Chapter II

Geology
To explain the evolution of landforms of a region it is very important to have the understanding of geology of the area.

The important parameters in understanding landforms of an area are

(i) Structure;

(ii) Process; and

(iii) Stage.

In present study all three parameters will be given due importance. Geology constitutes one of these three constituents of the geological formations influence the evolution of land forms in any specific area. They also determine the quality and quantity of mineral sources, drainage system and also the nature of soil. The geological conditions indirectly also determine the quality and quantity of forest resources and the agricultural produces.

The study area lies in the heart of the Narmada-Son valleys which have been unstable ever since the early part of the earth history. This is suggested by the disturbed geological beds and by the fact that no Gondwana rocks are found in the areas north of this region. Similarly no Vindhyan outcrops have been found south of this valley.
Murwara basin comprises of the rocks formed during purana age of geological time scale.

They include rocks belonging to Mahakoshal Group, Vindhyan Super group, Gondwana Supergroup, Mahakoshals and Vindhyans and also over Tertiary rocks. The Stratigraphic succession of the study area is presented in Table 2.1.
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<td>Dolomites, limestone with bands of Banded Iron Formation mnhcet quartzite and meta basalt pyroclastics</td>
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MURWARA BASIN
GEOLOGY

Source: Geological Survey of India, 2001
MAHAKOSHAL GROUP

The Mahakoshal group of rocks are Palaeo–proterzoic in age and are about 1800 ma to 2700 ma old. The rocks comprise sequence of quartzite interbedded with metabasics which are overlain by thick sequence of dolomites with chert interbeds. Dolomites are interbedded with metavolcanics and phyllite and a few quartzite bands also occur in the dolomite. BIF (Banded Iron Formation) and BFC (Bhitigarh Formation Conglomerate) bands are prominent towards the northern side. This sequence has been called as Sleemanabad formation (Roy and Devarajan, 2000). The sleemanabad formation is overlain by a sequence of clastic rocks comprising phyllite and quartzite. Thin conglomerate band has been reported towards the base separating the younger unit from the older formation. This sequence has locally been given the name of Bhitigarh formation. A comprehensive account of the lithostratigraphy and structure has been given by Jain et al. (1995), Nair et al. (1995), Roy and Bandyopadhyay (1990) and Roy and Devarajan (2000). However, due to complexity of structure and litho assemblages a comprehensive lithostratigraphic model is yet to be evolved.

Mahakoshal have suffered three phases of deformation. The first, two show regional ENE–WSW trend in this region. The structural
aspects in details have been covered by Roy and Bandyopadhyay (1990), Jain et al. (1995) and Nair et al. (1995), Mishra (1992), Arora et al. (1995) and Das and Mall (1995). Some of the earliest memoirs published by Geological Survey of India deals with the geology of this part of Central India (Medlicoff, 1860, Oldham, 1860).

Mahakoshal Supercrustals have been intruded by serpenitised ultra-mafic bodies of dunite-peridotite-pyroxenite composition.

Mahakoshals have been divided into two major formations. The older one is called Sleemanabad formation and consists of dolomite, metabasalts, chert, BIF, phyllite and quartzite. This is overlain by younger Bhitigarh formation which comprises quartzite and phyllite sequence. There is a prominent conglomerate band at the contact of these two formations.

**SLEEMANABAD FORMATION**

This group consists of the following rocks:

1. *Dolomite with rare intercalations of Phyllite:*

Dolomite with rare intercalations of phyllite is very well developed in the south-eastern part of the study area. The unite is dominated by well bedded light grey to greyish white occasionally pink and
purple, hard and compact crystalline dolomite with rare thin
greenish grey phyllite intercalations Greenish grey to dark grey
phyllites intercalations are well foliated and vary in width from 3
cm to as much as 30 cm. paper to cm. thin light grey, pale and
dark grey chert interbands defining the trend of bedding in
dolomite are frequently noticed. Dolomite exhibits typical elephant
skin weathering. The availability of out crops in this unit is very
poor.

(2). **Intercalations of Phyllite and dolomite:**

Phyllites on their own do not form a mapable lithounit. However, 1
cm. to as much as 3 m thick khaki, dark purple and greenish grey
intercalations of phyllites with dolomite have been reported in the
southern and south eastern parts. Phyllite bands show a discrete
contact with dolomite and always has a foliated nature.

(3). **Metabasalts:**

The metabasalts of Mahakoshal group are observed in the ENE-
WSW trending hill ranges of the region. The metabasalts are also
exposed in the peneplained parts of the area. The rock is essentially
of basaltic composition which has been metamorphosed. The rock
shows vesicular top, underlain by massive basalt.

(4). **Bended Iron Formations:**
A number of banded iron formations are exposed in the northern part of the area.

The BIF forms prominent ENE-WSW trending ridges and is interbedded with dolomites or with phyllite.

(5). *The Quartz Veins:*

Quartz veins have been reported at a number of places of the study area. Quartz veins are generally milky white to greyish white in colour and exhibit rare limonitisation, sheet like bodies of milky quartz represented generally by a large spread of rubbles.

(6). *Quartz Porphyry dykes:*

Quartz-porphyry dykes have been noticed in the central parts topography. They are intermittently exposed in an en-echelon pattern for a strike length of nearly 780 m cutting across the regional trend of the country rock. In north these dykes/veins continue further beyond the present area of investigation whereas they terminate in south in the central part.

It is a light greenish grey, very hard and compact, sheared inequigranular rock with phenocrysts of generally transparent quartz rarely feldspar set in a fine to medium grained greenish grey siliceous ground mass. Quartz porphyry dykes show alteration and
fineness in grain size at the contact with dolomite. Specks of pyrite rarely chalcopyrite and fluorite are occasionally seen.

(7). Basic dykes:

Very thin underformed basic dykes occurs in the regions.

These dykes are phritised. Individual crystals of pyrite vary in dimension from a few mm to as much as 1 cm.

The dykes are very fine grained, greenish black in colour, hard and compact.

BHITRIGARH FORMATION

Bhitigarh formation comprises of a sequence of phyllite and quartzite. Some times thin metabasalt flows are also observed in this formations. These includes following rocks.

(1). Conglomerate:

This conglomerate separates Sleemanabad and Bhitigarh formations and is exposed as a subvertical ridge in Shahdar area. The conglomerate consists of fragments of vein quartz, Jasper chert and some unidentified rock fragments.
Near Shahdar area big systematic trenches are observed in this rock indicating that the conglomerate may be containing some precious minerals.

(2). **Phyllite:**

The phyllite is grey and dirty white in colour and shows conspicuous pinching and swelling. The unit occupies a major part of the Bhitrigarh hill. It is also interrelated with thin white quartzite bands.

(3). **Quartzite:**

Quartzites are massive, thickly bedded and white in colour and form prominent ridges. The rock comprises of very high amount of quartz. Ferruginisation of these quartzites have given rise to reddish colour.

Best exposures of these quartzites are recorded near the village Pan Umaria where it also forms a syncline.

**VINDHYAN SUPERGROUP**

Vindhyan supergroup of rocks are exposed in the western and northern part of the area. "The Vindhyan system is a vast stratified formation of sand stones, Shalles and lime stones comprising a thickness of over 14,000". This system is very prominent in the
Location of Murwara Basin in the Vindhyan Basin

region under study because it covers a major portion of the area. It has its specific topographic importance.

In Wadia’s words “The east India railway now called (central railway) from Katni to Allahabad passes through the heart of the Vindhyan country”.

In the south–west of Katni, the lime stone, disappears and only Bijawars rocks are found.

The Vindhyans consists of two divisions:

(1) Upper Vindhyans (Maihar)

(2) Lower Vindhyans (Vijaraghogarh)

The study area may again be divided in the two part–

(a) Part consisting at North–North East, North–West making the upper Vindhyan sand-stones.

(b) Area other than the above area i.e. the area south to Murwara and Vijaraghogarh south to it consists to lower Vindhyans

The lower Vindhyans are calcareous in nature and are found distributed in Murwara block to a major extent.
Alluvium formed by surface runoff process

A view of Vindhyan rocks near Katni town
The rocks have been classified into three major groups i.e. Kaimur group, Rewa group, and Bhandar group.

**KAIMUR GROUP**

Kaimur group is represented by a sandstone unit which lies in the extreme south of Vindhyan exposures and forms a prominent hogback.

The exposures of these rocks are observed in the north-eastern part of the area. The sandstone is white, dirty white, grey and slightly pinkish. It is thickly bedded with intercalations of siltstone.

**REWA GROUP**

Rewa group is represented by a lower shale unit called Jhiri shale and the younger unit known as upper Rewa sandstone Jhiri Shale is pink and green coloured 10 to 25 meters thick unit. Due to its susceptibility to erosion many exposures of this unit are not observed.

Upper Rewa sandstone forms a prominent cuesta/hog back with southern escarpment face. The sandstone is pink coloured thickly and thinly bedded sandstone and is about 30 meters thick.
BHANDER GROUP

Bhander group of rocks are the most dominant unit in the study area and are exposed in the northern part. The basal unit of this group is Ganurgarh shale which is pink, green and black in colour and has variable thickness.

The shale is overlain by a limestone unit. The limestone is grey to greyish white in colour, thickly bedded. This limestone is used for making of cement and ‘Chuna’. Around the village of Jhukehi a number of limestone mines are observed.

The limestone is overlain a pink and green coloured shale unit which shows strong pinching and swelling unit.

Upper Bhander sandstone is the youngest lithounit of the Vindhyans. The sandstone forms prominent cappings over sirbu shale and is observed in the form of mesa and butte with prominent scarps. Lower Bhander cover a larger part of the Murwara basin.
View of the Bhandar rocks north of Murwara basin

Inclined joints in the Vindhyans near Niwar
DECCAN TRAPS

Basaltic flows of Deccan Trap are observed in the south-eastern part of the study area, i.e. Murwara basin and form horizontal basaltic flows. The flows overly Mahakoshal group of rocks and granites with a distinct erosional unconformity.

In this district it is found principally along the south eastern border approaching very close to Jabalpur town.

LATERITE FORMATIONS

This forms irregular patches, with a roughly horizontal base resting on the older Dharwar and lower Vindhyan rocks, and to a less extent on the upper Vindhyan.

Laterite, which is most widely spread Pleistocene formation of the Indian Peninsula, is derived from the dolerite and basalt of Deccan Trap formation. It is formed by the alteration of the Deccan Traps.

It is said to be a kind vesicular, compact rock, composed mainly of a mixture of the hydrated oxides of alumina and iron with small percentage of manganese and titanium oxides (Wadia 1970; 398). It is tinted with red and purple when ferruginous and when aluminous coloured grey or pink.
The origin of laterite are the result of prolonged monsoon conditions, the ultimate products of decomposition are silicates, alumina and iron oxides.

The thickness of the laterite horizon varies from a few meters to as much as 27 meters.

At places, soil cover upto 4 meter is found on laterites, which supports the forest growth and paddy fields. The laterite exhibits the vertical and horizontal joints.

The use of laterite as an ore of iron and as road building material is also common in the region.

In contrast, most of the laterite formed plateau and ridges are usually bare of soil and expect small scattered bushes and shrubs it is completely devoid of vegetative cover.

This is due to the highly porous nature of laterite which permits the top most layer to retain very little moisture to support any biotic growth.

The laterite deposits are economically significant as the source of alluminium, Bauxite is practically the only ore used in the production of metallic alluminium. It is most abundant in the Murwara basin, but it is also found commonly in the Sihora tahsil.
The lateritic masses of this district do not consist entirely of ordinary rock laterite.

There are also layers of course and fine ferruginous sand stones of red, white and purple clays and of rich oolitic iron ores and high grade bauxites.

The foregoing account applies to the main masses of laterite are found in the neighbourhood of Katni in the Murwara basin in the country round Sihora and Gosalpur.

**KATNI FORMATION**

To the east of Katni town, on Katni-Shahdol road, a thick sequence of shale and sandstone in exposed. The base of the formation comprises of a conglomerate having quartzite Pebbles and bauxite pebbles. The overlying sandstones and shales show evidences of lateritisation and bauxitisation.

**SOILS AND ALLUVIUM**

Alluvium of Quaternary age is dominant along the river course of Katni river. At places the alluvium has a thickness of more than 15 meters. Due to peneplanation of the study area extensive development of in-situ and transported has taken place in the north central part of the study area.
These recent superficial deposits of alluvial, generally, are found in strips along the bank of rivers and streams, because the rivers and streams have denudative nature in the upper course and deposit their sediments along the banks.

Though the alluvial deposits do not carry economic importance there presence in soil increases the fertility of the soil hence the area where the alluvial deposit are found are rich fields of wheat, rice and other crops.

**Dharwars**

These rocks form a central strip to the district. The south-west portion of the strip of Dharwars.

In the neighbourhood of Katni it is offer capped by laterite. This formation was formerly regarded as of Bijawar age but it is now thought to be much older and equivalent to the Dharwars of southern India.

In the country round Sleemanabad, Quartz veins some times containing minerals of value, often traverse the Dharwars.

In the country round Sleemanabad, where the veins contain copper, lead, silver, gold and barytes and are associated with veins to quartz-porphyry containing fluorite.
REFERENCES


Geological Map of India supplied by extended cooperation of G.I.C. office Jabalpur.


