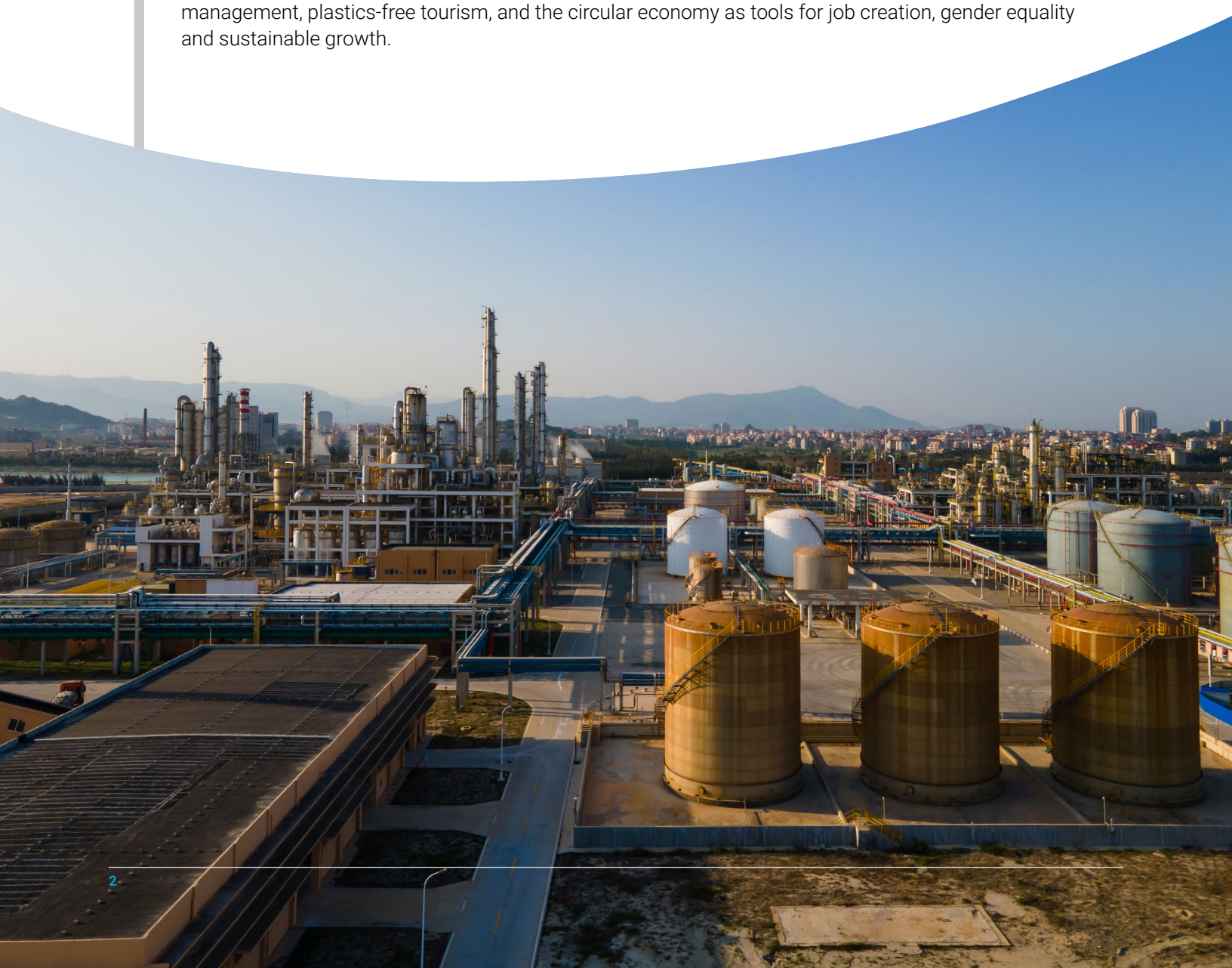
By 2050

- Emissions from plastics production alone will consume 21-25% of the world's 1.5° C carbon budget.[5]
- Plastics production could use more oil per capita than cars,[6] locking in fossil fuel demand.

KEY FINDINGS FROM ANALYSIS

While plastics reduction can deliver climate mitigation and adaptation[7] benefits, Ocean Conservancy's review of the NDCs of 98 coastal countries found the reduction of plastics production and consumption missing.

- **While 63% of coastal countries planned to improve waste management** as a climate mitigation strategy, only 14% directly mentioned plastics reduction, primarily focused on single-use plastics.
- Of coastal countries, **only 11% planned decarbonization efforts** in the chemicals sector; in fact, a few of the countries that produce plastics also included plans to *increase* production.
- **45% mentioned improving recycling** (plastics and other materials); only 19% of countries included brief mentions of reuse, despite the potential for significant emissions reduction.
- **36% of countries planned to explore or expand high-emissions disposal methods** like incineration, refuse-derived fuel, or waste-to-energy systems, sometimes counting them as "renewable fuels," despite their negative impact on climate change.
- However, **35% of coastal countries identified a circular economy as an overarching goal** of their NDC, and 23% identified waste and marine litter as adaptation and resilience challenges—but some also saw waste management, plastics-free tourism, and the circular economy as tools for job creation, gender equality and sustainable growth.



REASONS FOR OPTIMISM

Among the 14% of coastal countries that mentioned plastics reduction in their NDCs, the following have forward-looking commitments on plastics production and waste that can be strengthened in their 2025 updates and emulated by other countries.

CATALYZING SUSTAINABLE PRODUCTION AND CONSUMPTION

Fiji's NDC includes cross-cutting actions on "Sustainable Production and Consumption for holistic climate action," including bans on the import, export, manufacture, distribution and use of plastic products such as polyethylene bags and polystyrene.

CIRCULAR ECONOMY METRICS FOR MITIGATION AND ADAPTATION

Chile is building a circular economy to achieve adaption and mitigation benefits, committing to developing a Circular Economy Roadmap for 2020 to 2040 and to "establishing and implementing metrics and indicators on circularity to monitor the country's progress in circular economy and identify its contribution to climate change mitigation and adaptation."

CIRCULAR ECONOMY A PRIORITY

Panama names the circular economy as one of 11 priorities, establishing a Circular Economy Center and a zero-waste policy that "regulates the importation of materials or products whose valuation or comprehensive management is limited or non-existent in the country." It recognizes the importance of the waste sector for gender equality, highlighting the role of women in recycling and reuse.

SUSTAINABLE TOURISM AS AN ENGINE

Cabo Verde's NDC outlines aims to develop a national roadmap to shift to responsible tourism and a circular economy. The roadmap will define targets for local contributions to reducing GHG emissions, per visitor/day by 2030, including through strict reuse and recycling, bans of single-use plastic, and beach cleanups. It also includes fiscal incentives to design for circularity.

THE OPPORTUNITY TO STRENGTHEN COMMITMENTS TO PLASTICS REDUCTION

By including plastics reduction policies in countries' NDCs, coastal nations stand to gain significant co-benefits to local livelihoods, marine ecosystems, and public health. In addition, NDCs can help guide climate finance towards the countries that demonstrate political will and ambition towards increased attention on the climate impacts of growing plastics production and use.

Recommended policies for addressing the climate impacts of plastics include committing to a circular economy and sustainable consumption and production, and setting specific targets to:

- Reduce plastics and fossil fuel production, eliminate subsidies, and advance decarbonization of production and manufacturing.
- Reduce plastics (e.g., economy-wide, via procurement and in key sectors).
- Advance innovation and incentives for reuse, refill, recycled content, and product design to enable circular use.
- Require strong solid waste management, recycling and composting and policies that require producers to invest in waste management systems.
- Limit use of high-emissions disposal methods (incineration, waste-to-energy, refuse-derived fuels).
- Prioritize plastics cleanup in ecosystems critical for resilience and adaptation.
- Ensure a just transition for affected communities and workers.

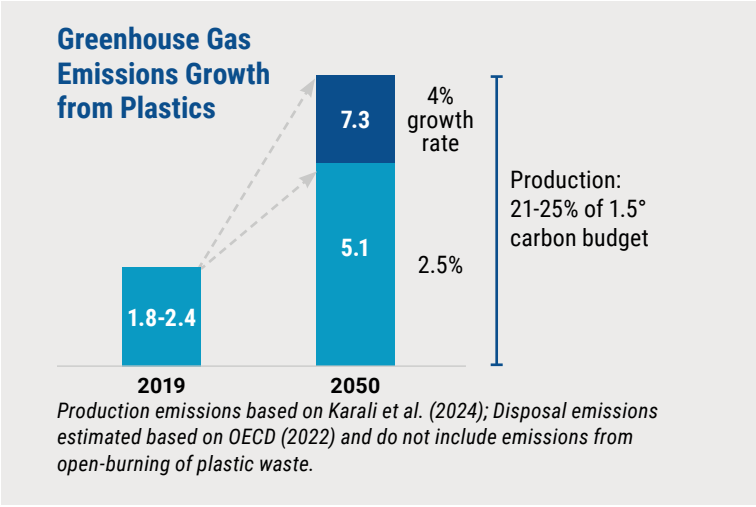
1. Plastics are a Climate Problem and an Existential Threat to the Ocean

The ocean is the planet's life support system, critical for regulating the Earth's climate and weather patterns, and supplying food and livelihoods around the world. Every part of this vital system—from the deepest trenches of the ocean to Arctic snow—has been impacted by both plastics pollution and climate change. Plastics and climate change are existential—*and interlinked*—threats to the ocean and the communities that depend on it.

Coastal nations and communities are on the front lines of these issues, facing the worst impacts of rising sea levels, extreme storms, and a tidal wave of plastic pollution. But these nations are also sources of solutions. From crisis comes opportunity, and island states at the forefront of international climate negotiations, countries advancing comprehensive plastics and circular economy policies, and cities leading on waste management, all have the expertise to be drivers of change.

At UNFCCC COP28 in 2023, governments made the historic commitment to phase out fossil fuels. On the heels of the hottest year on record, the first Global Stocktake (GST), an assessment of progress toward the goals of the Paris Agreement on Climate, showed that the world is woefully offtrack in reducing greenhouse gas emissions (GHG) to avert catastrophic climate change. These findings, included in the 28th Conference of the Parties (COP28) final decision text, "UAE Consensus," called on parties *to transition away from fossil fuels* to reach net zero emissions by 2050. **This agreement is vital to the well-being of coastal communities and the ocean, and reducing plastic production and consumption plays a critical role in this transition.**

Plastic reduction is a climate change mitigation solution. Switching to renewable energy and ramping up energy efficiency can only address 55% of global greenhouse gas emissions; a circular economy holds the keys for accessing the remaining 45%.[8] Plastics are responsible for almost 5% of global GHG emissions,[9] a staggering 12% of global oil demand and 8.5% of global gas demand.[10] The emissions impact of plastics is shaped by trends in growth (Figure 1), both of upstream production and downstream emissions-intensive disposal methods for waste. By 2050, emissions from plastics production alone will eat up approximately 21-25% of the world's carbon budget[11] to stay within 1.5° C of warming. Further, the buildout of plastic production creates the major risk of locking in oil and gas production and refinery infrastructure for decades to come.



Production emissions based on Karali et al. (2024); Disposal emissions estimated based on OECD (2022) and do not include emissions from open-burning of plastic waste.

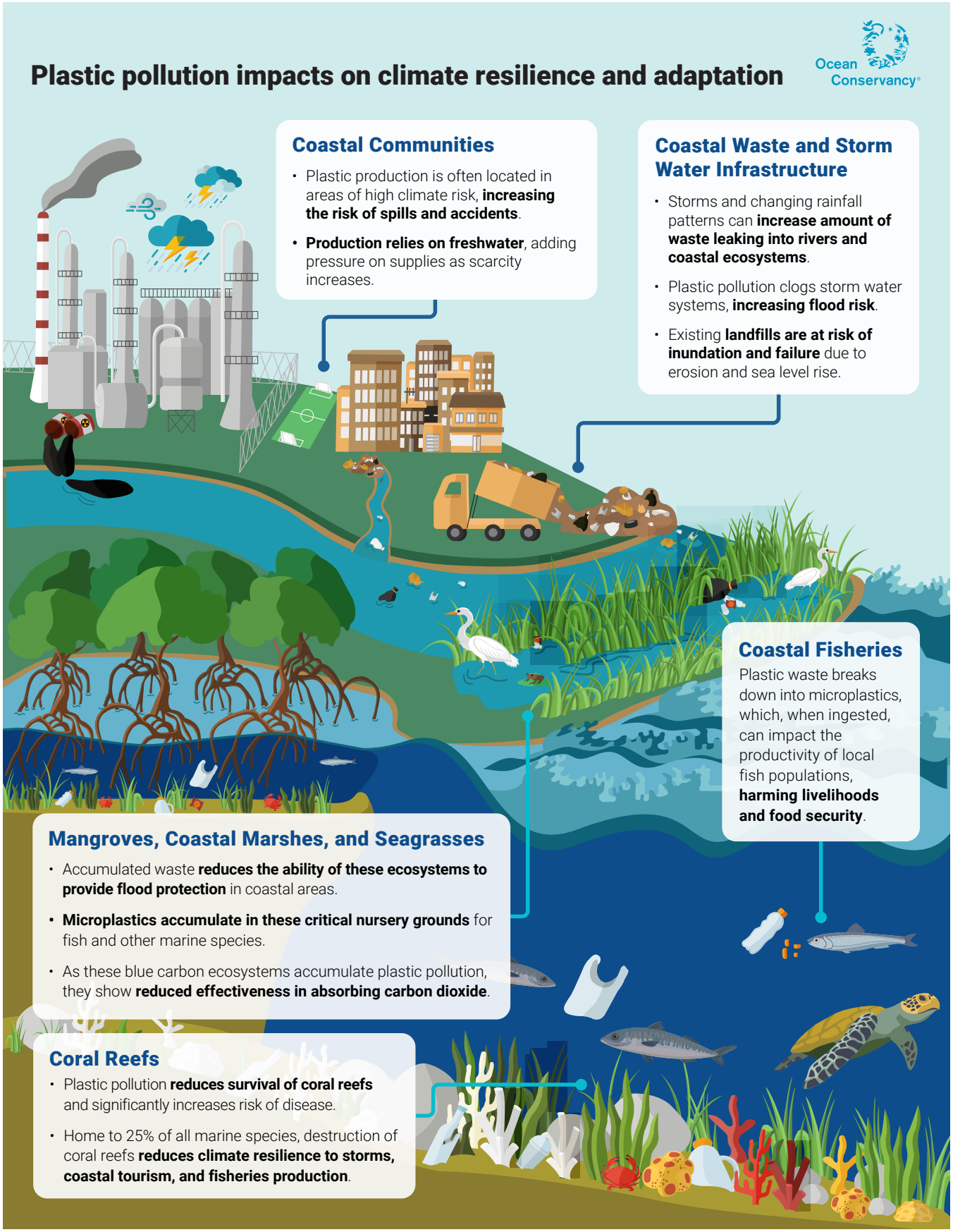
Research consistently shows that reducing plastic production and consumption are the most cost-effective and technologically ready options to reduce climate impacts from plastics.[12, 13] Accordingly, COP28's UAE Consensus notes "the importance of transitioning to sustainable lifestyles and sustainable patterns of consumption and production in efforts to address climate change, including through circular economy approaches."

Reducing plastics and transitioning to a circular economy supports climate adaptation, resilience, and justice. (Figure 2) Refineries and plastic production facilities are often concentrated in coastal regions already facing major climate risks. Surrounding communities are bearing the brunt of decades of pollution that has caused high rates of cancer and other diseases as well as decades of economic disinvestment, inequalities that will only be exacerbated by climate change.[14, 15, 16]

Additionally, plastic pollution can exacerbate climate risks in coastal cities and sensitive marine ecosystems that support livelihoods. For example, plastic waste can overwhelm stormwater management systems and lead to blockages, intensifying flooding.[17] Increased flooding in cities and erosion of landfills raises the risk of polluting drinking water and waterways. Coastal blue carbon ecosystems, such as marshes, seagrasses, and especially mangroves, play a vital role in oceanic carbon sequestration and storage, serve as nursery habitats for many species, facilitate nutrient cycling, and provide natural barriers for storm damage and coastal erosion. These ecosystems have been shown to trap plastic litter, leading to high concentrations of microplastics in benthic sediments.[18, 19] Microplastic pollution in these ecosystems has been shown to impact their functioning and health, including their ability to act as a carbon sink[20, 21, 22, 23, 24].

Further, these marine ecosystems are vital to coastal fisheries, and plastic accumulation in vegetation and sediments may increase the risk of plastics entering the food web, with potential risks to both fisheries productivity and human health.[25, 26] When coral reefs, habitat for 25% of all marine life and vital to coastal economies, are exposed to plastic waste, the likelihood of disease increases by 89%.[27] Plastic pollution smothers corals, inhibiting photosynthesis and growth, particularly in cold-water corals.[28, 29] Plastic pollution adds significant stressors to these vital coastal ecosystems already facing climate threats from warming waters and changing ocean conditions.

Figure 2


Plastic pollution impacts on climate resilience and adaptation
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Coastal Communities
• Plastic production is often located in areas of high climate risk, **increasing the risk of spills and accidents**.
• **Production relies on freshwater**, adding pressure on supplies as scarcity increases.
Coastal Waste and Storm Water Infrastructure
• Storms and changing rainfall patterns can **increase amount of waste leaking into rivers and coastal ecosystems**.
• Plastic pollution clogs storm water systems, **increasing flood risk**.
• Existing **landfills are at risk of inundation and failure** due to erosion and sea level rise.
Coastal Fisheries
Plastic waste breaks down into microplastics, which, when ingested, can impact the productivity of local fish populations, **harming livelihoods and food security**.
Mangroves, Coastal Marshes, and Seagrasses
• Accumulated waste **reduces the ability of these ecosystems to provide flood protection** in coastal areas.
• **Microplastics accumulate in these critical nursery grounds** for fish and other marine species.
• As these blue carbon ecosystems accumulate plastic pollution, they show **reduced effectiveness in absorbing carbon dioxide**.
Coral Reefs
• Plastic pollution **reduces survival of coral reefs** and significantly increases risk of disease.
• Home to 25% of all marine species, destruction of coral reefs **reduces climate resilience to storms, coastal tourism, and fisheries production**.

Reducing plastic pollution in coastal ecosystems can help countries meet commitments under the Global Goal on Adaptation UAE Framework for Climate Resilience, which highlights as a priority: *"Reducing climate impacts on ecosystems and biodiversity … including through their management, enhancement, restoration and conservation and the protection of terrestrial, inland water, mountain, marine and coastal ecosystems."* While financing for this framework has been limited to date, this will be a critical priority in the coming decade.

Coastal nations can take the lead on plastics reduction and the circular economy as climate solutions, achieving major co-benefits for health, livelihoods, and biodiversity. Including plastic reduction and a circular economy in national climate strategies, including NDCs, National Adaptation Plans (NAPs) and national long-term plans will demonstrate the strength of political will for plastics reduction goals, send signals in the market around softening long-term demand for plastics, and support existing efforts by nations to negotiate a legally binding instrument to reduce plastic pollution by 2040.

2. The “Plastics Gap” in NDCs

NDCs are voluntary commitments made by each signatory of the Paris Agreement to reduce their national greenhouse gas emissions and adapt to the impacts of climate change. These commitments signal the policy priorities, ambitions, and investment needs of each nation with regards to climate action. The next round of NDCs are due from each country in 2025 in advance of the Conference of the Parties (COP30) in Brazil, which will focus on equitable access to climate finance in the Global South. These updated NDCs will be vital in providing the financial community, particularly public finance, with an updated and clearer picture of financing needs and priorities.

To support future NDCs, Ocean Conservancy reviewed 98 coastal countries last iterations of NDCs for mentions of plastics and related terms to understand whether and how plastics reduction as a climate mitigation and adaption measure is included, and to make recommendations for advancing this climate solution in future NDCs. See the full methodology in Appendix A, p. 17.

KEY FINDINGS FROM THE ANALYSIS

Plastics is a cross-cutting topic. References to the circular economy and plastics were found in many countries’ NDC introduction or sections highlighting cross-cutting topics. Mitigation activities related to plastics were split between the “Industrial Processes and Product Use (IPPU)” and “Waste” Sectors of the NDC. This split demonstrates the primary challenge of addressing the climate impacts of plastics: the decision-making authorities to address upstream and downstream impacts of plastics are spread across government agencies (e.g., industrial production vs. waste management) and even countries (plastic producers vs. plastic consumers) along the plastics lifecycle. For example, some countries don’t produce plastics, but are inundated with plastic waste to manage. This makes the cost of action high and the benefits diffuse.

The circular economy was named as a goal in over one third of all NDCs, highlighting the importance of this issue for coastal countries. Thirty-five percent of coastal countries' NDCs mention the circular economy, often as an aspirational goal, or as a strategy supporting the achievement of NDC goals and national objectives related to sustainable economic development. However, most of these references to the circular economy were vague with limited supporting targets and goals. Notably, the NDCs of Chile and Panama took a forward-thinking approach on this topic, dedicating a section to the circular economy in their NDCs as a cross-cutting priority linked to sustainable economic development, mitigation, and adaptation.

CHILE: THE CIRCULAR ECONOMY IS A TOOL TO ACHIEVE ADAPTATION AND MITIGATION BENEFITS

In its 2020 NDC Update, Chile incorporated "a new integration component encompassing the role of oceans, circular economy […] as elements that holistically contribute to facing both the causes and the effects and impacts of climate change. This is an effort to advance towards an integrated and synergistic vision in the design and implementation of climate action in Chile." The government committed to developing a Circular Economy Roadmap for the years 2020 to 2040 "establishing and implementing metrics and indicators on circularity to monitor the country's progress in circular economy and identify its contribution to climate change mitigation and adaptation." In highlighting workforce development and job creation in a circular economy, the NDC recognizes the importance of the informal waste collection sector in ensuring a just transition. It also mentions a law passed by the Chilean Congress in 2016 limiting waste generation and promoting reuse and recycling by establishing extended producer responsibility (EPR) and other waste management measures. Looking forward, Chile plans to develop quantitative metrics for valuing future mitigation and adaptation benefits.

While some countries planned to decarbonize the petrochemicals sector, others plan to increase production. Eleven percent of countries mentioned plans to implement decarbonization projects or incentives for the chemicals sector, roughly the same as the number of plastic-producing nations included in the 98 countries reviewed. Three countries mentioned plans to increase petrochemicals production as part of the transition of the oil and gas industry, and three included mentions of "increasing greener production" from industry. Finally, three countries mentioned increasing the use of biobased feedstocks for petrochemicals, in one case, to phase out fossil-fuel-based plastics.

Only a small fraction of coastal countries mentioned plastic reduction, limited to single-use plastics. Only 14% of NDCs included some mention of efforts to reduce plastic. They were largely defined as limited bans on single-use plastics such as plastic bags, food ware, and polystyrene, or aimed at plastics use in tourism. No country included broader goals related to plastic reduction across sectors. This is an area of opportunity to address a growing source of emissions and waste for coastal nations.

FIJI: CATALYZING SUSTAINABLE PRODUCTION AND CONSUMPTION

Fiji's 2020 NDC includes cross-cutting actions on "Sustainable Production and Consumption for holistic climate action," including bans on the import, export, manufacture, distribution and use of plastic products such as polyethylene bags and polystyrene.

While expanded reuse systems hold significant potential for GHG reduction, there were only limited and vague mentions of it as part of the "3Rs". Only 19% of NDCs mentioned "reuse," and mostly as part of the "3Rs"—reduce, reuse, recycle. Expansion of reuse systems is critical in achieving plastic reduction goals.

Improved waste management was the most common aspect of the plastics lifecycle highlighted as a mitigation strategy in NDCs. Sixty-three percent of coastal countries' NDCs mention some form of waste management as a mitigation strategy. This is hardly a surprising result given that the United Nations Intergovernmental Panel on Climate Change (IPCC) guidance for NDCs identifies waste as one of five priority sectors for reporting emissions reductions. Significant, harmful methane emissions from the waste sector make this a priority area, particularly in nations with limited industrial production. Terms like "integrated solid waste management" and "waste reduction" were often used to describe mitigation activities, with limited detail. Management of plastic waste was seldom specified. Open burning of waste was often cited as a health hazard and source of GHG emissions.

Waste and marine litter were listed as key adaptation and resilience challenges—and also as opportunities. The waste sector is seen as an important source of jobs and a driver of low-carbon sustainable development and livelihoods. Twenty-three percent of countries identified waste or plastic as an adaptation and resilience priority or strategy for low-carbon development. Ten percent of countries called out the issue of marine debris specifically. Countries cited several adaptation issues, including: the impact of pollution on critical marine ecosystems like mangroves, corals, and fisheries; the need to maintain coastal tourism as an economic driver, an industry that is both a beneficiary of waste reduction measures and focal area for waste reduction; limits to landfill space, particularly due to sea level rise in coastal nations, and the need to conserve space/reduce costs in existing landfills by diverting recyclable waste when possible; threats to drinking water due to leaching of toxic chemicals from landfills into the ground and the water supply. Public health threats posed by waste and open burning was mentioned as well.

Eight percent of countries identified the development of a circular economy and the waste sector as important sources for job creation, including for ensuring the livelihoods of low-income women and other groups and promoting entrepreneurship and small business development among them.

CABO VERDE: SUSTAINABLE TOURISM AS A TOOL FOR MITIGATION AND ECONOMIC GROWTH

Cabo Verde's 2021 NDC outlines a forward-looking mitigation contribution around sustainable tourism based on a circular economy. The government has set a goal to develop, by 2025, a national roadmap to shift to responsible tourism and a circular economy. The roadmap will define targets for local contributions to reducing GHG emissions per visitor/day by 2030, including through strict reuse and recycling, bans of single-use plastic, beach clean-ups, community engagement, and tree planting. As described in the NDC, the roadmap "will make it compulsory for mid-scale and large-scale hospitality providers to produce [renewable energy] and implement [energy efficiency] measures, install sewage and wastewater infrastructures, compost their organic waste, and recycle treated water, on-site." Cabo Verde supports design for circularity by encouraging manufacturers and businesses, through fiscal incentives and capacity development, to design circular (simple, low-energy, easy to repair, and/or passive) products and services.

Recycling was often mentioned as a strategy for waste reduction, but countries largely did not quantify GHG mitigation benefits. Forty-five percent of coastal countries' NDCs cited recycling as a strategy for waste reduction, and included mention of activities related to increased collection, sorting, and diversion of recyclable materials. Of these, only a handful of countries quantified emissions reductions from recycling activities. Only one country noted an increase in emissions-intensive conversion chemical recycling, though most mentions of recycling did not specify the technologies used. *Note: It was often unclear in the NDCs whether the recycling mention referred to plastics or other materials like paper, glass, construction materials, and aluminum.*

Composting to reduce methane is on the rise. Thirty-one percent of countries mentioned plans to address emissions from organic waste, through processes such as organic waste separation, composting, or use of anaerobic digestion. This is largely aimed at addressing methane emissions when organic waste decomposes in landfills but has clear implications for improved capture of plastics from waste streams since plastic must be removed or kept separate from organic waste before it can be composted. Further, expansion of composting can reduce concerns over methane emissions from alternatives to plastics, like paper products, because they can be treated similarly to organic waste and kept out of landfills.

More than one third of countries planned to explore or expand incineration or waste-to-energy systems, at times counting them as "renewable fuels." Thirty-six percent of countries stated plans to explore or expand use of technologies to burn waste, including incineration for waste-to-energy, primarily to service cities, and refuse-derived fuel, largely for the cement sector. Alarmingly, 10 of those 35 countries counted these technologies as "renewable fuels," highlighting how climate policies, when not considered comprehensively, can incentivize and lock-in a fossil-fuel based plastics economy as an unintended consequence.

Commitments to expansion were sometimes listed with GHG emissions reduction estimates as a result of displacing fossil fuel-based energy consumption. In a couple cases, countries stated concerns regarding the challenge of maintaining a sufficient waste supply for these facilities—with one even proposing to import new waste. Others noted negative public opinion and air quality concerns related to these facilities. Expanded burning of waste most impacts low-income and climate-vulnerable communities—where these facilities are often sited. *Note: Plans to produce energy from landfill gas capture are not included in these estimates.*

3. Closing the "Plastics Gap"

RECOMMENDED POLICIES FOR COASTAL COUNTRIES AND THE ASSOCIATED CLIMATE BENEFITS

Per the 2023 Global Stocktake, countries are expected to submit revised NDCs by 2025 with increased ambition to meet the current trajectory of the climate crisis. For coastal countries looking to increase their ambition by include plastic reduction measures in their revised NDCs, Ocean Conservancy recommends the following policies for consideration:

Supportive Policies	GHG Emissions Estimates per kg of Plastics (2019)	Current Status in NDCs
CROSS-CUTTING		
• Commit to a circular economy, sustainable consumption and production (Sustainable Development Goal 12) • Ensure a just transition for affected communities and workers	Supports mitigation & adaptation	35% of NDCs mentioned the circular economy
FEEDSTOCK PRODUCTION		
• Reduce fossil fuel production & subsidies • Cut methane emissions from oil and gas operations • Reduce refinery emissions	2.56 kg CO_2e/ kg plastic[30]	Limited action planned to reduce methane emissions
RESIN PRODUCTION		
• Stop expansion of plastic production • Incentivize production facilities to decarbonize operations by switching to more efficient technologies, switch to renewable power where possible, and disincentivize use of unproven decarbonization technologies • Require the use of recycled content in plastic products	1.76 kg CO_2e/ kg plastic[31] *Note: The substitution of post-consumer recycled plastic for virgin plastic reduces emissions per ton of plastic by about one third.[32] This varies by polymer type and other factors and impacts emissions associated with feedstock and resin production by depressing demand for virgin material.*	11% of NDCs mentioned plans to decarbonize production technologies, in some cases, with plans to increase production
PRODUCT MANUFACTURING		
Incentivize decarbonization and electrification of the energy system, including for industrial activities	0.89 kg CO_2e/ kg plastic[33]	Not included in review

Supportive Policies	GHG Emissions Estimates per kg of Plastics (2019)	Current Status in NDCs
TRANSPORT & PRODUCT USE		
• Advance source reduction policies via plastics reduction targets, commitments to phase out single-use plastics, bans on problematic items or materials (e.g., polystyrene foam) • Leverage procurement policies to reduce plastics and encourage reuse, recyclable products, low-emissions polymers, and limited substitution with alternative sustainable materials • Direct public climate financing to the top of the waste hierarchy: reduction and reuse, including regional reuse infrastructure • Require extended producer responsibility (EPR) with strong targets for environmental outcomes • Engage key coastal industries in plastic reduction, e.g., tourism, fisheries • Support decarbonization of transportation (for product distribution and waste collection)	The emissions from this phase have not been quantified in the literature. However, unsustainable consumption patterns expectations of growing plastics demand drive the growth in emissions for each of the categories above.[34]	• 14% of current NDCs included limited plastic reduction measures • 19% included mentions of the "3Rs"
DISPOSAL		
• Leverage extended producer responsibility (EPR) policies to finance expanded collection and waste management, including reuse systems • Improve solid waste collection, sorting and diversion of recyclable plastics and organic waste • Fund increased plastics recycling and composting infrastructure • Support entrepreneurship and a just transition for informal waste sector workers • Restrict development of high-emissions plastic-to-fuel chemical recycling facilities • Limit burning of waste and plastics, including via open burning, incineration, refuse-derived fuels (RDF), and waste to energy	• Landfill: 0.7 kg CO_2e/ kg plastic • Mechanical Recycling: 0.38 kg CO_2e/ kg plastic • Incineration: 2.3 CO_2e/ kg plastic[35, 36] *Note: While landfilling has the lowest known climate impacts, concerns with pollution, health, and limited space (cited by many countries as adaptation issues) indicate the likely decline of this strategy. Further, without upstream reduction, landfilling continues to lock-in the need for more virgin plastics. It is critical to support upstream interventions that reduce plastic pollution before it is waste over downstream measures that release significant carbon emissions such as waste-to-energy or incineration.*	• 63% of NDCs include improved waste management • 45% mentioned increasing recycling • 36% planned increases in waste-to-energy, refuse derived fuel, or incineration • 31% included plans to improve treatment of organic waste, e.g., through separation & composting

Supportive Policies	GHG Emissions Estimates per kg of Plastics (2019)	Current Status in NDCs
CLEANUP		
• Prioritize cleanup activities in ecologically important areas, particularly blue carbon ecosystems and flood-prone areas • Prioritize cleanups along beaches and waterways, the most efficient and effective way to remove harmful debris • Prioritize cleanups of ecologically harmful plastics such as fishing gear	Emissions from this lifecycle stage have not been quantified in the literature, though early-stage research indicates potential impacts on blue carbon ecosystems, as described on p. 5. Significant adaptation co-benefits, including: • Increased resilience of coastal ecosystems vital to fisheries, food security, flood protection, and tourism • Reduced pollution and disease transport in waterways, drinking water, and coastal ecosystems • Improved flood management in coastal cities	23% mention waste as a resilience and adaptation issue, 10% highlighted marine litter in particular
Approximately 5.76 kilograms of GHGs (carbon dioxide equivalent - CO_2e) produced per kilogram of plastic.[37]		

Note: Plastics are a cross-cutting issue that are impacted by multiple multilateral environmental agreements (MEAs), including the Internationally Legally Binding Instrument (ILBI) to end plastic pollution (sometimes known as the "Plastics Treaty") currently being negotiated, as well as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes. While nation states may address some aspects of the plastic pollution problem under these agreements, climate impacts—and the GHG benefits of reduction—fall under that purview of the UNFCCC. Further, as the NDCs of Chile, Panama, and Fiji demonstrate, including plastics goals as a cross-cutting topic in NDCs provides opportunity for governments to tackle this multifaceted issue in an integrated, holistic manner, improving coordination across MEAs, and delivering numerous co-benefits to their populations.

Conclusion

This review reveals several themes that are critical to understanding the challenge—and opportunity—of addressing plastics in climate policies. Like its precursor oil and gas, plastic production is concentrated in a small number of countries, while downstream pollution impacts and costs are transboundary issues landing heavily in coastal communities. But efforts to advance a circular economy and sustainable consumption are possible across the nations surveyed. The inclusion of plastic reduction measures within NDCs can have global implications, demonstrate political will and send strong downward pressure on long-term plastics demand—a key variable in reducing the growth and GHG emissions from petrochemicals, refining, and oil and gas.

Coastal nations—particularly those already burdened by too much waste and limited infrastructure—stand to gain significant co-benefits from plastics reduction, management, and cleanup in the form of local livelihoods, marine ecosystems, and public health. By including plastics in their climate commitments as both a mitigation and adaptation priority, coastal nations can drive change toward a sustainable, circular economy and a clean energy transition.

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Calculation: Karali et al. estimates 2019 GHG emissions from extraction to plastics product manufacturing to be 2.24 Mt CO_2e. OECD estimates 2019 GHG emissions from plastics disposal to be 0.194 Gt CO_2e. The World Resources Institute estimates 2019 world GHG emissions to be 49.8 Gt CO_2e. Therefore, the GHG emissions associated with plastics account for approximately 4.89% of the global total. Note that OECD estimates of disposal emissions do not include emissions from open burning of plastic waste.

3 Karali et al. (2024).

4 See footnote 2 for sources and calculation.

5 Karali et al. (2024). A carbon budget represents the global amount of greenhouse gases that can be emitted globally through 2050 in order to remain below a specified threshold of warming. This estimate is based on a plastics growth rate of 20-25%, a 50% probability of remaining within 1.5°C of warming, and an assumption of no decarbonization of the energy sector.

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Calculation: Karali et al. estimates 2019 GHG emissions from extraction to plastics product manufacturing to be 2.24 Mt CO_2e. OECD estimates 2019 GHG emissions from plastics disposal to be 0.194 Gt CO_2e. The World Resources Institute estimates 2019 world GHG emissions to be 49.8 Gt CO_2e. Therefore, the GHG emissions associated with plastics account for approximately 4.89% of the global total. Note that OECD estimates of disposal emissions do not include emissions from open burning of plastic waste.

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34 For estimates of the climate benefits of reuse, see this resource from Upstream: https://upstreamsolutions.org/blog/reuse-is-a-climate-solution

35 Note: emissions related to the open-burning of mismanaged plastic waste are not included here and are likely higher than this estimate due to the production of black carbon.

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37 This assumes a weighted average emissions per kg at disposal of 0.55 kg CO2e/ kg plastic. Emissions factors and percentages of waste going to each disposal method: landfilling, recycling, and incineration for 2019 are pulled from OECD (2022).

Appendix A—Methodology

Ocean Conservancy reviewed the following 98 coastal country NDCs submitted as of October 2023: Albania, Angola, Antigua and Barbuda, Argentina, Australia, Bahamas, Bahrain, Bangladesh, Benin, Bosnia and Herzegovina, Brazil, Brunei Darussalam, Cabo Verde, Cambodia, Cameroon, Canada, Chile, China, Colombia, Comoros, Democratic Republic of the Congo, Costa Rica, Cuba, Dominica, Dominican Republic, Egypt, El Salvador, Equatorial Guinea, European Union, Fiji, Gabon, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, Iceland, India, Indonesia, Ivory Coast, Jamaica, Japan, Kenya, Kiribati, Lebanon, Malaysia, Maldives, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia (Federated States of), Monaco, Montenegro, Morocco, Mozambique, Namibia, Nauru, New Zealand, Nicaragua, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Republic of Korea, Russia, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Seychelles, Singapore, Solomon Islands, Somalia, Saint Kitts and Nevis, St. Lucia, Sudan, Thailand, Timor-Leste, Togo, Tonga, Tunisia, Türkiye, Tuvalu, United Arab Emirates, United Kingdom, United Republic of Tanzania, Uruguay, United States, Vanuatu, Venezuela, and Vietnam.

The study of each NDC began with a keyword search of 21 terms to identify mentions of plastics and related issues, including:

- **General:** circular economy, plastic
- **Production:** chemicals, cracker electrification, ethane, ethylene, naphtha, olefin, petrochemical, polymer, propylene, resin
- **End-of-Life:** anaerobic digestion, chemical recycling, compost, incineration, marine litter, organic waste separation, pyrolysis, recycling, reduction of open burning, refuse-derived fuel, reuse, waste management, waste-to-energy

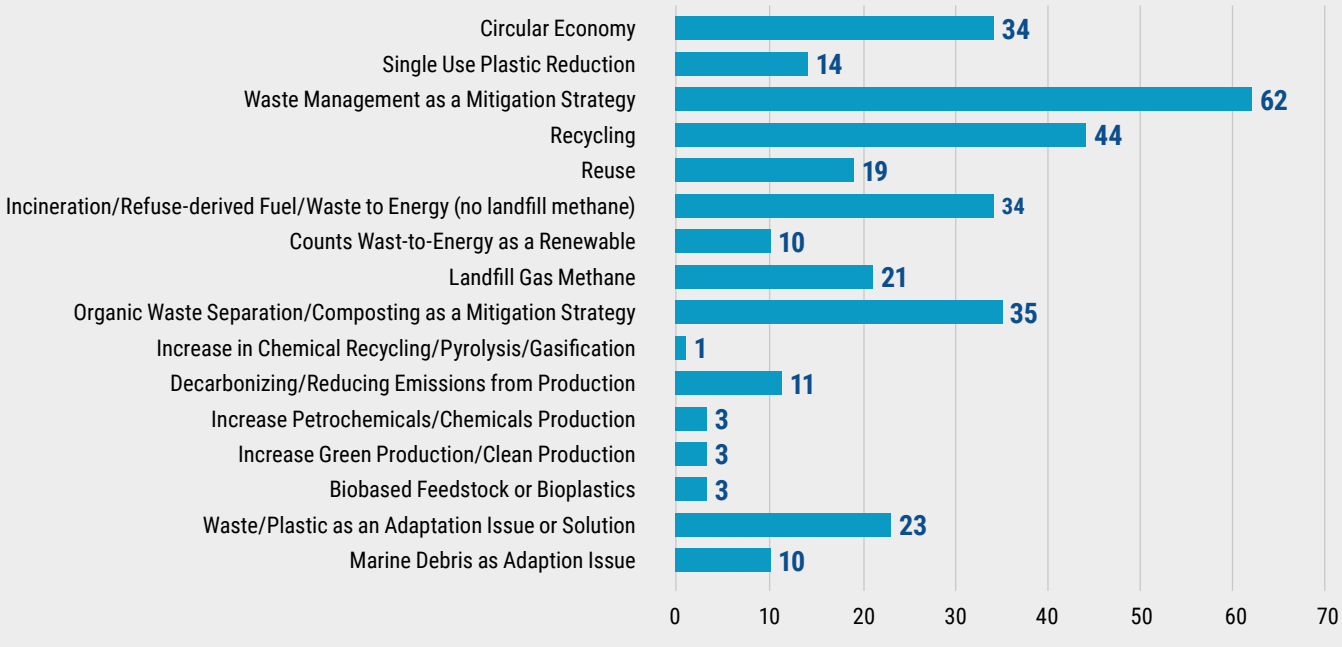
The analysis reviewed each mention of the above terms to assess relevance based on the context in which the term was used. All mentions included were related to concrete commitments, projects, policies, and goals of the NDC. For example, a country that stated that the overall aspiration of its NDC is to "build a sustainable, circular economy" would be included, whether or not specific actions or timebound targets were in its NDC. Alternately, a mention of "single use plastic bans" in an Annex detailing interviews that informed the NDC, but that was not listed as a stated policy or mitigation action was not included. NDCs were reviewed in English, Spanish, and French, with support from staff/contractors with appropriate language skills.

To facilitate the data analysis, mentions were grouped into one of 17 thematic categories, defining the context in which the commitment or statement was made. These categories include:

- Circular economy
- Single-use plastic reduction
- Increase in petrochemicals/chemicals production
- Increase green production or clean production
- Decarbonizing/reducing emissions from plastic production
- Bio-based feedstock or bioplastics
- Solid waste management as a mitigation strategy
  - Reuse as a mitigation strategy
  - Recycling as a mitigation strategy
  - Organic waste collection and composting as a mitigation strategy
- Incineration/refuse-derived fuel/waste-to-energy (excluding electricity from landfill gas)
  - Treatment of waste-to-energy as a renewable
- Landfill gas capture/energy
- Increase in chemical recycling, pyrolysis, or gasification
- Plastic/waste as an adaptation issue (problem or solution)
  - Marine debris, marine litter specifically mentioned
  - Importance of informal sector/job opportunities

Note: This review focused solely on publicly available NDC documents and did not include additional consultation with countries for local context and insights.

Number of mentions by category are summarized in the chart below:



Reviewed documents:

Country	Submission Date	Link to document
Albania	October 2021	https://unfccc.int/sites/default/files/2022-08/Albania%20Revised%20NDC.pdf
Angola	May 2021	https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20Angola.pdf
Antigua and Barbuda	September 2021	https://unfccc.int/sites/default/files/NDC/2022-06/ATG%20-%20UNFCCC%20NDC%20-%20 2021-09-02%20-%20Final.pdf
Argentina	October 2021	https://unfccc.int/sites/default/files/NDC/2022-05/Actualizacio%CC%81n%20meta%20de%20 emisiones%202030.pdf
Australia	June 2022	https://unfccc.int/sites/default/files/NDC/2022-06/Australias%20NDC%20June%202022%20 Update%20%283%29.pdf
Bahamas	July 2022	https://unfccc.int/sites/default/files/NDC/2022-11/Bahamas%20Updated%20Nationally%20 Determined%20Contributio
Bahrain	October 2022	https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20of%20the%20Kingdom%20of%20 Bahrain%20under%20UNFCCC.pdf
Bangladesh	August 2021	https://unfccc.int/sites/default/files/NDC/2022-06/NDC_submission_20210826revised.pdf
Benin	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/CDN_ACTUALISEE_BENIN2021.pdf
Bosnia and Herzegovina	April 2021	https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20BiH_November%202020%20 FINAL%20DRAFT%2005%20Nov%20ENG%20LR.pdf
Brazil	November 2023	https://unfccc.int/sites/default/files/NDC/2023-11/Brazil%20First%20NDC%202023%20 adjustment.pdf
Brunei Darussalam	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Brunei%20Darussalam%27s%20NDC%20 2020.pdf
Cabo Verde	April 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Cabo%20Verde_NDC%20Update%202021.pdf
Cambodia	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/20201231_NDC_Update_Cambodia.pdf
Cameroon	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/CDN%20r%C3%A9vis%C3%A9e%20 CMR%20finale%20sept%202021.pdf
Canada	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Canada%27s%20Enhanced%20NDC%20 Submission1_FINAL%20EN.pdf
Chile	April 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Chile%27s_NDC_2020_english.pdf
China	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/China%E2%80%99s%20 Achievements%2C%20New%20Goals%20and%20New%20Measures%20for%20Nationally%20 Determined%20Contributions.pdf
Colombia	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20actualizada%20de%20Colombia.pdf
Comoros	November 2021	https://unfccc.int/sites/default/files/NDC/2022-06/CDN_r%C3%A9vis%C3%A9e_Comores_vf.pdf
Costa Rica	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Contribucio%CC%81n%20 Nacionalmente%20Determinada%20de%20Costa%20Rica%202020%20-%20 Versio%CC%81n%20Completa.pdf
Democratic Republic of the Congo	December 2021	https://unfccc.int/sites/default/files/NDC/2022-06/CDN%20Revis%C3%A9e%20de%20la%20 RDC.pdf
Dominica	July 2022	https://unfccc.int/sites/default/files/2022-07/The%20Commonwealth%20of%20Dominica%20 updated%20NDC%20July%204%20%2C.pdf
Dominican Republic	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Dominican%20Republic%20First%20 NDC%20%28Updated%20Submission%29.pdf
Egypt	June 2023	https://unfccc.int/sites/default/files/NDC/2023-06/Egypts%20Updated%20First%20 Nationally%20Determined%20Contribution%202030%20%28Second%20Update%29.pdf

Country	Submission Date	Link to document
El Salvador	January 2022	https://unfccc.int/sites/default/files/NDC/2022-06/El%20Salvador%20NDC-%20Updated%20Dic.2021.pdf
Equatorial Guinea	October 2022	https://unfccc.int/documents/620167
European Union	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/EU_NDC_Submission_December%202020.pdf
Fiji	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Republic%20of%20Fiji%27s%20Updated%20NDC%2020201.pdf
Gabon	July 2022	https://unfccc.int/sites/default/files/NDC/2022-07/20220706_Gabon_Updated%20NDC.pdf
Ghana	November 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Ghana%27s%20Updated%20Nationally%20Determined%20Contribution%20to%20the%20UNFCCC_2021.pdf
Grenada	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/GrenadaSecondNDC2020%20-%2001-12-20.pdf
Guatemala	May 2022	https://unfccc.int/sites/default/files/2022-06/NDC%20-%20Guatemala%202021.pdf
Guinea	July 2021	https://unfccc.int/documents/497517
Guinea-Bissau	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/NDC-Guinea%20Bissau-12102021.Final.pdf
Haiti	June 2022	https://unfccc.int/sites/default/files/NDC/2022-06/CDN%20Revisee%20Haiti%202022.pdf
Honduras	May 2021	https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20de%20Honduras_%20Primera%20Actualizaci%C3%B3n.pdf
Iceland	February 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Iceland_updated_NDC_Submission_Feb_2021.pdf
India	August 2022	https://unfccc.int/sites/default/files/NDC/2022-08/India%20Updated%20First%20Nationally%20Determined%20Contrib.pdf
Indonesia	September 2022	https://unfccc.int/sites/default/files/NDC/2022-09/ENDC%20Indonesia.pdf
Ivory Coast	May 2022	https://unfccc.int/sites/default/files/NDC/2022-06/CDN_CIV_2022.pdf
Jamaica	July 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Updated%20NDC%20Jamaica%20-%20ICTU%20Guidance.pdf
Japan	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/JAPAN_FIRST%20NDC%20%28UPDATED%20SUBMISSION%29.pdf
Kenya	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Kenya%27s%20First%20%20NDC%20%28updated%20version%29.pdf
Kiribati	March 2023	https://unfccc.int/sites/default/files/NDC/2023-03/221213%20Kiribati%20NDC%20Web%20Quality.pdf
Lebanon	March 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Lebanon%27s%202020%20Nationally%20Determined%20Contribution%20Update.pdf
Malaysia	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Malaysia%20NDC%20Updated%20Submission%20to%20UNFCCC%20July%202021%20final.pdf
Maldives	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Maldives%20Nationally%20Determined%20Contribution%202020.pdf
Marshall Islands	December 2020	https://unfccc.int/documents/497728
Mauritania	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/CDN-actualis%C3%A9%202021_%20Mauritania.pdf
Mauritius	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Final%20Updated%20NDC%20for%20the%20Republic%20of%20Mauritius%2001%20October%202021.docx
Mexico	November 2022	https://unfccc.int/sites/default/files/NDC/2022-11/Mexico_NDC_UNFCCC_update2022_FINAL.pdf

Country	Submission Date	Link to document
Micronesia (Federated States of)	October 2022	https://unfccc.int/sites/default/files/NDC/2022-10/Updated%20NDC%20of%20the%20MICRONESIA.pdf
Monaco	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Monaco_NDC_2020.pdf
Montenegro	June 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Updated%20NDC%20for%20Montenegro.pdf
Morocco	June 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Moroccan%20updated%20NDC%202021%20_Fr.pdf
Mozambique	December 2021	https://unfccc.int/sites/default/files/NDC/2022-06/NDC_EN_Final.pdf
Namibia	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Namibia%27s%20Updated%20NDC_%20FINAL%2025%20July%202021.pdf
Nauru	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Nauru%20Updated%20NDC%20pdf.pdf
New Zealand	November 2021	https://unfccc.int/sites/default/files/NDC/2022-06/New%20Zealand%20NDC%20November%202021.pdf
Nicaragua	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Contribuciones_Nacionales_Determinadas_Nicaragua.pdf
Nigeria	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/NDC_File%20Amended%20_11222.pdf
Norway	November 2022	https://unfccc.int/sites/default/files/NDC/2022-11/NDC%20Norway_second%20update.pdf
Oman	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Second%20NDC%20Report%20Oman.pdf
Pakistan	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Pakistan%20Updated%20NDC%202021.pdf
Panama	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/CDN1%20Actualizada%20Rep%C3%BAblica%20de%20Panam%C3%A1.pdf
Papua New Guinea	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/PNG%20Second%20NDC.pdf
Peru	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Reporte%20de%20Actualizacio%CC%81n%20de%20las%20NDC%20del%20Peru%CC%81.pdf
Philippines	April 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Philippines%20-%20NDC.pdf
Qatar	August 2021	https://www.mme.gov.qa/pdocs/cview?siteID=2&docID=23348&year=2021
Republic of Korea	December 2021	https://unfccc.int/sites/default/files/NDC/2022-06/211223_The%20Republic%20of%20Korea%27s%20Enhanced%20Update%20of%20its%20First%20Nationally%20Determined%20Contribution_211227_editorial%20change.pdf
Russian Federation	November 2020	https://unfccc.int/sites/default/files/NDC/2022-06/NDC_RF_eng.pdf
Saint Kitts and Nevis	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/St.%20Kitts%20and%20Nevis%20Revised%20NDC_Updated.pdf
Saint Lucia	January 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Saint%20Lucia%20First%20NDC%20%28Updated%20submission%29.pdf
Samoa	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Samoa%27s%20Second%20NDC%20for%20UNFCCC%20Submission.pdf
Sao Tome and Principe	July 2021	https://unfccc.int/documents/497944
Saudi Arabia	October 2021	https://unfccc.int/sites/default/files/resource/202203111154---KSA%20NDC%202021.pdf
Senegal	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/CDNSenegal%20approuvée-pdf-.pdf
Seychelles	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Seychelles%20-%20NDC_Jul30th%202021%20_Final.pdf
Singapore	April 2022	https://unfccc.int/sites/default/files/NDC/2022-11/Singapore%20Second%20Update%20of%20First%20NDC.pdf

Country	Submission Date	Link to document
Solomon Islands	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20Report%202021%20Final%20Solomon%20Islands%20%281%29.pdf
Somalia	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Final%20Updated%20NDC%20for%20Somalia%202021.pdf
Sudan	September 2022	https://unfccc.int/sites/default/files/NDC/2022-10/Sudan%20Updated%20First%20NDC-12102021.pdf
Thailand	November 2022	https://unfccc.int/sites/default/files/NDC/2022-11/Thailand%202nd%20Updated%20NDC.pdf
Timor-Leste	November 2022	https://unfccc.int/sites/default/files/NDC/2022-11/Timor_Leste%20Updated%20NDC%202022_2030.pdf
Togo	October 2021	https://unfccc.int/sites/default/files/NDC/2022-06/CDN%20Revis%C3%A9es_Togo_Document%20int%C3%A9rimaire_rv_11%2010%2021.pdf
Tonga	December 2020	https://unfccc.int/sites/default/files/NDC/2022-06/Tonga%27s%20Second%20NDC.pdf
Tunisia	October 2021	https://unfccc.int/sites/default/files/NDC/2022-08/CDN%20-%20Updated%20-english%20version.pdf
Türkiye	April 2023	https://unfccc.int/sites/default/files/NDC/2023-04/T%C3%9CRK%C4%B0YE_UPDATED%201st%20NDC_EN.pdf
Tuvalu	November 2022	https://unfccc.int/sites/default/files/NDC/2023-02/Tuvalus%20Updated%20NDC%20for%20UNFCCC%20Submission.pdf
United Arab Emirates	July 2023	https://unfccc.int/sites/default/files/NDC/2023-07/Third%20Update%20of%20Second%20NDC%20for%20the%20UAE_v15.pdf
United Kingdom	September 2022	https://unfccc.int/sites/default/files/NDC/2022-09/UK%20NDC%20ICTU%202022.pdf
United Republic of Tanzania	July 2021	https://unfccc.int/sites/default/files/NDC/2022-06/TANZANIA_NDC_SUBMISSION_30%20JULY%202021.pdf
United States of America	April 2021	https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%2021%202021%20Final.pdf
Uruguay	December 2022	https://unfccc.int/sites/default/files/NDC/2022-12/Uruguay%20Segunda%20CDN.pdf
Vanuatu	August 2022	https://unfccc.int/sites/default/files/NDC/2022-08/Vanuatu%20NDC%20Revised%20and%20Enhanced.pdf
Venezuela	November 2021	https://unfccc.int/sites/default/files/NDC/2022-06/Actualizacion%20NDC%20Venezuela.pdf
Viet Nam	November 2022	https://unfccc.int/sites/default/files/NDC/2022-11/Viet%20Nam%20NDC%202022%20Update.pdf