Vol 5 No 2 June 2024 Pages 60-65 e-ISSN 2708-5694

Journal of Agriculture, Food and Environment (JAFE)

Journal Homepage: https://journal.safebd.org/index.php/jafe

https://doi.org/10.47440/JAFE.2024.5210

Mini Review

Global and Bangladesh Perspective on Covid-19 Plastic Pollution: A Hindrance in Achieving Sustainable Development Goals

Tasneem KA*

Department of Environmental Science, Asian University for Women, Chattogram 4000, Bangladesh

Article history

Received: 13 April 2024

Revised: 12 June 2024

Accepted: 25 June 2024

Published online: 30 June 2024

***Corresponding author**

Tasneem KA, E-mail: tasneem.kazi512@gmail.com

Keywords

Plastic, Waste, Management, Bangladesh, PPE, Marine pollution, Climate Change, SDG

How to cite: Tasneem KA (2024). Global and Bangladesh Perspective on Covid-19 Plastic Pollution: A Hindrance in Achieving Sustainable Development Goals. J. Agric. Food Environ. 5(2): 60-65.

A B S T R A C T

In the current COVID-19 pandemic, besides the millions of deaths and economic stagnation, isolation, and psychological stress, the global environment faces a new challenge; How to deal with plastic pollution? Before the pandemic, the world was already facing challenges in dealing with the huge amount of plastic waste, where over 70 percent was not managed and just thrown in the ocean, threatening the aquatic environment and its habitats. Now, due to the pandemic, plastic consumption will increase as PPE (Personal Protective Equipment) consists of plastics. However, there are no plastic waste management initiatives to deal with the huge amount of waste generated due to the pandemic. In this paper, I will highlight the disruption of plastic waste management due to COVID-19 from the perspective of global and Bangladesh, how plastic pollution is harmful to both land and aquatic environments, and how there are possibilities of not meeting SDG-14.1 in 2025 due to the climate funding gap. Lastly, the paper will also provide recommendations and further possible areas of improvement in plastic waste management.

INTRODUCTION

COVID-19 Plastic Pollution: Condition of both Global and Bangladesh

The increasing human attachment to plastic due to its lightweight, versatility, low cost, and sturdiness has led to an increase in marine plastic pollutants. As a result, plastic production reached over 350 million tons in 2018, with over 90% made from artificial polymers. This excessive use and resistance to degradation pose a significant environmental problem. There are various plans have been proposed to prevent plastic waste leak into the environment around the world and minimize its impact. And to reduce plastic waste, a ban on single-use plastic and reusable bags has been implemented. However, the COVID-19 pandemic has increased plastic production, making managing plastic waste a significant challenge (Issifu & Sumaila, 2020; Shams *et al.*, 2021).

Plastic Production before and after COVID-19 Crisis

The marine environment contains two types of plastics: macroplastics and microplastics. Macroplastics are large wastes released into the environment, while microplastics are small particles less than 5 mm in size. These substances can be intentionally added to products such as scrubs, toiletries, cosmetics, shower gels, etc (Boucher & Billard, 2019). The pandemic has led to an increase in single-use plastics due to the clean lifestyle and lockdowns, resulting in panic buying and increased demand for packaging. The disposable face mask market grew from $800 million in 2019 to $166 billion in 2020. The US is expected to increase plastic usage by 10% in 2021 (Shams *et al.*, 2021). Bangladesh's plastic manufacturing sector is growing at a rate of about 20% annually, but the COVID-19 pandemic has added to the already struggling waste management system. During the first month of the pandemic, over 14,000 tons of hazardous plastic garbage were generated, with Bangladesh ranking top

among Asian countries with a daily generation rate of close to 450 tons of COVID-19-associated waste (Shams *et al.*, 2021).

Threats of Plastic Pollution

Plastic pollution, affecting aquatic ecosystems, societies, and economies, directly impacts shipping, fishing, aquaculture, tourism, and recreation. The annual negative impact on oceans is estimated to be at least $8 billion, with 4.8 to 12.7 million tons of land-based plastic waste reaching the ocean each year (Löhr *et al.*, 2017). Plastic garbage has destroyed the marine ecosystem and, is a major threat to marine life. Because plastic goods might be mistaken for jellyfish, which are a favorite meal of sea turtles, "marine plastic pollution kills over 0.1 million marine animals and turtles each year" (Shams *et al.*, 2021).

The occurrence of the COVID-19 pandemic has had immense effects on plastic recycling plants across the globe, leading to a rise in unlawful waste disposal both in oceans and on land. When they are broken down due to loss of mechanical integrity and degradation, single-use plastics turn into micro-plastics which endanger life underwater. Marine debris entanglement causes whale death as well as fish and plant contamination among 260 other species according to Greenpeace. These species do not digest plastics and this leads to their incorporation in our food chain. Disposable plastics often carry toxic materials such as phthalates and bisphenol which are associated with various diseases in men like prostate cancer, breast cancer, ovarian chromosomal damage, infertility, type-2 diabetes etcetera. Already the burden is too heavy before COVID-19 on plastic management waste (Ali *et al.*, 2021; Shams *et al.*, 2021).

Objectives

The primary objective of this study is to make people acknowledge the fact that COVID-19 plastic pollution is the current obstacle to achieving SDG targets by providing enough evidence and spreading the knowledge to the potential target audience regarding it. The secondary objectives of this study are:

- Addressing the pandemic plastic pollution issues to the audience
- Locating the areas that contribute most to plastic pollution and finding out the reasons behind it
- Recommending possible cost-friendly solutions that may Upgrade the conditions of the affected environments as well as ecosystems

Covid-19 Crisis and Raising Plastic Pollution

The global demand for plastic products is increasing, with 6.3 billion tons of primary and secondary plastic waste generated between 1950 and 2015. Countries contributing the most to plastic waste are China, Indonesia, the Philippines, Vietnam, and Sri Lanka, with over 50% being plastic (Rhodes, 2018). A 2020 paper stated that the COVID-19 pandemic has disrupted plastic waste management, with increased use of personal protective equipment (PPE) among healthcare workers and single-use surgical masks. The lockdown has led to increased online shopping and grocery shopping, resulting in increased usage of plastic packaging and bags. Mixed plastics, such as single-use masks, pose a potential environmental threat due to their "flexibility, durability, water resistance, and affordability" (Vanapalli *et al.*, 2020). Littering PPE and plastic litter in open environments can cause sewage system blockage, negatively affect water percolation, and potentially provide breeding grounds for zoonotic diseases like dengue and Zika (Patricio *et al.*, 2020). The government promoted PPE use through public awareness campaigns and implemented a rule requiring mask use to restrict COVID-19 spread in Bangladesh. Plastic face masks and other PPE are known to be potential sources of microplastic fibers (Islam *et al.*, 2020). The potential threats that PPE-related waste poses to the environment and human health are shown in **Figure 1** (Islam *et al.*, 2020).

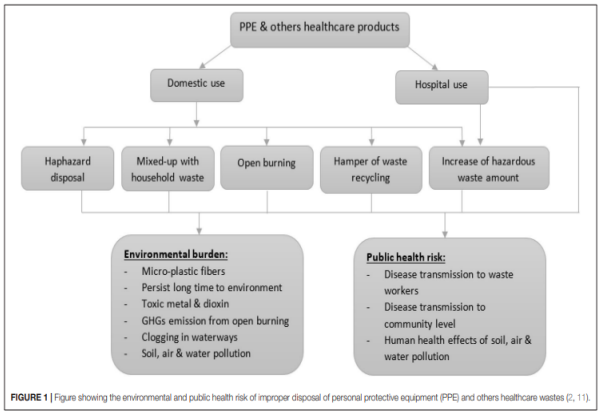

*photo taken from (Islam *et al.*, 2020, p. 2)

A study in Bangladesh has found that COVID-19 personal protection equipment, including face masks, is being contaminated by plastics in over 70% of ponds in the Muktagacha upazila. This pollution results in an estimated 60 pieces of macro-plastic pollution per 5 square meters. The study also highlighted the potential environmental impact of careless disposal of worn masks and improper waste management. With over 2 billion facemasks required monthly by Bangladesh's 160 million residents, the country is expected to produce over 150,000 MT of Covid waste from PPEs, with over 20% (36,987 MT) coming from surgical masks. (Fig 2) (Hasan *et al.*, 2021).

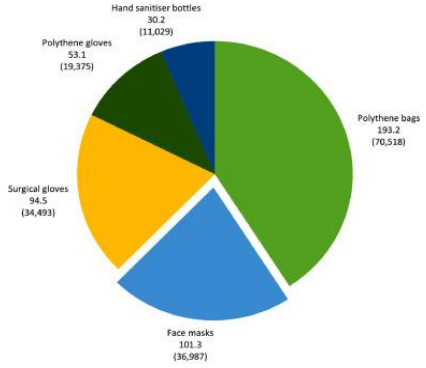

Figure 1: "Estimated non-degradable waste production in Bangladesh, broken down by the most common types of PPEs used. Values shown are metric tonnes per day (MT per year). (Adapted from ESDO, 2020)". Photo taken from (Hasan *et al.*, 2021, p. 4)

Climate Change as a Compounding factor in Plastic Pollution

Plastic production has grown significantly since 1950, emitting more greenhouse gases than ever before. The growth rate is 8.4%, which is quite concerning considering the harmful effects of plastics. If the growth continues, plastic production will reach over 50 billion metric tons, accounting for 10-13% of the remaining carbon budget (Ford *et al*., 2022). The industry is divided into three categories: "plastic production, transport, use, plastic disposal, mismanaged waste, and degradation, and bio-based plastics" (Ford *et al*., 2022). Plastic refining is a costly and environmentally damaging process. Even though recycling is one way of being sustainable, besides being expensive, it needs a lot of energy, so sometimes it ends up providing low-quality plastics. Bio-based plastics, made from renewable plant feedstock, offer lower emissions and could save over 200-300 million metric tons. However, bio-based plastics require land and can reduce over 10% of agricultural species (Ford *et al*., 2022).

The face mask or other plastic garbage will be broken up and degraded during this voyage, shifting in size from "macro-scale debris (≥ 5 mm) to micro (< 5 mm), and lastly nano size debris (1-100 nm)" (Hasan *et al*., 2021). They are consequently available to a wide variety of creatures and ecosystems due to their large particle sizes, and they can cause harm (Hasan *et al*., 2021). Face masks that have been improperly disposed of will probably cause more trouble for the water habitats than the terrestrial ecosystem. Face masks' ability to absorb water and subsequent partial submersion in water would further hamper their decomposition in comparison to other floating plastic objects. Microplastics made of PP and PE fibers from deteriorating face masks may fill a variety of aquatic habitats. Previous research has shown that microplastics are present in the intestines of various aquatic creatures, and also these are found in the stomachs of some commercial fish (Hasan *et al*., 2021). This shows that microplastics could spread from predatory birds to people through seafood eating and then back into terrestrial ecosystems. Following their “radiation, ultrasonic wave action, and other physical, chemical, and biological processes", these MP polymers survive in terrestrial and aquatic environments for 100-1000 years (Hasan *et al*., 2021).

COVID-19 Plastic Pollution: Creating Obstacles in achieving Sustainable Development Goals

The article discusses the impact of microplastics on various goals, including goal-2, goal-3, goal-6, goal-9, and goal-13. Microplastics in agricultural soils and aquatic biota pose potential health risks through ingestion of food products. Goal 3 aims to "ensure healthy lives and promote well-being for all ages", while goal 6 focuses on "sustainable water and sanitation management" (Walker, 2021). The article also highlights the challenges of "implementing sustainable water and sanitation management" due to the high number of microplastic particles entering wastewater treatment plants (Walker, 2021). Goal-9 focuses on "building resilient infrastructure and promoting inclusive industrialization", but the article highlights the threat of fossil fuel-based plastic production and waste, which contributes to over 400 million tons of Carbon dioxide emissions annually (Walker, 2021). Goal-13 emphasizes the urgent need to "combat climate change and conserve resources", but microplastic pollution is not recognized (Walker, 2021). Goal-15 aims to "protect terrestrial ecosystems, manage forests, combat desertification, and halt biodiversity loss", but the lack of monitoring indicators makes achieving these goals challenging (Walker, 2021).

Bangladesh, the fifth largest aquaculture producer in the country, faces challenges from microplastics, which pose a threat to freshwater fish, migratory fish, and crustaceans. A field investigation in Muktagacha, Mymensingh, found that over 70% of ponds were filled with plastic material, including discarded plastic bottles, containers of personal care products, plastic bags, leftover chemicals, and face masks. Over 60 major sources of microplastics were found per five square meters of aquaculture ponds (Hasan *et al*., 2021). A 2021 study revealed that COVID-19-related medical waste in Bangladesh increased significantly from March 2020 to June 2020. The lockdown imposed by the government reduced fatalities and infection rates, but the removal of the lockdown led to a doubled fatality and infection rate due to negligence and poor safety practices. Garbage production also increased in June and July 2020. The second wave of transmission reached its peak in April 2021, with the number of sick patients increasing, contributing to the largest waste creation. Quarantined individuals produced less than 20% of garbage, while infected individuals produced over 80%. Since September, there have been fewer infected, isolated, and quarantined patients, resulting in a decrease in waste production (Chowdhury *et al*., 2022).

Table 5
Estimated monthly COVID-19 related waste generated in Bangladesh.

Year	Month	Infectious waste ton	ICU waste ton	Deceased patient waste ton	Isolation waste ton	Quarantine waste ton	Total medical waste ton
2020	March	5.38	NA	0.53	37.84	614.33	658.08
	April	777.04	NA	16.63	144.84	707.68	1646.19
	May	4161.82	NA	50.80	610.7	615.65	5438.97
	June	10,029.66	NA	115.57	801.92	640.20	11,587.35
	July	10,123.46	34.90	137.02	1929.87	581.31	12,806.56
	August	8009.66	31.73	122.80	2101.90	534.18	10,800.27
	September	5224.54	29.90	99.04	1535.81	427.45	7316.74
	October	4509	8.87	68.54	476.95	206.43	5269.79
	November	5767.90	11.93	73.54	522.44	249.9	6625.71
	December	5120.12	13.71	96.44	535.85	251.72	6017.84
2021	January	2279.70	16.86	59.87	29.87	148.34	2534.64
	February	1054.53	6.28	26.75	15.58	89.81	1192.95
	March	6859.33	26.67	67.25	44.47	223.56	7221.28
	April	15,079.37	47.33	245.21	178.25	614.58	16,164.74
	May	4364.40	12.86	123.21	124.19	364.26	4988.92

*Photo taken from (Chowdhury *et al*., 2022)

Lockdowns have increased municipal, medical, online shopping, and food delivery waste, contributing to soil erosion, water, and air pollution. Some countries, including the US, have decreased waste recycling rates due to virus spread concerns. Over 30,000 waste collectors in Bangladesh lack personal protective equipment, making disposal difficult. The increased use of personal protective equipment has led to an increase in plastic waste, with Singapore producing over 1000 tons during lockdown. Waste management facilities are under additional stress due to lockdowns, with hand gloves, plastic gloves, surgical gloves, and polythene bags contributing to over 5000 tons of garbage (Chowdhury *et al*., 2022).

Progress of Different Sustainable Development Goals (SDGs) in Global and Bangladesh

The Sustainable Development Goals aim to create a better world by addressing 17 goals, including ending poverty, protecting the planet, and ensuring health, justice, and prosperity for all. SDG-14 (14.1) focuses on preventing and significantly reducing marine pollution by 2025. Reducing marine pollution enhances food security (SDG 2), protects coastal and marine ecosystems, and improves "human health and well-being" (SDG 3) (Le Blanc, 2017). It supports decent work and economic growth in industries like tourism and has the potential to support climate change adaptation by increasing the sensitivity of marine ecosystems, particularly coral reefs, to climate change effects. Actions related to six other SDGs (6, 8, 9, 11, 12, and 15) can directly impact this endeavor by decreasing ocean waste from ground activities (Le Blanc, 2017).

Earth observation is crucial for SDG-14's goals "14.1, 14.2, 14.3, 14.4, 14.6, and 14. a", and essential measures (Virto, 2018). However, most indicators are not accessible, making monitoring difficult. Indicators for eight out of ten of the SDGs for this objective are thus not currently accessible, which is higher than 50 percent for all SDG indicators. Monitoring human effects on oceans is challenging due to information gaps on pollution, such as marine debris, plastics, and heavy metals. Air pollution's effects on oceans are less well-known, and ocean acidification is less understood. A review process should evaluate progress and offer incentives for best practices and peer learning, informed by SDG indicators (Virto, 2018).

The Ministry of Environment, Forests, and Climate Change (MOEF) in Bangladesh was renamed in 2018 to address climate change and was designated as the main point of contact for environmental sustainability in the National Environmental Policy of 2018. However, the ministry is only partially achieving 25 of the 169 SDGs, with its main responsibility being sustainable goals 13, 14, and 15. Deforestation rates have been over 0.40% from 1930 to 2015, causing ongoing habitat destruction. It was discovered that from 2014 to 2016, the Ministry carried out very few initiatives related to ecotourism, rubber plantations, social forestation, afforestation, better cooking stoves, development of recently recognized areas, and re-excavation of canals and ponds (Rahman, 2021). However, to meet the targets of "1.5, 2.5, 6.3, 6.5, 6.6, 11.6, 11.7, 12.2, 12.4, 12.5, 13.1, 13.2, 13.3, 14.1, 14.2, 14.3, 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 16.5, 16.6, 16.7, 16.8, 17.6, and 17.7", the Ministry has not taken any noteworthy effort (Rahman, 2021). In a way, there was hardly any attention given to SDG 14.1 in Bangladesh.

Policies Supporting Sustainable Development Goals (SDGs) in Global and Bangladesh

The Marine Debris Treatment Program, led by Nancy Wallace of the National Oceanic and Atmospheric Administration (NOAA), aims to focus on "prevention, research, and reducing the effects of marine debris" (Wallace, 2016). Wallace asserts that human activity is the sole cause of marine trash, and emphasizes the need for action. NOAA supports community trash disposal initiatives to repair harmed habitats and prevent further harm. She emphasizes prevention as the most crucial long-term strategy, along with increasing community awareness, teacher training, and improved waste management infrastructure. Wallace also emphasizes the importance of global initiatives like the Global Partnership on Marine Litter, which allows for the free disposal of used fishing gear (Wallace, 2016).

Bangladesh had a major flood in 1988 that caused a lot of damage as a result of marine plastic pollution. The government's inquiry revealed that plastic bag rubbish made the flood worse. In 1990, the Environment and Social Development Organization spearheaded the first countrywide campaign against plastic bags. However, it was not considered successful, as only 15 percent of over 9 million plastic bags were in the dustbin in a year. After the 1998 flood, everyone, including consumers' producers and exporters, fiercely fought for a public ban. Although the Bangladesh government initiated the ban in the capital area, it spread into a national-wide ban on "single-use plastic bags" in 2002 due to strong public support (Kapinga & Chung, 2020). As per the prohibition, the offenses of manufacturing, import, and selling were subject to a ten-year rigorous jail sentence, a one million taka fine, or both. A six-month sentence of rigorous prison or a ten thousand takas fine, or both, was issued for the "sale, exhibition, storing, distribution, transportation, or use of plastic bags for commercial purposes" (Kapinga & Chung, 2020).

Possibilities of not able to achieve Target- 14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

There has been a marked high rise in plastic pollution during this COVID-19 pandemic, especially along tourist beaches. These are sites that host 2 million vacationers at the height of their calendar causing an increase in rates of wrongful disposal of personal protective equipment (PPE). Most PPEs found within these localities are thought to be originating from illegal dumping areas. Waste production in Chittagong continues to increase despite inadequate municipal solid waste management systems. Plastic pollution is likely to get worse at Cox's Bazar due to a lack of adequate financing and human capacity. No steps have been taken by the government on this issue (Rakib *et al*., 2021; Rahman, 2021).

The SDG-14 target is unlikely to be achieved by developing and under-developed countries due to high costs. A 2020 study found that over $170 billion is needed annually for

SDG-14 implementation, compared to only $25 billion at the 2017 UN Ocean Conference. Additionally, 80 billion would be needed annually to meet Aichi Objective 8 on pollution (Johansen & Vestvik, 2020). So, if the funding gap continues, it is likely impossible to achieve SDG-14.1 by 2025.

CONCLUSION AND RECOMMENDATION

We might lessen marine plastic pollution by addressing climate change. So, we need to preserve and rehabilitate blue-carbon coastal habitats like seagrass meadows and salt marshes. Also, Mangroves act as a barrier against plastic litter diffusion, preventing annual increases in carbon dioxide emissions (Ford *et al*., 2022). However, efforts have been hindered by factors such as "national interest, human psychology, and uncertainty" (Hossain *et al*., 2021). To address marine plastic pollution, the author suggests that countries should raise awareness, launch programs for collecting plastic debris, strengthen research cooperation, expand funding for biodegradable polymers, and provide specialized tax breaks (Hossain *et al*., 2021). The Government should encourage the use of biodegradable plastic items produced by Trims Sourcing, Expo Accessories, Captains Group, and Ecospear Pvt Company Ltd, to mitigate plastic pollution in Bangladesh (Hossain *et al*., 2021). Plastic pollution before COVID-19 was already a burden, now it needs urgent action as pollution has become worse after the pandemic. Without solving this issue, we can never reach SDG-14.1 and create obstacles in achieving other SDGs as well. So, in the end, public support is essential to implement the policies as well.

REFERENCES

Ali M, Bhuiyan AM & Gayen TK 2021: Rise in Single-Use Plastic Pollution amid COVID-19 Pandemic: Bangladesh Perspective. *Journal of Agriculture, Food and Environment*, **02**(02), 80–84. https://doi.org/10.47440/jafe.2021.2214

Boucher J & Billard G 2019: The challenges of measuring plastic pollution. *Field Actions Science Reports. The Journal of Field Actions*, (Special Issue 19), 68-75. https://journals.openedition.org/factsreports/5319#tocto1n2

Chowdhury H, Chowdhury T & Sait SM 2021: Estimating marine plastic pollution from COVID-19 face masks in coastal regions. *Marine Pollution Bulletin*, *168*, 112419. https://doi.org/10.1016/j.marpolbul.2021.112419

Chowdhury T, Chowdhury H, Rahman MS, Hossain N, Ahmed A & Sait SM 2022: Estimation of the healthcare waste generation during COVID-19 pandemic in Bangladesh. *Science of the Total Environment*, *811*, 152295. https://doi.org/10.1016/j.scitotenv.2021.152295

Ford HV, Jones NH, Davies AJ, Godley BJ, Jambeck JR, Napper IE & Koldewey HJ 2022: The fundamental links between climate change and marine plastic pollution. *Science of the Total Environment*, *806*, 150392. https://doi.org/10.1016/j.scitotenv.2021.150392

Hasan NA, Heal RD, Bashar A & Haque MM 2021: Face masks: protecting the wearer but neglecting the aquatic environment?-A perspective from Bangladesh. *Environmental Challenges*, **4**, 100126. https://doi.org/10.1016/j.envc.2021.100126

Hossain S, Rahman MA, Chowdhury MA & Mohonta SK 2021: Plastic pollution in Bangladesh: A review on current status emphasizing the impacts on environment and public health. *Environmental Engineering Research*, **26**(6). https://www.eeer.org/upload/eer-2020-535.pdf

Islam SDU, Safiq MB, Bodrud-Doza M & Mamun MA 2020: Perception and attitudes toward PPE-related waste disposal amid COVID-19 in Bangladesh: an exploratory study. *Frontiers in Public Health*, **8**, 592345. https://doi.org/10.3389/fpubh.2020.592345

Issifu I & Sumaila UR 2020a: A Review of the Production, Recycling and Management of Marine Plastic Pollution . *Journal of Marine Science and Engineering*. 2020. https://doi.org/10.3390/jmse8110945

Johansen DF & Vestvik RA 2020: The cost of saving our ocean - estimating the funding gap of sustainable development goal 14. *Marine Policy*, *112*, 103783. https://doi.org/10.1016/j.marpol.2019.103783

Kapinga CP & Chung SH 2020: *MARINE PLASTIC POLLUTION IN SOUTH ASIA*. United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). https://repository.unescap.org/bitstream/handle/20.500.12870/915/ESCAP-2020-WP-Marine-plastic-pollution-in-South-Asia.pdf?sequence=1&isAllowed=y

Le Blanc D, Freire C & Vierros M 2017: Mapping the linkages between oceans and other Sustainable Development Goals: a preliminary exploration. https://doi.org/10.18356/3adc8369-en

Löhr A, Savelli H, Beunen R, Kalz M, Ragas A & Van Belleghem F 2017: Solutions for global marine litter pollution. *Current Opinion in Environmental Sustainability*, *28*, 90–99. https://doi.org/10.1016/j.cosust.2017.08.009

Parker L 2018: A whopping 91% of plastic isn't recycled. *National Geographic Society*. https://www.nationalgeographic.com/science/article/plastic-produced-recycling-waste-ocean-trash-debris-environment

Patrício Silva AL, Prata JC, Walker TR, Duarte AC, Ouyang W, Barcelò D & Rocha-Santos T 2020: Increased plastic pollution due to Covid-19 pandemic: challenges and recommendations. Chemical Engineering Journal, 126683. doi:10.1016/j.cej.2020.126683. https://doi.org/10.1016/j.cej.2020.126683

Rahman MM 2021: Assessing the progress and pitfalls of the Ministry of Environment, Forest, and Climate Change in achieving SDGs in Bangladesh. *Bangladesh Journal of Public Administration*, **29**(2), 140-158. https://doi.org/10.36609/bjpa.v29i2.228

Rhodes CJ 2018: Plastic Pollution and Potential Solutions. *Science Progress*, 207–260. https://doi.org/10.3184/003685018X15294876706211

Rakib MRJ, De-la-Torre GE, Pizarro-Ortega CI, Dioses-Salinas DC & Al-Nahian S 2021: Personal protective equipment (PPE) pollution driven by the COVID-19 pandemic in Cox's Bazar, the longest natural beach in the world. *Marine pollution bulletin*, **169**, 112497. https://doi.org/10.1016/j.marpolbul.2021.112497

Saadat S, Rawtani D & Hussain CM 2020: Environmental perspective of COVID-19. *Science of the Total Environment*, 138870. https://doi.org/10.1016/j.scitotenv.2020.138870

Shams M, Alam I & Mahbub MS 2021: Plastic pollution during COVID-19: Plastic waste directives and its long-

term impact on the environment. *Environmental advances, 5,* 100119. https://doi.org/10.1016/j.envadv.2021.100119

Sustainable Development Goals 2022: https://www.who.int/europe/about-us/our-work/sustainable-development-goals

Vanapalli KR, Sharma HB, Ranjan VP, Samal B, Bhattacharya J, Dubey BK & Goel S 2020: *Challenges and strategies for effective plastic waste management during and post COVID-19 pandemic. Science of The Total Environment, 141514.* https://doi.org/10.1016/j.scitotenv.2020.141514

Virto LR 2018: A preliminary assessment of the indicators for Sustainable Development Goal (SDG) 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development". *Marine Policy*, *98*, 47-57. https://doi.org/10.1016/j.marpol.2018.08.036

Walker TR 2021: (Micro) plastics and the UN sustainable development goals. *Current Opinion in Green and Sustainable Chemistry*, 100497. https://doi.org/10.1016/j.cogsc.2021.100497

Wallace N 2016: *United Nations Informal Consultative Process on Oceans and the Law of the Sea, New York*. the International Institute for Sustainable Development (IISD). https://enb.iisd.org/events/icp-17/summary-report-13-17-june-2016