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CASE STUDY OF AIR POLLUTION IN RAJASTHAN

[1]Dr. Ganpat Singh, [2]Shivam Chauhan

[1,2]*Assistant Professor, Department of Civil Engineering,*

Engineering College, Ajmer, Rajasthan, India

Abstract- **Air pollution is one of the major environmental problems. It can cause serious health consequences such as cancer, heart disease and high mortality rates. The people of Rajasthan contribute significantly to air pollution in urban and rural areas or areas. The first largest state in India, Rajasthan, the subject of this concept, is one of the most polluted areas in the country. Severe air pollution of concern particles and high hydrocarbons. The height of the Rajasthan industry is a major source of air pollution compared to the rest of India. This project provides an analysis of the practice of fixed respiratory tract (PM_{10}) and fixed particle matter ($PM_{2.5}$) throughout the city of Rajasthan, India. Filtering of air particles compares with national standards for air quality of last year's data. Prices for PM_{10} and $PM_{2.5}$ were lower during the rainy season compared to the summer winter. The ARIMA Season Model (SARIMA) time analysis is used for air analysis and pollution forecasting. The data collection for PM_{10} and $PM_{2.5}$ is well integrated. Cross-model validation was performed using residual analysis. The remainder of the difference between the observed value and the predicted number of PM_{10} is not significant at that time in few years. In this project data collection and data analysis should be done on the basis of the Indian standard.**

Index Terms **– $PM_{2.5}$, PM_{10}, ARIMA, Air pollution**

1. INTRODUCTION

Air pollution is a major planetary health risk, with India estimated to have some of the worst levels globally (Balakrishnan et al., 2019).The main elements of the atmosphere - oxygen (O_2) respiration, carbon dioxide (CO_2) for photosynthesis, nitrogen (N2) to form products such as fertilizers in plants and to make airflow and ozone (player) against and the sun's rays. Urban air quality is one of the most serious issues, receiving attention by developing as well as developed countries. Studies also show poor air quality, not only in the megacities of Asia, but also in smaller cities with populations of 150,000 to 1.5 million (IAQP, 2010). Consequential Any imbalance of air quality to cause adverse effects on living organisms is called air pollution. When air is contaminated with contaminants that have a detrimental effect on living and non-living, it is referred as air pollution. Air pollution occurs when hazardous or excessive substances of gases (such as carbon dioxide, carbon monoxide, sulfur dioxide, nitrous oxides, methane and chlorofluorocarbons), are part of the inculcates (both organic and non-organic), and living molecules are placed in the atmosphere. SPM and PM10 is the major contributor to the deterioration of air quality in Jaipur city (Dadhich et al., 2018). The concentrations of the air pollutants are high in winter and summer in comparison to the monsoon.

The impact of gaseous and particulate pollutants on health varies with season, hence; seasonality has always been a factor for determining the concentration of pollution in the lower atmosphere (Balogun and Orimoogunje, 2015). Although a number of studies have reported seasonal variations in urban air quality (Karar and Gupta, 2006; Kulshrestha et al., 2009; George et al., 2013; Chen et al., 2015), the influence of local weather conditions are still poorly understood, and considerable effort needs to be devoted to this issue. Air pollution remains one of the major threats to human health and wellbeing in cities (WHO, 2016). Ambient air pollution was estimated to cause nearly 4.2 million premature deaths worldwide in 2016 (WHO, 2016). Given the rapid rates of growth and urbanization in Indian cities, air pollution is increasingly becoming a critical threat to the environment, human health, and to the quality of life among the urban population in India (Kumar et al., 2013).

In 2018, a government-led report released by the Indian Council of Medical Research revealed that the average life expectancy in Rajasthan was about 2.5 years high, if air pollution levels were below the minimum. Kota, Jaipur, Alwar and Jodhpur enter the top 100 most polluted cities in the country. Fastest growing cities of India, faces expanding urbanization, with traffic congestion, poor road conditions, poor control of industrial emission and increase in air pollution (Dhamaniya and Goyal, 2004; Kala et al., 2014).

1.1. Major Air Pollutants & Their Sources

Pollutants are called pollutants. Pollution can be added to the atmosphere by natural processes (volcanic eruptions, sandstorms, forest fires, etc.) and man-made processes such as (factories, power stations, car exhaust). There are very few pollutants in the air.

Carbon Monoxide (CO)
• Motor vehicle exhaust and mineral fuel burning.
• Carbon Oxide (C02)
• Central heating
• Burning of mineral oil.
• Sulfide oxides
• Petroleum refineries, thermal power stations
• Nitrogen oxides

Summary of Past studies of Secondary Data of particulate matter and gaseous pollutants

Pollutant	Source	Duration	Study by
PM_{10}, $PM_{2.5}$	CPCB	JAN 16	Kumar et al.,2007
SPM, SO_2, NO_2	DPCC	OCT10-OCT 14	Peshin et al.,2017
PM_{10}, $PM_{2.5}$, O_3	SAFAR	JAN-DEC 04	Tyagi et al., 2016
O_3, NO, NO_2, CO	CPCB	2003-05	Sharma et al.,2010
NO_X, NO, NO_2, CO	SAFAR	2004-06	Gurjar et al.,2013
$PM_{2.5}$, NO_2, CO	CPCB	2008-09	Guttikunda et al.,2012

Chlorofluorocarbons (CFC)
• Air fan and refrigerator
• Ozone
• It occurs naturally in the upper parts of the atmosphere. Shields from harmful UV rays.
• However, emissions from vehicles and industries emit Ozone near the earth's surface. Pollution with high toxic effects.
Particulate Matter (SPM) Suspension
• It contains solvents such as smoke, dust and vapor.
• Particulate matter 2.5 (PM2.5): particles or droplets in the air 2.5 micrometers or smaller in diameter.
• Particulate matter 10 (PM 10): particles that still exist, with diameters usually 10 micrometers or less.

1.2. Impact of Air Pollution in Rajasthan

Death associated with air pollution, according to a health survey report, more than 90,000 people who died in 2017 in Rajasthan were linked to air pollution. According to a 2020 study of health and economic pollution published in the journal Lancet, more than 1.13 million people in Rajasthan died from air pollution in the 20th year. This is 21.2% of total deaths reported from Rajasthan in 2019 and is more than the Indian average of 18%. The number of deaths caused by air pollution is the total number of deaths caused by existing particle particles, indoor air pollution and moderate ozone depletion. In Rajasthan, the death toll from pollution has risen to 58,167, while 49,352 deaths have been caused by indoor air pollution and more than 2,000 deaths have been caused by ozone depletion.

1.3. Control Measures Air Pollution in Rajasthan

Manage Air Pollution authority in Rajasthan is Rajasthan Land Pollution Control (RSPCB). The RSPCB is a general pollution control agency in the state of Rajasthan. Responsible for launching, Air Act (Pollution Prevention and Control), 1981, Regulations of Rajasthan Air (Prevention & Control of Pollution), 1983, Fly Ash Law. 1999, Ozone Decontamination Regulations, 2000.

2. DATA COLLECTION

Cities	Status	AQI	PM2.5 (ug/m3)	PM10 (ug/m3)	Temp (°C)	Humidity (%)
Abu	Moderate	75	32	70	32	42
Ajmer	Moderate	52	14	32	38	27
Alwar	Poor	106	44	58	34	42
Bharatpur	Moderate	60	29	60	36	44
Bhilwara	Moderate	74	22	49	35	35
Bikaner	Poor	116	22	47	38	27
Chittorgarh	Poor	106	38	82	36	36
Jaipur	Moderate	71	19	65	36	32
Jaisalmer	Poor	111	20	78	40	24
Jalore	Poor	103	37	88	39	36
Jodhpur	Moderate	75	20	58	40	29
Kota	Moderate	87	14	42	39	25
Pali	Poor	102	34	94	38	28
Pushkar	Moderate	76	21	51	37	30
Sikar	Moderate	71	25	72	34	46
Sriganganagar	Good	20	12	17	36	31
Tonk	Moderate	65	24	62	36	50
Udaipur	Moderate	90	37	84	37	27

3. Air quality index

Air quality index values are divided into six grades, and each grade is provided with an adjective and a color code. Community health tips are linked to each API level This is the following.

"Good" AQI is 0 - 50. Air quality is considered satisfactory, and air pollution poses little or no risk.

"Average" AQI is 51 - 100. Air quality is acceptable; however, in some cases there may be moderate health concerns for very few people. For example, people who are very sensitive to ozone may experience respiratory symptoms.

AQI 101 - 150 they are at high risk for airborne particles.

"Unhealthy" AQI is 151 - 200. Everyone can start experiencing serious health consequences, and members of critical groups can experience serious side effects.

"Very unhealthy" AQI is 201 - 300. This could create a health warning that shows that everyone can have serious health consequences. More than 300 "Hazardous" AQI. This could create an emergency medical alert. Everyone is likely to be affected.

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

4. Particulate matter

PM2.5: - PM2.5 refers to the space particles (PM) that are less than 2.5 micrometers wide, which is about 3% the width of human hair.

$PM_{2.5}$	Air Quality Index	$PM_{2.5}$ Health Effects	Precautionary Actions
0 to 12.0	**Good 0 to 50**	Little to no risk.	None.
12.1 to 35.4	**Moderate 51 to 100**	Unusually sensitive individuals may experience respiratory symptoms.	Unusually sensitive people should consider reducing prolonged or heavy exertion.
35.5 to 55.4	**Unhealthy for Sensitive Groups 101 to 150**	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion.

Protection against $PM_{2.5}$

If the PM2.5 level is unhealthy, take these steps to reduce exposure and protect your health:

• Stay indoors and close all windows and openings, if possible.

• Turn on an air purifier with an HEPA filter. Only the HEPA filter can effectively remove fine particles from the air.

• Most air conditioners in air conditioners are not HEPA filters as this will reduce air ingress and may require the car to work harder to push / pull. But an air conditioner is still useful when fresh air is restricted as it helps to circulate air and cool (or heat) the room temperature.

• If most or all windows are closed, do not burn a candle, incense or use smoke or gas emitters to protect harmful particles and gases (such as carbon monoxide) from forming.

• If you are a road hero who has to drive-in all-weather conditions, get a real air cleaner for your car that comes with at least HEPA and active carbon filters. A standard car filter cannot even remove traffic finishes properly, let alone particles.

• If air pollution is expected to last for several days, consider moving to an unaffected area.

• Improve your body's resistance to PM2.5 by increasing your intake of these nutrients.

• If you have to go outside, make it shorter and faster, and wear a N95 face mask or higher.

PM_{10}: - The abbreviation PM represents the particle matter, and the number to the right indicates the particle size. Therefore, PM_{10} refers to small particles of solids or liquids with a diameter less than 10m. PM_{10} can come from a variety of sources, both internal and external. The three main categories of sources are basic human emissions, secondary climate reactions, and natural resources. Humans can also indirectly create PM_{10} by a combination of atmospheric chemicals. Some gases can withstand chemical reactions and form particulate matter, such as sulfur dioxide forming sulfates. While other coarse particles are subjected to such a process, these “second”

particles are more common in $PM_{2.5}$. There is also plenty of natural resources for PM_{10} pollution, including dust storms, wildfires, sea spray and pollen. In parts of Africa and the Middle East, much of the pollution of particles comes from the dust that comes in from the arid lands.

EPA's PM10 Breakpoints

	AQI	PM10 (in µg/m³)
Good	0-50	0-54
Moderate	51-100	55-154
Unhealthy for sensitive individuals	101-150	155-254
Unhealthy	151-200	255-354
Very unhealthy	201-300	355-424
Hazardous	301-400	425-504
Hazardous	401-500	505-604
Hazardous	501-999	605-9999

Protection against PM_{10}

- See local AQI readings
- Wear a dirt-free mask
- Use an air quality monitor
- Take an air purifier
- Keep your home spick-and-span

5. CONCLUSIONS

This study shows that both the particulate matter, PM10, and PM2.5 tend to be higher than the permissible limits, are injurious for environment. Concentration of fine particulate matter, it is also high in all cities of Rajasthan. The concentration of fine particulate matter was associated with the heavy-duty transport activity in the area at the bottom of the attention, other than industrial emissions, dust from paved roads, as the burning of waste in open-air, the use of traditional fuels such as wood, cow dung, etc., etc. for cooking and other domestic purposes. It was noted that all of the particles have a high level of concentration in the winter compared to the summer, and Instagram due to the slow diffusion and dilution of the pollutants. According to the AQI calculation, it is determined that the particulate matter pollution is largely responsible for the pollution in the all cities of Rajasthan. It can be seen that the levels of air pollution in the area can be considered mainly due to the traffic. Re-routing, and the provision of alternative routes, limit the movement of heavy vehicles on the agreed-upon ways, the organization of the periodic maintenance of the vehicles, and the promotion of the public transport instead of private cars is worth of attention for the control of pollution caused by the transport. It is necessary to regularly monitor the level of pollution control equipment to be installed in a variety of industries, to monitor the emissions from the industrial processes. In addition to the above, the project to be taken in order to educate the public about the need to protect the environment and to promote green areas, roads, and industrial companies. Thus, it can be concluded that, strict compliance with environmental regulations, and the adoption of appropriate measures in the fight against pollution is an urgent need.

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