Reduce Carbon footprint in Rawalpindi Pakistan

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ABSTRACT: *In developing countries such as Pakistan, atmospheric pollution has become a disaster. This study's objective was to observe and evaluate the air quality in the 15-million-person combined population of the twin cities of Rawalpindi and Islamabad in Pakistan. The quantities of particulate pollution, as well as CO_2, were measured in five different cities. There are now far too many types and sources of pollution from numerous air pollutants. However, due to an absence of management skills for air pollution, the world is currently facing diminishing air quality. The ecosystem, public health, and quality of life are all seriously threatened by air pollution, according to facts from multiple governmental organizations and foreign organizations. Through the Pakistan Environmental Protection Program, the Pakistani government has implemented important strides toward air quality management, including the establishment of few active monitoring stations. However, there are currently no standards for environmental protection. This paper examines the standards for air pollutants from observational studies. Five main air pollutants—NO_2, SO_2, CO, O_3, and PM2—were taken into consideration. Our findings show that under the baseline scenario, Existing air pollution in Pakistan management efforts are inadequate to achieve the nation's air quality criteria. By 2050, the percentage of deaths caused by PM2.5 will be 24% lower nationwide because of the implementation of sustainable development policies. Innovative standard precautions can improve Pakistan's air quality and public health, but when associated with foreign long-term new developments, they can also lower greenhouse gas emissions (implementing SDG 13's indicator on climate action) and save about a quarter of GDP (0.32% of GDP) on costs associated with emission control by 2050. It seems to have a substantial co-benefit in terms of cost (economic), health (social), and air pollution (environmental), suggesting that Pakistani public policy should consider a co-control at a low cost of greenhouse gases and air pollution in the future.*

KEYWORDS: greenhouse gas emissions, public health, environment, carbon footprint, carbon dioxide CO2, air pollution, asthma, clean water, health. air quality, smoke

INTRODUCTION

The rich history of the strategically significant city of Rawalpindi has been preserved in its architecture. It is one of the best residential options in the twin cities due to its geography, demographics, and closeness to Islamabad. The airport housing society is one of the many residential societies available in Rawalpindi. With access to major roads leading to all areas of the twin cities, the airport housing society is in the center of Rawalpindi. It is a complete society with well-built homes for its citizens. Reduction in carbon emissions contributes to reducing the impact of climate transition, which is advantageous for both health of individuals and a wide range of animal and plant species.

Additionally, this boosts the economy and encourages the development of more creative, solutions. Carbon, charcoal, and gasoline are the major three sources of greenhouse gas emissions. Reducing consumption of these has a big influence on carbon footprint, which has a big impact on the economy, the ecosystem, and environmental health.

In the paper below, we conducted research on the consumption of diesel fuel in the Rawalpindi airport society. We are requesting that the Pakistani government take the necessary steps to curtail this consumption. Per liter of diesel fuel used, engines emit 2.7 kg of carbon dioxide. Every hour, diesel engines consumed 5 liters. 13.5 kg of CO_2 per hour are produced by diesel engines. Assume a single tanker is on the road for 10 hours per day, emitting 135 KG of CO_2 per day. If society has 50 water tankers, it will pollute our environment with 6750 kg per day and 24,63750 kg of CO_2 per year. According to estimates, an average tree absorbs about 25 kg of carbon dioxide annually: therefore, 98,550 trees are required to absorb 24,63750 kg of CO_2. However, it takes trees about 10 years to reach maturity.

Literature Review:

A reduction in environmental quality means major hazards to both the environment and health because clean air is necessary for healthy living (Athar, 2008). Substantial cities all over the world are currently dealing with ambient air pollution. (Athar, 2008), which have serious consequences for health of individuals, the environment, and the economic system (Ilyas et al. 2009). Unplanned urban migration, motorization, huge amounts of traffic are a significant contributor to air pollution in both industrialized and developing nations. Air pollutants (PM), CO, SO_2, NOx, and O_3 are among the toxins implicated for such negative effects. Pollution in the atmosphere has been shown to be the cause of serious human diseases, especially in locations with high levels of pollution. These negative impacts, which range from mild to serious illnesses like asthma, leukemia, lung cancer, stroke, and death, have been the subject of several research. (Laden et al,2000). Additionally, insufficient combustion produces black carbon, also known as "soot." One of the main causes of climate change has been recognized as the use of coal and other fossil fuels. (Seinfeld, 2014). According to a WHO, air pollution causes over two million early deaths each year, and emerging nations are incredibly susceptible to these effects because quarter of the chronic

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diseases is reported in their communities. (Krzyzanowski,2008). A World Bank research claims that the global consequences of air pollution result in more than 22600 deaths each year (Hopke et al,2008).

Pakistan often has dust and fumes thresholds that are five times higher than those in developed countries and multiple times higher than the worldwide average. As a result, it's crucial to regularly research the air quality in different cities to determine how it would likely affect the environment and people's health. The morphology and PM10 ratios in Rawalpindi during the cold fog season were examined (Krzyzanowski, 2008) in order to establish a standard that will show potential causes and identify prevention and emission reduction methods appropriately.

Rawalpindi's climate is dry and mild, with hot moist summertime, a rainy season, and a winter season (Khan, A,2019). The hottest months are typically May and June, with an average high temperature of 38.4 C (100.4 F) recorded in June. In January during the winter, the typical low temperature is 2 C (35.6 F). (Di Marco 2018). Rawalpindi experiences fog during the winter from July to September, the monsoon season provides frequent thunderstorms and significant rainfall. (Thapa, R. 2020) Temperatures in Rawalpindi range from frigid to warm, frequently falling below zero. There is little snowfall in the highlands (Margalla Hills). The average minimum temperature was 4C (24.8 F) in January, while the greatest recorded temperature was 46.5C (115.7 F) in June. (Rafique,2014)
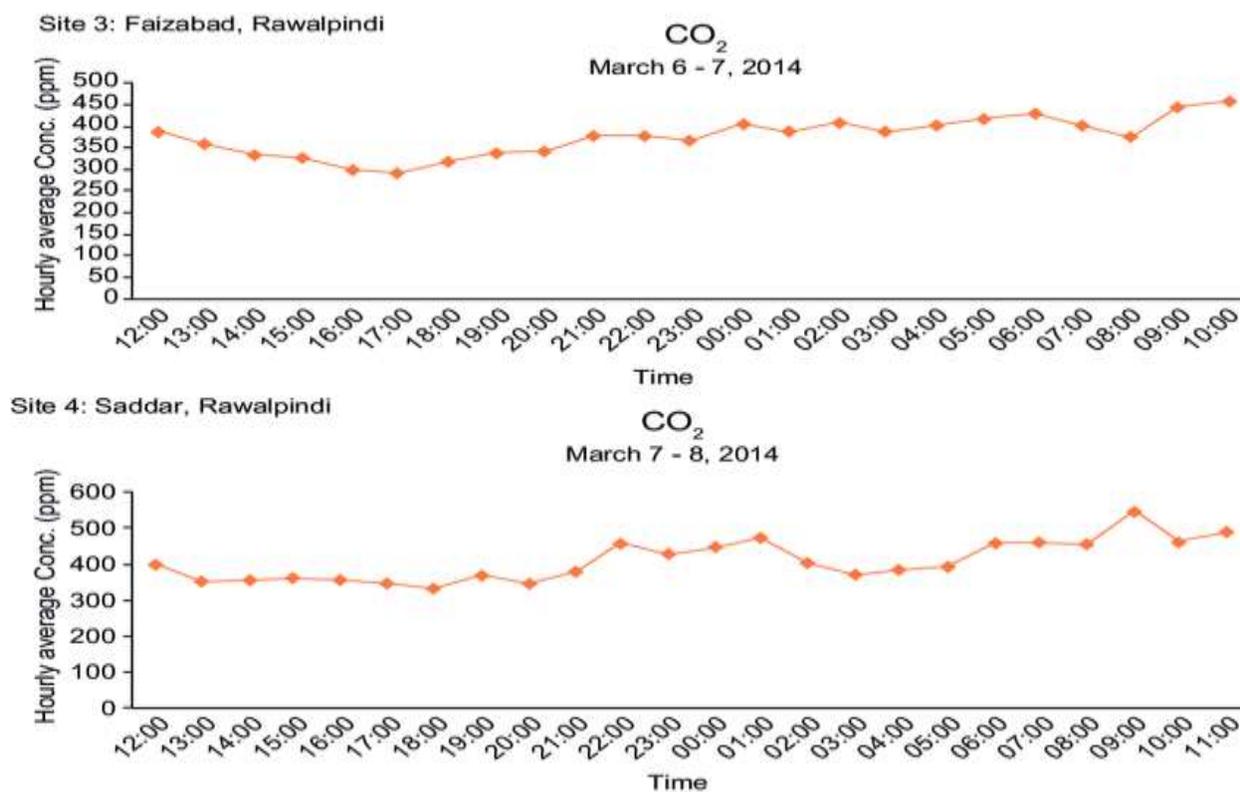
Carbon dioxide

Additionally, the twin cities' ambient CO_2 levels were assessed at five various sites. One of the primary greenhouse gas emissions (GHGs) that leads to global warming is CO_2. As a result, it is necessary to observe its condition in terms of ambient air quality. During the observation period, CO_2 concentrations were observed to be higher in almost all locations. As shown in Figure 10, the Saddar area of Rawalpindi had the maximum value (409 ppm). This is a result of more people traveling on congested roads, as this raises CO_2 concentrations. Exhaust emissions are most likely the main source of CO_2, followed by the West Industrial Area. The Blue sector of Islamabad and NUST both were observed to have CO_2 concentrations of 385.3 and 246.0 ppm, respectively. Because there are numerous local and international offices nearby, the Blue Area has elevated values that can be attributed to traffic emissions during business hours.
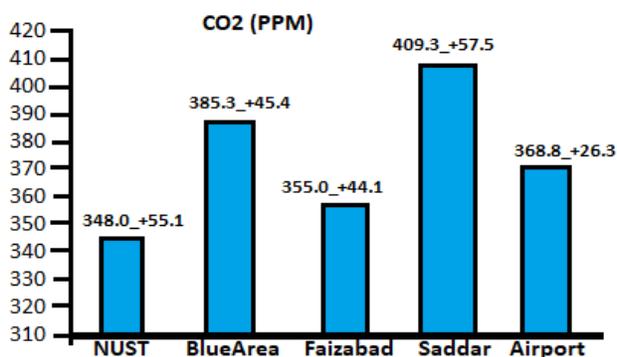
Fig. 10 CO2 concentrations in the NUST, Blue Area, Faizabad, Saddar, and Airport locations with standard deviation (mean + SD).

The locations in Faizabad and the Airport exhibit CO2 concentrations of 375.9 and 368.8 ppm, respectively. Overall, all of the sites appear to have high CO2 concentrations. As seen in Figure 11, hourly average concentrations demonstrated that CO2 levels were high throughout the day.

Fig. 11 Hourly trends for CO_2 concentrations ($\mu g\ m^{-3}$) at the Faizabad and Saddar sites.

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In 2022, carbon dioxide levels increased.
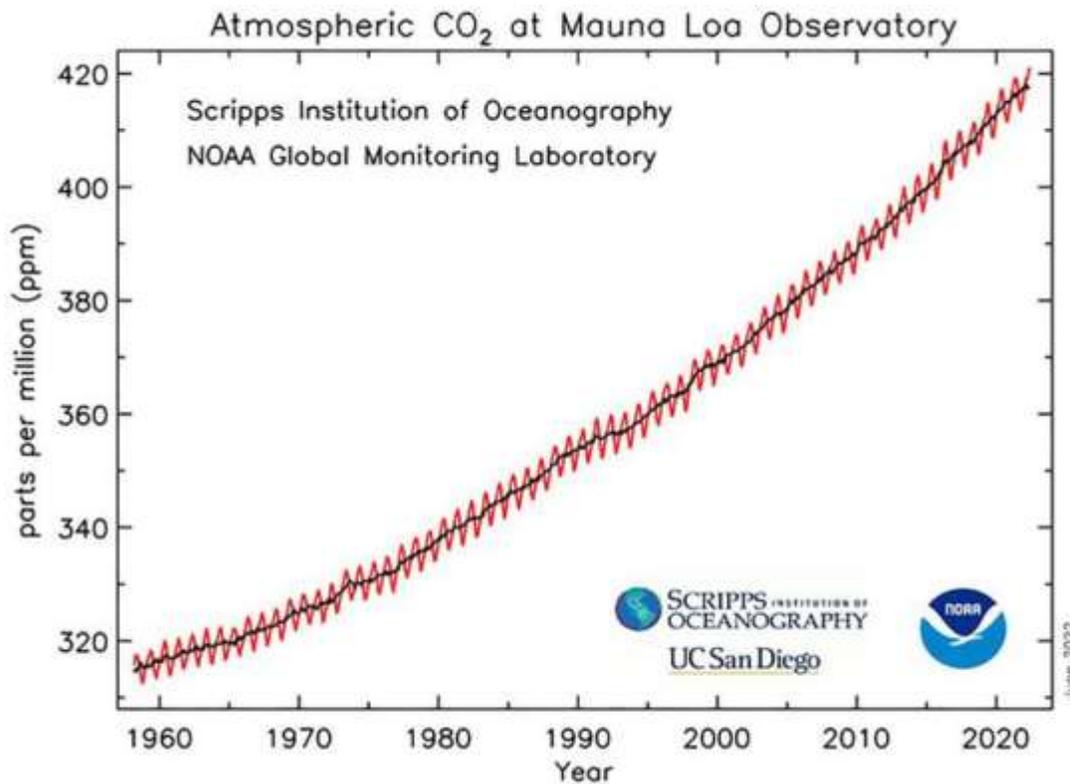
Carbon dioxide measured at NOAA's Mauna Loa Atmospheric Baseline Observatory peaked for 2022 at 421 parts per million in May, pushing the atmosphere further into territory not seen for millions of years.

The effects of climate change around us are seen every day. combustion of fossil fuels to create energy and fuel vehicles, producing cement, cutting down trees, farming, and many other activities all contribute to the polluting of the atmosphere with carbon dioxide. Carbon dioxide absorbs heat that would otherwise radiate from the earth's crust and escape into space, along with other greenhouse gases. This warming of the planet's atmosphere leads to a variety of weather impacts, such as periods of extreme heat, lack of rain, increases the occurrence of tropical storms, as well as increased snowfall, drowning, and burning activity.

Greenhouse Gases:

Greenhouse gases are responsible for greenhouse gas emissions because they absorb sunlight and reflect it back to the earth's surface. The main atmospheric gases involved in this impact include CO_2, methane, water vapor, ozone, and synthetic fluorinated gases. All of these gases, which are present in the earth's atmosphere in normal ranges, help to maintain the planet's current

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temperatures. However, since the 18th century, as a result of human activity, the amount of these gases has substantially enhanced, resulting in climate change and global warming. In 2012, Pakistan's emissions of greenhouse gases totaled 342 million metric tons with the farming and power sectors accounting for 87% of the total. Despite contributing only 0.72% of total global emissions, Pakistan is one of the countries most affected average temperatures are predicted to rise by 4 degrees Celsius by 2100 as a result of climate change.


The major contributors to gas emissions in Pakistan are rising CO2 emissions, which have increased by 123% since 1994 and are expected to increase fourfold in the next 15 years due to the emphasis on economic growth. The environmental results of these greenhouse gas emissions can be seen throughout Pakistan, with temperatures reaching the greatest ever measured internationally at 50.40 degrees Celsius. In 2015, the increasing heat killed approximately 1200 people, while 65,000 were treated for temperature related illnesses.

Method for lowering emissions of greenhouse gases

Reducing the number of automobiles is the major way to minimize these greenhouse gas emissions, but Pakistan's population is expected to reach over 100 million by 2050, creating alternate modes of transportation is also important. Other strategies include rising the Use of power products, particularly reducing the use of hydrofluorocarbon-containing materials such as climate control or refrigerants and using less hot water. By reducing consumption and cleaning, you can reduce your annual carbon dioxide emissions by 2,400 pounds. Government initiatives in Pakistan include a plan to reduce carbon dioxide emissions by 20% from the level anticipated in 2030. In particular, carbon emissions will be reduced through increased use of renewable energy sources and more improved agricultural water utilization will decrease the requirement for gasoline pumping. Imran Khan's reforestation campaign proposals are seen to be turning Pakistan's woods to use in decreasing emissions, with the potential to reduce the carbon footprint by 40% through a

25% increase in forest cover by 2030. In conclusion, Pakistan urgently needs to concentrate on and put in place policies to help in reducing greenhouse gas emissions. Together Pakistan is capable of overcoming these difficult environmental circumstances and ensuring a sustainable future by comprehending the threat to the environment and way of life.

Annual total CO_2 emissions, by world region
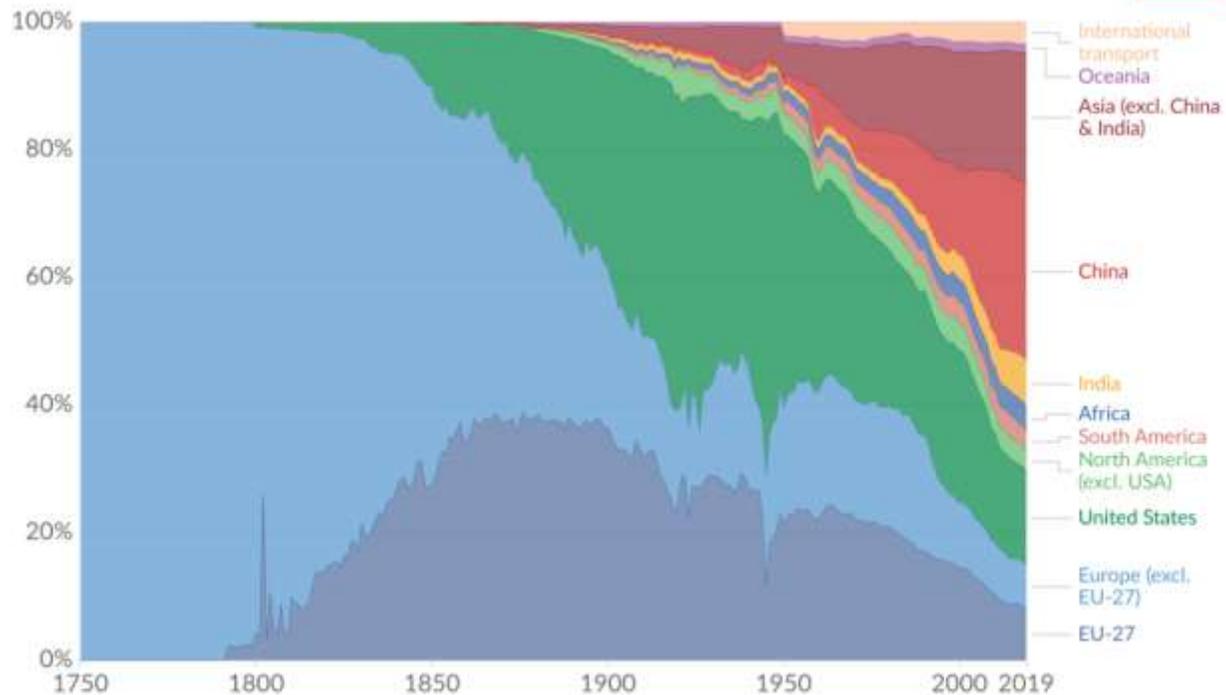
Source: Our World in Data based on the Global Carbon Project   OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY
Note: This measures CO_2 emissions from fossil fuels and cement production only – land use change is not included. 'Statistical differences' (included in the GCP dataset) are not included here.

Overall concentration of air pollution:

Figures 1 and 2 show the toxins' estimated yearly major constituents in Islamabad estimated for PM2.5, NO, CO, and O3 concentrations. Figures e and f show the percentage of times the ambient concentrations of CO and O3 exceeded the standards over the years 2007 to 2011. The 03 standard is a 1-hour average, while the CO level is either a 1 hour or an 8-hour norm. The average mass concentration of PM2.5 in the air is greater than Pakistan's yearly NEQS of 25 g/m3 (2007–2011). The highest hourly values recorded were 303 g m3 in December 2007, 495.0 g m3 in November 2008, 259.8 g m3 in September 2009, 456.0 g m3 in October 2010, and 379.0 g m3 in January 2011. Islamabad's predicted yearly mass concentrations of PM2.5 were 81.1 48.4, 93.0 49.9, 47.8 33.2, 79.0 49.2, and 66 In contrast to subsequent formation (i.e., gas-to-particle conversion), high mass quantities of PM2.5 can be attributed to primary sources like black carbon aerosols. (Husain

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et al., 2007). Adverse impacts on human health are linked to high PM2.5 levels [Petrovic et al., 2000].
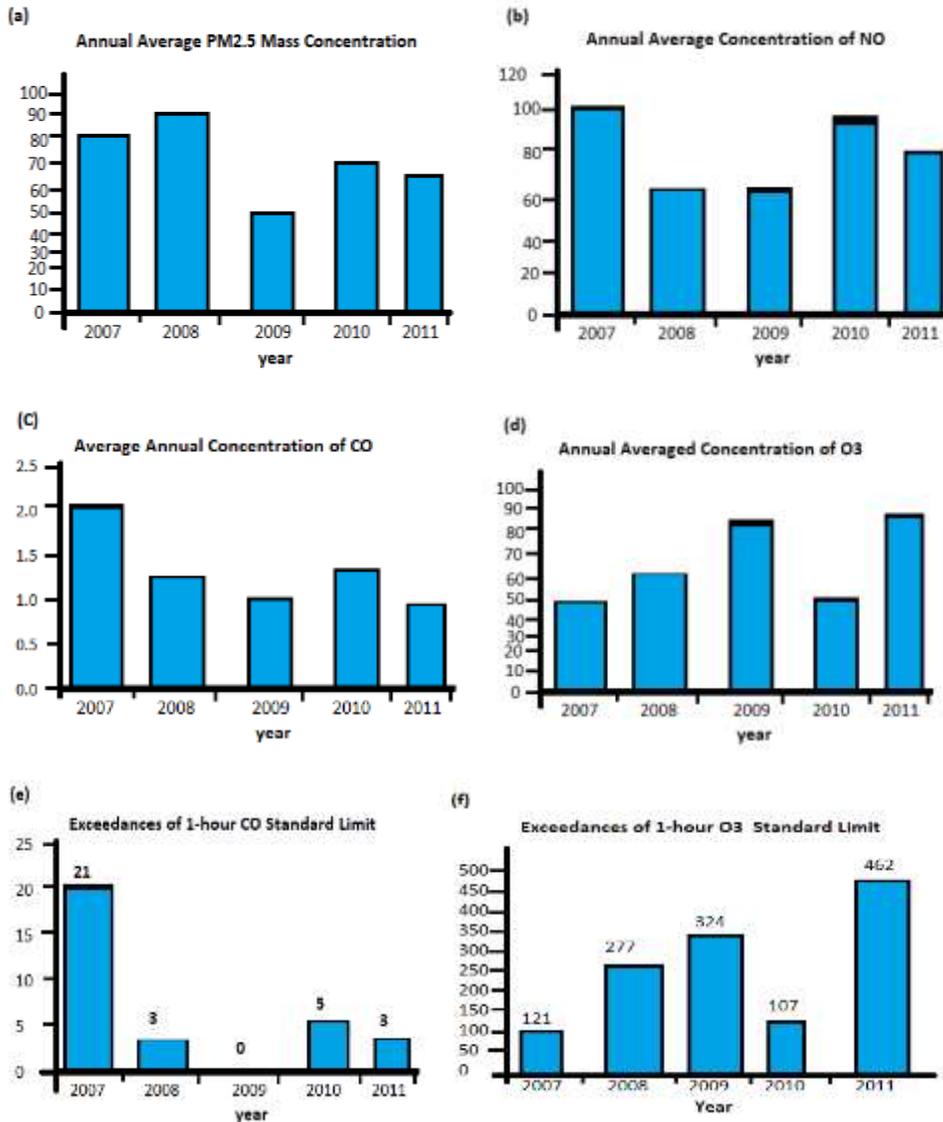
Underscoring the role of automobile, NO emissions, the annual mean NO concentration is also greater than the NEQS of 40 g m3 during the period of 2007 to 2010. The average hourly CO concentration for all years is less than the NEQS of 10 mg m3. The average O3 concentration is occasionally higher than the NEQS, particularly during the daytime in the summer. Overall, it was discovered that most pollutant concentrations were within the allowed range.

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Table : Concentration limits for air pollutants as determined by the US-EPA and PAK.

Parameter	PAK-EPA ($\mu g\ m^{-3}$)	US-EPA ($\mu g\ m^{-3}$)	Average time (h)
PM_{10}	150	150	24
NO_2	80	110	24
SO_2	120	365	24
CO	5000	10 300	8
O_3	130	235	1

Standard For Air Pollutant:

To reduce air pollution and improve quality of life, the Pakistani government enforced that all new vehicle approvals begin with the Euro 5 emissions standard in January 2021. However, the world's share of Euro 5 vehicles remains very low, according to Ali Tauqeer Shaikh, an expert in environmental protection and regulations, noting that less than 5% of cars in Pakistan meet the standard. "Moreover, high taxation on the utilization of Euro 5 vehicles is demotivating people from buying and using them. Through the promotion of environmental protection, the government is working to reduce air pollution on several levels. The government has never had a definite established strategy to raise air quality. (Leading environmentalist Tariq Banuri).

Governments can take steps to improve air quality and public health:

Many nations are making efforts to enhance the quality of the air, however WHO is urging an urgent expansion of efforts. The following steps must be taken in order to reduce carbon emissions and enhance air quality throughout Pakistan, especially in the twin cities of Islamabad and Rawalpindi.

❑ The government must impose an immediate ban on water tankers powered by tractor engines, which are industrial machines that emit more harmful gases than any other vehicle.

❑ Airport Housing Society and local governments must take action to provide water to each home because water is a basic human need, and we pay taxes and society takes service charges from residents, so they must provide enough water on every doorstep.

❑ Organizations that provide funding, such as the IMF, the World Bank, Asia Development Fund, and other NGOs, should fund projects that reduce carbon footprints, enhance air q uality in twin cities, and provide water resources.

- ❑ These organizations should also focus on encouraging local businesses to adopt new technologies and practices to help reduce emissions and waste
- ❑ Establish or modify national air quality standards and put them into practice in accordance with the most recent WHO Air Quality Guidelines.
- ❑ Track the state of the air and locate the sources of pollution.
- ❑ Promote the switch and use only sustainable energy for heating, lighting, and cooking in homes.
- ❑ Construct safe and affordable public transportation systems, as well as pedestrian and bicycle friendly networks.
- ❑ Enforce obligatory automotive inspection and maintenance, as well as higher automobile exhaust and efficiency regulations.
- ❑ Invest in electricity generating and homes that use less energy.
- ❑ Enhance the management of municipal and industrial trash.
- ❑ Reduce the burning of agricultural waste, forest fires, and some agro-forestry practices (such as the manufacturing of charcoal).
- ❑ Integrate air pollution in health professionals' courses; and provide resources for the health sector to use.

CONCLUSIONS

The recorded CO/NO and SO2/NO concentration ratios in Rawalpindi/Islamabad serve as a primary criterion for combustion inventories. The ratios of these hydrocarbon emissions in the available Islamabad emission inventory levels are consistent with the ratios derived from atmospheric principles for these pollutants. It is urgently necessary to create effective pollution control methods, especially in light of the deteriorating atmospheric environmental circumstances caused by the current air quality in Islamabad, Pakistan. In order to Satisfy standards for ambient air quality, regulatory agencies must also enforce emission restrictions for industries and automobiles. Our first and foremost goal is to save people suffering in asthma by co2 emissions. We want to reduce emission gases from local societies and twin cities of Rawalpindi and Islamabad. Because if greenhouse gas emissions are not considerably reduced, the situation is going to get much worse. Water tanker driven by tractor's engine should not be allow in residence area of any society.

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