

# Making a Case for Remote Working towards Positive Impact on Environment: Lessons from Covid-19 Lockdown

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## Abstract

One of the main sources of generating carbon dioxide (a potent greenhouse gas) is cement industry. This research presents an attempt to replace cement with an eco-friendly material i.e., Wheat Straw Ash (WSA) an attempt in reducing the onsite waste. The leading source of food for 2.45 billion people in the world is wheat. For the marketing year 2021, the yearly worldwide wheat production was about 775.9 million tons and Pakistan with a share of 3.5% of the global production of wheat is ranked 7<sup>th</sup>. It has been observed that the standard straw gain is about 1300–1400 grams per 1000 grams of grain and when these straws are burnt, they produce about 20% of ash. This wheat straw is being used in this research by burning it in a temperature-managed furnace at 600 °C for continuous four hours. The ash obtained was then sieved from the #200 sieve with proper grinding. The workability, water absorption, compressive strength and unit weight are the tests performed at a variety of replacement proportions of these ashes (0%, 5%, 10%, 15% and 20%) of cement weight. The samples of water absorption test were examined at intervals of 1 and 28 days, while the specimens of compressive strength and unit weights were tested at the periods of 3, 7, 28 and 56 days. The findings of the study revealed that an optimum value of compressive strength occurs at 10% replacement of WSA, and unit weights decrease as the WSA content increases. Workability and water absorption of concrete increased because proportion of WSA increased. This study may be used as one of the reference points towards an eco-friendly approach in the construction industry as the WSA showed positive results over cement.

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**Keywords:** COVID-19; Remote working; Environment pollution; Air Quality.

## 1. Introduction

The Coronavirus, also known as Covid-19 Pandemic was first reported in December 2019 in the city of Wuhan, China. On 11th of March 2020, the World Health Organization (WHO) declared the coronavirus as a pandemic[13]. The COVID-19 had spread worldwide and it not only affect the human health but also the country's economy and the environment in different ways. To control the spread of virus the Government had taken number of measures and imposed restrictions all businesses, industries and educational institutions. All public transport services were suspended except for the transportation of goods and emergency services[12]. Overall, the pandemic had caused major social upheavals worldwide and it affects the environment, such as improved air and, noise pollution, improves water quality and environmental recovery[11].

As lockdown had forced large sections of society to reduce commute. The effects of the such closure increase the remote working, which resulted into less pollution for example, nitrogen dioxide, greenhouse gas emissions, carbon black and water pollution are significantly reduced [1][10][14].

## 2. Literature review

Air pollution is the presence of atmospheric materials which can be harmful for human health and other living organism and may cause damage to the surroundings. The air pollutants are mainly emitted through essential human activities and with the usage of business machinery, combustion engines, power stations, and motors. Such activities are performed on such a large scale and are major contributor to air pollution [7].

### 2.1. Air pollutants

The air pollutants are classified primarily on these sources (Table 1).

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**Table 1: Sources of Air Pollutants**

Major sources	Indoor Area sources	Mobile sources	Natural sources
Contamination of pollutants from metallurgical, refineries, municipal incineration, petrochemicals, fertilizer industries, power stations and industrial plants	Cleaning activities, printing shops, dry cleaners and stations.	Cars, Automobiles, airways, railways, and other types of vehicles.	Forest fire, agricultural burning, volcanic erosion and dust storms,

## 2.2. Environmental aspects of Remote working

All the state and local Governments worldwide had imposed lockdown and put restrictions on people to go outside their home in order to practice social distancing and control the transmission of the virus. The various cultural, scientific, religious, social and political mass gathering events were cancelled. Due to lockdown the practice of remote working increases globally and industrial waste had reduced to a large extent due to the non-functioning of industries. Vehicles were hardly found on the roads which resulted in the less emission of green-house gases in the environment. Moreover, due to less consumption of power in industries the use of fossil fuels sources had been reduced considerably [8]. The lockdown globally had restricted industrial, transportation and agricultural services which are considered as major sources of environmental pollution [9]. According to the Global Air Quality Report 2019, high levels of air pollution is evaluated in all South Asian countries where, Pakistan, India and Bangladesh were ranked among the top five countries with the worst air quality. However, during the coronavirus crisis, global air pollution has reported significant improvements as major operations requiring massive mineral burning have been halted [6]. During the lockdown period, air quality data obtained from major cities of Pakistani has reported significant reductions in air pollution, while a gradual increase was observed after the period of lockdown [6]. The air quality index of five major Pakistani cities from January 2019 to December 2020 is presented in Table 2 and 3.

## 3. Methodology

The secondary data is used in this study by reviewing published literatures and World Quality Index (AQI) reports. Scientific literature is collected from Research Gate, Science direct, Google Scholar and internet sources. The targeted area of the study is Pakistan. The five major cities namely Karachi, Islamabad, Faisalabad, Gujranwala and Lahore were taken as a sample size. The convenience sampling technique was used as cities were selected based on the availability of data. Due to the limited availability of the data, 2019 to 2020 Air Quality data of Pakistan is evaluated.

## 4. Data and Results

The data set includes Pakistan throughout the period of 2019-2020. The data required for Air Quality is collected from World Air Quality Report. The reason for selecting Pakistan as a sample is that in Covid-19 Pandemic all affected countries have similar changes and measures to control the spread of virus. The mentioned time period is selected because of availability of the monthly data.

**Table 2: Air Quality Data 2019**

City	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	June 2019	July 2019	Aug 2019	Sep 2019	Oct 2019	Nov 2019	Dec 2019
Karachi	86.7	42.1	32.4	18.2	16.1	18.1	23.3	22.2	28.5	44.9	67.1	75.9
Lahore	199.1	110.3	73.6	62.5	53.7	44.5	39.9	40.9	54.7	104.6	134.9	182.7
Faisalabad	223.0	128.3	82.0	59.1	56.5	46.3	54.2	58.4	66.5	92.0	148.5	226.2
Gujranwala	220.4	127.4	86.4	70.9	65.8	53.3	59.2	48.8	67.4	107.6	144.9	217.3
Islamabad	37.0	24.9	18.6	17.2	14.6	20.5	31.7	29.8	42.9	40.0	48.8	96.3

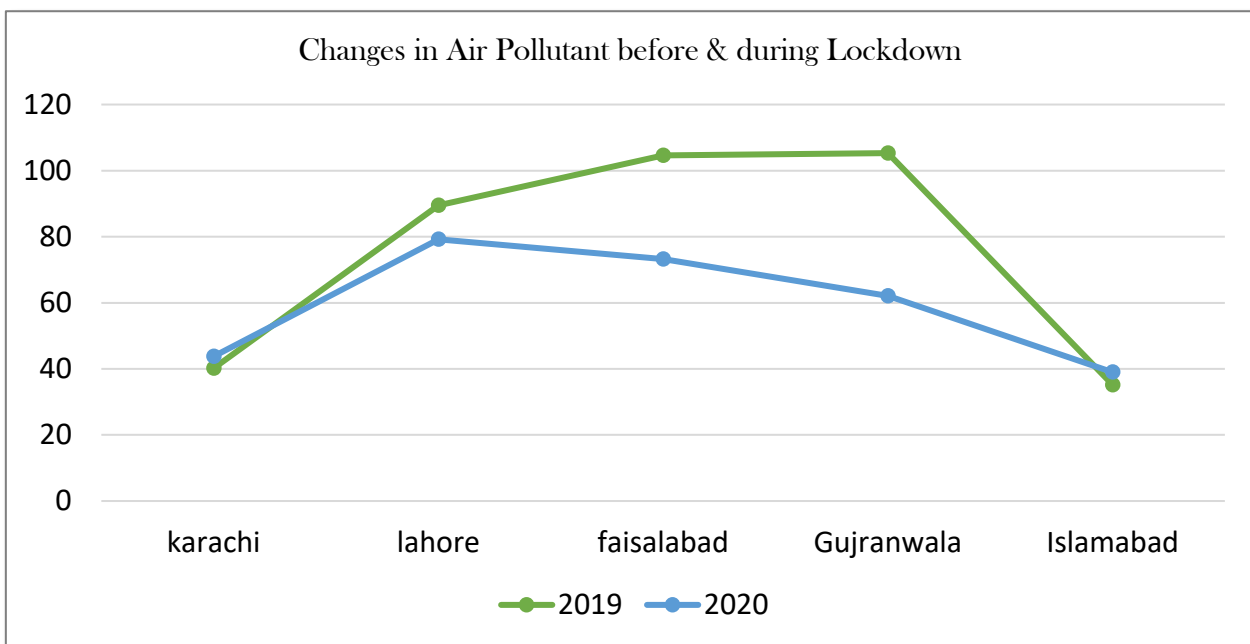
**Table 3: Air Quality Data 2020**

City	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	June 2020	July 2020	Aug 2020	Sep 2020	Oct 2020	Nov 2020	Jan 2020
Karachi	70.9	60.0	35.4	26.9	24.1	25.4	24.6	24.6	29.7	41.2	80.9	70.9
Lahore	138.0	107.3	47.0	31.4	38.9	39.9	39.7	30.8	56.0	109.9	151.3	138.0
Faisalabad	146.3	108.2	54.7	34.6	39.2	45.7	50.0	38.3	56.7	103.9	203.9	146.3
Gujranwala	86.6	104.4	35.6	22.4	30.7	49.8	46.6	32.4	57.0	98.6	118.0	86.6
Islamabad	63.5	52.9	26.7	22.4	18.8	29.8	33.2	27.2	32.0	42.4	53.3	63.5

Table 2 and 3 shows the data of five cities of Pakistan throughout the period of 2019-2020. The data required for Air Quality is collected from World Air Quality Report. Table 4 shows the data of average PM<sub>2.5</sub> Concentration of five major cities of Pakistan. There is a significant change in Air Quality in Pakistan in the year of 2020 which is represented in Fig 1.

**Table 4: Annual Average PM<sub>2.5</sub> 2019-2020**

Cities	2019 Annual AVG	2020 Annual AVG
Karachi	40.2	43.8
Lahore	89.5	79.2
Faisalabad	104.6	73.2
Gujranwala	105.3	62.1
Islamabad	35.2	39



**Fig. 1: Relative Change in Air Pollutants between 2019 & 2020**

It is assumed that aviation and vehicles are the main contributors to greenhouse gas emissions but with the closure of factories and companies the practice of away from home / remote work has resulted in less transportation which has led to a significant reduction in greenhouse gas emissions (GHGs). However, Lockdown allows people to work remotely and reduce economic and communications activities around the world, ultimately lowering noise levels in many cities. The changes noted in Fig. 1 result in a reduction in air pollution in the year of 2020 due Covid-19 restrictions. According

to the World Air Quality report 2020, a temporary reduction in fuel consumption due to global closures associated with a significant reduction in air pollution compared to previous years. By 2020 there have been 65% of cities in the world that have seen air quality development since 2019. The overall comparison of 2019 and 2020 is represented in Fig. 2.

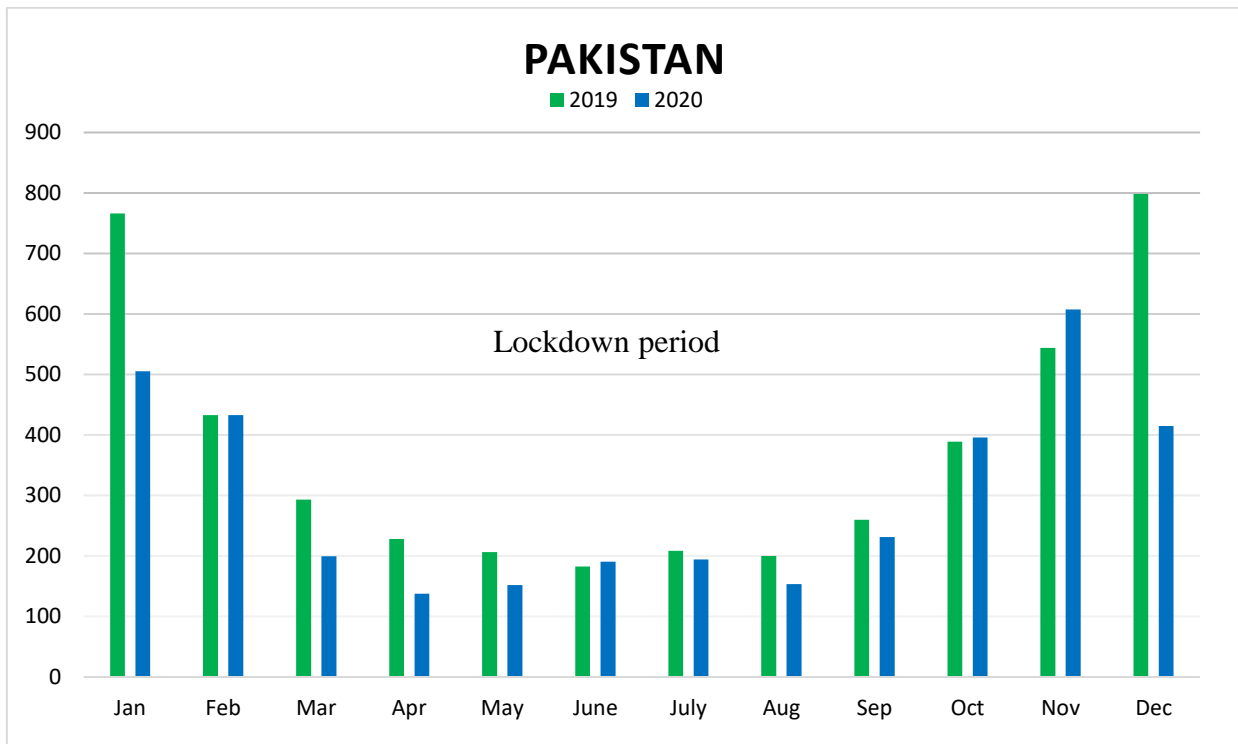


Fig. 2: Air Quality Comparison before, during and after Lockdown (2019-2020)

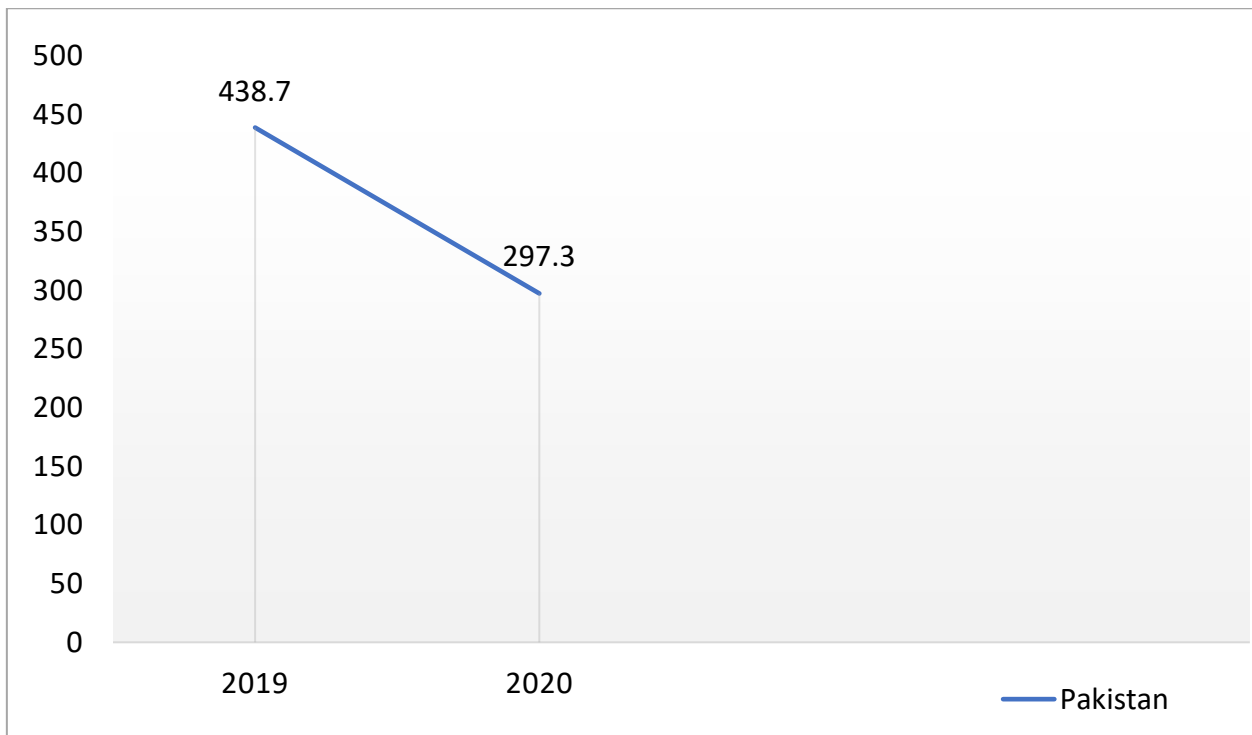


Fig. 3. Reduction in air pollution

The COVID-19 pandemic resulted in less air pollution due to reduction in energy demand, transportation and less consumption of fossil fuels etc which improved the air quality shows in Fig. 3.

## 5. Discussion

The present study has investigated the impact of changes in Air quality before and during the lockdown period in COVID-19. Based on the results, it may be inferred that the reduction in transportation and other sources of creating pollution had a positive impact on air quality. Another important factor is that after the COVID-19, Pakistan has taken strong and comprehensive measures to protect and control. The whole community stops work and production, and all workers were staying at home and practicing remote working [3]. However, remote working limits traffic flow and traffic, significantly reducing emissions of gasoline vehicles. The current study is evidence that in the advent of pandemic the air quality improved. The great lesson had taken from such incident the general development of a remote operating system can moderate and improve air pollution. However, a basic way to completely improve air pollution continues to operate remotely even after the closure of COVID-19. The organization must use a variety of environmental sustainability strategies.

- Increase use of clean fuels and technologies, switch to low-energy industries and implement energy saving policies[5]. In addition, factories should be built in certain areas where waste from one factory can be used in another factory or industry as raw material.
- To encourage people for carpooling or use public transport rather than private vehicles to reduce the carbon emissions. In addition, people should encourage short-term cycling, and a public bike sharing system which not only allows for a more environmentally friendly environment but also health benefits.
- As a result of the COVID-19, the demand of global energy being reduced that leads to a reduction in pollution and improved air quality in many regions [10][11]. Therefore, the use of renewable energy sources such as hydropower, geothermal heat, solar, wind, and biomass can meet demand of energy and can reduce GHGs emissions.
- Industrial and municipal wastewater must be properly collected before it can be discharged. In addition, recycling of wastewater used in non-productive activities such as cleaning roads and flushing toilets can reduce the use of excess water.
- Industry 4.0 is the way forward by means of using smart technology which can help by automating energy usage.4

## 6. Conclusion

The current research aims to understand the positive effect of the COVID-19 epidemic on the environment. As environment pollution is biggest problem nowadays which affects the human health. The pandemic successfully reintroduced the environment to a great extent that have a positive impact on global climate change. In March 2020, COVID-19 was considered a pandemic, leading to widespread economic sanctions and dramatic changes in human behavior. The lockdown had restricted industrial, transportation services and agricultural production which are major contributors of environmental pollution also the lockdown had increased the opportunity of remote working. Many organizations and educational institutions were working at home in the time of pandemic which resulted into less commuting, less paper usage, less energy consumption. The adoption of remote working system will improved the Air Quality so the organizations need to pay focus on remote working arrangements for improvement of the environment.

## Acknowledgement

The author would like to express the gratitude to Mehran University Institute of Science, Technology & Development (MUISTD) and all those persons who made it possible to complete this study.

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