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IMPACT OF COVID-19 OUTBREAK ON TROPOSPHERIC NO2 POLLUTION ASSESSED USING SATELLITE OBSERVATIONS IN DISTRICTS OF HINDON RIVER BASIN

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Introduction:

Coronavirus disease 2019 (COVID19) is the first infectious disease identified in December 2019 in Wuhan, the capital of Hubei Province, China. The virus that causes COVID19 is transmitted primarily through the droplets that occur when an infected person coughs, sneezes, or exhales [1] and is one of the main precautions to prevent the spread of the virus. Self-isolation is recognized. This situation led to a complete blockade in the devastated areas of China and Italy and a partial blockade in many countries. However, as of April 17, 2020, more than 2.2 million people have been infected, and the virus has killed more than 150,000 people worldwide. A similar effect was observed in the Indian situation. Prior to the lockdown, poor air quality in most Indian cities affected the most vulnerable people in the community, including children, the elderly, women, and the general public, with respiratory and cardiovascular problems. (Aggarwal and Jain, 2015; Kumar et al., 2013; WHO, 2018). The Global Burden of Disease Report reported that about 3.4 million premature deaths were due to exposure to air pollution (Stanaway et al., 2018). However, with COVID 19's current blockade of India, it has been observed that air quality has improved significantly in most cities. Ogen (2020) and Wuetal. (2020) reports that improving air quality reduces the severity of the effects of COVID 19. However, this situation will not last long. As the Government of India indicates, if companies are allowed to resume operations after May 17, 2020, air quality is expected to deteriorate in most cities and may remain the same as in 2019 as winter approaches. There is. It develops into a growing economy and emerges as one of the outcomes of a developing economy for the transition to industrialization. Therefore, there are trade-offs between natural and human activity that must be absolutely analyzed in order to make informed decisions. Therefore, considering the current situation, we analyzed the current state of air quality in most of India's largest cities and identified potential future challenges. In the future, some policy measures have been proposed to control the air quality of most Indian cities.

This study used satellite remote sensing data to monitor NO2 in the first month of COVID 19 presence in Turkey from March 15 to April 15, 2020, and the results. Compared with data from the same period in 2019. For this purpose, we will use the Sentinel5 Precursor Tropospheric Monitoring Instrument (Sentinel5P TROPOMI), launched by the European Space Agency (ESA) in 2017. TROPOMI has a relatively high spatial resolution required for air quality applications [7]. Since the introduction of Sentinel5p, several studies have demonstrated the success of TROPOMI equipment. Therefore, Kaplan, etc. [8] TROPOMI data was used to monitor Turkey's NO2. They metal. [9] Survey.

2. MATERIALS AND METHODS

This article examined India's NO2 levels in the first month of coronavirus outbreaks. Turkey has a population of 83 million, and the most populous city is Istanbul, with a population of about 15 million. Ankara is the capital, and Izmir, Konya, and Bursa are one of the most populous states. The Sentinel 5p TROPOMI is a space-based spectrometer covering the wavelength range between ultraviolet and near-infrared rays. The only payload. This device was developed to collect air quality and climate observation data. The device operates in a push bloom configuration with a swath width of approximately 2600 kilometers on the surface. This enables daily global coverage with satisfactory spatial resolution. There is a correlation between the two variables.

1. March 25 – June 30 2019
2. March 25 – June 30 2020
3. March 25 – June 30 2021
4. March 25 – May 30 2022

Population density map for the same region has also been downloaded from earth engine using dataset “NASA SEDAC at the Centre for International Earth Science Information Network”.

World Version 4 Grid Population (GPWv4), Revision 11 presents the distribution of the human world population in 2000, 2005, 2010, 2015, and 2020 in 30-second-square (about 1 km) grid cells. I am modeling. The population is distributed among cells based on census and proportional distribution of the population from administrative units. Population input data is collected with the most acceptable spatial resolution available from the results of the 2010 Census Round between 2005 and 2014. The input data is extrapolated to generate modeled population estimates for each year.

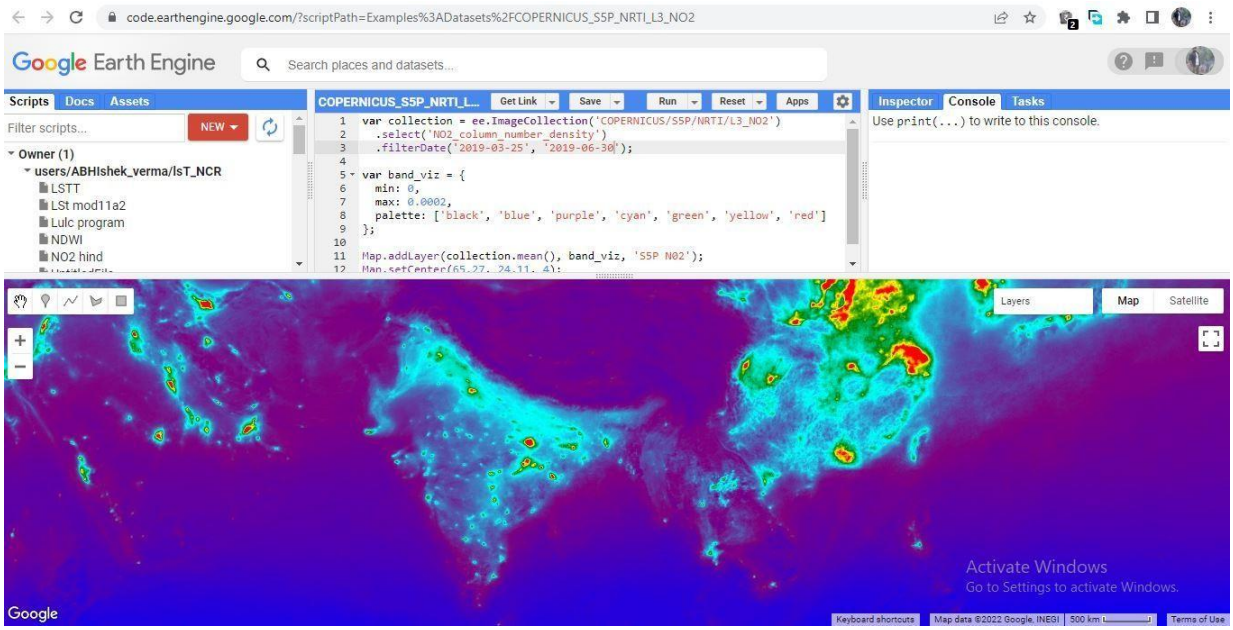

Fig 1: sentinel 5p NO2 band is extracted via earth engine

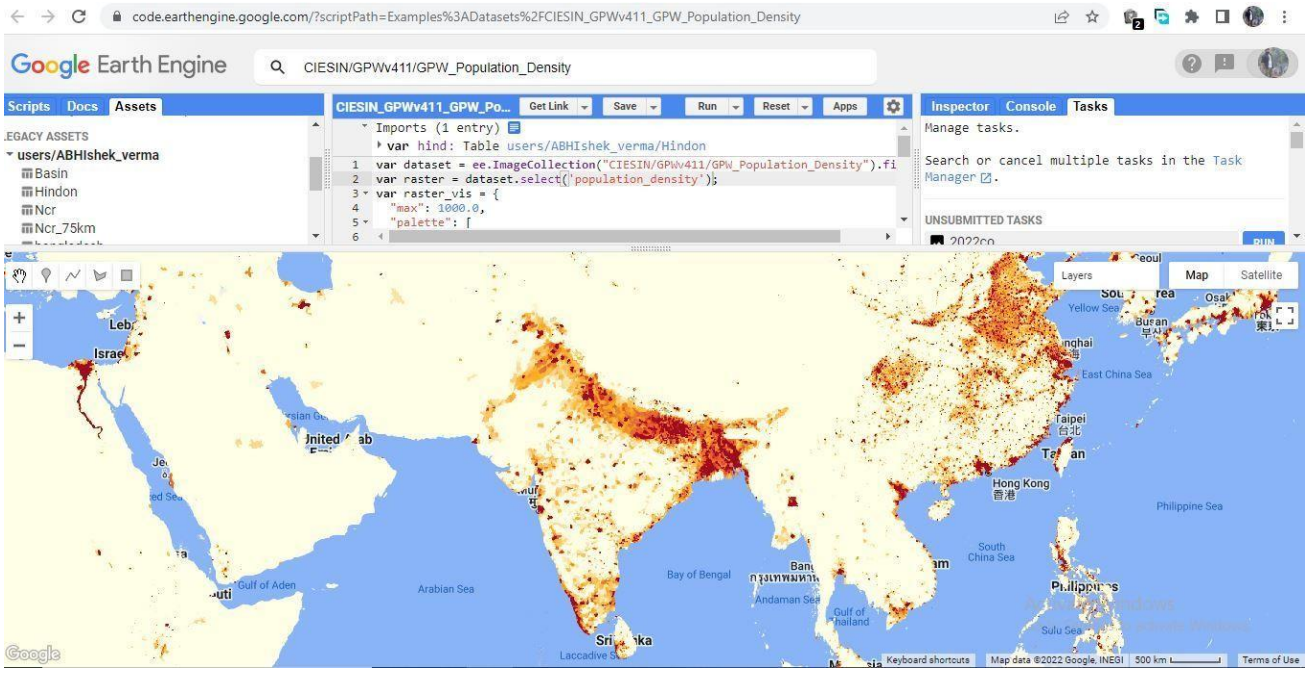

Fig 2 : NASA SEDAC at the Center for International Earth Science Information Network data set has been used and it is extracted by earth engine

3. STUDY AREA

The Hindon River begins in the lower Himalayas from kaluwala khol, barsani fall, Mohand range, Shivalik woodland division, Saharanpur area. The stream streams for 291 KMs through seven districts which are Saharanpur, Muzaffarnagar,Shamli, Meerut, Baghpat, Ghaziabad and Gautambudh Nagar.

So here we include all 7 districts in our study area.so since it is a plain area and include metro cities like of NCR which are Ghaziabad and Meerut so urban population is very densed as you can see in fig 3.

The zone which we have taken is a huge hub of industrialization of uttar Pradesh there are lot of industries in the region.

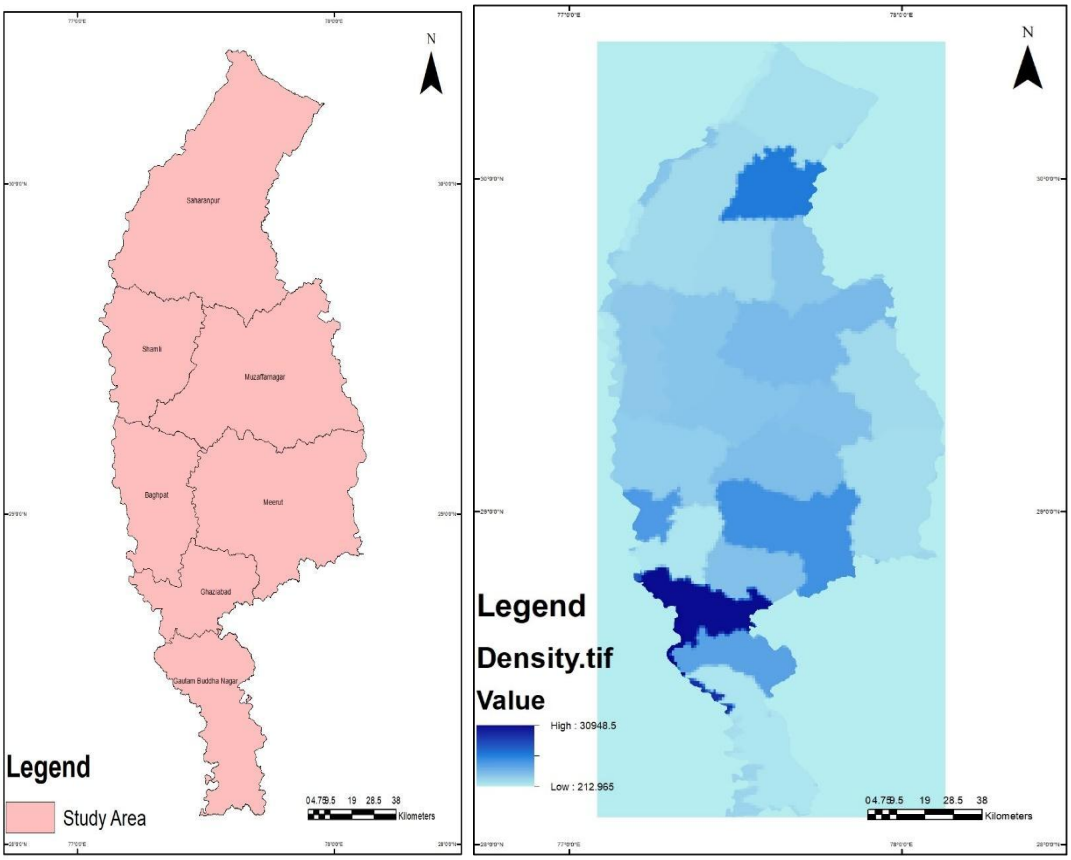

Fig 2: Study Area districts and NASA SEDAC at the Centre for International Earth Science Information Network data set has been used and it is extracted by earth engine

4. RESULTS AND DISCUSSION

The chnage between the mean data from 2019, 2020, 2021 and 2022 are shown in Figure 3. The decrease in NO2 levels in the districts where the Hindon river passes through is what we would expect. These changes are seen in areas with a high population density, which is Gautam Buddha Nagar and Ghaziabad.. The results can be clearly scene that how 2019 and 2022 are now on exactly same panel since one is before corona and other didn't have lockdown and how 2020 is least polluted as there was 1st complete lockdown.As we can watch in the figure that

Air quality has been slightly improved in the country during the lockdown period as outcomes of regulations amended over the various anthropogenic activities by lockdown policies, satellite-based sentinel 5P data sets(fig3).

So here in figure 3 we can clearly see how 2020 emissions are so low and how 2019 and 2022 are almost similar here and so we can clearly mark a change of emission which is because of covid lockdown

So , it is clearly scene that lockdown of 2020 which was has a little impact on 2022.

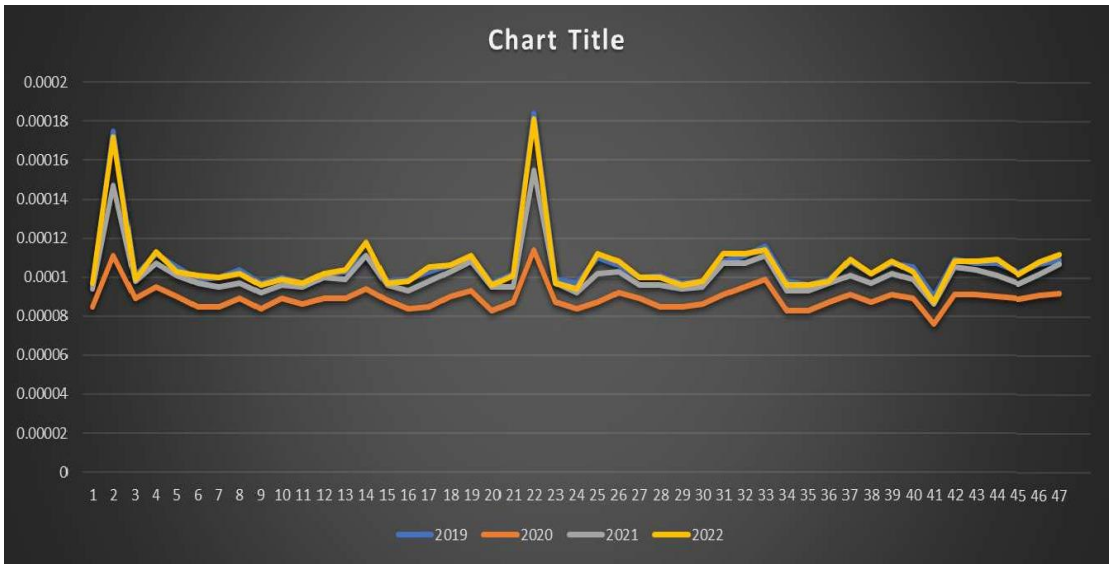

Fig 3: NO2 values compared from 2019 to 2022

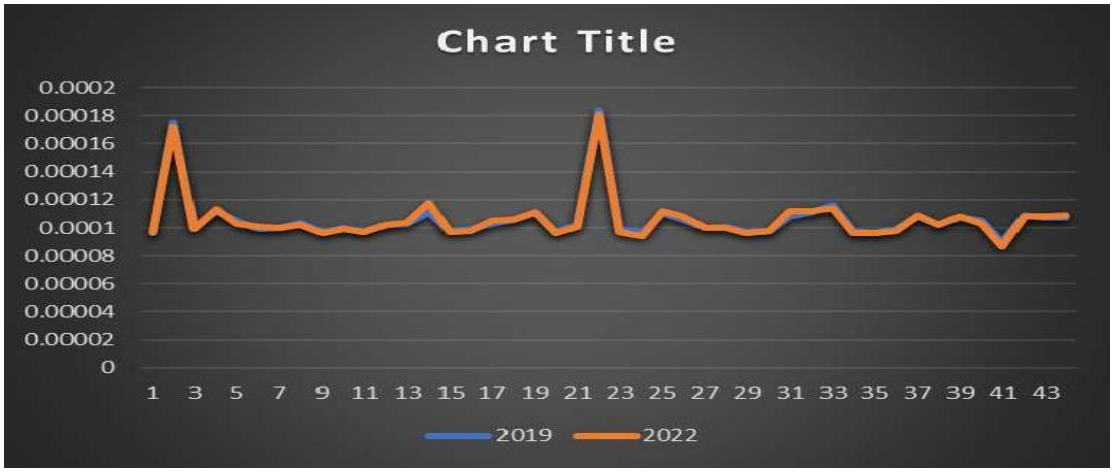

Fig 4: NO2 comparison of values in 2019 and 2022

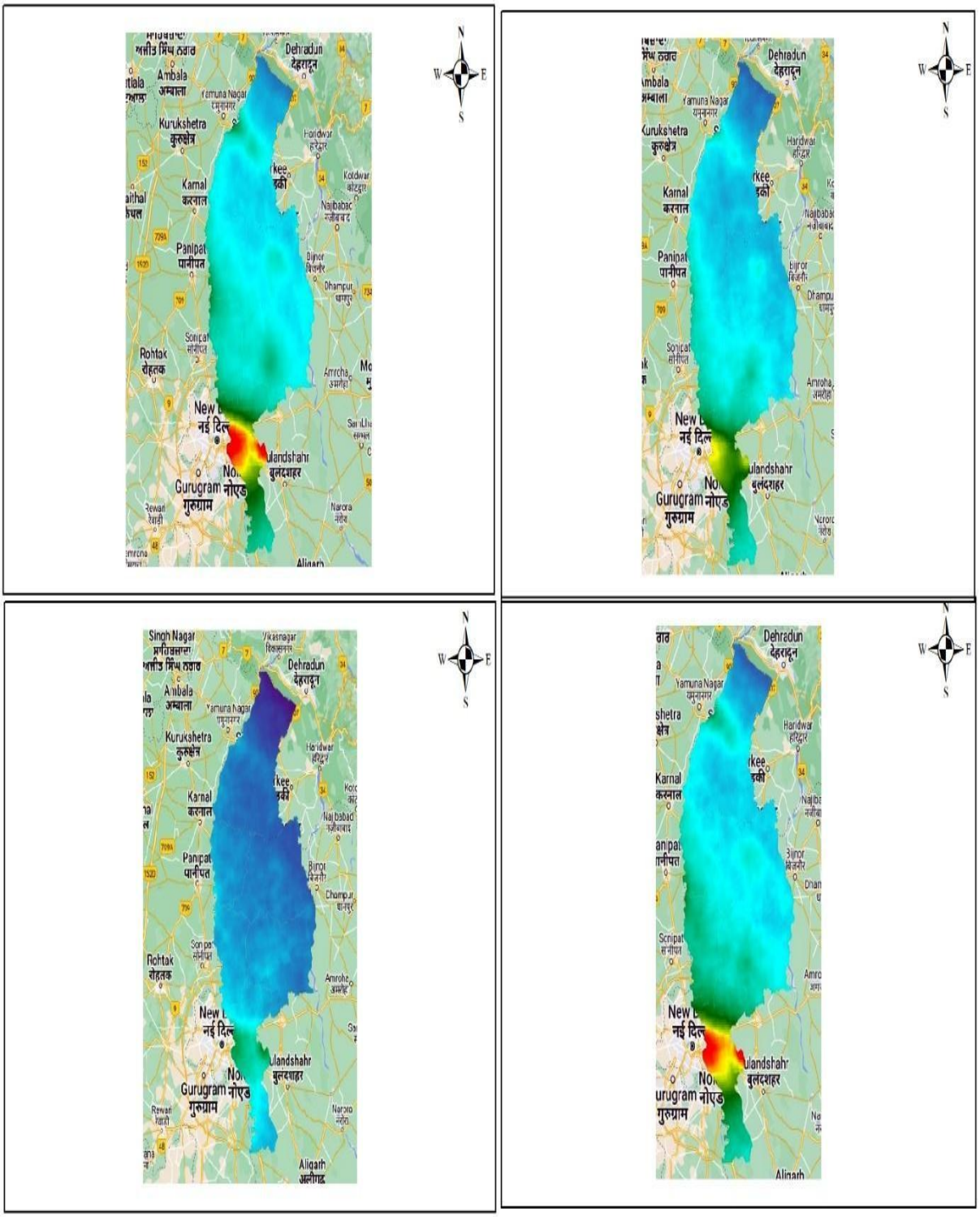

Fig 5: 2019,2020,2021&2022 NO2 emission in selected month of March to June

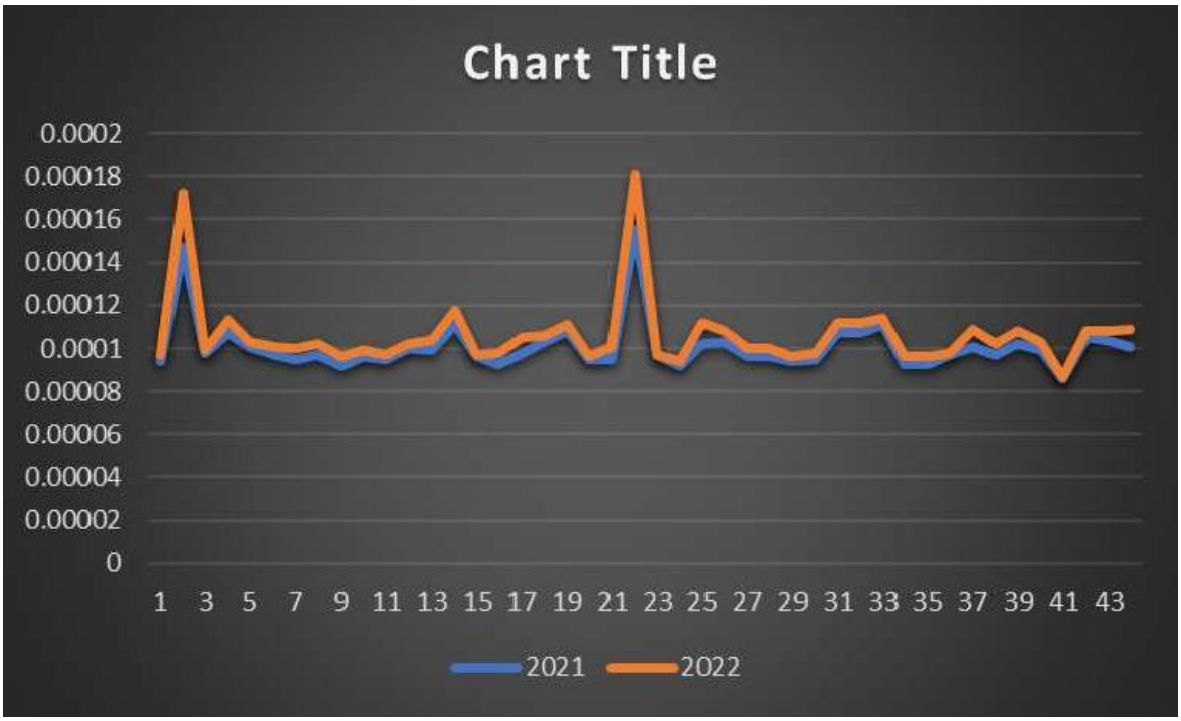

Fig 6: NO2 band mean compared for 2021 and 2022

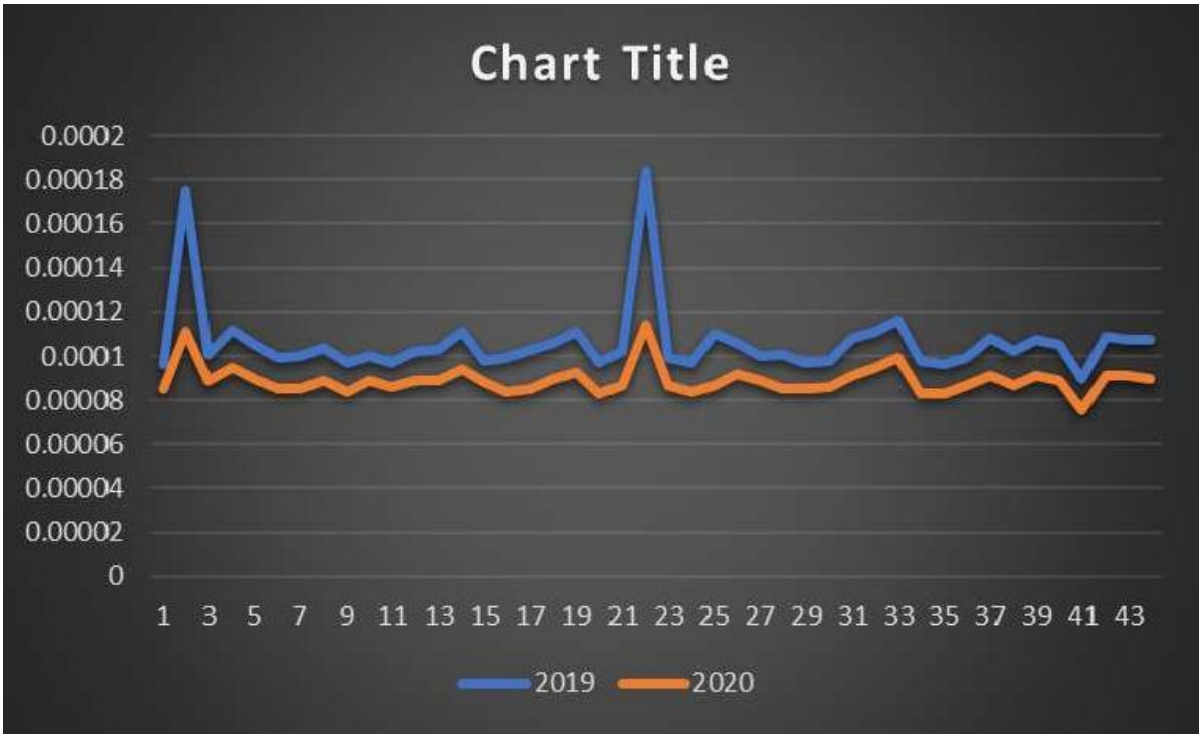

Fig 7: NO2 band mean of 2019 and 2020

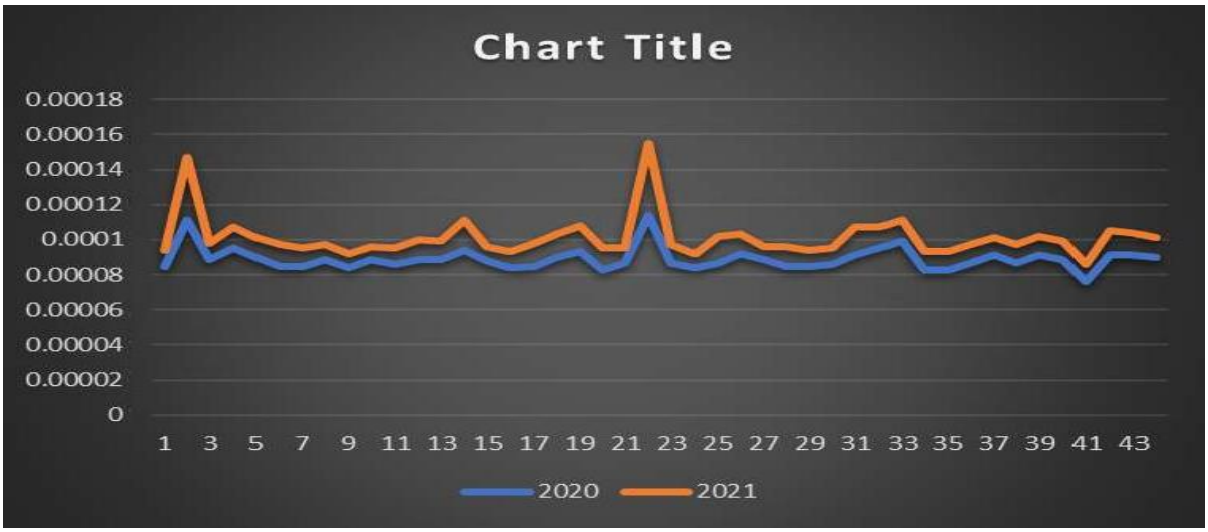

Fig 8: sentinel 5p NO2 band is extracted via earth engine

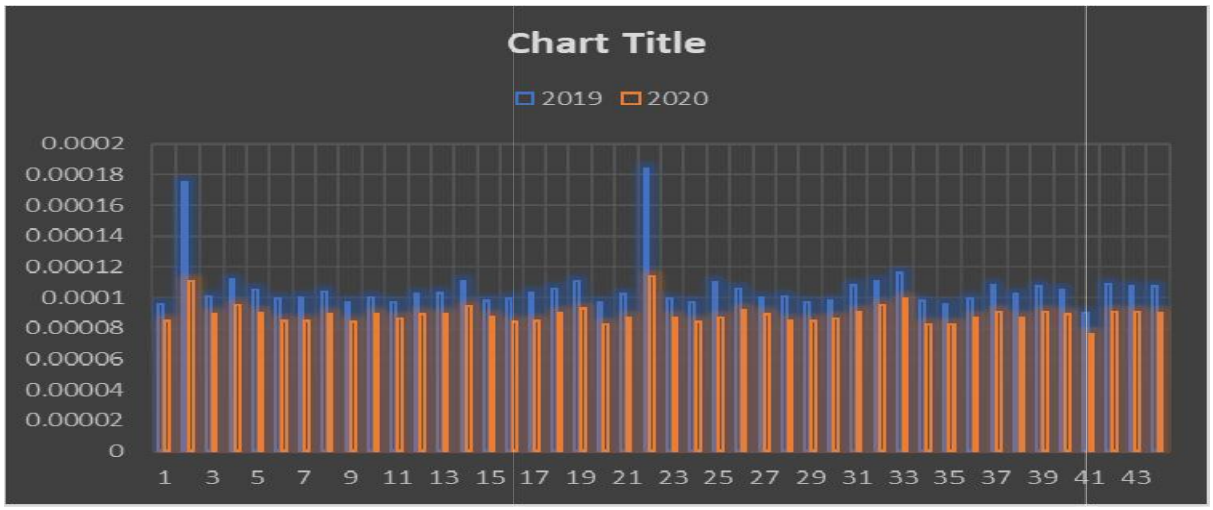

Fig 9: sentinel 5p NO2 band is extracted via earth engine

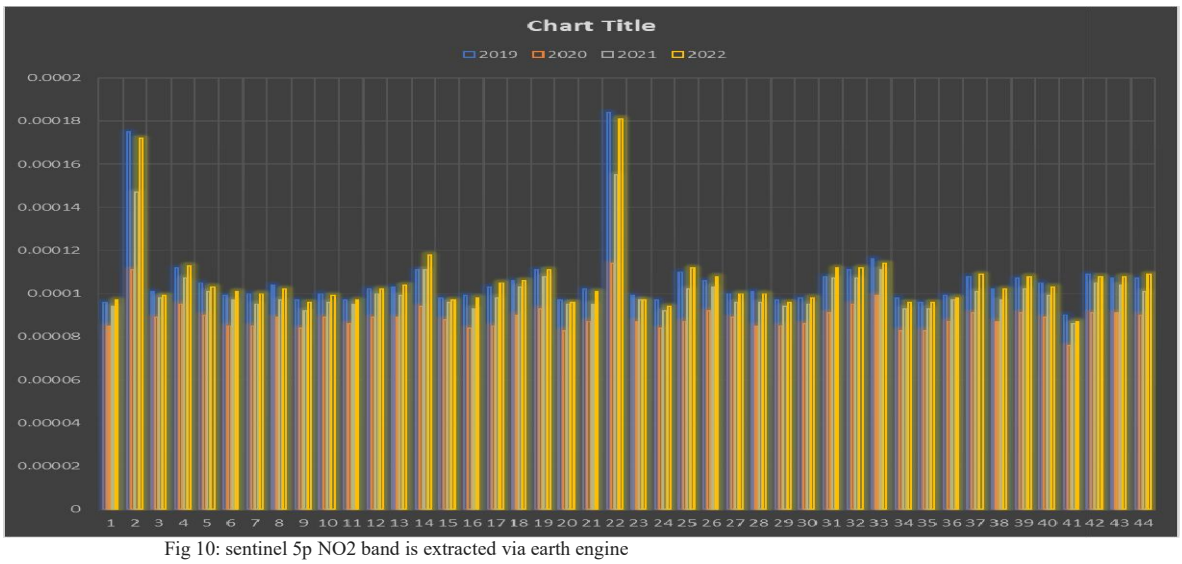

Fig 10: sentinel 5p NO2 band is extracted via earth engine

CONCLUSION:

By analyzing satellite observation data and ground surveillance data, our current study is within two weeks under the national blockade, compared to the two weeks before the blockade in significant cities and geographic areas. It indicates that the NO2 level has decreased. During the process of the national blockade, nitrogen dioxide (NO2) concentrations in the troposphere decreased by 40-50% in India's air pollution hotspots and industrial areas. Similarly, there was a dramatic decline in South and East Asia during the COVID 19 pandemic quarantine period. Cleaning the air is infeasible, so these are the fundamental steps to shut down the industry. Statistical patterns of tropical nitrogen dioxide (NO2) concentration spectra in past datasets (2018–2020), shown biweekly from October to March, were high each year. In addition, India shows a decrease in tropospheric NO2 content from April to June each year. In India, NO2 pollution levels suddenly dropped by about 50% during India's complete national blockade from 23032020 to 28042020.

According to India's National Air Quality Standard (NAAQS), the average NO2 level was 80 µg / m3 in the hourly range. However, our results show that 21 µg / m3 during the national lockdown, central 1 Air quality standards of the Pollution Control Board of India have fallen by more than 50% from the hourly average. All major cities are rated at the NO2 level based on India's NAAQS. Their air quality is mainly excellent and moderate; Bangalore, Chennai, and Mumbai are all every 22 days during the lockdown period report. In a good and satisfying category, Patna and the Northern-Eastern Region of India saw a gradual decline on most days in India. The pandemic has shown that it is effortless to achieve a clean sky and good air conditions if a robust process is adopted to delay the consumption of fossil fuels. We believe that these results and changes in environmental conditions are the keys to finding new things. Air quality for national health.

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