

### **PROTEROZOIC BASINS OF INDIA - VINDHYAN BASIN**

The Vindhyan Basin is the largest Proterozoic intra-continental basin in central India that occupies an area of ca. 1,20,000 sq. km. and attains a huge thickness of ~ 4500-5000 m . In addition, about 80,000 sq km is overlain by the Deccan traps in the southern and south-western region and in the north about 10,000 sq km is covered by the Gangatic alluvium (Mathur, 1987). The rocks are characteristically developed in the Son Valley and in parts of Rajasthan, Madhya Pradesh and Andhra Pradesh (Figure-1).

Oldham (1856) was the first to use the term 'Vindhyan' for the entire group of rocks forming a prominent feature along the northern bank of Narmada River known as *Vindhya Parbat* or *Vindhyanchal*.

The rocks are primarily unmetamorphosed and undisturbed to moderately disturbed sedimentary sequences deposited unconformably over the crystalline basement of gneisses, granites and schists having low angle dips. The unconformity between the crystalline basement and the Purana basins is known as the Eparchean Unconformity. The lower part of the system is made up of calcareous, argillaceous sediments with glauconitic beds and volcanic deposited in the marine environment while the upper part consists of arenaceous sediments of fluvial and estuarine environment. The Lower Vindhyan and Upper Vindhyan units are separated by multiple unconformities of undetermined duration (Bose et al., 2001). These sediments were deposited episodically, with frequent breaks in sedimentation over a time span between 1600 and 1000 Ma, a period of 600 my.

The evidence of life is seen either directly (megafossils) or indirectly (microfossils) (Venkatachala et al., 1996). Among the important megafossils are the various species of *Chuarina* and *Tawuia* in Semri, Rewa and Bhandar Series. Microfossils found in Semri and Bhandar Series are a number of cyanobacteria, algae, acritarchal remains.

#### **Stratigraphy**

Auden (1933) gave a comprehensive stratigraphic framework of the Vindhyan succession exposed in the Son Valley. He subdivided the succession into four equal series namely the Semri Series, the Kaimur Series, the Rewa Series and the Bhandar Series (Table-1).

[Following the recommendations of the Code of Stratigraphic Nomenclature, majority of the workers replaced the term 'Series' with 'Group' and gave the Vindhyan System the rank of a Supergroup. Traditionally, the Semri Group is referred to as the Lower Vindhyan and the Kaimur, Rewa and Bhandar Groups as the Upper Vindhyan. Upper Vindhyan enclose two diamond bearing horizon, from which Panna and Golconda diamonds have been mined. The upper and lower Vindhyan supergroup are separated by unconformity.]

#### **Semri Series/Group**

The Semri series is the oldest of the Vindhyan System and is best exposed in the Son Valley area, Central India where it unconformably overlies the phyllites of the Bijawar Series. Auden (1933) divided it into four stages as the Basal Stage, the Porcellanite Stage, the Kheinjua Stage and the Rohtas Stage. The thickness of this group is about 3694 m (Meert et al., 2010).

### Kaimur Series/Group

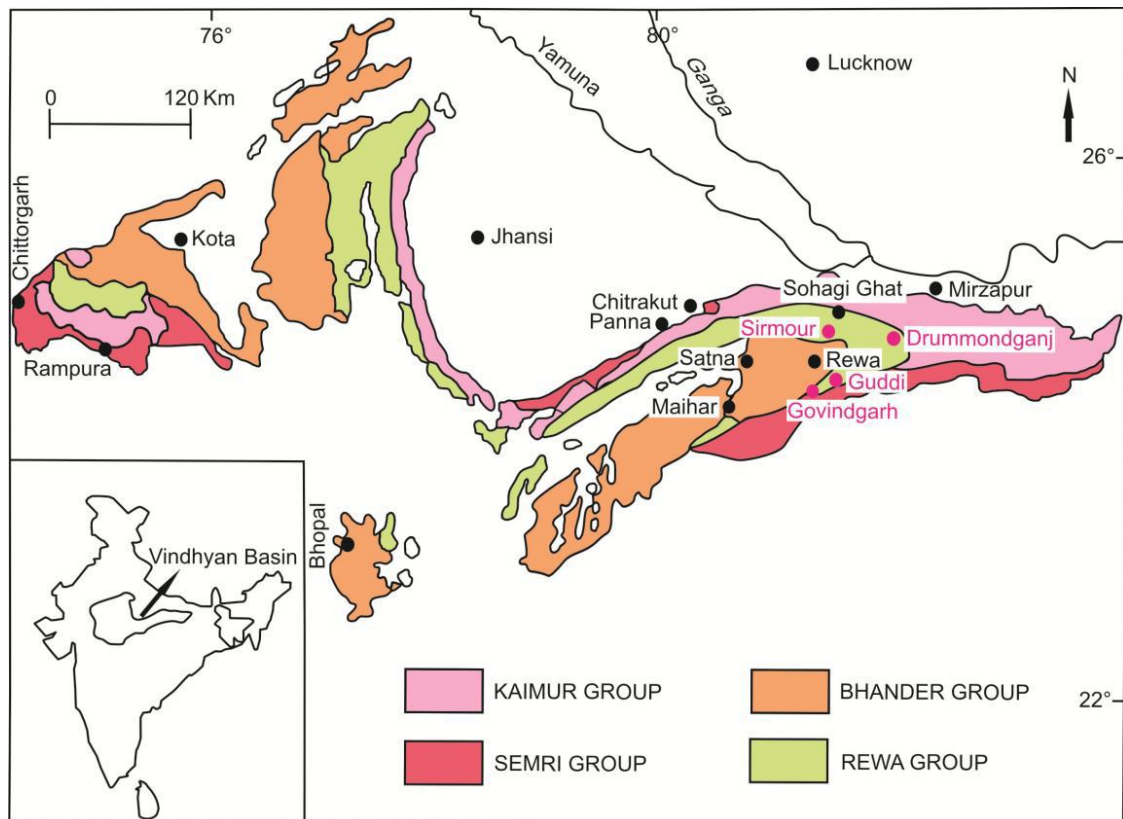
The is named after Kaimur hills in M.P. There is well marked unconformity between Kaimur and Semri Series. This group attains a thickness of 400 m and is characterized by argillo-arenaceous rocks. The sequence begins with conglomerate (containing pebbles of Jasper) and shale which is succeeded by the Susnai breccias, upper Kaimur sandstone and quartzites, the Bijaigarh Shale, Upper Kaimur Sandstone, scarps of sandstone and conglomerate and finally Dhandraul quartzites. This is the only horizon which can be traced from the eastern to the western part of the Vindhyan Basin. Thus it can be considered as marker horizon.

### Rewa Series/Group

The name Rewa is derived from a Rewa town in Madhya Pradesh in Central India. The Rewa Series occupies the middle position in the Upper Vindhyan. The rocks of the Rewa Series are exposed all along the synclinal exposure belt of the Vindhyan Supergroup in the Son Valley. This Series is composed of sandstones and shales. It contains kimberlite derived diamondiferous conglomerates (Bose et al., 2001). Carbonaceous megafossils *Chuarina circularis* and *Tawuia dalensis* have been recorded from the shales of this group (Rai et al., 1997; Srivastava, 2004).

### Bhander Series/Group

The Bhander Series is the youngest of the Vindhyan System with several carbonate units. This group is extensively developed in south-eastern Rajasthan and adjoining M.P. It attains a thickness of about 1200 m according to Meert et al. (2010) and comprises five formations starting from the Ganurgarh Shale, the Bhander Limestone, the Lower Bhander Sandstone, the Sirbu Shale and the Upper Bhander Sandstone. It is represented by shales, sandstones and limestones.



**Figure 1-** Location and geological map of the Vindhyan Basin (modified after Krishnan and Swaminath, 1959).

**Table 1-** Stratigraphic succession of Vindhyan System (after Krishnan, 1968).

SYSTEM	SERIES	STAGE	
	Bhander Series	Upper Bhander Sandstones	
		Sirbu Shales	
		Lower Bhander Sandstones	
		Bhander Limestone (Nagode)	
		Ganurgarh Shales	
	Diamondiferous	conglomerate beds	
Upper Vindhyan	Rewa Series	Upper Rewa sandstones	
		Jhiri shales	
		Lower	
		Panna shales	
		Diamondiferous	conglomerate beds
		Kaimur Series	Dhandraul Quartzite
		Scarp Sandstone and conglomerates	
		Bijaigarh Shales	
		Upper Quartzite and sandstone	
		Susnai breccia	
		Lower Quartzite and shale	
	<i>Unconformity</i>		
Lower Vindhyan	Semri Series	Rohtas Stage	
		Kheinjua Stage	
		Porcellanites Stage	
		Basal Stage-	
		Kajrahat Limestone	
		Basal Conglomerate	