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# Climate Change And Covid-19: A Blessing In Disguise Or A Health Hazard

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## Abstract

Climate change has now been linked to dozens of extreme weather events and temperature anomalies. The effects on health are posing elevated risk across many impact areas: infectious diseases, cardiovascular, respiratory and mental health problems, malnutrition, etc. This paper aims to highlight both positive as well as negative relationship between Covid-19 pandemic and climate change. Pandemics leave their mark quickly and that is what Covid-19 has done to the world. The alarming exponential increase in the transmission and fatality rates related to this disease has brought the world to a halt so as to cope up its stern consequences. This has led to the imposition of lockdown across the globe to prevent the further spread of this disease which brought about drastic impacts at social and economic fronts. Its multifarious presence has wreaked havoc on physical, economic and social lives of people across the world after its breakout in December 2019. It appeared as the world grappled with the epidemic of climate change. The emergency has acutely overshadowed public reckoning with the climate crises, the outbreak is still growing in most of the places. However, it also posed some positive impacts on environment as well, particularly in the context of air quality and has also led to a decline in industry supply chains, reducing demand for commercial activities that exploit natural resources in many parts of the world. The amount of pollution in the air, water, soil and noise showed a significant decline during the pandemic. Global air quality improved due to lower anthropogenic emissions of air pollutants and atmospheric particles.

**Keywords:** Climate change, Health, Environment, Covid-19 and Pollution.

## Introduction

Climate change is the single biggest health threat facing humanity<sup>1</sup> and health professionals worldwide are already responding to the health harms caused by this unfolding crisis.<sup>2</sup> The Intergovernmental Panel on Climate Change (IPCC) has concluded that to avert catastrophic health impacts and prevent millions of climate change related deaths, the world must limit temperature rise to 1.5°C.<sup>3</sup> Past emissions have already made a certain level of global temperature rise and other changes to the climate inevitable. Global heating of even 1.5°C is not considered safe. However, every additional tenth of a degree of warming will take a serious toll on people's lives and health.<sup>4</sup> While no one is safe from these risks, the people whose health is being harmed first and worst by climate crisis are the people who contribute least to its causes, and who are least able to protect themselves and their families against it- people with low-income and disadvantaged countries and communities.<sup>5</sup>

The climate crisis threatens to undo the last fifty years of progress in development, global health, and poverty reduction, and to further widen existing health inequalities between and within populations.<sup>6</sup> It severely jeopardizes the realization of Universal Health Coverage (UHC) in various ways – including by compounding the existing burden of disease and by exacerbating existing barriers to accessing health services, often at the times when they are most needed.<sup>7</sup>

Coronaviruses are the well-known cause of severe respiratory, enteric and systemic infections in wide range of animal hosts including man. The scientific interest on coronaviruses has increased since the outbreak of COVID-19 (SARS-CoV-2) that initiated in Wuhan, China. This was soon declared a 'Public Health Emergency of International Concern' by World Health Organization (WHO). Coronavirus has become the hottest word and the most debated topic in the world due to the magnitude of infections and the number of deaths it has caused. In late December, 2019, a case of unidentified pneumonia was reported in Wuhan, Hubei Province, People's Republic of China (PRC). The identified clinical features

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<sup>1</sup> Climate change and health: Report by Secretariat. A61/14. Geneva: World Health Organization; 2008 (<https://cdn.who.int/media/docs/default-source/climate-change/report-by-the-secretariat-on-climate-change-andhealth.pdf>).

<sup>2</sup> Healthy Climate Prescription. An urgent call for climate action from the health community ahead of COP26 (website). Healthy Climate Prescription Signatories; 2021 (<http://healthclimateletter.net/>).

<sup>3</sup> Summary for policymakers. In: Global warming of 1.5°C. An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Intergovernmental Panel on Climate Change; 2018 (<https://www.ipcc.ch/sr15/chapter/spm/>).

<sup>4</sup> Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva: Intergovernmental Panel on Climate Change; 2021 ([http://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC\\_AR6\\_WGI\\_SPM.pdf](http://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf)).

<sup>5</sup> Health Inequalities and Climate Change: Action for Global Health Position Paper. Action for Global Health; 2021 (<http://actionforglobalhealth.org.uk/resource-library/>).

<sup>6</sup> COP24 Special report: Health & Climate Change. Geneva: World Health Organization; 2021 (<https://www.who.int/publications/i/item/cop24-special-report-health-climate-change>).

<sup>7</sup> Watts N, et al. The 2020 report of The Lancet Countdown on health and climate change responding to converging crises.

were similar to that of viral pneumonia.<sup>8</sup> The experts of PRC Center for Disease Control, after analyzing the respiratory samples, declared that the pneumonia was caused by a novel coronavirus, later known as Novel Coronavirus Pneumonia (NCP). World Health Organization (WHO) officially named the coronavirus disease as 'COVID-19'. While the international Committee on Taxonomy of Viruses named the virus 'severe acute respiratory syndrome coronavirus 2' (SARS-CoV-2).<sup>9</sup>

COVID-19 spread to almost all the countries of the world in virtually no time.<sup>10</sup> The most common routes of SARS-CoV-2 transmission are droplets, close-contact with the infected person and also by the aerosol transmission.<sup>11</sup> Apart from this, the disease is resulting in stress, tension, fights, sleep disorders and other addictions. Self-confinement and solitary lifestyle are severely affecting physical and mental wellbeing.<sup>12</sup> Covid-19 also has social and economic impacts. It has affected almost all the sections of society, but the poor people have been most affected, particularly due to coronavirus-induced lockdown measures.<sup>13</sup> The lockdown imposed throughout the world has inflicted serious dents into the economy and crippled the nations on several fronts.<sup>14</sup> The economy has witnessed shock at both demand and supply fronts.

### **Environmental and Ecological perspectives of COVID-19**

The novel Coronavirus has caused unprecedented impacts throughout the world at medical, social, economic and environmental levels. It seems like the world has been put into a reset mode. The shutdown of industrial facilities, power plants, decreased transportation and shipping resulted in decreased levels of criteria pollutants such as Carbon Monoxide (CO), Nitrogen Oxide (NO<sub>2</sub>), Methane (CH<sub>4</sub>), Sulphur Oxide (SO<sub>2</sub>), Black Carbon (BC) and Particulate Matter (PM<sub>10</sub> and PM<sub>25</sub>).<sup>15</sup> Due to reduction in commercial activities and public

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<sup>8</sup> Chan JFW, Kok KH, Zhu Z, Chu H, To KKW, Yuan S, Yuen KY (2020) Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan. *Emerg Microbes Infect* 9(1):221-236

doi: <https://doi.org/10.1080/22221751.2020.1719902>

<sup>9</sup> Burrell C, Howard C, Murphy F, Fenner W (2016) *Medical Virology*, 5<sup>th</sup> edn. Academic Press, New York. <https://doi.org/10.1016/B978-0-12-375156-0.00031-X>

<sup>10</sup> Ali I, Alharbi OM (2020) COVID-19: disease, management, treatment, and social impact. *Sci Total Environ* 728:138861. <https://doi.org/10.1016/j.scitotenv.2020.138861>

<sup>11</sup> Xiao F, Tang M, Zheng X, Liu Y, Li X, Shan H (2020) Evidence for gastrointestinal infection of SARS-CoV-2. *Gastroenterology* 158 (6):1831-1833. <https://doi.org/10.1053/j.gastro.2020.02.055> (e3)

<sup>12</sup> Rajkumar RP (2020) COVID-19 and Mental health: a review of the existing literature. *Asian J psychiatry* 52:102066

<sup>13</sup> Singh K (2020) How to Manage the Economic Fallout of the Coronavirus, <https://www.chathamhouse.org/2020/03/how-fight-economic-fallout-coronavirus>

<sup>14</sup> Gopalan HS, Misra A (2020) COVID-19 pandemic and challenges for socio-economic issues, healthcare and National Health Programs in India. *Diabetes Metab Syndr* 14:757-759

<sup>15</sup> Srivastava S, Kumar A, Baudh K, Gautam AS, Kumar S (2020) 21-Day lockdown in India Dramatically reduced air pollution indices in Lucknow and New Delhi. *Bull Environ Contam Toxicol*, India. <https://doi.org/10.1007/s00128-020-02895-w>

transportation, noise pollution was also reduced.<sup>16</sup> However these positive effects were due to the imposed lockdown in several countries particularly during the initial phase of coronavirus and these positive impacts were only short-term benefits. As various activities resume to normal levels, these positive environmental effects have started to vanish. Covid-19 has also impacted the environment severely and indirectly. The usage of pesticides, soaps, detergents, single-use plastic etc. has increased many-fold in the past two years and is taking a heavy toll on the environment.<sup>17</sup> Sanitization of roads, complexes and whole cities has been carried out. The use of hand sanitizers has also increased manifold.<sup>18</sup>

Amidst corona pandemic, particularly during the lockdown phase, some positive effects were observed on the wildlife. During lockdown phase, animals had an increased and uninterrupted territory. In some areas, wild animals were seen on roads and residential areas. Less traffic, less human intervention, and less pollution gave space to wildlife to thrive. It was definitely a rare phenomenon on the roads. Wildlife re-entered to the areas snatched from them. Dolphins came to the tourist waterfront; birds were heard and seen like never before in the urban centers. During the lockdown, the wildlife was at peace with the less flow of humans and tourists.<sup>19</sup> However with increased mobility, these animals became vulnerable to poaching. A significant increase in overall poaching of wild animals in some areas was observed during the lockdown period; especially in the areas which were not protected or not marked to any specific wildlife area. If left unregulated, the poaching of ungulates and small animals may lead to a depletion of the prey base for predators. This might, in turn, result in increase in human-animal conflicts.<sup>20</sup> However, these positive and negative impacts were transient and were largely observed during the complete lockdown phase only.

The ripples of corona effect are far reaching. Along with humans, animals residing in urban areas, as well as the wild ones are getting infected. The list includes dogs, cats, rabbits, mink etc. It is indicative of the fact that coronavirus can transfer from humans to animals.<sup>21</sup> Further, stray animals like dogs and cats are amongst the sufferers of coronavirus pandemic

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<sup>16</sup> Zambrano-Monserrate MA, Ruano MA, Sanchez-Alcalde L (2020) Indirect effects of COVID-19 on the environment. *Sci Total Environ.* <https://doi.org/10.1016/j.scitotenv.2020.138813>

<sup>17</sup> Pata UK (2020) How is COVID-19 affecting environmental pollution in US cities? Evidence from asymmetric fourier causality test. *Air Qual Atmos Health* 13(10): 1149-1155

<sup>18</sup> Mahmood A, Eqan M, Pervez S, Alghamdi HA, Tabinda AB, Yasar A, Brindhadevi K, Pugazhendhi A (2020) COVID-19 and frequent use of hand sanitizers; human health and environmental hazards by exposure pathways. *Sci Total Environ* 742:140561. <https://doi.org/10.1016/j.scitotenv.2020.138820>

<sup>19</sup> Rutz C, Loretto MC, Bates AE, Davidson SC, Duarte CM, Jetz W, Johnson M, Kato A, Kays R, Mueller T, Primack RB (2020) COVID-19 lockdown allows researchers to quantify the effects of human activity on wildlife. *Nat Ecol Evol* 4(9):1156-1159

<sup>20</sup> Badola S (2020) Indian wildlife amidst the COVID-19 crisis: an analysis of status of poaching and illegal wildlife trade. *TRAFFIC, India oce*

<sup>21</sup> Shi J, Wen Z, Zhong G, Yang H, Wang C, Huang B, Liu R, He X, Shuai L, Sun Z, Zhao Y (2020) Susceptibility of ferrets, cats, dogs, and other domesticated animals to SARS-coronavirus 2. *Science* 368 (6494):1016-1020. <https://doi.org/10.1126/science.abb7015>

owing to the absence of waste food material due to restaurants and shops being closed since the inception of lockdown; particularly in the developing countries like India. Also, they are being abandoned by their owners due to unfounded fears that they may spread COVID-19. The worst possibility is that the stray animals might eat disposed masks and gloves, which can become lethal.

### **Pollution amid COVID-19**

Pollution is a serious challenge facing the whole world, especially in developing countries. Due to intensive anthropogenic activities, several deleterious effects on the environment and its resources

have been created.<sup>22</sup> These human activities may include agriculture, smelting, mining, traffic and machinery manufacturing, which have been recognized as main contributors to environmental pollution.<sup>23</sup> Soil pollution may reduce crop yield and quality as well as change soil organic matter, biodiversity, and groundwater quality.<sup>24</sup> Air pollution may originate from different anthropogenic and natural sources, which are able to bio-accumulate and bio-magnify in the trophic levels, and thus increase their toxicity in the food chain.<sup>25</sup> The most common air pollutants that threaten human health and other components of the biosphere of the biosphere include particulate matter,<sup>26</sup> heavy metals, inorganic air pollutants, volatile organic compounds,<sup>27</sup> persistent organic pollutants<sup>28</sup> and black carbon.<sup>29</sup>

Environmental pollution is considered a crucial issue because of the way it penetrates all aspects of human life. Hundreds of thousands of published materials have been issued regarding air, water and soil pollution by the main publishing houses worldwide. The types of soil, water and air pollutants and their environmental fate was and still is an important

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<sup>22</sup> Brevik EC, Pereg L, Steffan J, Burgess LC (2018) Soil ecosystem Services and human health. *Current Opinion in Environmental Science & Health* 5, 87-92. <https://doi.org/10.1016/j.coesh.2018.07.003>

<sup>23</sup> Boente C, Baragano D, Gallego JR (2020) Benzo[a] pyrene sourcing and abundance in a coal region in transition reveals historical pollution, rendering soil screening levels impractical. *Environmental Pollution* 266, 115341. <https://doi.org/10.1016/j.envpol.2020.115341>

<sup>24</sup> Singh P, Singh SK, Prasad SM (2020) Plant Responses to Soil Pollution. <https://doi.org/10.1007/978-981-15-4964-9>, Springer Nature Singapore Pte Ltd.

<sup>25</sup> Lee BXY, Hadibarata T, Tuniarto A (2020) Phytoremediation Mechanisms in Air Pollution Control: a Review. *Water Air Soil Pollut* 231, 437. <https://doi.org/10.1007/s11270-020-04813-6>

<sup>26</sup> Daiber A, Kuntic M, Hahad O, Delogu LG, Rohrbach S, Di Lisa F, Schulz R, Munzel T (2020) Effects of air pollution particles (ultrafine and fine particulate matter) on mitochondrial function and oxidative stress – Implications for cardiovascular and neurodegenerative diseases, *Archives of Biochemistry and Biophysics*, <https://doi.org/10.1016/j.abb.2020.108662>

<sup>27</sup> Jia H, Gao S, Duan Y, Fu Q, Che X, Xu H, wang Z, Cheng J (2021) Investigation of health risk assessment and odor pollution of volatile organic compounds from industrial activities in the Yangtze River Delta region, China. *Ecotoxicology and Environmental Safety* 208, 111474. <https://doi.org/10.1016/j.ecoenv.2020.111474>

<sup>28</sup> Cindoruk SS, Sakin AE, Tasdemir Y (2020) Levels of persistent organic pollutants in pine tree components and ambient air. *Environmental Pollution* 256, 113418. <https://doi.org/10.1016/j.envpol.2019.113418>

<sup>29</sup> Sitnov SA, Mokhov II, Likhosherstova AA (2020) Exploring large-scale blackcarbon air pollution over Northern Eurasia in summer 2016 using MERRA-2



issue regarding environmental protection, particularly in the era of COVID-19. Proper monitoring and remediation strategies for contaminated soils are selected after evaluating (1) sources of soil pollutants, their distribution and transport, (2) chemical transformations and accumulation in soils, (3) changes in soil ecosystem functions and its structure due to pollution, (4) ecotoxicological effects and risk assessment of these pollutants and (5) different strategies for soil remediation and its protection.<sup>30</sup> Air pollutants consists of primary pollutants (PMs, CO, SO<sub>2</sub> nitrogen oxides) and secondary pollutants (e.g., particular ozone, CO<sub>2</sub> and SO<sub>3</sub>). Natural air pollutants may be generated from sandstorms, forest fires, volcanic eruptions, photochemical reactions and the carbon and nitrogen cycles.<sup>31</sup> Anthropogenic sources of air pollutants may include energy production, fossil fuel combustion, transportation, agriculture management, and municipal and industrial activities.<sup>32</sup>

### **Covid-19 and Biomedical Waste**

Single-use masks, wipes, bottles of sanitizers and gloves are critical for the safety of the frontline workers of Corona pandemic.<sup>33</sup> Amidst increasing fear, single-use plastic manufacturing industries are trying to seize the opportunity and make a comeback into their otherwise declining business. This would definitely lead to an abrupt surge in the use of plastics. Many grocery stores are not allowing customers to bring their reusable bags. In restaurants there is an increase in the frequency of online ordering of food which resulted in a per capita increase in plastic bags. In restaurants there is an increase in the frequency of online ordering of food which resulted in a per capita increase in plastic usage<sup>34</sup> showed that worldwide plastic pollution increased due to COVID-19 pandemic. Plastic demand in terms of packaging (40%) and other applications (17%) including medical uses has significantly increased.<sup>35</sup>

The safe disposal of plastics after use has become a matter of grave concern. It has come as a blow to our collective fight against plastic pollution. The products are ending up in places where they must not be. They can easily be found on streets, in wild habitats and in the seas.<sup>36</sup>

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<sup>30</sup> Duarte AC, Cachada A, Rocha-Santos T (2018) Soil Pollution: From Monitoring to Remediation. Elsevier Inc., Academic Press, <https://doi.org/10.1016/C2016-0-02243-X>

<sup>31</sup> Lee BXY Hadibarata T, Yuniarto A (2020) Phytoremediation Mechanisms in Air Pollution Control: a Review. Water Air Soil Pollut 231, 437. <https://doi.org/10.1007/s11270-020-04813-6>

<sup>32</sup> Agarwal P, Sarkar M, Chakraborty B, Banerjee T (2018) Phytoremediation of air pollutants: prospects and challenges. Intech Open.

<sup>33</sup> Herron JBT, Hay-David AGC, Gilliam AD, Brennan PA (2020a) personal protective equipment and COVID-19: a risk to healthcare staff? Br J Oral Maxillfac Surg 58(5):500-502

<sup>34</sup> Klemes JJ, Fan YV, Tan RR, Jiang P (2020) Minimizing the present and future plastic waste, energy and environmental footprints related to COVID-19. Renew Sust Energ Rev 127:109883. <https://doi.org/10.1016/j.rser.2020.109883>

<sup>35</sup> Prata JC, Silva AL, Walker TR, Duarte AC, Rocha-Santos T (2020) COVID-19 pandemic repercussions on the use and management of plastics, Environ Sci Technol 54(13):7760-7765

<sup>36</sup> DW (Deutsche Welle), Germany (2020) <https://www.dw.com/en/coronavirus-plastic-waste-polluting-the-environment/a-53216807>.

Masks are scattered across roads, sidewalks and parks as people are striving hard to protect themselves from the virus. If the masks reach the oceans, they can pose a serious threat to marine life. The safe disposal of PPE's is also matter of concern.<sup>37</sup> It is important to note that SARS-CoV-2 is more stable on plastic and stainless steel than on copper and cardboard, and the viable virus particles can be detected up to 72 h after application to the surface.<sup>38</sup> Although, gloves made of latex rubber are natural products but there are apprehensions of them being not always eco-friendly. Chemicals used in their manufacturing are not environmentally safe and the disposal of such wastewater is another problem.<sup>39</sup>

The biomedical waste (BMW) generation from COVID-19 patients is increasing throughout the world. India is producing approximately 550 tons of biomedical waste (BMW) per annum which is treated by only 198 Common Bio-Medical Waste Treatment Facilities (CBMWTFs) and 225 captive incinerators.<sup>40</sup> There is a concern about the management of COVID-19 waste; as the cases increase, the treatment centers are becoming overburdened by such medical waste, and if precautions are not ensured, it could result in infections among sanitary workers. There lies risk of mixing of COVID-19 waste with regular medical waste including food waste from COVID-19 wards. Regular sanitization of workers and adequate personal protective equipment including three-layer masks, splash-proof aprons/gowns, nitrile gloves, gumboots, and safety goggles involved in handling and collection of biomedical waste is mandatory. However, this is going to lead to huge increase in the generation of BMW. The proper monitoring is quite essential while disposing of COVID-19 waste,<sup>41</sup> it is important to know the composition so that its proper disposal can be ensured.<sup>42</sup> Some of the promising ways to get rid of BMW is incineration at high temperatures between 800 and 1200°C, which kills the pathogens and also reduces organic matter by up to 90%.<sup>43</sup> High temperature pyrolysis and medium temperature microwave technique are two primary alternative

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<sup>37</sup> Klemes JJ, Fan YV, Tan RR, Jiang P (2020) Minimizing the present and future plastic waste, energy and environmental footprints related to COVID-19. *Renew Sust Energ Rev* 127:109883. <https://doi.org/10.1016/j.rser.2020.109883>

<sup>38</sup> Doremalen NV, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Wiiliamson BN, Tamin A, Harcourt JL, Thornburg NJ, Gerber SI, Lloyd-Smith JO, de Wit E, Munster VJ (2020) Aerosol and surface stability of SARS-Cov-1. *N Engl J Med* 382: 1564-1567

<sup>39</sup> Kumar V, Singh SB, Singh S (2020) COVID-19: environmental concern and impact of Indian medicinal system. *J Environ Chem Eng* 8(5):104144. <https://doi.org/10.1016/j.jece.2020.104144>  
<https://doi.org/10.1016/j.jece.2020.104144>  
<https://doi.org/10.1016/j.jece.2020.104144>

<sup>40</sup> Singh A, Unnikrishnan S, Dongre S (2019) Biomedical waste management in India: awareness and novel approaches. *Biomed J Sci Tech Res*. <https://doi.org/10.26717/BJSTR.2019.13.002424>

<sup>41</sup> Kumar V, Singh SB, Singh S (2020) COVID-19: environmental concern and impact if Indian medicinal system. *J Environ Chem Eng* 8(5):104144. <https://doi.org/10.1016/j.jece.2020.104144>

<sup>42</sup> Ilyas S, Srivastava RR, Kim H (2020) Disinfection technology and strategies for COVID-19 hospital and biomedical waste management. *Sci Total Environ* 749:141652. <https://doi.org/10.1016/j.scitotenv.2020.141652>

<sup>43</sup> Wang J, Shen J, Ye D, Yan X, Zhang Y, Yang W, Li X, Wang J, Zhang L, Pan L (2020) Disinfection technology of hospital wastes and wastewater: suggestions for disinfection strategy during coronavirus disease 2019 (COVID-19) pandemic. *Environ Pollut* 262: Article 114665. <https://doi.org/10.1016/j.envpol.2020.114665>

thermal technologies that are available to deal with biomedical waste. Chemical disinfection may also be used to pre-treat COVID-19 waste before mechanical shredding.

## **Conclusions and Suggestions**

The International Community should focus on the impacts of climate change and commit for taking action on environmental issues for healthier and safer future. The unwanted COVID-19 taught good lesson to humans that if we protect the environment, the environment will protect us. Although a few positive impacts of COVID-19 on the environment were seen, these were the short-term effects induced largely by nation-wide lockdown globally. Indeed, the pandemic is expected to pose long term adverse effects on the environment in future. The use of chemicals like soaps, detergents and other chemical means of cleaning, medicines and plastics such as gloves, masks, PPE kits, Syringes, etc. is expected to enhance further leading to increased environmental pollution.

The COVID-19 pandemic has already had tremendous impact on the waste sector. Waste management in an essential public service and should be continued as usual in order to minimize the possible impact upon health and environment. COVID-19 has revealed our vulnerabilities and has taught us lifelong lessons. It is important for the world to realize the significance of maintaining the habitats of animals, forests, wetlands, oceans and other ecosystems. The COVID-19 has emphasized on improving the mutual relationship between humans and animals. The Novel Coronavirus is signaling a catastrophic imbalance and it is crucial to respect the carrying capacity of nature, before it is too late.

The positive impacts of the pandemic on the environment are temporary and unsustainable, hence should not be contemplated. To tackle the ongoing and future impacts of COVID-19, the need is

- To frame policy guidelines and implement them at international and national levels for proper management of plastic and chemical waste and wastewater treatment.
- To develop safety guidelines and ensure their implementation for doctors, sanitary workers, and hospital staff so as to keep them healthy and to also avoid any viral spread.
- To drive awareness programs and campaigns at various levels including schools, colleges, villages, far-flung areas etc. to avoid spread of wrong information and misconceptions and to guarantee proper implementation of various guidelines.
- To understand environmental and ecological impacts of COVID-19 with concerted research efforts so that in future such adversities may be tackled in a more effective way.
- To develop database of elderly people who might require more care, proper and timely treatment due to COVID-19 and to ensure their healthy and care in future.



