

Plastic's Resurgence Amidst the COVID-19 Pandemic

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Abstract: *Plastic is the world's primary defense against the spread of COVID-19 due to its disposability, versatility, and low-cost. Before the pandemic, there was growing international consensus regarding the mitigation of plastic waste, evidenced by the proliferation of plastic-related policies. The arrival of the pandemic, however, setback these efforts, causing delays, complications, and reversals to these policies. The oil industry hopes to capitalize on this increased reliance on plastic with their lobbying efforts against these policies being strengthened in the backdrop of the pandemic. Furthermore, record-low oil prices, triggered by the pandemic, have disrupted the recycling industry by making recycled plastic not viable when compared to virgin plastic. These developments are concerning considering that plastic consumption is exploding, waste management systems are crumbling, and plastic waste is being increasingly mismanaged.*

Keywords: COVID-19, Environmental Issues, Environmental Policy, Plastic, Waste Management

Introduction

The COVID-19 pandemic started as a health crisis but promptly evolved into an economic, social, and environmental threat.¹ At the advent of the pandemic, the World Health Organization (WHO) called for all industries and governments to increase plastic production by 40 percent to meet rising global demand.² With the world focused on prioritizing public health and mitigating social and economic impacts, the resurgence of plastic during the pandemic has been largely understated.

The pandemic arrived at a crucial point in the "war on plastic," as policy actions on plastic waste began to proliferate in governments across the world. The plastic-touting oil industry, which has been combatting these recent policies, found leverage during the pandemic. Due to its disposability, versatility, and cheapness, plastic has temporarily regained its foothold

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¹ Patricio Silva, Ana L., et al. "Increased plastic pollution due to COVID-19 pandemic: Challenges and recommendations." *Chemical Engineering Journal*, vol. 405, 1 Feb. 2021, 2 doi.org/10.1016/j.cej.2020.126683

² Hari Bhakta Sharma, et al. "Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic." *Resources, Conservation and Recycling*, vol. 162, Nov. 2020, 4 doi.org/10.1016/j.resconrec.2020.105052.

while playing a paramount role in the fight against COVID-19. In addition, delays and suspensions of bans on single-use plastics (SUPs) combined with mounting hygiene concerns has paved the way for a surge in the demand for plastic. Environmentalists are worried that the pandemic will permanently shift consumer behavior towards favoring plastic, foiling the recent progress made.³ This public health crisis will not last forever, but plastic can persist in the environment for centuries. The health of the planet has been placed on the backburner for some, with governments failing to confront the task of juggling the environmental crisis with COVID-19. There will be more pandemics and unforeseen disasters, and as the ongoing climate crisis worsens, it will become harder for governments to not give precedence to protecting the Earth.

Meanwhile, waste management and recycling industries are crippled with financial difficulties and logistical issues attributed to the pandemic. With waste processors unprepared and overwhelmed, a large portion of waste collected during the pandemic has been mismanaged, illegally dumped, or excessively landfilled. Environmentalists are equally concerned about the increasing environmental footprint of the pandemic. Paused plastic restrictions, a disrupted recycling and waste management industry, and increased plastic usage will worsen the pandemic's environmental footprint and contribute to a plastic pollution surge because the governments of the world are prioritizing human health over the environment's.

Growing Momentum in the Fight Against Plastic Waste

In recent years, growing consensus about the threat of plastic pollution materialized into increased plastic-related policy efforts. One hundred twenty-seven out of one hundred ninety-two countries (about 66 percent) have adopted some form of legislation to regulate plastic bags.⁴ In the World Trade Organization (WTO), the number of trade measures mentioning plastics increased annually by 28% over the past decade.⁵ Between 2009 and 2018, WTO members notified 128 measures affecting trade in plastics for environmental reasons, with 71 out of 128 notified in the last three years alone.⁶ A 2019 Plastic Waste Amendment to The Basel Convention, the only global legally binding instrument governing the transboundary movement

³ Sebastian Kahlert, and Catharina R. Bening. "Plastics recycling after the global pandemic: resurgence or regression?" *Resources, Conservation and Recycling*, vol. 160, Sept. 2020, doi.org/10.1016/j.resconrec.2020.104948.

⁴ United Nations, Environment Program. *Legal Limits on Single-Use Plastics and Microplastics: A Global Review of National Laws and Regulations*. 5 Dec. 2018, www.unenvironment.org/resources/publication/legal-limits-single-use-plastics-and-microplastics-global-review-national.

⁵ "Growing plastic pollution in wake of COVID-19: how trade policy can help." United Nations Conference on Trade and Development, 27 July 2020, unctad.org/news/growing-plastic-pollution-wake-covid-19-how-trade-policy-can-help.

⁶ Carolyn Deere Birkbeck. "Here's how the WTO can help address plastic pollution." World Economic Forum Annual Meeting, Jan. 2020, Davos-Klosters, Switzerland. *World Economic Forum*, 9 Jan. 2020, www.weforum.org/agenda/2020/01/wto-address-plastic-pollution/.

of plastic waste, expanded the scope of plastic waste covered by the Convention.⁷ In the European Union, a recent strategy towards a circular economy was improving plastic waste management. The European Parliament approved a “Single-Use Plastics Directive” banning SUPs by 2021.⁸ Furthermore, the recycling of plastic packaging is a central theme in the European Green Deal, which includes an investment of a trillion euros.⁹ Other international efforts include the United Nations Convention on the Law of the Sea (controlling plastic pollution of the marine environment), International Convention for the Prevention of Pollution from Ships (banning ships from dumping plastic at sea), Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), and the United Nations Global Partnership on Marine Litter (GPLM).¹⁰ With the momentum built up before the pandemic, it seemed that the international consensus was to address the plastic waste problem.

The Pandemic Pause

During the pandemic, governments favored disposability over sustainability as hygiene concerns pushed them to rescind their plastic policies. SUP bans have been delayed in Canada, Portugal, and Australia.¹¹ Italy postponed a tax on virgin plastics until 2021 while Scotland delayed its deposit return scheme of soft plastics until 2022.¹² The U.K. has also suspended its mandated plastic bag charge, and their ban on plastic straws, cotton buds, and stirrers has been delayed by six months.¹³ Singapore has given companies an extra year before they must submit plans for reducing the amount of packaging they use.¹⁴ California postponed the state's ban on single-use plastic bags to January 2021, suspended fees on single-use plastic bags, and approved a pause in the redemption of beverage containers in stores.¹⁵ In Massachusetts, Maine, Connecticut, Hawaii, Oregon, Delaware, New York, New Hampshire, and Oregon, reusable

⁷ *Actions to address Plastic Waste*. Basel Convention Conference of the Parties, 2019. *Basel.int*.

⁸ European Parliament, European Union. *Directive (EU) 2019/904*. Report no. L 155/1, 6 Dec. 2019. *Europa*, publications.europa.eu/resource/cellar/ab83570c-8cc8-11e9-9369-01aa75ed71a1.0006.03/DOC_1.

⁹ Kahler and Bening, “Plastics recycling after the global pandemic: resurgence or regression?”

¹⁰ Patrício Silva, Ana L., et al. “Rethinking and optimising plastic waste management under COVID-19 pandemic: Policy solutions based on redesign and reduction of single-use plastics and personal protective equipment.” *Science of the Total Environment*, vol. 742, 10 Nov. 2020, doi.org/10.1016/j.scitotenv.2020.140565.

¹¹ Silva, “Increased plastic pollution due to COVID-19 pandemic,” 5; Silva, “Rethinking and optimising plastic waste management under COVID-19 pandemic,” 3.

¹² Joana C. Prata, et al. “COVID-19 Pandemic Repercussions on the Use and Management of Plastics.” *Environmental Science & Technology*, vol. 54, no. 13, 12 June 2020, pp. 7760-65, 7762 doi:10.1021/acs.est.0c02178.

¹³ *Ibid.*

¹⁴ Kumar Raja Vanapalli, et al. “Challenges and strategies for effective plastic waste management during and post COVID-19 pandemic.” *Science of the Total Environment*, vol. 750, 1 Jan. 2021, 6 doi.org/10.1016/j.scitotenv.2020.141514.

¹⁵ Yee Van Fan, et al. “An update of COVID-19 influence on waste management.” *Science of the Total Environment*, vol. 754, 1 Feb. 2021, 4 doi.org/10.1016/j.scitotenv.2020.142014.

shopping bags have been restricted and fees and bans on SUPs have been postponed or suspended.¹⁶ These reversals to plastic policy may have damaging effects to the environment, but the governments of the world decided to prioritize the public's health over the environment - in a move that also benefits the oil industry.

Before the pandemic, the oil industry feared that climate change would decrease the demand for fossil fuels, with predictions that oil's share of transport energy falling from more than 90 percent in 2018 to just under 80 percent or as low as 20 percent by 2050.¹⁷ What was the oil industry's solution to this? Selling petrochemicals, the raw materials used to make plastic. Exxon Mobil has forecast that global demand for petrochemicals could rise by nearly 45 percent over the next decade.¹⁸ The industry is betting on the soaring use of plastic-based goods by millions of new middle-class consumers in emerging markets like Asia and Africa.¹⁹ Furthermore, the advent of new hydraulic fracturing (fracking) technologies, known as the "Shale Revolution," has led to a massive oil and gas boom in recent years. This fueled a plastic production boom in the U.S., where almost 350 new chemical plants are in the works.²⁰ These developments demonstrate how oil industry companies are betting on plastic as their next big source of profit.

Fearing that the proliferation of plastic policies will block these goals, the opportunistic industry is pushing back, arguing that SUPs are safer and more hygienic amid a pandemic.²¹ In a letter to the U.S. Department of Health, the CEO of the Plastics Industry Association asked "the department to speak out against bans on these products as a public safety risk and help stop the rush to ban these products by environmentalists and elected officials that puts consumers and workers at risk."²² Likewise, plastic and oil lobbyists in Turkey, Germany, and Italy are trying to seize the crisis by arguing for single-use plastics as an ultimate option for maintaining hygiene.²³ The industry's pandemic strategy is to bash plastic policies and bans that would protect the

¹⁶ Vanapalli, "Challenges and strategies for effective plastic waste management during and post COVID-19 pandemic," 6; Tabuchi, Hiroko. "In Coronavirus, Industry Sees Chance to Undo Plastic Bag Bans." *New York Times*, 26 Mar. 2020, www.nytimes.com/2020/03/26/climate/plastic-bag-ban-virus.html; Murphy, Heather. "California Lifts Ban on Plastic Bags Amid Virus Concerns." *New York Times*, 26 Apr. 2020, www.nytimes.com/2020/04/24/us/california-plastic-bag-ban-coronavirus.html.

¹⁷ Joe Brock. *The Plastic Pandemic*. 5 Oct. 2020. *Reuters*, www.reuters.com/investigates/special-report/health-coronavirus-plastic-recycling/.

¹⁸ Hiroko Tabuchi, et al. "Big Oil Is in Trouble. Its Plan: Flood Africa With Plastic." *New York Times*, 30 Aug. 2020, www.nytimes.com/2020/08/30/climate/oil-kenya-africa-plastics-trade.html.

¹⁹ Joe Brock, *The Plastic Pandemic*.

²⁰ Hiroko Tabuchi, "Big Oil Is in Trouble. Its Plan: Flood Africa With Plastic."; *Plastic and Climate*. Center for International Environmental Law, May 2019, www.ciel.org/plasticandclimate.

²¹ Adam Vaughan. "The Plastic Pandemic." *New Scientist*, vol. 247, no. 3295, 15 Aug. 2020, p. 11, doi:10.1016/s0262-4079(20)31391-9.

²² Tony Radoszewski. Letter to Alex Azar. 18 Mar. 2020. *Politico*, www.politico.com/states/f/?id=00000171-0d87-d270-a773-6fdfcc4d0000.

²³ Vanapalli, "Challenges and strategies for effective plastic waste management during and post COVID-19 pandemic," 6.

environment in order to eulogize plastic as the sole form of protection against COVID-19.

The Plastic Pandemic

A pandemic-induced economic slowdown, triggered by the decrease in water, land, and air transport, plummeted the demand for oil. In response, Russia, hoping to keep up with U.S. shale production, refused to cooperate with fellow OPEC (Organization of the Petroleum Exporting Countries) members. The resultant overproduction of oil ignited a price war with Saudi Arabia, which resulted in record-low oil prices.²⁴ This slump in oil prices is detrimental to the plastic recycling sector because it cuts the cost of new or virgin plastic, thus amplifying the price gap between virgin and recycled plastics.²⁵ In turn, even the most commonly recycled plastic item, drink bottles, has become less viable during the pandemic, since the recycled plastic to make them is now 83 percent to 93 percent more expensive than new bottle-grade plastic.²⁶

Due to the relative cheapness of virgin plastic, the reduced demand for recycled plastic devastated the recycling industry. Those businesses have shrunk by more than 20 percent in Europe, by 50 percent in parts of Asia, and as much as 60 percent for some firms in the U.S.²⁷ Across South and Southeast Asia, there was a 50 percent average drop in demand for recycled plastic. In the Philippines, Vietnam, and India, as much as 80 percent of the recycling industry was not operating during the height of the pandemic.²⁸ In the U.S., 34 percent of recycling companies were partially or completely closed as a result of decreased demand from industries and falling oil prices.²⁹ In China, the demand for recycled plastics dropped to 30-40 percent of pre-pandemic levels due to the cancellation of overseas orders.³⁰ And, in the Netherlands, collection and sorting companies raised prices or asked the public not to donate because of the financial difficulties in the markets for sorted textile and plastic packaging.³¹ Facing dire economic circumstances, recycling companies around the world, like many other types of businesses, have been incapacitated. With these recyclers not operating at normal levels, the

²⁴ Amy M. Jaffe, and Gabriela Hasaj. "Oil Price War: Is U.S. Shale The First To Blink?" *Energy Realpolitik and Energy Security and Climate Change Program*, Council on Foreign Relations, 19 Mar. 2020, www.cfr.org/blog/oil-price-war-us-shale-first-blink.

²⁵ Sharma, "Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic," 6.

²⁶ Joe Brock, *The Plastic Pandemic*.

²⁷ Joe Brock, *The Plastic Pandemic*.

²⁸ Joe Brock, *The Plastic Pandemic*.

²⁹ Prata, "COVID-19 Pandemic Repercussions on the Use and Management of Plastics," 7762.

³⁰ Sharma, "Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic," 2.

³¹ Marco Ragazzi, et al. "Municipal solid waste management during the SARS-COV-2 outbreak and lockdown ease: Lessons from Italy." *Science of the Total Environment*, vol. 745, 25 Nov. 2020, 4 doi.org/10.1016/j.scitotenv.2020.141159.

environment will surely be harmed.

On top of the financial difficulties facing recyclers, health concerns created disruptions as they struggled with the logistical challenge of waste management in a pandemic. In Tehran, Spain, Italy, and Eastern Europe, solid waste transfer stations and recycling facilities stopped completely due to the COVID-19 outbreak.³² In Brazil, about 90 percent of the municipal solid waste (MSW) recycled is collected by 800,000 waste pickers. When the Environmental Company of the State of São Paulo recommended the interruption of manual collection and sorting of recyclable materials in all municipalities within the state, waste pickers were asked to stop collecting.³³ Of Brazil's 504 municipalities: 26.3 percent reduced the frequency of waste delivery to recycling cooperatives, 24.9 percent temporarily suspended selective collection, and 12.7 percent already did not have selective collection implemented.³⁴ Singapore also reduced their frequency of recyclable waste collection.³⁵ In the UK, around 46 percent of the material recovery facilities have stopped or reduced their processes.³⁶ In Turkey, over 8,000 waste pickers were banned as part of COVID-19 containment measures.³⁷ On top of financial difficulties, recycling companies have to maintain their responsibility to protect their workers. This is another example of human health preceding environmental health during this global crisis.

Rising hygiene concerns and increasing pressure on healthcare systems led to an explosion of plastic waste during the pandemic lockdown. In Thailand, plastic waste soared from 1,500 to 6,300 tons daily as plastic waste increased by more than 15 percent overall.³⁸ The amount of plastic waste in Bangkok jumped 62 percent in April from a year earlier. A leading Thai petrochemical producer, posted a 33 percent year-on-year rise in sales of packaging materials and containers in the first quarter of 2020.³⁹ In the U.S., the consumption of SUP has

³² Kahlert and Bening, "Plastics recycling after the global pandemic: resurgence or regression?"; Zand, Ali Darya beigi, and Azar Vaezi Heir. "Emerging challenges in urban waste management in Tehran, Iran during the COVID-19 pandemic." *Resources, Conservation and Recycling*, vol. 162, Nov. 2020, doi.org/10.1016/j.resconrec.2020.105051.

³³ Carmenlucia Santos Giordano Penteadó, and Marco Aurélio Soares de Castro. "Covid-19 Effects on Municipal Solid Waste Management: What Can Effectively Be Done in the Brazilian Scenario?" *Resources, Conservation and Recycling*, vol. 164, Jan. 2021, 4, doi:10.1016/j.resconrec.2020.105152.

³⁴ *Ibid*, 5.

³⁵ Bhargavi N. Kularmi, and V. Anantharama. "Repercussions of COVID-19 Pandemic on Municipal Solid Waste Management: Challenges and Opportunities." *Science of the Total Environment*, vol. 743, Nov. 2020, 6, doi:10.1016/j.scitotenv.2020.140693.

³⁶ Mohit Somani, et al. "Indirect Implications of COVID-19 towards Sustainable Environment: An Investigation in Indian Context." *Bioresourcetechnology Reports*, vol. 11, Sept. 2020, 6 doi:10.1016/j.biteb.2020.100491.

³⁷ Samuel Asumadu Sarkodie, and Phebe Asantewaa Owusu. "Impact of COVID-19 pandemic on waste management." *Environment, Development and Sustainability*, Aug. 2020, doi.org/10.1007/s10668-020-00956-y.

³⁸ Prata, "COVID-19 Pandemic Repercussions on the Use and Management of Plastics," 7762; Sarkodie, Samuel Asumadu, and Phebe Asantewaa Owusu. "Impact of COVID-19 pandemic on waste management."

³⁹ Marimi Kishimoto. "Global drive to reduce use of plastics hits COVID-19 roadblock." *Nikkei*, 26 July 2020, asia.nikkei.com/Spotlight/Environment/Global-drive-to-reduce-use-of-plastics-hits-COVID-19-roadblock.

grown by 250-300 percent since the coronavirus broke out.⁴⁰ In late April the residential waste volume peaked nationally at about 20 percent higher than normal, with some localities experiencing an increase of more than 30 percent.⁴¹ In Athens, there has been a 150 percent increase in the amount of plastic found in the general-waste stream.⁴² Behavioral changes during lockdown, such as an increased reliance on food delivery/carry-out and online shopping, may be attributed to this. Before the pandemic, people could go to restaurants with washable plates and silverware. Now, food is often delivered or carried out in plastic bags with plastic Tupperware and plastic silverware wrapped in even more plastic. Before, one could use reusable bags, but with online shopping comes increased packaging. The plastic packaging bags, labels, and bubble wrap all must be disposed of, increasing the pandemic's environmental footprint.

Hospitals are also producing more plastic waste as medical professionals battle the pandemic on the frontline. Medical wastes increased by 350 percent in Catalonia, Spain, and by 370 percent in Hubei, China.⁴³ In Jordan, The King Abdullah University Hospital produced tenfold higher medical waste.⁴⁴ In India, Gurugram's medical wastes increased by 40 times while Ahmedabad's wastes doubled during the first phase of lockdown.⁴⁵ Hospital waste generation in Tehran also increased by 17.6 –61.8 percent during the pandemic.⁴⁶ In addition, the rise in plastic personal protective equipment (PPE) is equally concerning. For instance, in the UK, it is predicted that mask usage will add at least 60,000 tons of contaminated plastic to the general waste stream daily.⁴⁷ Increased demand for PPE is expected to be sustained beyond COVID-19 with an estimated compound annual growth of 20 percent in facial and surgical masks supply from 2020 to 2025.⁴⁸ With mask usage increasingly becoming a new social norm for some societies and the need to equip the world's medical professionals with PPE, it is highly unlikely that plastic reliance will drop back to pre-pandemic levels. So, what will happen to all this extra plastic waste?

⁴⁰ "Covid-19 has led to a pandemic of plastic pollution; Sea of troubles." *The Economist*, 22 June 2020.

⁴¹ Kulkarni and Anantharama, "Repercussions of COVID-19 Pandemic on Municipal Solid Waste Management," 2.

⁴² "Covid-19 has led to a pandemic of plastic pollution; Sea of troubles." *The Economist*.

⁴³ Jiri Jaromir Klemes, et al. "Minimising the present and future plastic waste, energy and environmental footprints related to COVID-19." *Renewable and Sustainable Energy Reviews*, vol. 127, July 2020, 2
doi.org/10.1016/j.rser.2020.109883.

⁴⁴ Silva, "Increased plastic pollution due to COVID-19 pandemic," 2.

⁴⁵ Somani, "Indirect implications of COVID-19 towards sustainable environment: An investigation in Indian context," 6.

⁴⁶ Daryabeigi Zand, and Heir, "Emerging challenges in urban waste management in Tehran, Iran during the COVID-19 pandemic."

⁴⁷ Sameep S. Shetty, et al. "Discarded Covid 19 gear: A looming threat." *Oral Oncology*, vol. 107, Aug. 2020, doi.org/10.1016/j.oraloncology.2020.104868.

⁴⁸ Neil J. Rowan, and John G. Laffey. "Unlocking the Surge in Demand for Personal and Protective Equipment (PPE) and Improvised Face Coverings Arising from Coronavirus Disease (COVID-19) Pandemic – Implications for Efficacy, Re-use and Sustainable Waste Management." *Science of the Total Environment*, vol. 752, Jan. 2021, 11, doi: 10.1016/j.scitotenv.2020.142259.

Plastic's resurgence amid the pandemic is concerning because about "80% of plastic will become landfilled or littered in natural environments during the coronavirus."⁴⁹ With landfilling and incineration (the optimal method for treating medical waste) being prioritized during the pandemic, considerable amounts of plastic are either being buried or burned; increasing the pandemic's environmental footprint.⁵⁰ For example, France switched from a separate to mixed collection of all household waste resulting in a waste stream that is more difficult to recycle and a larger share of material dumped in landfills or incinerated.⁵¹ In Tehran, incineration and composting of wastes has stopped and, instead, the collected MSW are being transported to the Aradkouh disposal site where approximately 7,500 tons of urban wastes are now being landfilled every day without undergoing any separation or treatment. Consequently, the landfilling of wastes in Tehran has increased by 34.7 percent.⁵² This spike in landfilling and incineration will create more plastic pollution and cause further harm to the environment.

The low recycling rate of plastic waste in recent years, along with the pandemic-induced waste surge, is exacerbating the threat of mismanaged wastes and makes sustainable waste management more difficult.⁵³ Before the pandemic, global recycling rates of waste plastics were at 16 percent while the remaining plastics were either incinerated (25 percent), landfilled (40 percent), or leaked into the environment due to mismanagement (19 percent).⁵⁴ In Indonesia, 60-70 percent of generated waste is transported to landfills, while the remaining 30-40 percent ends up in rivers, burned, or independently managed by the community. In India, more than 70 percent of waste generated in cities are land disposed. And in the US more than 50 percent of the MSW generated is landfilled.⁵⁵ Waste management was already abysmal before the pandemic yet, governments are relaxing environmental regulations in the wake of the pandemic, making the plastic problem worse. For example, the U.K. Environment Agency temporarily allowed the storage of waste at sites that have not been granted a permit.⁵⁶ Additionally, disrupted waste services have increased waste mismanagement. For instance, the 300 percent increase in illegal dumping in rural UK communities and the Irish government's million-euro plan to tackle illegal dumping are both attributed to the COVID-19 crisis.⁵⁷ Littered PPE has also piqued concern

⁴⁹ Ibid.

⁵⁰ Silva, "Rethinking and optimising plastic waste management under COVID-19 pandemic," 4.

⁵¹ Kahlert and Bening, "Plastics recycling after the global pandemic: resurgence or regression?"

⁵² Darya beigi Zand, and Heir, "Emerging challenges in urban waste management in Tehran, Iran during the COVID-19 pandemic."

⁵³ Fan, "An update of COVID-19 influence on waste management," 3.

⁵⁴ Vanapalli, "Challenges and strategies for effective plastic waste management during and post COVID-19 pandemic," 4.

⁵⁵ Kulkarni and Anantharama, "Repercussions of COVID-19 Pandemic on Municipal Solid Waste Management," 3.

⁵⁶ Siming You, et al. "COVID-19's Unsustainable Waste Management." *Science*, vol. 368, no. 6498, 25 June 2020, 1438, doi:10.1126/science.abc7778.

⁵⁷ Sarkodie, Asumadu, and Owusu, "Impact of COVID-19 pandemic on waste management," *Environment, Development and Sustainability*, Aug. 2020, doi.org/10.1007/s10668-020-00956-y; You, Siming, et al. "COVID-19's Unsustainable Waste Management."

from environmentalists. The Worldwide Fund for Nature (WWF) reports that “if even only 1% of the masks were disposed of incorrectly... this would result in 10 million masks per month dispersed in the environment.”⁵⁸ Already, a large number of face masks are being found on Nigeria’s highways and drainage systems, while in Hong Kong face masks are becoming a common sight on its beaches and nature trails.⁵⁹ Unsightly beaches are a harbinger when compared to the bigger picture because pollution that is seen is just only the tip of the iceberg.

Mismanaged waste disproportionately threatens the world’s poor during the pandemic because “secondary contagion from improper waste management is probable in developing countries.”⁶⁰ Already, the underdeveloped waste management system leaves approximately 2 billion people without access to waste collection and approximately 3 billion without controlled waste disposal facilities.⁶¹ The aforementioned waste facility disruptions and closures will only increase this pre-pandemic number. Worse, open dumps, ubiquitous in developing countries, are notorious for plastic leakages because light plastic materials are easily swept by rain or wind into the natural environment. With 93 percent of waste going into open dumps in low-income countries, the resultant excess leakage can become vectors for the virus and threaten public health.⁶² Regarding medical wastes, overwhelmed countries and municipalities might be forced to apply inappropriate management strategies, likely creating adverse environmental and public health outcomes. For example, some Indian municipalities have been following a flawed system of medical waste disposal and management relying on landfilling and local burning strategies amid the pandemic.⁶³ With the vaccine rollout favoring wealthier countries, the world’s poor will be subject to the pandemic longer than those in highly developed countries. As the battle against COVID-19 rages on, waste management systems should be monitored to avoid societies being further devastated by unforeseen consequences of the pandemic.

Conclusion

Because the governments of the world are prioritizing human health over the environment’s, the pandemic’s impact - paused plastic restrictions, a disrupted recycling and waste management industry, and increased plastic usage - will ultimately worsen COVID-19’s

⁵⁸ “Responsibility is required when disposing of masks and gloves.” *World Wide Fund for Nature*, 29 Apr. 2020, www.wwf.it/scuole/?53500%2FNello-smaltimento-di-mascherine-e-guanti-serve-responsabilita.

⁵⁹ Saddam Akber Abbasi, et al. "Extensive use of face masks during COVID-19 pandemic: (micro-)plastic pollution and potential health concerns in the Arabian Peninsula." *Saudi Journal of Biological Sciences*, 2020, doi:10.1016/j.sjbs.2020.09.054.

⁶⁰ Zand, Daryabeigi, and Heir, "Emerging challenges in urban waste management in Tehran, Iran during the COVID-19 pandemic."

⁶¹ Sameep S. Shetty, et al. "Discarded Covid 19 gear: A looming threat." *Oral Oncology*, vol. 107, Aug. 2020, doi.org/10.1016/j.oraloncology.2020.104868.

⁶² "Covid-19 has led to a pandemic of plastic pollution; Sea of troubles." *The Economist*, 22 June 2020.

⁶³ Silva, "Increased plastic pollution due to COVID-19 pandemic," 3.

environmental footprint and contribute to a plastic pollution surge. This development raises concern that the pandemic will negate all the environmental developments achieved through global consensus over the past few decades. However, some government actions suggest

otherwise. Notably, the European Union promised 25 percent of its economic stimulus package to climate-friendly measures and is still persistent to its single-use plastic directive deadline of 2021, despite pressure from the plastic industry to postpone. Kenya, Burundi, Rwanda, Tanzania, and Uganda are still pursuing their policies like bans and tipping fees to contain plastic pollution. Moreover, some states in the U.S., and several countries, including Canada, are still on track with their plans to ban plastic bags by 2021.⁶⁴ To conclude, the COVID-19 pandemic precipitated the resurgence of plastics, but there is still momentum in the fight against plastic pollution.

⁶⁴ Vanapalli, "Challenges and strategies for effective plastic waste management during and post COVID-19 pandemic," 6.

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