IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology
Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86132

IMPACT OF COVID 19 ON AIR QUALITY DURING LOCKDOWN IN INDIA – A STATE OF ART

Arun V. Parwate[1*], Kulvant[2], Anubhav Tyagi[3], Anuj Chaudhary[4]

Professor & Head, Department of Civil Engineering, Meerut Institute of Engineering and Technology (MIET), Meerut – Uttar Pradesh, India[1*].

Research Scholars of UG, Department of Civil Engineering, Meerut Institute of Engineering and Technology, Meerut, Uttar Pradesh, India[2,3,4].

Abstract: The novel corona virus is one of those viruses recently identified from Wuhan city of China and spread around 200 nations which causes severe acute respiratory syndromes similar to corona virus -2(SARS COVID 2) which has spread widely through human-to-human contact and was declared pandemic by the WHO in March 2020. It is offering the entire world to go for lockdown of most countries and halt business activities like IT sectors free moment of people from one place to another place interstate and intra state however there is various positive outcome due to covid 19 on the environment. First phase was 20 days which was complete lockdown, Phase second, April 15 - 2020, Phase third, 4 May -2020, Phase 4 1st May 2020 have resulted in sufficient improvement in air quality in the country, as revealed by data analysis and comparison of data for time before enforcement of restriction the major sector contributing to air pollution are transport industries, power plants, construction activities, biomass and refuse burning, road dust resuspension and residential activities. Air quality improvement has been noted in many towns and cities across the nations, authors studied the difference in air quality Index AQI Uttar Pradesh Meerut from 15 February 2020 to 7 May 2020. The AQI was calculated by combination of in divided sub individual of seven pollutants, namely PM2.5, PM10, NO_2, SO_2, CO and O_3 collected from central board website. Overall, significant improvement in the air quality was observed during the lockdown which led to better climatic condition, lessor pollution and asthma and their cardia-respiratory issues in people. In this paper, authors tried to discuss the various researchers' opinion about impact of Covid – 19 on air quality during the lockdown period in India.

Keywords: Covid-19, Air quality standard, Lockdown, Air Pollution.

I. INTRODUCTION

Since the first outbreak of COVID-19 was reported in Wuhan, China in December 20197, at present there are rarely any country which is unaffected with this global pandemic infection8. The COVID-19 virus spreads generally through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. It affects aged people more than the children and young through the infection of the respiratory tract epithelium. The World Health Organization suggested travel restrictions and nationwide lockdowns across the world to control its rapid community transmission. COVID-19 may have a mammoth negative effect on human health and wealth, but it has a significant positive effect on the environment. As there was sudden and worldwide impactful outburst of corona virus the Director General-WHO declared it as a pandemic on March 11, 202011, the Governments of almost all the nations of the world implemented lockdown in their respective nations to control the level of transmission of the infection. From the end of March 2020 till mid-May 2020 almost the whole world was shut down and this demanded the temporary closure of the industries, factories, tourism, movement of vehicles, public organizations etc. Hence it led to a decrease in the emission of poisonous gases in the atmosphere, resulting in the decrease of the level of air pollution. The lockdown period improved the air and water quality in a very short span of time due to very few human activities. The novel coronavirus (COVID-19) pandemic outbreak created chaos to regular human life across the worldwide. It has affected almost 180 countries with more than 1.8 million reported cases across the world so far. In the previous year, the confirmed cases have almost doubled its number and is increasing continually at the alarming rate of 20% new cases per day. As per the Ministry of Health & Family Welfare (MoHFW), total 11439 COVID affected cases were reported so far in India up to 15th April 2020 and however, the present number is much more. In December 2019, many pneumonia cases were suddenly observed in the Wuhan, China as the result of infection to a novel coronavirus (Li et al., 2020; Wu et al., 2020; Xu et al., 2020). The World Health Organization (WHO) has named this new syndrome as a Covid-19 for Corona Virus Disease 2019. The coronavirus outbreak has spread across the world and in the pretext of the situation on 11th March World Health Organization has declared a COVID-19 as a global pandemic disease (WHO, 2020). To

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology
Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86132

prevent the current spread of the Coronavirus, most countries of the world are imposing strict and preventive measures by aggressive testing regime and bringing countries to lockdown to enact the social distancing. The coronavirus outbreak has sent the global economy reeling as businesses are getting closed and billions of people shelter at home. Air travel, vehicle traffic, and industrial production have rapidly declined in previous year with much of the world frozen in place until the virus which has killed more than 100,000 people globally, can be safely contained (The Atlantic,2020; The Hindu,2020). This is the world's largest lockdown, which means all Industrial work, running factories, construction work has come to a halt. During travel bans, movement of citizens is a very less. Self-isolation orders, home stay, practice social distancing is being implemented all over the world to stop the spread of coronavirus. Lockdown has several adverse effects on economy and health, but this has led to a huge drop in air pollution and this shutdown is a rejuvenation of the environment and Earth system due to reduced anthropogenic activities and air pollution (Kulshrestha, 2020). Therefore, the investigators of the present study attempted to evaluate the studies related to the empirical verifications of the air quality improvement during the lockdown period and infer the nature of such improvement.

II. LITERATURE REVIEW

Sasanka Gosh and Arijit Das ***(*** *Impact of COVID-19 Induced Lockdown on Environmental Quality in Four Indian Megacities Using Landsat 8 OLI and TIRS-Derived Data and Mamdani Fuzzy Logic Modelling Approach)* has discussed that "Environmental quality for the world has changed negatively for the last few decades due to rapid population growth and increased human intervention in the natural environment; more specifically environmental parameters have changed rapidly such as air quality, water quality and many more. The COVID-19 pandemic imposes a positive indication of the recovery of environmental degradation through improving the environmental parameters. Restriction on human movement, industrial production, and vehicle movement results in the reduction of PM10 concentration in the atmosphere and on the other hand, less anthropogenic heat flux in the near-surface atmosphere resulting from human movement has also reduced LST, which helps to minimize the natural increase of LST from its previous year PM10 concentration is one of the determinants of air quality industrial activities, motor vehicles, and construction works are the sources of PM10 concentration in the air which may destroy human comforts and creates lots of respiratory diseases. This is not only the human problem, but it also harms environmental conditions indirectly in the form of increasing air and land surface temperature. The lockdown situation has successfully restricted the spread of the COVID-19 virus in the study areas and these restrictions play a positive role in recovering the past situation of PM10 concentration by reducing PM10 supply into the atmosphere. This is a clear declination of PM10 concentration from 2019—the same month for which lockdown data are collected to 2020 lockdown, representing the same period, although the pre-lockdown phase shows an increasing amount of PM10 concentration compared to 2019, which is a natural trend of increasing this air quality parameter. The PM10 concentration map of Delhi shows that the pre-lockdown phase indicated a decreased amount of PM10 concentration, but lockdown time indicated a higher decrease in PM10 concentration than in 2019 and the pre-lockdown situation. This different result has taken place because of the early shutdown of the industrial sector and restriction on human movement before imposing lockdown. Kolkata is showing an exceptional pattern of PM10 concentration compared to the rest of the study sites, because the pre-lockdown phase showing minimum PM10 concentration than 2019 and lockdown phase, although the lockdown phase representing lower PM10 concentration than 2019 same month. This maybe the same reason as in Delhi, which is discussed earlier. The result indicates that overall environmental quality of all the study sites has improved during lockdown time, although the better environmental quality is found during the pre-lockdown time, which is the combination of following factors:

1) Imposition of restriction rules in megacities of India before declaring formal lockdown for the whole country
2) Seasonal variation due to changes in data collection months.

Delhi NCR has repeatedly come into headlines of a reputed Indian newspaper for degraded air quality during the last 3 to 4 months and other studied megacities are also in the same direction of degraded air quality, but COVID-19 lockdown on these megacities has shown a drastic change in the air quality, especially in PM10 concentration. LST has also been showing a similar increasing trend for the last few years, which is also reduced in this time because of lesser amount of vehicle and human exposure to the environment.

Mohd Kafeel Ahmad Ansari Nasreen Islam Khan2 and Gary Owens ***(The Environmental Impact of COVID-19)*** 2020 discussed that the COVID-19 outbreak, which first appeared in Wuhan, China in December 2019, rapidly spread to the rest of the world, including Asia, Europe, and the United States, within just a few months (Renda and Castro, 2020). COVID-19, known as "2019 novel coronavirus", is a newly discovered virus which causes severe acute respiratory syndrome, like corona virus 2 (SARS-CoV-2), which has spread widely through human-to-human contact and was declared a pandemic by the WHO in March 2020. To cope with this pandemic many countries have adopted nationwide lockdowns which restrict nonessential activities and encourage their populations to avoid public transport, work from home and to always maintain social distancing. While COVID-19 has no direct impact on the environment, several literature reviews has revealed potential for indirect climate impact resulting from the corona virus-related lockdown. A decreased PM 2.5 level was also reported during this lockdown period in India. However, as of March 29,

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86132

2020, a total of 91 cities classified as having 'Good' or 'Satisfactory' AQI, with 31 cities classified as 'Good' and no city considered to be in the 'Poor' AQI category. The shutdown measures associated with COVID-19 have also led to a plummet in PM 2.5, decreasing by 15, 30 and 15% in Ahmedabad, Delhi, and Pune, respectively. In New Delhi, cessation of flights witnessed a 71% plummet in air pollution within one week, where the level of PM 2.5 decreased from 91 micrograms per cubic meter (on 20 March 2020) to only 26 micrograms per cubic meter within a couple of days of the lockdown. Similarly, the earlier, the 'Janata Curfew', observed on March 22 (from 7 am-9 pm) also led to decrease in both particulate matter (PM10) and nitrogen oxide (NOx) levels, where a 44 % decline in PM10 was observed mainly in Delhi between 22nd and 23rd of March 2020

Benjamin Schäfer, Rulan Verma,2 Aswin Giri,Hankun He, Shiva Nagendra, Mukesh Khare and Christian Beck ***(Covid-19 impact on air quality in megacities) 2020*** - discussed the impact of Covid-19 induced lockdown measures on the air quality in two major cities: Delhi as an example for an Asian city in an emerging country and London as an example of a Western city, well developed but with a complicated Brexit-induced future. Mean pollution values tend to drop due to lockdown for both London and Delhi. However, they noted certain significant differences: pollutant concentrations dropped both in London and Delhi, the reduction of NOx and PM10 was much stronger in Delhi than in London. A specific observation for London is the change of the probability distributions, manifesting itself as an increase of kurtosis during lockdown and this is explained by the fact that temporary high-pollution states during and before the lockdown are not qualitatively different in London, but persist. Contrary to an earlier analysis for the London data [15], we did not observe a statistically significant increase in particulate matter (PM) concentrations during lockdown but in Delhi, there was a very substantial drop in PM concentrations. The comparison between Delhi and London during the lockdown provides insightful lessons on air quality control: A very strict lockdown in London did improve the air quality significantly, in terms of NOx, highlighting the effectiveness of e.g., decreasing the traffic of vehicles with combustion engines. Simultaneously, it also shows that a very drastic improvement by regulating traffic or industry alone will not suffice but pollution caused by other causes, such as residential or background should also consider. The picture for Delhi is quite different: Without a lockdown, the pollutant concentrations are regularly 3 to 5 times as high as in London, indicating a much worse air quality. The lockdown in Delhi improved air quality very drastically. The great potential of clean air in Delhi if traffic and industrial emissions were reduced in the future by suitable control or regulation mechanisms.

Alok Sagar Gauta, Nikhilesh Kumar Dilwaliya, Ayushi Srivastava, Sanjeev Kumar, Kuldeep Bauddh, Devendraa Siingh, M. A. Shah,Karan Singh,Sneha Gautam ***(Temporary reduction in air pollution due to anthropogenic activity switch‐of during COVID‐19 lockdown in northern parts of India) 2020-*** discussed that the COVID-19 pandemic forced many countries to implement lockdown, causing a substantial reduction in the anthropogenic activities due to being prohibited from outdoor invasion which resulted in less transportation and shutting down of industries. On the one side, it caused people to suffer, whereas on the other side, the environment benefited from reduced emission of atmospheric pollutants. Initially, the levels of the considered pollutants PM2.5, PM10, NO_2, NH_3 and CO were above the standard limits, which right after lockdown showed a sudden decline in the concentration level and once the conditional relaxation was given, the levels again took a significant rise. The AQI is improved up to 30–46.67% after implication of lockdown. The levels of the particulate matter showed the most reduction in Delhi, followed by UP and Haryana because of reduced industrial emission and lesser vehicle on road. The AQI slope values − 1.87, − 1.70 and − 1.35 were reported for Delhi, − 1.11, − 1.31 and − 1.04 were observed for Haryana and − 1.48, − 1.79 and − 1.78 were found for Uttar Pradesh (UP), which is due to the limited access of transportation and industrial facilities during lockdown. NO2 levels have reduced mostly in UP, whereas a similar trend can be seen in Haryana and Delhi and the increase in the level of SO2 followed a similar trend in all the three regions. The level of NH3 reduced mostly in Haryana, followed by UP and Delhi because Haryana has most agricultural activity among the three regions which were halted. The level of O3 was enhanced and found highest in Delhi because of lesser greenery, followed by UP and Haryana, which resulted in higher atmospheric temperature favorable for O3 formation. The AMBT (Air Mass Back Trajectory) reveals that the air quality is potentially impacted by long-range and short-range transportation of air masses, resulting in significant fluctuations in the major air pollutants. Considering the changes observed in air quality in such a short duration of inactivity, it can be conceived as an idea for future where the Government of India can implement semi-lockdowns or even complete lockdowns. This will help to improved quality of the air which will directly influence the health of environment and people.

Central Pollution Control Board (Ministry of Environment, Forest and Climate Change) Govt. of India, Delhi ***(IMPACT OF JANTA CURFEW & LOCKDOWN ON AIR QUALITY) 2020-*** discussed that the nationwide Janta Curfew on March 22, 2020, and lockdown since March 24, 2020, have resulted in significant improvement in air quality in the country, as revealed by data analysis. The major sectors contributing to air pollution are transport, industries, power plants, construction activities, biomass & refuse burning, road dust resuspension activities. Certain activities such as operation of DG sets, restaurant, landfill fires, etc. also contribute to air pollution. As a result of stringent travel restrictions and shutting down of non-essential activities including those of air polluting sectors, air quality improvement has been noted in many cities across the nation. The improvement in air quality of 85 cities was noted as most of the vehicles remained off road and non-essential industrial units closed during Janta Curfew and

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86132

lockdown. Most of the populated cities, which have high population density and substantial share of emissions from transport sector, showed improvement in air quality levels. Indo gangetic cities and town showed significant improvement in AQI values with levels moving from higher to lower end of category and 17 cities moving in 'Satisfactory' category and 07 cities in 'Good' category. The AQI value in coastal areas was slightly improved though not as significantly as noted for Indo gangetic cities. Janta Curfew resulted in general improvement in air quality across the country with quantum improvement being varied based on local contribution sources, though regional contribution was largely absent.

Sasanka Ghosh, Arijit Das, Tusar Kanti Hembram, Sunil Saha, Biswajeet Pradhan and Abdullah M. Alamri ***(Impact of COVID-19 Induced Lockdown on Environmental Quality in Four Indian Megacities Using Landsat 8 OLI and TIRS-Derived Data and Mamdani Fuzzy Logic Modelling Approach)*** 2020 discussed that changing environmental quality of the world have a positive impact toward sustainable environment-friendly conditions due to the imposition of the lockdown owing to the COVID-19 pandemic. The outbreak of COVID-19 has greatly impacted the global environment to regain its health. This study takes four megacities of India for a comprehensive assessment of the dynamicity of environmental quality resulting from the COVID-19 induced lockdown situation. An environmental quality index was formulated using remotely sensed biophysical parameters such as Particulate Matters PM10 concentration, Land Surface Temperature (LST), Normalized Different Moisture Index (NDMI), Normalized Difference Vegetation Index (NDVI), and Normalized Difference Water Index (NDWI). Fuzzy-AHP, which is a Multi-Criteria Decision-Making process, has been used to derive the weight of the indicators and aggregation. The results showing that COVID-19 induced lockdown in the form of restrictions on human and vehicular movements and decreasing economic activities has improved the overall quality of the environment for a short time span. Overall, the results indicate that lockdown is not only capable of controlling COVID-19 spread, but also helpful in minimizing environmental pollution.

Dr. Kannamani Ramasamy, Jayakumar, Dr.Somasundaram ***(Enchanted Improvements in Air Quality across India- A Studyfrom COVID-19 Lockdown Perspective)*** 2020 discussed that the study carried out on the improvement of AQI across the country before and after lockdown due to COVID-19 shows that there is a reduction in AQI levels from minimum 42% to the extent of 66% which is under the acceptable to satisfactory category leads to the comfortable living of human beings. It is a crystal-clear pattern that the influence of lockdown is helped to reduce the air pollution level. Maintaining low AQI is needed for people who have an allergy, asthma, respiratory issues. However, this is not a permanent solution and as soon as the government of India lift the lockdown across the nation, then we can expect a massive spike in the AQI value of all major cities in India. This would happen because of the usage of vehicles, train and flight operations, full-fledged operations of factories and construction of the buildings. To keep the people in the healthy state, it is important to maintain the air pollution at a lower level which can be achieved by the systematic procedure and stringent norms by the government and strict adherence to the same by the citizens and Industries. 2020 discussed that the following paper evaluate the observed changes in air quality amid the global lockdown scenario arising due to the outbreak of novel coronavirus COVID-19. There has been a significant reduction in PM2.5 and NOx levels. The prevailing lockdown situation has brought all the major human activities such as industries, automobiles etc., to a halt. During the lockdown period in India, the concentration of PM2.5, PM10, CO, and NO2 were observed to decrease by 43%, 31%, 10%, and 18% respectively (Sharma et al., 2020) and the concentration of O3 was increased by 17%. There were negligible changes in SO2 concentration. Sharma & co-workers (2020) reported the air quality index (AQI) reduced by 44, 33, 29, 32 and 15% in north, south, east, west and central India, respectively during the lockdown The lockdown scenario has revealed that the fossil fuel burning is the major cause of air pollution, and this is confirmed by the IPCC findings on present era climate change.

Ankita Katoch and U. C. Kulshrestha (*Countrywide Air Pollution Scenario in India during COVID-19 Lockdown)* 2020- This paper discusses the impact of the lockdown exercise against corona crises on the air pollution levels of various Indian cities. The halting of all non-essential activities and a rigorous shutdown of the economy, proved to be blessings in disguise for the air quality levels in cities. Localized improvements in air quality were noticeable in the AQI after the 'Janta curfew' itself which was just a one-day lockdown implemented on March 22, 2020. Significant decrease in AQI was observed in various Indian cities as the lockdown proceed further. According to Central Pollution Control Board (CPCB), on 29th March 2020 there were 91 cities under 'Good' & 'Satisfactory' categories and total 31 cities were under 'Good' AQI values across India. Overall, it can be inferred that number of Indian cities had rapidly shifted from AQI in moderate category to AQI in satisfactory and AQI in good category due to the enforcement of Janta Curfew and lockdown in March, 2020.These observations suggest that tackling air pollution is possible by relying on clean energy for our future needs .At the end of causing human suffering, breathing clean air in the existing corona period cannot be the most ideal way to bring down air pollution, but it indicates that air pollution is manmade and we can cut down on pollution by resorting to clean and sustainable energy options.

Yogender Singh and U. C. Kulshrestha ***(Air Quality of NCR Delhi during COVID-19 Pandemic: Changes in PM2.5, NO2 and O3 AQI)*** 2020 -The COVID-19 lockdown has significant impact on environment. It is noticed that post lockdown air is much cleaner as compared to before lockdown. Due to the lockdown, the concentrations of both PM2.5 and NO2 significantly decreased and the values of ground level ozone have increased during this period,

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology
Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86132

because of the reason that during lockdown period the atmosphere is very clear due to low emission and production of particulate matter and other pollutants, due to which the sunlight reaches to earth surface is high which help in formation of photochemical smog or ground level ozone due to reaction with volatile organic compounds (VOCs) and oxides of nitrogen (NOx). Net NO/NO2 ratios are low. The Air Quality Index (AQI) before the lockdown was falling under poor category at most of the sites such as Delhi NCR but the air quality has improved to satisfactory level during the lockdown. For example, the average value of AQI at Punjabi Bagh was noticed as 212 before the lockdown which dropped down to 74 during the lockdown indicating a significant improvement in air quality and AQI values of NO2 also showed a significant improvement during the lockdown. The paper concluded that the lockdown period was very effective regarding the air quality improvement of NCR.

Kopal verma and Kulshrestha U. C. ***(Covid 19: air pollution and health effects in ludhiana, punjab)*** 2020 - The paper discusses that the lockdown has brought a significant positive changes in air quality in the Ludhiana city. Before the lockdown, the average concentration of PM2.5 was 62 µg/m3 which is brought down to 30.76 µg/m3 during the lockdown marking a 50.5% reduction and the average NOx concentration is reduced by 47.3% as compared to the prior to the lockdown. A remarkable reduction also seen in the SO2 concentration during the lockdown period. Before lockdown, the average SO2 concentration was 3.22±0.16 µg/m3 which is bought down to 0.93±0.09 µg/m3 during the lockdown marking a 71% reduction. This huge drop was successfully possible because of the temporary closure of industries using fossil fuel combustion due to the lockdown.

Sudesh and U. C. Kulshrestha (*COVID-19 lockdown: Air Pollution and Health effects in Rewari, Haryana)* 2020- This paper discusses that lockdown decision taken by the Government of India to fight against COVID-19 which is caused by the novel coronavirus (SARS-CoV-2) has both good and bad sides. Good sides are mainly for environmental aspect with few advantages such as drastic reduction in pollution, greenhouse effect and global warming ozone layer healing improved city but bad for the global economy as it came to a screeching halt because of the closing of all non-essential activities. As we know air quality in megacities is a serious problem due to their high pollutant concentrations above permissible limits. In India, the increasing rate of vehicular population attributes to degradation of the atmospheric conditions which are responsible for several diseases and hence, the increasing concentration of SO_2, NO_x, CO_2, CO, etc. is of serious concern because of their above permissible levels. The nationwide Janta Curfew on March 22, 2020, and lockdown since March 24, 2020, have resulted in substantial improvement in air quality in India, as revealed by data analysis and comparison of data for time before enforcement of restrictions. As a result of a combination of travel restrictions, functioning of only essential commercial units and prevailing weather conditions, air quality improvement has been noted in many towns and cities and significant reduction was also noted for PM10, PM2.5, NO_2 levels and less pronounced for other pollutants. The maximum value of PM2.5 was 80 µg/m3 on March 20, 2020, which dropped to 18 µg/m3 on March 28, 2020, Similarly, maximum and minimum values for PM10, NO_2, SO_2 were 206, 60, 35 and 25, 3, 9 µg/m3 before and during lockdown period due to the restriction on industrial activities, vehicular movement and other non-essential activities during the lockdown period is attributable to the declining trend.

Moh Naseem and Umesh Chandra Kulshrestha ***(Air pollution and health effects in Meerut, India during COVID-19 Lockdown) 2020*** - Lockdown in India plummeted the social and economic dynamics leading drastic halt into dynamics major air pollution sources, for instance, automobiles, trains, factories planes, etc. across the country and this halt turned skies of the some of the most polluted cities of the country clean and blue which resulted into the improvement of air quality index (AQI) of almost 90% of the 103 cities continuously monitored by India's Central Pollution Control Board (CPCB) of GOI on 29th march 2019 and plunged it to a satisfactory level. To see the effect of this lockdown on the air pollution level of Meerut ,10 days data (5 days prior to lockdown and 5 days during the lockdown) of Sulphur dioxides (SO2), Particulate matter with an aerodynamic diameter < 2.5 µm (PM2.5), articulate matter with an aerodynamic diameter < 10 µm (PM10), Nitrogen dioxide (NO2), Carbon monoxide (CO), Ozone (O3), Ammonia (NH3), Nitrogen oxides (NOx), Benzene (C6H6), Xylene ((CH3)2C6H4) and Toluene (C6H5C3) was collected from AQI monitoring station situated in Ganga Nagar, Meerut, India and the following study find that they all show a downward trend due to lockdown.

Partima kumari and Durga Toshniwal ***(Impact of lockdown measures during COVID-19 on air quality) 2020*** - The following discussed that the COVID-19 outbreak has shown some positive impacts on the environment as pollution is reducing and earth is reviving itself. Three India cities are taken as a case study to evaluate the effect of lockdown on air quality. The variation in concentration of air pollutants including PM10, PM2.5, NO2, SO2 and O3 are analyzed during two phases, pre-lockdown, and post-lockdown phases. The concentration of PM10, PM2.5, NO2 and SO2 reduced by 55%, 49%, 60% and 19%, and 44%, 37%, 78% and 39% for Delhi and Mumbai during post-lockdown phase. A significant reduction in concentration of PM10, PM2.5 and NO2 was observed for Delhi and Mumbai during lockdown period and O3 concentration was increased during lockdown, which could be due to less consumption of O3 in titration because of a reduction in NOx emission. Overall, a significant improvement in air quality of Delhi and Mumbai was observed during the lockdown phase as compared to pre-lockdown phase and post lockdown phase. The preliminary analysis of air quality data in present study shows that the COVID-19 pandemic may be considered as a 'blessing in disguise,' where air quality is improved. This reduction in air pollution due to controlled emission of major

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology
Vol. 8, Issue 6, June 2021

DOI: 10.17148/IARJSET.2021.86132

air pollutants can minimize several health issues such as respiratory problems, cardiovascular illness, asthma, premature deaths etc. These positive impact of lockdown on air pollution can provide confidence to the government and authorities that the implementation of strict air quality policies and emission control strategies can significantly improve the air quality, environmental and human health in future.

Ramesh P. Singh and Akansha Chauhan *(impact of lockdown on air quality in India during COVID-19 pandemic) 2020* - The following discussed that in India, total lockdown was announced on 22 March 2020 to stop the spread of COVID-19 and the lockdown was extended for further 21 days on 24 March 2020 in the first phase. During the complete lockdown, most of the sources for poor air quality were stopped in India. In this paper an analysis of air quality (particulate matter-PM2.5, Air Quality Index, and tropospheric NO2) over India using ground and satellite observations. A pronounced decline in PM2.5 and AQI (Air Quality Index) is observed over Delhi, Mumbai, Kolkata, and Chennai and also a declining trend was observed in tropospheric NO2 concentration during the lockdown period compared with the same period in the year 2019. During the total lockdown period, the air quality has improved significantly which provides an important information to the cities' administration to develop rules and regulations on stick air quality policies and emission control strategies which can significantly improve the air quality, environmental and human health in future.

III. CONCLUSION

The world currently facing a gravest health crisis due to a virus. This has culminated into a pandemic, also known as "coronavirus pandemic", which until months ago were unknown to the scientists. Coronaviruses are a large family of RNA viruses that cause mainly respiratory diseases ranging from the common cold to more severe pneumonia. Viruses continue to emerge and challenge public health. According to the World Health Organization (WHO) some of the coronavirus varieties, found to affect global public health are SARS-CoV (severe acute respiratory syndrome corona virus) in 2002; MERS-CoV (Middle East Respiratory Syndrome corona virus) in 2012 and the newly emerged novel corona virus also known as SARS-CoV2 in 20191.This virus was named as COVID-19 by WHO after it became a pandemic threat to the world. Coronaviruses are enveloped virus with a helical symmetry nucleocapsid and contains positive sense single stranded RNA genome of 26-32 kilobases, making it one of the largest and dangerous RNA viruses. Based on the literature it has observed that due to lockdown, air quality has been improved a lot during the lockdown period in India.

REFERENCES

1. Sasanka Gosh and Arijit Das *(Impact of COVID-19 Induced Lockdown on Environmental Quality in Four Indian Megacities Using Landsat 8 OLI and TIRS-Derived Data and Mamdani Fuzzy Logic Modelling Approach)*
2. Mohd Kafeel Ahmad Ansari Nasreen Islam Khan2 and Gary Owens *(The Environmental Impact of COVID-19)*
3. Benjamin Schäfer,Rulan Verma,2 Aswin Giri,Hankun He, Shiva Nagendra, Mukesh Khare and Christian Beck *(Covid-19 impact on air quality in megacities) 2020*
4. Alok Sagar Gauta, Nikhilesh Kumar Dilwaliya, Ayushi Srivastava, Sanjeev Kumar, Kuldeep Bauddh, Devendraa Siingh, M. A. Shah,Karan Singh,Sneha Gautam *(Temporary reduction in air pollution due to anthropogenic activity switch ‑of during COVID ‑19 lockdown in northern parts of India) 2020*
5. *Central* Pollution Control Board (Ministry of Environment, Forest and Climate Change) Govt. of India, Delhi *(IMPACT OF JANTA CURFEW & LOCKDOWN ON AIR QUALITY) 2020*
6. Dr. Kannamani Ramasamy, Jayakumar, Dr.Somasundaram *(Enchanted Improvements in Air Quality across India- A Studyfrom COVID-19 Lockdown Perspective)* 2020
7. Ankita Katoch and U. C. Kulshrestha (*Countrywide Air Pollution Scenario in India during COVID-19 Lockdown)*
8. Yogender Singh and U. C. Kulshrestha *(Air Quality of NCR Delhi during COVID-19 Pandemic: Changes in PM2.5, NO2 and O3 AQI)*
9. *Kopal* Verma And U.C. Kulshrestha *(Covid 19: Air Pollution and Health Effects In Ludhiana, Punjab)*
10. Sudesh and U. C. Kulshrestha (*COVID-19 lockdown: Air Pollution and Health effects in Rewari, Haryana)*
11. Moh Naseem and Umesh Chandra Kulshrestha *(Air pollution and health effects in Meerut, India during COVID-19 Lockdown) 2020*
12. Partima kumari and Durga toshniwal *(Impact of lockdown measures during COVID-19 on air quality) 2020*
13. Ramesh P. Singh and Akansha Chauhan *(impact of lockdown on air quality in India during COVID-19 pandemic) 2020*

