

## THE KEN AND ITS GORGE-SOME EXPLANATIONS

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**ABSTRACT :** The Ken river, a tributary of Jamuna, rises from Bhandar plateau and drains the Sagar-Damoh plateau. Across the Panna range its drainage is discordant with the topography. From the northern scarp of the Bijawar-Panna range there is a gentle slope towards the center of the plateau. But the Ken flows against this slope and crosses the range through a 60 km long gorge. It is 500' -600' deep. From the field study, landsat imageries and the detailed maps it seems the river Ken has captured the drainage of the Sagar-Damoh plateau and after the removal of the Deccan Trap the river has been superimposed on the Vindhyan sandstone.

The Ken river is one of the major tributaries of Yamuna. It rises from the Bhandar-Vindhya range and drains the Sagar-Damoh plateau. This upper basin designated as the Sonar-Bearma Basin has been studied by Rai (1980). After the confluence of the Sonar and Bearma, the Ken enters Panna district and crosses the Panna-Bijawar ranges and after traversing the 'Yamunapar' plain on the Chhatarpur upland it falls in Yamuna. Across the Panna-Bijawar range the Ken flows through a deep gorge and here the Gangau dam was constructed ( $24^{\circ}30'$ - $25^{\circ}$  and  $79^{\circ}30'$ - $80^{\circ}30'$ ). In the west the watershed of the basin is between the Dhasan and the Ken and on the east it is bounded by the Rewa plateau and the river Tons (Fig. 1).

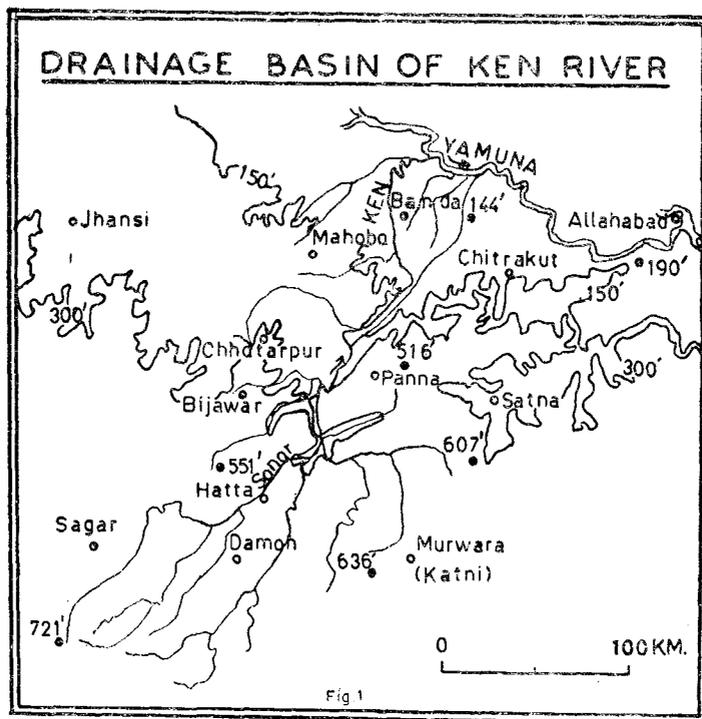
In the lower basin the Ken drains the Chhatarpur upland which is essentially composed of Bundelkhand gneiss. In the south the upland is bounded by the Panna-Bijawar range and backed by the Damoh-Rewa plateau. This region is composed of Bijawars and Vindhyan. In the north

the Bundelkhand gneiss is buried under the alluvium. Similarly the Rewa plateau again has a soil cover. The maximum height in the above-said ranges is 1744' but the 'Yamunapar' plain gradually descends northwards where the minimum height is 889' (Fig. 3).

### Geology

#### The Bundelkhand Granite and Gneiss

The northern part of the lower Ken basin consists of Bundelkhand granite and gneiss which generally forms the lowland and looks like a typical peneplain. It is generally a pink granite, the foliation being very crude, if at all developed. At places gneisses and schists also occur. These granites are traversed by basic dykes which run in SE to NW direction. Besides several granite and quartz reefs rise above the general level of the plain and run in SW-NE direction. These could be traced both on 1" maps and land-at imageries for miles together. These hills are the suitable sites for damming the rivers. The Bundelkhand country



therefore, has a very large number of reservoirs and ponds ( Fig. 2 and 4 ).

#### Bijawar Series

Between the Bundelkhand gneiss and the Vindhyan there is a belt of Bijawars which is broad in the west and narrows down near Ken and dies out in the east. The Bijawars include lillite, conglomerates, chert, jasper, breccia, quartz and dolomite. These are intruded by Traps. These are also effected by folding and overthrust. There is an unconformity between the Bijawars and the overlying Semri Series of the lower Vindhyan system.

#### The Vindhyan System

The Ken river in its lower basin drains the Vindhyan formations and cuts across almost all the members of this group. The main Rewa plateau consists of Rewa sandstone and Kaimur sandstone which in the centre is covered by recent alluvium.

In the northern scarpment, along the river course of Ken, the older members

of the Vindhyan are exposed. These are Rewa and Kaimur series of Upper Vindhyan system and Semri series of Lower Vindhyan. These consist of sandstones and shales and limestone. And unequal resistance to weathering has given rise to step like descent and the main scarp is now in the form of three parallel scarps. In every descent the wall-like scarp of sandstone is underlain by beds of shale. Correlating the geological character of the Vindhyan country with its topography Mathur and Shrivastava (1969-71) say " The topography of the area has a stepped landscape with linear step-like tablelands, each of which is capped by quartzite, belonging respectively to the Kaimur, Rewa and Bhandar group." These authors further analyse " The most characteristic feature of the Vindhyan is the presence of numerous escarpments all along the northern limits and also the contact of different groups. Each group is capped by quartzite. The commonest of escarpment exhibits an under

cliff with a vertical precipice above, the under-cliff of generally shale and the precipice of quartzite."

The scarps become further prominent by the gentle dip southwards. It is about 5° to 7°, where the river Ken plunges down these scarps it has made a long grove by headward erosion and vertical cutting. (Fig 2 and 4). On this northern margin the Vindhyaans are less disturbed than along the eastern margin along the Aravallis or the southern margin adjacent to the Narmada and the Son. In the southwest Vindhyan formations are overlain by the Deccan Trap.

The Bundelkhand granite is a batholith intruded into the Vindhyaans and according to Krishnan and Swaminathan (1959) must have covered the Bundelkhand granite massif.

**The Gorge of the Ken river**

The shape of the Ken basin is peculiar and the way in which it changes the direction of its flow attracts the attention. In the Bhandar and Rewa-Damoh plateau the Ken and its tributaries have spread like a fan or drain a semi-circular area. And normally it should have taken eastward course across the Rewa plateau and should have avoided the Panna-Bijawar ranges. But it crosses this range northwards through a very deep gorge. Besides on the southern slope of this range, facing the Rewa-Damoh plateau, it appears as if the river is flowing against the general slope. The feature is very evident even on the quarter inch map. From 1000' on the Rewa-Damoh pletau the height towards north (along the edge of the plateau) increases to 1580'-1600' and the Ken irrespective of this rise flows towards north. Here the gorge is 60 kms. long and 500' to 600' deep. After crossing the range the river takes a sudden eastwards turn, following the above said range for a long distance. Further downwards it again takes a right angle turn northwards to join the Yamuna. Along this lower part there

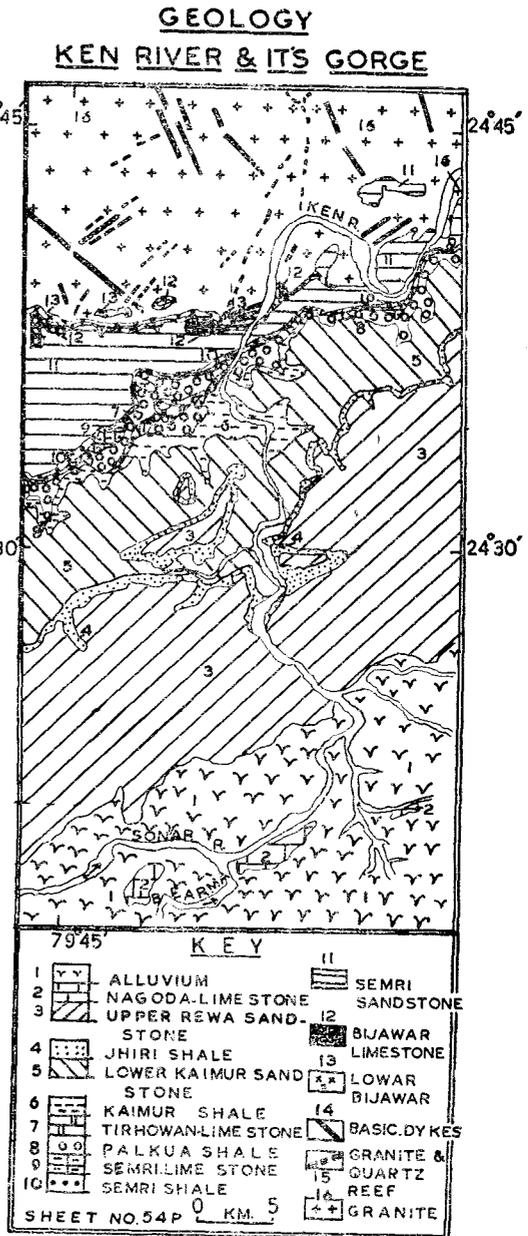


Fig 2

are a number of tributaries coming from the west but there is none from the east. East of the Ken itself the basin of river Baghain begins.

Thus, the ken has a very unconformable behaviour across the Panna-Bijawar range

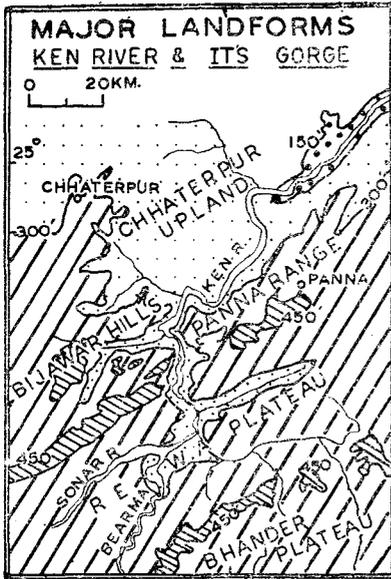


Fig. 3

But this is not an unusual feature of the northern tributaries of Yamuna. Chambal cuts across triple plateaus in Mandsaur, and Kota districts and similarly Dhasan and Betwa take their courses across Norhat range while flowing northwards.

**The Superimposition of Ken**

Frequent references are made that the Deccan lava flow covered a much larger area and after erosion the marginal areas have been exhumed. The present extent of the Deccan Trap is just west of the lower Ken basin. It seems, when the flow of lava ceased and it cooled down the present drainage developed on the Deccan Trap. West and Choube (1964) say "when the eruption of the Traps finally ceased, a new drainage would have developed on the surface of the last flows. This surface may have had a slight tilt to the north or north-east, for, as will be seen from Fig. 1, the entire drainage north of the Vindhyan range flows north and north-east into the Jamuna valley". The authors have also stated that around Sagar the flows of Deccan Trap have a slight tilt northwards (a matter of about 100 ft. in 25 miles). After the

removal of the Trap it seems the Ken has been superimposed on the Vindhyan exhumed surface. It has ignored the Panna-Bijawar range and has continued to flow across it towards north. The evidences of such superimpositions are still seen in the landscape of the Sagar-Damoh plateau; the southern vicinity of the region under study (West and Choube, 1964). Except the Ken not even a single river crosses the Panna ranges. The small streams, which perhaps are a recent phenomena, rise from the range and have developed a number of waterfalls before they join the Ken. This fact also supports the superimposition of the Ken.

It may not be out of place to mention that the Vindhyan formations in the Damoh-Rewa plateau, structurally are saucer-shaped and their dip in the Panna-Bijawar range is towards south, i. e. towards the centre of the said plateau. The saucer shape of the region has been explained by Dube (1965-67) while analysing the geomorphology of the Rewa plateau. Rao (1967) has also analysed in detail the structural characteristics of southern margin of the Rewa plateau overlooking the Son valley "The Archaeans dip dominantly to the south at average angles of about 70° where as Vindhyan dip to the north at an average angle of 30°, locally increasing upto 70° in areas of faulting". The saucer shape of the Vindhyan basin becomes evident from the dip directions mentioned above. Thus the rivers should have descended from the Bhandar and Panna scarps towards the centre of the Rewa plateau. And this is the direction

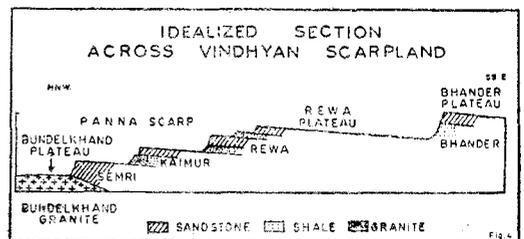


Fig. 4

of the small rivers descending down the Panna range which follow the dip direction. But Ken flows towards north, and has its course against the dip direction and the elevation of the Vindhyan and is in accordance with the Deccan Trap. Ken, therefore, seems to be a superimposed stream.

### The Capture of the Ken

As has been mentioned earlier, while crossing the Panna-Bijawar range the Ken and its tributaries make a peculiar drainage pattern. The tributaries of the Ken collect the water of the Bhandar plateau and the Panna range and thus make a fan-shaped drainage basin. Sonar and Mirhasan rivers collect the water of the Panna range and Bearma along with Patna drain the Bhandar plateau. After taking their water the Ken takes a right-angled turn and enters its gorge across the range. It seems at this point the capture has taken place. The Ken, it appears, has captured the upper reaches of the Tons river which has been beheaded and now only drains the Rewa plateau. Due to this factor the added water has accelerated the erosive power of the Ken and enabled it to flow across the range.

### The Rejuvenation and the Gorge

There is another factor which seems to have helped the Ken to flow across the Panna-Bijawar range by making a gorge across it. It has been analysed that this area has been subject to recent upliftment (Kumar and Rai, 1975). The imprints of this uplift have been studied by Rai (1969) who has identified several erosion surfaces around Sagar the Deccan Trap country which is the upper Ken basin. Thus it seems the river has been rejuvenated and with the added erosive power has entrenched into the range.

On the landsat imagery the southern edge of the Panna range is a straight line and extends from south-west to north-east for several hundred kms. and it looks like a fault. Although no fault has been reported

in the area and it needs further investigation. It seems when the force of compression was operating in the area the northern edge of the Vindhyan basin was tilted giving rise to Panna-Bijawar scarp and accentuated the erosion of the Ken river across this scarp.

Later in this range two new sets of streams developed. The streams at right angle to the Ken follow the strike of the Vindhyan formations giving rise to cuestas and deep gorges. The cuestas have steep slopes to the north and gentle to the south. On these back slopes of cuestas a large number of streams follow the dip direction and flow parallel to each other. These streams flow against the direction of Ken.

Doubts are raised that Vindhyan formations are hard formations and the Ken is not such a big river to make a gorge in which it is flowing at present. It is also suggested that the gorge of the Ken is older than the Deccan Trap and was filled by the lava. When the Vindhyan surface was exhumed the river occupied the old gorge. But the study of the Panna-Bijawar range does not support this view. As mentioned in the preceding paragraph, Ken river while crossing the range has developed a number of east-west flowing streams which follow the strike and also are guided by the lines of structural weakness of the country rock viz., the joints and cracks. Major tributaries in this part are Barana, Bane and Saimri which have cut deep gorges. If these seasonal streams are capable of dissecting the Vindhyan formations the Ken can make its gorge across the range. Besides, a number of other streams descending down the Rewa and Kaimur plateau in the north also flow through deep gorge. The only difference is that Panna-Bijawar is a prominent landform and is about 60 kms. wide, whereas the Binjha range is a low hill which Tons has traversed. The discordance in the erosive power between the Ken and its tributaries may be realized by the fact that

while flowing across this range the Ken has rocky bottom and a steep descent but does not make any waterfall. But its right and left hand tributaries plunge into the gorge through high waterfalls. There are four waterfalls of 30'-160' on the left wall and another four of 140'-170' on the right wall of the gorge. The country here is very difficult and there is no road leading to the Ken gorge. Hence the nature of the waterfalls could not be studied in detail. However, it

may be mentioned that while descending the Panna-Bijawar range if there was a waterfall in Ken, it has been smoothed out by the process of upstream retreat.

Thus, the present analysis explains the geomorphic processes which could have helped the formation of the gorge of the Ken river and the peculiar drainage the Panna-Bijawar of range of the central highland.

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