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TO STUDY THE ASSESSMENT OF SOME VARIATION IN AIR POLLUTION INORGANIC IN NATURE.A STUDY OF JHARKHAND REGION

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ABSTRACT

Air pollution is one of the biggest problems of our day, not only because it contributes to climate change but also because it has a negative effect on public and individual health due to rising morbidity and mortality. There are numerous contaminants that play a significant role in human disease. Particulate Matter (PM), which has a varied but very small diameter, is one of them. By inhaling it, it damages the respiratory and cardiovascular systems, the reproductive and central neurological systems, and even causes cancer. Ozone, which protects against ultraviolet light in the stratosphere, is detrimental when it is present in large quantities below ground level because it also affects the cardiovascular and respiratory systems. In addition, air pollutants that are detrimental to people include nitrogen oxide, sulphur dioxide, volatile organic compounds (VOCs), dioxins, and polycyclic aromatic hydrocarbons (PAHs). High concentrations of carbon monoxide can even result in immediate toxicity when inhaled. Depending on the exposure, heavy metals like lead can either cause acute poisoning or chronic intoxication when absorbed into the human body. Chronic obstructive pulmonary disease (COPD), asthma, bronchiolitis, lung cancer, cardiovascular events, central nervous system dysfunctions, and skin illnesses are the primary diseases brought on by the aforementioned drugs. Last but not least, environmental pollution-induced climate change has an impact on both natural disasters and the geographic distribution of numerous infectious diseases. The public must be made aware of the issue, and scientific professionals must attack the issue from a variety of angles. National and international institutions must confront the rise of this threat and offer viable answers.

Keywords: Air pollution, Particulate Matter (PM), polycyclic aromatic hydrocarbons (PAHs), chronic obstructive pulmonary disease (COPD)

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1. INTRODUCTION

Atmospheric particles and gases plays vital role in compound and physical procedures occurring in the air, subsistence of living life forms and the entire biosphere. These constituents confine unsafe UV radiation and keep up sunlight based radiation arriving at the earth. Developments of water beads and ice precious stones in air are exceptionally impacted by atmospheric particles. Supplement and Biogeochemical cycles are deficient without dynamic cooperation of mist concentrates. Airborne gases and particles were never conceived as a danger to the ecological balance until the sensational changes in their fixations with the approach of industrial time. Anthropogenic emissions from different industrial, domestic and vehicle sources have expanded complex and in the long run have prompted numerous global issues. Almost 3000 distinctive anthropogenic gases pollutants have been recognized, of which most are natural. Burning sources, particularly vehicles radiate around 500 distinct mixes. Be that as it may, just for around 200 such intensifies the effect on condition and people have been researched to a prominent degree.

1..1 POLLUTANT

Pollutant is a substance which causes contamination. Contamination is brought about by the expansion of substances by human activity to the environment. At the point when these substances are not evacuated, absorbed or decomposed by the nature (physical or organic procedure), the amassing of these pollutants causes pollution. A pollutant may incorporate any activity (sound), concoction, geochemical (dust), substances, biotic part or item, physical factor (light, heat) and so forth., that is discharged into the environment in such a fixation, that may have hurtful or upsetting impacts. Pollutant is likewise characterized as "any fluid, strong or vaporous substance present in such focus as might be or will in general be injurious to the environment.

1.2 TYPES OF ENVIRONMENTAL POLLUTION

Pollution can be classified according to the medium in which it is added or occurs. Types of pollution are.

- 1) Air pollution (atmospheric pollution)
- 2) Water pollution
- 3) Land/Soil pollution

Pollution can also be classified on the basis of the individual pollution:

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- Sewage pollution
- Noise pollution
- Metal pollution
- Oil pollution
- Biological pollution
- Thermal pollution
- Radioactive pollution
- Pesticide pollution
- Marine pollution
- Industrial pollution

1.3 INDIAN PERSPECTIVE OF POLLUTION:

World Bank in a report (1995) provided the aggregate estimate of loss of economy due to different environmental pollutions in India. In the report, the health impact due to water pollution is estimated to be \$5,710 million, due to air pollution was assessed as \$1,310 million and overall, the total environmental damage was estimated to be \$9.7 billion per year or 4.5% of GDP 1992 values. In another report in the year 2005, the annual economic cost of damage to public health from increased air pollution alone based on RSPM measurements for 50 cities with the total population of 110 million was close to US\$ 3 billion in 2004.

Based on a recent report, "An Analysis of Physical and Monetary Losses of Environmental Health and Natural Resources in India" (2012) by the World Bank, South Asia Region, the total damages amount to about Rs. 3.75 trillion (US\$80 billion) equivalent to 5.7percent of GDP. Of this, outdoor air pollution accounts for the highest share at 29.4 percent followed by the cost of indoor air pollution at 23 percent, croplands degradation cost at 19 percent, inadequate Water supply, Sanitation and Hygiene (WSH) cost at around 14 percent; pastures degradation cost at 11 percent, and forest degradation cost at 4 percent. Wide array of gases pollutants is being released into the atmosphere through diversified sources. These include natural sources (wind, volcanoes, etc) and the mechanised world with its anthropogenic activities (industrialisation, mining, combustion related activities etc...) in the name of development and activities like firing of crackers, loud speakers, etc.., on the socioreligious occasions are releasing various gases pollutants through different portals into the atmosphere. In all these forms of pollution (Land, water and Air), Air Pollution may be considered as severe, since, it has no boundaries and will affect larger areas from the point

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of release. The gases pollutants will be carried through air and are governed by the atmospheric properties like wind speed, wind direction, temperature, precipitation and humidity.

2. OBJECTIVES OF THE STUDY

- 1. To review the origin, development and the types of pollution in recent times with reference to air
- 2. To assess the impact of ambient air pollution in the study area with selected samples

3. RESEARCH METHODOLOGY

3.1 METHODOLOGY

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically.

3.2 SOURCES OF DATA COLLECTION

The data have been collected through primary and secondary sources which are as follows:

3.3 Primary data

We will attempt to strengthen the analysis by collecting primary data from selected cities of Jharkhand where air quality was monitored namely,

- 1) Ranchi,
- 2) Ramgarh,
- 3) Chirkunda,
- 4) Dhanbad and
- 5) Jamshedpur.

A sum of 250 persons had been selected at random from the public in the neighbourhood of ambient air quality monitoring stations located at Ranchi, Ramgarh, Chirkunda, Dhanbad and Jamshedpur at the rate of 50 samples in each city.

3.4 Secondary Data

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There were four major agencies that took up the responsibility of collecting the data on air and pollution internationally, nationally and regionally. At the international level, air quality data were collected by

1. United States Environmental Protection Agency;

2. The National Air Quality Monitoring Programme at the all 43 India level was under the network of the Central Pollution Control Board (CPCB) which operates at 342 stations, covering 127 cities/towns in twenty six (26) States and Four (4) Union Territories of the country. The National Air Quality Monitoring Programme (NAMP) data are available for all the major states and their respective cities in India since 1987.

3. Ministry of Environment and Forests, Government of India was another agency that collected air quality data and made them available for research process.

4. RESULTS AND ANALYSIS

4.1 VARIATION IN AIR POLLUTION ON A MONTHLY BASIS

Meteorological conditions have a significant impact on air pollution dispersion. Pollution dilution is mostly determined by total rainfall and rainfall frequency. The speed at which contaminants advance and disperse in the city is determined by wind velocity. Pollution movement in Jharkhand Region is dictated by the region's general air flow, although multi-story structures and pollutants alter the air flow in and around the city. Pollution diffusion is also influenced by the vertical temperature distribution in the lower atmosphere. Jharkhand Region has a semi-arid climate. The months of May and June are the hottest of the year, with dust storms from the Rajasthan desert and scorching winds. Jharkhand Region is a rapidly expanding commercial, industrial, and trading hub.

TABLE 4.1: MONTHEN CONCENTRATION OF POLI LITANTS IN HEADKHAND DECION												
MONTHLY CONCENTRATION OF POLLUTANTS IN JHARKHAND REGION												
Month	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
SPM												
Ranchi	380	380	150	110	100	150	350	490	395	380	310	390
Ramgarh	490	425	200	100	150	245	450	625	234	450	425	524
Chirkunda	445	515	210	195	275	370	390	500	405	390	400	700
Dhanbad	550	380	400	290	215	290	470	780	750	775	719	850

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Jamshedpur	380	380	150	110	100	150	350	490	395	380	310	390
RSPM												
Ranchi	140	150	60	45	40	60	175	290	260	165	140	195
Ramgarh	190	165	60	48	60	75	200	340	495	245	350	360
Chirkunda	190	210	90	75	100	100	140	290	210	175	200	230
Dhanbad	270	145	115	90	75	105	210	308	248	275	250	375
Jamshedpur	140	150	60	45	40	60	175	290	260	165	140	195
SO ₂												
Ranchi	6	5	9	6	4	5	6	6	12	8	8	7
Ramgarh	8	7	6	5	4	4	5	4	6	7	6	6
Chirkunda	6	5	4	6	4	4	5	4	6	7	6	6
Dhanbad	9	6	6	4	4	5	4	5	10	4	4	5
Jamshedpur	6	5	4	6	4	4	5	4	6	7	6	6
NO ₂												
Ranchi	25	22	12	11	11	12	22	35	28	18	19	21
Ramgarh	29	22	19	15	21	22	33	42	39	38	31	29
Chirkunda	25	28	19	18	18	20	30	35	25	22	25	26
Dhanbad	34	45	32	24	25	33	35	52	55	48	37	38
Jamshedpur	25	22	12	11	11	12	22	35	28	18	19	21

Table shows that the lowest concentrations of air pollutants were reported during the rainy season, when the process of pollutant washout is most efficient. In the wet season, Jharkhand Region receives an average rainfall of 686 mm, and air pollution levels are lowest in July, with SPM (100 g/m3), RSPM (45 g/m3), SO2 (5 g/m3), and NO2 (11 g/m3). Gaseous pollutants such as SO2 and NO2 have high concentrations throughout the winter season. It's mostly due to the lack of rain, the calm wind speed, and the clear sky. In the months of November and December, the highest concentrations of SO2 (12 g/m3) and NOX (55 g/m3) were reported (historical monuments combined with commercial) and (industrial region). Furthermore, the data shows that the concentrations of SO2 and NO2 are somewhat low during the summer season. Due to the high wind speed from the Rajasthan desert, air pollution dispersion is quite high during the summer season. The SPM and RSPM concentrations were highest in the summer season, 850 g/m3 and 375 g/m3, respectively, in March.

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4.2 AIR QUALITY INDEX:

An "Air Quality Index" is a single number that can be used to report air quality and its implications on human health (Thom and Ott, 1976; Bortnick et al., 2002; Murena, 2004). Shukla (2010) defined an air quality index as a tool used by the Environmental Protection Agency (EPA) and other agencies to provide the public with timely and easy-to-understand information on local air quality and if pollution levels are a health risk. The Air Quality Index (AQI) is a grading scale for reporting ambient air pollution measured at monitoring stations over time. The major goal of calculating the AQI is to inform and warn the public about the dangers of daily pollution levels, as well as to enact necessary regulatory measures with immediate local impact (Stieb et al, 2005). Air quality indices (AQI) are now used by a variety of government entities to assess air quality. As the AQI rises, a larger percentage of the population is expected to suffer from more severe unfavourable health impacts. Simkhada (2005) for Kathmandu, Ghose (2005) for Kolkata, Senthilnathan (2008) for Chennai, Bishoi (2009) for Delhi Shukla (2010) Lucknow, Ilyas et al. (2010) Quetta, Pakistan, Barman et al. (2010) Lucknow, and Prasad (2011) Lucknow have all attempted to calculate the Air Quality Index for various characteristics of air pollution. To determine the AQI level in Jharkhand Region, a survey was conducted to determine the spatial variation of air pollutants across the city during the pre-monsoon and post-monsoon seasons. There are 20 sample stations for monitoring the level of contaminants in the air. Suspended particulate matter (SPM), Respiratory Particulate Matter (RSPM), Sulphur-di-Oxide (SO2), and Nitrogen Oxide are the principal contaminants considered in AQI calculations (NO2). The formula employed by Senthilnathan (2007) for Chennai city was utilised to calculate the Air Quality Index.

TABLE 4.2 AIR QUALITY INDEX (AQI), JHARKHAND REGION									
Sl. No.	No. Characteristics Monitoring Station AQI								
			Pre-Monsoon	Post-	Average				
				Monsoon					
1.	Historical Monument	SITE-1	182.63	164.48	173.55				
2.	(Surrounded by industrial units	SITE-2	208.84	180.56	194.70				
3.	Residential	SITE-1	224.41	211.40	217.91				
4.		SITE-2	119.19	99.95	109.57				
5.		SITE-3	92.07	76.67	84.37				

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6.		SITE-4	105.34	97.71	101.52	
7.		SITE-5	88.54	86.49	87.51	
8.		SITE-6	95.96	84.81	90.39	
9.		SITE-7	189.14	188.90	189.02	
10.		SITE-8	222.31	218.74	220.52	
11.		SITE-9	164.90	156.68	160.79	
12.		SITE-10	119.05	111.38	115.21	
13.	Commercial	SITE-1	287.42	263.92	275.67	
14.		SITE-2	130.74	128.52	129.63	
15.		SITE-3	112.80	106.41	109.61	
16.		SITE-4	81.66	69.59	75.62	
17.		SITE-5	241.11	212.57	226.84	
18.	Industrial	SITE-1	192.52	192.51	192.52	
19.		SITE-2	186.70	187.79	187.24	
20.	Silence	SITE-1	196.80	185.88	191.34	

Table depicts the air quality index level in Jharkhand Region during the pre-monsoon and post-monsoon seasons. The sampling points with the highest AQI levels 287.42, 241.11, 224.41, 222.31, 208.84, etc. This is due to their location in the city's core area, which results in a large number of automobiles and busy commercial activities during peak and non-peak hours, whereas the 81.66, During the pre-monsoon season, these areas are at the city's outer periphery, which offers superior environmental conditions. AQI levels appear to be high during the post-monsoon season 263.92, 218.74, 212.57, 211.4, 192.5, and other locations, but low 69.59, 76.67, 84.81, 86.49, 97.71. The post-monsoon data shows that the AQI distribution pattern is similar to that of the pre-monsoon period, with minor variations. The city's average AQI level was 156.67, with a range of 275.62 to 75.67.

4.3 ZONES OF AIR POLLUTION

With the use of the Air Quality Index The city of Jharkhand Region is classified into four air pollution zones: very high (above 210), high (155-210), moderate (100-155), and low (below 100). (below 100). Table shows that four sample stations fall into the very high category, with values ranging from 275.67 to

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217.41. The occurrence of a particularly high degree of air pollution in the city's centre area, as well as more economic activity during peak and non-peak hours, are the reasons for this. In these places, vehicular traffic is likewise fairly heavy. The slow movement of traffic in these places is due to narrow width roads and the absence of traffic enforcement at important intersections. Pedestrian walkways are underdeveloped in business and commercial/residential zones, forcing people to cross the road in the middle. Illegal stores, hawkers, vendors, and other merchants have taken over the roadside areas, clogging it up. All of the aforementioned factors contribute to the deterioration of the transportation system and bad environmental conditions in these areas. The high air pollution zone has seven sampling stations with indexes ranging from 194.7 to 160.79. The wind circulation system in Jharkhand Region is also a source of worry, because during the pre-monsoon period, the western section of the city is subjected to an input of hot, dry wind (Loo), which has an impact on the city's air pollution levels. As a result, this zone includes in the south west. Small-scale businesses such as foundries and other iron-based industries are the primary source of air pollution. Furthermore, traffic-related issues such as narrow roads and commercial activity contribute to a higher air pollution index. Five sampling stations in the third zone (moderate air pollution zone) have air pollution indexes ranging from 129.63 to 101.52. This zone has a better environmental state than the previously described zones. It has a moderate air pollution index due to its proximity to the cantonment area 129.63. The fourth zone is the low air pollution zone, with an air pollution index of 90.39 and 75.62. It has superior living circumstances than the other three zones. It could be due to its location in the city's outskirts. These places feature natural vegetation and enough open space for air pollutants to disperse and diffuse quickly.

4.4 EFFECT OF AIR POLLUTION ON HUMAN HEALTH

Air pollution can harm people's health in a variety of ways, including irritation of the eyes, nose, and throat, as well as upper respiratory infections like bronchitis and pneumonia, as well as long-term (chronic respiratory diseases, lung cancer, heart disease, and even damage to the brain, nerves, liver, and kidneys). Air pollution has a variety of effects on different groups of people. Some people are far more sensitive to contaminants than others. The consequences of air pollution are sometimes felt more acutely by young children and the elderly. When the air in their neighbourhood is contaminated, those with health concerns like asthma, heart disease, and lung illness will suffer more. The amount to which an individual is injured by air pollution is usually determined by the total exposure to harmful gases, which includes the period of exposure as well as the chemical concentrations. "Growing industry, expanding motorised population, and fossil fuel combustion are the main causes of day-to-day degradation in urban air quality. According to a

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study conducted by K.E.M. Hospital in Mumbai on the impact of pollution on human health over the previous two decades, the impact of air pollution has become increasingly pronounced (Kamat, 1997). Due to traffic congestion, substandard housing, poor sanitation and drainage, and rubbish accumulation, urban air pollution has increased at an alarming rate in Indian cities in recent decades. Increased levels of air pollution have harmed human health, particularly in children. According to a study, outdoor air pollution in Indian cities was directly responsible for 84,000 deaths (WHO, 1996). Indoor air pollution, on the other hand, was responsible for 496,000 fatalities in villages and 93,000 deaths in cities (WHO, 1997). Every year, 51,779 people in India die as a result of high levels of air pollution. Furthermore, 26 million people are admitted to hospitals each year, putting a strain on the government's finances. Every year, 9,859 children in Delhi die prematurely as a result of poor air quality. Kolkata (10,647), Mumbai (7,023), Kanpur (3,639), and Ahmadabad (3,006), as well as other major cities, account for roughly 66% of India's total premature fatalities.

5. CONCLUSION

The characteristics of very high, high, moderate, and low pollution zones clearly demonstrate that the severity and magnitude of environmental problems differ from one pollution intensity zone to the next. The quality of life in extremely high and high polluted zones has already degraded to the point that it is unmanageable, necessitating immediate action by the local government. The living conditions in the moderately polluted zone have also worsened to a significant degree, although they can still be managed provided prompt action is taken. Implementing long-term planning initiatives can help manage the low-polluted zone. Controlling rising levels of air, water, and noise pollution, as well as having an effective and scientific solid waste management system, are required to ensure a cleaner and healthier environment for all residents of Jharkhand area city. A comprehensive and integrated environmental management programme is required to improve the quality of the environment and human life in the Jharkhand area city.

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