



GEOENVIRONMENTAL ATTRIBUTES AND CHALLENGES: A CASE STUDY OF RANCHI

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ABSTRACT:

Every natural resource on the earth is a component of geoenvironment and it is directly connected with the life and production activity of the society. Therefore, for the sustainable development it is a must to minimize and mitigate the adverse impacts to the geoenvironment and its ecosystem. It is also a fact that especially urban quality of life is analyzed with a special emphasis on the estimation of implicit impact of geoenvironmental attributes and challenges. In Ranchi urban area, the geomorphological and geological resources of the Earth have provided the raw materials to support the expansion of human population. But, the geoenvironment of Ranchi city has been to some extent altered by anthropogenic activities. In the process of urbanization the attributes of geoenvironment of the study area is changing so much that it has become a challenge for sustainable urbanization. The study aims to find out not only the attributes of the geoenvironment of Ranchi city but also the challenges to the sustainability of this plateau city of India.

KEYWORDS: *Geoenvironment, natural resource, sustainable development, mitigate, ecosystem, anthropogenic activities, urbanization, sustainability, plateau city.*

INTRODUCTION:

Ranchi, the capital of Jharkhand state in India, is located on the centre of Ranchi Plateau. It is a tabular plateau having 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. But the geoenvironment of the city is being degraded due to rapid urbanization without accepting any master plan.

Geoenvironment is a branch of the Earth Science. It is rather a new field. The term geoenvironment includes all the attributes of landforms along with rocks, soil, hydrology and vegetation of that region, and also the climate as manifestation of these five elements. Here landforms are the basic and most dominant component. The basic and dominating

components of the geoenvironment are relief, rocks and ground water, and geodynamic phenomena. Geoenvironment is the part of the lithosphere that directly influences the condition of the existence and development of the various land and biota. It is man who exploits and modifies the lithosphere. Its studies provide a variety of information about different geoenvironmental behaviours of an area. In the opinion of German geographer-ecologist Carl Troll (1968) the roots of the concept geoenvironment lie in the term landscape ecology and geocology. Carl Troll focuses on those geoenvironmental factors which influence environment and in turn man. Actually, it is the environment directly created by the land bound elements of environment. There are two specific dimensions of geoenvironmental studies- assessment, mapping and combating various geological and geomorphological hazards and conservation of landscape for optimum benefits. The geoenvironment concept applies to the management of natural resources, and the natural as well as anthropogenic processes that affect the solid earth as a habitat of human beings (Bobrowsky, 2001). The use of an ecosystem approach to urban environment, emphasizing the city as a complex system, enables a greater understanding of human, biophysical and urban interactions (Alberti, M., 2003).

Geo-resource exploitation and industrial activities are essentials for food, shelter, clothing etc. for the sustenance of humankind. So, geoenvironment is directly connected with the life and production activity of the society. It is also a fact that especially urban quality of life is analyzed with a special emphasis on the estimation of implicit impact of geoenvironmental attributes. Actually, geoenvironmental studies include man-induced geomorphic changes and processes. These changes or alterations degrade environment and create environmental problems. Geohazards have become a threat to man and environment and are increasing with rapid urbanization. Its scientific knowledge is significant to solve many complex environmental problems or geohazards especially in the urban areas. Therefore, hazards are seen as an essential component of developmental planning. As far as the environment and ecosystems of Ranchi city area is concerned it is being disturbed by the interferences of unplanned urbanization. In Ranchi, the geomorphological and geological resources of the Earth have provided the raw materials to support the expansion of human population. These needs include the provision of raw materials for shelter, energy, technology and the space for the disposal of wastes. Population growth, industrial expansion and urbanization are, therefore, intimately linked to the direct impact of human activity on the landscape. That's why the city is facing so many geoenvironmental challenges viz. landfill pollution, water pollution, ground water crisis, air pollution, wetland degradation, sewage-sanitation hazards etc. For the sustainable development it is a must to take steps to minimize and mitigate the geoenvironmental adverse impact and its ecosystem. Therefore, researchers, planners and decision makers need to evaluate geoenvironmental attributes and challenges of Ranchi city for sustainable environment and urbanization. The present paper aims to find out the way to utilize geoenvironmental attributes of the study area and also to mitigate geoenvironmental challenges.

STATEMENT OF THE PROBLEM:

Today the understanding of the geoenvironment of an urban area as a natural system and the urbanization processes operating there has become relevant to have a better use of the land and its attributes. This understanding deals with the geoenvironmental challenges as well as hazards. For sustainability of a city evaluation and mitigation of natural and man-induced hazards is a must.

Ranchi city rarely faces hazards such as earthquakes and landslides. It is facing the degradation of land, water and air, destruction of natural panorama, sewage and waste hazards, urban heat island phenomena etc. Evaluation of the earth's materials, attributes and dynamic processes is essential for comprehending geoenvironment of this plateau region where large settlements have come up. The ecosystem of this urban area has its own geoenvironmental potential and limitation for utilization for the growth of human settlements. But, Ranchi city and its environs are experiencing a number of geoenvironmental problems affecting life and property of the people. The urbanization and urban growth of this plateau has reached to a dangerous level where geo-environment is being degraded and the sustainability of the city is challenged.

OBJECTIVES:

The main objectives of study are as follows:

- To delineate geoenvironmental attributes of Ranchi city area on the basis of parameters like lithology, relief, altitude, structure, soil, drainage, sewage-sanitation, climate and forest of Ranchi city.
- To find out the geoenvironmental challenges in the study area.
- To suggest remedial measures for the geoenvironmental problems.

STUDY AREA:

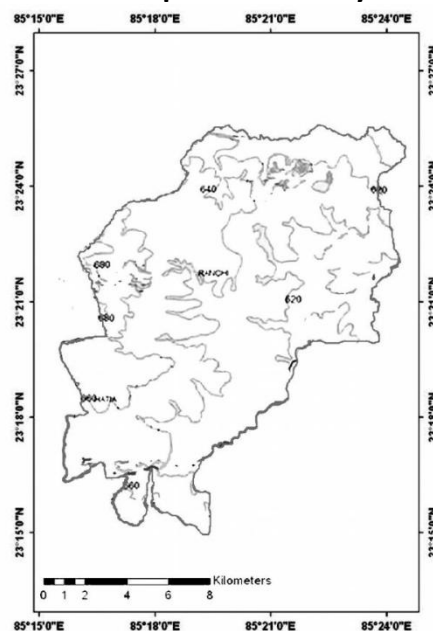
Ranchi city (figure 1) lies between the latitude and longitude of 23°15' N - 23°25'30" and 85°15' E - 85°24' E and presents largely a tropical location. Its Municipal area is 175.12 Km² (67.61 Sq.ml) and its average elevation is 651 above sea level. It is located on the centre of the Ranchi Plateau. Ranchi has a hilly topography. 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. As per 2011 India Census, Ranchi Municipal Corporation has a population of 1,120,374. Ranchi city has an average literacy rate of 87.68%.

MATERIAL AND METHODS:

Data for the study have been collected from both primary and secondary sources on various components of geoenvironment including physiography, relief, geology, hydrology, soil, climate and forest cover. 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/II) and master plan of Ranchi city have been used and interpreted. Geoenvironmental 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 Survey of India, Geological Survey of India, Central Ground Water Board, Jharkhand Space Application Centre, Ranchi Regional Development Authority, Ranchi Municipal Corporation, Ministry of Urban development, Govt. of Jharkhand etc. Field survey has been done to record various geoenvironmental data in the study area. Secondary data on geology, hydrology, forests and

Figure: 1 Location Map of Ranchi City with Contour



Source: Toposheet 73E/6, E/7, E/10 and E/11, RMC-CPD, JNNURM, 2006

soils have also been collected from published and unpublished reports of different departments and laboratories. For population data various census reports have been used. Data on climate have been collected from Meteorology Department of Birsa Agricultural University, Kanke, Ranchi. 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.

DISCUSSIONS AND RESULTS:

The geoenvironment is directly connected with the life and production activity of society. It is the resource base that serves as the engine to provide elements necessary for the sustenance of humankind. The urban quality of life and parameters of sustainability of an urban area are analyzed with a special emphasis on the estimation of implicit prices of geoenvironmental attributes and challenges born of this. Urban geoenvironmental challenges

can be divided into two broad groups: (1) hazards associated with city location and (2) hazards created by accelerated resource utilization. Human impact as well as urbanization effect on the different attributes of the geoenvironment of Ranchi city is followed by geoenvironmental challenges and that may be discussed as follows:

LANDFORMS:

Ranchi city is located on the central area of the Ranchi Plateau. This plateau is the largest granitic mass of the Chotanagpur plateau. It is mostly covered by batholith 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 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).” The monadnocks are referred to as “such deep-seated intrusive bodies of hard igneous rocks like granite exposed by long continued erosion have resisted erosion with reference to the less hard gneiss of the surrounding country, and are known as residual erosion with hills (Ahmad, E., 1965).” Geographically, it is found that at the Ranchi planation level a change of climate from more arid condition has cumbered the rock plains with cover and the bedrock is beyond the reach of the forces of weathering and erosion (Shrivastva, Bimla, 1984). The surface of Ranchi city area is mostly uneven; and rolling surfaces are intersected with streams and rivulets. They are studded with a few isolated residual hills and ridges. Alternate dry uplands and gently sloping lowlands the tanks and the dams with beautiful flights of terraced fields are seen carved in the area of Ranchi city. The tanks, suitable for agriculture, are capped with this laterite cover (Shrivastva, Bimla, 1984). Since the foundation of the city the extent of fallow lands and gullies has been reduced by the pressure of urban population.

RELIEF:

The region generally slopes towards east. Slopes or relief in this region are variable. The average slope may be 2 per cent. But the growing nature of Ranchi city has been altering the topography of the region by the super imposition of the urban profile. In the course of urban growth and land use planning hillocks have been leveled down, depressions are filled and deforestation continued for residential, commercial and industrial purposes. Stream courses dammed for the water supply to fulfill urban needs. In fact the relief isn't a hindrance to urban growth at the major area of the region, but the haphazard settlement is creating geoenvironmental crisis.

NATURE OF TOPOGRAPHY:

The nature of the topography of Ranchi city is undulating. It is located at the Ranchi Plateau which is a tabled plateau suitable for settlements. The land of the city was subjected to

a phase of denudation. It is a peneplain having some residual hill rocks. This geomorphic attribute have been an attraction from prehistoric age. The general ground elevation ranges from 596 meter to 700 meter above sea level with the regional slope of the area towards east.

LOCAL WEATHER CONDITIONS:

Ranchi'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 local weather conditions of Ranchi area are important in determining the geoenvironmental attributes.

PRESENCE OF MINERALS, ROCKS AND HILLS:

In ancient days rocks and minerals played the important role for the earlier settlements. Best example is that of Jharkhand where primitive tribes like Asur and Birhors were attracted towards the forest and hilly terrain of this state thousand of years ago. Asur used to extract iron ore for iron smelting from the laterite rocks present in this state.

Soil:

Soil attributes agricultural yields. The quality of soil of Ranchi is suitable for vegetation. In fact, in Ranchi region the humid tropical climate has led to the formation of red soil in the area of higher elevation. This is overlain by lateritic soil. The area underlain by schistose rocks is having more deep red soil than those of granite rocks. It is due to the dominance of minerals, particularly garnet. Soils of granitic rocks are lighter in color due to the leaching of felsic components. In Ranchi urban area variations in soil type are observed in the areas around the Ranchi Hill, Hehal Hill and Argora Hill with the Harmu River traversing the whole area.

Land Use:

Before 1834 Ranchi city was a small village which was called 'Aranchi'. The village was inhabited mainly by the Munda and Oraon tribes. Then the settlements were predominantly engaged in agriculture. Agricultural fields, hills, rivers, lakes, forests and rocky exposures were means for their lives (Shrivastva, Bimla, 1984). In 1834 the British arrived to Ranchi influenced by the geographical features and strategic conditions of Ranchi city. After their arrival the non-agricultural settlement was established. Gradually roads, streets, quarters, offices began to be constructed. The coming of Christian Missionaries and Defense Forces started fast growth of Ranchi. By 1902-10 the survey of the land use of Sadar area was taken by J. Reid (table 5.1). Before 1910 housing covered only 0.34% of the total area. Cultivation-vegetation remained almost without any disturbance. Then there were no sign of geoenvironmental degradation due to urbanization.

Table: 1 Land Use

Sl. No.	Use	Area (in Hectares)
1.	Cultivated area	73,427.88
2.	Uncultivated area	43,163.11
	(i) Current fallow	163.69
	(ii) Cultural area other than current fallow	,566.19
	(a) Old fallow	7,251.83
	(b) Groves not fruit bearing kharor and bamboo	274.82
	(c) Culturable jungle	5,014.16
	(d) Other kinds	1,025.37
	(iii) Area not available for cultivation	28,836.72
	(a) House sites	413.03
	(b) Water	3,118.21
	(c) Jungle	15,447.82
	(d) Other kinds	3,118.21
	(iv) Unkhanapuried kinds	596.51
	Total	1,16,590.91

Source: Reid, J., *Final Report on Survey and Settlement Operations in the District of Ranchi, 1902-10 (Patna, 1926)*

Agriculture and fallow-land decreased from 75 per cent in 1985 to 53 per cent in 2004 due to utilization of agricultural and fallow land for settlement and commercial purposes. (table 2 & table 2). Most of the growth has taken place towards north and north-west in circular form. Encroaching was started on the nearby agricultural and fallow lands. Area under plantations increased from 0.67 per cent in 1985 to 8 per cent in 2004 due to government and public efforts.

Table: 2 Ranchi City – Land Use Pattern, 1985

<i>Land use Classification</i>	<i>Area (in</i>	<i>Area (in %)</i>
Agricultural Area		75.00%
Built-Up Area Airport		21.94%
	1.87	
River Tanks/Ponds Plantation		3.06%
	1.97	
	1.20	
Total Area		100.00%

Source: Ranchi Municipal Corporation

Land use during 1985 to 2004 shows that built-up land had grown from 21 per cent to

34 per cent i.e. an increase of 12.75 per cent. During this period agriculture and open area declined. Land under other uses also got reduced. This indicates that the city was in growing stage. Population crossed 8.5 lakh in 2001. The demand of land increased tremendously. Encroachments weren't under control in the surrounding plains. Land use land cover was not following Master Plan 1983.

Table: 3 Ranchi City – Land Use Pattern, 2004

<i>Land use Classes</i>	<i>Area (in Sq. Km.)</i>	<i>Area (in %)</i>
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

It is observed that three categories of land use have undergone substantial changes (figure 2). The maximum change has occurred in agriculture land indicating conversion of rich agriculture land to non agriculture uses particularly built-up area in the region.

LAND POLLUTION:

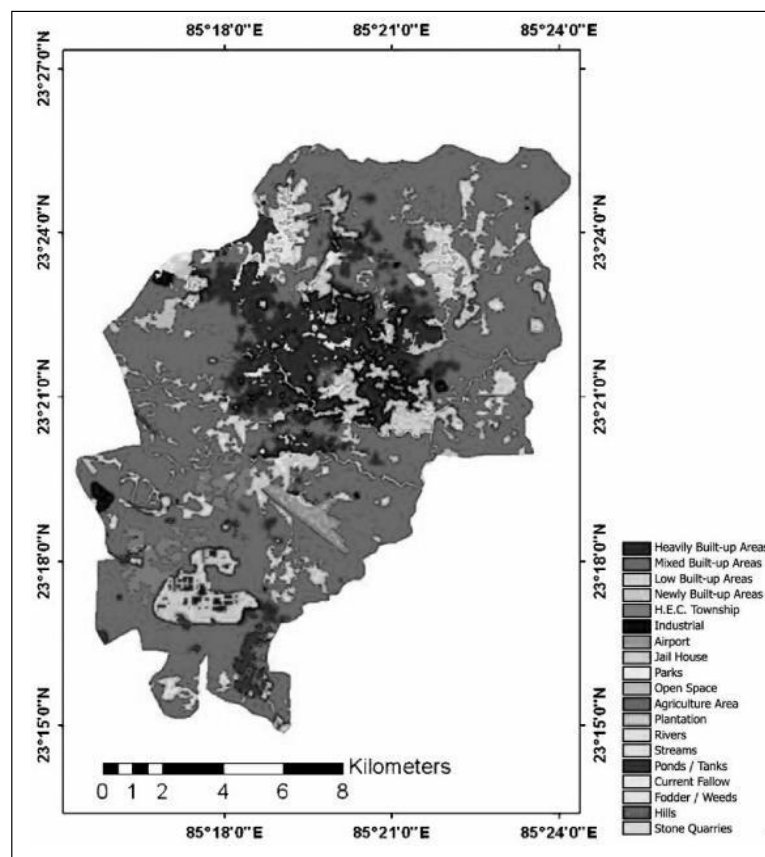
Absence of municipal solid waste storage and disposal system in proper way is a major cause of land pollution. Littering of waste on the streets, footpaths, open spaces and drains degrades geoenvironmental attributes. In slum areas, the problem is aggravated due to complete neglect of municipal solid waste collection and transportation system. Biomedical wastes, other infectious and hazardous wastes contaminate land. Silt and dirt accumulating from hilly areas to low lying areas as a result of heavy rainfall cause siltation in the low lying areas. 33% of household does not have access to any toilet. 41% 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% people's sewerage and sanitation systems are gripping bad

geoenvironmental impact. Only a meager 5% of populations in slums have access to clean public environment with drainage system. The rest 95% of population has to live with muddy lanes, dirty streets, stagnant water, mosquito breeding and unhealthy environment. Floods make these areas environmentally worse.

STONE QUARRYING:

In the study area stone quarrying imposes dangerous impact on the ecology. It removes vegetation because it requires land not only for the area to be mined, but also for the dumping of overburden rocks. Removal of vegetation has made animals leave the area required for quarrying.

Figure 2: Ranchi City Land Use, RMC Area, 2004



Source: Ranchi Municipal Corporation \$ JNNURM CDP Report, 2006

Stone quarrying creates dust and throws it in the atmosphere from various activities. It slows the growth of some of the plant species in the surrounding area. Noise and vibrations from

blasting, operation of the machines and transportation have driven away birds and small animals from nearby forests. Stone quarrying damage top soil and changes topography by digging of open pits and dumping of overburden weathered rock mass in the form of large heaps. Rapid urbanization demand huge amount of stone chips. As far as Ranchi city is concerned according to some surveys it needs stone chips more than 1000 trucks daily. Stone quarrying is a big business in Ranchi and its production is being done in and around the city area. So, the geoenvironment of the area is deteriorating.

HYDROLOGY:

The major hydro-geomorphic region of this area is divided into five watershed areas i.e. the Subernarekha River area, Jumar River area, Potpoto River area, Bada Ghagra River area and Harmu Nadi area. Except the Subernrekha River all the rivers are badly affected by the Urban growth hazards and are losing depth and breadth day by day. All the five rivers flowing in the city are connected by small and large tributaries or natural nallas. These tributaries drain rain water as well as waste water of urban usage. But, due to unplanned urbanization of the area, they have lost their natural drain-capacity. Almost all the water bodies, drains, rivers at present are used as dumping grounds for solid waste. The water bodies are choked up and full of aquatic vegetation. Sewer flows directly into these water bodies. Hydro-geomorphically, the region is classified into different zones covered by residual hills, plateau weathered shallow, plateau weathered moderate valley, valley gullied and plateau slightly dissected residual hills. They are the products of the process of pedepplanation, which reduces the original mountain mass into a series of scattered knolls standing on the pediplains (Thumbur y, 1990). The urban agglomerations in Ranchi city are facing at least four hydrological problems, i.e., the mobilization of sufficient volume of water for domestic and industrial consumption, urban water pollution, quality, ground water protection and urban storm water run-off disposal.

Ground Water:

Groundwater in Ranchi city is mainly stored here in secondary porosity features or void spaces developed as result of weathering, fracturing, jointing, shearing or faulting phenomena. Sources of groundwater recharge in Ranchi city is the vertical percolation of rain water. Although city experiences about 1000 to 1200 mm rainfall annually, the rate of vertical percolation is hindered by the presence of highly weathered and metamorphosed rocks. The thin soil layer of Ranchi Plateau which is becoming thinner due to weathering is gradually losing its water retaining capacity. Moreover, present land development practices in the recharge area and natural canals or rivulets in and around the city are also reducing the natural recharge significantly. More than 40% of the rain water is lost in the form of surface runoff. The rate of decline ranges between 1m/year to 5m/year at different observation locations within the city.

Water Supply:

Ranchi is becoming one of the important business centers in Eastern India. There is a rampant increase in construction and expansion of city. Water supply from the dams is inadequate. So, dependency on ground water is increasing. Over pressed zones in the city are Upper Bazaar, Main Road, Ratu Road, Chutia, Hindhpirhi, Circular Road, Burdwan Compound, Lalpur and Harmu Road.

Drought:

Ranchi gets average annual rainfall 1000 to 1200 mm, but less than 800 mm of rainfall causes drought like situation. The city has experienced such situation in 2004 and 2005 when water crisis became the major problem.

Polluted Surface Water:

Ranchi city is bounded by several small rivulets like Harmu River, Jumar River, Potpoto River etc. The indiscriminate disposal of municipal, household and industrial wastes has made these sites of waste disposal wastes has made these sites of waste disposal and land, water and air contaminated. Harmu River is choked and has become a threat to the ground water quality (figure 7). Dams, ponds- watersheds are also being polluted by the wastes of the city.

Water Pollution:

Water pollution is coming from thousands of sources including toxic chemicals, nutrients, bacteria, siltation, oxygen-depleting substances, metals, pesticides, herbicides, and other habitat altering materials. Environmentalist has found that the groundwater quality in the city is slightly alkaline. It also contains fluoride. It is observed that though the concentration is low, its presence is toxic to human body. Observations confirmed the presence of sulphate, bicarbonate, magnesium, sodium and potassium in the water in permissible limit. In some area, it exceeds the limit. Those areas are Chutupalu, Ormanjhi and some parts of Harmu area (Nitish, Priyadarshi, 2011).

Figure: 3 Air Pollution (coal burning) in a slum area, Ranchi **Figure: 4 Air Pollution by vehicles at Main Road, Ranchi** **Figure: 5 Water-Land Pollution a Site of Harmu River, Ranchi**



The pollutants are mostly man-made. Hand pumps to bore wells are not taken properly. The surface water bodies like ponds and dams are contaminated. It should be reduced. The water in Bariatu, and Morabadi is generally red in color. The contamination is taking place from the surrounding soil. The drainage system is a failure in Ranchi. The contaminated water can also cause serious health hazards. Among them stomach infection and joint pain are common (Nitish, Priyadarshi, 2011).

Liquid Waste:

Due to lack of proper drainage system most of the house hold liquid waste are sent in the disposal wells underground. That liquid waste pollutes aquifers. At some sites these leakages from these wells introduce high concentration of Biological Oxygen Demand (**BOD**), Chemical Oxygen Demand (**COD**), nitrate, organic chemicals, and possibly bacteria into ground water.

Geo-urban Factor:

Many of the small ponds which were main source of water in the surrounding areas are now filled for different construction purpose affecting the water table. Lots of deep-boring in the Ranchi city has also forced the water table to move down because Ranchi plateau consists of metamorphic rocks which are relatively impermeable and hence serve as poor aquifers. They bear groundwater only in their weathered top portion which rarely exceeds 10 meters.

Aquifer Factor:

Many houses have been built over the recharge area which is the major source of water to unconfined aquifer below. An unconfined aquifer is one in which a water table varies, depending on areas of recharge and discharge and pumping from the wells.

Water Supply in Slums:

Meager 3% households have access to water by Ranchi Municipal Corporation in the form of authorized connection. Another 37% of household have access to public posts and 6% from tanker supply, which again suffer from scarcity of water. Remaining 54% of households have no access to municipal water supply and has to manage only with water from public and private wells and other natural resources like river.

Vegetation:

Forests cover a considerable portion of the Ranchi district. Dry peninsular Sal is the main type of forests found. 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 environmental problems. Everywhere 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 (figure 6). But, deforestation and urban land use is continuous phenomena here. The most important need for any city for the remedy of pollution is proper vegetation.

Transport:

The road length of the city was about 58.5 km in 1928, 121 km in 1980, 207 km in 1996 and 227 km in 2004. As per analysis (table 4) by 2004 metalled road accounted 94 per cent (215 km of 227 km) of total roads. It was about 37 km in 1928, 103 km in 1980, 195 km in 1996 and 215 km in 2004. Average annual increase is about 2.3 km/year during 1928-2004.

Figure: 6 Vegetation, HEC, Hatia Area Figure: 7 Land-water Pollution Kishor Ganj, Ranchi



During 1928-1980 the increase was 66 km (1.3 km/year), in 1980- 1996 it was 92 km (5.7 km/year) and 20 km (2.9 km/year) in 1996-2004. Major expansion is observed in western, southern and south-eastern parts and along National Highway 8, National Highway 11 and National Highway 12.

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

Sound Pollution:

Sound pollution means unpleasant sound in the atmosphere causing health hazards like sleeplessness, annoyance, stress and fright. The major sources of noise or sound pollution are traffic, music played during occasions and industries.

Table: 5 Noise Qualities in the Town

S.No.	Location	Average Noise		Level in dB(A)	
		Avg. Day Noise Level	Standard Limit	Avg. Night Noise Level	Standard Limit
1.	Nawatoli	66	65	45	55
2.	Siramtoli	60	65	43	55
3.	Lalpur Chowk	63	65	45	55
4.	Upper Bazar	80	65	51	55

Source: RMC & CDP-JNNURM, 2006

At Upper Bazaar and Nawatoli the average day noise level is found to be exceeding the standard noise limits. This is due to high density of population, congestion and commercial activities taking place in these areas (table 5). The average night noise levels are mostly below the standard limits.

Urban Heat Inland Effect:

The urban heat island effect has become a growing concern in Ranchi and is increasing over the years. This effect causes the Ranchi city to become 1-6° C warmer than surrounding landscapes. Impacts also include reducing soil moisture and intensification of carbon dioxide emissions. Ranchi City has put heavy pressure on the ecologically sensitive areas due to deforestation and loss of cropped area. Ranchi is fast becoming an "island of heat", as surface temperatures have raised by 1-2° C in the past three decades.

CONCLUSION:

Three decades ago Ranchi was known for its healthy climate. Ranchi was known for its clean air and very less pollution. Now the air in Ranchi city has become polluted 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. Now Ranchi is under the grip of air pollution.

The cleanup of an aquifer is a very difficult task. So, every effort should be made to prevent the contamination of the ground water in the first instance. Rain water harvesting, harvesting of surface runoff and ground water recharge should be done in community level also. Identification of the recharge areas or catchment areas in and around Ranchi city must be done on priority. No construction on those lands should be done. To mitigate geoenvironmental problems construction of artificial water reservoirs in suitable areas in and around Ranchi is a must to collect the rain waters. Cleaning of ponds, lakes, rivulets and dams periodically to rejuvenate their capacity of storage of water is also required.

For geoenvironmental solutions Solid Waste Management is 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. Stone quarrying as well as stone chips production in and around city must be banned.

Operational planning should take care of improvement of urban infrastructure, e.g. roads, traffic, transport etc. Developmental planning should emphasize the development of newly annexed urban areas. Various urban renewal processes can be used for the goal to achieve crisis free geoenvironment. Deforestation, reducing area of watershed, leaning rivers in the area, air pollution, decreasing number of birds, increasing temperature in the city, haphazard settlement, slums here and there and above all geomorphic as well as environmental degradation of the region are threatening the geoenvironmental attributes and beautiful panorama of the city. The geoenvironmental attributes of the area, is now in crisis particularly in and around the old city area. The city needs proper vegetation and care and planning at the earliest. The urban metabolism of Ranchi city has started to respond in the negative.

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