Original Article

GIS-Based Geological Mapping in Achanakmar-Amarkantak Biosphere Reserve, Central India

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ABSTRACT

Present Research is focused to investigate the objectives for determination of indicators, to identify the surface rock exposure through GIS. The present study is motivated by the idea to develop a method in which GIS data is used in order to optimize future investments; GIS have played a major role to establish the geological mapping foundation. Purpose of the current study is to analyze the rock distribution and structural geology through most advanced techniques of GIS. With the application of GIS in geological mapping, it became very easy for surveyors to create maps for any area with precise and desired scaling. Application of GIS in geological mapping results in accurate measurements of study area. According to this research we prepare a whole account of geological framework of Achanakmar-Amarkantak biosphere reserve (AABR). Arc GIS 9.3 Software which aided a better option for visualizing the terrain and mapping.

Keywords: GIS, Geological mapping, AABR**,** Biogeographic zone.

INTRODUCTION

A geological map (also called a geologic map) is a special map that displays the geological features of an area. Different colors (legends) are used to show the rock formations. The geological history of a region is a record of Earth's past events concerning to its geological, geographical and climatic life has undergone or witnessed. It also explains note of the effects of earth movements, the rocks of a district have experienced of different functions. According to Wadia[8], 'nature had a way of writing her own history in her rocks and stones …' or in other words, all these changes and events inscribed in the stratified rocks of a region or area Mehdiratta[4]. It traces the evolution of the earth and its inhabitants through the records left in the rock sequences in different regions Mukarjee[6].

The study area forms a part of Biogeographic zone of 6 and Biogeographic province 6a (Deccan peninsula, central highlands) in Achanakmar-Amarkantak

Biosphere Reserve in Anuppur & Dindori district in Madhya Pradesh and Bilaspur district, Chhattisgarh. This research first time tried to establish a complete geological account of biosphere reserve with map.

As per the geological map the major rock types in the area are unclassified granites & gneiss, Basalt Flow (Deccan Traps), Unclassified Metamorphics, Unclassified shale & limestone (Raipur Group), Sandstone & conglomerate (Chandanpur Formation) and Laterite etc. These rocks have been folded, faulted and thrusted as consequences of different tectonic episodes.

For preparing the geological map of the study area, the geological map of Sutluj and Beas valley Mishra[5], has been taken as a basic data. The study area was digitized in Arc /Map GIS domain as shown in Fig.2 and details of area in table no.1 & 2.

Study area

The Achanakmar Amarkantak biosphere reserve lies between lat. 22° 15' N to 22° 58' N and long. 81° 25' E to 82° 5' E, having an area 3835.51 sq. km, partly falling in Madhya Pradesh and partly in Chhattisgarh state. The area falls in almost northern part of Biogeographic zone of 6 and Biogeographic province 6a (Deccan peninsula, central highlands). Out of the total area, (68.10%) lies in Bilaspur district followed by Anuppur (16.20%) and Dindori (15.70%).The protected area, Achanakmar Sanctuary (AWLS) is located in Bilaspur district, within the area of the Biosphere Reserve. The sanctuary has a total geographical area of 551.15 sq. km.

Presently the Achanakmar-Amarkantak biosphere reserve has been divided into core and buffer zones area only. The entire area of 551.15 sq. km of Achanakmar sanctuary has been designated as core zone and remaining area of 3284.36 sq. km serves as buffer zone. Out of this an area of 1224.98 sq. km. falls in Madhya Pradesh and the rest of the area of 2059.38 sq. km. fall in Chhattisgarh state. Fig-1 shown the details of the study area.

MATERIALS AND METHODS

District Resource Map (GSI) on 1:250,000 and topographic sheets no. 64F/5, 64F/6, 64F/7, 64F/9, 64F/10, 64F/11, 64F/13, 64F/14, 64F/15, 64J/1, 64J/2, and 64J/3 were used in this study.

METHODOLOGY

The study work will be carried out systematically in the following.

- Ground trusting for mapping and other detail.
- Base map preparation through topographic map.
- Incorporation of other thematic detail through topographic map for final map preparation
- Information transfer to base map.
- Field investigation and correction.
- Preparation of geological map on 1:50,000 scales through SOI toposheet.
- Analysis using GIS.

RESULT AND DISCUSSION

Achanakmar-Amarkantak biosphere reserve (AABR) hosts a wide variety of minerals found associated with igneous, sedimentary and metamorphic rock formation. A few of them form large economic deposits while a number of other minerals are reported as occurrences. Large deposits of Iron ore, Limestone, Dolomite and Bauxite are located in parts of the Chattisgarh State. Details of result shown in table no. 1, 2 and figure 2.

CONCLUSION

The geology of the area is unique, varied from schists and gneisses with granite intrusion rocks, sand stones, shales, limestone, basaltic lava and bauxite. The soils of the Achanakmar - Amarkantak BR vary in composition and texture from sandy to loamy-clays, generally light brown to brownish yellow in colour. An olive green clay zone up to 5 mm sometimes exists at some places where marshy conditions develop due to poor seepage in these areas. Red soils (due to presence of iron oxide), which is porous and fertile, also occur in some places. Deposits of alluvial soils are also seen on the banks of numerous streams in the tract. The black cotton soil exists in many areas of Achanakmar - Amarkantak BR.

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Table 1. Areal estimation of geological formation in AABR

Lithology	Area(sq.km)	Percentage (%)
Laterite	166.30	4.34
Diamiclite sandstone, shale, conglomerate (Talchir Group)	24.00	0.26
Lateritic Soil(Alluvial)	76.00	1.98
Laterite/Bauxitic laterite	24.00	0.63
Maniari Tank(limestone, arkosic, sandstone)	47.24	1.23
Basalt Flow (Deccan Traps)	1160.21	30.25
Quartz and Pegmatite veins	9.04	0.24
Dolerite and basic intrusive	5.03	0.13
Sandstone & conglomerate (Chandanpur Formation)	30.07	0.78
Unclassified shale & limestone (Raipur Group)	143.71	3.75
Unclassified Metamorphics	599.23	15.62
Boulder bed, sandstone & shale	45.57	1.19
Unclassified granites & gneiss	1519.11	39.61
Total	**3835.51**	**100**

Table 2. Lithological characteristics of AABR

Lithology	Age (GTS)	Nature & Characteristics
Laterite	Cainozoic	Reddish brown, hard and massive
Basalt	Upper Cretaceous to Ecocene	Dark grey, fine to medium grained, hard and compact volcanic rock.
Sandstone, Shale	Lower Permian	Buff & Khaki green shale with splintery fragments. Greyish white, fine to medium grained sandstone.
Shale, Limestone	Meso-Neo Proterozoic	Purple, pink and light grey, medium to fine grained, hard and compact shale; grey, fine grained limestone with intra-formational conglomerate.
Quartz Veins	Meso-Neo Proterozoic	Medium to coarse grained acid intrusive composed of quartz, feldspar and mica.
Dolerite Basic Intrusive	Meso-Neo Proterozoic	Grey hard and compact dolomite.
Granite, Gneiss	Archaean to Proterozoic	Grey, medium to coarse grained granites, grey to dark grey, medium to coarse grained biotite gneisses.
Metamorphic Complex	Archaean to Proterozoic	Grey to dark grey, fine grained.

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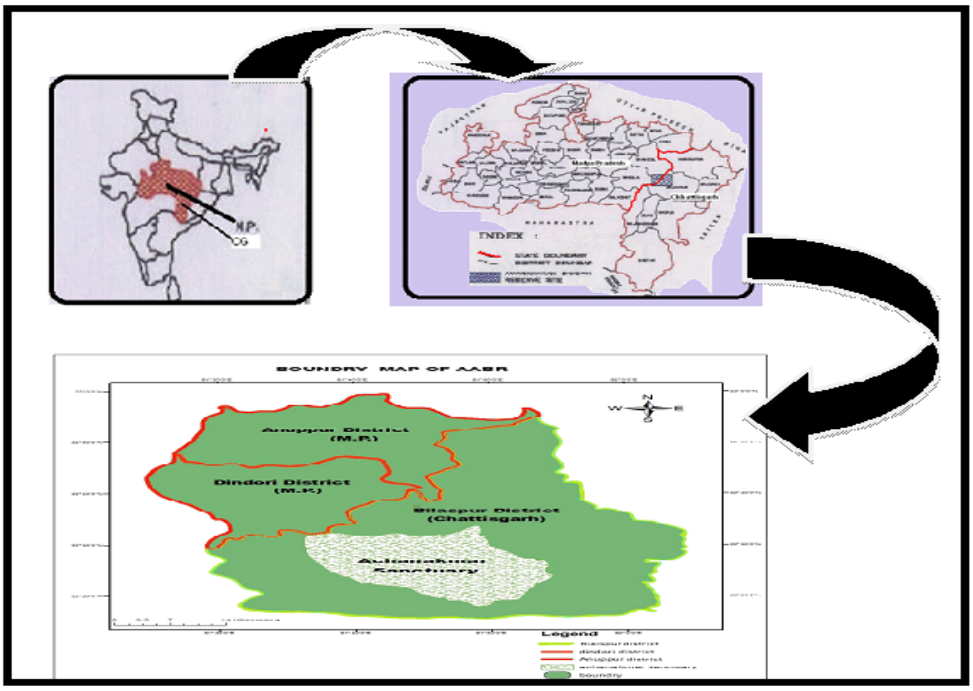

Figure 1. Location Map of study area

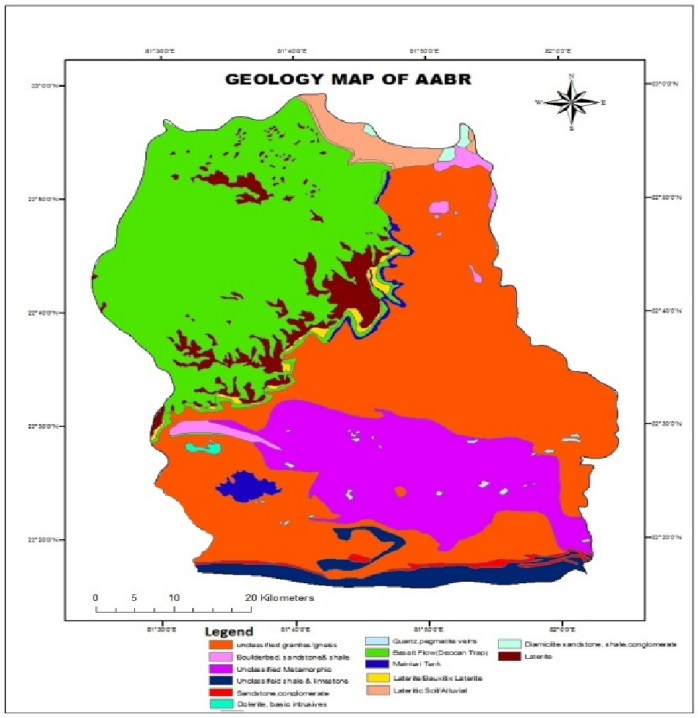

Figure 2. Shown geology map of AABR