Pandemic especially with reference to the India. Situation will change, people will forget and will engage in their routine work but this book will helpful to the people to understand how it has impacted on the life of Indian people.

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COVID-19 Pandemic and INDIA

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IMPACT ON ENVIRONMENT AS A CONSEQUENCE OF COVID-19

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Corona virus disease (COVID-19) is an infectious disease caused by a newly discovered corona virus. The outbreak of corona virus disease-2019 (COVID-19) first emerged at the end of December 2019, from the Hunan seafood market in Wuhan City of China, and declared as an international public health emergency in a couple of weeks by the World Health Organization (WHO, 2020) [1]

Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness (WHO). Prime Minister Modi announced the first 21 days of India's lockdown on 24 March.

During this address to the nation he said, "*Jaan hai toh jahaan hai*" After Lockdown 1 it is extended in different phases till 31st May 2020.

The present study focuses on how measures taken to control the spread of corona virus impacts on the environment. During lockdown phases many initiatives were taken in which people placed on enforced lockdown due to the corona virus pandemic. It is found that India restricted the movement of the largest number of people (approximately 1.3 billion) as a preventive measure of COVID-19, which started from March 24, 2020 [2], all the public transport services (e.g., bus, truck, train, aero planes etc.) were banned, with exceptions of the transportation of essential goods and emergency services, all the educational institution are being closed, all the industries except pharmaceutical and essential service provider are being closed. All these activities have direct or indirect effect on environment by improvement of Water, Noise and Air pollution, Maintaining of Ozone layer etc.

Impact on water pollution:-

India's water bodies are in a poor state. In the name of economic growth, most rivers and streams have been turned into sewer canals and are getting difficult to be treated.

It is estimated that every day, almost 40 million litres of wastewater enters rivers and other water bodies; only 37 per

cent is adequately treated. A Centre Pollution Control Board (CPCB) report showed that critically polluted river stretches in the country have increased from 302 stretches in 2016 to 351 stretches in 2018. The finding was based on Biological Oxygen Demand (BOD). The intensity of the situation can be assessed through the figures presented by CPCB to National Green Tribunal in August 2018. Only five of 70-odd monitoring stations had water fit for drinking; and seven had water fit for bathing.

COVID-19's gift to Ganga

The Ganga water quality imporved remarkably during the lockdown period. The 2,500-kilometre river has been an important part of India's history, identity, religious beliefs and economy for thousands of years. But the river became a dump yard for untreated sewage and industrial waste. According to CPCB, more than half of wastewater treatment plants in the basin do not comply with the discharge norms. Since 1985, several programmes and schemes have been launched to clean the Ganga. It began with the Ganga Action Plan I, followed by Ganga Action Plan II.

In 2015, the biggest-ever initiative, Namami Gange was launched with a budget of over Rs 20,000. Despite numerous programmes and huge funds, the Ganga still runs polluted.

The nationwide lockdown was imposed on March 25, 2020, and within 10 days, signs of improvement in water quality started

surfacing. According to the real-time water monitoring data of the CPCB, out of the 36 monitoring units placed at various points of the Ganga river, the water quality around 27 points was found suitable for bathing and propagation of wildlife and fisheries.

On April 4, at Varanasi's Nagwa Nala, the Dissolved Oxygen (DO) values were found increased to 6.8 milligram/litre against 3.8 mg/l on March 6, showcasing an extraordinary improvement of 79 per cent in DO values.[3]

In India Human life came to standstill from 24th March 2020 due to lockdown as a consequence of novel corona virus pandemic (Covid-19) All types of Industries, vehicle movement, and people's activity suddenly halted, perhaps for the first time in modern history. As we know for a long time many industrial activities have polluted the water, air and noise. For decades, the hydrosphere has been severely polluted because of rapid urbanization, industrialization, and overexploitation. During the lockdown period, the major industrial sources of pollution that affect aquatic ecosystems, such as industrial wastewater disposal, crude oil, heavy metals, and plastics, have shrunk or completely stopped.[4]

e.g. Ali P.Yunus et al used to study and analyze the status of water pollution in Vembanad Lake, the longest freshwater lake in India, and to evaluate the effect of the lockdown on the water

quality. Vembanad Lake is selected as a case area to study water quality before and during the COVID-19 lockdown period. The analysis of SPM concentrations in Vembanad lake based on the Landsat-8 OLI data revealed that the concentrations during the lockdown period were lower than those in the pre-lockdown period by 15.9% on average (−10.3%–36.4%). The decrease was observed in 18 out of 20 zones of the lake. Eleven of the zones showed that the concentration was the lowest in April of 2013–2020. While non-industrial pollution (e.g. discharge of domestic wastewater) remained during the lockdown period, our results suggested that pollution from industries and tourism had a severe impact on lake water quality. [5]

Positive effects of COVID-19 lockdown on air quality

A 21-day nationwide lockdown phase-1 was enforced from March 25 to April 14, which was extended further until May 31, 2020. Divided into different phases, the lockdown was marked by increasing relaxations in socio-economic activities in less infected regions. Lockdown in various cities led to shutting down of power plants, transportation, and other industries which resulted in drastic decrease in concentration levels of GHGs, NO_2, $PM_{2.5}$, PM_{10} and CO. The common air pollutants in cities and industrial towns are NO_2, SO_2, PM_{10}, which are responsible for cardiovascular and respiratory diseases. The primary sources of these pollutants are vehicular exhaust, road dust, and mainly metal processing industries. Continuous degradation of air quality in some of the Indian metropolitan cities (New Delhi, Mumbai, Kolkata, Chennai), that often exceed the standards set by WHO and Central Pollution Control Board (CPCB), India, cemented their regular presence in the list of top 20 polluted cities of the world. The Ministry of Earth, Forest, and Climate change (MoEFC) under its National Clean Air Programme (NCAP) launched a five-year action plan in 2019 to reduce by 30% the nationwide concentration of particulate matter. Due to the mandatory lockdown imposed across the country, 88 Indian cities have observed a drastic reduction in air pollution.[6]

As per the reports of CPCB (Ministry of Environment , Forest and Climate Change) Govt. of India, Delhi, The nationwide Lockdown since March 24,2020, have resulted in significant improvement in air quality in India, as revealed by data analysis and comparison of data for time before enforcement of restrictions. According to CPCB report in Delhi, the reduction in number of on road vehicles, resulted in up to 51 % reduction in NO_X level and 32 % reduction in CO levels during March 22-23,2020 as compared to March 21,2020. Air Quality Monitoring data reveal that during lockdown period PM_{10} and $PM_{2.5}$ levels were reduced by 35 to 40 % which may be explained as possible reduction from industries (~ 10% considering continued operation of power plants with~ 7-8% share ,conversion of industries to natural gas etc) and transport (15% with essential service vehicles and a small part of fleet still plying on roads) and dust (10-15%)

According to CPCB, in other 85 cities of India, improvement in the air quality was noted as most of the vehicles remained off road and non-essential industrial units were closed during National wide lockdown.

The real time air quality data from CAAQM stations in 115 cities was examined for March 16
- 29, 2020 to assess impact of lockdown period. During start of pre lockdown period on March 16, 2020, 55 cities were under 'Good' & 'Satisfactory' AQI categories, as days progressed the number of cities under 'Good' & 'Satisfactory' categories started to decrease with more cities moving in 'Moderate' category. The pattern continued till March 21, 2020. The situation changed on March 22, 2020, on the day of Janta Curfew 67 cities recorded 'Good' & 'Satisfactory' AQI values. The trend has continued since then, with increasing number of cities recording 'Good' AQI value. As on March 29, 2020, a total 91 cities were under 'Good' & 'Satisfactory' category, with 31 cities with 'Good' AQI values. However, Lucknow, Muzaffarpur, Kalyan, Guwahati & Singrauli were under 'Poor' category during March 25-28, 2020. High emission levels in Lucknow & Guwahati were noted for PM2.5, which can be attributed to local combustion related activities. High PM10 emission levels were observed in Singrauli, the road dust resuspension due to gusty winds may be a contributing factor.[7]

As on March 29, 2020 no city is under 'Poor' AQI category. The date wise AQI is given in Table 1

Table 1 - Comparative AQI Status from 16th March to 29 March, 2020
(Based on CPCB AQI Bulletin, published at 4 PM)
Total Number of cities with CAAQM stations: 126 (as of 16th March 2020)

Date	No. of cities for which data is available	No. of cities in AQI category				No. of cities with AQI in range of Good to Satisfactory	No. of cities with AQI in Moderate Category	No. of cities with AQI in range of Poor
		Good	Satisfactory	Moderate	Poor			
16-03-20	108	6	49	3	0	55	50	0
17-03-20	111	3	44	5	0	47	59	0
18-03-20	112	3	42	9	0	45	58	0
19-03-20	115	3	39	8	0	42	65	0
20-03-20	115	2	51	12	0	53	50	0
21-03-20	112	2	52	9	0	54	49	0
22-03-20	114	9	58	8	0	67	39	0
23-03-20	108	10	63	2	0	73	33	0
24-03-20	110	11	54	2	0	65	43	0
National lockdown in effect due to COVID-19 Pandemic								
25-03-20	104	14	67	2	0	81	21	0
26-03-20	102	21	64	3	0	85	14	0
27-03-20	103	31	59	3	0	90	10	0
28-03-20	101	35	57	1	0	92	8	0
29-03-20	103	30	61	0	0	91	12	0

Conclusion:-

It is observed from this study that that the lockdown measures imposed not only restricted the spread of infection rate but also has given chance for restoration ability of environment with reduced air and water pollution. The bold decision to impose strict lockdown measures by the Government of India despite economic losses, on the positive front, these measures brought significant improvement in air and water quality.

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