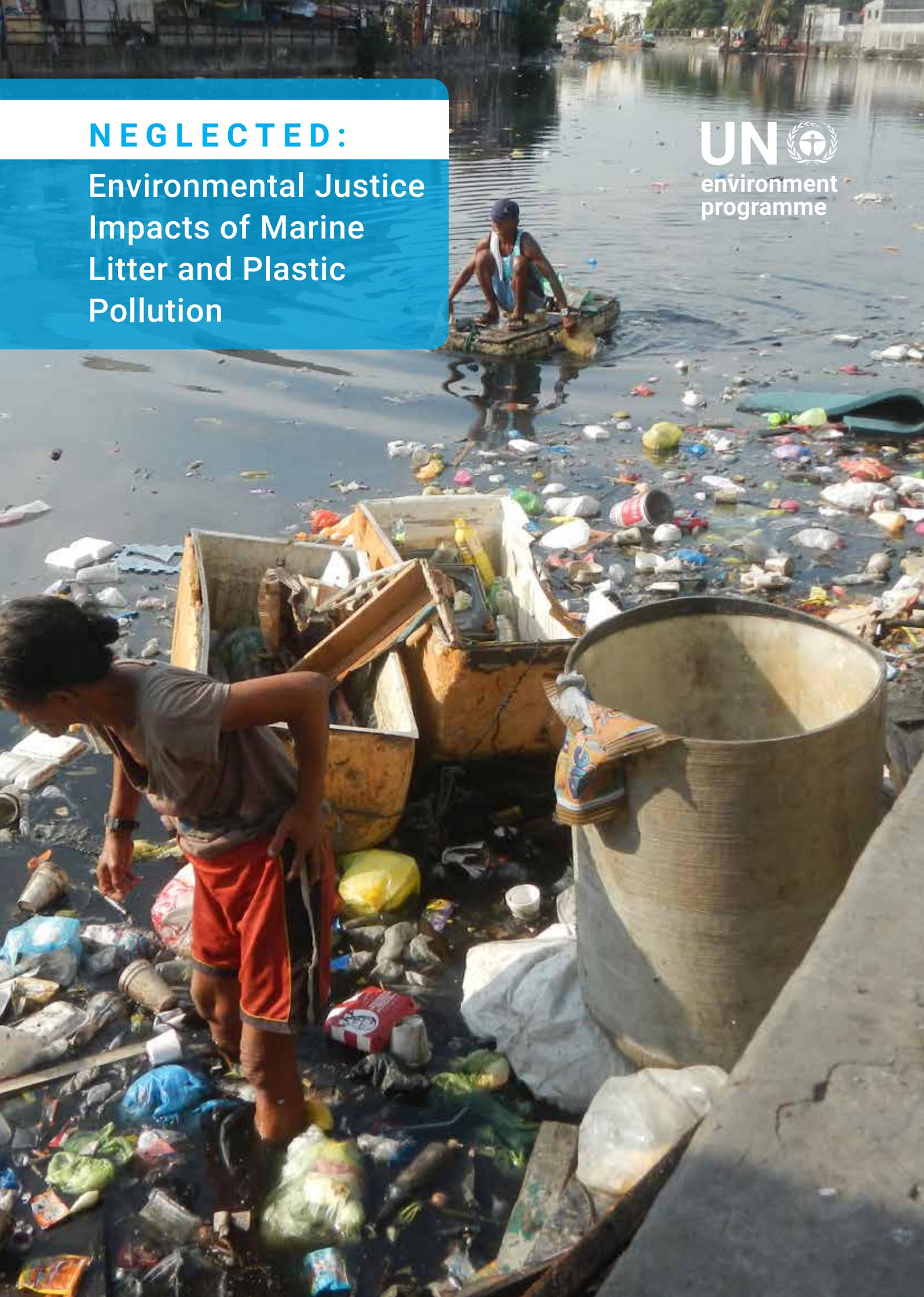


**NEGLECTED:**

**Environmental Justice  
Impacts of Marine  
Litter and Plastic  
Pollution**

**UN**   
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# **NEGLECTED:**

## **Environmental Justice Impacts of Marine Litter and Plastic Pollution**

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## COVID-19 AND PLASTIC

This report was completed a few months before the onset of the COVID-19 pandemic that brought massive economic disruptions around the globe with sharp declines in Gross Domestic Product (GDP) and global trade.<sup>1</sup> This section of the report is not intended to be a comprehensive overview of the relationship between COVID-19 and plastic. The United Nations Environment Programme (UNEP) and the authors of this report acknowledge that more recent literature has since been released. The United Nations Environment Programme (UNEP) and the authors of this report stand in solidarity with millions of healthcare professionals keeping us safe, and partners both within and outside the UN system that are working around the clock to tackle the global pandemic. As the United Nations Secretary-General has noted, COVID-19 is more than a health crisis. It is a human crisis that is attacking societies at their core. The poor and marginalized are among those worst impacted by both COVID-19 and environmental harms, such as marine litter and plastic pollution, that directly and indirectly threaten the full and effective enjoyment of all human rights including the rights to life, water and sanitation, food, health, housing, culture, and development. Environmental harms disproportionately impact persons, groups and peoples already living in vulnerable situations – including women, children, the poor, migrants and internally displaced people, indigenous peoples, and persons with disabilities. In addition, environmental harms impact environmental human rights defenders – “individuals and groups who, in their personal or professional capacity and in a peaceful manner, strive to protect and promote human rights relating to the environment, including water, air, land, flora and fauna.”<sup>2</sup> Crises such as COVID-19 add another layer of risk, through impacts on access to food and land, water and sanitation, livelihoods and the right to decent work, healthcare, and other basic necessities.

Recent publications related to COVID-19 include the Basel, Rotterdam, and Stockholm Conventions’

guidance document on Environmentally Sound Management of Medical Waste, and the UN Special Rapporteur’s report “on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes,” presented to the Human Rights Council.<sup>3,4</sup> This section of the report was completed in October 2020 when, at the time, not many peer-reviewed studies had been published on the impacts of the pandemic on plastics consumption, but the limited research conducted points to an increase in consumption and disposal of plastic and medical materials, and severe disruptions of already faulty recycling processes. These issues have been further accentuated by historically low oil prices that made virgin resins cheaper than recycled ones.<sup>5</sup>

### Plastic Demand and Waste Increase During the Pandemic

There is great concern that the pandemic may reverse any progress on reducing consumption of single-use plastic. The pandemic resulted in a staggering increase in the use of disposable plastic products such as masks and face shields, gloves, hand sanitizer bottles, protective medical suits, test kits, food take out containers, delivery packaging, and many other products that have become commonplace.<sup>6</sup> One study estimated that if the global population were to use the same number of masks and gloves used in Italy in the spring of 2020, 129 billion face masks and 65 billion gloves would be consumed monthly worldwide.<sup>7</sup>

Moreover, the pandemic has been viewed as an opportunity to drive consumption of single-use plastics. For instance, during the early weeks of the pandemic in March 2020, the U.S. Department of Health and Human Services received a letter from the Plastics Industry Association requesting a public announcement from the Department praising promoting the health and safety benefits of single-use plastics and speaking out against bans

- 1 UNCTAD, ‘Post - COVID-19: Investment Promotion Agencies and the ‘New Normal’ (2020), [https://unctad.org/system/files/official-document/diaepcbinf2020d5\\_en.pdf](https://unctad.org/system/files/official-document/diaepcbinf2020d5_en.pdf), accessed 18 November 2020.
- 2 UN Human Rights Council, ‘Report of the Special Rapporteur on the situation of human rights defenders’ (United Nations General Assembly 2016)
- 3 BRS Conventions, ‘COVID-19 Factsheet on Environmentally Sound Management of Medical Waste’ (2020).
- 4 Human Rights Council, ‘Duty to prevent exposure to the COVID-19 virus’ (United Nations General Assembly 2020)
- 5 Dunn K, “Black April:” IEA Warns of “Staggering” Demand Drop in Global Oil Markets’ (Fortune, 15 April 2020) <https://fortune.com/2020/04/15/black-april-oil-production-iea/>, accessed 18 November 2020.
- 6 Bengali S, ‘The COVID-19 Pandemic Is Unleashing a Tidal Wave of Plastic Waste’ (Los Angeles Times, 13 June 2020) <https://www.latimes.com/world-nation/story/2020-06-13/coronavirus-pandemic-plastic-waste-recycling>, accessed 18 November 2020.
- 7 Prata JC and others, ‘COVID-19 Pandemic Repercussions on the Use and Management of Plastics’ (2020) 54 Environmental Science & Technology 7760

of single-use plastic materials.<sup>8</sup> The letter was sent a week after a peer-reviewed study was published demonstrating that the novel COVID-19 virus could survive on plastic surfaces for up to 72 hours, compared to up to 24 hours on cardboard surfaces,<sup>9</sup> and in spite of the fact that health experts stated that disposable products present similar COVID-19-related health concerns as reusable ones.<sup>10</sup>

An increase in plastic waste, as well as in medical waste, is being observed worldwide.<sup>11</sup> Global sales of disposable facemasks may reach an estimated US\$166 billion in 2020, a 200-fold increase from 2019 numbers of US\$800 million.<sup>12</sup> In Singapore, during an eight-week lockdown, an additional 1,470 tons of plastic waste was generated from takeout packaging alone.<sup>13</sup> In Wuhan, China, medical waste increased six-fold to 240 tons per day during the pandemic, overloading the city's incineration capacity of 49 tons per day.<sup>14</sup> A single hospital in Jordan produced ten times more medical waste per day, with only 95 COVID-19 patients, than it normally produces.<sup>15</sup> In Tehran, Iran, medical waste from hospitals increased between 17.6% and 61.9% during the early months of the pandemic (from 52-74 tons per day to 80-110 tons per day).<sup>16</sup> Such increases of medical waste are resulting in a collapse of waste management chains globally. As of April 2020, 46% of recycling facilities in the UK had reduced or stopped their recycling services.<sup>17</sup>

Some analysts suggest that the reduction in use of some plastic materials may offset the increase in disposable plastic products,<sup>18</sup> but there is not find much publicly available evidence supporting such suggestions. Knock-on effects on human health, livelihood, and rights, which are likely to hit those poorest and marginalized without access to waste management or sanitation infrastructure, must be avoided. Effective and inclusive waste management, including medical, household, and other hazardous waste, is critical to minimize possible secondary impacts on health and the environment caused by the COVID-19 response.

## Oil Prices at Historical Lows

The lockdowns have drastically reduced demand for oil, pushing its prices to historical lows.<sup>19</sup> As a result, the cost to produce virgin plastics can be lower than recycled materials.<sup>20</sup> The lower cost of virgin plastics has a double negative effect, as it increases production of new plastic materials, and could make recycling facilities no longer economically viable.<sup>21</sup> A recycling facility in Portugal has seen revenues drop up to 40% since the pandemic began. The facility produces recycled polyethylene, which is used to manufacture plastic bags and bottles.<sup>22</sup>

These same effects are also felt in California, U.S. In an effort to contain the spread of COVID-19

- 8 Schlegel I, 'How the Plastic Industry Is Exploiting Anxiety about COVID-19' (Greenpeace USA, 26 March 2020) <https://www.greenpeace.org/usa/how-the-plastic-industry-is-exploiting-anxiety-about-covid-19/>, accessed 18 November 2020.
- 9 van Doremalen N and others, 'Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1' (2020) 382 *New England Journal of Medicine* 1564.
- 10 'Health Expert Statement Addressing Safety of Reusables and COVID-19' (Greenpeace, 22 June 2020) [https://www.greenpeace.org/usa/wp-content/uploads/2020/06/Health-Expert-Statement\\_Final.pdf](https://www.greenpeace.org/usa/wp-content/uploads/2020/06/Health-Expert-Statement_Final.pdf), ccessed 18 November 2020.
- 11 'Growing Plastic Pollution in Wake of COVID-19: How Trade Policy Can Help' (UNCTAD , 27 July 2020) <https://unctad.org/news/growing-plastic-pollution-wake-covid-19-how-trade-policy-can-help>, accessed 18 November 2020.
- 12 Bengali S, 'The COVID-19 Pandemic Is Unleashing a Tidal Wave of Plastic Waste' (Los Angeles Times, 13 June 2020) <https://www.latimes.com/world-nation/story/2020-06-13/coronavirus-pandemic-plastic-waste-recycling>, accessed 18 November 2020.
- 13 Patrício Silva AL and others, 'Increased Plastic Pollution Due to COVID-19 Pandemic: Challenges and Recommendations' (2021) 405 *Chemical Engineering Journal* 126683
- 14 Klemeš JJ and others, 'Minimising the Present and Future Plastic Waste, Energy and Environmental Footprints Related to COVID-19' (2020) 127 *Renewable and Sustain-able Energy Reviews* 109883
- 15 Ibid.
- 16 Zand AD and Heir AV, 'Emerging Challenges in Urban Waste Management in Tehran, Iran during the COVID-19 Pandemic' (2020) 162 *Resources, Conservation and Recycling* 105051
- 17 Eminton S, 'Council Waste Services "Disrupted", Finds Survey' (letsrecycle.com, 5 April 2020) <https://www.letsrecycle.com/news/latest-news/council-waste-survey-coronavirus/>, accessed 18 November 2020.
- 18 Dunn K, 'Another casualty of the pandemic: We're 'drowning' in single-use plastics again' (Fortune, 17 August 2020) <https://fortune.com/2020/08/17/single-use-plastics-coronavirus-climate-change-pollution-covid/>, accessed 18 November 2020.
- 19 Dunn K, "Black April:" IEA Warns of "Staggering" Demand Drop in Global Oil Markets' (Fortune, 15 April 2020) <https://fortune.com/2020/04/15/black-april-oil-production-ia/>, accessed 18 November 2020.
- 20 Dunn K, 'Another casualty of the pandemic: We're 'drowning' in single-use plastics again' (Fortune, 17 August 2020) <https://fortune.com/2020/08/17/single-use-plastics-coronavirus-climate-change-pollution-covid/>, accessed 18 November 2020; Demony C, 'Economic Meltdown Threatens Europe's War on Plastic' Reuters (7 August 2020) <https://www.reuters.com/article/us-health-coronavirus-europe-plastic-idUSKCN2531A0>, accessed 18 November 2020.
- 21 Ibid.
- 22 Demony C, 'Economic Meltdown Threatens Europe's War on Plastic' Reuters (7 August 2020) <https://www.reuters.com/article/us-health-coronavirus-europe-plastic-idUSKCN2531A0>, accessed 18 November 2020.

contamination, the state suspended its plastic bag ban for sixty days starting April 22, 2020.<sup>23</sup> The goal of the ban was to reduce “the risk of COVID-19 exposure for workers engaged in essential activities, such as those handling reusable grocery bags or recyclable containers”.<sup>24</sup> The impacts of the temporary suspension of the bag ban had negative impacts on the production and recycling of plastic bags and film packaging. Similarly to what happened in Europe, manufacturers in the U.S. quickly reverted to using 100% virgin resins as they cost less than recycled resins.<sup>25</sup> In Southeast Asia, recyclers reduced prices by an average of 21%, due to the fall in virgin resin prices.<sup>26</sup>

## Waste Pickers

The impacts of the global lockdown have also been severe to waste pickers. In Manila in the Philippines, waste pickers are no longer able to sell recyclables as most junkyards and other businesses that purchase them have been closed for months.<sup>27</sup> In some cases, waste pickers are reprimanded by police if they leave their homes to collect plastic products, forcing them to revert to insufficient government or social support, if available, or borrowing money to survive.<sup>28</sup> In Vietnam and Thailand, two of the first countries to end their lockdown mandates, the volumes of recycled materials were still significantly lower than the pre-pandemic levels.<sup>29</sup>

If historical numbers are to indicate the future, less than 10% of plastics used during the pandemic will ever be recycled, and more than 70% will find its way to landfills or the environment.<sup>30</sup> As COVID-19 can survive on plastic surfaces for up to three days, this poses additional concerns for human contamination from plastic waste.<sup>31</sup>

## Conclusion

The disruption brought up on by the 2020 pandemic may provide opportunities for significant and long-lasting changes to economic structures and facilitate a move towards a circular economy where waste is managed much more sustainably. The lessons learned from this first truly global pandemic will provide invaluable insights for future improvements, but the future of plastics may well be determined by the path that society takes in the global economic recovery from the pandemic.<sup>32</sup>

However, these early studies about the impacts of COVID-19 on plastic waste seem to confirm the main finding from this report that plastic pollution and, including marine litter, disproportionately impacts persons, groups, and peoples in vulnerable situations and their basic rights, health, and well-being, and will pose substantial obstacles to the fulfilment of the Sustainable Development Goals (SDGs). Moreover, a rights-based approach, including social justice approaches, to the COVID-19 recovery and response requires that we build back better and more sustainably. Effective responses to COVID-19 and environmental crises must be global responses grounded in solidarity, compassion, and respect for human dignity. The required actions must build on obligations of States countries and other duty-bearers in international environmental law and human rights instruments as well as regional treaties.

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- 23 'Governor Newsom Signs Executive Order on Actions in Response to COVID-19' (California Governor, 24 April 2020) <https://www.gov.ca.gov/2020/04/23/governor-newsom-signs-executive-order-on-actions-in-response-to-covid-19-2/>, accessed 18 November 2020.
- 24 'Announcement: Executive Order N-54-20 Suspends Deadlines for Filing, Noticing, and Posting CEQA Documents with County Clerks' (27 April 2020) <https://opr.ca.gov/news/2020/04-27.html#:~:text=Pursuant%20to%20Executive%20Order%20N,been%20suspended%20for%2060%20days.>, accessed 18 November 2020.
- 25 Staub C, 'Pause on Bag Law Is a Hit to Some Recyclers' (Plastics Recycling Update, 29 April 2020) <https://resource-recycling.com/plastics/2020/04/29/pause-on-bag-law-is-a-hit-to-some-recyclers/>, accessed 18 November 2020.
- 26 Suratman N, 'SE Asia, India Plastic Recycling Weighed down by Pandemic, Low Oil Prices' (ICIS Explore) (20 August 2020), <<https://www.icis.com/explore/resources/news/2020/08/20/10543073/se-asia-india-plastic-recycling-weighted-down-by-pandemic-low-oil-prices>>, accessed 18 November 2020.
- 27 Philippine Trash Trawlers Struggle with Virus-Led Plastic Surge' (Al Jazeera, 10 August 2020) <https://www.aljazeera.com/economy/2020/8/10/philippine-trash-trawlers-struggle-with-virus-led-plastic-surge>, accessed 18 November 2020.
- 28 Ibid.
- 29 Suratman N, 'SE Asia, India Plastic Recycling Weighed down by Pandemic, Low Oil Prices' (ICIS Explore) <https://www.icis.com/explore/resources/news/2020/08/20/10543073/se-asia-india-plastic-recycling-weighted-down-by-pandemic-low-oil-prices>, accessed 18 November 2020.
- 30 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances e1700782
- 31 Prata JC and others, 'COVID-19 Pandemic Repercussions on the Use and Management of Plastics' (2020) 54 Environmental Science & Technology 7760
- 32 Kahlert S and Bening CR, 'Plastics Recycling after the Global Pandemic: Resurgence or Regression?' (2020) 160 Resources, Conservation and Recycling 104948



Photo by Opération Mer Propre taken on July 9, 2020 (Creative Commons).

## INTRODUCTION AND OBJECTIVES

Public understanding of marine litter and plastic pollution has risen considerably in the last couple of years. People understand the issues brought on by using unnecessary plastics – namely, the pollution of our waterways and oceans. Far less understood is the broader context in which this pollution exists, and of the full extent of its impacts.

Plastics, described as a group of synthetic materials used in a “huge and growing range of applications”<sup>33</sup> have been incorporated into our lives at a truly astonishing speed. Convenience, hygiene, and safety are often mentioned as the main benefits of these materials, which is true if the context considered is narrowly defined as the specific use intended, rather than the whole life cycle of these materials. Unfortunately, plastic products do not exist in a void, but rather, as part of a global chain of commerce that impacts humans, as well as the natural resources and ecosystems they depend on

for survival.<sup>34</sup> Therefore, it is essential to understand the disproportionate impacts on persons, groups, and peoples in vulnerable situations at all stages of a plastic product’s cycle.

Ninety-nine percent of plastics are produced from petrochemicals, which are sourced from fossil fuels.<sup>35</sup> Given the volatility of some of the raw materials, the processes to source these stocks are highly dependent on complex logistics, and thus, plastics are frequently produced in geographic proximity to fossil fuel refinery facilities. This vertical integration benefits industry, but it comes at the expense of communities and people located in the vicinity of large-scale industrial complexes.<sup>36</sup>

Once these plastic materials are in use, there are other impacts to consider. For instance, the use of plastic bottles as packaging for drinking water is one example. The pollution found in plastic sachets used as a gap measure in some locations without sufficient public water distribution systems,<sup>37</sup> to not enough being done by some local governments to address this issue,<sup>38</sup> plastic packaged water can be both a driver and a symptom of water scarcity.<sup>39</sup>

What happens to all these single-use plastic products once people are done using them? Depending on the location, single-use plastics can be recycled, sent to a landfill, shipped to other countries, repurposed, or incinerated. In some recent high-profile cases, some countries in the Global North sent mislabeled waste to less industrialized locations, prompting potential high-level crises among countries.<sup>40,41,42</sup>

A problem not often discussed lies in the additives and chemicals that these plastics contain, some of which could be harmful to humans. In 2011, a study found that half of recycled plastics in India contained a class of flame retardants (PBDE), which

33 Plastics Europe, “What Are Plastics,” <https://www.plasticseurope.org/en/about-plastics/what-are-plastics>, accessed 18 November 2020.

34 ‘Plastic Industry Awareness of the Ocean Plastics Problem’ (CIEL 2017)

35 ‘Fossils, Plastics, & Petrochemical Feedstocks’ (CIEL 2017)

36 ‘Plastic & Health: The Hidden Costs of a Plastic Planet’ (CIEL 2019)

37 Wright J and others, ‘Effects of Sachet Water Consumption on Exposure to Microbe-Contaminated Drinking Water: Household Survey Evidence from Ghana’ (2016) 13 International Journal of Environmental Research and Public Health 303

38 Pacheco-Vega R, ‘Agua Embotellada En México: De La Privatización Del Suministro a La Mercantilización de Los Recursos Hídricos’ (2015) 22 Espiral (Guadalaj.) 221

39 Mason SA, Welch VG and Neratko J, ‘Synthetic Polymer Contamination in Bottled Water’ (2018) 6 Frontiers in Chemistry 407

40 Dayaram S, ‘Canada to Haul Back Mountains of Trash Sent to Philippines Years Ago’ (CNN, 23 May 2019), <https://www.cnn.com/2019/05/23/asia/canada-to-take-back-philippines-trash-intl/index.html>, accessed 18 November 2020.

41 Yeung J, ‘Cambodia to Send Plastic Waste Back to the US and Canada’ (CNN, 18 July 2019), <https://www.cnn.com/2019/07/18/asia/cambodia-rejects-trash-intl-hnk/index.html>, accessed 18 November 2020.

42 GAIA, ‘DISCARDED: Communities on the Frontlines of the Global Plastic Crisis’ (2019)

was recently banned for use in juvenile products in California, U.S.,<sup>43</sup> and in some cases, entirely prohibited in the European Union (EU).<sup>44,45,46</sup>

Women in particular bear the brunt of plastic-related toxicity risk due to higher aggregate exposure to plastics in the household and even in feminine care products. Differences in biology, social roles, and political power in regulating plastic use and health standards place women at high risk of miscarriages and cancer, which further exacerbate existing gender-related disparities.

Public outcry about plastic pollution waste has driven some countries to make commitments<sup>47</sup> and allegations,<sup>48</sup> but a close look at the context should be taken to better understand the situation.

While environmental justice is entering the mainstream, it is still not a traditional consideration within the marine conservation field. Vulnerable communities around the world deal with the impacts of plastic waste and have historically been unable to inform environmental conversations on the matter. This means that efforts to control and decrease plastic pollution are inadequate to address the specific needs of groups and peoples already in vulnerable situations, who are socially, economically, politically, institutionally, or otherwise marginalized.

As the world endeavors to achieve the Sustainable Development Goals (SDGs), we must move towards an environmental conservation movement that prioritizes the needs of those disproportionately affected by pollution around the world. When we leave out persons, groups, and peoples in vulnerable situations, we risk falling into the traps of grandiose, but potentially empty gestures, the exact opposite proposed by the blueprint provided in the SDGs.

Though a life without plastics may be difficult to imagine in the 21st century, the advent of our modern conception of plastics is very recent and can be traced only to World War II. This relative newness magnifies the severity of the plastic problem. From 1950 to 2015, 8.3 billion metric tons of new plastics were produced. Without action, the annual flow of plastic into the ocean will nearly triple by 2040, to 29 million metric tons per year (range: 23 million-37 million metric tons per year), equivalent to 50 kg of plastic per metre of coastline worldwide. The prevalence of plastics in the natural environment has reached such an extent that some scholars have begun to refer to this sphere of interaction between ecosystems and plastics as the “plastisphere.”

Though a life without plastics may be difficult to imagine in the 21st century, the advent of our modern conception of plastics is very recent and can be traced only to World War II.<sup>49</sup> This relative newness magnifies the severity of the plastic problem. From 1950 to 2015, 8.3 billion metric tons of new plastics were produced.<sup>50</sup> Without action, the annual flow of plastic into the ocean will nearly triple by 2040, to 29 million metric tons per year (range: 23 million-37 million metric tons per year), equivalent to 50 kg of plastic per metre of coastline worldwide.<sup>51</sup> The prevalence of plastics in the natural environment has reached such an extent that some scholars have begun to refer to this sphere of interaction between ecosystems and plastics as the “plastisphere.”<sup>52</sup>

Plastic gained popularity for its durability and lighter weight, and it is these attributes that still make it popular among consumers. However, as consumer consciousness about the hazards of plastic pollution

43 'Bill Text - AB-2998 Consumer Products: Flame Retardant Materials.' (2018), [https://leginfo.ca.gov/faces/billTextClient.xhtml?bill\\_id=201720180AB2998](https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2998), accessed 18 November 2020.

44 Ibid.

45 Toxics Link, 'Brominated Flame Retardants Spreading the Fire' (2011)

46 DiGangi J, Strakova J and Bell L, 'POPs Recycling Contaminates Children's Toys with Toxic Flame Retardants' (IPEN 2017)

47 Campisi J, 'Trudeau Announces Canadian Ban of Single-Use Plastics as Early as 2021' (TheHill, 10 June 2019), <https://thehill.com/policy/international/447716-trudeau-announces-canadian-ban-of-single-use-plastics-as-early-as-2021>, accessed 18 November 2020.

48 Wheeling K, 'The EPA Blames Six Asian Nations That The U.S. Exports Plastic Waste to for Ocean Pollution' (Pacific Standard, 15 July 2019), <https://psmag.com/environment/the-epa-blames-six-asian-nations-that-the-u-s-exports-plastic-waste-to-for-ocean-pollution>, accessed 18 November 2020.

49 Vince J and Hardesty BD, 'Governance Solutions to the Tragedy of the Commons That Marine Plastics Have Become' (2018) 5 *Frontiers in Marine Science*

50 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 *Science Advances* e1700782

51 The Pew Charitable Trusts and SYSTEMIQ, 'Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution' (2020), 9 < [https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave\\_report.pdf](https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf)>, accessed 9 April 2021.

52 Stoett P, 'People and Plastic: The Oceans Plastic Crisis, Global Governance, and Development Norms' 23 <http://acuns.org/wpcontent/uploads/2016/05/ACUNS2016Stoett.pdf>, accessed 18 November 2020.

grows, more systemic issues have come to light. Factors of convenience intermingle with concerns over how peers may perceive the use of substitute materials,<sup>53</sup> hygiene,<sup>54</sup> and affordability.<sup>55</sup> In much of the Global South, the resources to pursue alternatives or to manage plastic wastes more effectively are simply not present and citizens are left waiting for structural and regulatory changes.<sup>56</sup>

The plastics problem is less of an issue of consumption and proper disposal than one of the fundamental nature of plastics. As a product, plastics are unlike anything that national and global governance has dealt with before. Plastics are diverse, even more so than the number in the small triangle used in plastic labeling might suggest, due to the variety of methods of manufacturing, polymers forming their foundation, and plasticizers added to achieve different qualities.<sup>57</sup> As a result, processing plastics simply cannot be achieved with a one-size-fits-all solution, a fact which has hampered recycling and reuse efforts.<sup>58</sup>

Plastic pollution impacts our marine environment and human communities. Particularly, vulnerable communities disproportionately bear the consequences of environmental degradation caused by plastics pollution from production to waste.

Plastics are persistent – indeed, that was part of their appeal, but it is also one of their worst qualities. Plastics, which are primarily composed of fossil hydrocarbon-derived monomers, are not biodegradable.<sup>59</sup> When plastics are discarded, they do not break down and assimilate through biological processes. Instead, they release fillers, like plasticizers, as gas and contaminated liquid and break down into increasingly smaller pieces that retain many of their original properties.<sup>60</sup> This persistence allows plastics to accumulate, not only in sheer number and volume, but also as toxins and micro-plastics in the environment.<sup>61</sup> Common waste management processes that purport to truly eliminate plastics, such as incineration, generate toxic outputs and significant CO<sub>2</sub> emissions, posing additional pollution and climate change challenges. Moreover, plastic pollution transcends national boundaries, making responsibilities and strategies for effective clean-up unclear.<sup>62</sup> Combined, these features make plastic waste pollution a considerably challenging problem, and one which goes beyond impacting the health of our lands and oceans – it impacts the health and rights of our communities every day.

Plastic pollution impacts our marine environment and human communities. Particularly, vulnerable communities disproportionately bear the consequences of environmental degradation caused by plastics pollution, from production to waste. Discussions around this subject have seldom looked at these negative impacts specifically through an environmental justice lens.<sup>63</sup>

From oil extraction to plastic disposal there are three main external impacts from using plastics and plastic packaging: ecosystem degradation due to leakage, especially in the marine environment;

53 Jahani A and others, 'Iranian Experiences in Terms of Consumption of Disposable Single-Use Plastics: Introduction to Theoretical Variables for Developing Environmental Health Promotion Efforts' (2019) 65 *Environmental Toxicology and Pharmacology* 18

54 McDermott K, 'Plastic Pollution and the Global Throwaway Culture: Environmental Injustices of Single-Use Plastic' [2016] ENV 434 *Environmental Justice* [https://digitalcommons.salve.edu/env434\\_justice/7](https://digitalcommons.salve.edu/env434_justice/7), accessed 18 November 2020.

55 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)

56 Hanson A-M, 'Women's Environmental Health Activism around Waste and Plastic Pollution in the Coastal Wetlands of Yucatán' (2017) 25 *Gender & Development* 221 (2017): 221–34, <https://doi.org/10.1080/13552074.2017.1335450>, accessed 18 November 2020.

57 Liboiron M, 'Redefining Pollution: Plastics in the Wild' (Thesis, New York University 2012)

58 Hopewell J, Dvorak R and Kosior E, 'Plastics Recycling: Challenges and Opportunities' (2009) 364 *Philosophical Transactions of the Royal Society B: Biological Sciences* 2115

59 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 *Science Advances* e1700782

60 Eagle L, Hamann M and Low DR, 'The Role of Social Marketing, Marine Turtles and Sustainable Tourism in Reducing Plastic Pollution' (2016) 107 *Marine Pollution Bulletin* 324

61 Choy CA and others, 'The Vertical Distribution and Biological Transport of Marine Microplastics across the Epipelagic and Mesopelagic Water Column' (2019) 9 *Scientific Reports* 7843

62 Vince J and Hardesty BD, 'Governance Solutions to the Tragedy of the Commons That Marine Plastics Have Become' (2018) 5 *Frontiers in Marine Science*

63 Walker B and Bullard RD, 'Dumping in Dixie: Race, Class, and Environmental Quality' (2006) 13 *Journal of Public Health Policy* 522

fossil fuel emissions from plastic production and incineration of disposed materials; and health and environmental impacts (including biodiversity loss) from toxic substances.<sup>64</sup>

## Environmental Justice and Vulnerable Populations

The term “environmental justice” was born in the United States (U.S.) during the 1980s,<sup>65</sup> to address problems in the main-stream environmental movement – challenges both of omission and commission. It was originally a response to growing allegations of environmental racism – the location of polluting facilities and industries in the areas inhabited by persons, groups, and peoples in vulnerable situations. However, environmental justice issues may arise from issues of exclusion, as persons, groups, and peoples in vulnerable situations are often not allowed to participate meaningfully in the leadership and composition of the environmental movement and related decision-making processes, and have restricted access to land and natural resources.<sup>66</sup> Environmental justice literature is growing, conceptually and in terms of data gathering, in different regions of the world, and insights from it are being included in international processes, such as under the Convention on Biological Diversity.<sup>67</sup> So this study is complemented with some international examples. It is recommended that future reports on this topic include as much non-U.S. data as possible as new studies become available.

In addition, environmental injustices cannot be thought of as strictly local issues.<sup>68</sup> As described in this report, the impacts resulting from the global supply chain of plastic materials is widespread, affecting persons, groups, and peoples in vulnerable situations across the globe. As the complexities implicit to global market systems reinforce issues of access and representation, the discourse

surrounding environmental justice progressed from assigning blame to actors to evaluating larger social dynamics of the production and distribution of environmental degradation.<sup>69</sup> As an example, in the context of marine plastic litter, national structures of production and trade make preventive action difficult to implement, even without explicit intervention of the commercial entities.<sup>70</sup> Broader systemic issues of policies of inclusion or exclusion of certain interests in negotiation, such as ensuring rights to information and public participation in decision-making,<sup>71</sup> can create spaces for the proliferation of environmental injustices at all geographic scales.

A detailed exploration of environmental justice as a field is not within the scope of this report, as multiple dimensions of environmental justice have been identified as inter-related.<sup>72</sup> For the purposes of the present study, two key concepts are focused on: procedural justice and distributive justice. Procedural justice investigates the inequity of bargaining powers of communities with different levels of economic development and is associated with issues of the right of all peoples to participate in the decision-making process. Mean-while, distributive justice is concerned with the inequitable distribution of burdens. Both themes arise in the context of marine plastics pollution, both within and among countries, as illustrated in this report. While the field principally focused on domestic policy issues in its early years, environmental injustices seem to be perpetuated across borders by modern business practices.<sup>73</sup> It cannot be assumed that the distribution of costs and benefits that has arisen organically through the course of history is fully just.<sup>74</sup> The marine plastics crisis is a stark example of social injustices, but also presents a great opportunity to do better in the future. Future studies should also focus on other inter-related dimensions of environmental justice, such as recognition of the social, cultural and institutional causes underlying unjust distribution and discrimination and “contextual” justice (pre-

64 World Economic Forum, 'The New Plastics Economy: Rethinking the Future of Plastics' (2016)  
65 Martínez-Alier J, 'Environmental Justice and Economic Degrowth: An Alliance between Two Movements' (2012) 23 *Capitalism Nature Socialism* 51  
66 Walker B and Bullard RD, 'Dumping in Dixie: Race, Class, and Environmental Quality' (2006) 13 *Journal of Public Health Policy* 522  
67 CBD Dec XIV/8 (2018) 8  
68 Martínez-Alier J, 'Environmental Justice and Economic Degrowth: An Alliance between Two Movements' (2012) 23 *Capitalism Nature Socialism* 51  
69 Brulle RJ and Pellow DN, 'ENVIRONMENTAL JUSTICE: Human Health and Environmental Inequalities' (2006) 27 *Annual Review of Public Health* 103  
70 Boyd D and others, 'Marine Litter – Impacts, Inequality and Environmental Injustice' (Fourth UN Environment Assembly, 15 April 2019) <https://www.unep.org/fr/node/24772>, accessed 18 November 2020.  
71 Anand R, *International Environmental Justice: A North-South Dimension* (Ashgate 2003)  
72 Ibid.  
73 Martínez-Alier J, 'Environmental Justice and Economic Degrowth: An Alliance between Two Movements' (2012) 23 *Capitalism Nature Socialism* 51  
74 Shue H, 'The Unavoidability of Justice' in Andrew Hurrell and Benedict Kingsbury (eds), *The International politics of the environment : actors, interests, and institutions* (Oxford University Press 1992)

existing social, economic and political conditions that influence an actor's ability to enjoy all other dimensions of justice).<sup>75</sup>

Environmental justice issues are often difficult to address because they do not fit neatly into any one category of global governance – they often transcend the boundaries of environmental, human rights, public health, and others.<sup>76</sup> Domestic laws are further developed than international law to prevent harm to people and the environment.<sup>77</sup> However, corruption and procedural injustices may hinder the application of national legislation, necessitating a more robust international framework.<sup>78</sup> The increasing disconnection of economic benefits and ecological costs of the global economy has created opportunities for exploitation by more powerful actors from the Global North,<sup>79</sup> while also complicating the attribution of liability. Differences in functional levels of sovereignty of states in the context of these economic influences allow the burden of pollutants to be shifted around rather than eliminated.<sup>80</sup>

Some guiding principles for achieving environmental justice have already been identified, many of which are alluded to throughout the report. These include rights to information, appropriate training for potentially exposed workers, public participation in decision-making, opportunities for input and partnership for all stakeholders, and ensuring the involvement and guidance of vulnerable communities in the environmental decision-making process.<sup>81</sup> For the purpose of this analysis, we classify vulnerable populations as persons, groups and peoples in vulnerable situations outside of the traditional or mainstream spheres of power due to a different ethnic or national origin, political/religious affiliation, socioeconomic status, or gender.<sup>82</sup> This broad definition aims to capture the diversity of vulnerabilities that may exist, beyond more vague definitions of increased likelihood of incurring harm

but also with the goal of avoiding exclusion of groups with a narrower definition.<sup>84</sup> As discussed later in the report, the ubiquity of marine plastic pollution poses an imminent threat to the attainment of the SDGs. Therefore, the meaningful inclusion of vulnerable communities in developing action plans to address plastics is a multi-fold mandate.

This report directly responds to the United Nations Environment Assembly (UNEA) resolution 2/11 which calls for more research on marine plastic debris and microplastics, including associated chemicals, and especially on environmental and social impacts – including on human health.<sup>83</sup> The main objective of this report is to clarify the interlinkages between environmental justice and plastic pollution and to examine the following factors: (i) the extent to which economic disadvantage and social exclusion may be compounded or compensated by a plastics-polluted vs. a favorable natural environment; (ii) impacts of plastic pollution, including marine plastic and microplastics, on people's rights, health, and well-being, as well as how it poses obstacles to the fulfilment of the SDGs; and (iii) recommendations of practical actions that can be taken by different actors to address the challenges emanating from the interlinkage issues outlined in this report. Specifically, this report will explore the extent to which vulnerabilities (including economic disadvantage and social exclusion) could be worsened or alleviated by a polluted vs. a favorable marine environment.

To understand the full scope of the social impacts related to plastic materials, there needs to be a step-by-step understanding of each stage of the life cycle of plastic, from production to waste, and how each of these phases impacts vulnerable communities. The report starts with a brief explanation of the complex life cycle of plastics and outline how vulnerable populations are impacted by all stages from oil extraction and molding, to product use, and the disposal of plastic products. Throughout

75 Schlosberg, 'Defining Environmental Justice: Theories, Movements and Nature' (2007)

76 Osofsky HM, 'Learning from Environmental Justice: A New Model for International Environmental Rights' (2005) 24 Stanford Environmental Law Journal 71

77 Anand R, *International Environmental Justice: A North-South Dimension* (Ashgate 2003)

78 Osofsky HM, 'Learning from Environmental Justice: A New Model for International Environmental Rights' (2005) 24 Stanford Environmental Law Journal 71

79 Anand R, *International Environmental Justice: A North-South Dimension* (Ashgate 2003)

80 Ibid.; Osofsky HM, 'Learning from Environmental Justice: A New Model for International Environmental Rights' (2005) 24 Stanford Environmental Law Journal 71

81 Anand R, *International Environmental Justice: A North-South Dimension* (Ashgate 2003)

82 Bracken-Roche D and others, 'The Concept of "Vulnerability" in Research Ethics: An in-Depth Analysis of Policies and Guidelines' (2017) 15 Health Research Policy and Systems 8

83 UNEA Resolution 2/11 (UNEP/EA.2/Res.11), Marine plastic litter and microplastics 2016 [https://wedocs.unep.org/bitstream/handle/20.500.11822/11186/K1607228\\_UNEPEA2\\_RES11E.pdf?sequence=1&isAllowed=y](https://wedocs.unep.org/bitstream/handle/20.500.11822/11186/K1607228_UNEPEA2_RES11E.pdf?sequence=1&isAllowed=y), accessed 18 November 2020.

this analysis, illustrations are provided on how vulnerable communities are disproportionately and negatively affected during all stages – from exposure to toxic materials during the production stages, to food contamination from plastics in the ocean, and mounds of trash on riverbanks and shorelines.

Finally, this report provides a brief review of international treaties and mechanisms exploring historical successes and challenges related to environmental justice concerns, a review of relevant global agreements related to marine plastic pollution and interlinkages with environmental justice, a deeper dive into regional and local policies, and proposes a high-level set of actions that will set a research and exploration agenda for various actors to integrate environmental justice principles into actions to address marine litter and plastic pollution.

## How did we get here?

### What are plastics?

Plastics are synthetic materials made from a wide range of organic polymers, which are chains of monomers, or single molecules.<sup>84</sup> Naturally occurring polymers are the building blocks of proteins and include cellulose, wool, keratin, collagen, and our very own DNA. Humans have been benefiting from natural polymers for thousands of years.<sup>85</sup> Around 1,600BC Mesoamerican peoples were harvesting latex from trees and converting it into rubber balls and figurines.<sup>86</sup> Most plastics are based on carbon atoms and use chemicals generally coming from oil, natural gas, and even coal.

In the early 1900s chemists invented the first synthetic polymers, effectively starting the human plastic age.<sup>87</sup> In 1907, Leo H. Baekeland invented the first fully synthetic plastic, Bakelite, which is still in use today.<sup>88</sup> Currently, various types of plastics are used in hundreds of thousands of products.<sup>89</sup>

Plastics can be classified according to their molecular structure; properties, such as density, hardness, meltability, and degree of crystallinity; or by application, including molded objects, sheets and films, coating, paint and inks, and fibers and yarns.<sup>90</sup> Plastics are also commonly classified into two categories: thermoplastics and thermosets. Thermoplastics can be melted and hardened multiple times through heating and cooling processes. Thermosets, on the other hand, undergo a chemical transformation when heated and cannot be reformed.<sup>91</sup>

## Scale of the Problem

Less than 10% of the total amount of plastics produced between 1950 and 2015 – estimated at 8.3 billion metric tons (MT) – has ever been recycled (only 600 million MT),<sup>92</sup> resulting in near-permanent contamination on a planetary scale. Of the estimated 8.3 billion MT of plastic produced by 2015, only 30% (2.5 billion MT) is still in use.<sup>93</sup> A staggering 4.9 billion MT of plastics (nearly 80% of plastics discarded in this period) are accumulating in landfills and the natural environment.<sup>94</sup> The total amount of plastics ever produced adds to more than 9 billion MT, the equivalent of roughly 1,200kg of plastics for each human being alive today.

The total amount of plastics ever produced is almost 9 billion MT, roughly 1.3 tons of plastics for each human being alive today.

84 Hosler D Burkett SL and Tarkanian MJ, 'Prehistoric Polymers: Rubber Processing in Ancient Mesoamerica' (1999) 284 Science 1988

85 Ibid.

86 Ibid.

87 Crespy D, Bozonnet M and Meier M, '100 Years of Bakelite, the Material of a 1000 Uses' (2008) 47 Angewandte Chemie International Edition 3322

88 Ibid.

89 PlasticsEurope, 'Plastics - the Facts 2016' (2016)

90 Polymers and Plastics: A Chemical Introduction' <http://www.chem1.com/acad/webtext/states/polymers.html>, accessed 18 November 2020.

91 Ibid.

92 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances e1700782

93 Ibid.

94 Ibid.

## THERMOSET VS. THERMOPLASTIC CHARACTERISTICS

	Thermoset (Cannot be melted)	Thermoplastic (Can be melted repeatedly)
<b>Materials</b>	<ul style="list-style-type: none"> <li>• Butyl</li> <li>• EPDM</li> <li>• Hypalon</li> <li>• Melamine</li> <li>• Natural rubber</li> <li>• Nitrile</li> <li>• Neoprene</li> <li>• SBR</li> <li>• Silicone</li> <li>• Synthetic Polyisoprene</li> <li>• Urea formaldehyde</li> </ul> 	<ul style="list-style-type: none"> <li>• ABS</li> <li>• Acetal</li> <li>• Nylon</li> <li>• Polycarbonate</li> <li>• Polyethylene</li> <li>• Styrene</li> <li>• Vinyl and Polyvinyl Chloride</li> </ul> 
<b>Curing Process</b>	<ul style="list-style-type: none"> <li>• Contains polymers that cross-link together during the curing process to form an irreversible chemical bond</li> <li>• Eliminates the risk of product melting; heat resistant</li> </ul>	<ul style="list-style-type: none"> <li>• Softens when heated and becomes more fluid as additional heat is applied</li> <li>• Reversible curing process</li> <li>• No chemical bonding</li> </ul>
<b>Features and Benefits</b>	<ul style="list-style-type: none"> <li>• Improves the material's mechanical properties</li> <li>• Enhances chemical resistance, heat resistance, and structural integrity</li> </ul>	<ul style="list-style-type: none"> <li>• High strength</li> <li>• Shrink-performance</li> <li>• Easy bendability</li> </ul>
<b>Advantages</b>	<ul style="list-style-type: none"> <li>• More resistant to high temperatures than thermoplastics</li> <li>• High flexible design</li> <li>• Thick to thin wall capabilities</li> <li>• Excellent aesthetic appearance</li> <li>• High levels of dimensional stability</li> <li>• Cost-effective</li> </ul>	<ul style="list-style-type: none"> <li>• High impact resistance (10 X thermosets)</li> <li>• Can be recycled and reused</li> <li>• Easy repair</li> <li>• High chemical resistance</li> <li>• Aesthetically better surface finish</li> <li>• Uncured thermoplastics do not need refrigerated storage</li> <li>• Fewer emissions</li> <li>• They can be blended with other thermoplastic materials</li> <li>• Hard crystalline or rubbery surface options</li> </ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"> <li>• Cannot be recycled</li> <li>• Refrigerated storage required by liquid raw materials</li> <li>• Repair difficulty</li> <li>• Good surface finish is tough to accomplish</li> <li>• Lengthy, complex process stages</li> <li>• Structural failure on high-force impact</li> <li>• Emissions during production process</li> <li>• Inability to blend thermosets by welding</li> <li>• Cannot be remolded or reshaped</li> </ul>	<ul style="list-style-type: none"> <li>• Heat and pressure requirement for fiber reinforcement</li> <li>• High cost</li> <li>• Heat and UV sensitivity</li> <li>• Polymer degradation after constant remelting and remolding</li> <li>• Structural failure on high stress or long-term load application</li> <li>• Leaching of hazardous chemicals in the long run</li> </ul>

## PLASTIC WASTE AND THE SUSTAINABLE DEVELOPMENT GOALS (SDGS)

In 2017, the world's plastic production reached 348 million MT, a 20% increase in just five years<sup>95</sup> and a 200-fold (20,000%) increase since 1950. This increase in production has rapidly accelerated in the last few decades,<sup>96</sup> and more than half of the plastics ever created were produced in just the last 15 years.<sup>97</sup> Plastic production is expected to double by 2035 (from 2015 numbers), reaching more than 600 million MTs per year.<sup>98</sup> Moreover, without action, the annual plastic flows to the ocean are expected to grow from 11 million metric tons (range: 9 million-14 million metric tons per year) in 2016 to 29 million metric tons in 2040 (range: 23 million-37 million metric tons per year), with consequences for communities, businesses, and ecosystems.<sup>99</sup>

As a result, and an example, plastic bags have become ubiquitous and were found at the bottom of the Mariana's Trench, in the Pacific Ocean, at 11km below the surface.<sup>100</sup>

Microplastics have been found in the Arctic,<sup>101</sup> Antarctica,<sup>102</sup> and in every ocean basin on the planet,<sup>103</sup> as well as in rainwater in Colorado, U.S.<sup>104</sup> Plastic fibers have been found in drinking water around the planet.<sup>105</sup>

From source extraction to waste, the entire life cycle of plastics can pose obstacles to the full and timely achievement of the Sustainable Development Goals (SDGs). Plastic production, use, and pollution, and the processes that generate it impact populations around the world and the natural resources they depend on to live.

Plastics producers could be seen to be driving consumption of commodities that the public is trying to turn away from and shoring up otherwise unattractive industries, like natural gas extraction.<sup>106</sup> In turn, this boosts the continued production of substances that drive climate change, exacerbating the impacts disproportionately felt by individuals, groups, and peoples in vulnerable situations around the world.<sup>107,108,109</sup>

Next, these fuels are transported, refined, and processed in facilities that impact the life quality and possibly, the health of the communities around them. These areas exposed to toxic chemical exposure have been named as sacrifice zones,<sup>110,111</sup> and are frequently located in areas populated by vulnerable communities with less political recognition and less economic means to relocate.<sup>112</sup>

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- 95 Ibid.  
96 PlasticsEurope, 'Plastics - the Facts 2013' (2013)  
97 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances e1700782  
98 Ibid.  
99 The Pew Charitable Trusts and SYSTEMIQ, 'Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution' (2020) 9< [https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave\\_report.pdf](https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf)>, accessed 9 April 2021.  
100 Morelle R, 'Mariana Trench: Deepest-Ever Sub Dive Finds Plastic Bag' BBC News (13 May 2019) <https://www.bbc.com/news/science-environment-48230157>, accessed 18 November 2020.  
101 Kanhai LDK and others, 'Microplastics in Sub-Surface Waters of the Arctic Central Basin' (2018) 130 Marine Pollution Bulletin 8  
102 Reed S and others, 'Microplastics in Marine Sediments near Rothera Research Station, Antarctica' (2018) 133 Marine Pollution Bulletin 460  
103 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances e1700782  
104 Wetherbee G, Baldwin A and James Ranville, 'It Is Raining Plastic' [2019] U.S. Geological Survey 3  
105 Tyree C and Morrison D, 'Invisibles: The Plastic inside Us' [http://orbmedia.org/stories/Invisibles\\_plastics/multimedia](http://orbmedia.org/stories/Invisibles_plastics/multimedia), accessed 18 November 2020.  
106 'Fossils, Plastics, & Petrochemical Feedstocks' (CIEL 2017)  
107 'How Fracked Gas, Cheap Oil, and Unburnable Coal Are Driving the Plastics Boom' (CIEL 2017)  
108 Royer S-J and others, 'Production of Methane and Ethylene from Plastic in the Environment' (2018) 13 PLOS ONE e0200574  
109 U.S. EPA, 'Global Greenhouse Gas Emissions Data' (U.S. EPA, 12 January 2016) <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>, accessed 18 November 2020.  
110 Lerner S, Sacrifice Zones: The Front Lines of Toxic Chemical Exposure in the United States (MIT Press 2010)  
111 Bullard R, 'Comments of Dr. Robert D. Bullard on EPA's Proposed Updates to Refinery Emissions Standards' (Dr. Robert Bullard Father of Environmental Justice, 9 August 2014) <https://drrobertbullard.com/comments-of-dr-robert-d-bullard-on-epas-proposed-updates-to-refinery-emissions-standards/>, accessed 18 November 2020.  
112 Lerner S, Sacrifice Zones: The Front Lines of Toxic Chemical Exposure in the United States (MIT Press 2010)

The production of plastics presents problems of its own, with salient examples in communities like Reserve, Louisiana, the only neoprene/stock production facility in the U.S., and the location with the highest risk of cancer in the U.S.<sup>113</sup>

Plastics products, such as plastic water bottles, may in some cases allow local governments to abdicate responsibilities owed to their constituents, such as the provision of potable water, with bottled water becoming the de facto source for consumption.<sup>114</sup> This commodification and privatization of water delivery systems may drive up the price for what should be an easily accessible resource and impacts those that have less money to pay for it, as well as result in almost unimaginable volumes of plastic waste.<sup>115</sup>

Once these plastics are used, their disposal presents myriad problems, largely aggravated by imbalances

of power and inequality. Countries in the Global North often ship their waste to those in the Global South under the premise of recyclability, fueling industries that harm the health of local populations (e.g. by incineration). These practices are not consistent with local efforts and political gestures announcing single-use plastic bans are often vague and lack detailed guidelines.

Historically, after use, almost 80% of plastic products end up accumulated in landfills or the environment, and 12% incinerated.<sup>116</sup> Huge amounts of plastic pollution end up in rivers, waterways and oceans, aggregating pollutants, harming wildlife and impacting communities that depend on the ocean for their sustenance and livelihoods. This pollution washes up on shores all over the world and impacts the use and enjoyment of these areas by marring their appearance, and the possibilities of tourism.<sup>117</sup>

## CHALLENGES OF PLASTIC POLLUTION TO MEETING SDGS

SDG	Description	Issue
1	 <p><b>1</b> NO POVERTY</p>	Plastic pollution threatens the livelihood of those who depend on marine resources for work. Plastics may enter waterways causing flooding. <sup>118</sup> Tourism and fisheries in marginalized coastal areas are impacted.
2	 <p><b>2</b> ZERO HUNGER</p>	Microplastics can impact fisheries (decreasing income) and pollute seafood that people depend on for sustenance.
3	 <p><b>3</b> GOOD HEALTH AND WELL-BEING</p>	From fuel extraction, refining, and transportation, to feedstock and plastic production, plastics can impact the health of populations living in the vicinity of such facilities. Additionally, this infrastructure is usually located in communities with less political or economic power to influence it, prevent it, or oppose it at planning stages. Parents of children exposed to plastic pollution and related toxics suffer from significant psychological stress and anxiety. <sup>119</sup>

113 Lartey J and others, 'Cancer Town - Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status' (The Guardian, 2019) <https://www.theguardian.com/us-news/ng-interactive/2019/may/06/cancertown-louisiana-reserve-special-report>, accessed 18 November 2020.

114 Pacheco-Vega R, 'Agua Embotellada En México: De La Privatización Del Suministro a La Mercantilización de Los Recursos Hídricos' (2015) 22 Espiral (Guadalaj.) 221

115 Pacheco-Vega R, '(Re)Theorizing the Politics of Bottled Water: Water Insecurity in the Context of Weak Regulatory Regimes' (2019) 11 Water 658

116 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances e1700782

117 Meletis ZA and Campbell LM, 'Benevolent and Benign? Using Environmental Justice to Investigate Waste-Related Impacts of Ecotourism in Destination Communities' (2009) 41 Antipode 741

118 Davidson J, Myers D and Chakraborty M, No Time to Waste: Poverty and the Global Environment (Oxfam Publishing 1992)

119 Human Rights Council, 'Report of the Special Rapporteur on the Implications for Human Rights of the Environmentally Sound Management and Disposal of Hazardous Substances and Wastes' (United Nations General Assembly 2016)

SDG	Description	Issue
4	<p><b>4</b> QUALITY EDUCATION</p> 	Students located in fenceline communities (next to extraction / refinery/production/waste burning/incinerator locations) are more susceptible to adverse health impacts, compounding education disparities. <sup>120</sup>
5	<p><b>5</b> GENDER EQUALITY</p> 	Waste picking is thought to be a woman's job at some locations, making them more exposed to waste and sanitation issues. <sup>121</sup> Women's specific biology can lead to disproportional gender impacts and specific vulnerabilities, especially during menstruation, pregnancy, and breast-feeding. <sup>122</sup>
6	<p><b>6</b> CLEAN WATER AND SANITATION</p> 	From fuel extraction to production, use and disposal, plastics can pollute water sources, aggregate contaminants and clog/disrupt sanitation infrastructure.
7	<p><b>7</b> AFFORDABLE AND CLEAN ENERGY</p> 	Subsidies drive plastic production and fossil fuel extraction via highly polluting extractive methods that would not be commercially feasible without this use. Possibly hinders the development of cleaner energies.
8	<p><b>8</b> DECENT WORK AND ECONOMIC GROWTH</p> 	Employment opportunities along the production (extraction to use) of plastics, can present health risks to workers from exposure to toxics. Existing infrastructure can hinder development of other industries that consider the risks to their own facilities.  The development of circular economies and recycling/collection infrastructures could create more jobs, however the lack of political will and financing doesn't let this sector develop appropriately. Moreover, those jobs could help address unemployment amongst vulnerable groups.
9	<p><b>9</b> INDUSTRY, INNOVATION AND INFRASTRUCTURE</p> 	Subsidies, financing, and investments from businesses drive plastic production and fossil fuel extraction via highly polluting extractive methods that would not be commercially feasible without these incentives. Possibly hinders the development of cleaner energies.

120 Bullard R, 'Comments of Dr. Robert D. Bullard on EPA's Proposed Updates to Refinery Emissions Standards' (Dr. Robert Bullard Father of Environmental Justice, 9 August 2014) <https://drobertbullard.com/comments-of-dr-robert-d-bullard-on-epas-proposed-updates-to-refinery-emissions-standards/>, accessed 18 November 2020.

121 Hanson A-M, 'Women's Environmental Health Activism around Waste and Plastic Pollution in the Coastal Wetlands of Yucatán' (2017) 25 Gender & Development 221

122 Lynn H, Rech S and Samwel-Mantingh M, 'Plastic, Gender and the Environment. Findings of a Literature Study on the Lifecycle of Plastics and Its Impacts on Women and Men, from Production to Litter.' <http://rgdoi.net/10.13140/RG.2.2.33644.26242>, accessed 18 November 2020.

SDG	Description	Issue
10		<p>Many Global North countries ship their plastic waste to poorer countries in the Global South for disposal. Methods for disposal of waste (incineration, etc.) impact the health and quality of life of those in the receiving countries, while exporters of waste avoid the health impacts, and garner environmental accolades at the expense of others.<sup>123</sup></p> <p>Petrochemical and waste management facilities, such as incinerators and landfills, are disproportionately built in low-income and heavily minority communities, further deepening social disparities with environmental degradation, health costs, and wasted public investments.<sup>124</sup></p> <p>Plastic waste burning similarly exacerbates inequalities: open burning, which is widespread in Global South countries, transforms plastic waste into toxic ash and air pollution, harming the health of nearby communities. Meanwhile, 79 percent of all municipal waste incinerators in the U.S. are located in communities with the least amount of political or economic power.<sup>125</sup></p>
11		<p>The commodification of a public resource (water) by the plastics industry, hinders the development of local infrastructure by becoming the de facto replacement of potable water, which can lead to local authorities abdicating their responsibility to provide it.<sup>126</sup> Insufficient regulations, penalties, and control on oil spills, and ineffective/lack of plans on dealing with them in case of emergencies, results in additional risks and potentially inadequate responses.<sup>127</sup> Moreover, the burden of navigating complex and confusing recycling systems is placed on individual consumers.</p>
12		<p>Plastics, from extraction and material sourcing, to production and waste disposal, can be a problematic industry, in some cases commodifying natural resources for profit (bottled water), and hindering the development of public infrastructure.<sup>128</sup></p>

123 'Indonesia Returning 57 Containers of Developed World's Waste' (AP NEWS, 9 July 2019) <https://apnews.com/article/d73dbac3f1e74eeda6843d6f64e69aad>, accessed 18 November 2020.

124 Lerner S, Sacrifice Zones: The Front Lines of Toxic Chemical Exposure in the United States (MIT Press 2010)

125 Baptista Al and Perovich A, 'U.S. Municipal Solid Waste Incinerators: An Industry in Decline' (Tishman Environment and Design Center 2019)

126 Pacheco-Vega R, 'Agua Embotellada En México: De La Privatización Del Suministro a La Mercantilización de Los Recursos Hídricos' (2015) 22 Espiral (Guadalaj.) 221

127 LaCresha J, 'They Cleaned Up the Oil-Why Aren't Things Better? The Need to Track Oil Spill Response in Vulnerable Communities' (Masters Paper, University of North Carolina at Chapel Hill 2017)

128 Pacheco-Vega R, '(Re)Theorizing the Politics of Bottled Water: Water Insecurity in the Context of Weak Regulatory Regimes' (2019) 11 Water 658

SDG	Description	Issue
13	<p><b>13</b> CLIMATE ACTION</p> 	Plastic production drives climate change through the emission of greenhouse gases related to oil extraction, transportation of plastic materials, disposal, and incineration. <sup>129</sup>
14	<p><b>14</b> LIFE BELOW WATER</p> 	Plastic pollution threatens marine wildlife (suffocation, ingestion, entanglement, and threatened reproduction) and aggregates contaminants through bioaccumulation. <sup>130</sup> From extraction, CO2 threatens all marine life with ocean acidification.
15	<p><b>15</b> LIFE ON LAND</p> 	Over 50% of all microplastics remain on land, and comprise nearly all (95%) of global annual plastic waste output. <sup>131</sup> While the number of studies about the impacts of plastics on soils is limited, there is emerging evidence that microplastics impact reproduction, growth, and mortality of earthworms. <sup>132,133</sup>
16	<p><b>16</b> PEACE, JUSTICE AND STRONG INSTITUTIONS</p> 	Differential exposure of vulnerable communities to health hazards due to plastics threatens strong institutions by undermining justice and promoting instability through protests and water insecurity.
17	<p><b>17</b> PARTNERSHIPS FOR THE GOALS</p> 	This problem presents an opportunity to create equitable and fair collaboration opportunities to address the problems posed by plastic pollution. For instance, some suggest that an international instrument that addresses the whole plastic cycle at the global scale may help mitigate the issue and strengthen the voices from impacted countries. <sup>134</sup>

129 Hamilton LA and Feit S, 'Plastic & Climate: The Hidden Costs of a Plastic Planet' (CIEL 2019) [www.ciel.org/plasticandclimate](http://www.ciel.org/plasticandclimate), accessed 18 November 2020.

130 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)

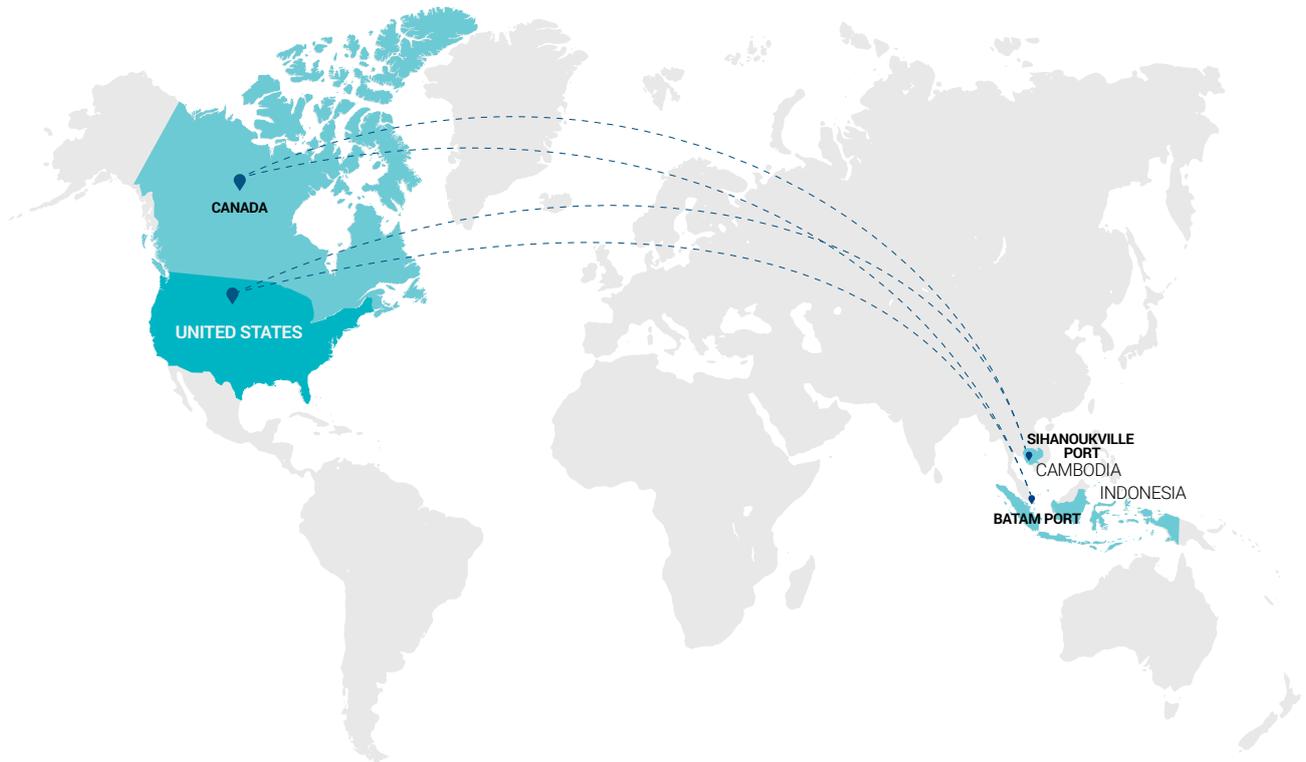
131 Jambeck JR and others, 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 768

132 Bläsing M and Amelung W, 'Plastics in Soil: Analytical Methods and Possible Sources' (2018) 612 Science of The Total Environment 422

133 Mai L and others, 'Microplastics in the Terrestrial Environment', Microplastic Contamination in Aquatic Environments (Elsevier 2018)

134 'Toward an International Legally Binding Agreement on Plastics and Plastic Pollution' (CIEL, 2017), <<https://sdgtoolkit.org/wp-content/uploads/2017/11/TOWARD-AN-INTERNATIONAL-LEGALLY-BINDING-AGREEMENT-ON-PLASTICS-AND-PLASTIC-POLLUTION-REFERENCES.pdf>>, accessed 8 April 2021.

## CASE STUDY - Canada/U.S.



STAGE	Waste/Disposal
Substances	Varied
COMMON USES	Varied
Actors	Canada, U.S.
Problem	Exporting plastic waste to other countries Petrochemicals are a major driver of oil and gas demand and are set to grow Single-use plastic bans without binding time-lines do nothing to solve a problem

June 10  
2019

Canadian Prime Minister Justin Trudeau announces a single-use plastic ban

"Canada aims to ban single-use plastics by 2021," National Geographic, June 11, 2019, <https://www.national-geographic.com/environment/2019/06/canada-single-use-plastics-ban-2021/>.

June 19  
2019

Canadian Prime Minister Justin Trudeau approves Transmountain pipeline expansion

"Canada's Trudeau Approves Controversial Pipeline Expansion," NPR, June 19, 2019, <https://www.npr.org/2019/06/19/733938077/canadas-trudeau-approves-controversial-pipeline-expansion>.

July 9  
2019

Indonesia returns containers full of diapers, plastic waste, etc to Australia, the U.S., France, Germany, and Hong Kong

"Indonesia returning 57 containers of developed world's waste," AP News, July 9, 2019, <https://apnews.com/article/d73dbac3f1e74eed-a6843d6f64e69aad>.

July 17  
2019

Cambodian officials announce return of 1600 tones of plastic trash back to U.S. and Canada. The 83 containers were labelled as recyclables, but full of trash.

Kann Vicheika, "Cambodia Rejects 1,600 Tons of Plastic Waste From US, Canada," VOA News, July 18, 2019, <https://www.voanews.com/east-asia-pacific/cambodia-rejects-1600-tons-plastic-waste-us-canada>.



Image by falco from Pixabay (Vietnam)

# IMPACTS OF PLASTICS TO VULNERABLE POPULATIONS



**EXTRACTION**  
Raw Materials

**PRODUCTION**  
Manufacturing

**USE**  
Market Penetration

**WASTE**  
Disposal & Incineration

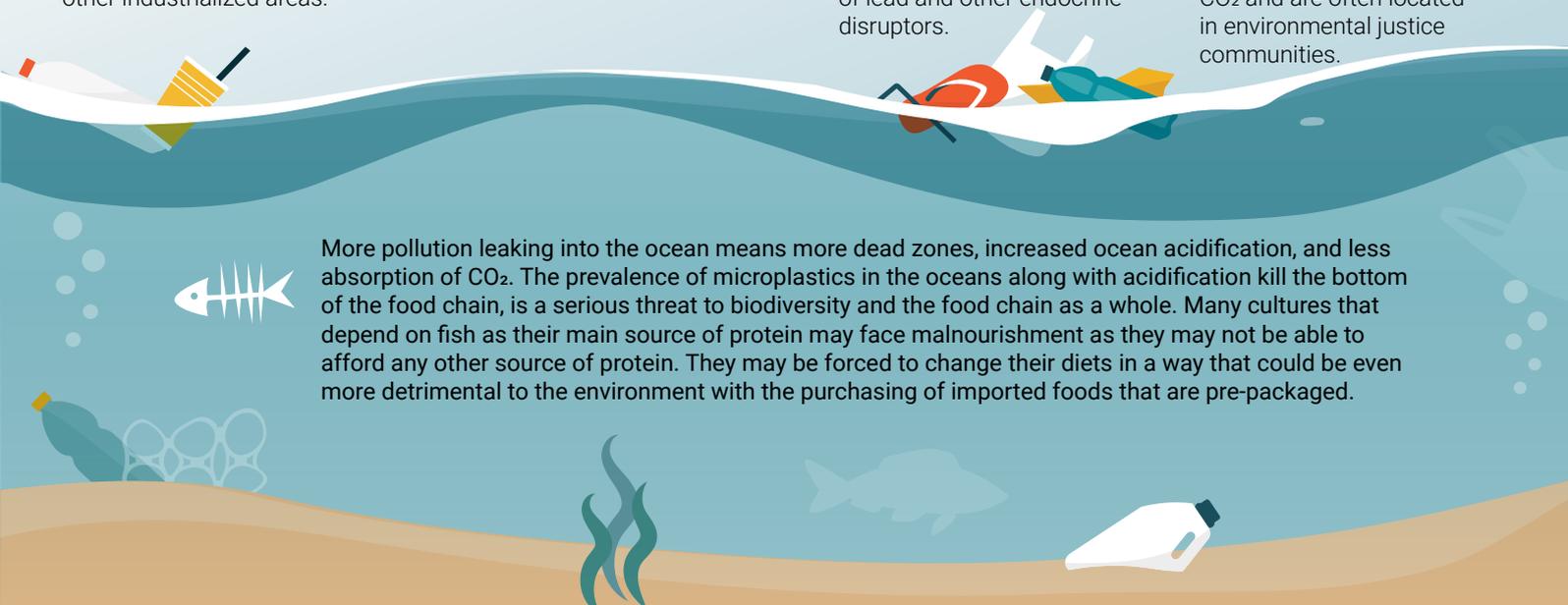


Drilling for oil and gas usually happens in or nearby environmental justice communities. A concrete example is Los Angeles, U.S., with the largest urban oil field in the nation. Low income families and people of color are often exposed to toxic emissions and spills. Environmental justice communities often live near oil shore drilling, as well as close to ports, refineries and other industrialized areas.

Crude oil and gas are refined in factories and refineries in environmental justice communities. Residents are exposed not only to toxic chemicals from production, but also to indirect source emissions from warehouses and heavy traffic from trucks. These facilities are often next to rivers and/or groundwater, which can get polluted and carry that pollution to the ocean.

Corporations are seen to spend marketing dollars to ensure maximum penetration in communities. Dollar stores are often located in lower-income communities where families feel they can get their money's worth, emphasizing their product's "value" and convenience. Most of that merchandise is very low quality and many times may also be toxic as it may contain high levels of lead and other endocrine disruptors.

The majority of plastics end up being thrown "away". Waste, even if discarded "properly", usually finds a way to the ocean. Landfills are located in areas in which low income families, and vulnerable communities live, exposing them to air, water and soil pollution. In many countries, it has become popular to burn the waste. Incinerators contribute to climate change by emitting CO<sub>2</sub> and are often located in environmental justice communities.



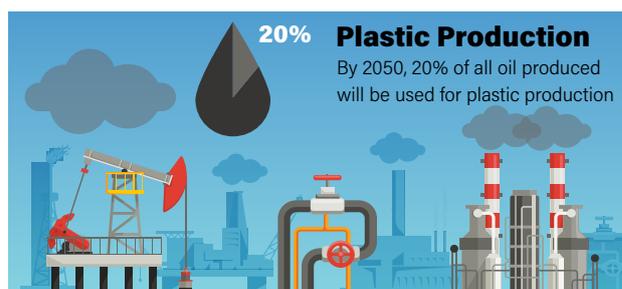
More pollution leaking into the ocean means more dead zones, increased ocean acidification, and less absorption of CO<sub>2</sub>. The prevalence of microplastics in the oceans along with acidification kill the bottom of the food chain, is a serious threat to biodiversity and the food chain as a whole. Many cultures that depend on fish as their main source of protein may face malnourishment as they may not be able to afford any other source of protein. They may be forced to change their diets in a way that could be even more detrimental to the environment with the purchasing of imported foods that are pre-packaged.

## Impacts of Plastic Production

### Plastics and GHG Emissions

Due to their lightweight quality and durability, plastics are often praised for their efficient transport, low carbon footprint, and sustainable reduction of greenhouse gas emissions.<sup>135</sup> However, when the full life cycle of plastics is considered, from production to end-of-life disposal, a more accurate picture of their global warming impacts emerges. The impacts of plastic production on climate change and greenhouse gas concentration in the environment includes the activities from oil extraction and refining, to transport and plastic production, to use and final disposal of waste.<sup>136</sup> Most plastics are made of fossil fuel hydrocarbons<sup>136</sup> so they inherently emit greenhouse gases during fossil fuel extraction. Plastic products also emit greenhouse gases through the transport of raw materials, pellets, plastics products, and even plastic waste, shipped across the planet on a massive and unprecedented scale.<sup>137</sup> Mismanaged or illegal dump sites can also contribute to greenhouse gas emissions as plastics release methane and ethylene when exposed to sunlight.<sup>138</sup>

Currently, the global plastic industry emits 400 million tons of greenhouse gases per year, more than the total carbon footprint of the United Kingdom of Great Britain and Northern Ireland.<sup>139</sup> This accounts for roughly 4% of global emissions,<sup>140</sup> exacerbating the processes of climate change, and creating air quality issues, such as urban smog and atmospheric pollution.<sup>141</sup> Polyethylene, the most discarded synthetic polymer, is used in shopping bags and is the highest emitter of methane, a powerful greenhouse gas, and ethylene, which reacts with OH (Hydroxide) in the atmosphere, increasing the concentrations of carbon monoxide.<sup>142</sup>



### Environmental Impacts of Oil Extraction and Oil Refineries

The production of plastics begins with fossil fuel extraction, including mining, fracking, and drilling of coal, oil, and gas.<sup>143</sup> As fossil fuels, especially oil, are the primary material from which plastic is made, the costs and trends in plastic production strongly rely on the availability, cost, and location of such materials.<sup>144</sup> The availability and accessibility of fossil fuels, especially fracking in the U.S. and coal mining in China, tend to drive the market prices and trends of plastic production.<sup>145</sup> In Global South countries with lax environmental regulations, such as South Sudan, oil exploration and extraction is destroying unique ecosystems and biodiversity.<sup>146</sup>

Destruction of habitat, contaminated run-off and waste, spills, and equipment malfunction plague indigenous and rural communities, and other affected stakeholders/general public, compromising local culture.<sup>147</sup> The contamination of soil and waterways, a common negative consequence from oil extraction, can be made worse in areas of weaker or even nonexistent environmental regulation, such as some areas in Ecuador, where large volumes of untreated effluents are discharged into the environment without much oversight.<sup>148</sup> By 2050, 20% of all oil produced will be used for plastic

- 135 PlasticsEurope, 'Plastics - the Facts 2016' (2016)  
136 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)  
137 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances e1700782  
138 Brooks AL, Wang S and Jambeck JR, 'The Chinese Import Ban and Its Impact on Global Plastic Waste Trade' (2018) 4 Science Advances eaat0131  
139 Royer S-J and others, 'Production of Methane and Ethylene from Plastic in the Environment' (2018) 13 PLOS ONE e0200574  
140 U.S. EPA, 'Global Greenhouse Gas Emissions Data' (U.S. EPA, 12 January 2016)  
<https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>, accessed 18 November 2020.  
141 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)  
142 Ibid.  
143 'Fossils, Plastics, & Petrochemical Feedstocks' (CIEL 2017)  
144 Ibid.  
145 'How Fracked Gas, Cheap Oil, and Unburnable Coal Are Driving the Plastics Boom' (CIEL 2017)  
146 Legge LEL and Zhibo L, 'The Environmental and Social Impacts of Oil Exploration and Production on Melut Basin of South Sudan' (2018) 8 International Journal of Scientific and Research Publications (IJSRP)  
147 Ibid.  
148 Ibid.

production.<sup>149</sup> With more than 40,000 oil fields on the planet,<sup>150</sup> problems related to plastic pollution extend far beyond global plastic dependency, and end of life cycle disposal issues, including the petroleum extraction processes, transport of raw materials, and industrial production.<sup>151</sup> Labor groups in Louisiana, U.S. have raised concerns about dangerous working environments in oil refineries.<sup>152</sup> Chemical spills and benzene gas leaks have coincided with increased asthma issues, especially in vulnerable communities that surround some of the largest refineries in the state.<sup>153</sup> In these neighborhoods, especially Standard Heights in Baton Rouge, adjacent to an Exxon Mobil refinery, the child poverty rate is 45%.<sup>154</sup> Issues related to the plastic industry have permeated into vulnerable communities' water supply, air pollution issues, and labor injustices.<sup>155</sup>

## Impacts on Indigenous Peoples

Oil exploration and drilling fields have caused severe impacts on indigenous peoples around the world who rely on the health of their natural environment to survive.<sup>156</sup> Deforestation related to road construction to support oil drilling in the Amazon basin impacts indigenous groups that depend on the local natural resources, biodiversity, and clean air.<sup>157</sup> These impacts include health and wellness challenges, toxic exposure, and dangerous conditions for local workers.<sup>158</sup> Oil exploration has also contributed to land take from indigenous groups for the purpose of establishing well fields, often preying on the disproportionate vulnerability these populations experience with respect to legal action and land

tenure due to historic exclusion from decision-making spaces.<sup>159</sup> Incursions into indigenous lands are common and have been recorded in more than 20 communities in at least 10 countries including the United States (U.S.), Australia, Bolivia (Plurinational state of), Brazil, Myanmar, Colombia, Ecuador, Indonesia, Nigeria, and Peru.<sup>160</sup> Through the installation of extraction structures, such operations affect the landscape aesthetic, of tremendous traditional value to indigenous communities whose sense of place is deeply tied to the landscape.<sup>161</sup> The social aesthetic is also impacted as the visible presence of these populations is effaced.<sup>162</sup>

## Impacts on Women

In addition to the risks to fetuses associated with plastics, usage of these materials disproportionately impacts women worldwide. The burden of household responsibilities tends to fall to women, and as plastics have become more prevalent in our daily lives, so too has women's exposure to their various toxic additives.<sup>163</sup> A 2019 study found that women in Mexico with diabetes had higher levels of Bisphenol-A (BPA) in their urine compared to their non-diabetic counterparts, and that exposure levels were higher for older women.<sup>164</sup> Dioxins, associated with the burning of plastic wastes (a common fire-starting practice in many Global South countries), are extremely carcinogenic and have a particularly negative impact on women.<sup>165</sup> In the case of both dioxins and BPA, such plastic additives are released at high temperatures, increasing the likelihood of exposure to these materials in hot climates.<sup>166</sup>

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- 149 'How Fracked Gas, Cheap Oil, and Unburnable Coal Are Driving the Plastics Boom' (CIEL 2017)
- 150 O'Rourke D and Connolly S, 'Just Oil? The Distribution of Environmental and Social Impacts of Oil Production and Consumption' (2003) 28 Annual Review of Environment and Resources 587
- 151 Ibid.
- 152 Fleischman L and Franklin M, 'Fumes Across the Fence-Line' (NAACP & Clean Air Task Force 2017)
- 153 Ibid.
- 154 Ibid.
- 155 Ibid.
- 156 O'Rourke D and Connolly S, 'Just Oil? The Distribution of Environmental and Social Impacts of Oil Production and Consumption' (2003) 28 Annual Review of Environment and Resources 587
- 157 Ibid.
- 158 Osofsky HM, 'Learning from Environmental Justice: A New Model for International Environmental Rights' (2005) 24 Stanford Environmental Law Journal 71
- 159 O'Rourke D and Connolly S, 'Just Oil? The Distribution of Environmental and Social Impacts of Oil Production and Consumption' (2003) 28 Annual Review of Environment and Resources 587
- 160 Lu GMM, 'The Corrientes River Case: Indigenous People's Mobilization in Response to Oil Development in the Peruvian Amazon' (Thesis, University of Oregon 2009)
- 161 Bellamy BR, O'Driscoll M and Simpson M, 'Introduction: Toward a Theory of Resource Aesthetics' (2016) 26 Postmodern Culture
- 162 Lakhani M, 'Wasting Women—The Biopolitics of Waste and Women' [2007] Agenda: Empowering Women for Gender Equity 93
- 163 Murphy L and others, 'Exposure to Bisphenol A and Diabetes Risk in Mexican Women' (2019) 26 Environmental Science and Pollution Research 26332
- 164 Lakhani M, 'Wasting Women—The Biopolitics of Waste and Women' [2007] Agenda: Empowering Women for Gender Equity 93
- 165 Murphy L and others, 'Exposure to Bisphenol A and Diabetes Risk in Mexican Women' (2019) 26 Environmental Science and Pollution Research 26332
- 166 Liao K-W and others, 'Increased Risk of Phthalates Exposure for Recurrent Pregnancy Loss in Reproductive-Aged Women' (2018) 241 Environmental Pollution 969

Phthalates, which are often used as plasticizers, have been found at higher levels in women than in men.<sup>167</sup> These plasticizers are common in cosmetic products and have been found in 86% of feminine care products tested in China, including in the outer layers of sanitary napkins.<sup>168</sup> Phthalates can also increase the risk of recurrent pregnancy loss.<sup>169</sup> Such pregnancy losses, or birth defects in pregnancies carried to term, can lead to social consequences for mothers who may be blamed or abused for these negative outcomes.<sup>170</sup> Most recently, microplastics have been detected in human placentas.<sup>171</sup> Unfortunately, the risks of plastic usage are often poorly communicated, particularly to women,<sup>172</sup> and feminine health professionals do not routinely screen patients for such exposure despite the disproportionate risks they face.

## Impacts of Fracking

In regions where fracking is used as a method to extract shale gas, such as Pennsylvania, U.S., and many other regions of the world, surface and well waters are continually contaminated with the hundreds of chemicals used in fracking fluids and petrochemical run-off and spills.<sup>173</sup> Fracking fluids and waste-water contain salts, heavy metals, and radioactive chemicals, posing an inherent risk for groundwater contamination.<sup>174</sup> Wells associated with fracking operations also pose dangers to rural, under-developed regions reliant on agricultural productivity, where clean water is a crucial resource.<sup>175</sup> High levels of methane and ethane have been detected in wells that supply residential drinking water within one



Fracking rig in Southwest Pennsylvania. Photo by Ted Auch, a FracTracker Alliance staff member, in 2016.

kilometer of shale gas extraction operations.<sup>176</sup> Not only does oil pollution contaminate drinking water, but also agricultural water supplies for livestock and irrigation.<sup>177</sup> This has been found to be particularly detrimental in the Melut Basin of South Sudan, where oil exploration and extraction is destroying unique ecosystems.<sup>178</sup>

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- 167 Gao C-J and others, 'Feminine Hygiene Products—A Neglected Source of Phthalate Exposure in Women' (2020) 54 *Environmental Science & Technology* 930
- 168 Liao K-W and others, 'Increased Risk of Phthalates Exposure for Recurrent Pregnancy Loss in Reproductive-Aged Women' (2018) 241 *Environmental Pollution* 969
- 169 Ibid.
- 170 Lakhani M, 'Wasting Women—The Biopolitics of Waste and Women' [2007] *Agenda: Empowering Women for Gender Equity* 93
- 171 Ragusa A and others, 'Plasticenta: First Evidence of Microplastics in Human Placenta' (2021) 146 *Environment International* 106274
- 172 Lakhani M, 'Wasting Women—The Biopolitics of Waste and Women' [2007] *Agenda: Empowering Women for Gender Equity* 93
- 173 Jackson RB and others, 'The Environmental Costs and Benefits of Fracking' (2014) 39 *Annual Review of Environment and Resources* 327
- 174 Ibid.
- 175 Ibid.
- 176 Ibid.
- 177 Legge LEL and Zhibo L, 'The Environmental and Social Impacts of Oil Exploration and Production on Melut Basin of South Sudan' (2018) 8 *International Journal of Scientific and Research Publications (IJSRP)*
- 178 O'Rourke D and Connolly S, 'Just Oil? The Distribution of Environmental and Social Impacts of Oil Production and Consumption' (2003) 28 *Annual Review of Environment and Resources* 587

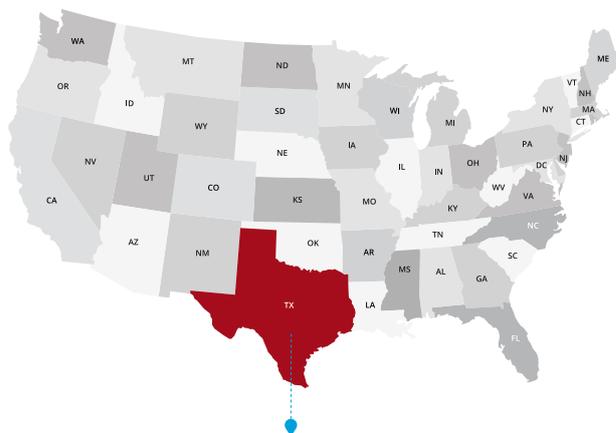
## Fenceline Communities

Once extracted, petroleum products must be transported to refineries, where they undergo a “cracking” process for purification.<sup>179</sup> Refineries emit several types of toxic chemicals, including benzene, formaldehyde, hydrogen sulfide, sulfur dioxide, and sulfuric acid.<sup>180</sup> Oil production companies are permitted to release these chemicals to the environment up to a certain level, but accidental spills and leaks often exceed the allowable volumes.<sup>181</sup> This toxic contamination puts nearby communities at high risk of environmental health problems.<sup>182</sup> As noted in *Fumes Across the Fenceline*, low-cost technology and practices are available that would reduce harmful emissions and improve air quality, and therefore public health.<sup>183</sup>

Refineries and other chemical releasing facilities are predominantly surrounded by minority populations.<sup>184</sup> Communities located in close proximity to such facilities, often along the edges of chain-link fences, and exposed to various kinds of toxic pollution, are known as fenceline communities. *Fenceline communities*<sup>185</sup> in the U.S. are disproportionately composed of African Americans, Latinos, and low-income groups, and generally have lower access to healthy food options.<sup>186</sup>

The highest concentration of U.S. oil refineries occurs in the Gulf of Mexico, with one of the most notable fenceline communities located outside Houston, Texas, where three quarters of the city’s residents live within three miles of the 191 hazardous chemical facilities.<sup>187</sup> These areas are known to be at higher risk for heart disease, cancer, and respiratory problems related to poor air quality, such as asthma and emphysema.<sup>188</sup> The combination of lack of access to healthy food, high poverty rates, and increased exposure to deadly contaminants makes for a serious problem in fenceline vulnerable communities, especially African Americans.<sup>189</sup> Fenceline communities can be found in many countries.

## CASE STUDY - South Gulf Coast, U.S



<b>LOCATION</b>	Point Comfort
<b>STAGE</b>	Extraction/Refining
<b>SUBSTANCES</b>	Resins for plastics: high density polyethylene, low density polyethylene, polypropylene, and polyvinyl chloride (PVC)
<b>ACTORS</b>	Formosa Plastics, Texas Commission on Environmental Quality, U.S. EPA
<b>PROBLEM</b>	Chronic lack of enforcement enabled a commercial enterprise to evade compliance with any environmental laws Nurdles (plastic pellets) have been released in an ongoing manner into local waters, contaminating marine wildlife

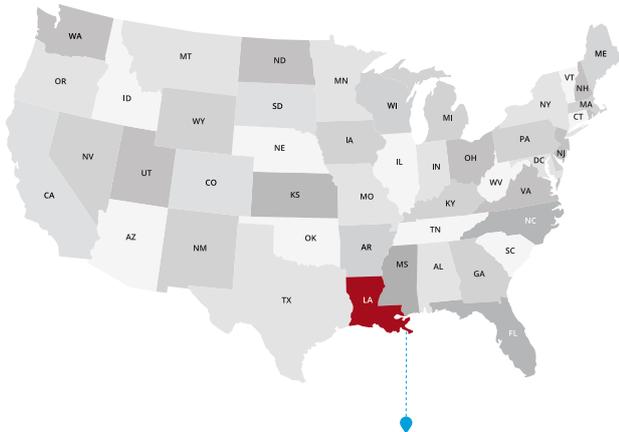


U.S. Department of Justice, “Formosa Plastics Corp., TX, and Formosa Plastics Corp., LA, will spend more than \$10 million on pollution controls to address air, water, and hazardous waste violations at two petrochemical plants in Point Comfort, TX, and Baton Rouge, LA.”, September 29, 2009.

Houston Chronicle, “Judge Finds Formosa Liable for Plastic Pollution at Texas Plant - HoustonChronicle.Com,” accessed August 1, 2019, <https://www.houstonchronicle.com/business/energy/article/Judge-finds-Formosa-liable-for-plastic-pollution-14060091.php#photo-17775737>

179 O’roure and Connolly, “JUST OIL? THE DISTRIBUTION OF ENVIRONMENTAL AND SOCIAL IMPACTS OF OIL PRODUCTION AND CONSUMPTION.”  
 180 ‘Analysis of Refinery Chemical Emissions and Health Effects’ (California Office of Environmental Health Hazard Assessment 2019)  
 181 Fleischman L and Franklin M, ‘Fumes Across the Fence-Line’ (NAACP & Clean Air Task Force 2017)  
 182 ‘Analysis of Refinery Chemical Emissions and Health Effects’ (California Office of Environmental Health Hazard Assessment 2019)  
 183 Fleischman L and Franklin M, ‘Fumes Across the Fence-Line’ (NAACP & Clean Air Task Force 2017)  
 184 White R, ‘Life at the Fenceline; Understanding Cumulative Health Hazards in Environmental Justice Communities’ (Environmental Justice Health Alliance for Chemical Policy Reform 2018)  
 185 Ibid.  
 186 Ibid.  
 187 Ibid.  
 188 Williams M and others, ‘No Time to Waste: Tackling the Plastic Pollution Crisis Before It’s Too Late’ (Tearfund 2019) 23  
 189 White R, ‘Life at the Fenceline; Understanding Cumulative Health Hazards in Environmental Justice Communities’ (Environmental Justice Health Alliance for Chemical Policy Reform 2018)

## CASE STUDY - Louisiana



<b>LOCATION</b>	Reserve, Louisiana
<b>STAGE</b>	Production
<b>SUBSTANCES</b>	Chloroprene
<b>COMMON USES</b>	Neoprene, wetsuits, etc.
<b>ACTORS</b>	DuPont/Denka
<b>PROBLEM</b>	Impact to health of local residents Risk of cancer is 50 times the national average—the highest in the U.S. Only chloroprene manufacturing plant in the United States
<b>SDG</b>	Goal 3 - Good Health and Well-being
<b>OTHER ISSUES</b>	Regulatory capture



Rebecca Hersher, "After Decades of Air Pollution, A Louisiana Town Rebels Against A Chemical Giant," NPR, March 6, 2018, <https://www.npr.org/sections/health-shots/2018/03/06/583973428/after-decades-of-air-pollution-a-louisiana-town-rebels-against-a-chemical-giant>.

Oliver Laughland, "School at centre of Guardian's Cancer Town series may move students due to air pollution," The Guardian, August, 24, 2019, <https://www.theguardian.com/us-news/2019/aug/24/reserve-louisiana-elementary-school-air-pollution>.

## Impacts of Plastic Usage

### Types of Plastics and Plastic Products

The first global study of all mass-produced plastics, conducted in 2017, provided a comprehensive material flow for plastics, including polymer resins, synthetic fibers, and additives.<sup>190</sup> In 2015, 407 million metric tons of primary plastics were produced to support various industrial sectors.<sup>191</sup> The accumulated amount of fibers, resins, and plasticizers produced from 1950 and 2015 was 8.3 billion metric tons, with roughly 28% of resins and 68% of fibers produced in China.<sup>192</sup>

Market Sector	2015 Primary Production (Million Metric Tons)
Packaging	146 (35.9%)
Building and Construction	65 (15.97%)
Textiles	59 (14.5%)
Other	47 (11.5%)
Consumer & Institutional Products	42 (10.3%)
Transportation	27 (6.6%)
Electrical/ Electronic	18 (4.4%)
Industrial Machinery	3 (0.7%)
<b>Total</b>	<b>407 (100%)</b>

Although there are many kinds of plastic, the five "standard plastics" constitute approximately 85% of world plastic consumption by weight (% of global demand).<sup>193</sup>

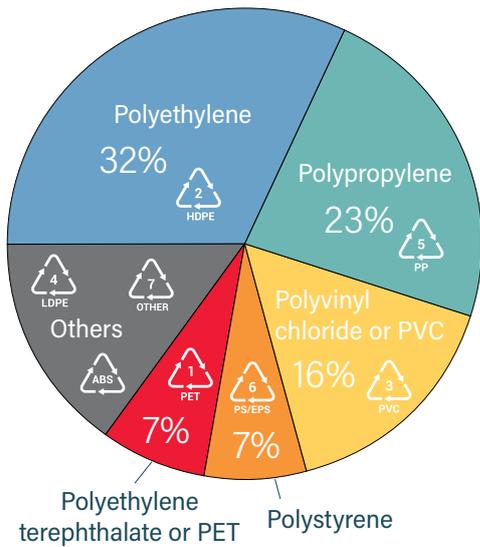
190 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances e1700782

191 Ibid.

192 Ibid.

193 'How Fracked Gas, Cheap Oil, and Unburnable Coal Are Driving the Plastics Boom' (CIEL 2017)

## Global Plastic Consumption



## Transportation and Export of Plastic Products

Perhaps two of the greatest challenges to managing plastic waste are the difficulty in conducting a life cycle assessment due to the diversity of their chemical composition,<sup>194</sup> and the near impossibility of tracking a plastic product from raw material extraction to manufacturing, use, and disposal.<sup>195</sup> Indeed, sources of information related to the emissions generated from the transportation and export of plastic products on the global market were difficult to find during this research. This is an important area of work that must be undertaken to develop more effective interventions. In 2021, UNEP published a lifecycle assessment of single use-plastics which summarises government actions to address single-use plastic products pollution and assesses the full life-cycle environmental impacts of single-use plastic products in comparison with their alternatives.<sup>196</sup> Furthermore, while several international agreements like the Basel Convention (discussed in more detail later in this report) incorporate prior informed consent protocols that should track the export of plastic products and waste,<sup>197</sup> these protocols are often not followed,<sup>198</sup> especially when the recipient country is less economically developed. Global trade and export in waste consistently undermines the proximity and self-sufficiency principles, instead allowing countries to export the burden of processing waste to other countries.<sup>199</sup> In addition, it is also an issue for waste-importing countries i.e. it becomes a burden when a receiving country lacks the necessary facilities and associated mechanisms to manage disposal. Such situations further complicate life cycle assessments for the modern plastics market.

PLASTIC RESIN CODES		
	<b>PET(E)</b> Polyethylene Terephthalate	Water and soft drink bottles, salad domes, biscuit trays, salad dressing and peanut butter containers.
	<b>HDPE</b> High-density polyethylene	Milk bottles, freezer bags, dip tubs, crinkly shopping bags, ice cream containers, juice bottles, shampoo chemical and detergent bottles.
	<b>PVC</b> Polyvinyl chloride	Cosmetic containers, commercial cling wrap, flooring, window frames, plumbing pipes.
	<b>HDPE</b> Low-density polyethylene	Squeeze bottles, cling wrap, shrink wrap, rubbish bags.
	<b>PP</b> Polypropylene	Microwave dishes, ice cream tubs, potato chip bags and dip tubs.
	<b>PS/EPS</b> Polystyrene	PS - CD cases, water station cups, plastic cutlery, imitation "crystal glassware," video cases. EPS - Foamed polystyrene hot drink cups, foamed meat trays, protective packaging for fragile items.
	<b>OTHER</b> All other plastics	Bioplastics, baby milk bottles, reusable bottles.
	<b>ABS</b> Acrylonitrile butadiene styrene	Appliances, toys, computer plastics.
	<b>PA</b> Polyamide	Nylon socks, stockings, rope.

194 Liboiron M, 'Redefining Pollution: Plastics in the Wild' (Thesis, New York University 2012)  
 195 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)  
 196 United Nations Environment Programme, 'Addressing Single-use Plastic Products Pollution Using a Life Cycle Approach,' (2021), accessed 8 April 2021, < [https://www.lifecycleinitiative.org/wp-content/uploads/2021/02/Addressing-SUP-Products-using-LCA\\_UNEP-2021\\_FINAL-Report-sml.pdf](https://www.lifecycleinitiative.org/wp-content/uploads/2021/02/Addressing-SUP-Products-using-LCA_UNEP-2021_FINAL-Report-sml.pdf)>, accessed 8 April 2021.  
 197 Secretariat of the Basel Convention, 'Controlling Transboundary Movements of Hazardous Wastes' (2011) <http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/leaflets/leaflet-control-procedures-en.pdf>, accessed 18 November 2020.  
 198 Raubenheimer K and McIlgorm A, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 Marine Policy 285  
 199 Skroback A, 'Even a Sacred Cow Must Live in a Green Pasture: The Proximity Principle, Free Movement of Goods, and Regulation 259/93 on Transfrontier Waste Shipments Within the EC' (1994) 17 Boston College International and Comparative Law Review 85



Wikimedia Commons, Convenience store in India, January 19, 2019

## Impacts of Single-Use Plastics

Much of the conversation surrounding environmental justice in the context of plastics focuses on exposure to toxic fumes and materials during production and disposal. However, the distribution of and access to plastic products also have severe environmental justice implications. This is of particular significance in crafting interventions. Plastic packaging can provide greater access to food in affordable portions, where buying full size, unpackaged alternatives may be a financial burden.<sup>200</sup> However, in many countries in the Global South, these affordable portions are often packaged in single-use sachets or films that are not recyclable.<sup>201</sup> Sachets are particularly impactful, as they often consist of multi-laminate materials that are not cost effective to recycle. Additionally,

sachets are small and lightweight so they can easily be lost to the environment if not properly disposed of or contained. Sachets are hugely popular in some of the areas facing the greatest solid waste management challenges, accounting for as much as 95% of industry sales in India and South East Asian countries.<sup>202</sup>

In communities in Iran, single-use plastic plates are common and sometimes essential to family and community gatherings, where the costs of using water, detergent, and time to clean reusable plates would be prohibitive.<sup>203</sup> It is also important to consider, when crafting policies like product specific bans, the potential economic and social impacts. For example, Kenya's plastic bag ban in 2017 provided for exemptions for larger producers of baked goods

200 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)

201 Ibid.

202 Ibid.

203 Jahani A and others, 'Iranian Experiences in Terms of Consumption of Disposable Single- Use Plastics: Introduction to Theoretical Variables for Developing Environmental Health Promotion Efforts' (2019) 65 Environmental Toxicology and Pharmacology 18

in the industrial zones and large cities, while bakers in small towns were no longer allowed to wrap their products in plastics.<sup>204</sup>

This led to friction, especially as people previously working in plastics manufacturing facilities saw their livelihoods threatened.<sup>205</sup> Even when directly confronted with the livelihood impacts of livestock death due to plastic consumption, people must make a difficult judgement on whether the benefits of single use plastic outweigh its costs, and when the decision is made for them without consultation, this may result in friction.<sup>206</sup>

## Health Impacts of Plastic Usage

In 2018, “chemicals used in plastic, like bisphenol A, were linked to cancer, endocrine disruption, and adverse developmental consequences in children.”<sup>207</sup> Likewise, phthalates, known as “plasticizers”, used to make plastics flexible, were classified as endocrine disrupting chemicals and linked to disorders in children and even in fetuses.<sup>208</sup>

People must make a difficult judgement on whether the benefits of plastic use outweigh its costs, and when the decision is made for them without consultation, this can result in friction.

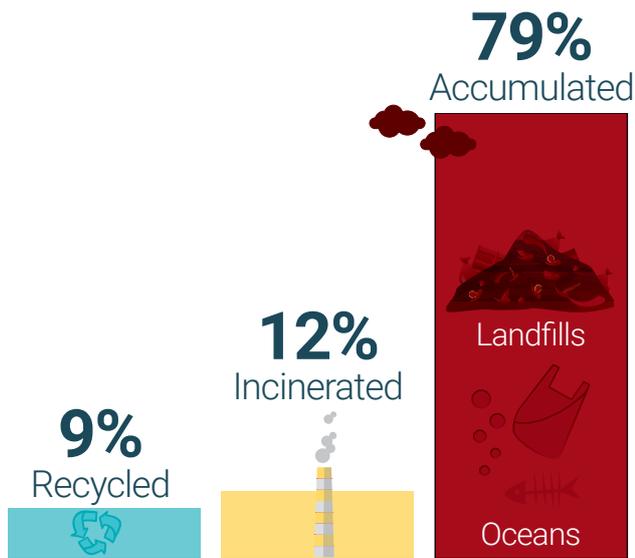
The same year, plastics degrading due to sunlight exposure was revealed as source of greenhouse gases.<sup>209</sup> Not much is currently known about the specific impacts of the use of plastic products to human health,<sup>210</sup> but the migration of chemicals from food packaging is likely the main source of plastic ingestion for humans.<sup>211</sup> A large number of compounds, natural and man-made, can act as endocrine disruptors, interfering with the body's systems, potentially causing reproductive and neurological issues and negatively impacting the immune systems of humans and wildlife.<sup>212</sup> Endocrine disruptors can mimic hormones and take their place in the human system, triggering abnormal processes in the body. They can affect sperm quality and fertility, lead to early puberty, and cause cancer, heart disease, or obesity.<sup>213</sup>

A notorious example of such a substance is Bisphenol-A (BPA), which is widely used as a monomer in polymers including polycarbonate and epoxy resins, and thermal paper.

The United States Environmental Protection Agency (EPA) banned the use of BPA from baby bottles and sippy cups in 2012, and its use as a coating in packaging for infant formula in 2013.<sup>214</sup> In 2015, BPA was added to the list of chemicals known to cause cancer or reproductive harm under proposition 65, which requires businesses to disclose exposures to these chemicals, and define procedures for adding chemicals to the list.<sup>215</sup> More recently, in September of 2019, the General Court of the European Union classified BPA as a substance toxic to reproduction.<sup>216</sup>

- 204 Njuguna JK, 'The Efficacy of the Ban on Use of Plastic Bags in Kenya' (2018) 2 Journal of Conflict Management and Sustainable Development <http://journalofcmsd.net/the-efficacy-of-the-ban-on-use-of-plastic-bags-in-kenya/>, accessed 18 November 2020.
- 205 Vince J and Hardesty BD, 'Governance Solutions to the Tragedy of the Commons That Marine Plastics Have Become' (2018) 5 Frontiers in Marine Science
- 206 Ibid.
- 207 Campisi J, 'Trudeau Announces Canadian Ban of Single-Use Plastics as Early as 2021' (TheHill, 10 June 2019) <https://thehill.com/policy/international/447716-trudeau-announces-canadian-ban-of-single-use-plastics-as-early-as-2021>, accessed 18 November 2020.
- 208 Tsatsakis AM and others, 'Phthalates: Exposure and Health Effects' [2019] Encyclopedia of Environmental Health 163
- 209 Royer S-J and others, 'Production of Methane and Ethylene from Plastic in the Environment' (2018) 13 PLOS ONE e0200574
- 210 Wright SL and Kelly FJ, 'Plastic and Human Health: A Micro Issue?' (2017) 51 Environmental Science and Technology 6634
- 211 Grob K and others, 'Food Contamination with Organic Materials in Perspective: Packaging Materials as the Largest and Least Controlled Source? A View Focusing on the European Situation' (2006) 46 Critical Reviews in Food Science and Nutrition 529
- 212 National Institute of Environmental Health Sciences, 'Endocrine Disruptors' <https://www.niehs.nih.gov/health/topics/agents/endocrine/index.cfm>, accessed 18 November 2020.
- 213 'Bisphenol A (BPA) and Proposition 65: Frequently Asked Questions' (Proposition 65 Warnings) <https://www.p65warnings.ca.gov/fact-sheets/bisphenol-bpa-and-proposition-65-frequently-asked-questions>, accessed 18 November 2020.
- 214 National Institute of Environmental Health Sciences, 'Endocrine Disruptors' <https://www.niehs.nih.gov/health/topics/agents/endocrine/index.cfm>, accessed 18 November 2020.
- 215 'Bisphenol A (BPA) and Proposition 65: Frequently Asked Questions' (Proposition 65 Warnings) <https://www.p65warnings.ca.gov/fact-sheets/bisphenol-bpa-and-proposition-65-frequently-asked-questions>, accessed 18 November 2020.
- 216 T-636/17 - PlasticsEurope v European Chemicals Agency (2018)

## Global Plastic Waste Estimates



U.S. Department of Justice, "Formosa Plastics Corp., TX, and Formosa Plastics Corp., LA, will spend more than \$10 million on pollution controls to address air, water, and hazardous waste violations at two petrochemical plants in Point Comfort, TX, and Baton Rouge, LA.", September 29, 2009.

However, despite these policies and restrictions, BPA is still widely used and can be found in food cans, plastic bottles, plastic toys, flooring, furniture, construction materials, curtains, footwear, leather products, paper and cardboard products, electronic equipment, and thermal paper.<sup>217</sup> Furthermore, not much is known about the impacts of BPA substitutes in human health, and much more research is urgently needed.<sup>218</sup>

## Impacts of Plastic Waste

Once discarded, plastic can have several fates, each with its own implications for the communities burdened with the waste in its various forms. In the often considered "ideal" scenario, plastics are recycled – broken down into their original constituents and used to form new plastic products. In this ideal scenario, the demand for raw materials and need to manage plastics waste is minimized.

However, in its current state, recycling does not prevent disposal; it merely delays it<sup>219</sup>. It is difficult to quantify the extent to which recycling is actually alleviating pressure for primary plastic production, especially given that only about 9% of plastics produced since 1950 has been recycled at all.<sup>220</sup> Recycling efforts should be carried out alongside ongoing discourse surrounding the issue of plastics production, consumption, and waste management.

## Recycling / Wishcycling

Consumers are often engaged in aspirational recycling<sup>221</sup> or "wishcycling."<sup>222</sup> As most communities have adopted single stream recycling, items are discarded with little thought of proper pre-processing or of what is actually recyclable. This places a greater burden on recycling facilities to sort wastes and determine which items have value, a labor-intensive and often cost-ineffective and hazardous activity for many plants around the world. The excess is then shipped off to countries like Malaysia, Thailand, and Indonesia, where waste pickers attempt to sort out items which may be recyclable among the waste.<sup>223</sup> These potential recyclables are often dumped on low-income, already marginalized communities, where low pay and hazardous working conditions may still appeal to individuals needing to support themselves and their families.<sup>224,225</sup>

This line of work can either be readily accepted by communities, leading to the development of unions and partnerships to attempt to safeguard workers against the hazards of their job, as in Pune, India,<sup>226</sup> or can be vilified by community members who view the work as "unclean" and degrading. The latter was the case in the Yucatan Peninsula, Mexico, when a group of women chose to take on the task being overlooked by municipal governments of sorting and managing waste.<sup>227</sup> Over time, the taboo has subsided slightly, but waste picking remains the work of disenfranchised individuals and communities,

217 United States Food and Drug Administration, 'No Bisphenol A (BPA): Use in Food Contact Application' (2018) <https://www.fda.gov/food/food-additives-petitions/bisphenol-bpa-use-food-contact-application>, accessed 18 November 2020.

218 Wright SL and Kelly FJ, 'Plastic and Human Health: A Micro Issue?' (2017) 51 Environmental Science and Technology 6634

219 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances e1700782

220 Ibid.

221 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)

222 Econie A and Dougherty ML, 'Contingent Work in the US Recycling Industry: Permatemps and Precarious Green Jobs' (2019) 99 Geoforum 132

223 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)

224 Ibid.

225 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)

226 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)

227 Hanson A-M, 'Women's Environmental Health Activism around Waste and Plastic Pollution in the Coastal Wetlands of Yucatán' (2017) 25 Gender & Development 221

forcing these individuals to bear a burden disproportionate to their responsibility in the crisis.

Waste pickers have come to play a pivotal part in our global recycling process, but it is a role that does not often receive government support. This has led to the blossoming of a relatively unregulated field, exposing individuals to great hazard from the accumulation of rubbish in their neighborhoods.<sup>228</sup> This disposal chain has made it difficult to trace the exact fate of recycled plastics, as they may end up at a licensed recycling center, where they may be melted down and pelletized again to form new products, or at illegal dump sites and informal recycling facilities.

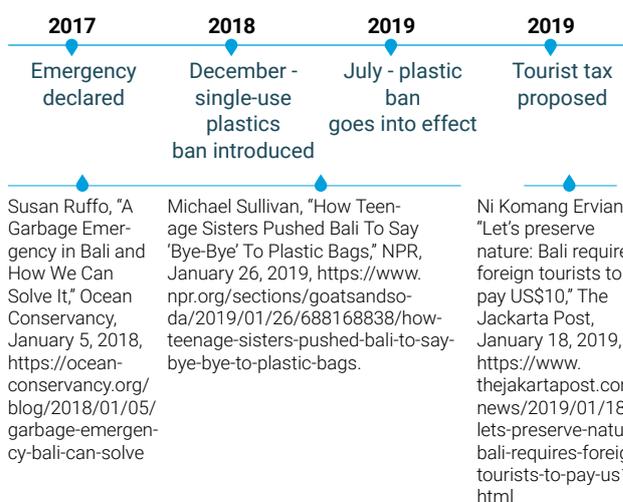


Furthermore, all plastic products that cannot be or simply are not recycled are relegated to break down in unprotected conditions, leaching toxins into soils and water, and potentially washing away in heavy rains.<sup>229</sup> Mismanaged or illegal dump sites can contribute to greenhouse gas emissions as plastics release methane and ethylene when exposed to sunlight,<sup>230</sup> and provide habitat for disease-carrying pests to proliferate.<sup>231</sup> Around the world, incineration is a common “solution” applied to prevent waste from piling up, but it is often done without the proper technology to remove toxic chemicals from raining back down on the communities around these facilities.<sup>232</sup>

## CASE STUDY - Bali



<b>STAGE</b>	Waste
<b>SUBSTANCES</b>	All types of plastic
<b>COMMON USES</b>	Water bottles, wrappers, straws
<b>ACTORS</b>	Tourists, neighboring countries
<b>PROBLEM</b>	Plastic pollution washing up on beaches, threatening tourism
<b>SDG</b>	Goal 11 - Sustainable Cities and Communities Goal 12 - Responsible Consumption and Production
<b>RECENT HISTORY AND IMPACTS</b>	Plastic pollution in the form of plastic bottles, shopping bags, and styrofoam cups has been inundating the beaches of Bali and threatening the tourism industry. In 2017, the island’s government declared a 3.6 mile long emergency zone along the beach, as workers were removing up to 100 tons of junk per day as part of beach cleanup. In order to curb plastic pollution, in December 2018, Bali passed a ban on single-use plastic items with the goal of reducing plastic pollution by 70% within a year. After a six month transition period, the ban went into effect in July 2019. Additionally, in January 2019, the government introduced a proposal for a \$10 tourist tax to help address the plastic pollution.



228 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)  
 229 Ibid.  
 230 Royer S-J and others, 'Production of Methane and Ethylene from Plastic in the Environment' (2018) 13 PLOS ONE e0200574  
 231 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)  
 232 Ibid.

## Incineration

It is estimated that 12% of plastics produced since the 1950s have been incinerated,<sup>233</sup> just slightly outpacing recycling. This practice is far more prevalent in countries in the Global South where centralized solid waste management systems are less common, and individuals must tend to their own waste.<sup>234</sup>

Incineration results in the disruption of the plastic's structure, releasing additives such as black carbon, dioxin, and other volatilized compounds,<sup>235</sup> increasing the risk of premature mortality related to respiratory issues, and may cause damage to organ systems.<sup>236</sup> Furthermore, during incineration, persistent organic pollutants (POPs), such as dioxins and furans, are released into the environment and can disperse over large regions.<sup>237</sup> Dioxins and furans are found mostly in incinerator fly ash, which is expensive to manage properly (it is hazardous waste).<sup>238</sup> As a result, plastic waste incineration has resulted in disproportionately dangerous impacts in Global South countries and communities where authorities/incinerator operators are not prepared/able to commit enough financial resources to minimize harm from ashes.

In Tortuguero, Costa Rica, a prominent eco-tourism destination, a malfunctioning incinerator, located in the center of the local community, led a local health clinic director to file a complaint with the municipal tribunal over concerns of community members being exposed to respiratory and other ailments by the ash billowing out from the stack.<sup>239</sup> The resulting audit revealed that tourist lodges were responsible for the majority of the wastes being sent to the incinerator, despite less than 20% of the lodges using this

disposal site, and contributed the greatest amount of inorganic waste (particularly plastics), while waste from the local community consisted principally of organic material.

The incinerator's placement in the center of the village, far from the lodges, was forcing community members to bear the burden of the wastes generated by the growing tourism industry. In Kenya, plastic wastes are deposited at a dumpsite and burned in the open.<sup>240</sup> In many communities, families burn their wastes in their backyards.<sup>241</sup>

## Landfill, Dumped, and Littered in the Environment

If plastic products are not removed from circulation through recycling or incineration (which together account for about only 21% of the fate of plastics), they accumulate in landfills, dumps, or in the natural environment.<sup>242</sup> It is this fate which has led to the marine plastics crisis, as large volumes of plastic waste washes into the ocean, impacting the marine food web, becoming trapped in its circulation, washing on beaches, or sinking to the deep and into the ocean floor.<sup>243</sup> On its way to these marine and coastal destinations, plastics breed myriad problems as they accumulate in rivers destined for the ocean. Plastic containers can provide breeding grounds for disease vectors such as mosquitoes as they accumulate water.<sup>244</sup> In cases of heavy rainfall, plastic accumulation in rivers may even exacerbate flash floods by creating obstacles to natural flow patterns in rivers or blocking drainage pipes.<sup>245</sup> At the same time, flooding can carry improperly disposed plastics into homes and yards, burdening communities with contaminated waste.<sup>246</sup>

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- 233 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 *Science Advances* e1700782  
234 Ibid.  
235 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)  
236 Ibid.  
237 Thompson J and Anthony (Moderators) H, 'The Health Effects of Waste Incinerators' (2005) 15 *Journal of Nutritional & Environmental Medicine* 115  
238 Petrlik J and Ryder A, 'After Incineration The Toxic Ash Problem (2015 Update)' (IPEN Dioxin, PCBs and Waste Working Group 2005)  
239 Meletis ZA and Campbell LM, 'Benevolent and Benign? Using Environmental Justice to Investigate Waste-Related Impacts of Ecotourism in Destination Communities' (2009) 41 *Antipode* 741  
240 Njuguna JK, 'The Efficacy of the Ban on Use of Plastic Bags in Kenya' (2018) 2 *Journal of Conflict Management and Sustainable Development* <http://journalofcmsd.net/the-efficacy-of-the-ban-on-use-of-plastic-bags-in-kenya/>, accessed 18 November 2020.  
241 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)  
242 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 *Science Advances* e1700782  
243 Cotter B, 'Ethical Problems with Plastic in the Ocean' (Thesis, Dominican University of California 2019)  
244 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)  
245 Vince J and Hardesty BD, 'Governance Solutions to the Tragedy of the Commons That Marine Plastics Have Become' (2018) 5 *Frontiers in Marine Science*  
246 Hanson A-M, 'Women's Environmental Health Activism around Waste and Plastic Pollution in the Coastal Wetlands of Yucatán' (2017) 25 *Gender & Development* 221

All size categories of plastic litter have been found in virtually every corner of the globe.

It is estimated that approximately 50% of plastics are denser than water and sink to the ocean floor.<sup>247</sup> As sun-light weakens the polymer bonds in plastics, sun exposure can result in photodegradation of the material, allowing it to break down into smaller and smaller pieces.<sup>248</sup> In the cool, dark conditions of a covered landfill or the ocean bottom, this breakdown will likely slow down or never occur, contributing further to the issue of plastic accumulation. At the ocean surface, degradation is more likely causing off-gassing and leaching of contaminants directly into the marine environment, and generating increasing quantities of micro and nanoplastics.<sup>249</sup>

At this stage, all size categories of plastic litter have been found in virtually every corner of the globe.<sup>250</sup> Microplastics pose an increasing threat to biodiversity and efforts to mitigate climate change. While still understudied, it is evident that these microplastics will have serious implications for communities around the world. Microplastics have been recorded in drinking water<sup>251</sup> and even rain.<sup>252</sup> As plastic degrades, the polymer attracts other compounds in the surrounding ecosystem, allowing for the adsorption of toxins into these microplastics<sup>253</sup> and are readily ingested by fish and other marine organisms. Since microplastics cannot be properly metabolized, they accumulate over time, and have been termed “poison pills” due to their negative effects to marine life.<sup>254</sup>

This biological accumulation has led to the realization that POPs when combined with microplastics may pose a serious threat to human health and well-being,<sup>255</sup> even as the exact impacts of microplastics remain poorly understood. As these pollutants bioaccumulate up the food chain, those who consume top marine predators are likely to experience the greatest pollutant load, as has been seen in Greenland natives.<sup>256</sup> Though these arctic populations are spatially quite isolated from major sources of pollution, their diet has brought them into direct contact with plastics-carried pollutants at high enough doses to warrant questions over the safety of breastfeeding in these communities.<sup>257</sup> The problem is certainly not limited to northern regions. About a quarter of fish sold in markets globally contain human-made debris, much of it in the form of plastic fibers.<sup>258</sup> In Global South countries, where there is a greater variety of protein available to consumers, this may not pose as much of a threat. However, in coastal communities of countries in the Global South, which have traditionally depended on fish as a primary food source, the likelihood of persistent exposure and potential health effects can be quite high.<sup>259</sup>

The distribution of impacts of marine plastics is unequal, because communities have different relationships with the ocean.

The distribution of impacts of marine plastics is unequal as communities have different relationships with the ocean. This presents a major challenge to developing regulation and altering the course of plastic pollution because the polluters and people

- 247 Liboiron M, 'Redefining Pollution: Plastics in the Wild' (Thesis, New York University 2012)  
248 Geyer R, Jambeck JR and Law KL, 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances e1700782  
249 Vince J and Stoett P, 'From Problem to Crisis to Interdisciplinary Solutions: Plastic Marine Debris' (2018) 96 Marine Policy 200  
250 Ibid.  
251 Smith A, 'Micro Plastics and Their Implications for Human Health : An Environmental Justice Approach' (2017) 3 Environmental Justice [https://digitalcommons.salve.edu/env334\\_justice%0Ahttps://digitalcommons.salve.edu/env334\\_justice/3](https://digitalcommons.salve.edu/env334_justice%0Ahttps://digitalcommons.salve.edu/env334_justice/3), accessed 18 November 2020.  
252 Wetherbee G, Baldwin A and James Ranville, 'It Is Raining Plastic' [2019] U.S. Geological Survey 3  
253 Smith A, 'Micro Plastics and Their Implications for Human Health : An Environmental Justice Approach' (2017) 3 Environmental Justice [https://digitalcommons.salve.edu/env334\\_justice%0Ahttps://digitalcommons.salve.edu/env334\\_justice/3](https://digitalcommons.salve.edu/env334_justice%0Ahttps://digitalcommons.salve.edu/env334_justice/3), accessed 18 November 2020.  
254 Liboiron M, 'Redefining Pollution: Plastics in the Wild' (Thesis, New York University 2012)  
255 Rochman CM and others, 'Anthropogenic Debris in Seafood: Plastic Debris and Fibers from Textiles in Fish and Bivalves Sold for Human Consumption' (2015) 5 Scientific Reports 14340  
256 Liboiron M, 'Redefining Pollution: Plastics in the Wild' (Thesis, New York University 2012)  
257 Ibid.  
258 McDermott K, 'Plastic Pollution and the Global Throwaway Culture: Environmental Injustices of Single-Use Plastic' [2016] ENV 434 Environmental Justice [https://digitalcom-mons.salve.edu/env434\\_justice/7](https://digitalcom-mons.salve.edu/env434_justice/7), accessed 18 November 2020.  
259 Ibid.

living with the pollution are rarely in the same community, or even the same country.

## CASE STUDY - Waste pickers

India has nearly 2 million waste pickers.<sup>260</sup>

Formal recycling plants can often be costly to build, maintain, and operate, especially when the waste received is contaminated by non-recyclable products.<sup>261</sup> They may be temporarily shut down when overwhelmed or jammed, relegating all waste to informal, non-sorted dump sites.<sup>262</sup> Such dump sites are common in India's rapidly growing cities.<sup>263</sup> However, this waste contains a good deal of economic value when properly sorted – the problem is determining who must do the sorting. It is estimated that 15-20 million people globally work as waste pickers,<sup>264</sup> persons informally engaged in recovering recyclable and reusable solid waste to sell to recyclers.<sup>265</sup>

India's megacities are facing unprecedented growth,<sup>266</sup> challenging municipal leaders with the daunting task of managing the accompanying increase in waste. Already, Delhi's major dump sites are beginning to rival the Taj Mahal in height.<sup>267</sup> Without waste pickers, much of India would be overrun with waste – but the burden of this service falls squarely on the health and well-being of those preventing this catastrophic outcome.<sup>268</sup>

Due to the informal nature of their work, waste pickers are often more exposed than their formally employed counterparts in the waste management sector to occupational hazards.<sup>269</sup> They often report the highest incidence of work-related injury, such as cuts, though they may be less knowledgeable about indirect health effects of their work, such as respiratory illness and infection, than formal waste collectors.<sup>270</sup> Unsorted waste at dump sites often puts them in contact with biohazards, like needles,<sup>271</sup> and pests attracted to the organic waste and human feces are often found at these dumps.<sup>272</sup> For instance, one study found that 93% waste pickers had experienced a work-related illness.<sup>273</sup>

While most solid waste management (SWM) sector employees work 5-10 hours per day, 98.7% of waste pickers reported working more than 10 hours per day.<sup>274</sup>

The hazardous nature of the work, combined with the long hours, results in a series of indirect deleterious effects. Waste pickers have exceptionally high illiteracy rates (72.3%), even higher than other SWM workers,<sup>275</sup> and many did not attend school.<sup>276</sup> Waste pickers often lack access to health services, and thus must absorb the economic burden of their work.<sup>277</sup> Though most waste pickers in India are over 18 (85%), families often struggle to support their children attending school, or children of waste pickers are bullied or alienated in the classroom

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- 262 Manral K, 'Why We Need To Do Away With Single-Use Plastics As Consumers' (shethepeople, 16 September 2019) <https://www.shethepeople.tv/home-top-video/ban-single-use-plastic-consumers/>, accessed 18 November 2020.
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- 267 'India's Megacities, Mumbai and Delhi, Sitting on a Pile of Waste' (Mongabay-India, 11 October 2019) <https://india.mongabay.com/2019/10/indias-megacities-mumbai-and-delhi-sitting-on-a-pile-of-waste/>, accessed 18 November 2020.
- 268 Ravindra K, Kaur K and Mor S, 'Occupational Exposure to the Municipal Solid Waste Workers in Chandigarh, India' (2016) 34 *Waste Management & Research: The Journal for a Sustainable Circular Economy* 1192
- 269 Ibid.
- 270 'InFormal–Formal: Creating Opportunities for the Informal Waste Recycling Sector in Asia' (WIEGO, January 2005) <https://www.wiego.org/publications/informal%E2%80%93formal%E2%80%93creating-opportunities-informal-waste-recycling-sector-asia>, accessed 18 November 2020.
- 271 Ravindra K, Kaur K and Mor S, 'Occupational Exposure to the Municipal Solid Waste Workers in Chandigarh, India' (2016) 34 *Waste Management & Research: The Journal for a Sustainable Circular Economy* 1192; Manral K, 'Toxic Cities: Do We Even Wonder Where Our Garbage Goes?' (shethepeople, 1 July 2019) <https://www.shethepeople.tv/news/garbage-disposal-cities-pollution-india/>, accessed 18 November 2020.
- 272 'Wastepickers: Delhi's Forgotten Environmentalists?' (Chintan Environmental Research and Action Group 2018)
- 273 Ibid.
- 274 Ravindra K, Kaur K and Mor S, 'Occupational Exposure to the Municipal Solid Waste Workers in Chandigarh, India' (2016) 34 *Waste Management & Research: The Journal for a Sustainable Circular Economy* 1192
- 275 Ibid.
- 276 Smith G, 'Delhi's "No Child in Trash" Safe Spaces' (UN Environment, 10 August 2018) <http://www.unep.org/news-and-stories/story/delhis-no-child-trash-safe-spaces>, accessed 18 November 2020.
- 277 'Wastepickers: Delhi's Forgotten Environmentalists?' (Chintan Environmental Research and Action Group 2018)

# Case Study – Waste pickers



Delhi produces 8,360 tonnes of municipal solid waste per day; it could triple by 2021.<sup>269</sup>

## SOLID WASTE GROWTH

Waste pickers are more exposed than their formally employed counterparts in the waste management sector to work-related injuries.<sup>271</sup>



## OCCUPATIONAL HAZARDS

Public initiatives can play a critical role in supporting waste pickers to avoid incentivizing shifting towards waste-to-energy models that favor businesses.<sup>295</sup>



## PRIVATIZATION & DIRTY ENERGY

Nearly 2 million waste pickers<sup>260</sup>



Waste pickers in Ahmedabad prevent the emission of 200,000 tons of CO<sub>2</sub> per year.<sup>281</sup>



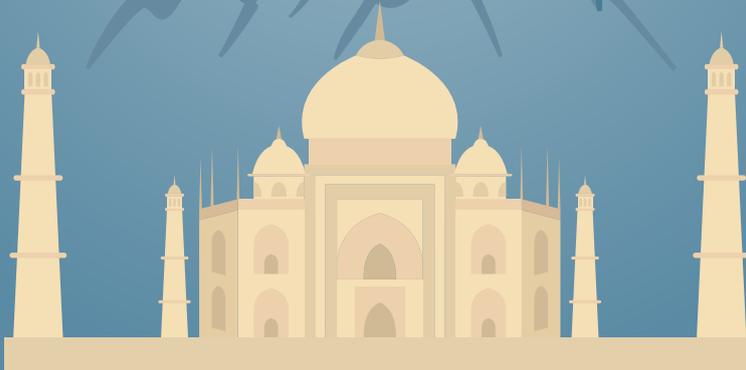
## OFFSETTING EMISSIONS

With the support of local environmental groups, waste pickers are organizing into labor unions with more power to advocate for better working conditions.<sup>288</sup>



## UNIONS & WORKING CONDITIONS

Delhi's major dump sites are beginning to rival the Taj Mahal in height.<sup>269</sup>



## DUMP SITES



and experience high attrition.<sup>278</sup> Without access to education, their children are also likely to become waste pickers themselves, thus perpetuating the environmental and social injustice of the current labor force.

Even as India's per capita carbon footprint increases, waste pickers try to curb this trend. Waste pickers in Ahmedabad prevent the emission of 200,000 tons of CO<sub>2</sub> per year, the equivalent of taking 130,000 cars off the road, by sorting waste and feeding the

recycling sector.<sup>279</sup> Each waste picker's carbon footprint of -4 tonnes offsets the emissions of two average Delhiites.<sup>280</sup> Even as they work actively to mitigate climate change, they are also facing disproportionately lower resilience to these changes due to their hazards exposure.<sup>281</sup> Landfills often are sited near vulnerable, low-income communities, and through time, attract more such settlements as migrants and unemployed individuals move to live closer to their work.<sup>282</sup> The dumps often catch on fire from the high methane emissions of the decaying

278

Ibid.

279

Oates L and others, 'Reduced Waste and Improved Livelihoods for All: Lessons on Waste Management from Ahmedabad, India' (Coalition for Urban Transitions 2018)

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Ibid.

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Ibid.

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Manral K, 'Toxic Cities: Do We Even Wonder Where Our Garbage Goes?' (shethepeople, 1 July 2019) <https://www.shethepeople.tv/news/garbage-disposal-cities-pollution-india/>, accessed 18 November 2020.

organic matter, and leachates infiltrate the water on which these communities depend.<sup>283</sup>

However, several groups and initiatives in India are working to secure better conditions for these workers. A major challenge for many waste pickers is sourcing, as they may be shunned from doorstep collection<sup>284</sup> or have to pay for a pile of unsorted waste.<sup>285</sup> With the support of local environmental groups, waste pickers are organizing into labor unions with more power to advocate for more reliable sourcing and better working conditions.<sup>286</sup> A key component is the establishment of formal contracts between waste producers and waste pickers.<sup>287</sup> When the Self-Employed Women's Association (SEWA) of Ahmedabad entered into a contract with a local ward, union members' monthly income quadrupled, health improved as the ward provided a small initial investment to purchase protective equipment, and nearly 70% of all waste was recycled.<sup>288</sup> When such programs succeed, it is important to formalize these agreements with higher levels of government, to ensure that the service provided by the waste pickers is not outsourced to private industries.<sup>289</sup> Environmental groups are also intervening, connecting waste pickers directly to businesses that need waste pick-up.<sup>290</sup> Waste pickers in such programs report that, beyond increasing their earnings and stability, these partnerships grant them more legitimacy and remove the stigma of the work.<sup>291</sup> This success provides a great political opportunity as Indian politicians begin to speak more openly about waste management and environmental

issues in their platforms.<sup>292</sup> Initiatives like the Swachh Bharat and Smart Cities Missions can play a critical role in supporting waste pickers, but they must be deliberate to avoid incentivizing shifting towards waste-to-energy models that favor other actors and remove economic opportunity for waste pickers.<sup>293</sup>

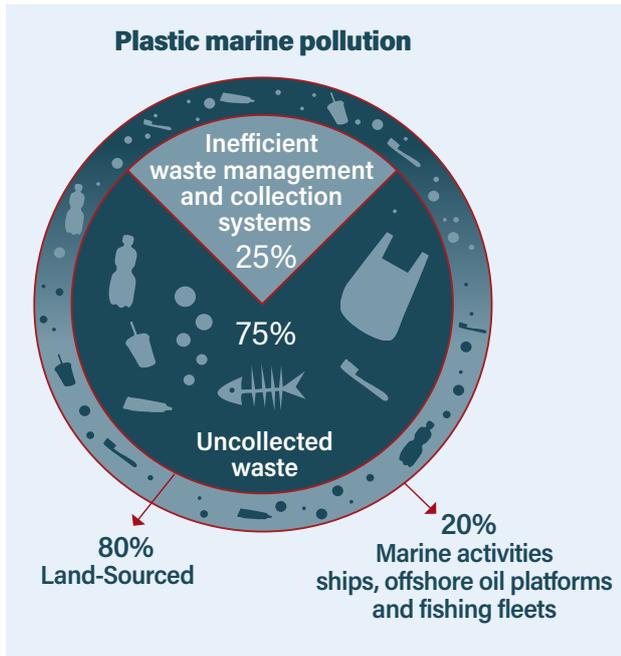
## Impacts of Marine Plastic Pollution

### Sources and Quantity

Plastic in the sea poses a threat not only to the oceans, but to those who rely on them. It is estimated that of the 275 million metric tons of plastic produced globally in 2010, 99.5 million MT was produced within 50 kilometers of the coast, and 31.9 million metric tons were mismanaged<sup>294</sup> (measured by determining the population of the coastal region and the quality of waste management systems in each country).<sup>295</sup> Ultimately, between 4.8 to 12.7 million MT of plastic were deposited into the ocean.<sup>296</sup> It is estimated that 83% of the marine plastic litter originated on land and came from 20 countries, including China, Indonesia, the Philippines, Vietnam, and Sri Lanka.<sup>297</sup> Notably, these are some of the countries to which other countries export their waste.<sup>298</sup>

Land-based sources of marine pollution account for 80% of all marine plastic pollution.<sup>299</sup> The remaining 20% of marine plastic pollution originates

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- 283 'India's Megacities, Mumbai and Delhi, Sitting on a Pile of Waste' (Mongabay-India, 11 October 2019) <https://india.mongabay.com/2019/10/indias-megacities-mumbai-and-delhi-sitting-on-a-pile-of-waste/>, accessed 18 November 2020.
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- 286 Oates L and others, 'Reduced Waste and Improved Livelihoods for All: Lessons on Waste Management from Ahmedabad, India' (Coalition for Urban Transitions 2018)
- 287 'InFormal-Formal: Creating Opportunities for the Informal Waste Recycling Sector in Asia' (WIEGO, January 2005) <https://www.wiego.org/publications/informal%E2%80%93formal%2%80%93creating-opportunities-informal-waste-recycling-sector-asia>, accessed 18 November 2020.
- 288 Oates L and others, 'Reduced Waste and Improved Livelihoods for All: Lessons on Waste Management from Ahmedabad, India' (Coalition for Urban Transitions 2018)
- 289 Ibid.
- 290 Khullar Relph M, 'India's Informal Environmental Army' (Ensia, 14 November 2013) <https://ensia.com/articles/indias-informal-environmental-army/>, accessed 18 November 2020.
- 291 Ibid.
- 292 'Will Urban Outrage over Environmental Apathy Reflect in Voting?' (Mongabay-India, 21 March 2019) <https://india.mongabay.com/2019/03/will-urban-outrage-over-environmental-apathy-reflect-in-voting/>, accessed 18 November 2020.
- 293 Oates L and others, 'Reduced Waste and Improved Livelihoods for All: Lessons on Waste Management from Ahmedabad, India' (Coalition for Urban Transitions 2018)
- 294 Jambeck JR and others, 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 768
- 295 Ibid.
- 296 Ibid.
- 297 Garcia B, Fang MM and Lin J, 'All Hands on Deck: Addressing the Global Marine Plastics Pollution Crisis in Asia' (Social Science Research Network 2019) SSRN Scholarly Paper ID 3387269
- 298 Brooks, Wang, and Jambeck, "The Chinese Import Ban and Its Impact on Global Plastic Waste Trade."
- 299 Gold M and others, 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' [2013] UCLA: Emmett Institute on Climate Change and the Environment



from sea-based sources such as ships, offshore oil platforms, and fishing fleets.<sup>300</sup> Three quarters of all land-sourced plastic marine pollution come from uncollected waste, while the other quarter is the result of inefficient waste management and collection systems.<sup>301</sup>

China was highlighted in Jambeck et al., in 2015 as the top contributor of marine plastic pollution—roughly between 1.32 to 3.5 million metric tons<sup>302</sup>—with four main sources for its marine plastic pollution at the time: (i) a high density coastal population, allowing for heavy consumption practices and waste output; (ii) a rapidly growing economy that has promulgated plastic dependency and usage; (iii) a high quantity of plastics in the country due to their historical import of plastic waste for profit; and (iv), a lack of a proper waste management system to handle the amount of plastic trash, marked by the informal and under-invested system of recyclers and waste pickers.<sup>303</sup>

Although China may be one of the greatest contributors of marine plastic pollution, marine litter travels throughout the ocean environment. Marine litter is cycled through oceans by currents, tides, and wind, rendering it a pervasive problem in marine habitats.<sup>304</sup> Plastics are known to gather in cycling oceanic current systems known as gyres.<sup>305</sup>

## Impacts on Tourism

Marine plastic pollution is no longer a problem that simply mars pristine beaches. Beaches trashed with marine litter are less likely to be visited by tourists, reducing income for beach communities by millions of dollars annually.<sup>306</sup> As trash washes up on coastlines, or invades remote marine habitats, it harms livelihoods of coastal inhabitants, especially those in the tourism and recreation industry. Beach related tourism is a major source of income for middle and low-income countries, where national and international visitors come to enjoy clean beaches and coastal waters.<sup>307</sup> In addition to driving away tourists, beach litter requires large clean-up efforts at high costs,<sup>308</sup> further impacting coastal communities that may not be able to afford to clean-up their shorelines.<sup>309</sup> Middle and low-income countries stand to lose greatly if beach litter continues to drive away customers and revenue, key elements upon which their livelihood relies.

Tourists are much less likely to visit beaches trashed with marine litter, reducing income for beach communities by millions of dollars annually.<sup>310</sup>

- 300 Bonanno G and Orlando-Bonaca M, 'Ten Inconvenient Questions about Plastics in the Sea' (2018) 85 Environmental Science & Policy 146
- 301 Woglom E, 'Stemming the Tide: Land-Based Strategies for a Plastic-Free Ocean' (Ocean Conservancy 2017)
- 302 Jambeck JR and others, 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 768
- 303 Garcia B, Fang MM and Lin J, 'All Hands on Deck: Addressing the Global Marine Plastics Pollution Crisis in Asia' (Social Science Research Network 2019) SSRN Scholarly Paper ID 3387269
- 304 Bonanno G and Orlando-Bonaca M, 'Ten Inconvenient Questions about Plastics in the Sea' (2018) 85 Environmental Science & Policy 146
- 305 Ibid.
- 306 Gold M and others, 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' [2013] UCLA: Emmett Institute on Climate Change and the Environment
- 307 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)
- 308 Woglom E, 'Stemming the Tide: Land-Based Strategies for a Plastic-Free Ocean' (Ocean Conservancy 2017)
- 309 Gold M and others, 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' [2013] UCLA: Emmett Institute on Climate Change and the Environment
- 310 Oates L and others, 'Reduced Waste and Improved Livelihoods for All: Lessons on Waste Management from Ahmedabad, India' (Coalition for Urban Transitions 2018)

Tourists are much less likely to visit beaches trashed with marine litter, reducing income for beach communities by millions of dollars annually.

A study on marine litter on the shorelines of England argues that the trash-filled beaches undermine the psychological benefits of going to the beach.<sup>311</sup> Although people generally connect beach time to wellness and physical health, the presence of pollution generated negative responses, and might discourage people from visiting the coast.<sup>312</sup> The most deterring types of marine litter were public items such as plastic bags, followed by fishing industry waste.<sup>313</sup> However, it has been found that by experiencing and visualizing marine litter, especially on beaches, people also become more impassioned to change their consumption patterns.<sup>314</sup> Connecting symptoms to solutions for marine plastic pollution can help motivate action to solve marine issues.<sup>315</sup>

## Impacts on Fishing Industry

The fishing industry is another example of a commercial industry that feels the negative effects of marine plastic pollution. Globally, 820 million people rely on fishing and fisheries as a source of income.<sup>316</sup> Plastics have been detected in fish for sale for human consumption in Indonesia and California, U.S.<sup>317</sup> This suggests that humans are subjected to

plastic consumption by eating both wild and farmed fish. Plastic particles and waste can be ingested by all types of farmed and wild fish and feedstock, transferred between trophic layers, while plastic bags and fishing gear cause entanglement in large wild marine mammals.<sup>318</sup>

Subsistence fisherfolk are threatened with a lowered fishing yield, contaminated waters, and marine debris that interferes with fishing activity.

Pollution originated in different stages of the plastic life cycle harm fishing activities as well. Hazardous chemicals such as bi-phenols are released by microplastics entering marine food chains and bioaccumulates through trophic levels.<sup>319</sup> The runoff from plastic recycling and incineration systems in countries such as Indonesia and Thailand threaten to pollute waters used for fishing and other agricultural activities.<sup>320</sup> UNEP estimates that marine plastic pollution costs US\$ 13 billion annually, impacting global fishing industries, agriculture, and marine tourism.<sup>321</sup>

The cost of marine plastic pollution on natural capital and resources is estimated to be between US\$ 3,300 and US\$ 33,000 per ton of plastic waste in the oceans, based on 2011 data.<sup>322</sup> Subsistence fisherfolk are threatened with a lowered fishing yield, contaminated waters, and marine debris that interferes with fishing activity.<sup>323</sup>

Subsistence fisherfolk are threatened with a lowered fishing yield, contaminated waters, and marine debris that interferes with fishing activity.

## Microplastics

Microplastics (plastic particles smaller than 5mm in size)<sup>324</sup> have become an urgent threat to our marine environment and coastal communities in the past few decades, during which plastic use has proliferated but waste management systems have

- 311 Wyles KJ and others, 'Factors That Can Undermine the Psychological Benefits of Coastal Environments: Exploring the Effect of Tidal State, Presence, and Type of Litter' (2016) 48 *Environment and Behavior* 1095
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- 316 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)
- 317 Rochman CM and others, 'Anthropogenic Debris in Seafood: Plastic Debris and Fibers from Textiles in Fish and Bivalves Sold for Human Consumption' (2015) 5 *Scientific Reports* 14340
- 318 Avio CG, Gorbi S and Regoli F, 'Plastics and Microplastics in the Oceans: From Emerging Pollutants to Emerged Threat' (2017) 128 *Marine Environmental Research* 2
- 319 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)
- 320 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)
- 321 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)
- 322 'Global Ecological, Social and Economic Impacts of Marine Plastic' (2019) 142 *Marine Pollution Bulletin* 189
- 323 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)
- 324 Arthur C, Baker JE and Bamford HA, 'Proceedings of the International Research Workshop on the Occurrence, Effects, and Fate of Microplastic Marine Debris' (NOAA 2009) <https://repository.library.noaa.gov/view/noaa/2509>, accessed 18 November 2020.

not been properly developed to handle processing this waste.<sup>325</sup> Microplastics can be categorized as either primary plastics, those that were produced to be their size originally; or secondary microplastics, those that have broken down from their original size from larger plastic items, rubber tires, or synthetic textiles.<sup>326</sup> Primary microplastics include plastic powders or industrial scrubbers, microbeads used in cosmetics, or pre-production pellets. Secondary microplastics include particles that have fragmented or undergone weathering and are transported through wastewater treatment effluents and other sources. Microplastics have been documented in various sizes and shapes including film, sheet, fragment, pellet, sphere, and fiber.<sup>327</sup> Due to their microscopic size, most microplastics in the natural

environment are counted by unit, rather than size. Globally, microplastics are more prevalent than macroplastics by particle count, but less so by weight.<sup>328</sup>

Due to their microscopic size and diverse chemical composition, it is difficult to quantify and track microplastics in the environment. The widespread dissemination of microplastics throughout all marine regions and habitats suggests the problem will impact many aspects of biological services as well as human livelihoods.

Due to their lightweight composition and size, microplastics can travel through the entire water column, including deep water regions and seafloor habitats. Microplastic particles were first discovered floating on the Sargasso Sea in 1970, averaging 3,500 particles per square kilometer, (measuring between 2.5 and 5mm in size).<sup>329</sup> Since then, a number of studies have been performed to measure the abundance of microplastics in open seawater.<sup>330</sup> Of 70 average concentrations of microplastics sampled worldwide, the median abundance of microplastics in the open ocean was 0.089 units per cubic meter of seawater.<sup>331</sup> High concentrations of microplastics can be found in the major ocean gyres such as the North Pacific Gyre, where circular ocean currents trap plastic fragments near the surface.<sup>332</sup> Very high concentrations of marine microplastics (15 particles per cubic meter) were also found at a depth of around 200 meters in the Monterey Bay in California, where plastic particles were found in all samples of pelagic red crabs and giant larvaceans collected.<sup>333</sup> Microplastics have also been detected in beach sand and sediment, with high concentrations on Korean beaches and Swedish subtidal zones.

Due to their microscopic size and diverse chemical composition, it is difficult to quantify and track microplastics in the environment. The widespread dissemination of microplastics throughout all marine regions and habitats suggests the problem will impact many aspects of biological services as well as human livelihoods.

325 GESAMP, 'Sources, Fate and Effects of Microplastics in the Marine Environment (Part 1)' (IMO 2015) 90

326 Ibid.

327 Shim WJ, Hong SH and Eo S, 'Marine Microplastics: Abundance, Distribution, and Composition', *Microplastic Contamination in Aquatic Environments* (Elsevier 2018) <https://linkinghub.elsevier.com/retrieve/pii/B9780128137475000011>, accessed 18 November 2020.

328 Erni-Cassola G and others, 'Lost, but Found with Nile Red: A Novel Method for Detecting and Quantifying Small Microplastics (1 Mm to 20 Mm) in Environmental Samples' (2017) 51 *Environmental Science & Technology* 13641

329 Carpenter EJ and Smith KL, 'Plastics on the Sargasso Sea Surface' (1972) 175 *Science* (New York, N.Y.) 1240

330 Shim WJ, Hong SH and Eo S, 'Marine Microplastics: Abundance, Distribution, and Composition', *Microplastic Contamination in Aquatic Environments* (Elsevier 2018) <https://linkinghub.elsevier.com/retrieve/pii/B9780128137475000011>, accessed 18 November 2020.

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332 Avio CG, Gorbi S and Regoli F, 'Plastics and Microplastics in the Oceans: From Emerging Pollutants to Emerged Threat' (2017) 128 *Marine Environmental Research* 2

333 Choy CA and others, 'The Vertical Distribution and Biological Transport of Marine Microplastics across the Epipelagic and Mesopelagic Water Column' (2019) 9 *Scientific Reports* 7843

## Microplastics in the Food Chain

Microplastics have found their way into the human food chain by way of marine organisms cultivated and harvested for human consumption.<sup>335</sup> Microplastic particles were found in farmed mussels and oysters, bivalves known for filter feeding throughout the entire water column.<sup>336</sup> Similarly, microplastic particles were found in 8% of freshwater fish and 10% of marine fish in the Gulf of Mexico.<sup>337</sup> Within the last few decades, trends such as these have continued to arise, elucidating the problem of microplastics in the food chain,<sup>338</sup> and threatening our global food supply and reliance on marine organisms.<sup>339</sup>

## Impacts on Agriculture

Plastic waste processing threatens the natural resources of surrounding communities and landscapes, many of which are Global South countries that rely on agriculture for economic stability and local food security.<sup>340</sup> In Thailand, a country that imports significant amounts of plastic waste, farmers have witnessed plastic factory workers pouring melted plastic directly on farmland and openly burning trash near their communities.<sup>341</sup> These disposal processes contaminate surrounding soils and water sources with leached chemicals and plastic particles, reducing agricultural and fisheries productivity.<sup>342</sup> In Thailand, where plastic waste import increased by 1,000 percent since the Chinese ban on plastic waste imports in 2018, shrimp farms have especially taken an economic hit from plastic pollution.<sup>343</sup>

Across countries in the Global South, land-based plastic litter accumulates in agricultural areas and is ingested by farm animals.<sup>344</sup> Up to a third of cattle and half of goats used in agricultural activity in the Global South region have consumed a significant amount of plastics.<sup>345</sup> This causes a burden on local farmers that goes beyond water and soil contamination, and directly impacts the livelihood and health of stock.<sup>346</sup>

Marine-based plastic litter has been found on farmland that lies adjacent to shorelines in Scotland, contaminating soils and costing individual farmers an average of 500 Euros annually in clean-up efforts.<sup>347</sup> Marine-based plastic litter also impacts aquaculture by entangling equipment and causing harmful ingestion in fish.<sup>348</sup>

Examples of plastic reuse systems include compacting single-use plastic into multi-layer bricks used for constructing buildings in the Philippines, plastic-to-road programs in India and Indonesia, and using diapers to produce roof tiles and upholstery filling in Mexico.<sup>349</sup> Although these reuse programs intend to reduce plastic waste by giving it a second life, the impacts of leached chemicals in the water supply and shedding microplastics that contaminate soil and water sources are a great risk.<sup>350</sup> Some countries are taking steps to reuse plastic waste in a sustainable way, but many may be further harming their environment.<sup>351</sup> The impacts of these practices are not yet well known and may be putting local public health, agricultural, and fishing productivity in surrounding communities at risk.

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- 334 Shim WJ, Hong SH and Eo S, 'Marine Microplastics: Abundance, Distribution, and Composition', *Microplastic Contamination in Aquatic Environments* (Elsevier 2018) <https://linkinghub.elsevier.com/retrieve/pii/B9780128137475000011>, accessed 18 November 2020.
- 335 Phillips MB and Bonner TH, 'Occurrence and Amount of Microplastic Ingested by Fishes in Watersheds of the Gulf of Mexico' (2015) 100 *Marine Pollution Bulletin* 264
- 336 Ibid.
- 337 Melissa B. Phillips and Timothy H. Bonner, "Occurrence and Amount of Microplastic Ingested by Fishes in Watersheds of the Gulf of Mexico," *Marine Pollution Bulletin* 100, no. 1 (November 15, 2015): 264–69, <https://doi.org/10.1016/J.MARPOLBUL.2015.08.041>, accessed 18 November 2020.
- 338 Setälä O and others, 'Microplastics in Marine Food Webs', *Microplastic Contamination in Aquatic Environments* (Elsevier 2018) <https://linkinghub.elsevier.com/retrieve/pii/B9780128137475000114>, accessed 18 November 2020.
- 339 Barboza LGA and others, 'Marine Microplastic Debris: An Emerging Issue for Food Security, Food Safety and Human Health' (2018) 133 *Marine Pollution Bulletin* 336
- 340 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)
- 341 Ibid.
- 342 Ibid.
- 343 Ibid.
- 344 Williams M and others, 'No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late' (Tearfund 2019)
- 345 Ibid.
- 346 Ibid.
- 347 Bergmann M, Gutow L and Klages M (eds), *Marine Anthropogenic Litter* (Springer International Publishing 2015) <http://link.springer.com/10.1007/978-3-319-16510-3>, accessed 18 November 2020.
- 348 Ibid.
- 349 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)
- 350 Ibid.
- 351 Ibid.

## Connection to Vulnerable Populations

Microplastic fragments have been detected in fish and shellfish for sale for human consumption in markets in Makassar, Indonesia, and California, U.S.<sup>352</sup> In California, 24% of fish and 33% of shellfish sampled contained textile fibers (averaging 6.3mm in length), linked to the prevalent use of plastic fibers and textiles in the U.S.<sup>353</sup> In Indonesia, 28% of fish sampled contained plastic and foam fragments, (averaging 3.5mm in size), which were linked to faulty waste management systems in the country.<sup>354</sup>

Linking specific types of microplastic pollution to regional waste management issues will be critical to guide policy makers to target regional solutions. While some regions will need to improve solid waste management systems, others will need to address synthetic textile production and end-of-life processes.

## LEGAL AND POLICY REVIEW

The legal and policy review conducted in this study showed that Multilateral Environmental Agreements (MEAs) do not explicitly guarantee either environmental human rights or environmental justice, but they are relevant to human rights obligations, and can help spur environmental justice action. Many MEAs are intended to protect general interests that are identified as human rights in international human rights instruments. For instance, many MEAs include obligations regarding gathering and disclosure of environmental information and public participation in decision-making. Several of these obligations require countries to take actions vis-à-vis members of the public, although the obligations may be owed to the other Parties to the agreement as a matter of international law (as opposed to being owed directly to individuals, which is, instead, the case for international human rights treaties). MEAs and international human rights treaties thus need to be implemented together by countries to respond to environmental justice issues. For instance, a general obligation under an MEA on public access to environmental information needs to be implemented in accordance with international human rights standards, such as ensuring that timely and accessible information is provided to potentially affected members of the public, coupled with national provisions on effective access to justice and remedies. Similarly, an international environmental obligation to regulate a certain activity needs to be implemented through the adoption of non-discriminatory and non-regressive legal provisions at the national level, with a specific view to preventing any foreseeable and unjustifiable negative impact on human rights. These are essential considerations relevant for discussion on environmental justice issues. Future studies should systematically assess how relevant MEAs can be implemented in accordance with relevant international human rights standards to better address environmental justice issues.

352 Rochman CM and others, 'Anthropogenic Debris in Seafood: Plastic Debris and Fibers from Textiles in Fish and Bivalves Sold for Human Consumption' (2015) 5 Scientific Reports 14340

353 Ibid.

354 Ibid.

## International Agreements Related to Waste Disposal and Control of Hazardous Waste

The magnitude of marine litter has necessitated international efforts on global and regional fronts. Thus far, the approaches most relevant to marine plastic debris have consisted of international conventions and various regional seas programmes. Plastic debris has continued to enter the marine environment at high rates despite these efforts.<sup>355</sup> This section focuses on the three primary international conventions (International Convention for the Prevention of Pollution from Ships, UN Convention for the Law of the Sea, and the London Dumping Convention) most typically cited in marine plastics debris policy analyses from the perspective of marine disposal of wastes.

Perhaps one of the most relevant international agreement pertaining to marine plastic debris is the Convention for the Prevention of Pollution from Ships, commonly known as MARPOL.<sup>356</sup> This convention, signed in 1973, prohibits dumping at sea with a few exceptions.<sup>357</sup> Specifically, Annex V of the convention has been voluntarily ratified by 140 parties, together accounting for nearly 100% of global shipping tonnage.<sup>358</sup> This annex came into force in 1988, and provides a legally binding ban against discharging plastic waste from ships anywhere in the world.<sup>359</sup> Even with the wide acceptance of this annex, research has indicated that the problem of marine pollution has worsened.<sup>360</sup> While this may be at least partially attributable to the fact that MARPOL exempts accidental loss or plastics disposal resulting from ship or equipment damage,<sup>361</sup> it is more likely

a reflection of the terrestrial origins of the marine plastics debris problem. Furthermore, enforcement, even of intentional discharges, is challenging on the high seas. In the U.S., Congress has made efforts to increase disclosures by rewarding whistleblowers who report MARPOL violations with the Act to Prevent Pollution from Ships (APPS), but APPS applies only to ships with U.S. flags or in U.S. waters.<sup>362</sup> It has proven an effective measure, credited with leading to the prosecution of 76% of all successful MARPOL violation cases in the U.S. from 1993–2017, and may therefore be a good model for other MARPOL parties to effectively increase enforcement.

A second international policy measure is the UN Law of the Sea Convention (UNCLOS). With more than 160 contracting parties, UNCLOS is one of the most widely accepted measures to prevent ocean dumping, and broadly tasks its signatories with an obligation to protect and preserve the marine environment.<sup>363</sup> UNCLOS addresses the issue of land-based sources of pollution to the extent that it states that countries shall adopt laws and regulations to stem the flow of pollutants from land to the marine environment.<sup>364</sup> Similar to MARPOL, however, UNCLOS does not penalize Member States for “incidental” losses of wastes.

Lastly, the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, commonly referred to as the London Dumping Convention, was designed to address all sources of marine pollutants.<sup>365</sup>

It includes detailed lists of materials that can and cannot be disposed of at sea, and applies

355 Vince J and Hardesty BD, 'Plastic Pollution Challenges in Marine and Coastal Environments: From Local to Global Governance' (2017) 25 *Restoration Ecology* 123

356 Trouwborst A, 'Managing Marine Litter: Exploring the Evolving Role of International and European Law in Confronting a Persistent Environmental Problem' (2013) 27 *Utrecht Journal of International and European Law* 4

357 Xanthos D and Walker TR, 'International Policies to Reduce Plastic Marine Pollution from Single-Use Plastics (Plastic Bags and Microbeads): A Review' (2017) 118 *Marine Pollution Bulletin* 17

358 Trouwborst A, 'Managing Marine Litter: Exploring the Evolving Role of International and European Law in Confronting a Persistent Environmental Problem' (2013) 27 *Utrecht Journal of International and European Law* 4

359 Ibid.

360 Xanthos D and Walker TR, 'International Policies to Reduce Plastic Marine Pollution from Single-Use Plastics (Plastic Bags and Microbeads): A Review' (2017) 118 *Marine Pollution Bulletin* 17

361 Gold M and others, 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' [2013] UCLA: Emmett Institute on Climate Change and the Environment

362 National Whistleblower Center, 'Sub-Standard Ships and Poor Shipping Practices Are Leading to Massive Pollution and Damage: Act to Prevent Pollution from Ships (APPS)' (2018)

363 Trouwborst A, 'Managing Marine Litter: Exploring the Evolving Role of International and European Law in Confronting a Persistent Environmental Problem' (2013) *Utrecht Journal of International and European Law* 4

364 Gold M and others, 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' [2013] UCLA: Emmett Institute on Climate Change and the Environment

365 Vince J and Hardesty BD, 'Plastic Pollution Challenges in Marine and Coastal Environments: From Local to Global Governance' (2017) 25 *Restoration Ecology* 123

to land-based waste loaded onto ships explicitly for dumping.<sup>366</sup> Unfortunately, it does not outline penalties for non-compliance, instead relying on Member States to set domestic legislation regulating their dumping.<sup>367</sup> Member States are expected to report on all permits issued, and while meeting proceedings are largely transparent, concerns over low or inaccurate reporting has called its efficacy into question.<sup>368</sup>

## International Agreements Related to the Transportation of Hazardous Chemicals and Waste

While the aforementioned conventions apply to marine debris more broadly, there is also a suite of additional legally binding conventions specifically governing hazardous chemicals and wastes. The Stockholm Convention on Persistent Organic Pollutants (POPs) is intended to regulate the production, use and trade of materials which have detrimental effects on human health.<sup>369</sup> Similar to the London Convention, it lists specific POPs to be regulated, but goes a step further in encouraging its 181 Parties and manufacturers of these products to reduce the production and discharge of these substances.<sup>370</sup> Its sister convention, the Rotterdam Convention, further includes a prior informed consent provision requiring that exporting countries of substances considered hazardous obtain consent from importing countries prior to sending any of the listed chemicals.<sup>371</sup>

A study found that these MEAs are indeed effective, as ratification of the Stockholm and Rotterdam Conventions leads to a reduction in the trade of hazardous chemicals especially between the Organisation for Economic Cooperation (OECD) and non-OECD countries.<sup>372</sup> The Stockholm Convention further commits parties to take legal and administrative measures needed to regulate the production, use, and trade of hazardous substances, providing Member States with the jurisdiction required to effect change.<sup>373</sup> However, they both suffer the same limitation: they may only apply to items explicitly listed in their text. As a result, the export of most plastics is unregulated by these conventions unless they, or any of their chemical components, are specifically prohibited or restricted.<sup>374</sup>

The Basel Convention, another related MEA, governs the environmentally sound management, specifically as it pertains to transboundary movement, of hazardous wastes.<sup>375</sup> The Convention has published guidelines on plastics, specifically addressing eight plastic groups.<sup>378</sup> However, critics have asserted the Basel Convention in its current form is not strong enough to protect importing countries, and that with the exception of its ban amendment, had merely legitimized a waste dumping process that was previously illegal. It is also constrained to a listing of hazardous substances developed by the Stockholm and Rotterdam Conventions, though Member States may choose to list a substance as hazardous domestically to make its importation illegal under the Basel Convention. While technical guidelines

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- 366 Gold M and others, 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' [2013] UCLA: Emmett Institute on Climate Change and the Environment
- 367 Vince J and Hardesty BD, 'Plastic Pollution Challenges in Marine and Coastal Environments: From Local to Global Governance' (2017) 25 *Restoration Ecology* 123
- 368 Stokke OS, 'Beyond Dumping? The Effectiveness of the London Convention' [1999] *Yearbook of International Cooperation on Environment and Development* 1998–99 39
- 369 Núñez-Rocha T and Martínez-Zarzoso I, 'Are International Environmental Policies Effective? The Case of the Rotterdam and the Stockholm Conventions' (2019) 81 *Economic Modelling* 480
- 370 Raubenheimer K and McIlgorm A, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 *Marine Policy* 285
- 371 Núñez-Rocha T and Martínez-Zarzoso I, 'Are International Environmental Policies Effective? The Case of the Rotterdam and the Stockholm Conventions' (2019) 81 *Economic Modelling* 480
- 372 Ibid.
- 373 Raubenheimer K and McIlgorm A, 'Is the Montreal Protocol a Model That Can Help Solve the Global Marine Plastic Debris Problem?' (2017) 81 *Marine Policy* 322
- 374 Raubenheimer K and McIlgorm A, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 *Marine Policy* 285
- 375 Ibid.
- 376 Raubenheimer K and McIlgorm A, 'Is the Montreal Protocol a Model That Can Help Solve the Global Marine Plastic Debris Problem?' (2017) 81 *Marine Policy* 322
- 377 Núñez-Rocha T and Martínez-Zarzoso I, 'Are International Environmental Policies Effective? The Case of the Rotterdam and the Stockholm Conventions' (2019) 81 *Economic Modelling* 480
- 378 Raubenheimer K and McIlgorm A, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 *Marine Policy* 285

were developed under the Convention and guidance as to its implementation and national reporting do exist, the Convention does not provide for targets, timelines, or reporting standards regarding reductions in generation of plastic waste or the trade thereof, further complicating efforts to evaluate its efficacy.<sup>379</sup>

However, at the 14th meeting of the Conference of the Parties of the Basel Convention in 2019, the parties agreed to a suite of plastics-specific amendments, known as the Plastic Waste Amendments.<sup>380</sup> These amendments to the Annexes of the Basel Convention became effective on 1 January 2021, and shore up some of the gaps in earlier iterations of the Basel Convention with respect to plastic wastes, especially mixed, contaminated plastics which are most likely to complicate recycling.<sup>381</sup> These also expand the categories for which prior informed consent is required.<sup>382</sup> The amendments further prohibit the trade of plastic waste occurring between member and non-member states without a special binational or multilateral agreement. The Conference of the Parties further agreed to launch a new partnership on plastic wastes: with more than 50 multi-stakeholder members, the Plastic Waste Partnership (PWP) is the largest partnership in the history of the Basel Convention.<sup>383</sup> The workplan adopted will be implemented for the 2020-2021 period, and will cover all plastic wastes.<sup>384</sup> The PWP will, among other things, facilitate information gathering and sharing, undertake pilot projects, and promote the development of policies to minimize plastic waste.

## Non-binding International Efforts

In addition to these global agreements, several non-binding partnerships and frameworks have been developed over the last decade. The Honolulu strategy provides a framework for tracking marine litter and evaluating interventions,<sup>385</sup> with the main goal of preventing plastic debris from entering the ocean.<sup>386</sup> The UNEP Global Partnership on Marine Litter (GPML), formed in 2012, acts as a coordinating forum for all stakeholders involved in marine debris management and prevention.<sup>387</sup> It adapts seven objectives from the Honolulu Strategy meant to guide projects, and has thus far resulted in several demonstration projects, private-public partnerships, and an online marine litter network.<sup>388</sup> Both aim to achieve SDGs 12, 13, and 14 through their work. While they depart from the international conventions in that they recognize land-based sources as a major challenge in managing marine debris,<sup>389</sup> they set no explicit targets for marine litter.<sup>390</sup>

The GPML also includes a Digital Platform. This Platform aims to be an open-source, crowd-source, multi-stakeholder platform that compiles different resources, connects stakeholders, and integrates data to guide action. The Platform will offer a single coordinated point of access for high-quality, accurate, and up to date data and information on plastic pollution, marine litter, and related topics as well as a virtual forum for stakeholders to come together. The Platform will make available a wide range of materials to support stakeholders' needs and goals ranging from scientific research, technological innovation, and public outreach, in order to inform decision-making, educate and raise awareness, facilitate target setting, advance cooperation for better management decisions, and more.

379 Ibid.

380 Conference of the Parties to the Basel Convention, 'Plastic Waste Amendments' (2019) <http://www.basel.int/Implementation/Plasticwaste/PlasticWasteAmendments/Overview/tabid/8426/Default.aspx>, accessed 18 November 2020.

381 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)

382 Basel Action Network, 'The Norwegian Amendments: Implications for Recyclers' (2019) [http://wiki.ban.org/images/3/3e/Norwegian\\_Implications.pdf](http://wiki.ban.org/images/3/3e/Norwegian_Implications.pdf), accessed 18 November 2020.

383 Conference of the Parties to the Basel Convention, 'Plastic Waste Partnership' (2 May 2019) <<http://www.basel.int/Implementation/Plasticwaste/PlasticWastePartnership/tabid/8096/Default.aspx>>, accessed 18 November 2020.

384 Conference of the Parties to the Basel Convention, 'Terms of Reference for the Basel Convention Partnership on Plastic Waste and Workplan for the Working Group of the Partnership on Plastic Waste for the Biennium 2020-2021' (2019)

385 Pettipas S, Bernier M and Walker TR, 'A Canadian Policy Framework to Mitigate Plastic Marine Pollution' (2016) 68 Marine Policy 117

386 Dauvergne P, 'Why Is the Global Governance of Plastic Failing the Oceans?' (2018) 51 Global Environmental Change 22

387 Vince J and Hardesty BD, 'Plastic Pollution Challenges in Marine and Coastal Environments: From Local to Global Governance' (2017) 25 Restoration Ecology 123

388 Pettipas S, Bernier M and Walker TR, 'A Canadian Policy Framework to Mitigate Plastic Marine Pollution' (2016) 68 Marine Policy 117

389 Ibid.

390 Raubenheimer K and McIlgorm A, 'Is the Montreal Protocol a Model That Can Help Solve the Global Marine Plastic Debris Problem?' (2017) 81 Marine Policy 322

Regional partnerships have also been instrumental in the adoption of national marine debris legislation and management efforts.<sup>391</sup> The Regional Seas Programme (RSP), created in 1974 as one of UNEP's first priority areas, now comprises 150 countries across 18 regions. Of these, 14 have also adopted legally binding framework conventions for their regions.<sup>392</sup> Although relatively few of these address land-based sources of pollution directly,<sup>393</sup> this is likely to change as UNEP and the GPML turn their attention to marine litter at the regional level.<sup>394</sup> Two of the most well-known examples of land-based source protocols are the Cartagena Convention of the Caribbean RSP and that of the Mediterranean. Both protocols require notification of regional Member States in the event of a pollution-induced emergency,<sup>395</sup> and the Mediterranean land-based source protocol further includes the provision of information to the public as a "best environmental practice."<sup>396</sup> Such provisions are vital to protecting vulnerable coastal communities from the harmful impacts of land-based sources of pollution in the marine environment, though challenging to adhere to at the national and subnational scales. This patchwork of implementation,<sup>397</sup> combined with limited progress by Member States to enforce regional protocols through domestic legislation,<sup>398</sup> has rendered these efforts more relevant on paper than in practice.

Consistently, existing policy approaches for managing marine litter are plagued by challenges which undermine their efficacy. For the few binding conventions, the focus is simply not where it must

be, considering that land-based sources have been estimated to account for as much as 80% of global marine plastic debris.<sup>399</sup> At the same time, the approaches such as those of the GPML, RSP, and the Honolulu strategy lack enforceable standards,<sup>400</sup> even if the GPML looks into addressing land-based and sea-based sources of marine litter and plastic pollution. Lastly, even where Member States have adopted implementing measures, any penalties that are levied are often insufficient to discourage the negative behavior,<sup>401</sup> allowing the problem to persist. An additional challenge comes not from these policy approaches, but rather from a lack of consensus on the exact nature and scope of the marine plastic pollution problem,<sup>402</sup> such as a standard definition of microplastics.<sup>403</sup> As a result, the global consensus has been that existing ocean governance mechanisms are simply not robust enough to conserve marine ecosystems,<sup>404</sup> leading many to turn to economic methods for solutions.<sup>405</sup>

## Global Impacts of the 2018 China Ban on Plastic Waste Imports

Historically, high-income countries and upper middle-income countries with stricter environmental regulations and waste management infrastructures exported their plastic waste destined for recycling to China and a few other southeast Asian countries.<sup>406</sup> Easy transport of lightweight materials, inexpensive Chinese labor, and lax contamination standards made plastic waste imports, either for recycling into reusable materials or incineration, a profitable

- 391 Rochette J and others, 'Regional Oceans Governance Mechanisms: A Review' (2015) 60 *Marine Policy* 9
- 392 UNEP, 'Regional Seas Programmes' (17 August 2017) <http://www.unep.org/explore-topics/oceans-seas/what-we-do/working-regional-seas/regional-seas-programmes>, accessed 18 November 2020.
- 393 Rochette J and others, 'Regional Oceans Governance Mechanisms: A Review' (2015) 60 *Marine Policy* 9
- 394 Trouwborst A, 'Managing Marine Litter: Exploring the Evolving Role of International and European Law in Confronting a Persistent Environmental Problem' (2013) 27 *Utrecht Journal of International and European Law* 4
- 395 UNEP, 'The Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (WCR)' (24 March 1983) <https://www.unep.org/cep/who-we-are/cartagena-convention#:~:text=The%20Convention%20for%20the%20Protection,force%20on%2011%20October%201986>, accessed 18 November 2020.
- 396 UNEP, 'Amendments to the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources' (7 March 1996) <https://www.ecolex.org/details/treaty/amendments-to-the-protocol-for-the-protection-of-the-mediterranean-sea-against-pollution-from-land-based-sources-tre-001335/>, accessed 18 November 2020.
- 397 Raubenheimer K and McIlgorm A, 'Is the Montreal Protocol a Model That Can Help Solve the Global Marine Plastic Debris Problem?' (2017) 81 *Marine Policy* 322
- 398 Gold M and others, 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' [2013] UCLA: Emmett Institute on Climate Change and the Environment
- 399 Ibid.
- 400 Ibid.
- 401 Liu T-K, Kao J-C and Chen P, 'Tragedy of the Unwanted Commons: Governing the Marine Debris in Taiwan's Oyster Farming' (2015) 53 *Marine Policy* 123
- 402 Landon-Lane M, 'Corporate Social Responsibility in Marine Plastic Debris Governance' (2018) 127 *Marine Pollution Bulletin* 310
- 403 Hartmann NB and others, 'Are We Speaking the Same Language? Recommendations for a Definition and Categorization Framework for Plastic Debris' (2019) 53 *Environmental Science & Technology* 1039
- 404 Dauvergne P, 'Why Is the Global Governance of Plastic Failing the Oceans?' (2018) 51 *Global Environmental Change* 22
- 405 Hennlock M and others, *Economic Policy Instruments for Plastic Waste: A Review with Nordic Perspectives* (Nordisk Ministerråd 2015) <http://urn.kb.se/re-solve?urn=urn:nbn:se:norden:org:diva-3844>, accessed 18 November 2020.
- 406 Brooks AL, Wang S and Jambeck JR, 'The Chinese Import Ban and Its Impact on Global Plastic Waste Trade' (2018) 4 *Science Advances* eaat0131

industry.<sup>407</sup> Historically, roughly half of all exported plastic waste has made its way to China.<sup>408</sup> By 2017, China had imported more than 50% (by weight) of plastic waste exported for recycling.<sup>409</sup> One similar estimate finds that half of the world's plastic waste from the past two decades has made its way to China for recycling or final disposal, much of which ends up in rivers, polluting the local water supply.<sup>410</sup>

plastic scrap economy in rural China, where lower income families relied on sorting waste for their livelihood and income.<sup>414</sup> In mid-2016, China was receiving 600,000 metric tons of plastic waste per month.<sup>415</sup> Following the film's public exposé on the waste problem in China, government officials began making policy changes to protect their environmental reputation.<sup>416</sup>

During 2018, the amount of plastic waste China accepted was reduced by 99%, alleviating the nation from the burden of the world's plastic waste habit, and protecting their ecological resources.

The impacts of China's plastic ban reach far beyond the importers of plastic waste... For now, countries with lax environmental standards will continue to carry the burden of plastic waste and recycling.

Plastic waste imports for China and Hong Kong (the main point of entry for most Chinese plastic waste import) combined account for 72.4% of global plastic waste ever processed.<sup>411</sup> Since reporting on plastic waste imports began in 1992, nearly half of all of China's imports, roughly 106 million metric tons, was plastic waste.

Due to the economic incentives for accepting foreign plastic scrap and refuse, plastic waste was a popular import in China.<sup>421</sup> However, the huge influx of dirty waste began to have noticeable impacts on rural Chinese communities, their residents and workers, and natural environments.<sup>413</sup> In 2016, a documentary titled "Plastic China" by filmmaker Jiu-Liang Wang was released, showcasing the hardships of the

In December 2017, China announced it would no longer freely accept plastic waste.<sup>417</sup> The plastic ban, known as China's "National Sword Policy"<sup>418</sup> prohibited the importation of plastic unless it was 99.5% uncontaminated industrial plastic scrap.<sup>419</sup> During 2018, the amount of plastic waste China accepted reduced by 99%, alleviating the nation from the burden of the world's plastic waste habit, and protecting their ecological resources.<sup>420</sup> Since China shut its doors, countries in the Global North have been forced to rethink their waste management and recycling habits.<sup>421</sup>

Roughly 111 million metric tons of plastic waste will be displaced by 2030 due to the Chinese National Sword Policy.<sup>422</sup> Most of that waste has since been

407 Ibid.  
 408 Ibid.  
 409 UNEP, 'SINGLE-USE PLASTICS: A Roadmap for Sustainability' (2018)  
 410 Garcia B, Fang MM and Lin J, 'All Hands on Deck: Addressing the Global Marine Plastics Pollution Crisis in Asia' (Social Science Research Network 2019) SSRN Scholarly Paper ID 3387269  
 411 Brooks AL, Wang S and Jambeck JR, 'The Chinese Import Ban and Its Impact on Global Plastic Waste Trade' (2018) 4 Science Advances eaat0131  
 412 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)  
 413 Ibid.  
 414 Ibid.  
 415 Greenpeace, 'Data from the Global Plastics Waste Trade 2016-2018 and the Offshore Impact of China's Foreign Waste Import Ban' (2019)  
 416 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)  
 417 Ibid.  
 418 Ibid.  
 419 Brooks AL, Wang S and Jambeck JR, 'The Chinese Import Ban and Its Impact on Global Plastic Waste Trade' (2018) 4 Science Advances eaat0131  
 420 Garcia B, Fang MM and Lin J, 'All Hands on Deck: Addressing the Global Marine Plastics Pollution Crisis in Asia' (Social Science Research Network 2019) SSRN Scholarly Paper ID 3387269  
 421 Ibid.  
 422 Brooks AL, Wang S and Jambeck JR, 'The Chinese Import Ban and Its Impact on Global Plastic Waste Trade' (2018) 4 Science Advances eaat0131

redirected to other south-east Asian countries, who do not have the capacity to handle such massive amounts of plastic waste.<sup>423</sup> These countries, clustered in southeastern Asia, include Vietnam, Malaysia, and Thailand.<sup>424</sup> Mid 2018, after importing the plastic waste China was rejecting, Vietnam and Thailand eventually enacted their own restrictions on plastic waste importation.<sup>425</sup> While Malaysia began to do the same, in October of 2018 it placed a levy on plastic waste and reopened its ports.<sup>426</sup> With even fewer resources than China, workers in countries such as Malaysia, Vietnam, and Indonesia are suffering from damage to their environment and natural resources, and exploitation of waste pickers in rural communities.<sup>427</sup>

Although not one of the world's largest importers of plastic, South Korea began accepting four times the amount of plastic waste than it had prior to China's ban (as much as 20,000 pounds in late 2018).<sup>428</sup> As a result of the market incentives created by the imported foreign waste, South Korean domestic recycling rates dropped, discouraging the practice, forcing trash to pile up in streets and illegal exportation of plastic to the Philippines.<sup>429</sup> The impacts of China's plastic ban reach far beyond the importers of plastic waste. The producers, primarily the U.S. and E.U., will need to rethink their strategies and develop new strategies for managing their own domestic plastic waste.<sup>430</sup> For now, countries with lax environmental standards are likely to continue to carry the burden of plastic waste and recycling, jeopardizing their environment and public health, while wealthier countries strive to develop waste management to support their plastic consumption habits.<sup>431</sup>

## RECOMMENDATIONS – WHERE DO WE GO FROM HERE?

Plastic pollution itself, as well as the processes that create plastic, directly and indirectly contribute to environmental injustice. Action to combat plastic pollution and to mitigate its deleterious effects on persons, groups, and peoples in vulnerable situations must be taken on local, national, regional, and global levels and consistently address social justice issues.

Governing bodies and intergovernmental organizations may wish to consider and employ responses to measure existing and projected impacts from plastic pollution, adopt regulatory and legislative solutions, regulate and restrict the use and import of specific products, materials and resins, and related toxins. Furthermore, efforts could be explored to consider eliminating unnecessary packaging and, where applicable, extended producer responsibility (EPR) should be implemented, while alternatives to single-use plastics are developed and adopted. Finally, education can be an effective tool to support the actions above by informing individuals of the consequences of plastic consumption and encouraging them to choose alternatives.

The following is a summary of suggestions and recommendations that could be considered to address plastics, targeted for different stakeholders. Within each stakeholder section, icons indicate the category of work:

-  Education
-  Monitoring
-  Cooperation
-  Regulation
-  Purchasing
-  Advocacy

423 Greenpeace, 'Data from the Global Plastics Waste Trade 2016-2018 and the Offshore Impact of China's Foreign Waste Import Ban' (2019)

424 Ibid.

425 Ibid.

426 Ibid.

427 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)

428 Greenpeace, 'Data from the Global Plastics Waste Trade 2016-2018 and the Offshore Impact of China's Foreign Waste Import Ban' (2019)

429 Ibid.

430 Garcia B, Fang MM and Lin J, 'All Hands on Deck: Addressing the Global Marine Plastics Pollution Crisis in Asia' (Social Science Research Network 2019) SSRN Scholarly Paper ID 3387269

431 GAIA, 'DISCARDED: Communities on the Frontlines of the Global Plastic Crisis' (2019)

No single strategy will be enough to fully address the problem, so groups should choose those which are most applicable to and feasible within their contexts. In addition, a section is included on critical research needs to inform future scientific pursuits.

## Business and Industry

Businesses play a critical role in ensuring environmental justice. As producers and consumers of plastics, enterprises will be at the forefront of

a transition away from plastics. Because of the important role of business, it must be embedded into broader conversations about best practices, stakeholder engagement, and government action to ensure a smooth and equitable approach to improving waste management. In addition, environmental justice issues related to plastic pollution should also be seen through the lens of business responsibility to respect human rights.

	Educate employees on proper disposal techniques and the impacts of plastics more broadly.
	Provide safety trainings to ensure that any workers exposed to potential hazards from the use of plastics in business operations can properly protect themselves through appropriate equipment and increase risk awareness to ensure informed consent.
	Monitor and report on supply chain metrics, including suppliers and disposal partners.
	Integrate waste management reporting into business reporting, including monitoring of plastic waste generated and recycled through business operations.
	Research plastic alternatives to promote materials innovation.
	Cooperate with local bodies to inform communities of business operations and comply with regulatory statutes, including extended producer responsibility and circular economy schemes.
	Join trade alliances to stay up-to-date on best practices in the business community.
	Work with employees to improve quality of life, contribute to alleviating additional burden on local communities.
	Implement and enforce strict standards for supply chain partners.
	Mandate waste sorting in offices and business operations to alleviate the burden on municipal solid waste management.
	Endeavour to purchase materials only from responsible suppliers.
	Support local waste pickers to improve recycling rates by paying them to collect and sort waste.
	Pay into local waste management programs.
	Provide reparations for local communities impacted by harmful practices, especially in the event of toxic exposure events.
	Partner with and support local non-profit organizations advocating for social and environmental justice in your communities.
	Advocate within trade alliances for sector-wide agreements to curb plastic pollution.

## Countries

Countries are tasked with the enormous challenge of developing and implementing effective policies to address plastics management. In this process, they should be deliberate and cautious, integrating the best available science on the sources and impacts of plastics, incorporating environmental justice

principles, and applying the precautionary principle to protect communities from the potential risks associated with the current uncertainties about the impacts of plastic pollution. To do so will require multi-sectoral collaborating and organizing, as well as improving monitoring and reporting to verify the effectiveness of different approaches.

	Consider developing and implementing curricula on environmental justice, including training courses for government employees and partners so they may recognize, report, and address actual and potential injustices.
	Educate consumers on the full life cycle of plastics, the waste management stream, and how to reduce their own production and creation of waste.
	Provide resources for community members to understand their rights with respect to hazard exposure.
	Regularly monitor waterways for plastics and leachates.
	Integrate monitoring programs into government initiatives, including waste management efforts, education, and housing, to track and report on impacts. The most successful examples of legislation and regulation will include provisions for monitoring.
	Document and audit existing waste management infrastructure.
	Improve monitoring of sources of plastic waste, including imports, exports, diversion rates, and proportion of current waste management volume.
	Partner with NGOs to increase capacity and maximize impact of government initiatives.
	Document the locations and compositions of fenceline communities, including historical context and health impacts.
	Collaborate with national authorities on international policies and agreements related to waste management.
	Increase coordination between SDGs and waste management legislation.
	Work with the businesses and industry to increase cooperation and trust to improve waste management and social justice for communities.
	Implement extended producer responsibility schemes, where applicable, and encourage the transition to more circular economies.
	Consider restricting importation of products, materials, or resins deemed problematic and/or difficult for life cycle management or waste stream handling.
	Place restrictions on importation of toxics, both in conjunction with the Basel Convention and through the passage of more restrictive national legislation for substances of concern.
	Restrict excessive packaging to provide relief from excess plastic waste.

	If plastics and/or plastic materials are produced in your jurisdiction, efforts can be undertaken to reduce or restrict certain materials or products. This especially works well in conjunction with and complements efforts to restrict imports so as not to impede free trade.
	Consider banning single-use plastics, while encouraging reduction and reuse, to avoid simple replacement of one product with another waste stream burden.
	Integrate waste pickers into formal waste management channels to provide better jobs and reduce exposure to toxic conditions.
	Ensure that environmental justice principles, such as prior informed consent and rights to information, are incorporated into legislation at all levels to avoid injustices.
	Fund research into the health impacts of plastic raw materials, pellets, and transportation.
	Invest in improving waste management infrastructure, especially the creation of in-country recycling plants, provisioning of protective equipment for workers, and scientific landfills to avoid leaching of toxic decomposition products into water sources.
	Continue global dialogue to explore shared solutions. It is imperative that countries collaborate to address the full life cycle of plastic and its associated problems.

## Non-Governmental Actors

Non-profits and other organizations are already playing a critical role in advocating for environmental justice and sustainable development. They can also play a part in influencing other actors to shift away from plastics. To support these efforts, it is

important for non-governmental actors to expand their resources, focusing on the skills and unique positions they hold, and leveraging connections to extend their impact to other areas of focus outside of their usual scope. By serving as intermediaries, they can build relationships between otherwise disparate stakeholder groups and thus improve outcomes.

	Develop and implement curricula on environmental justice, including training courses so they may recognize, report, and address actual and potential injustices.
	Educate consumers on the full life cycle of plastics, the waste management stream, and how to reduce their own production and creation of waste.
	Provide resources for community members to know their rights with respect to hazard exposure.
	Monitor progress towards implementation of government directives to ensure accountability.
	Document the locations and compositions of fenceline communities, including historical context and health impacts.
	Study the symptoms and drivers of environmental injustice in your communities, with a special focus on waste pickers and vulnerable communities impacted by the plastics industry.

	Collaborate with governments to implement plastics education programs.
	Partner with labor unions to secure improved living and working conditions for local communities.
	Serve as an intermediary between the informal sector and private and government actors.
	Join forces with other non-governmental organizations to pursue larger campaigns.
	Propose amendments or new legislation to address environmental justice issues.
	Raise funds to provide micro-loans to plastics entrepreneurs.
	Fund research into the health impacts of plastic raw materials, pellets, and transportation.
	Advocate for increased investment in waste management infrastructure from local governments.
	Speak out on behalf of communities and individuals whose voices are often excluded from decision making processes.
	Support efforts to regulate the plastics industry at local, national, and international scales.

## Consumers

Consumers are the base of the plastics production industry. Though they may not always hold the greatest power in the network to inform decision-making, the impact of how consumers make and act on value judgements in purchasing should not be discounted. By becoming more informed consumers,

they can support decision makers in government and industry to shift practices. They are also frequently the victims of environmental injustices, and thus the people who can speak most authentically to the potential perils of plastic production, consumption, and disposal. Hearing their voices improves other actors' ability to make better decisions concerning plastics.

	Get informed on the impacts and potential health risks of plastic use.
	Educate yourself or take advantage of training programs in your community about your civil rights.
	Learn about your local waste management system and engage in activities to help alleviate the burdens on these, such as sorting waste at the source.
	Monitor your own plastic consumption and identify easy swaps you can make to reduce the burden on waste management systems.
	Monitor the activities of local businesses and governments to hold them accountable for their actions (or inaction).
	Work with your neighbors to implement better waste management strategies at the small scale if larger programs are not available.
	Collaborate with local non-governmental organizations by volunteering for, supporting, or signal boosting their campaigns.e

	<p>Be strict about plastic consumption and disposal in your daily life. Set personal goals, for example, to stop using single-use plastics, and hold yourself accountable.</p>
	<p>Consumer purchasing power can drive markets to innovate. When choosing products on which to spend your money, consider opting for alternatives that avoid excessive packaging or otherwise challenging to recycle materials, and support businesses committed to closing the loop.</p>
	<p>Invest in reusable products that can replace single-use items.</p>
	<p>Support local waste pickers to improve recycling rates by paying them to collect and sort waste.</p>
	<p>Advocate for recycling and recovery in your neighborhoods and among your peers.</p>
	<p>Let local officials know if you see symptoms of poor waste management or environmental injustice in your communities.</p>
	<p>Communicate to local business owners about concerns regarding plastics and encourage them to carry more environmentally-friendly products.</p>

## Limitations and Recommendations for Future Studies

It is important to note key limitations in this report. The first is that, as is often the case with reports on such a broad topic as pollution and environmental justice, not all material ever written on the topic could be included. The report endeavors to capture the salient points and reflect, as much as possible, the scope of the work that has been done on the topic to date. A completely comprehensive analysis would require far more time than the global community can afford to wait to act on this issue. By using certain literature search platforms, the report may unintentionally exclude work being done by researchers in other countries who may be publishing in local journals or in their native languages. Anybody pursuing action on the environmental justice implications of plastics should therefore leverage local platforms to fill in these gaps and ascertain where more research is truly needed for that local or national context.

In writing this report, several critical data gaps were identified in the literature surrounding environmental justice and the impacts of plastic production, use, and disposal. Currently, much of the literature on environmental justice issues related to plastics focuses only on the local to national scales and is pre-dominantly U.S.-centric. To better understand the environmental justice implications of global dependence on plastics, future studies should focus on transboundary or international cases, and look to examples in other countries. One particularly data-deficient area is in fenceline community literature, for which non-U.S. examples of such communities is extremely rare.

Another data deficiency is in understanding the trade in plastics. Because different steps in the supply chain tend to be geographically isolated (i.e. oil extraction and oil refineries vs. plastic pellet production vs. primary product manufacturing, etc.), it is exceptionally difficult to track plastics through the supply chain. This makes estimating impacts in terms of emissions and pollution challenging. Future studies should endeavor to clarify these linkages so that better trade policy may be developed to address them. A related issue is tracking whether or not items that are put in the recycling bin are recycled at all or processed locally as opposed to being shipped

internationally. Clearer reporting on these practices can help identify and protect sacrifice zones from being unduly burdened by somebody else's waste.

While some studies have been conducted on what happens to plastics in different environmental contexts, there is still much uncertainty as to how conditions influence plastic degradation, especially in terms of the release of additives. In addition, as photodegradation in the marine environment seems particularly relevant in the context of trophic transfer, more studies are needed to understand how micro and nano plastics may be assimilated through the food web and into humans. Specifically, very little is known about the health effects of using and consuming plastics. A better understanding of these can inform smarter regulation with an emphasis on public health.

Furthermore, more in depth studies should be conducted on how to interpret and implement MEAs in accordance with international human rights obligations with a view to addressing environmental justice issues related to plastic pollution.

Lastly, it is critical to link specific types of microplastic pollution to regional waste management issues. The plastic problem is large, diffuse, and complex, which makes policy development to address it very difficult. More data on specific types of plastics and how they come to be found in the environment, as well as the impacts they have once there, can help decision makers to strategically target the worst offenders in their area and manage them accordingly. Some regions will likely need to improve solid waste management systems, while others will need to address synthetic textile production and end-of-life processes.

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