# The Nature's SOS: Covid-19[1]

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***Abstract*— The ecological balance of our mother earth has been continuously degenerating making this lovely planet a living hell. Industrialization, toxic wastes, use of excessive plastic, vehicular pollution and deforestation has worsened the situation further. COVID- 19, a global pandemic had forced the world to lockdown their homes. Mother earth heaved a sigh of relief with less people and fewer vehicles on the roads. The research undertaken utilized data gathered from reputable research papers and authoritative websites to thoroughly analyze the effects of lockdown measures on our ecological system. The primary focus of this study was to explore the positive impact of the pandemic-induced lockdown on nature, specifically evaluating its influence on air and water quality, wildlife populations, noise levels, and land surface temperature.**

***Index Terms*— Air, covid-19, environment, human, lockdown, nature, noise, pandemic, pollution, quality, water.**

## I. INTRODUCTION

The coronavirus disease was first detected in Wuhan, China at the end of 2019 [1] and WHO declared Covid19 as pandemic on March 11, 2020 [2]. Covid 19, a global pandemic crippled human lives all over the world by its serious implications. Lockdown was a significant necessity to cope with this pandemic as its transmission is very rapid. Lockdown was forced by almost every country to culminate the community transmission of this disease. The life of everyone had come to a standstill during this unprecedented lockdown were predominant.

Before the coronavirus outbreak and the lockdown, the air was toxic to breathe. Many issues like global warming, melting of glaciers and pollution were predominant. After the pandemic there had been a very dramatic change in the environment. As there was complete hampering of human activities, this turned out to be a boon for mother nature. Due to the curtailment of all human activities which include travelling the air and noise pollution decreased. Industrial units were closed which further reduced the carbon emission in the air and the industrial wastes in the water bodies. This improved water quality for human consumption and aquatic life as well. As the humans were locked in their homes many wild animals could be seen walking freely on the streets and forests due to lack of human interference.

The kind of recovery shown by nature showed that a periodic lockdown can serve as an emergency measure to combat severe air, land and water pollution. There was a dramatic improvement in our surroundings with decreased pollution, better surroundings and clean environment. Rare species of birds, wild and aquatic animals could be sighted during lockdown. Hence lockdown proved to be a blessing in disguise for our nature.

## II. RESULT AND DISCUSSION

### A. Effect of Lockdown on Air Quality.

Due to the forced restrictions, air pollution levels in cities across the country drastically decreased just within a few days which ignited discussions regarding lockdown to be the effective alternative measure to be implemented for controlling air pollution.

#### *1. Impact on PM 2.5*

Before lockdown, in NCT Delhi, for the last several years, PM 2.5 concentration was recorded very high [3] and it was far beyond the tolerable limits as per National Ambient Air Quality Standards (NAAQS) [4]. This high air pollution intensity causes significant public health problems [5] particularly shortness of breath, chronic respiratory disorders, pneumonia, acute asthma etc.[6]. Due to the public health threats, in 2017, the Indian Council of Medical Research (ICMR) declared a community health emergency for the National Capital Region (NCR) of Delhi.[7].

During lockdown in south India, on an average, reduction in particulate matter (PM) concentrations

was around 50-60% and over the Indo - Gangetic basin, including Delhi, U.P., Bihar, West Bengal etc it was as much as 75%. Concentrations of PM 10 and PM 2.5 have witnessed maximum reduction (>50%) in comparison to the pre-lockdown phase [8]. In comparison to 2019 during the said time period the reduction of PM 10 and PM 2.5 was as high as about 60% and 39% respectively. This was observed all over the world. As per Bloomberg [9] cities with high PM2.5 concentration levels showed the most substantial reductions in air pollution as depicted in Table 1.

| S.No | Name of Country | Percentage reduction in PM 2.5 for a three week period in 2020 compared to same time in 2019 |
|---|---|---|
| 1 | Los Angeles | 31 |
| 2 | Seoul | 54 |
| 3 | Wuhan | 44 |
| 4 | New York | 25 |
| 5 | Mumbai | 34 |
| 6 | Madrid | 11 |
| 7 | London | 9 |
| 8 | Delhi | 60 |

Table 1 shows the reductions in fine particulate matter or PM 2.5 in global cities including Delhi, Seoul, Los Angeles and New York during the lockdown.

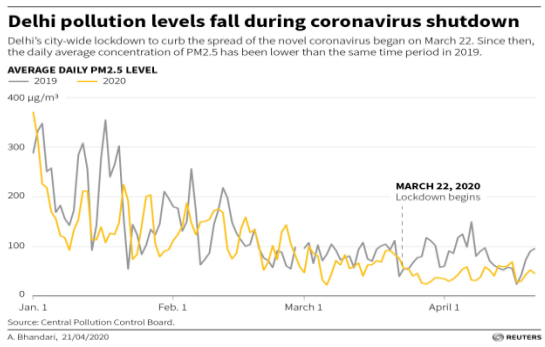


Figure 1: Delhi, which was ranked as the fifth most polluted city and the most polluted capital in 2019, saw a 60% drop in air pollution as reported by CPCB [10].

There was a substantial reduction in the concentration of suspended particulate matter, a major component of air pollution, due to reduced human activities as a consequence of the lockdown. Large reduction in air traffic resulted in a significant reduction in particulate matter and greenhouse gas emissions in the upper atmosphere which would also lead to the recovery of ozone holes [11].

*2. Impact on $NO_2$ emissions*

Air, road, sea transport and power plants are responsible for $NO_2$ emissions in urban regions. During the stringent global lockdowns, $NO_2$ levels have dropped significantly in urban areas. In Delhi's metropolitan area, $NO_2$ levels from March 25 (the day quarantine began) to May 2020 have averaged 90 µmol/m² compared to 162 µmol/m² from March 1 to March 24, 2020. In 2019, $NO_2$ levels from March 25 to May 2 were also far above this year's levels, averaging 158 µmol/m² [12]. Similar drops in $NO_2$ levels were also seen in major cities highlighting the beneficial effects of lockdown on nature.

*3. Impact on $CO_2$ emissions*

$C0_2$ emissions fell by 1% in the fiscal year ending March 2020, due to low coal and oil consumption. The country's $CO_2$ emissions fell by an estimated 15% during the month of March and 30% in April. Coal fired power generation fell 15% in March and 31% in the first three weeks of April. In contrast, renewable energy generation increased by 6.4% in March and saw a slight decrease of 1.4% in the first three weeks of April. Similar to electricity demand, oil consumption has been slowing down since early 2019. This is compounded by the dramatic impact of the COVID-19 national lockdown measures on transport oil consumption. India's $CO_2$ emission fell for the first time since 1982 [13].

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*4. Impact on $SO_2$ level*

$SO_2$ is one of the important indicators of air pollutants that are strongly related to the combustion of coal, petroleum, and chemical fuel emissions. It is the major precursor of nucleation formation of new particles in the atmosphere; and when these processes occur in populated regions, they could increase the human exposure to ultra-fine particles [14]. For the present study, the variations in $SO_2$ concentrations were not as significant as those of PM10 and $NO_2$ since their levels have decreased since the use of fuel and lubricant oil with low sulphur content in 2009. Closure of commercial ships, industrial zones and pottery complexes around the sampling site contributed significantly in the reduction of $SO_2$ emissions, which dropped by 3.2 $\mu g/m^3$ (from 6.6 to 3.4 $\mu/m^3$) [10].

B. Effect of Lockdown on water quality locally and globally

The closure of industrial activities in the world during the lockdown led to an apparent improvement in the water quality of many water bodies in the world as tons of toxic wastes and effluents were not discharged into them. The status of water bodies in India is very poor. They have been turned into sewer canals by the industries. It is found that almost 40 million litres of wastewater enters rivers etc. and only 37 percent is treated.

Vembanad Lake in Kerala is polluted due to the micro plastics which led to the high concentrations of toxic elements [15]. It was found that 18 out of 20 zones showed a decrease in the Suspended Particulate Matter (SPM) concentration caused by sedimentation, sewage disposal and other pollutants. The SPM concentration in Vembanad Lake had decreased by 15.9%. The decrease in SPM was up to 34% when compared with the previous years.

Dissolved Oxygen (DO) is the life line of aquatic lives. Wastes disposed from various industrial sources when enriched with organic load deplete the DO level causing an adverse impact on aquatic biodiversity. A significant increase in DO was reported which supported the positive role of COVID-19 lockdown phase in terms of water quality, which may be due to complete closure of industrial operations, vessel movements, fish landing and tourism activities at these sites.

The Ganga water quality improved remarkably during the lockdown period. One- tenth of the pollution in it is due to industrial wastes. IIT -BHU confirmed that there is a 40-50 per cent improvement in the Ganga. On April 4, 2020, at Varanasi's Nagwa Nala, the Dissolved Oxygen (DO) values were found to have increased to 6.8 milligram/litre against 3.8 milligram/litre on March 6, showing a remarkable improvement of 79 per cent in DO values [16].

According to the Central Pollution Control Board (CPCB), on April 19, 2020 the water quality of the Ganga met the drinking water standards at 27 points out of the 36 monitoring units. The biological oxygen demand (BOD) was less than 3 mg/l, dissolved oxygen (DO) was less than 4 mg/l and pH 6 to 9 [17]. According to Uttarakhand Environment Protection and Pollution Board, there has been a 34% reduction in faecal coliform and 20% in biochemical oxygen demand in Haridwar. The industries and offices in Delhi-NCR were closed due to lockdown which showed a positive effect on water quality of the Yamuna River. Clean Yamuna and pure water was also possible as the industrial pollutants and industrial waste were not discharged in it [18]. The lockdown had a dramatic impact on the health of the Narmada River which is considered the lifeline of Madhya Pradesh. The pH value of the water samples of the Narmada River collected on April 24, April 28 and May 2 from the five ghats showed a value between 7.2 and 7.8 on the pH scale which was neither acidic nor alkaline which is suitable for humans and animals. Before lockdown the dissolved oxygen level in the

river water was between 5 and 3, the value during the lockdown was between 6.5 and 6.8 which meant the Narmada water quality was A grade. The level of coliform bacteria, which dirties the water, reduced to six to seven times of the pre-lockdown levels. Venice, a highly trafficked tourist location in Italy is usually filled with gondolas, water taxis and cruise ships. The stoppage of the water traffic led to settlement of sediment in the canals.[19]. Lockdown measures in Venice restricted the mobility and stopped water traffic, with a consequent decrease of wake waves.[20]. An unprecedented water transparency in the city canals was determined by the reduction of boat traffic and tourism.

Lockdown period coincided with non-seasonal rains which reduced the power consumption used for irrigation, thus resulting in more water in reservoirs and rivers. The river water became fit for drinking and for outdoor bathing, also an increased amount of dissolved oxygen (DO) and decreased biological oxygen demand (BOD) and nitrate ($NO_3$) concentration was reported [17].

C. Impact on Wildlife

COVID 19 lockdown was a boon for wildlife. There was a drastic change in wildlife within a few months**.** When the lockdown was in full force, the animals roamed freely since they did not sense vibrations from the vehicles on the road. There was reduction in air and pollution due to which marine life also enhanced. Nature seemed to have changed, especially in urban environments. Nilgai were spotted in Noida, which was their natural inhabitant a few decades ago, but as forests and farmlands gave way, they were forced to look for a safer area. Nature seemed to have changed, especially in urban environments. Rare sights like Pumas in downtown Santiago, Chile, dolphins in unusually calm waters of Trieste, Italy, and jackals in urban parks in Tel Aviv, Israel were seen [21]. Meppayur in Kozhikode also witnessed a small Indian civet using a zebra crossing. Dolphins were spotted in the waters of Marine drive and Malabar Hill, which is not so uncommon in this marine landscape, but fishing and other human activities keep them away from appearing so close to the coast [22]. The sight of sparrows was reassuring, as their numbers have gone down a great deal. Red whiskered bulbul in Bangalore, Common iora in Vadodara, Purple rumped sunbird in Coimbatore, Indian Grey Hornbill in Mumbai were examples of few birds seen during the lockdown. Cougars were reportedly spotted prowling the streets in Santiago, Chile in April 2020. Wild Kashmiri goats meandered through the town of Llandudno, Wales in March [23]. According to the forest officials over a period of 68 days, no road killing of wild animals was reported in Visakhapatnam. So, it can be concluded that wildlife has benefited a lot from these reduced levels of human activity during the Covid-19 pandemic, which is termed as a great "andropause" by the scientists [24].

D. Impact on Noise Pollution

Traffic and industries are the major sources of noise pollution, COVID-19 lockdown reduced both of these. The standard value of sound intensity for industrial areas is 75dB(A) during day and 70dB(A) at night time which was reduced to a significant level during the lockdown.[25].

The measured levels of noise pollution have proved Delhi to be the most polluted city, but during the lockdown period, the data was significantly lower. Reduction of normally recorded 100dB to nearly 50-60 dB (Govindpuri Metro station area) was stunning. Most residential areas in Delhi clicked 30-40dB(A) down from usual 55dB(A) [26]. This shows how this lockdown influenced human lives for better, by reducing noise pollution remarkably.

The noise levels from shipping traffic, whose 20-200 Hz hum disturbs sea life despite being a low frequency, decreased with a significant reduction below 150 Hz during lockdown. According to a landmark study, reduction in shipping traffic has made whales calmer.

Reduction in pollution not only helped animals on land but also helped aerial animals such as birds and insects. The birds send signals to one another through songs, which is a means of their survival. The swift rise of human-made noise-also known as anthropogenic noise over the past century has made it very difficult for birds to communicate or send their signals. The loud sounds make many of these birds uncomfortable and unhealthy. The reduction in Global flights during lockdown had proved to be a boon for the birds [27].

In the places dominated by stone crush areas, it was observed that only after 18 days of the commencement of lockdown, the noise level dropped to below

65dB(A) which was above 85dB(A) in pre lockdown period.[28[.

According to the World Health Organization, noise affects over 100 million people in Europe alone. Exposure to chronic noise pollution not only causes problems like hearing loss, sleeplessness, high blood pressure, heart disease and cognitive impairment in children. Road traffic noise is said to contribute to at least 12,000 premature deaths annually in Europe, The European Environment Agency (EEA) has found that the same number of children are experiencing either learning difficulties or disruptions due to excessive aircraft noise (29).

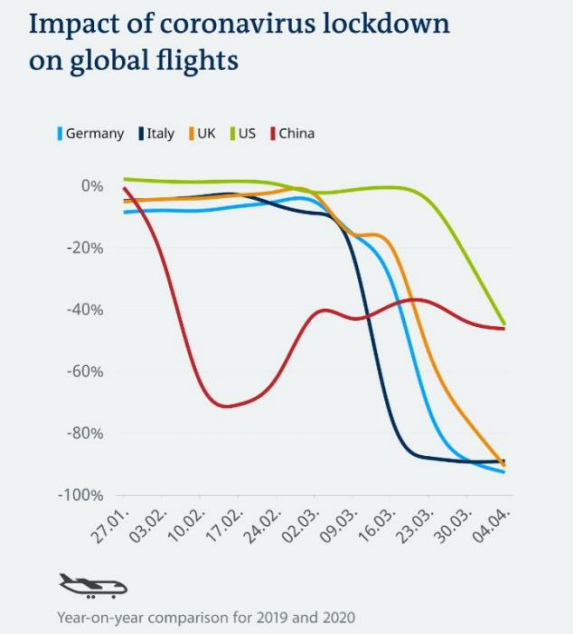


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Figure 2: This graph shows the percentage of global flights in an interval of every 8 days starting from late January to early April in different countries. one can see how it has slashed amid COVID 19 lockdown.

Germany has seen a slash of over 90% in air travel. Moreover car traffic dropped by more than 50% and trains ran at less than 25% their usual frequency. This change was positive enough for Nature to heal itself [30].

The British Geological Survey has found that in April 2020, the level of human-generated or anthropogenic noise fell by as much as half as compared with levels recorded before the lockdown. According to Dr Brian Baptie, head of seismology at the Survey, the organization has a network of around 100 sensors deployed nationwide in order to monitor earthquakes and volcanic activity. Besides seismic noises, these seismometers also track other activities in the Earth's crust, like noise created anthropogenically by road and rail traffic and factories, etc. Scientists at Royal Holloway, University of London have reported a 30 per cent drop in seismic noise near King's Cross station. Due to drop in human noise, seismologists were able to detect minor geophysical events which were hard to identify before lockdown [31].

Therefore, during the lockdown only we observed a significant reduction in transportation noise levels due to decreased mobility. The strong implication is that as society emerged from lockdown and transport usage gradually returned to its previous levels, so too had been noise pollution levels [28].

E. Effects on land surface temperature (LST)

Lockdown period has recorded about 3–5°C temperature less than pre-lockdown phase indicating the fact that industry induced energy footprint enhances temperature significantly.

Highest temperature is usually found in and around the stone quarrying and crushing units. A pre lockdown LST record shows the fact [32].

This thermal condition adversely affects the health of the workers and proximate local people. But amid lockdown the LST is reduced considerably. For instance, in the pre lockdown period, maximum recorded temperature varied from 35.49 to 38.48°C and just after four days of commencing lockdown it was reduced by 3.24 to 5.07°C and 4 to 6.5°C after 18 days [28]. Average temperature of all the clusters ranged from 31.25 to 35.11°C in pre lockdown period and it was reduced to 2.27 to 5.53°C after four days and 2.74 to 7.06°C after eighteen days of commencing lockdown as shown in Table 2. So the temperature recorded during the operation of quarrying and crushing activities is not the sole effect of solar radiation. The reduced amount is due to the effect of anthropogenic activities.

| S.N. | PHASE | CLUSTER 1 | | | CLUSTER 2 | | | CLUSTER 3 | | | CLUSTER 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Max. | Avg. | Min. | Max. | Avg. | Min. | Max. | Avg. | Min. | Max. | Avg. | Min. |
| 1 | 12.03.2020 | 35.49 | 31.25 | 28.12 | 38.17 | 33.41 | 28.78 | 37.15 | 34.64 | 27.48 | 38.48 | 35.11 | 31.21 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 28.03.2020 | 30.58 | 28.54 | 26.43 | 33.1 | 28.49 | 27.47 | 32.11 | 29.11 | 25.12 | 35.24 | 32.37 | 28.55 |
| 3 | 13.04.2020 | 27.18 | 25.14 | 24.25 | 26.24 | 25.44 | 24.24 | 28.27 | 27.58 | 24.33 | 34.45 | 30.24 | 28.47 |

Table 2: Clusterwise levels of LST value in Pre lockdown and during the lockdown periods (Values in °C) [28].

F. Effects on Carbon emissions

Global carbon emissions dropped by an unprecedented 17% during the coronavirus lockdown. The researchers analyzed lockdown measures in 69 countries, which account for 97% of global carbon dioxide emissions. The data was taken from six key economic sectors including ground transportation, air transportation, power, industry, public buildings and private residences to estimate the changes in daily emissions from each sector between January and April 2020, compared with mean levels from the same period in 2019. The

largest drop in carbon emissions came from the reduced traffic from cars, trucks and buses, accounting for roughly 43% of the total estimated emission reduction; the power and industrial sectors accounted for another combined 43% of the total. The peak 17% daily decline occurred on April 7, when China, India, America and most other major carbon-emitting countries were all under a high-level of lockdown simultaneously. Some individual countries saw daily emission drops of up to 26%, the researchers found however, most of those reductions are already going away [33].

## III. RESULT

The outbreak of Covid-19 had created an unprecedented situation around the world. The pandemic had restricted human activities across the world which led to a positive impact on the environment. The dramatic changes in the environment as a result of the lockdown have surprised everyone as the measures which were taken earlier to conserve the environment were ineffective. The results emphatically depicted the exploitation of nature by humans.

The paper has compiled several studies that have examined the impact of the COVID-19 lockdown on various environmental aspects, viz. air, water, sound, land, etc. The improved air quality in big cities saw their average air quality index within safe limits. The study data revealed a massive drop of pollutants like $NO_2$, $CO_2$ and $SO_2$ levels because of restricted human activities and this fact is empirically revealed that human beings contribute the maximum to the environment degeneration.

Research on water bodies revealed positive effects on water quality during the lockdown. The contamination levels of rivers were significantly reduced due to less human activity, highlighting the potential for future river rejuvenation strategies. The wild land and aquatic animals, flying birds, etc. which were not commonly seen before the pandemic, were sighted frequently enjoying nature during the lockdown.

The changes in decibel levels of soundscape resulting from the lockdown were assessed and a significant drop in noise levels was observed. The pandemic-induced lockdown had made the world a quieter place to live and breathe comfortably.

This paper provides valuable insights into the relationship between human activities and environmental factors. Hence it can be concluded that the pandemic Covid 19 has been proved to be a blessing in disguise and gave us a SOS call for our mother nature to be a sustainable planet to live in.

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