



Impact of Environmental Pollution on COVID-19 pandemic in Pakistan

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Abstract

The global COVID-19 pandemic is not finished yet, so it's taught us a lot of lessons already-the hard way. The current situation is dominated by studies on identifying the factors that impact, taking preventive steps and trying to find successful care at the top of the list. Countries around the globe have made some arrangement of lockdown in order to slow down their infection. However this lockdown makes some positive effect on air quality and substantial reduction in nitrogen dioxide (NO₂) air pollution worldwide. Luckily, NASA collected the images over Sentinel-5p satellite broadcasting using TROPOMI (TROPPSpheric Monitoring Instrument) and issues the various images of major city of Pakistan before and after lockdown due to COVID-19 pandemic and its influence on the Pakistan air pollution.

Keywords: COVID-19; Pakistan; Environmental Pollution; NO₂ emissions; Outbreak

Introduction

The novel Coronavirus (COVID-19) disease outbreak was take place in Wuhan city of Hubei province of China. The COVID-19 is transmitting like a diffusion reaction to all over the world and reach up to 210 countries and territories within last four months. Moreover, COVID-19 pandemic disease declared as international health emergency by The World Health Organization (WHO) [1-3]. Furthermore, major problem in the fast transmission of the COVID-19 is transmissibility through physical contact (i.e. touching, sneezing, hand shake, etc.) [4]. Therefore, due to fast transmission rate of this epidemic disease, it is observed that, the number of reported COVID-19 cases outside the China were higher as compare to new cases within China (427 vs. 411) on 26 February 2020 [5]. By April 29, 2020 the pandemic disease effect the more than 3.15 million people in the world and more than 0.218 million casualties have been reported and every country has different death rate

per million [2,3,6,7] moreover, WHO has released COVID-19 warnings to countries which are at risk i.e. Pakistan and India [8]. The country like Pakistan borders are linked with highly affected countries by COVID-19 i.e. China and Iran. The China is the epicentre of the COVID-19 and Italy is the highest number of COVID-19 deaths. The Iran in the north, after Italy has high number of deaths cases [9,10]. Furthermore, India and Afghanistan are also affected by COVID-19 and it is transmitting at a fast rate in India. The India is having 1.25 billion populations and WHO declared that, now India is at high risk. In Pakistan, the first case was reported on February 26, 2020, and confirmed by the Government of Pakistan. Moreover, the first case was confirmed case of COVID-19 was reported in Karachi, province of Sindh and on the same day reported another case in Islamabad [9-11]. After identification of 1st positive case in next fifteen days, the number of infected cases reached up to 471 and highest cases were reported in Sindh and GB and moreover, many of reported cases come from London, Italy, Syria, and Iran, [10].

As of 29 April 2020, the reported cases reached 14885, with 327 casualties and 3425 recovered cases.

Pakistan's geographic position, with the constant increment of COVID-19 positive cases, requires an extraordinary level of intervention, management and strategies. On 12 February, 2020 Pakistan's Ministry of National Health Services, Control & Coordination offered a plan entitled "National Action Plan for coronavirus disease preparedness & response (Covid-19) Pakistan." The goal is to monitor the spread of the virus and to improve country and community preparedness for emergencies to ensure a prompt, secure and effective response to possible Covid-19 events including, the national, regional and local, outbreaks that can seriously affect the health of the Pakistani people and society. Keeping in view the fast transmission rate of COVID-19 cases in Pakistan, national wide lockdown was declared on 23rd March 2020. In results of lockdown, the manufacturing operations, industries, schools, colleges, universities as well as public and private transports were shut down in the country. Transport is the hardest hit industry, due to lockdowns, among several other industries. According to the study, COVID-19 reduced air travel by 96 percent, the lowest in 75 years [12].

Data collection during COVID-19

Over the past few weeks the improvements in air quality have come as a by-product of the lockdowns due to

coronavirus outbreak across the globe, this sheds light on some aspects of the environmental and pollution problem which otherwise hardly gets any serious attention in the larger scheme of things [13,14]. The rates of air pollution across geographies have decreased significantly due to reduced fossil fuel use in transportation, factories and power plants, as well as other sources of pollution. Real-time availability of ambient air quality data in Pakistan is very limited and, in the absence of these data sets, it is very difficult for politicians, media, civil society organizations and the general public to recognize the effect of any policy decisions or actions on air quality and public health rates. Luckily, with advancements in remote sensing and satellite data collection as well as technical development, it has become possible for researchers and analysts to determine predominant rates of pollution in areas with or without the availability of vast volumes of ground emissions monitoring data in the public domain. Luckily, NASA collected the images over Sentinel-5p satellite broadcasting using TROPOMI (TROPPspheric Monitoring Instrument). NASA out the various imageries of major city of Pakistan before and after lockdown (Figure 1). NO₂ is known to be extremely dangerous to human health as studies indicate that both short-term and long-term exposure to NO₂ can raise mortality rates [13,14]. Data for Pakistan last few weeks has shown that Pakistan's shutdown has resulted in a dramatic drop in pollution rates in many cities across the country (Table 1).

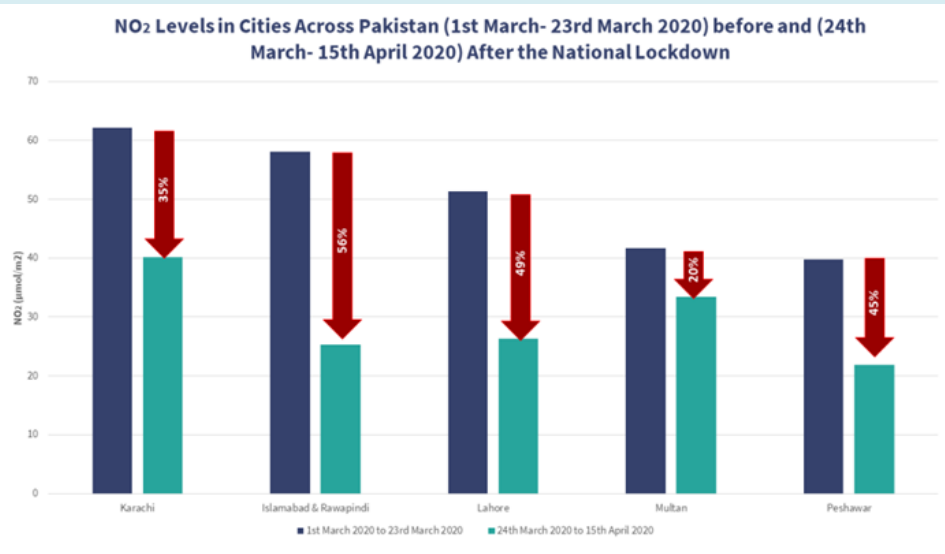


Figure 1: All over Reductions in NO₂ rates in main Pakistani cities before (1 March- 23 March 2020) and after (24 March-15 April 2020) the national lockdown notification (TROPOMI Sentinel-5P satellite).

Locations	Agency	Satellite	Time	Reduction%	Source
Peshawar	NASA	Sentinel-5P satellite	23rd March 2020-15th April 2020	45	(NASA,2020)
Lahore	NASA	Sentinel-5P satellite	23rd March 2020-15th April 2020	49	(NASA,2020)
Multan	NASA	Sentinel-5P satellite	23rd March 2020-15th April 2020	20	(NASA,2020)
Islamabad	NASA	Sentinel-5P satellite	23rd March 2020-15th April 2020	56	(NASA,2020)
Karachi	NASA	Sentinel-5P satellite	23rd March 2020-15th April 2020	35	(NASA,2020)

Table 1: Data acquisition of NO₂ emission across different major city of Pakistan.

Here are some maps plotted using TROPOMI-Sentinel-5P satellite data showing a decrease in NO₂ levels 23 days before and after the national lockdown across cities in Pakistan. These images provide comparison between NO₂ reductions in different major cities of Pakistan before (1st March to 23rd March 2020) and after (24th March to 15th April 2020) the national lockdown announcement. It is clear that NO₂ emissions have decreased significantly due to the COVID-19 lockdown situation in the region. Wide lockdown in Pakistan commenced on 24th March 2020. NO₂ primarily comes into the air from fuel burning and is generated primarily by pollution from vehicles, trucks and buses, power plants, and off-road equipment. Thanks to the national lockdown, most of these operations are absent/reduced, the emissions have fallen significantly. Two NO₂ hotspots seen before lockdown the Lahore (Figure 2b) areas such as the Lahore-Sheikhupura road (North-West of Lahore) and the Raiwind to the Pattoki belt (South of Lahore) with clusters of oil-based power plants have significantly reduced suggesting decrease in operations. Likewise, satellite data for Karachi (Figure 2e) shows that

there have been major emission reductions but areas around Korangi-Landhi industrial areas as well as around fertilizer and cement plants at Bin Qasim port still tend to be NO₂ emission hotspots suggesting that some of these plants were still in operation during the lockdown. Furthermore, explanation for small improvements in NO₂ emissions is the sudden decrease in urban traffic, which in Pakistan has declined by some estimates as much as 65 percent. Google reports that Pakistanis stayed largely away from companies, parks, shopping centres and workplaces under the lockdown using anonymised geolocation data. Poor fuel quality and increasing concentration of vehicles have been blamed as the primary cause of poor air quality in Pakistan, and the drastic decline in vehicle mobility has reduced a large proportion of urban pollution. The below (Figure 2) NO₂ reduction maps of major cities of Pakistan, the pollution problem can be solved, clean skies and breathable air can be achieved. While the current situation and restrictions are not recommended as a way to clean the air that is causing tremendous misery to the country's people.

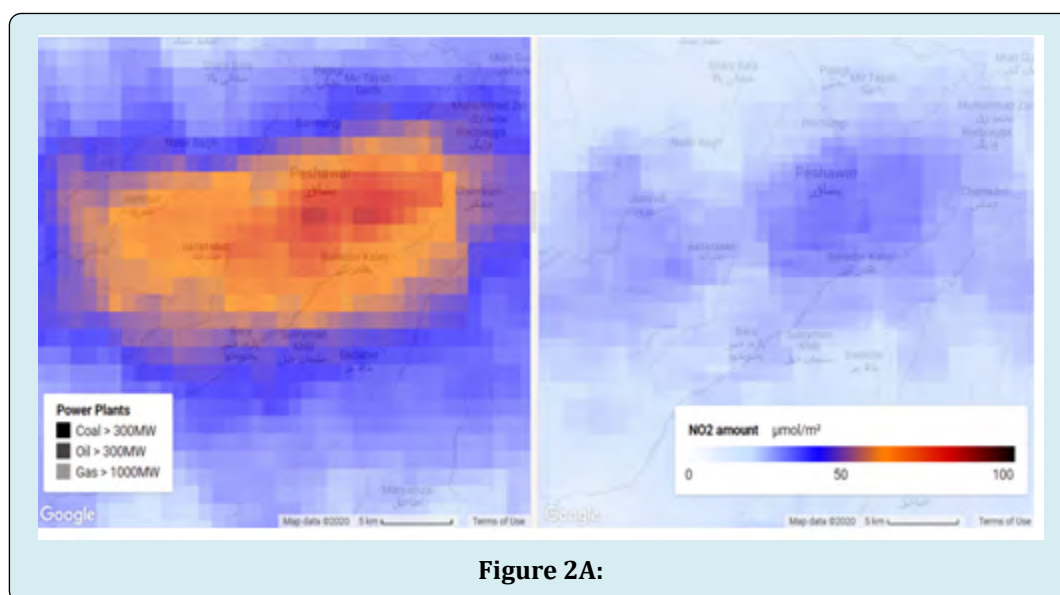


Figure 2A:

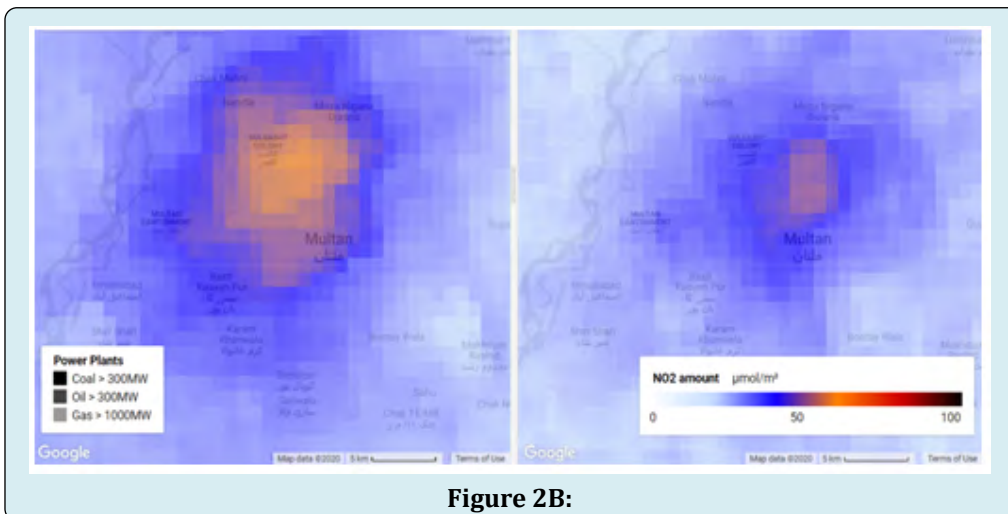


Figure 2B:

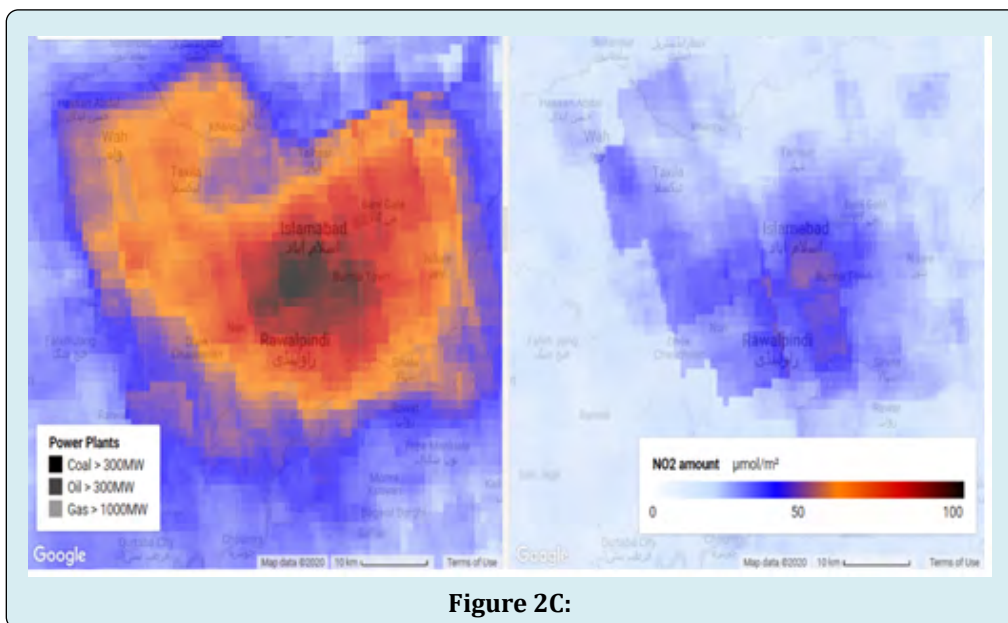


Figure 2C:

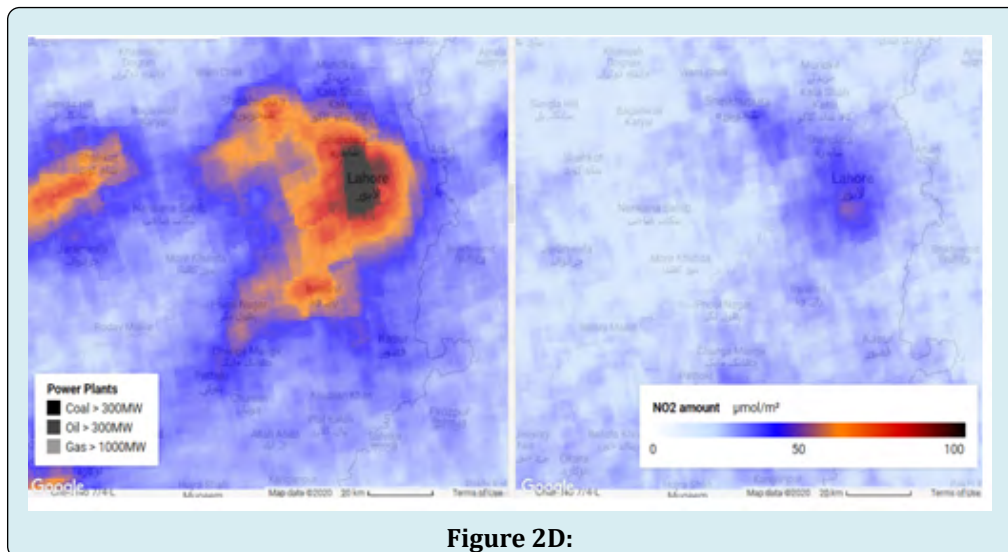


Figure 2D:

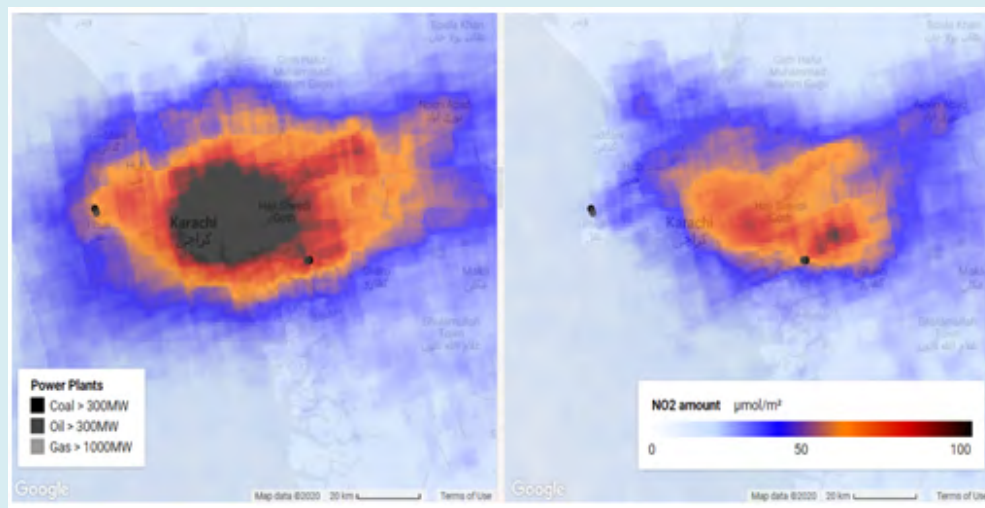


Figure 2e:

Figure 2: Map showing NO₂ reductions over Pakistan before (1st March- 23rd March 2020) and after (24th March- 15th April 2020) the national lockdown announcement (a) Pashawer (b) Lahore (c) Multan (d) Islamabad (e) Karachi (NASA,2020).

Conclusion

This is the first study to investigate the air pollution on Pakistan affected with COVID-19. COVID-19 is a deadly virus and a serious human health threat which stops economic activity. However, the ongoing lockdown helping to clean the air also demonstrates that linking air pollution rates in the South Asian region is very closely correlated with larger economic activities (transport, energy production and industrial activities) along with small-scale city-level interventions.

Authors' Contribution

Awais Muhammad conceptualisation, analysis, writing-review and editing. Wei Li: conceptualisation, observation, writing-analysis and editing. Saddam Hussain: Conceptualisation, Analysis.

Declaration of Interest

The author has no conflict of interest to declare.

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