

## **Environmental impacts of the COVID-19 pandemic and potential sustainability strategies**

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### **Abstract**

*The COVID-19 pandemic has had an impact on the environment, with changes in human activity leading to temporary changes in air pollution, greenhouse gas emissions and water quality. As the pandemic became a global health crisis in the early 2020s, various national responses including lockdowns and travel restrictions caused substantial disruption to society, travel, energy consumption and economic activity, sometimes referred to as the "anthropause". As public health measures were later lifted during the pandemic, its impact has sometimes been discussed in terms of effects on the implementation of the transition to renewable energy and climate change mitigation. This study shows that the pandemic situation significantly improves air quality in various cities around the world, reduces greenhouse gas emissions, reduces water pollution and noise, and reduces pressure on tourist destinations, which can help restore the ecological system. In addition, there are also some negative consequences of COVID-19, such as an increase in medical waste, indiscriminate use and disposal of disinfectants, masks and gloves; and the burden of untreated waste permanently endangering the environment. Economic activities seem to return soon after the pandemic and the situation may change. Therefore, this study also outlines possible ways to achieve long-term environmental benefits. It is expected that proper implementation of the proposed strategies can be useful for global environmental sustainability. COVID-19 and the environment. Various articles have been published in recent weeks on the environmental causes and impacts of the COVID-19 pandemic. This page focuses on listing relevant information, research, data and/or press releases issued by our partners in Geneva and other institutions around the world.*

**Keywords:** *Environmental assessment, Environmental pollution, Environmental management, Environmental sustainability,*

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### **I. Introduction :-**

The COVID-19 pandemic is a crisis that affects everyone. Various articles have been published in recent weeks on the environmental causes and impacts of the COVID-19 pandemic. This page focuses on listing relevant information, research, data and/or press releases issued by our partners in Geneva and other institutions around the world. An outbreak of coronavirus disease-2019 (COVID-19) first appeared in late December 2019 at the Hunan Seafood Market in the Chinese city of Wuhan, and within weeks the World Health Organization declared it an international public health emergency. (WHO, 2020). It is an infectious disease caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) (Islam et al., 2020; Nghiem et al., 2020; Wang et al., 2020). Genomic analysis revealed that SARS-CoV-2 is phylogenetically related to SARS viruses and bats could be a possible primary source (Chakraborty and Maity, 2020). Although the intermediate source of origin and transmission to humans is not clearly known, the ability of rapid human-to-human transmission of this virus has been demonstrated (Hui et al., 2020). Transmission of the virus occurred mainly through direct contact between people or droplets produced by coughing, sneezing, and talking (Islam et al., 2020; Li et al., 2020; Wang et al., 2020). From September 6, 2020; the virus has claimed to have spread to 216 countries, regions or territories, killing 876,616 people out of 26,763,217 confirmed cases (WHO, 2020a), and the number is rising rapidly.

### **Environmental issues :-**

The increasing amount of greenhouse gases since the beginning of the industrialization era has caused an increase in the average global temperature on Earth. Climate change has led to melting glaciers, an increase in extreme weather, species decline, frequent fires and rising sea levels. Prior to the COVID-19 pandemic, quarantines and social distancing were among the measures that health authorities were expected to recommend in the event of a pandemic. At the same time, researchers [who?] predicted that the reduction in economic activity would focus on problems caused by global warming; it would stop rising temperatures, reduce air and sea pollution and benefit the environment. The relationship between human activity and the environment has been observed in the past in various public health crises, such as the Spanish flu and smallpox epidemics, and has been observed again in the COVID-19 pandemic.

### **Covid19 pandemic :-**

On 11 March 2020, the outbreak of COVID-19 was declared a pandemic by the World Health Organization (WHO). As of July 5, 2020, 188 countries or regions have reported cases of COVID-19. By November 2021, the ongoing COVID-19 pandemic had killed more than 5 million people. Due to the severity of the virus, most countries have adopted lockdowns to protect people, mitigate the spread and secure hospital space. These lockdowns have disrupted daily life around the world and reduced the level and frequency of human activity and production. COVID-19 has forced industries, businesses and large corporations to close. Although the damage caused to human life, economy and society has been extensive, the dramatic changes in human activity have had an impact on the environment. An excess over new estimates of monthly energy supply or parameter estimates that produced near-real-time daily CO<sub>2</sub> emissions inventories during the COVID mitigation was observed based on activity from power generation (for 29 countries), industry (for 73 countries), road transport (for 406 cities), air and sea transport and emissions from the commercial and residential sectors (for 206 countries). This decrease in CO<sub>2</sub> emissions was followed by a decrease in regional concentrations of nitrogen oxide, which was observed by ground-based networks and satellites. These emissions were calculated by researchers, with observations showing little impact (less than 0.13 ppm by April 30, 2020) on excess global CO<sub>2</sub> concentration. There has been a reduction in both fossil fuel consumption and economic activity due to travel restrictions, business closures and other dramatic responses to COVID-19. As human activity has slowed worldwide, substantial reductions in fossil fuel consumption, resource consumption, and waste disposal have been observed, resulting in less air and water pollution in many regions of the world. Specifically, there was a sharp and sustained decline in scheduled air and automobile travel during the COVID-19 pandemic, which actually reduced net carbon emissions worldwide. As the impact has been noted, some researchers and officials have called for protecting biodiversity and the environment as part of COVID-19 recovery strategies

Number of COVID-19 cases reported weekly by WHO region and total number of deaths up to 6 September 2020 (data source: WHO, 2020). Symptoms of COVID-19 infection typically include fever, chills, cough, sore throat, difficulty breathing, myalgia or fatigue, nausea, vomiting, and diarrhea (Huang et al., 2020; Wang et al., 2020). Severe cases can lead to heart damage, respiratory failure, acute respiratory distress syndrome, and even death (Holshue, 2020; Wang et al., 2020). The elderly, along with other underlying health conditions, are at high risk of mortality (Chen, 2020). So far, there has been no significant breakthrough in the development of an effective drug or vaccine against the disease. National and international authorities and experts recommend the use of non-pharmaceutical measures such as wearing masks and gloves, washing hands with soap, frequent use of antiseptic solutions and maintaining social distance (Hui et al., 2020; Sajed and Amgain, 2020; WHO, 2020). To control the spread of the virus and reduce mortality, the government of most of the affected countries has started restricting the movement of people. Figure 3 shows global examples of the number of people in individual countries who have been forced to lock down due to the coronavirus pandemic. India has been found to have restricted the movement of the largest number of people (approximately 1.3 billion) as a precautionary measure against COVID-19 starting from March 24, 2020 (Somani et al., 2020). Apart from emergency services (e.g. medical, fire, police, food, etc.), all other organizations including educational institutions are closed to keep people at home. All public transport services (e.g. bus, truck, train, planes, etc.) were suspended, except for the transportation of essential goods and emergency services (Tripathi, 2020). In Italy, the most extensive travel restrictions are imposed after World War II (Cellini et al., 2020). London's typically bustling pubs, bars and theaters were closed and people were advised to stay at home. As of April 7, 2020, the World Economic Forum reported that nearly 3 billion people worldwide are facing some form of lockdown and relevant governments are restricting movement to control the infection of COVID-19 (WEF, 2020). Overall, the pandemic caused a huge global socioeconomic disruption that directly or indirectly affected the environment, such as improving air and water quality, reducing noise, and restoring ecology (Chakraborty and Maity, 2020; Somani et al., 2020; Saadat et al., 2020). . Additionally, the increased use of personal protective equipment (PPE) (e.g. face mask, gloves, coats, goggles, face shield, etc.) and their haphazard disposal creates a burden on the environment (Fadare and Okoffo, 2020; Nghiem et al., 2020; Singh et al., 2020). Under these circumstances, this study aimed to explore the positive and negative environmental consequences of the COVID-19 pandemic and suggest possible strategies as a future guide for environmental sustainability. A global example of the number of people (as of 23 April 2020) subject to forced lockdowns during the COVID-19 outbreak (data source: Buchholz, 2020).

Due to the pandemic's impact on travel and industry, the planet as a whole experienced a decrease in air pollution. A reduction in air pollution mitigated both climate change and COVID-19 risks, but it has not yet been established which types of air pollution, if any, are common risks to both.[35] The Centre for Research on Energy and Clean Air reported that methods to contain the spread of SARS-CoV-2, such as quarantines and travel bans, resulted in a 25% reduction of carbon emission in China. In the first month of lockdowns, China produced approximately 200 million fewer metric tons of carbon dioxide than the same period in 2019 due to a reduction in air traffic, oil refining, and coal consumption. In this same period, car travel fell by 70% in the

UK.[38] One Earth systems scientist estimated that this reduction may have saved at least 77,000 lives.[39] However, Sarah Ladislaw from the Center for Strategic & International Studies argued that reductions in emissions resulting from economic downturns should not be viewed as beneficial, because China's return to previous rates of growth amidst trade wars and supply chain disruptions in the energy market will worsen its environmental impact. Additionally, Nature reported that in 2020, global carbon emissions only fell by 6.4%. [2] Between 1 January and 11 March 2020, the European Space Agency observed a marked decline in nitrous oxide emissions from cars, power plants, and factories in the Po Valley region in northern Italy, coinciding with lockdowns in the region. Throughout areas in North India such as Jalandhar, the Himalayas became visible again for the first time in decades, as the drop in pollution triggered air quality improvement.

NOx emission changes in East China. During the initial phase of the COVID-19 pandemic, NASA and the ESA monitored the significant decrease in nitrogen dioxide gases in China. The economic slowdown from the virus drastically reduced pollution levels, especially in cities like Wuhan, China by 25-40%. NASA used an ozone monitoring instrument (OMI) to analyze and observe the ozone layer as well as pollutants such as NO<sub>2</sub>, aerosols, and other chemicals. This instrument helped NASA to process and interpret the data coming in due to the lock-downs worldwide.[46] According to NASA scientists, the drop in NO<sub>2</sub> pollution began in Wuhan, China and slowly spread to the rest of the world. The drop occurred drastically because the emergence of the virus coincided with the same time of year as the lunar year celebrations in China. During this festival, factories and businesses were closed for the last week of January to celebrate the lunar year festival. The drop in NO<sub>2</sub> in China did not achieve an air quality of the standard considered acceptable by health authorities. Other pollutants in the air such as aerosol emissions remained.

In early 2020, improvements were observed in transboundary Southeast Asian haze, attributed to lockdowns and other restrictions introduced by governments, as well as favourable meteorological conditions. Joint research led by scientists from China and the U.S. estimated that nitrogen oxide emissions decreased by 50% in East China from 23 January (Wuhan lockdown) to 9 February 2020 in comparison to the period from 1 to 22 January 2020. Emissions then increased by 26% from 10 February (back-to-work day) to 12 March 2020, indicating possible increasing socioeconomic activities after most provinces allowed businesses to open. It is yet to be investigated what COVID-19 control measures are most efficient controlling virus spread and least socioeconomic impact.

According to the World Health Organization, more than 80% of individuals living in cities are typically exposed to dangerous air pollution, which has been associated with an increased risk of COVID-19 problems and mortality. The changes in air pollution during COVID lockdowns have also impacted water quality. Scientists have long noted that air quality and surface water quality have a close connection; however, the decrease in air pollution during the pandemic specific impact on water systems remains unclear. Most studies have found that improvements due to COVID-19 were temporary, although there have been notable decreases in pollutants in various water systems.

#### **India :-**

On 30 January 2020, the first COVID-19 case in India was recorded in Kerala in South India, which was followed by a nationwide lockdown from March 25 to May 31, 2020. Reduction in air pollution as well as improvement in air quality was reported due to the lockdown which came as a relief to the environment; restrictions on industrial activities were also beneficial. Many Indian cities also observed a major reduction in air pollution. Even the industrial state of Gujarat, situated on the west coast of India, reported remarkable reduction of air pollutants due to restrictions imposed on industrial activities and traffic between the lockdown period from 25 March to 20 April 2020. Some of the major air pollutants, like nitrogen dioxide and sulphur dioxide, decreased by one to two percent along with average reduction of 0.3 degree Celsius in temperature in Vapi within the year 2019. Moreover, the emissions of pollutants decreased on an average of fifty-one to seventy two percent, resulting in an average temperature dropdown by two degrees Celsius within the lockdown period. In India the megacities that are Mumbai, Delhi, Chennai and Kolkata also reported the fall in temperature in Celsius by 2°, 3°, 2° and 2.5° respectively. The COVID-19 lockdown led to improvement of the water and air quality due to significant fall of air pollutants as reported in countrywide researches. Emissions of chemicals which lead to pollution of the environment such as carbon monoxide, ammonia, sulphur dioxide and nitrogen dioxide showed a significant reduction of 22.82%, 30.61%, 32.11% and 46.95% respectively; PM<sub>2.5</sub> as well as PM<sub>10</sub> reported a downfall by 57.09% and 48.56% respectively, resulting in improvement of air quality during the fourth phase of lockdown, from 22 March to 31 May 2020, named "Janta Curfew". The global disruption caused by the COVID-19 has brought about several effects on the environment and climate. Due to movement restriction and a significant slowdown of social and economic activities, air quality has improved in many cities with a reduction in water pollution in different parts of the world. Besides, increased use of PPE (e.g., face mask, hand gloves etc.), their haphazard disposal, and generation of a huge amount of hospital waste has negative impacts on the environment. Both positive and negative environmental impacts of COVID-19

## II. Conclusion :-

Directly or indirectly, the pandemic affects human life and the global economy, which ultimately affects the environment and climate. It reminds us how we have neglected environmental components and promoted human climate change. In addition, the global response to COVID-19 is also teaching us how to work together to combat a threat to humanity. Although the environmental impacts of COVID-19 are short-term, a unified and designed time-oriented effort can strengthen environmental sustainability and save the Earth from the effects of global climate change. Changing behavior in daily life: To reduce carbon footprint and global carbon emissions, it is necessary to change behavior in our daily life and optimal consumption of resources like; avoid processed and eat locally grown foods, compost food waste, turn off or unplug electronic devices when not in use, and use a bike instead of a car for short distances.

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