

## **2. Unseen Environmental Ripple Effects of the COVID-19 Pandemic**

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### **2.1 Introduction:**

COVID-19, a pulmonary disease first identified in Wuhan, China, at the end of 2019, is caused by a novel coronavirus known as SARS-CoV-2. It has manifested a wide range of symptoms, from mild to severe respiratory issues. By March 2022, it had drastically impacted global public health, with approximately 500 million cases and over 6 million deaths worldwide [1]. This pandemic led to significant social and economic disruptions due to measures like lockdowns and travel restrictions. These measures, while necessary for public health, also had unintended environmental consequences. On the positive side, the reduction in industrial activities and travel significantly lowered carbon emissions and air pollution. For instance, cities like Barcelona experienced a 50% drop in air pollution, and China saw a 25% reduction in carbon emissions. Venice's canals became visibly clearer, indicating improved water quality.

These reductions briefly aligned with targets set in the Paris Agreement, demonstrating the impact of reduced human activity on the environment [2]. However, the pandemic also brought negative environmental impacts. The surge in medical waste, primarily from personal protective equipment (PPE), posed new challenges for waste management systems. The pandemic also disrupted recycling initiatives, as attention shifted towards immediate public health concerns. Overall, the COVID-19 pandemic has highlighted the delicate balance between human activity, public health, and environmental health, underscoring the need for sustainable practices in both healthcare and daily life. The COVID-19 pandemic, which swept across the globe in early 2020, has had multifaceted impacts on human health, economies, and daily life. However, its indirect effects on the environment are equally

significant and complex. This chapter aims to explore the various indirect environmental impacts of the COVID-19 pandemic, shedding light on both positive and negative consequences.

## **2.2 Positive Effect of Covid -19:**

### **2.2.1 Reduction in Air Pollution:**

During the initial phase of the pandemic, stringent lockdowns led to a drastic reduction in industrial activities and vehicular traffic. This unexpected hiatus resulted in a significant decrease in air pollution levels in many urban areas. Studies have shown marked improvements in air quality indices and a reduction in the concentration of pollutants like nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>2.5</sub>). The period marked by the COVID-19 pandemic witnessed a notable decrease in CO<sub>2</sub> emissions, which previously contributed to poor air quality due to high levels of pollution [3].

This reduction is largely attributed to decreased human movement following the implementation of lockdowns, curfews, and various mobility restrictions. Before the pandemic, increased use of automobiles and traffic congestion in urban areas were primary contributors to air pollution. This pollution not only deteriorated environmental health but also posed health risks to wildlife and humans, potentially leading to conditions like Chronic Obstructive Pulmonary Disease (COPD). With the enforcement of stay-at-home orders and travel limitations, there has been a significant improvement in air quality. This positive change has even led to wildlife venturing into urban spaces, a phenomenon less observed when pollution levels were higher. The improvement in air quality, resulting from reduced emissions due to the temporary closure or scaling down of factory operations and less vehicular traffic, has been beneficial for both the environment and public health [4].

This period has demonstrated the direct impact of human activities on air quality and the potential for environmental restoration through reduced emissions. While the improvement in air quality was temporary, it provided a unique opportunity to study the impact of human activities on air pollution. This period has been a crucial reference point for environmental scientists and policymakers in understanding the potential for air quality improvements.

### **2.2.2 Reduced Water Pollution:**

Water bodies in various parts of the world witnessed reduced pollution levels. The decrease in industrial discharge and tourist activities led to clearer waters and improved conditions for aquatic life. During the COVID-19 pandemic, various factors contributed to a marked improvement in water quality. The notable decrease in air pollution, resulting from reduced industrial and transport activities, positively impacted rainwater quality. Before the pandemic, air pollutants contributed to the formation of acid rain, which not only threatened ecosystems and wildlife but also caused structural damage to buildings, as noted by Chu et al. [5].

With the pandemic-induced restrictions like movement limitations, remote working, virtual events, and reduced transport activities, the emission of these pollutants significantly lessened, leading to cleaner air and, consequently, improved rainwater quality. Additionally, the pandemic saw a reduction in water contamination from sources such as oil spills in oceans, previously exacerbated by extensive maritime activities. The travel bans, quarantines, and lockdowns effectively diminished the contamination risks posed by transportation systems to marine environments. The pandemic also indirectly led to a decrease in the usage of agricultural chemicals like pesticides and fertilizers. Supply chain disruptions resulted in their reduced availability, which, in turn, lessened the contamination of water bodies from agricultural runoff [6]. This reduction has been beneficial to the health of aquatic ecosystems. Furthermore, many industrial and factory operations, which are common sources of wastewater and chemical pollutants, were either scaled down or halted during the pandemic. This pause in industrial activities provided a respite for water sources such as rivers and underground reservoirs, leading to an improvement in their quality.

### **2.2.3 Wildlife and Natural Habitats:**

The reduction in human activity provided some wildlife species with a respite from disturbances, leading to sightings of animals in areas previously dominated by humans. This period also allowed for the regeneration of certain natural habitats. The COVID-19 pandemic led to a significant reduction in fishing activities due to various governmental measures such as travel bans and movement restrictions. This decrease in fishing activity,

as reported by Hu et al. [7], has had notable environmental consequences, including a steady increase in fish biomass. The restriction on fishing activities contributed to a rapid growth in fish populations, which in turn influenced market dynamics, notably decreasing fish prices. Additionally, the burgeoning fish populations have played a role in the redistribution of phosphorus within aquatic ecosystems. Fish movements between shores and deeper sea areas facilitate the transfer of nutrients and minerals, impacting the ecological balance of these environments. Furthermore, the reduced fishing pressure during the pandemic has enabled fish to explore and inhabit areas that were previously less accessible due to human activity. This shift has brought changes to local ecosystems, which were historically influenced by the presence of fishing activities. Importantly, the pandemic-induced pause in fishing has provided a critical respite for overfished and endangered species, allowing them an opportunity for recovery and growth. This period has highlighted the significant impact of human fishing activity on aquatic life and has underscored the potential for environmental recovery when such pressures are alleviated.

#### **2.2.4 Climate Change:**

The COVID-19 pandemic, along with its containment strategies, has inadvertently contributed to efforts in addressing the longstanding global issue of climate change. Traditionally, high levels of CO<sub>2</sub> emissions from water, air, and land transport have been a major factor exacerbating climate change.

However, the pandemic has catalyzed a shift towards new practices that reduce these emissions. One significant change brought about by the pandemic is the widespread adoption of virtual events and remote working arrangements. These practices have substantially decreased the necessity for travel, which in turn has led to a reduction in CO<sub>2</sub> emissions [8]. This shift not only contributes to immediate reductions in greenhouse gases but also presents a long-term opportunity.

If the adoption of virtual meetings and remote work continues post-pandemic, it could lead to a sustained decrease in transport-related emissions. CO<sub>2</sub> is a known contributor to the depletion of the ozone layer, which acts as a protective shield against harmful ultraviolet rays. By depleting the ozone layer, CO<sub>2</sub> emissions increase the Earth's exposure to extreme

temperatures and other climatic anomalies. Therefore, the pandemic-induced reduction in CO<sub>2</sub> emissions represents a positive step towards mitigating the impacts of climate change and protecting the ozone layer [9]. The global experience during the COVID-19 pandemic has highlighted the potential benefits of these new practices and their role in a broader strategy to combat climate change.

### **2.2.5 Reduce Traffic:**

The COVID-19 pandemic, which swept the globe in 2020, had an unprecedented impact on various aspects of life, including a significant reduction in traffic congestion. With governments implementing lockdowns and stay-at-home orders to curb the spread of the virus, the roads, typically bustling with vehicles, became noticeably quieter. Major cities across the world, known for their traffic jams, witnessed a drastic drop in vehicular movement. This reduction in traffic had multiple implications. On the positive side, it led to a decrease in air pollution and greenhouse gas emissions, contributing to a temporary improvement in air quality in many urban areas. The quiet streets also allowed for a reimagining of urban spaces, with some cities expanding bike lanes and pedestrian zones to encourage social distancing [10]. However, the reduced congestion was a direct result of economic slowdowns and restrictions on movement, reflecting the challenges faced by businesses and individuals. Public transport systems also saw a decline in usage due to health safety concerns, posing financial challenges for these essential services. Overall, the pandemic's impact on traffic congestion highlighted the complex relationship between urban mobility, public health, and the environment, offering insights for future urban planning and sustainable transportation strategies.

### **2.2.6 Noise Reduction:**

The COVID-19 pandemic, which led to global lockdowns and a dramatic shift in daily activities, also resulted in a significant reduction in noise levels, particularly in urban areas. With the enforcement of stay-at-home orders, the hustle and bustle of city life quieted down. Traffic, a primary source of urban noise pollution, diminished as fewer vehicles were on the roads due to restrictions and a rise in remote working [11]. This decrease in noise pollution had a notable impact on the environment and public health. Urban dwellers experienced a

rare quietness, leading to a decrease in stress and disturbance associated with constant noise. Wildlife in urban areas also benefited, with reports of birds being more audible and a general increase in wildlife activity in quieter cityscapes. The reduced industrial activity and fewer public events further contributed to this quietude. This situation offered a unique opportunity for researchers to study the effects of noise pollution on health and the environment under unprecedented conditions. However, the reduction in noise levels was a direct consequence of the pandemic's restrictive measures, reflecting broader social and economic challenges. As the world gradually recovers and activities resume, the experience of reduced noise pollution during the pandemic could inform future urban planning and noise management strategies.

### **2.2.7 Human Activity:**

The COVID-19 pandemic brought about a significant transformation in human activity globally. As countries implemented lockdowns and social distancing measures to control the virus's spread, everyday life underwent drastic changes. Workplaces shut down or shifted to remote operations, reducing commuting and altering professional routines. Educational institutions transitioned to online learning, affecting students and teachers alike. Social activities were markedly impacted. Public gatherings, including festivals, sports events, and concerts, were cancelled or postponed, leading to a notable decrease in communal interactions [12]. Tourism and travel experienced a steep decline due to travel restrictions and safety concerns, severely impacting the industry. Consumer behaviour shifted as well, with a surge in online shopping and digital services, while physical retail stores saw reduced footfall. The pandemic also accelerated the adoption of technology in various aspects of life, from telemedicine in healthcare to increased reliance on digital communication tools for personal interactions. The psychological impact of these changes was significant, with many experiencing increased stress and mental health challenges due to isolation and uncertainty [13].

However, the pandemic also fostered a sense of community and resilience, as people adapted to new ways of living, working, and connecting with others. This period of altered human activity highlighted the adaptability and resilience of societies in the face of unprecedented challenges.

### **2.2.8 Increase Soil Health:**

To increase soil health during the COVID-19 pandemic, consider adopting sustainable agricultural practices that are both environmentally friendly and effective in maintaining soil fertility. Incorporate organic matter like compost or manure into the soil. This enhances soil fertility, structure, and microbial activity, leading to healthier plant growth. Utilize cover crops, such as legumes, which fix nitrogen in the soil, and other species that add organic matter and prevent erosion. Minimize soil disturbance to preserve its structure, retain moisture, and maintain a healthy microorganism population. This approach helps in carbon sequestration and reduces erosion. These methods not only improve soil health but also contribute to broader environmental sustainability and community resilience during the challenging times of a pandemic.

## **2.3 Negative Effect of Covid -19:**

### **2.3.1 Increased Water Demand:**

During the COVID-19 pandemic, there was a noticeable shift in water usage patterns, leading to an increased demand for water in certain sectors. With more people staying at home due to lockdowns and remote work policies, residential water usage saw a significant rise. This increase was partly due to more frequent handwashing, a key measure recommended to prevent the virus's spread, as well as higher consumption for general domestic purposes like cooking and cleaning [14]. Conversely, commercial and industrial water demand experienced a decline due to the temporary closure of businesses, offices, and manufacturing plants. However, this reduction was often outweighed by the surge in residential demand. The heightened need for water also underscored the importance of reliable and safe water supply for hygiene and health purposes, especially in healthcare facilities where the demand for stringent sanitation measures was crucial. In many regions, this situation exposed the challenges in water supply systems, particularly in areas already grappling with water scarcity. Moreover, the pandemic highlighted the need for sustainable water management practices, both to handle such sudden shifts in demand and to ensure equitable access to clean water. It emphasized the critical role of water in public health and the need for robust infrastructure to support changing water usage patterns in crises.

### **2.3.2 Increase Deforestation:**

The COVID-19 pandemic has had profound and multifaceted impacts on our world. One of the less discussed but significant consequences is the increase in deforestation, particularly in tropical regions. This surge in tree cutting can be attributed to several pandemic-related factors. Firstly, the pandemic's economic fallout has been immense. Many businesses, unable to cope with the restrictions and reduced consumer demand, have either paused their operations or closed down permanently. This has led to widespread job losses, leaving numerous individuals without a stable income. In desperate attempts to provide for their families during a period marked by food scarcity and broken supply chains, some have turned to deforestation as a means of survival [15]. Secondly, government priorities shifted dramatically during the pandemic. Resources were reallocated to combat the virus, often at the expense of environmental conservation efforts. This shift in focus provided an opportunity for increased illegal deforestation, as oversight and enforcement of environmental protections waned. The impact of this increased deforestation is far-reaching. Not only does it threaten wildlife habitats and biodiversity, but it also exacerbates climate change. The reduction in forest cover during the COVID-19 period represents a significant setback in global efforts to conserve the environment and combat climate change. This situation underscores the complex and interconnected challenges that crises like pandemics can pose, extending beyond immediate health impacts to long-term environmental sustainability.

### **2.3.3 Increased Medical and Plastic Waste:**

The pandemic saw a surge in medical waste, including personal protective equipment (PPE) like masks and gloves. This increase posed significant challenges for waste management systems and raised concerns about plastic pollution. The COVID-19 pandemic has notably influenced the environmental landscape, particularly in terms of cleanliness and waste management in urban areas. Previously, high levels of human activity in markets and public spaces led to substantial littering and accumulation of solid waste, posing health risks to both the environment and the population. During the pandemic, however, reduced human presence in these areas, a result of movement restrictions, lockdowns, and stay-at-home orders, allowed for more effective cleaning and waste management efforts by city



authorities [16]. This resulted in a noticeable improvement in the cleanliness and aesthetic appeal of public spaces, which were once characterized by crowding and litter. The pandemic period can be seen as a time when the environmental appearance of many cities and towns improved significantly, thanks to more efficient waste disposal and reduced pollution due to lower human activity. The visibility of cleaner, less congested public spaces highlighted the potential for maintaining higher standards of urban cleanliness and environmental stewardship.

#### **2.3.4 Recycling Disruptions:**

Recycling efforts were also hampered due to concerns about virus transmission and the prioritization of health over recycling initiatives. However, this period also brought new challenges in waste management, particularly concerning the disposal of face masks and gloves. Improper disposal of these items not only posed health risks to humans but also to domestic animals, which faced increased risks from ingesting this litter. The proliferation of littered face masks and gloves during the pandemic has highlighted the need for more responsible disposal practices and raised concerns about the degradation of environmental conservation efforts in this aspect [17].

#### **2.3.5 Reduced Agriculture Production:**

The COVID-19 pandemic significantly impacted agricultural production, primarily due to disruptions in supply chains, labor shortages, and logistical challenges. Movement restrictions and quarantines led to delays in planting and harvesting crops, reducing overall production efficiency.

Many farmers faced difficulties in accessing markets to sell their produce or to buy seeds and fertilizers, further hindering production. Labor shortages were acute, as migrant workers, crucial to many farming operations, were unable to travel. This lack of labor affected both the planting and harvesting phases, leading to crop losses and reduced yields. Additionally, the pandemic disrupted food supply chains. Transportation restrictions and border closures led to delays in moving agricultural goods, resulting in spoilage and waste, especially for perishable goods.

This not only reduced the available food supply but also impacted farmers' incomes and market prices. The pandemic also highlighted the vulnerabilities of the agricultural sector to global shocks. It underscored the need for more resilient agricultural practices, improved supply chain management, and better support systems for farmers to withstand such unprecedented challenges.

## **2.4 Conclusion:**

The COVID-19 pandemic, while presenting numerous challenges, has also created unique opportunities, particularly in the realm of environmental conservation. The drastic changes in daily life, necessitated by efforts to control the virus's spread, have led to unexpected benefits for the environment. Actions such as quarantine, travel restrictions, and the suspension of group activities have significantly contributed to the mitigation of the pandemic.

These measures have inadvertently led to improvements in air and water quality, wildlife protection, and overall environmental health. Interestingly, the positive environmental impacts of these containment strategies have been substantial, often outweighing their negative aspects. This situation highlights the potential for ongoing positive environmental change, suggesting that maintaining certain COVID-19 response strategies could bolster efforts to tackle broader environmental issues. Embracing the "new normal" brought about by the pandemic could be crucial in continuing to realize these indirect environmental benefits, thus supporting sustainable development goals.

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