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QUALITY ASSESSMENT OF GROUNDWATER OF RAMGARH DISTRICT, A COAL MINING ZONE OF JHARKHAND STATE

Anil Kumar* and Vipul Suman**

Key words : Gondwana, Barakar, Barren measures, coalseams.

Ramgarh district of Jharkhand state is one of the important storehouses of medium- coking metallurgical coal in Gondwana basin. It has got large number of coalfields, where coal is taken-out and distributed to all parts in the country. The coalfields contain a number of thick and thin coal seams of talchir, barren measures, and the barakars. The barakars contain sandstone, shale, carbonaceous shale, coals and barren measures have got sandstone and shale only. Groundwater occurs in the porous granular colluvial material, weathered mantle as well as joints, fissures, fractures or in the weather zone of alluvium. During the study it is found that coal mining is affecting the ground water quality, which is a major concern for the health of the common people living there. The analytical results show that groundwater is mildly acidic at some sites and has got slightly higher concentration of some chemical constituents, mainly lead, in some places of the study area. It is recommended that efforts should be made to reduce the discharge of toxic and objectionable effluents from coal washaries and related industries to surface water bodies and ground water aquifers in the district.

INTRODUCTION

In Ramgarh district there are many Industrial areas like Patratu Thermal Power Plant, Bhurkunda (Glass Factory) and Coal Mining Areas, viz., Barkakana, Kuju, Mandu and Rajarapa. There we find many coal washaries also.

Ramgarh district is a part of Pre-cambrin segment of Chotanagpur plateau forming narrow truf in which lower Gondwana rocks were deposited. The area under study lies between 23°'24'38" to 23° 56'25" north latitude and 85° 11'15" to 85° 52'80" east longitude.

The district is traversed by residual hills, hillocks and mounds. The upland area has an E-W trend in an almost continuous chain of hillocks of gneissose rocks.

The district is well drained due to undulatory topography giving the denderitic pattern of drainage. The immediate runoff is discharged through numerous streams and rivers of the area such as Damodar river, Bokaro river, Konar river, Bharavy river, etc.

The climate of the region is humid tropical which leads to the formation of red soil in the area of higher elevation known as laterite soil. The area is of gneissose rocks, possessing deep red to grey brown own soil. Here spheroidal, residual and biological type of weathering have been noticed at many places.

The natural vegetation is mainly tropical deciduous type. The hilly terrain occupies numerous shrubs and occasionally Sal trees (*Shorea robusta*).

The climate of the area is tropical and monsoonal and it experiences rainfall during rainy season which accelerates the chemical and mechanical weathering.

MATERIALS AND METHODS

Systematic sampling was carried out for analytical study of ground water quality. Groundwater samples were collected from the dug well and bore wells from different coal mining and non-coal mining areas.

*Dept. of Geology, Patna Science College, Patna
**Faculty, P.G. Dept. of Environmental Sciences, A. N. College, Patna

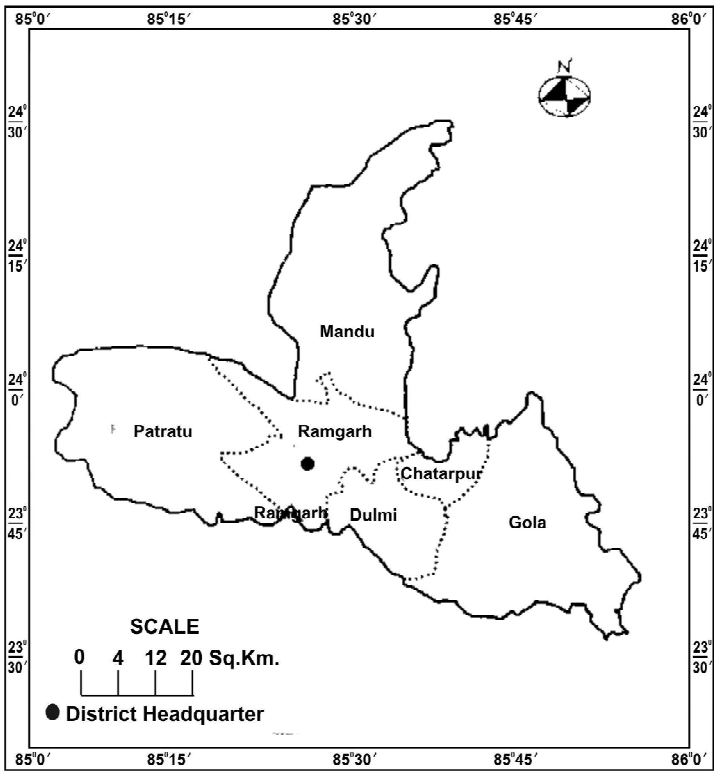

Fig.1 : Administrative Map of Ramgarh District, Jharkhand

Specific conductivity and pH values were measured in the field itself using Portable conductivity and pH meter. Titration method was used to determine the concentration of bicarbonate. Major anions mainly chloride were estimated through Ion chromatography. Major cations (Ca, Mg, Na, K) were measured by Ion chromatography. For heavy metals, AAS was used. (APHA, 1992)

GEOLOGY OF THE AREA :

The area is quite accessible for geological surveying and mapping due to availability of many mettelled and non-metteled roads.

Geologically, the area consists of Biotite granite gneiss, Migmatite Augen gneiss, Porphyroblastic granite gneiss, Hornblende granite gneiss and Epidote granite of Pre-cambrian age.

Sandstone and shale of lower Gondwana formation with coal seams are also found in Ramgarh District.

At few places Felspathic/ micaceous quartz schist, phyllite, mica schist, crystalline limestone and calc. silicate rock, Boulder bed sandstone, shale, dolerite, Amphibolite, horn blende schist, epidiorite, talc, chlorite schist are also exposed in different parts of the district.

Different types of folding were encountered in the study area. Small faults were also encountered in many parts of the district.

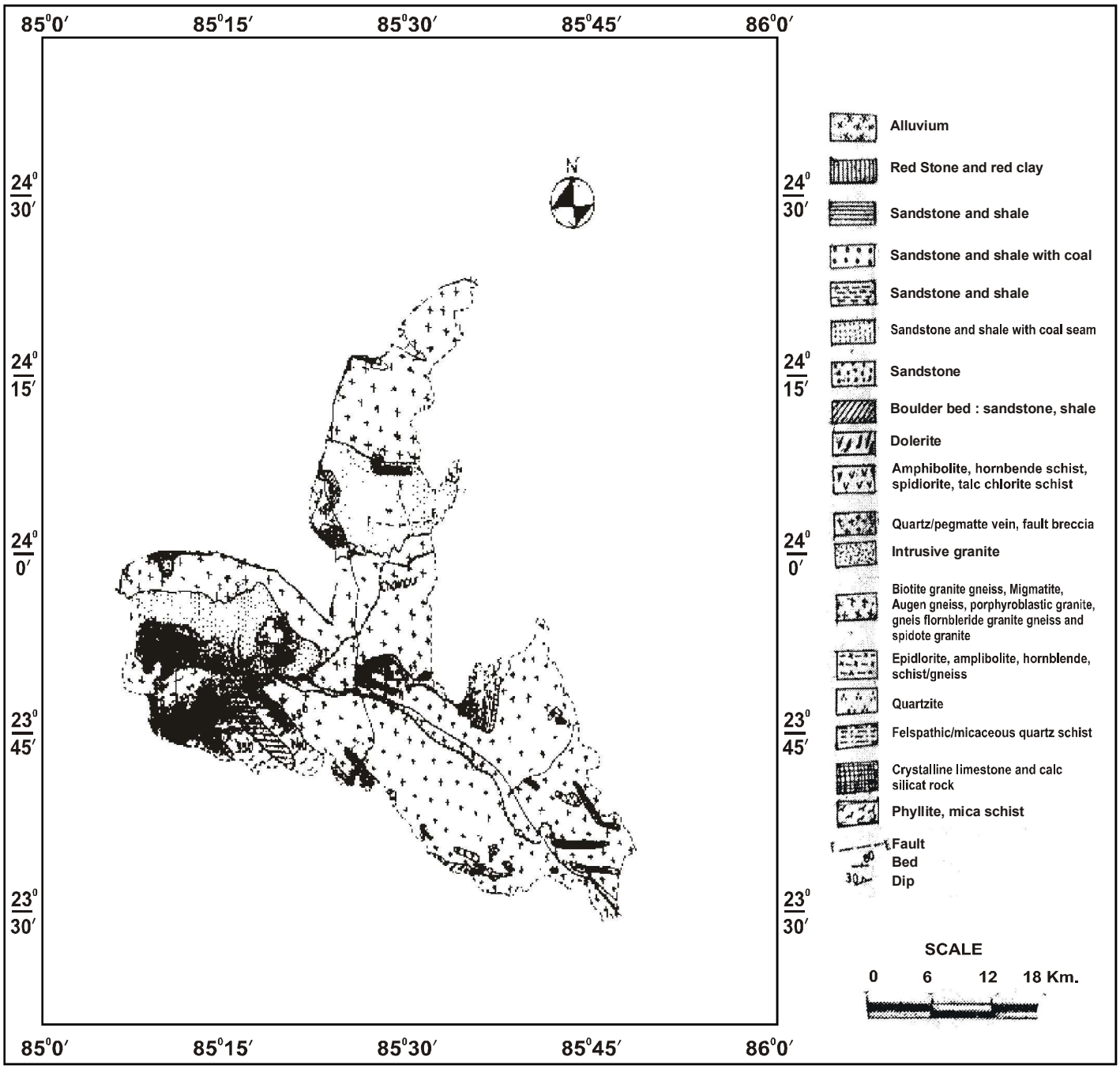

Fig. 2 : Geological Map of Hazaribagh District, Jharkhand

HYDROGEOLOGY :

Ramgarh district consists of two types of formations, consolidated (Confined) and semi- consolidated (Semi Confined). Approximately two third area of the district consists of hard crystalline rocks known as consolidated formation.

In coal field area which comprises mainly the lower Gondwana formation, groundwater occurs in the porous granular colluvial material and weathered mantle as well as in the joints, fissures and fracture (Srivastava, 1963).

The consolidated formation of the district which consists mainly of Pre- Cambrian formation, groundwater accurs either in the interconnected joints, fissures and fractures or in the weathered zone of alluvium.

ANALYTICAL STUDY :

From the analytical study it is found that the pH of the groundwater samples of the study area is slightly low (6.1, 6.2, 6.4) in some parts of the district where extensive coal mining occurs.

The concentration of calcium, magnesium, sodium and potassium in groundwater is caused due to the presence of Biotite granite gneiss and Hornblende granite gneiss in this area. Concentration of anions like chloride and sulphate present in goundwater is due to coal beds. During the calcification these anions get separated from the stratified decaying vegetation and dissolved in groundwater.

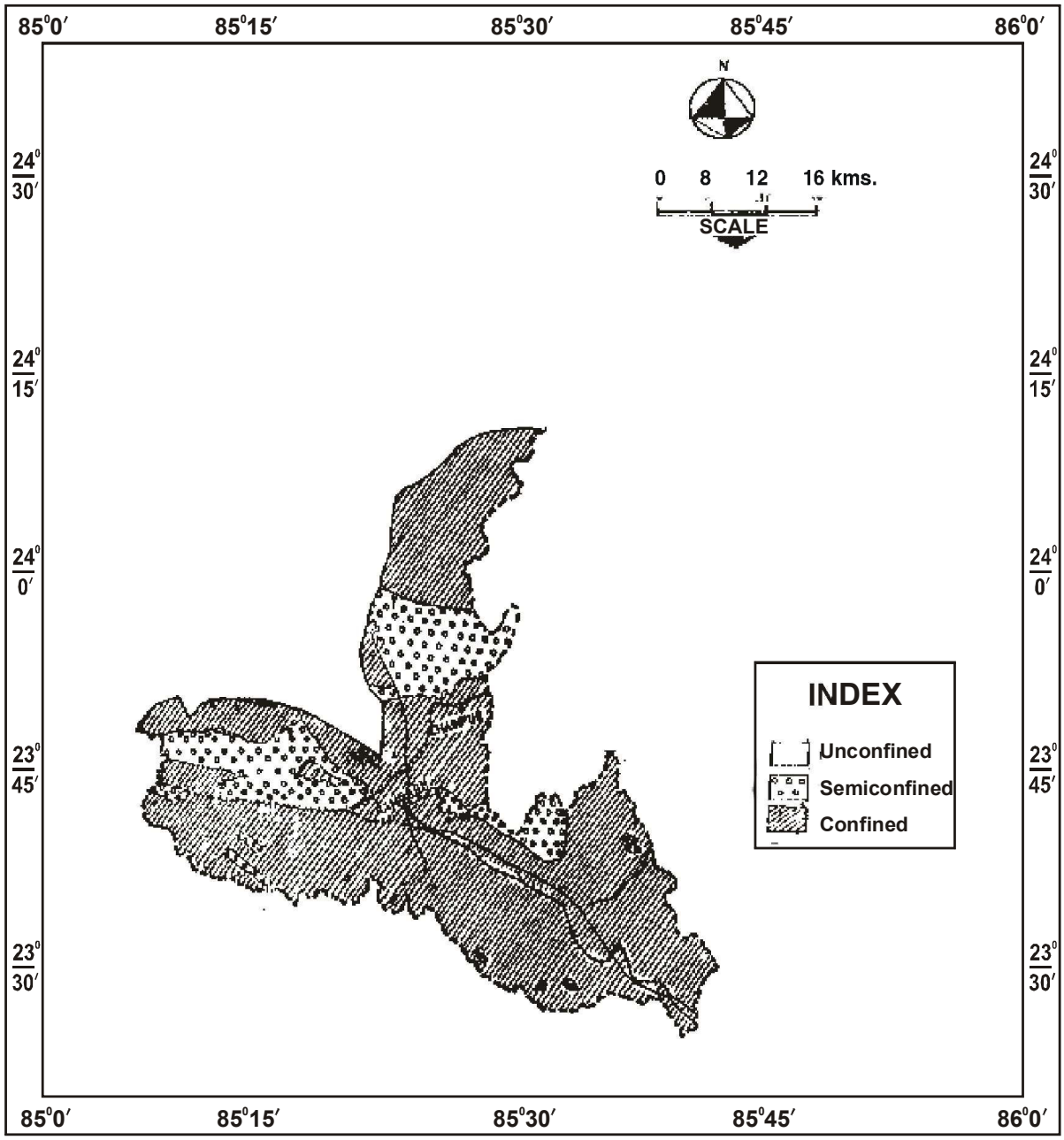

Fig. 3 : Hydro Geological Map of Ramgarh District, Jharkhand

The concentration of the calcium and magnesium is caused due to crystalline limestone and calcium silicate rocks which are exposed at few places.

The higher concentration of Pb (Lead) is found at few places in the study area. Higher concentration of lead is found in Patratu thermal area of Ramgarh district.

Lead (Pb) enters water bodies from industrial waste, mine and smelter discharges or from dissolution of old lead plumbing (Dey, 1986).

Higher concentration of lead can cause various problems to the residents of the study area like mental deficiency, chronic kidney infection, abnormal behaviour of problems, etc.

CONCLUSIONS

It has been observed that rise in concentration of heavy metals may be due to the close association of heavy metals with coal mining, industrial waste, heavy vehicular movement releasing large amount of oil and grease, and movement of machineries in the coal fields which pollute the groundwater to a large extent in Ramgarh district.

It is recommended that dumping of wastes from mines in valleys or depressed tracts or the sites of the mined area that constitute the basic sources of water supplies should be avoided.

Effluents from industries or washaries should be discharged into the groundwater system only after proper treatment (Kumar,1992).

The mine waste and ash waste form thermal power plants may be used in filling of the open cast quarried land and mine waste should not be dumped.

Ash waste from thermal power plants can be used in making cement, ash bricks and concrete, floor tiles, etc. in construction industry.

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