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From Curbing Pollution to Restoring Spaces: A Study on the Consequences of COVID-19 on Mother nature

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ABSTRACT

Nations around the globe are experiencing so much anxiety, apprehension, and ambiguity. Everyone is forced to find their means of livelihood. The coronavirus, which transformed our way of living, was first identified at the WHO Country Office in Wuhan, China's largest metropolitan area, in December 2019 and is now spread worldwide. Globally, the lockdown has been implemented to slow down the unfurl of the virus. Pandemic COVID-19 has a profound pay off on human activities, the financial sector, and the health care system. The epidemic also has a huge impact on humans, the economy, education, industry, and health care centers. In addition to the various negative consequences, the present pandemic also has some positive effects. The global report speculates that the emergence of COVID-19 is having a very positive impact on the environmental conditions such as a huge improvement is noticed in the air and water quality, and on the movement of wildlife. India is among the most polluted country in the world because it is highly populated, and due to which more industrial activities are carried out, which gradually result into a high level of air and water pollution. The immediate shutdown announced by the government to control the spread of COVID-19 entrained into the improved air and water quality. Nowadays when the man began to withdraw from the open space in fear of COVID-19, nature began to regain its place. This less intervention of human beings with nature proved as a blessing for the environment. Because of this virus, the authorities have reduced the shipbuilding and other water transport activities which helped in reducing the smoke pollution, resulting in a massive drop in air pollution and a huge improvement in water quality.

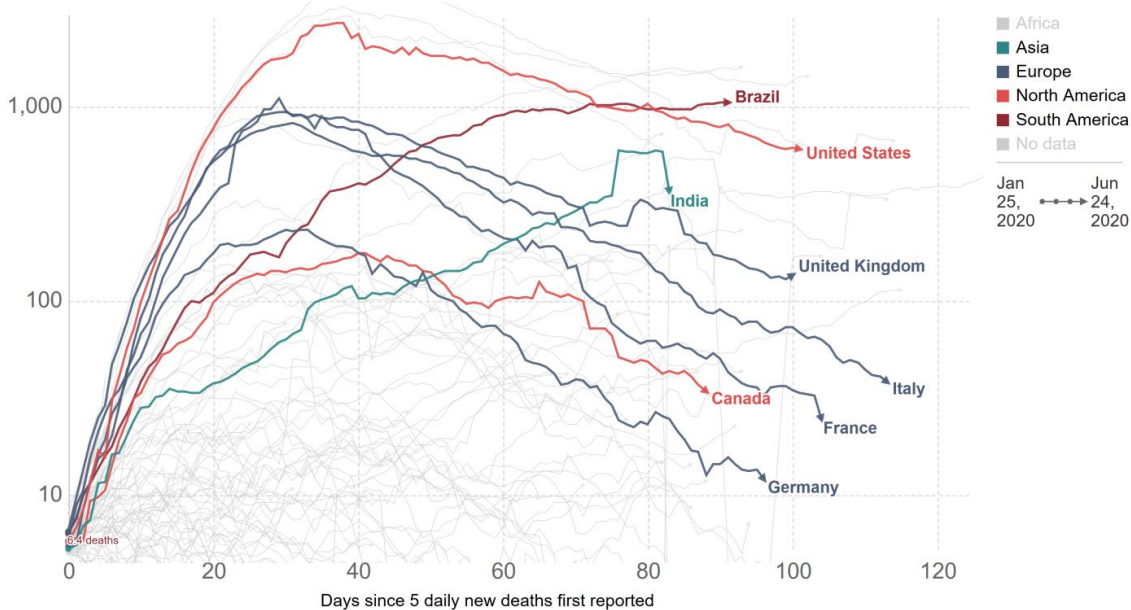
Keywords: Environment, COVID-19, air quality index (AQI), the ozone layer, Wildlife, water pollution, Central Pollution Control Board (CPCB).

1. INTRODUCTION:

The first symptom of COVID-19 has been discerned in Wuhan, a metropolitan city of China in December 2019. COVID-19 also known as SARS-CoV2 is a highly infectious disease that mainly includes a cluster of viruses that proliferate from a person infected with COVID-19 to another person in form of tiny particles through the mouth, sneezing, handshaking, etc. The indefinite period of growth and the lack of human immunity to tackle the increasing rate of infection has made it a “health emergency” as declared by the World Health Organization on the 11th of March, 2020. Although since December 2019 China has been the 1st country to face the crisis, the rest of the world is now facing a rapid spread of COVID-19. There are 9,532,128 cases worldwide with approx. 5 lakh deaths as confirmed on June, 25. The COVID-19 epidemic has led to a major drop in pricing of commodities and the demand of imported goods and services, and because of travel restrictions imposed by Government, global supply chain and international tourism is also badly affected, all of this wrecking results into a major economic induce in the world. This deadly virus has a long-lasting influence on the economy like stress among the population regarding their economic situation, and the increasing rate of the disease will effectuate the expenses of healthcare services. This pandemic has affected every sector whether it is economical manufacturing, education, or services. All these sectors are indulged in the process of defending themselves, from the venomous effects of COVID-19.

Daily new confirmed COVID-19 deaths

Shown is the rolling 7-day average. Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.



Source: European CDC – Situation Update Worldwide - Data last updated 24th Jun, 15:20 (GMT+05:30), European CDC – Situation Update Worldwide
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Figure 1. Showing daily confirmed deaths in the world till 24 June 2020

There is a enormous advantage of the decline in industrial and human activities that have been witnessed in the world, as it resulted in the diminution of Nitrogen Dioxide(NO_2) concentration. An unmitigated closure of industry, transport, and tourism has led to the notable decline in the consequences of commercial operations on the environment. So, these reductions in pollution level will assist our mother nature in retrieving itself and humans will get fresh air to breathe.

2. Background Information: COVID-19 pandemic in India:

The Prime Minister of India announced a 21-day lockdown for the whole country in his direct address on 24 March 2020, further extended it till May 17 after inspecting the increment in the rate of the virus. All the authorizations such as the tourism sector, traffic regulation, Government of India, and various post-industrial and construction ventures are operated through virtual platforms. In India, precautionary guidelines have been directed among the public, like maintenance of suitable distance, usage of hand sanitizer and face masks, restraining social gathering and travel, and other the necessary administrative measures including their treatment, masks. COVID-19 is having a very harmful impact on the economy of various countries around the world, but along with this negative side, it is also having a positive side, due to less human intervention in the environment, our mother nature has started to heal itself. Undoubtedly, the world is facing pollution due to human activities such as urbanization, industrialization, and fossil fuel exhaustion. In such a situation, a natural protective measure is aimed at addressing environmental problems. Lockdown is one of the natural effects that nature expects through the introduction of COVID-19. According to updates from MoHFW on 24 June 2020, in India, there are about 473k COVID-19 patients were diagnosed. Of these, 14,894 deaths and 272K people were recovered. The Prime Minister of India declared the countrywide shutdown from March 25 to June 8, 2020, excluding containment zones. The Indian government is working around the clock with readiness and response. This includes identifying suspected cases, setting up a diagnostic facility, and community prevention Engagement, hospital logistics, control, and control plans. Under the brave and determined leadership of India's Prime Minister, India, has responded with persistence and urged it to overcome this unprecedented challenge.

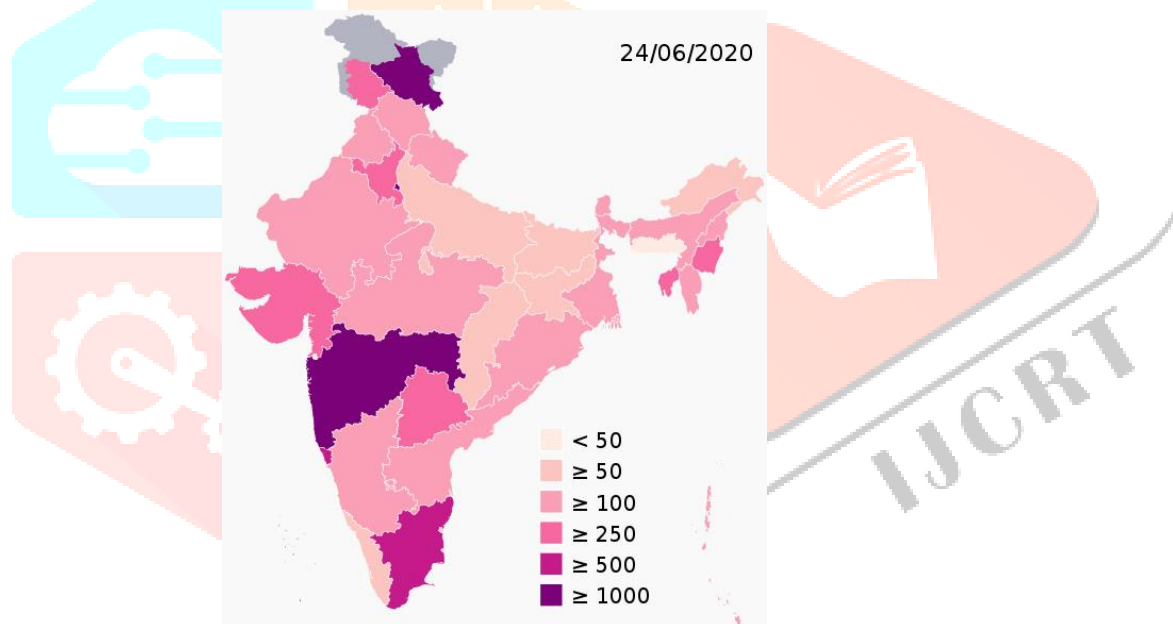


Figure 2. Showing Covid-19 cases Density in India.

A. Improvement in India's Air Quality Index in India under Lockdown:

Countries around the globe reported a major fall in air pollution amid the lockdown and witnessed an improved air quality. As listed in a report by the World Air Quality Index, there is a huge drop reported in Nitrogen Dioxide (NO₂) levels as compared to last year, around the world. The major impact of the lockdown is reported on the Air Quality Index of Delhi, where skies are clearer than before, the air has become less polluted and better for breathing, these improvements are noticed in various metro cities.

India comprises of about 50 most polluted urban areas around the world, as indicated by IQAir, a Swiss Company. The biggest reason for the increasing rate of pollution is the day by day enhancement in the number of vehicles. But after the announcement of lockdown by India's Prime Minister Shri Narendra Modi a massive reduction in the number of vehicles on the roads has been noticed. The roads which are found to be crowded before lockdown are now seemed to be clear. There is an instantaneous positive influence on the air quality of New Delhi, which is among the most polluted city in India. The reason behind this sudden improvement is the overall lockdown to control the spreading rate of COVID-19. The Indian national capital reported a drop in its NO₂ levels amid the lockdown. Motor vehicles and industrial activities are mainly responsible for the high emission of NO₂, but during the lockdown period, there is a huge drop reported in its level, which is a result of fewer human activities. The Air Quality Index (AQI) of New Delhi was chronicled at about 93 on 23 March, which is moderate but when the figure falls beneath 50 air quality is deemed to be good. According to IQAir, Air Quality Index be around 161 in March last year in New Delhi's due to which it was regularly regarded as harmful.

Air Quality Index of some major cities in India:

One of the world's enormous lockdowns, i.e. the lockdown imposed to prevent the spread of COVID-19 has resulted in shutting down of markets, shops, factories, heckled the constructions, and stopped the transport services has strengthened the quality of air.

A huge influence of COVID-19 lockdown is observed on the Air Quality Index of 4 majorly polluted and industrialized metropolises of India i.e. Pune, Delhi, Mumbai, and Ahmedabad. SAFAR conducted a comparison during the first stage of lockdown from March 25 to April 14, between the most dangerous air pollutants in air PM_{2.5}, PM₁₀, and NO₂, in these cities.

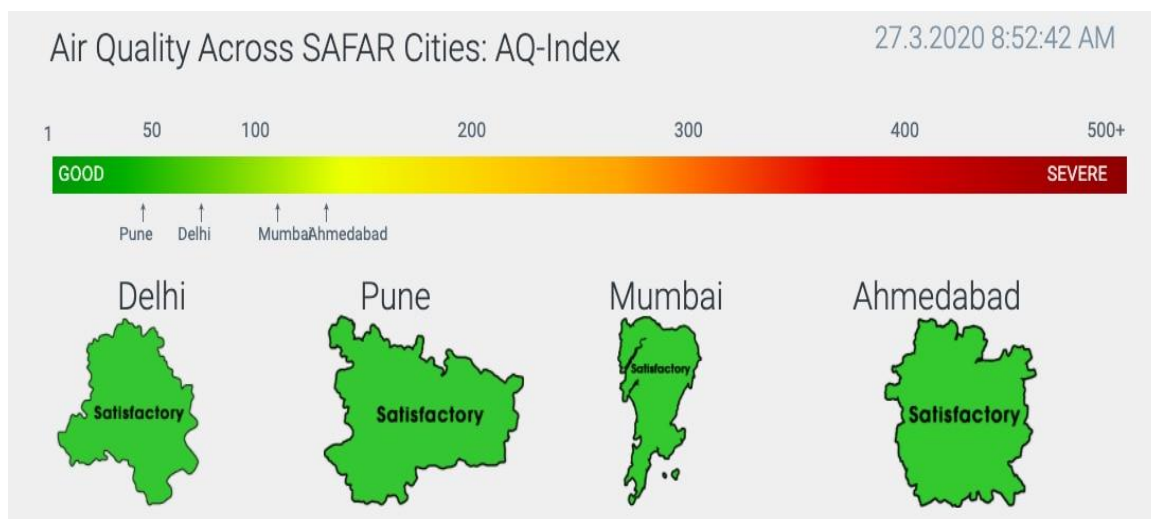


Figure 3.Screenshot: <http://safar.tropmet.res.in/>

PM_{2.5} (atmospheric tissue smaller than 2.5 micrometers in diameter), PM₁₀ (atmospheric tissue smaller than 10 micrometers in diameter), and NO₂ (nitrogen de-oxide emitted in traffic emissions) are dangerous pollutants and prolonged exposure to acute respiratory disorders leads.

- ✓ The PM_{2.5} amount has been declined by 36%, PM₁₀ by 43%, and NO₂ by 52 % in Delhi during the lockdown.
- ✓ In Mumbai, during the lockdown, the rate of PM_{2.5} dropped by 39%, PM₁₀ through 43%, and NO₂ via 63 %.

AQI	LEVEL
From 50 to 100	Adequate
From 101 to 200	Moderate
From 201 to 300	Unsatisfactory
From 301 to 400	Most Unsatisfactory
From 401 to 500	Severe

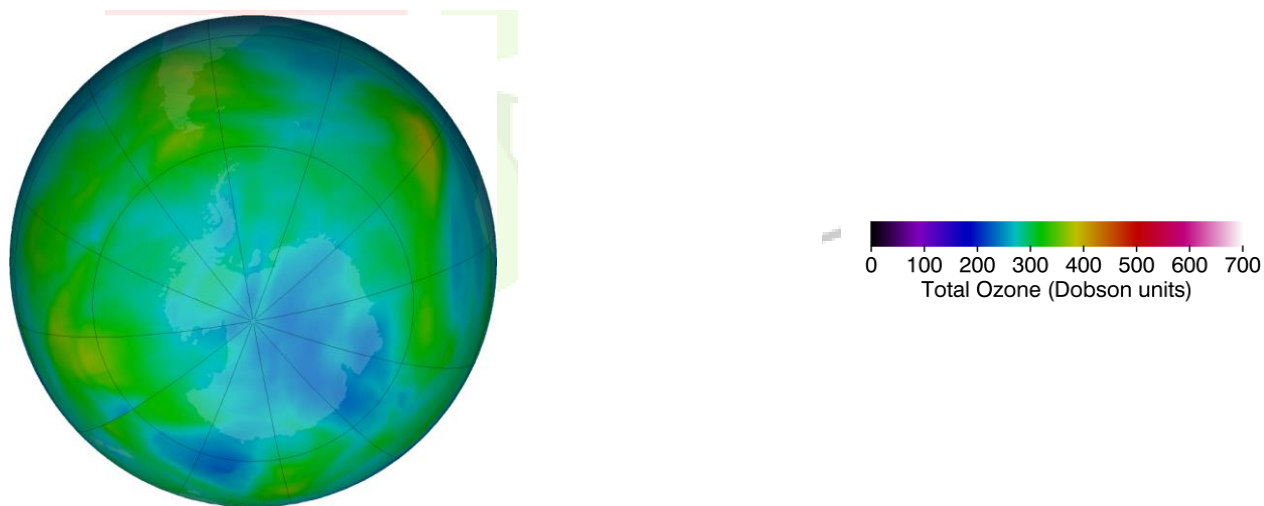
- ✓ In Pune, statistics showed a deterioration by 25 percent in PM_{2.5}, 26 percent in PM₁₀, and NO₂ by 57 percent.
- ✓ In Ahmedabad, PM 2.5 reduced 39%, PM 10 reduced by 32% and NO₂ decreased by 27%.

According to a report issued by CPCBs, there are around 92 cities in India, which have recorded a huge improvement i.e. from 'Adequate' they have attained 'Good' air quality index. This increment indicates that less human intervention due to lockdown having a very positive influence on air quality.

The Ozone Layer of Earth is healing

The world is struggling with the COVID-19, there is gleeful news that shows that the earth's vital ozone layer has finally started healing itself. The ozone layer that covers the earth is vital to maintaining the equilibrium and keeping the ocean currents in their natural way. Over the past few decades, however, human activity has led to layer degradation. This eliminated the usual course of ocean currents. The ozone layer around the Earth helps absorb harmful ultraviolet rays from the sun and prevents the Earth's surface from coming directly. The ozone layer, however, has now begun to repair itself. Its credit goes to the lockdown in various countries. (News18.com,2020)

An agreement was reached in 1987 between various countries known as the Montreal Protocol to minimize the usage of substances responsible for depleting the ozone layer. The ozone layer is getting exploited due to the utilization of CFC_s i.e. Chlorofluorocarbons. Their usage has also led to the decrement in the stratospheric ozone and has also made a hole in its ozone layer of Earth, which is responsible for protecting us from harmful solar radiation. In,2016 a modification has been made in the Montreal Protocol agreement, enunciating the execution of a multi-phase venture, comprising the employment of HFC_s(Hydrochlorofluorocarbons). These HFC_s are less harmful to our environment in comparison to CFC_s and these carbons can also be used in equipment in place of CFC_s as the chemical composition of both of these carbons is analogous. The use of hydrochlorofluorocarbons gets slowly eradicated with a period, as they contribute to global warming and their contribution to ozone layer depletion is also lower than CFC_s. There was data in 2000 to show that atmospheric pollutants significantly decreased which could harm the ozone layer. But, a recent report reveals that the deal made between countries has already been able to slow the ozone layer's degradation, and has also managed to restore itself. (NASA,2020)



**Figure 4.Ozone layer over Antartic pole.
The yellow and red colors for more ozone
and purple and blues for less ozone.**

B. Reduction in emissions

COVID-19 can have long-lasting impressions around the world. .As this situation is influencing the living standard of millions of peoples, along with this it is also helping nature to recover itself. The change that has been observed is that emissions of CO₂ and NO₂. There is a limited emission of carbon dioxide and the credits can be given to Coronavirus lockdown due to which motorways are cleared and factories are closed. Dirty brown emission belts are diminishing in the several cities and industrial areas of various countries amid the lockdown. As suggested by Carbon Brief's study. The output produced by key industrial sectors has been reduced by 15 percent - 40 percent and has resulted in a 25 percent reduction in carbon dioxide (CO₂) gas emissions over the past few weeks (Watts,2020). A report conducted in May 2020 revealed that the average global carbon emissions during the early April lockdown measures fell by 17% and could contribute to an annual decline in carbon emissions of up to 7%, which according to researchers would be the biggest reduction since the World War II. This reduction will assist in decreasing the chances of lung disease like asthma, chest cold, and lowers the risk of heart attacks, which will gradually result in the improvement of our quality of life.

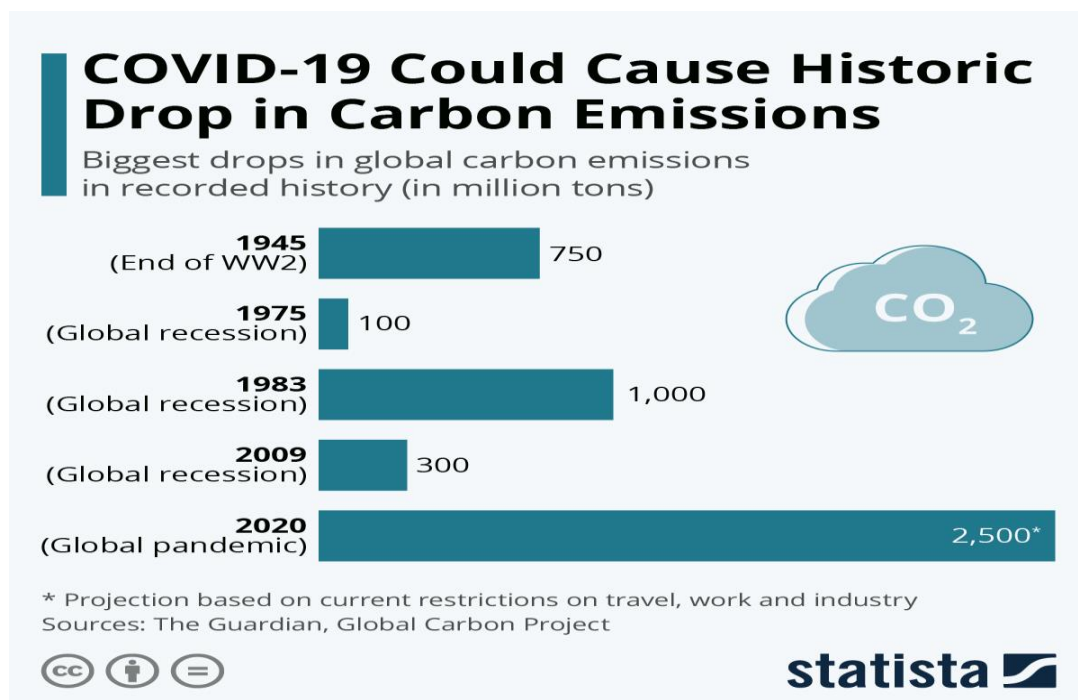


Figure 5. Drop-in CO₂ emission

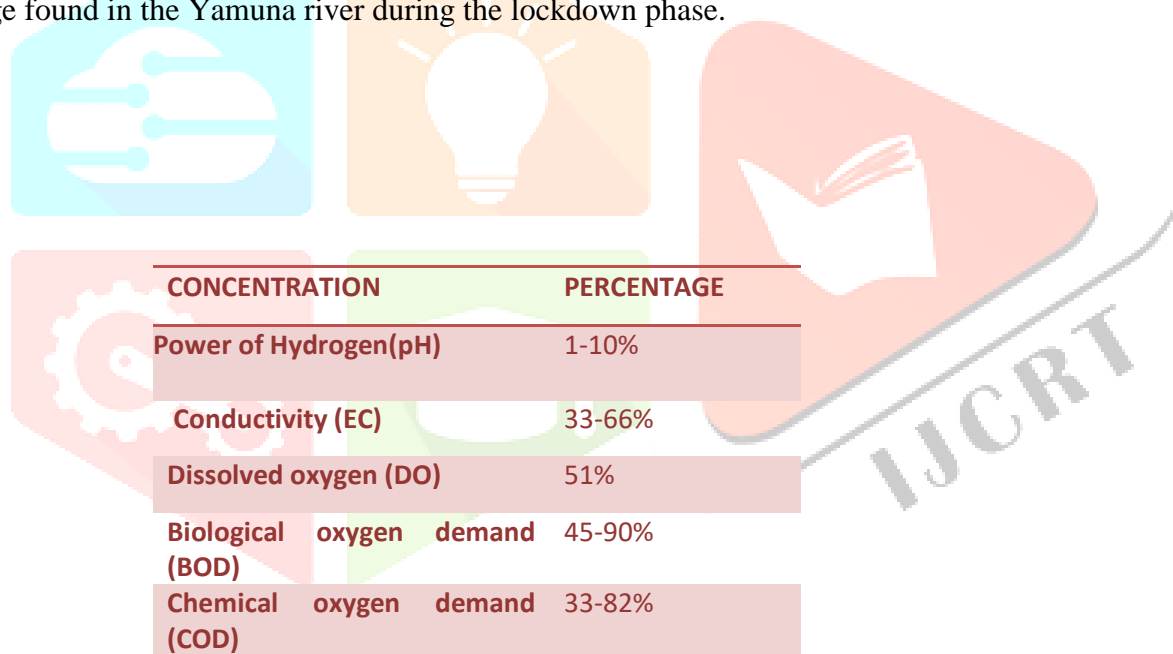
C. Wildlife Recurring Spaces

The quarantine COVID-19 binds people at home, with this it gives wildlife freedom like never . The free movement of wildlife has been observed in metropolitan areas or populated areas. An application used by the Wildlife organization of India shared real-time data. This app known as “Lockdown Wildlife Tracker” shares the flexible wildlife movements in man-made zones. The data stored in this application is totally free and also publicly available for scientific research related to the movement of wildlife during the lockdown. Videos of animals roaming the roads have been on social media for the past few days. Cities, roads, and highways throughout the country have been deserted with minimal movement of vehicles (News18, 2020). A video from Chandigarh has shown a sambar deer taking a zebra crossing on a wide, empty road that divides the city's Sector 9 and Sector 10. In Kozhikode, North Kerala, an unusual sight that has excited the police and a few people on the road. Civet, which was in danger, took the zebra crossing and passed them. Now it is the turn of the Malabar large spotted civet on the road. With less than 250 mature people in danger. It was not seen ever since 1990 but during the current lockdown, it was spotted at

Kozhikode. Another viral video showed that Nilgai was traveling freely on a busy road outside a mall in Noida. On normal days, it is almost impossible for people to cross the road due to the endless movement of fast vehicles. Many city residents say they have seen more birds singing in their neighborhood. Animal lovers and rights activists have advised people for continuing feeding birds, stray dogs, cats, and cattle, which heavily depend on the leftover food that people feed on the roads. (NDTV News, 2020).

D. Improvement in Water Quality

A decisive variation has been noticed in the quality of water around the world. The water standard of Ganga and Yamuna's rivers is significantly improving due to reduced industrial activities and the implementation of lockdown. Ganga river water quality has been found to improve with the increase of dissolved oxygen (DO) and decreased ratio of nitrate. Ganga has also been redefined due to the increase of DO throughout the lockdown phase. It is estimated that about 40 million liters of wastewater are pumped into the river and other water bodies daily, of which, only 37 percent receive adequate treatment. A national lockdown was imposed on 25 March 2020 and signs of improving the water quality were reported within 10 days of lockdown. There are 27 units of river Ganga out of 36 monitoring units that are discovered to be perfect for bathing and endorsing fisheries and wildlife as disclosed in real-time observed data released by CPCB_s(Central Pollution Control Board). Below chart shows the concentration and their percentage found in the Yamuna river during the lockdown phase.



CONCENTRATION	PERCENTAGE
Power of Hydrogen(pH)	1-10%
Conductivity (EC)	33-66%
Dissolved oxygen (DO)	51%
Biological oxygen demand (BOD)	45-90%
Chemical oxygen demand (COD)	33-82%

Dissolved oxygen (DO) values at Varanasi's Nagwa Nala on April 4 were found to rise to 6.8 mg/liter, compared to 3.8 mg/L. While On March 6, an abnormal improvement in DO values was 79%. However, due to the restrictions imposed during the lockdown and a decrease in industrial waste, a general improvement in water quality is being witnessed.

3. CONCLUSION

At this juncture, when the entire world is combating with the deadly virus and with plotting the relevant schemes to overcome from it, an initial implementation of lockdown indicates that we will safeguard our Mother Nature and ecological system from its vandalism. This pandemic situation is having a very adverse impact on the social and economic well-being, but the positive impact on the environment has provided us a way to protect us from natural calamities if we sincerely think about nature. A drastic climate change is observed because of less human interference in the environment. The usage of fossil fuels is substantially reduced mainly due to the shutdown of industries and the limitation of vehicular traffic. Consequently, there is a huge reduction in NO₂ and CO₂ in many metropolitan cities around the world. In many countries around the world, due to clean air and sparkling water bodies and beautiful wildlife that roam around human habitats, people are experiencing an incredibly high environmental revival. Due to this Coronavirus lockdown, our nature is trying to bounce back. During this lockdown, it has been realized that life is possible without so much modernization especially the use of fossil fuel as it will result in a healthier environment. The world has ascertained the relevance of nature in our quotidian life during the lockdown and has provided an accurate reflection about the over-exploitation of natural resources demonstrating that we are subduing our well-being into threats and also causing destruction to the environment.

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