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COVID-19 and Its Impact on Air Pollution

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Abstract: Primary Objective of this study is to discuss the effectiveness of COVID-19 on air pollution. We have collected data from NASA, ESA (European Space Agency) and CPCB online portal for air quality data dissemination. The satellite images from the above mentioned agencies elucidate that quality of air has improved causing reduction in the air pollution during COVID-19.It was observed that Nitrogen Dioxide content was decreased in the air compared to same period last year. It suggests that COVID-19 lockdown mitigated air pollution across the globe. We will discuss data of nitrogen dioxide content this data in paper, and how much air pollution was controlled due to this lockdown.

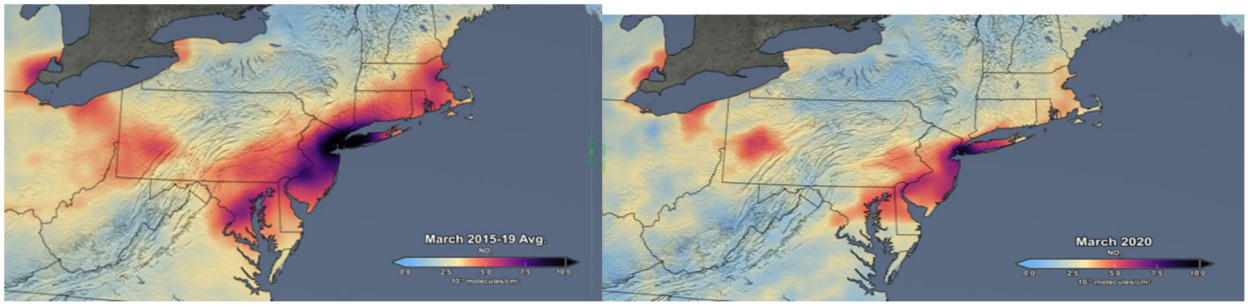
I. INTRODUCTION

In 2019 December, a new pandemic has erupted in Wuhan city, China. At a very early stage, the reason for the disease was unknown, but it did spread fast disturbing the whole world. COVID-19 was the name given to this novel pandemic disease [1]. Severe Acute Respiratory Syndrome (SARS) which has caused pandemic in 2002 has resemblance to nCoV-2019 [2]. The main symptoms of COVID-19 are cough, fever, body aches, breathing problems leading to death [3].There are a total number of 52 Million cases as of nov 11, 2020 world wide and 1.28M global deaths[22], and this fast spread is the reason which made WHO to declare health emergency all over the world. Who recommended drastic steps to prevent the disease spread through implementing social distancing. In this regard, some counties have started lock down, international, and local transportation halt As a result of that there are many changes that occurred in a positive way causing reduction in air pollution. We will talk about how lock down has affected world in terms of air pollution.

A. COVID-19 And its Impact on Environment

With the increase in number of cases for COVID-19 , which led to national crisis , with infected people diagnosed all over the country, multiple countries did shut down the transportation , and travel in and out of the country. Lockdown has happened in many of the counties leading to shut down of offices, business, schools to reduce the spread of the disease. Fig. 1 shows concentration of NO2(nitrogen Dioxide), that is emitted primarily by burning fossil fuels [5,6].and you can see the images from figure 1 with greater reduction in NO2 content after quarantine has started [7]. This data was collected by Tropo-spheric Monitoring Instruments (TROPOMI) on-board ESA'sSentinel-5 satellite. A related sensor, OMI (Ozone Monitoring Instrument) on -board NASA'S satellite also has recording similar changes in the atmosphere.NO_2 is considered as common tracer of air pollution associated with morbidity and mortality [5,6].Nitrogen dioxide , primarily is emitted from burning fossil fuels for electricity generation ,transportation, can be used as an indicator of changes in human activities. From the images NASA has got, a significant reduction in NO_2 is first seen in Wuhan, and eventually rest of the world and then worldwide [7]. There was a significant reduction in NO_2 by 30%.CO_2 is also considered as another tracer for air pollution [8] which decreased by 25% in china and 6% by worldwide [9]. A shown in figure 1, it was reported that there is a drop of 30% in air pollution over Northeast US.

Figure:1: Sequence of airborne NO2concentrations measured with the TROPOMI sensor on-board ESA's Sentinel-5 satellite before and after the COVID-19 pandemic. (Satellite images from (NASA, 2020))



The left image in the slider shows the average concentration in March of 2015-19, while the right image in the slider shows the average concentration measured in March of this year.
Credits: NASA

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According to WHO, (World Health Organization), an average of 4.6 million people dies annually due to air pollution [10]. Poor quality of air has been the reason for many deaths and increase respiratory problems [11].Air pollution is a major problem even in developed countries,193,000 people died in European countries in 2012 from , airborne particulate matter[12].Many diseases that occur due to air pollution that led to death, some of them are lung, heart disease, respiratory allergies [11]. China is also one of those counties which is heavily affected by air pollution [13,14], there are 1.6 million fatalities in 2016 and 4000 deaths each day. The relation between environment and Coronavirus has been explained in detailed way in this paper [20].There is a reduction in mortality rate due to air pollution in not only China but around the world, due to the quarantine period. The reduction in air pollution also had positive benefits in controlling non communicable diseases [16] [17].

Figure 2 reported by National Aeronautics and Space Administration (NASA) and European Space Agency (ESA) shows the drop in the levels of NO2 in March 25, 2020 to April 20, 2020 compared to January 01, 2020 to March 24, 2020, improving the air quality. The comparison was also made with the same dates of 2019.NASA used its Ozone Monitoring Instrument (OMI) through the AURA satellite and ESA operated Tropospheric Monitoring Instrument (TROPOMI) through the Sentinel-5P satellite to collect this data. The main cities those images show the data for is Mumbai and Delhi which are heavily populated and busy cities with lots of traffic. It is noted that there is a significant reduction of 40-50% in Nitrogen Dioxide emission compared to last year. Air quality has improved very fast and significant just within few days after the lockdown [18]. These clusters shown in the maps, were investigated and it was found that they have direct linkages with coal-based power production units. The Thermal power plant that is leading in this field is Vindhyachal super Thermal power plant, and it has dropped its production by 15% [19].Also another reason is electricity consumption which has been dropped up to 9.2%in March 2020, due to lock down [21].These factors also contributed to reduction in air pollution.

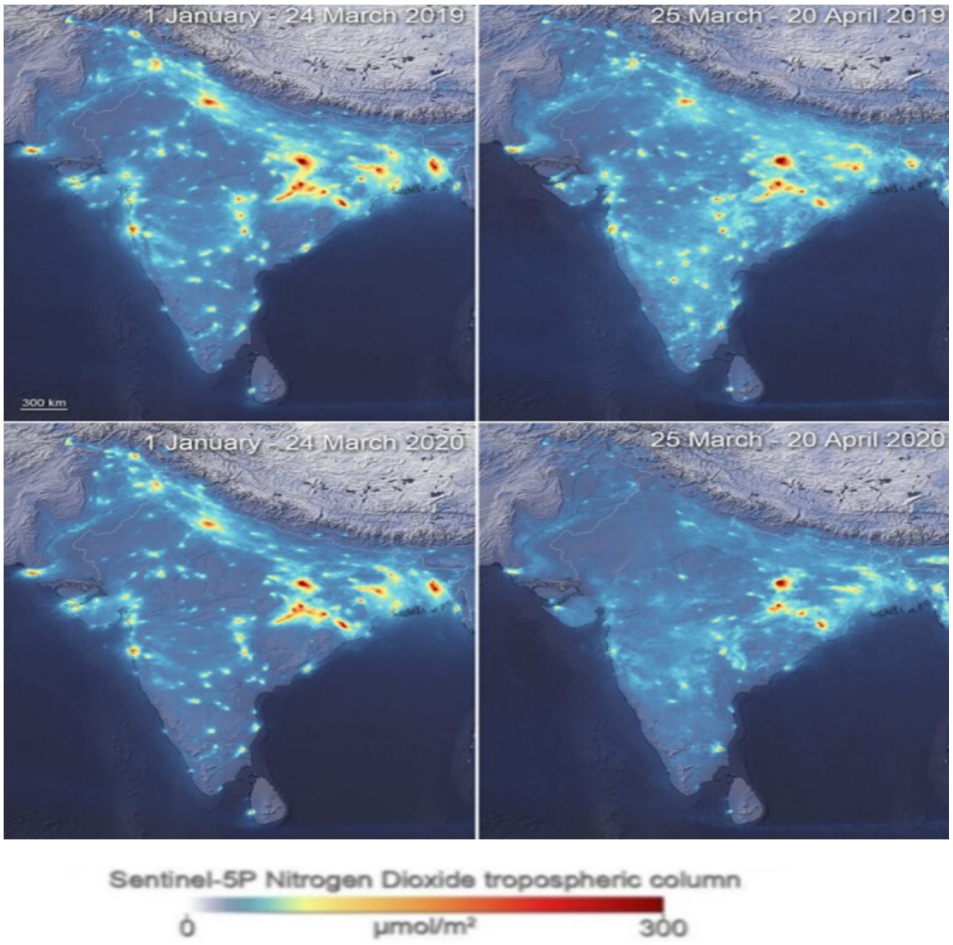


Figure 2:Satellite maps, produced using data from the Copernicus Sentinel-5P satellite, show averaged nitrogen dioxide concentrations over India from January 1 to March 24, 2020 and March 25 (the first day of the lockdown) to April 20, 2020 – compared to the same time-frame as last year.
Credits: NASA

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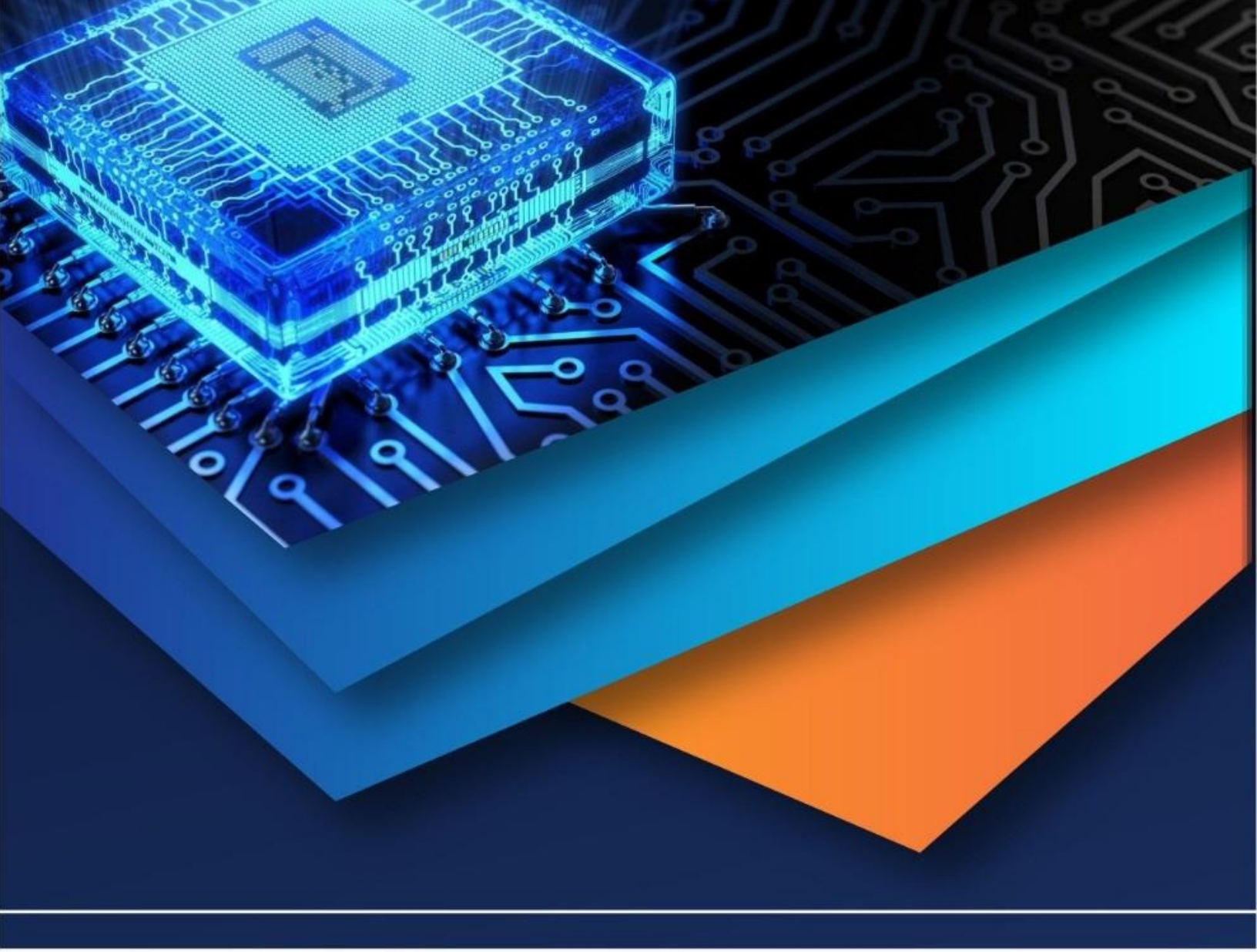
II. CONCLUSION

Covid-19 has caused big effect on the lives of people all over the world. It had a dramatic impression on international and local transportation. Also on the other side, lockdown has slowed down the economy of the world .In this study we have evaluated significant influence of lock down due to COVID-19 on multiple counties around the world, which caused reduction in air pollution according to the images taken by collecting Sentinel – 5 P satellite images of the European Space Agency and National Aeronautics and Space Administration (NASA).These findings reported that there is a reduction of 20- 30% in NO_2 levels in the air for China, Europe, Italy, France, Spain, and 30% reduction of NO_2 levels in Wuhan, India, and USA. This will be helpful to control the mortality rate due to air pollution.

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