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12. Effect of COVID-19 on Environment

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Abstract:

The world has been hit hard by the coronavirus pandemic, the biggest threat to public health in more than a century. The economy, healthcare institutions, and most human activities have all been significantly harmed by the COVID-19 pandemic. End of December 2019, COVID-19 first surfaced in the Hunan seafood market in Wuhan City, China. The World Health Organization designated COVID-19 a global public health emergency a few weeks later, in early 2020.Lockdowns have been enforced all around the world to stop the spread of this virus due to the potential threat and contagiousness of the Covid-19 pandemic. The absence of economic activity minimized the anthropogenic impact on the environment, particularly with regard to greenhouse gas and aerosol emissions. Changes in travel and production swiftly and noticeably improved the air quality and reduced the carbon footprint, which lead to an improvement in the health of the environment. Just after the lockdown, China noticed a 70% drop in NO_2 and up to 40% drop in SO_2, PM_{10}, PM_2.5, and CO levels, while carbon emissions decreased by 25%, all compared to levels in 2017–19. NO_2 pollution over New York City decreased by 30%. Industries that make up 24% of Italy's GDP were shut down, which resulted in a reduction in NO_2 emissions of around 45%. After the lockdown, Delhi saw a reduction in NO_2 and CO levels of 70% and 82%, respectively. In north, western, east, and central India, the air quality index (AQI) declined by 44, 33, 32, 29, and 15 percent, respectively. The global disruption of COVID-19 had a variety of short-term environmental impacts. The environment is also negatively impacted by the increased use of PPE (such as hand gloves, facemasks, etc.), their careless disposal, and the enormous amounts of hospital waste that are produced.

12.1 Introduction:

A novel coronavirus disease (COVID-19) first surfaced in Hubei Province (Wuhan) in China in December of 2019 and spread fast to other parts of the world. [1]. The family of viruses known as Coronavirinae, which includes the group of viruses known as Coronaviruses, potentially cause respiratory illnesses with symptoms like the flu, runny nose, fever, difficulty breathing, cough, sore throat, pneumonia, and lung infection as well as vomiting, and diarrhea [2] [3]. According to genomic research, both SARS virus and

SARS-CoV-2 were found to be phylogenetically similar, where bats have been identified as the main source. [4]. The primary means of virus transmission were direct contact between individuals or droplets produced by coughing, sneezing, and talking [5] [6]. By February 2020, there were much more daily COVID-19 instances outside of China, with Italy, the United States, Germany, Spain, Japan, Iran and South Korea emerging as the new primary epicentres. The COVID-19 issue was classified as a pandemic by the World Health Organization (WHO) on March 11, 2020: problem's worrisome rates of spread and severity. The virus spread to 216 countries, regions, or territories by September 6, 2020, resulting in 26,763,217 confirmed cases and 876,616 fatalities. [1].

The majority of the affected countries' governments in order to prevent the rapid spread and lower the rate of mortality have started imposing limitations on people's freedom of movement. Various non-pharmaceutical precautions, including the use of hand gloves, face masks, frequent hand washing, disinfectant solution usage, and practice of physical distance (6 feet or more) were counselled by authorities and professionals on a national and international level. [7] [8]. In addition to wreaking havoc on public health, the virus has completely disrupted our everyday lives, wreaking havoc on the global economy and prompting countries to close their borders. [1] [9]. The mobility of a large number of people in India spanning 1.3 billion was imposed as a precautionary measure in the year 2020 (March 24) [10]. With the exception of emergency services including food supply, medical etc. was encouraged whereas the public transport facility (trains, buses etc.) were suspended [11]. In addition to the quarantine measures, the lockdown measures implemented in numerous nations had led to the suspension of various economic and industrial activity. The primary commercial operations of the country were significantly impacted by these lockdown measures [12].

Global socio-economic system, has been greatly devastated by the pandemic which has either directly or indirectly impacted environmental aspects like improved air and water quality, decreased noise, and ecological restoration [4] [10]. Industrialization and urbanization, which are the primary causes of the massive release of greenhouse gasses, are the fundamental causes of environmental pollution. The COVID-19's most advantageous environmental effect was an increase in air quality, primarily as a result of less fuel being used in the transportation and industrial sectors, which were shut down. Based on existing lines of evidence released by the National Aeronautics and Space Administration and the European Space Agency (ESA) (NASA), some of the COVID-19 epicentres are polluted, including, the United States, Wuhan, Italy and Spain, dropped by up to 30% [13]. Numerous reports have indicated improved air quality and decreased emissions of major pollutants such Particulate particles, carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen oxides (NOx), and (PM), which has resulted in a decrease in the concentration of these pollutants in the atmosphere [13] [14] [15]. A few papers have also covered the improved water quality, largely because numerous industrial activities that released effluent into these water bodies had been stopped [16] [17] [18]. As a result of the excessive use of disinfectants, sanitizers, antibiotics and medications, according to certain reports, wastewater has a significant increase in the amount of organic load that it contains. [13] [17] [18] [19] [20]. Additionally, the extended usage of face masks, hand gloves, face shields etc are examples of personal protective equipment (PPE).as well as their careless disposal placed a burden on the environment. Thus, the COVID-19 global disruption affected the global ecology and climate in both positive and harmful ways. [21] [22] [23].

However, the reduction in harmful human impacts on the environment, climate, and the environment as a result of imposed and voluntary punishments was insufficient and short-lived, and it immediately resumed once the economy and public activities returned [24].

12.2 Reduction of GHGs Emission and Air Pollution:

A sharp decline in greenhouse gas emissions has been observed at global level due to the sudden shut down of businesses, transportation, and industry. The emission of NO_2 results from the combustion of fossil fuels, of which 80% come from vehicle exhaust. One of the most important measures of world economic activity. NO2 is produced when O_2 and H_2O combine, causing respiratory diseases in humans as well as acid rain. [25]. after the lockout, air pollution emissions were drastically reduced across the globe. China noticed a 70% drop in NO_2 and up to 40% drop in SO_2, PM10, PM2.5, and CO levels, while carbon emissions decreased by 25%, all compared to levels in 2017–19. [26]. NO2 levels have decreased by 30 to 60 percent, according to the European Environmental Agency (EEA), in major European cities like Madrid, Barcelona, Rome, Milan, and Paris. [27]. New York's air pollution was decreased by 50%. [28]. Similarly, the US reported 25.3% and Sao Paulo of Brazil reported a 54.3% decline in NO_2 level compared to 2019 [30]. Industries that make up 24% of Italy's GDP were shut down, which resulted in a reduction in NO2 emissions of around 45% [29]. Delhi saw a reduction in NO_2 and CO levels of 70% and 82%, respectively. In north, western, east, and central India, the air quality index (AQI) declined by 44, 33, 32, 29, and 15 percent, respectively [26]. **Table 12.1** represents the reduction in particulate matter (PM 2.5) across different countries during lockdown. (ND- No data).

Table 12.1: Reduction in Particulate matter (PM 2.5).

Countries	Avg PM 2.5 during lockdown 2020 (μg/m^3)	Reduction compared with 2019 (%)	Reduction compared with prior 4-year avg (%)
Los Angeles, USA	5.5	-31	-51
UK	16.2	-9	+6
China	35.1	-44	-50
Italy	16.7	+30	ND
Spain	6.4	-11	+2
New York, US	4.4	-25	-29
Brazil	10.1	-32	-26*
South Korea	24.1	-54	-32
India	32.8	-60	-55

As a result of lower energy demand during the lockdown, global coal consumption reduces. Coal-based power generation in India declined by 26% and in China by 36% compared to the same period the previous year [31]. **Figure 12.1** outlines the pre- and post-lockdown level of airborne aerosols over India [45]

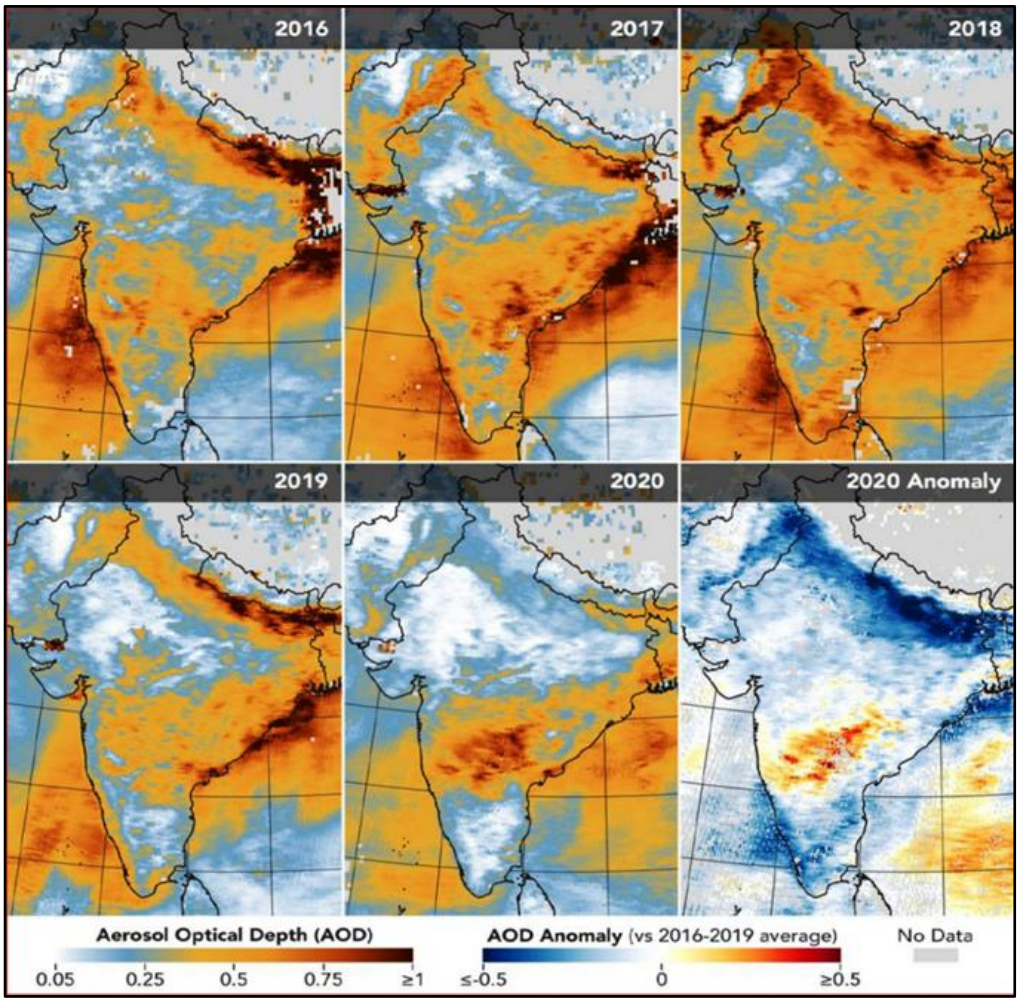

Figure 12.1: Pre- and Post-Lockdown Level of Airborne Aerosols Over India [45]

12.2.1 Water Pollution Reduction:

Water pollution remains as a major issue in developing countries including India and Bangladesh due to release of industrial and residential pollutants in to rivers before treatment. Due to lock down the rivers including Ganga and Yamuna were in the acceptable levels of 27/36 monitoring sites. Water quality improvement in both Haridwar and Rishikesh was achieved by two factors (a) Decrease in tourism [33]. (b)Reduction in the release of industrial and sewage effluents [32]. Physicochemical characteristics of Ganga river include (0.6-1.2 mg/L: biochemical oxygen demand (BOD)) dissolved oxygen (DO, (9.4-10.6 mg/L) and total coliform (40-90 MPN/10mL) and pH (7.4-7.8), were found to be in compliance with India's standards for surface water quality [34]. Numerous aquatic species in Italy have made a comeback as the grand canal in Italy became clearer [35]. Beaches all throughout the world have become pollution-free. Water, soil, and marine pollution were also reduced as a result of the drop in export-import commerce and solid waste generation.

12.2.2 Reduction of Noise Pollution

Noise typically has a bad impact on people's physiological health, including cardiovascular disease, hypertension, and shortness of sleep [36]. According to reports, noise pollution puts 360 million individuals at risk for hearing damage worldwide. Human activity noise pollution also impacts wildlife by changing the balance between predator and prey detection and avoidance. [37]. The quarantine and lockdown procedures, on the other hand, forced people to remain inside and decreased economic activity, travel restrictions, and global communication, which in turn reduced noise levels in most places [13].

Delhi's noise level was dramatically lowered by 40–50% during lockdown [33]. Delhi's Govindpuri metro station's noise levels have dropped from 100 dB to 50–60 dB [38]. According to CPCD (Central pollution board of India) the noise intensity in Delhi's residential areas was found to decrease from 55dB to 40 dB during the day and from 45dB to 30 at night. City inhabitants were found to enjoy the chirping of birds ranging from 40 to 50 dB [39].

During the lockdown, over 90% of Germany's passenger air travel had been cut, over 50% of its car traffic had decreased, and only 25% of its railroads were operating at their normal rates [37].

12.3 Negative Environmental Effects:

12.3.1 Increased Production of Biomedical Waste:

Due to outbreak of COVID-19, the generation of medical waste has tripled which causes a serious threat to both human welfare and environment globally. Existing lines of evidence suggests that hospitals were found to generate both infectious and biological waste. Hospitals generate a large amount of infectious and biological waste.

Sources include probable COVID-19 patients, to treat a large number of patients, disinfect, and diagnose [13] [33]. Medical waste generated during the COVID outbreak in Wuhan was found to be 240 metric tonnes in comparison to 190 million tonnes than other times [40]. The medical waste generated during the initial lockdown in India was observed to increase from 550-600 kg/day -1000 kg/day [33].

Similar increases were observed in Bangladesh, where 154-280 million tonnes of medical waste were generated each day in cities such as Kuala Lumpur, Manila, Hanoi, and Bangkok. [41]. Studies have shown that the virus can persist for up to three days on plastic and stainless steel, and for one day on cardboard.

Therefore, trash Similar increases were observed in Bangladesh, where 154-280 million tonnes of waste were generated each day in cities such as Kuala Lumpur, Manila, Hanoi, and Bangkok.by hospitals (such as used syringes, tissues, gloves, bandages, masks, and discarded medications) should be managed effectively in order to prevent further illness and environmental contamination, which is currently a concern for the entire world [42].

12.3.2 Use of PPE and Haphazard Disposal:

Worldwide manufacture and use of PPE made of plastic has expanded since the COVID-19 outbreak [23]. As of February 2020, China produced 14.8 million medical masks every day, a significant rise over the previous level [21]. Due to lack of knowledge and lack of awareness in handling infectious waste people were found to discard the masks, gloves etc. along with the household waste. Such careless disposal of these wastes clogs waterways and exacerbates environmental pollution [23] [41]. N-95 masks, which are typically made of polypropylene withstand for long time can release harmful substance in the environment due to the leak of dioxin from the masks. The protective suit were made of Tyvek including face shields and gloves. [23]. The waste generated i.e. medical waste and domestic organic waste must be segregated under proper conditions and treated as per protocols. Pooling of these waste leads to disease transmission & viral exposure for trash employees.

12.3.3 Municipal Solid Waste Generation and Recycling Reduction:

Pollution of the air, water, and soil is a direct and indirect result of increased waste generation in cities (both organic and inorganic). Due to pandemic quarantine restrictions being enacted in several countries, which have raised household waste output including shipped package contents, [13] [33]. Garbage recycling is a practical way to reduce pollution, conserve energy, and safeguard the environment. However, in order to prevent the spread of viral diseases, many countries discontinued their trash recycling programmes due to the pandemic. Nearly 46% of localities in the USA have their recycling operations halted because of government concerns over the possibility of COVID-19 spread in recycling facilities.

Other European nations like the United Kingdom and Italy forbade infected citizens from sorting their garbage. Global landfilling and environmental pollutants have increased as a result of ordinary waste recovery, municipal waste management, and recycling activities being disrupted. In order to eradicate the SARS-CoV-2 virus, a significant number of disinfectants have been administered to roadways, businesses, and residential areas.

Such heavy disinfectant use could lead to the extinction of beneficial species that aren't targeted, which could lead to ecological imbalance. Additionally, the SARS-CoV-2 virus was found in the faeces of the COVID-19 patient as well as in municipal wastewater from various nations, including India, Australia, the Netherlands, Sweden, and the United States [43] [44]. Therefore, it is necessary to take additional steps to treat wastewater, which is difficult for developing countries to do. China has already improved its disinfection procedures (increasing the use of chlorine) to stop the SARS-CoV-2 virus from migrating through wastewater. However, overusing chlorine in water may result in hazardous by-products [13].

12.4 Conclusion:

Like earlier Earth-related disasters, humans will eventually overcome this pandemic. People should be mindful of how far they can push nature before it is too late. Possibly the most significant and difficult task of the 21st century is environmental change. Despite continued

government and non-governmental efforts to rehabilitate and restore nature, humans can only advance a little amount, and there are still significant obstacles to overcome.

The recent Covid-19 epidemic has been a blessing in disguise which has significantly strengthened the mutually beneficial relationship between nature and humans while also successfully recovering the environment. Although the lockdown and social isolation have been beneficial to the environment, it is crucial to recognise the negative consequences, such as death, effects on social aspects, and major economic ramifications.

The viral pandemic has had indirect effects on the environment that are both beneficial and harmful. At this time, it's critical to keep the disease under control, lessen transmission, and actively preserve lives. Even while the environmental benefits might only last a short while, governments, nongovernmental organizations, and individuals can all benefit from this shutdown by learning how to permanently cut down on pollution.

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