



THE INFLUENCE OF URBANIZATION TO AIR POLLUTION IN RANCHI

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Abstract:

Urbanization without sustainability leads to environmental pollution. The influence of urbanization to natural composition of air is seen as ambient (outdoor) air pollution and household (indoor) air pollution. Hazardous deterioration of the pure air has been witnessed across the world due to the onset of urbanization which promotes increase of population, loss of vegetation, concretization of the area, dumping of wastes, combustion of fuels in motors and vehicles, use of energy for domestic purposes, and above all rapid industrialization. Industrialization causes energy production from fuel burning. Industrialization starts multiple activities which releases impacts on the composition of pure air. Pure air contains oxygen, nitrogen, argon, carbon dioxide, and small amount of other gases in a fixed proportion. When the composition of air alters by any means it becomes polluted and is known as air pollution. Air pollution is hazardous or slow poison. It can lead to effects on human health, environment and other living creatures. Air pollution has now become one of the serious issues of concern in not only developing countries but also in developed countries. It is a challenging problem. It has hindered sustainable development all over the world (Han et al., 2011). So air pollution affected countries are formulating strategies to deal with it. There are a number of factors responsible for the altered composition of air. Responsible factors may be categorized as natural causes and anthropogenic causes. Ranchi city, the capital of Jharkhand state in India, is suffering from air pollution mainly due to anthropogenic factors. This study discusses the relationship of air pollution and urbanization; influence of urbanization to air pollution which is complex. This paper aims to discuss the impact of urbanization level on air pollution applying mainly empirical method and puts forward the related questions and policy recommendations.

KEYWORDS—

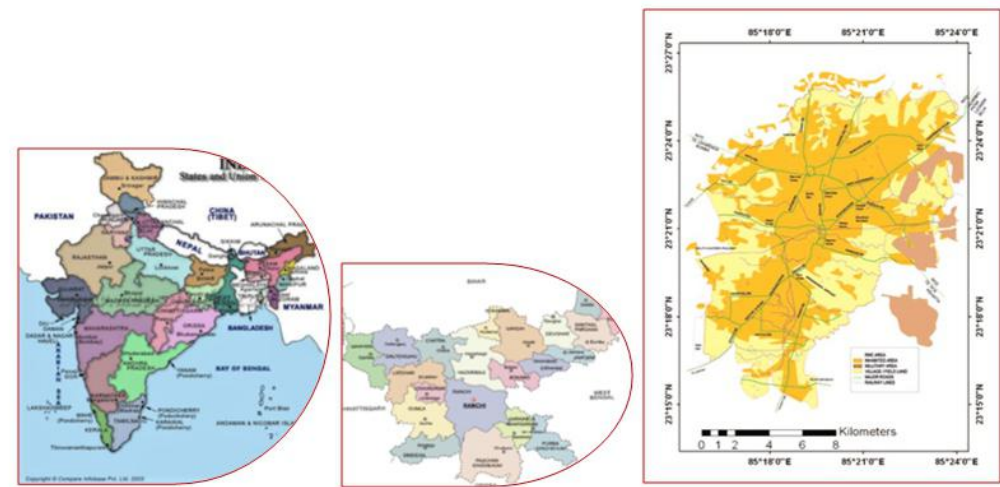
Urbanization, environmental pollution, hazardous, air pollution, sustainable development, anthropogenic.

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INTRODUCTION

Ranchi, the capital of Jharkhand in India, is located on a tabular plateau. The municipal area of Ranchi is divided into 55 wards. Population of Ranchi Municipal Corporation area was 847093 in 2001. It increased 26.72 per cent in 10 years and became 1073427 in 2011. The city has useful aquifer, enough water bodies, geomorphic base which could develop soil and vegetation for agriculture and settlements. The area has an average elevation of 651 meter. It is on the tropic of cancer which has imported to it a typical tropical climate. Ranchi city's local weather conditions have been favorable for human settlements. Its salubrious climate with moderate summer and bracing winter suits even today for urbanization. Ranchi represents a sub-tropical climate. The city lies on a natural undulating landscape, surrounded by two major rivers on north and eastern parts. It is also a city of lakes surrounded by water falls and forests. Forests cover a considerable portion of the district. Dry peninsular Sal is the main type of forests found here. The trees found along with Sal trees are Gamhar, Asan, Kend, Simul and Mahua. It has been rich in healthy climate. But the urbanization and uncontrolled growth have made the city surrounded by environmental problems.

Figure 1: Map of India, Map of Jharkhand and Major Roads in Ranchi City with Populated/Inhabited Area



Source: Map of India, Toposheet73E/6, E/7, E/10 and E/11, RMC-CDP, JNNURM, 2006

So far as air pollution of Ranchi city area is concerned it is being disturbed by the interferences of unplanned rapid urbanization with poor infrastructure. Air pollution is contributed by landfill pollution, water pollution, sewage-sanitation hazards, stone quarrying, vehicular emissions etc. Pollution refers to the contamination of the earth's environment. Environment becomes contaminated with materials that alter the natural functioning of the ecosystems. In fact, those pollutants start to deteriorate human health as well as quality of life. Air pollution is hazardous or slow poison. It can lead to effects on human health, environment and other living creatures. Prevention and Control of Pollution Act, 1981 declares that air pollution is the presence of any solid, liquid, or gaseous substance in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment. An air pollutant is a substance in the air which can cause harm to humans and the environment. Air pollutants may be anthropogenic or natural. They may be in the form of gases, solid particles, or liquid droplets. Particulate matters, nitrogen dioxides, sulfur dioxide, carbon monoxide, ozone, lead, etc. are air pollutants. These air pollutants are mixed in ambient air due to

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numerous diverse and widespread sources of emissions. Various kinds of dust is also mixed into the air due to urban activities. For the sustainable development it is a must to take steps to minimize and mitigate air pollution impact and ecosystem of the city. Therefore, the evaluation of the influence of urbanization to air pollution in Ranchi city may be useful for researchers, planners and decision makers. The present paper aims to find out the level of pollution in the city and way to mitigate air pollution for sustainable development of this geographically unique city of India.

STATEMENT OF THE PROBLEM:

Ranchi city and its environs are experiencing a number of environmental problems. In fact, Ranchi city is facing the degradation of pure air. The urbanization and urban growth of this plateau has reached to a dangerous level where environment is being degraded and the sustainability of the city is challenged. It has hindered sustainable development all over the world (Han et al., 2011). Air pollution is one of the challenging problems in most of the developed and developing countries (Molina and Molina, 2004). Air pollution is a serious problem in Ranchi city because it is increasing day by day and has started to cause harmful effects to living organism. Suspended particulate matter (SPM), SO₂ and NO₂ are main and common air pollutants here produced by the combustion of fuels in factories, power generators, motor vehicles or automotive engines and power plants. Wastes deposited beside the city rivulets poses more threat to environment. These wastes contain large amounts of plastics and medical wastes. Most people who burn their plastic domestic waste do not realize how harmful this practice is to their health and to the environment. Current research indicates that backyard burning of waste is far more harmful to our health than previously thought. It pollutes household (indoor) air also which is more hazardous. It can increase the risk of heart disease; aggravate respiratory ailments such as asthma and emphysema, and cause rashes, nausea, or headaches, damages in the nervous system, kidney or liver, in the reproductive and development system (Priyadarshi, Nitish, 2008). After the creation of Jharkhand as a state Ranchi city became its capital and this city witnessed rapid urbanization. Number of vehicles increased by leaps and bounds. Air of this city started to accept pollutants. Now Ranchi city needs to mitigate air pollution.

OBJECTIVES:

There are four primary objectives of this study:

1. To identify important causes and trends of air pollution in Ranchi city;
2. To identify the areas hazardous for human health;
3. To assess the urbanization effect and challenges due to increasing air pollution in Ranchi city area; and
4. To suggest remedial measures for the air pollution.

STUDY AREA:

Ranchi, with an area (municipal area) of 174.91 Km² (Figure 1) is geographically located at the Ranchi Plateau within the latitude and longitude of 23°15' N - 23°25'30" and 85°15' E - 85°24' E. Ranchi Plateau is a part of the Chotanagpur Plateau in Jharkhand state of India. Ranchi is the capital of Jharkhand. Its average elevation is 651 above sea level. As of 2011, Ranchi Municipal Corporation area has a population of 1073427. The number of male is 558872 and female 514555. There were 144882 households in 2001 and in 2011 the number increased to 207636 with 43.31 per cent growth. Ranchi city has an average literacy rate of 87.68%. Dense tropical forests surround it and contribute to produce usually pleasant climate for which this city is known. The morphological characteristics of this urban centre are also affected due to industrial centre and habitation of people of various cultural backgrounds. This plateau is the largest granitic mass of the Chotanagpur Plateau. It is mostly covered by bathylith and creates Ranchi planation surfaces. The Ranchi Plateau resembles a tableland with some isolated worn hill-tops or inselbergs detached by circumdenudation (Wadia, D.N. (1966)). The Ranchi Plateau is a region of flat and gently undulating country with occasional residual ridge (Dunn, J.A., 1939). The 651

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meter contour fixes the Ranchi Plateau limit on three sides, the north, the east and the south, while the western limit is fixed by the 739 meters contour. It is a polycyclic region (Ahmad, E; 1958).

MATERIALAND METHODS:

Data for the study have been collected from both primary and secondary sources on various components of air pollution, climate and urbanization. For the preparation of base map, contour map, landforms, forests, Survey of India toposheet on scale 1:50,000 (73E/6, E/7, E/10 and E/11) and Master Plan of Ranchi city (1983) have been used and interpreted. Air pollution aspect of the city has been analyzed through various research papers, studies, findings, municipal map and on the basis of intensive field surveys. Secondary data and relevant information have also been obtained from Jharkhand State Pollution Control Board, Central Pollution Control Board, Ministry of Environment, Forest and Climate, Jharkhand Space Application Centre, Ranchi Regional Development Authority, Ranchi Municipal Corporation, Ministry of Urban development, Govt. of Jharkhand, Meteorology Department of Birsa Agricultural University, Kanke, Ranchi etc. Field survey has been done to record various air pollution data in the study area. For population data various census reports have been used. Different websites have also been used to gather information on various aspects of the research. This study is based on empirical analytical method of investigation.

DISCUSSIONSAND RESULTS:

Air pollution has become a serious issue of concern in Ranchi city. There are a number of factors responsible for the altered quality of ambient (outdoor) air and household (indoor) air. Classification of air pollutants may be categorized on various means, e.g. on the basis of source of origin, on the basis of method of origin, on the basis of state of matter and on the basis of chemical composition; but here mixed approach has been applied to get the influence of urbanization to air pollution in Ranchi city. Seeing the nature of the city we know that the air pollution of Ranchi city is caused mainly by anthropogenic sources. Natural sources of air pollution are minimal. In anthropogenic sources emission from industries, motor vehicular emission, waste as well as waste disposal landfills, building-road construction, dust, coal as well as other fuels used in houses, open burning etc. are main and major sources of air pollution. As the influence of urbanization to air pollution they may be discussed as follows:

Increase in Build-up Area:

The composition of pure air in Ranchi urban area was maintained by major area of agricultural land, vegetational zone, forest cover and river/tanks/ponds plantation lands. After 1984 its major decrease and increase in build-up area started to alter the natural composition of air.

Table 1: Ranchi City: Spatial Growth (1869-2010)

Year	Area (sq. km)	Increase (sq. km)	Growth Per Year	Growth Percent	Time (years)
1869	6.00	-	-	-	-
1965	43.44	37.44	0.38	21.87	96
1985	175.29	131.85	6.60	77.01	20
2004	177.19	1.90	0.10	1.10	19
2010	273.23 (RMC Area with Urban Sprawl)	96.04	29.49	54.20	6

Source: Secondary Data

The urban growth per cent of Ranchi city from 1965 to 1985 and from 2004 to 2010 was 77.01 and 54.20. In between 1965 to 1985 the growth was due to industrialization (table 1); HEC (Heavy Engineering Corporation), Hatia was established and the city got rapid or faster

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urbanization. Ranchi became the capital of newly formed Jharkhand in 2000 and the city again began to get faster urbanization and urban growth. Population of the city increased every day every year but without following any Master Plan of the city. Heavy load of people, unplanned urbanization and failure of suitability invited air pollution in the city. The combination of the ambient air quality started to be altered; there was almost no check and balance on anthropogenic causes of air pollutants.

Land use during 1985 to 2004 shows that built-up land had grown from 21 per cent to 34 per cent (table 2 & table 3). During this period agriculture land and open area declined. Land under other uses also got reduced. Population of Ranchi Municipal Corporation area got growth of 26.72 per cent in 10 years; population became 1073427 in 2011 from 847093 of 2001. Land use land cover was not following Master Plan, 1983. The maximum change has occurred in agriculture land indicating conversion of rich agriculture land to non agriculture uses particularly to built-up area in the region.

Table: 2 Ranchi City – Land Use Pattern, 1985

Land use Classification	Area (in Sq. :Km)	Area (in %)
Agricultural Area	132.90	75.00
Built-Up Area Airport	37.00	21.94
River Tanks/ Ponds Plantation	1.87	3.06
	2.25	
	1.97	
Total Area	177.19	100.00

Source: Ranchi Municipal Corporation Secondary Data

Stone Quarrying and Brick Kilns:

Urbanization makes the urban area concretized. Rapid urbanization demands huge amount of stone chips. Ranchi city, according to some surveys, needs stone chips more than 1000 trucks daily. This need of stone chips encourages stone quarrying. In the study area stone quarrying imposes dangerous impact on the ecology. It removes vegetation, creates dust and throws it in the atmosphere from various activities. It damages top soil and changes topography by digging of open pits and dumping of overburden weathered rock mass in the form of large heaps. Stone

Table 3: Ranchi City – Land Use Pattern, 2004

Land Use Classes	Area (in Sq. Km.)	Area (in %)
Agricultural Area	93.82	53.26%
Current Fallow	0.56	
Heavily Built-up Area	25.00	
Low Built-up Area	11.00	
Mixed Built-up Area	6.10	32.95%
Newly Built Areas	5.51	
Residential Pockets	5.00	
H.E.C. Township	4.78	
Airport	1.00	
Plantations	14.00	
Rivers/Tanks/ Ponds	6.15	
Hills	2.14	13.78%
Parks/ Open Spaces	1.36	
Stone Quarries	0.77	
Total Area	177.19	100.00%

Source: Ranchi Municipal Corporation Secondary Data

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quarrying is a big business in Ranchi and its production is being done in and around the city area. So, the air quality of the area is deteriorating. Personal surveys finds that about one hundred brick kilns in the urban airshed and many outside the urban airshed are altering the purity of the air because they are fueled mostly by coal and agricultural waste.

Vegetation:

Sustainable urbanization needs proper vegetation. It works as lungs of the city, because forest stores about 80% of all above ground and 40% of all below ground terrestrial organic carbon. The land of Ranchi provides it a vast area of vegetation, open land, forest area and agricultural fields. But, deforestation and urban land use is continuous phenomena here. The trees found along with Sal trees are Gamhar, Asan, Kend, Simul and Mahua. It is situated at the height of 649 meter. These forests produce rich and healthy climate. But, the urbanization and uncontrolled growth of the city have made the city surrounded by air pollutants.

Figure: 2 & Figure: 3 Vegetation & Loss of Vegetation due to urbanization



Solid Waste Management in Slums:

There is non-existence of solid waste management mechanism especially in slum areas. So garbage is being dumped in the streets, inside the slums and on the periphery of the slums. A few households are saved by the Solid Waste Disposal initiatives by the Ranchi Municipal Corporation. But some tribal villages and streets which are in the heart of the city are clean because of the initiatives of the villagers & slum dwellers. Only a 13% of population is aware of such practice. Due to no-availability of SWM mechanism and refuse bins all the solid waste is seen scattered on the streets and into the drains. These wastes are choking of the natural drains and rivers. The expected solid waste generation from the slum area is computed to be 105.8 MT per day at 300gm per day per capita (RMC-CDP & JNNURM data, 2006).

Solid Waste Management and Treatment Plants:

Study surveys found many areas of Ranchi city looking like dumping grounds of municipal and household wastes. Wastes deposited beside the city rivulets poses more threat to environment because these wastes contain large amounts of plastics and medical wastes. When these toxic wastes are burned in an open air the air becomes polluted with harmful toxins and odorous smoke. Study indicates that backyard-burning of waste is more harmful. It can increase the risk of heart disease; aggravate respiratory ailments such as asthma and emphysema, and cause rashes, nausea, or headaches, damages in the nervous system, kidney or liver, in the reproductive and development system. The burning of polystyrene polymers- such as foam cups, meat trays, egg containers, yogurt and daily containers releases styrene. Styrene gas can readily be absorbed through the skin and lungs. At high levels styrene vapor can damage the eyes and mucous membranes (Priyadarshi, Nitish, 2008). The emissions from solid waste combustion include carbon monoxide, particulate matter, nitrogen oxides, volatile organic compounds, mercury, lead, hydrogen chloride, and minor amounts of chlorinated dioxins. Long term exposure to styrene can affect the central nervous system, causing headaches, fatigue, weakness, and depression. Not only these people, who are burning the trash, are exposed to these pollutants, but also their neighbours, children and families (Priyadarshi, Nitish, 2008).

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To mitigate the impact of air pollution in Ranchi city Solid Waste Management is to be handled properly at priority. Bio-medical wastes and hazardous industrial wastes need to be segregated from municipal solid wastes for separate incineration. Wastes from slaughter houses, meat and fish markets, fruits and vegetable markets are biodegradable in nature. These wastes must be separately collected and managed to make use of such wastes. Horticultural, construction or demolition wastes/ debris are to be separately collected and disposed off in separate landfill site for future use. Fulfillment of management and handling of bio-medical wastes as per guidelines of Ministry of Environment and Forest, 1998 seems to be appropriate to be followed by Ranchi Municipal Corporation. RM C must follow the fulfillment of management and handling of hazardous waste guidelines of Ministry of Environment and Forest, 1989.

Air Pollution due to Land Pollution:

Urbanization without land use is not possible. It has been human nature that urban dwellers use land not only for housing, roads, industries but also for wastes dumping. This without proper management creates land pollution which ultimately impacts air with pollution. Absence of municipal solid waste storage and disposal system in proper way is a major cause of land pollution. Littering of waste on the streets, footpaths, open spaces and drains degrades environment. In Ranchi municipal area 33 per cent of household does not have access to any toilet. 41 per cent have water closet, 7 per cent have pit toilet and others 18 per cent have other toilet. The overflow from septic and soak pits is causing health hazards. Above all about 60 per cent people's sewerage and sanitation systems are gripping bad environmental impact. Only a meager 5 per cent of populations in slums have access to clean public environment with drainage system (RMC-City Development Programme, JNNURM, 2006).

Road Network in the City:

The process of urbanization increases population and requires infrastructure. Roads are required to connect every colony, every slum area and every door of the city. In Ranchi city the road length was about 58.5 km in 1928, 121 km in 1980, 207 km in 1996 and 227 km in 2004. By 2004 metalled road accounted 94 per cent (215 km of 227 km) of total roads (table 4). Metalled road was about 37 km in 1928, 103 km in 1980, 195 km in 1996 and 215 km in 2004. Now the city has 55 wards. The growth demanded a Ring Road (Ranchi Ring Road) which is being developed.

Table 4: Ranchi city – Transport Network (in km)

Category	1928	1980	1996	2004
Metalled Road	36.8	103.1	194.7	215.0
Other Roads	21.7	18.3	12.4	12.3
All Roads	58.5	121.4	207.1	227.3
Rail	5.2	14.5	14.5	14.5
Total	63.7	135.9	221.6	241.8

Source: RMC & CDP-JNNURM, 2006

The main road network is in the old 37 wards of the city which is facing heavy traffic jam daily (figure 2 and figure 3). Increase of roads and urbanization in Ranchi city encouraged increase of the number of motor vehicles which made the city full of heavy traffic, congestion and jams. The data indicates that 14,096 new vehicles were registered in 2010-11 and this number increased to 19,995 in 2011-12. The number of two wheelers was 10372 in 2010-11 and in 1011-12 it reached to 11282. Surveys indicate that two wheelers are more pollution creating vehicles in comparison to cars. That is why heavy emission of air pollutants by fuel combustion degraded ambient air quality in the urban area of Ranchi.

Traffic flow is affected in business and office areas because the numerous commuters getting into this area from its surrounding areas and the dense area is unable to accept the influx of these flows leading to traffic constrictions (figure 4). Peak hour flows on major traffic corridors is more than 8000 passenger car units, further due to mixed traffic conditions and lack of discipline,

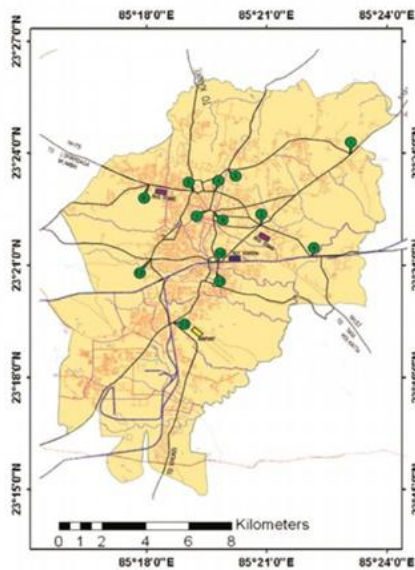
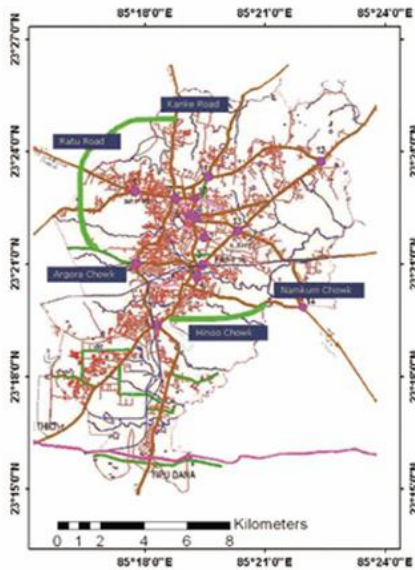
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the lane capacity is substantially reduced. The peak travel (traffic) time is 10-11 AM and 5-6 PM. In fact, roads need to be widened and the city needs short as well as long by-pass roads. Even short by-pass roads too can lighten the congestion; for example green lines/patches may be converted into roads to lessen traffic congestion (figure 2). The absence of other infrastructure viz. footpaths, road marking, rotary, railing etc. leads to reduction in traffic speed. The present average speed is just about 10 km per hour during peak hours, and it is still likely to reduce if there is no improvement in the situation (RMC & CDP JNNURM, 2006). Personal surveys of the city found bottle necks at Main Market, Main Road, wholesale markets in Upper Bazar, Railway Station, Birsa Munda Bus Stand, and Kachahari Chawk. Traffic congestion and jams found here are also due to encroachment by the retail shops along the roads and unauthorized parking along the roads. As the traffic becomes slow it creates more pollution. Bottle necks, congestions, jams releases more pollutants and increases air pollution.

Air Quality:

An air pollutant is known as a substance in the air that can cause harm to humans and the environment. In Ranchi city the main sources of human-created air pollution are energy generation, transportation, and industries that use a great deal of energy sources (figure 4). Air pollutants are here in the form of gaseous pollutants, odors, and suspended particulate matter (SPM) such as dust, fumes, mist and smoke. The mixture of these in and near the urban areas causes severe pollution to the surroundings in Ranchi city. The ambient air quality of Ranchi city is alarming mostly in the core areas of the city (table 6).

Figure 4: Traffic Attraction Points in Ranchi City and Network of Ranchi City Figure 5: Air Quality Monitoring Location Road in Ranchi city



Source: Map of India, Toposheet73E/6, E/7, E/10 and E/11, RMC-CDP, JNNURM, 2006

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Table 5: Ranchi City: Registered Vehicles (2010-2012)

Types of Vehicles	2010-11	2011-12
Trucks	416	312
Bus	65	72
Private Taxis / Cars	1284	1975
Taxi	172	108
Jeep	472	178
3 Wheeler	972	4375
2 Wheeler	10372	11282
Trucks	342	448
TO TAL	14096	19950

Source: District Transport Office, Ranchi

Fig. : 6 Air Pollution by vehicles Fig. : 7 Air Pollution by Land Pollution Fig. 8: Air Pollution by Water Pollution



Table 6: Ambient Air Quality in Ranchi Town (2005-6)

Sl. No.	Parameter Ambient standards	SPM 200ug/m ³	RPM 100ug/m ³	SO ₂ 80ug/m ³	NO ₂ 80ug/m ³
1.	Location : Nawatoli	189.10	78.70	9.60	20.90
	Maximum				
	Minimum	71.00	21.00	5.00	5.00
2.	Average	130.05	49.85	7.30	12.95
	Location : Simantoli	228.10	82.10	10.10	21.80
	Maximum				
3.	Minimum	89.80	21.90	5.00	5.20
	Average	158.95	52.00	7.55	13.50
	Location : Lalpur Chowk	240.70	127.70	12.50	22.80
4.	Maximum				
	Minimum	99.00	41.30	5.20	5.40
	Average	169.85	84.50	8.85	14.10
4.	Location : Upper Bazaar	454.89	179.50	24.23	54.70
	Maximum				
	Minimum	95.25	63.40	4.24	9.40
4.	Average	275.07	121.45	14.24	32.05

Source: RMC-CPD, JNNURM, 2006 and MSPL, 2005-06

At present, the ambient air quality of Ranchi city is generally below the ambient air quality standard limits. Almost all the monitored air quality parameters are generally below their ambient air quality standards. The charts illustrate the air quality at the four locations (figure 5) for the different parameters (table 6). The SPM and RPM values have been found to be on the higher side at all the locations. At Upper Bazar and Lalpur Chauk, the SPM and RPM values have been found exceeding the permissible limits. This is mainly due to the commercial activities taking place at these locations. The SO₂ and NO₂ values obtained at all the locations have been found to be much below the standard limits.

Ranchi was known for its clean air even in seventies-eighties in the previous century. The major source of pollution, two wheelers, was less those days. In fact, any kind of transportation by cars, trucks, buses, motor bikes etc. is responsible for a significant percentage of criteria

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pollutants, such as Sulfur dioxide, Nitrogen oxides, volatile organic compounds, particulates, Carbon monoxide and Lead. Ranchi is connected by busy highways also and thousands of vehicles pass daily through the urban areas of the city. So, the Ranchi air has become highly polluted especially at some locations. Children are suffering from different lung diseases. Eyes starts burning while drive on the busy roads or walk along the road side. It is now a very common phenomenon. Toxic gases emitted from the automobiles are increasing many folds. Lots of trees have also been cut down for making houses, marketing complexes etc. Due to thin or decreasing vegetation Ranchi city is under the grip of dust pollution.

FINDINGS, RECOMMENDATIONS AND CONCLUSIONS:

Three decades ago Ranchi was known for its healthy climate. But now it is under the grip of air pollution especially in dense populated areas. Children are suffering from different lung diseases. Toxic gases emitted from the automobiles are increasing many folds. Lacks of trees have been cut down in the course of urbanization. Day by day growing traffic requires proper geometric design of rotary and land at intersections based on traffic volume and space availability incorporating signalization, zebra crossing. Improvement of all major arteries, i.e. widening & strengthening of pavement construction of footpaths, railings, streetlights, drainage, median, shoulder, road painting, road signage, strengthening of culverts etc. is essential. Simultaneously road space management is significant by restricting use of road space by heavy vehicles and motor cars in congested areas. Pollution control checks including the inspection of fitness of vehicles as well as training and testing of the drivers must be done perfectly in the urban area of Ranchi. Road safety is a must too. If pedestrians and cycle travelers are encouraged the level of pollutants may decrease for pollution free urbanization.

The air pollution is directly connected with the health of human being and urban metabolism of the city. Polluted air is one of the most dangerous side effects of rapid and unsustainable urbanization. Personal surveys indicates that transport, road dust, open waste burning, domestic cooking and heating, stone quarrying including building and road construction, brick kilns located inside and outside the urban airshed, large industries, coal fired power plants and influence of outside sources are the key air pollution sources in the urban area of Ranchi city. SPM value at Upper Bazar, Siramtoli and Lalpur Chawk and RPM value at Upper Bazar and Lalpur Chowk are harmful; enough to pollute the ambient air quality. To mitigate household or indoor air pollution burning of coal or agricultural fuel need to be stopped. Surroundings of every house, colony and slum must be garbage free as well as clean because clean air is the base resource of the health and longevity of every living being. Pure air is the first necessity for the sustenance of humankind.

Ranchi city requires a judicious combination of bus service and public transport service for minimizing the use of personalized modes. High capacity bus service is required to connect major institutions, hospitals of capital city, stations, airport and industrial areas. Along with this, Mini Bus shuttle services may be alternatives for Mass transit system. The capital of Jharkhand, Ranchi, may have smooth traffic if automatic signal system based on traffic volume, large size rotary, proper traffic speed and flow are systemized properly. Identifying missing road links and their creation, Ranchi Ring Road and required inner connecting roads may be built for smooth functioning of traffic.

Weak infrastructure, weak institutional set up and poor motivation of workers lead the city to air pollution. All kind of wastes are littered on the streets, footpaths, open spaces, drains or in water bodies indiscriminately. World's best practice such as segregation of waste at source is not encouraged or practiced here. The collection, transportation and disposal system in Ranchi city is almost primitive. Street sweeping is done only for 50 per cent of the area. It must be 100 per cent without throwing the dust in air. To maintain the quality of ambient air solid waste management needs to be handled properly at priority. Biodegradable wastes must be separately collected and managed to make use of such wastes. Unhygienic conditions are continuing in Ranchi city because of insufficient sanitation facility for slums. Without its solution Ranchi cannot be made pollution free. Operational planning should take care of the improvement of

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urban infrastructure, e.g. roads, traffic, transport etc. Along with this stone quarrying as well as stone chips production in and around the city must be banned. The urban metabolism of Ranchi city has started to respond in the negative. So, the city needs proper vegetation and care and planning at the earliest.

REFERENCES:

- 1.Ahmad, E., “Geographic outline of Chotanagpur”, Geographical outlook, vol.II, No. III (Ranchi, 1958), P. 17.
- 2.Ahmad, E., 1965, Bihar – A Physical, Economic and Regional Geography, Ranchi University, Ranchi, Pp. 26.
- 3.Alberti M. et al. 2003. Integrating humans into ecology: opportunities and challenges for studying urban ecosystems. *BioScience*. 53 (12): 1169-1179.
- 4.Anonymous (1983). Master plan of Ranchi, RRDA, Ranchi.
- 5.Anonymous (2006). Information Brochure of Ranchi Municipal Corporation (RMC), Ranchi.
- 6.Antrop, M. (2004). Landscape change and urbanization process in Europe. *Landscape and Urban Planning*, 67 (1), 9–26.
- 7.Blowers, A. (1996). Global problems and local solution. In: K. Krizek & J. Power (Eds.), *A planners guide to Sustainable Development* American Planning Association: Planning Advisory Service report No. 467.
- 8.City Development Programme (CDP) under Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Ranchi, 2006.
- 9.Directorate of Agriculture (2006), Jharkhand Agricultural Report 2005–06. Govt. of Jharkhand.
- 10.Do v N i r, (1 9 8 3), M a n , A G e o m o r p h o l o g i a l A g e n t, K e t e r Publishing House, Jerusalem, Israel, Pp. 100-113.
- 11.Dunn, J.A., 1939, The Geology of North Singhbhum including Parts of Ranchi and Manbhum Districts, Mem, Geological Survey of India, 54, Pp. 132.
- 12.Environmental assessment of urbanization in mountains: a case study of Gangtok city and its environs in eastern Himalaya using remote sensing. *Asian-Pacific Remote Sensing and GIS Journal*, UN-ESCAP, Thailand, vol. 9, no. 2. pp. 15-18 Krishna AP (1996).
- 13.G o y a l S K , G h a t g e S V , N e m a P , T a m h a n e S M (2006). Understanding urban vehicular pollution problem vis-a vis ambient air quality - case study of a mega city (Delhi-India), *Environmental Monitoring and Assessment*, 119:557-569.
- 14.Gupta, R., & Sen, A. (2008). Monitoring physical growth of Ranchi City by Using Geoinformatics Techniques. *Institute of Town Planning India Journal*, 5(4), 38–48.
- 15.Han, J., Kamber, M., & Pei, J. (2011). *Data Mining: Concepts and techniques* (3rd ed.). Elsevier.
- 16.Elsevier.
- 17.Han, J., Kamber, M., & Pei, J. (2011). *Data Mining: Concepts and techniques* (3rd ed.). Elsevier.
- 18.Elsevier.
- 19.Han, J., Kamber, M., & Pei, J. (2011). *Data Mining: Concepts and techniques* (3rd ed.). Elsevier.
- 20.Elsevier.
- 21.Han, J., Kamber, M., & Pei, J. (2011). *Data Mining: Concepts and techniques* (3rd ed.). Elsevier.
- 22.Elsevier.
- 23.Han, J., Kamber, M., & Pei, J. (2011). *Data Mining: Concepts and techniques* (3rd ed.). Elsevier.
- 24.Elsevier. Han, J., Kamber, M. and Pei, J. (2011). *Data Mining: Concepts and techniques* (3rd ed.), Elsevier.
- 25.Mario j. Molina & Luisa T. Molina (2004). Megacities and Atmospheric Pollution: *Journal of the Air & Waste Management Association*, Volume 54, Issue 6, Pp. 644-680.
- 26.Pidwirny, Michael, (2008), ‘Soil Erosion and Deposition’, In: *Encyclopedia of Earth*. Eds. Cutler J. Cleveland, Washington, D.C.: Environmental Information Coalition National Council for Science and Environment.
- 27.16.Priyadarshi, N,, 2011. <http://nitishpriyadarshi.blogspot.com/2011>
- 28.17.Priyadarshi, N,, 2008. <http://nitishpriyadarshi.blogspot.com/2008>
- 29.18.Reid, J., 1926. Final Report on Survey and Settlement Operations in the District of Ranchi, 1902-10, Patna.

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19. Shrivastva, Bimla, 1984. Urban Land Use in A Tribal Area, Classical Publishing Company, New Delhi.
20. Survey of India, Kolkata, Toposheet 73E/6, E/7, E/10 and E/11
21. Wadia, D.N 1966. Geology of India Sixth Edition. Macmillan, London.
22. http://www.epa.state.il.us/air/vim/guide/air_pollution.html