Chapter II

Study Area, Geology and Environment
THE STUDY AREA

The Nimar region that forms part of Central Narmada valley in Madhya Pradesh comprises the districts Khandwa (earlier district East Nimar), district Khargone and Barwani (both earlier part of district West Nimar) and district Dhar (Fig. 3). It is surrounded by districts Indore and Dewas on the north, district Harda in the east, district Burhanpur and bordering Maharashtra on the south, and district Alirajpur on the west, comprising mostly the low lying Deccan Trap area with the fertile alluvial belt of the Narmada in the centre.

Topographically (Fig. 2) the area can be divided into three broad physiographic divisions– (i) the Narmada valley with Vindhyan range, (ii) the undulating Deccan trap plain area and (iii) the fertile alluvial belt along the confining banks of the Narmada.

The present study area is the submergence area of the both the mega dams i.e. Narmada Sagar Project and Sardar Sarovar Project both of which are within the Nimar region (Fig. 1). The Narmada Sagar Dam Project will submerge 91,000 hectares of land and affect 254 villages, whereas the Sardar Sarovar Dam Project will submerge almost 40,000 hectares and 245 villages. Since the present investigation forms part of the salvage operation of the submergence area of these two mega dams, the study area was limited to the submergence area, a major part of Nimar region.
Figure 2. Physiographic & Location Map of Narmada (After Microsoft Map Point)

Figure 3. District Map of Madhya Pradesh (http://www.nchse.org/mpgis/sub_mpgis/)
GEOLOGY AND ENVIRONMENT

Topography

Three broad physiographic divisions (Singh 1995) (Fig. 4 and 5) can be recognised in the study area – (i) the Narmada valley with the Vindhyan range, (ii) the undulating Deccan trap plain area and (iii) the fertile alluvial belt along both the banks of the Narmada.

**Figure 4**

i) Narmada valley area with the Vindhyan formations Range

The Narmada flows in the northern part of the area, roughly in an east-west direction. Both the sides of Narmada are bordered by high cliffs and hilly tracts mostly of upper Vindhyan formations. These chains of hills are with good vegetation cover and rich in wild life. The hills rise conspicuously reaching more than 390 meter above MSL at certain places. The Narmada flows here between thick alluvial deposits in some stretches and rocky cliffs at others. Numerous small and large deep streams as well as ravines flow into the Narmada from both of its banks. These hill ranges form the drainage divide between the tributaries flowing into the Narmada and those flowing into the Ganga. The Vindhyan range is more conspicuous in East Nimar district, whereas in districts Dhar and West Nimar the overall elevation of these hills reduced.
(ii) Undulating Deccan trap area plain area

It is mainly an erosional land surface of the Deccan trap plain, forming the gently sloping surface from the southern divide of the Satpuras. The area forms an undulating land surface mostly between 240 m to 270 m above MSL. A large number of streams and streamlets as tributaries of the Narmada traverse through the landscape. Because of the erosional nature of the landscape a number of outcrops and flat barren table lands are exposed in the area. Due to less soil cover on the trap vegetation growth is also poor.

(iii) The Fertile Alluvial belt

The younger alluvium of the Narmada that spreads laterally one to two kilometres from both the banks of the Narmada is very fertile in Central Narmada valley. This alluvium is more conspicuous in the downstream of the Narmada in districts Dhar and West Nimar. Because of fertile nature of the soil, the area is profusely cultivated by the local people. As a result the density of population is also more at this stretch in comparison to upstream of the part of the Narmada.
Geology

The geological history (Singh 1995, Srivastav 1969 & 1970, Verma 1984) of the area with its formations are as follows (Fig. 6):

- **Recent**: Surface soil and newer alluvium
- **Pleistocene**: Older alluvium
- **U. Cretaceous to Ecocene**: Deccan Trap
- **U. Cretaceous**: Lameta beds
- **Late Precambrian**: Upper Vindhyan system
- **Archaean**: Bijawar series, Granites and Gneisses

Figure 6
**Archaean**

This geological period is characterised in the area by the occurrence of granites and gneisses, and several outcrops of Bijawar rocks. It occurs on either side of the Narmada River particularly in Harsud tehsil. The Bijawar formation comprises quartzite, horn-stone breccias and chert banded lime stones. The quartzites range from quartzitic sandstones to unaltered sandstones which are sometimes conglomeratic. Limestone is seen in a peculiar concentric structure with alternating layers or bands of siliceous and calcareous matter of the confluence of Chhota Tawa and Narmada. The quartzite-breccia which occurs further south comprises purplish jasper with angular fragments of quartzite.

**Late Precambrian**

The formations belonging to Late Precambrian phase consists of sandstones, shales, and conglomerates of the Upper Vindhyan system form a narrow belt to the south of the Narmada. The predominant rock type of this information is one intermediate between a sandstone and quartzite and is of a deep red or publish in colour. The bedding in the sandstone is well marked. The quartzite formation seems to be a local metamorphism. The sandstones and conglomerates exposed near Bhorla, 4 km north-east of Punasa is considered to be of Vindhyan age.

**U. Cretaceous**

U. Cretaceous is represented in the area in the form of Lameta rocks comprising horizontally bedded grit stones and conglomerates. At some places conglomerates are found associated with lime stones. Due to its various contextual occurrences, it is difficult to state whether they are Inter-Trappeans or Intra-Trappeans. However, the conglomerates and limestone are now considered to be of Lameta age.

**U. Cretaceous to Eocene**

Deccan traps are the formations of this geological age which occupy major portions with the exception of the fringe along the Narmada in the northern portion of the area. The bulk of the plain area seems to be formed of the lower traps consisting of trap-beds associated with Inter-Trappean sedimentary rocks. The whole undulating Deccan trap plain of the area consists of various forms of basalt, usually more or less
amygdaloidal. The area between the Machak and Chhota Tawa, large outliers of traps overlie the metamorphic rocks.

**Pleistocene**

Pleistocene phase represented in the form of older alluvium is observed in both the banks of Narmada.

**Holocene**

Holocene deposit is common in the area in the form of recent alluvium confined to Narmada as well as to all its major tributaries. Holocene alluvial deposits are to be seen almost everywhere along every stream in the area. The maximum deposit of this alluvium is observed both on Narmada and its major tributaries. Apart from river bank alluvium which is mainly silt, the other surface soil found in the area is black soil or the regur and man, a yellow sandy soil. The black soil is the result of the weathering of trap.

**Drainage**

The study area is drained by the Narmada with its major tributaries (Fig. 7), called Chhota Tawa in district Khandwa, Uri and Man in district Dhar, Kundi in district Khargone and Goi in district Barwani with a number of affluents in rest of the area. Seasonality behaviour in terms of perennial, seasonal, and ephemeral nature of the drainage observed in the area is interesting for understanding settlement patterns and cultural movements both in time and space. The drainage patterns in general show the typical character of rift-valley drainage of the drainage systems, the following are the major ones.

**Narmada**

The Narmada is one of the sacred rivers which is referred in many ancient religious texts. Skanda Purana has a chapter devoted to the story of the birth of Narmada. The river was known to Ptolemy as the Nommodos of Nammadius in his famous work ‘Periplus’. Narmada enters East Nimar district after its confluence with Machak River at Panghat. It flows from east to west in the northern part of the area through the fault or rift-valleys in the hard and compact mass of the Deccan Plateau. The narrow and straight alluvial valleys, the closely bordering ranges, the deep river-beds and numerous small tributaries joining the major rivers more or less at right angles,
are the characteristics of the Narmada system, which are all observed in the area. After flowing a short distance in Harsud tehsil, it receives Chhota Tawa river from the south at village Sarai. After entering into the area for about 65 km., Narmada flows between high alluvial banks closely bordered by high cliffs of basalt and wooded hills on the north and a wild broken country on the south. The banks are intersected by a numerous deep ravines. A sandstone hill from surrounding country occupies the angle at the junction of the Chhota Tawa and the Narmada. At Dhairi opposite of village Punasa, the river tumbles through and partly over a broken ledge of hard basalt, and then flows through a gorge of the same rock.

![Figure 7](image)

**Man River**

It rises from the southern scarps of the Malwa plateau. It flows to the south and joins the Narmada passing through Nimkhera and Kheri amidst the hills and Manawa and Bakaner in the Narmada valley. This tributary of the Narmada flows in the administrative boundary of district Dhar.
**Wagh and Uri River**

Both the rivers Wagh and the Uri rise from the southern scraps and jointly drain into the Narmada. Village Tanda is located on the bank of Uri. The river Wagh flows through Bagh, Kukshi and Nisarpur. The river Hatni rises in Jhabua district and forms the western boundary of district Dhar for some distance before joining the Narmada.

**Kundi River**

The Kundi river is formed after the confluence of two streams, viz. the Beda and the Kharak which rise from the Satpuras. These rivers have a northerly flow and after the confluence, the Kundi joins the southern bank of Narmada, south of Mandleshwar. Kundi river has the widest valley in the district. Its length together with the Kharak is about 113 km. It falls within the district administration of Khargone.

**Goi River**

The Goi river is a long river rising from the southern slope of the Bijagarh fort hill and cutting its channel through the Satpuras. It meanders for over 120 km to the north-west and joins the Narmada south of Nisarpur which is on the opposite northern bank. Sendhwa and Silawad are the important places along its course. It falls within the district jurisdiction of Barwani.

**Chhota Tawa**

This river is formed by the confluence of three major streams namely Abna, Sukta na Bham near Bhamgarh; and enters into the Harsud tehsil after flowing a distance of about 52 km. It’s main tributaries in the study area are kala Machak, Ghorapachhar and Agni on the right bank and Pipar on the left bank. It flows through an area of an average between 240 m to 300 m above M.S.L. in the Deccan trap area. Chhota Tawa valley shows a dendritic pattern because of the gradual water erosion for long time on a trap country. It also contains a thick alluvium deposit on both of its bank after reaching a height of below 270 meters. The lateral spread of this alluvium is not much like that of Narmada.

Apart from Chhota Tawa, a number of nullahs also join Narmada on both of its banks of them, Pahari nullah joins on the right bank, whereas Samdehi nullah, Pipalghati nullah, and Bajrikund nullah join on the left bank.
Climate

The district experiences four major seasons in a year (i) the winter, lasts from December to February, (ii) the summer, from March to May, (iii) the monsoon, from June to September, and (iv) the post-monsoon during October and November.

(a) Rainfall

The district gets an annual average rainfall of 880 mm. The northern portion of the area gets comparatively more rainfall than the southern portion due to high relief. The average rainy days in a year is 43.3 days. July is the rainiest month with the highest rainfall and the highest number of rainy days. The monsoon breaks by about 10th of June and continues till the beginning of October.

(b) Temperature

The hottest month is May with an average of 34.55°C., whereas December is the coldest month with average of 19.96°C. of the year. The daily day and night temperature begin to rise just after December but markedly after February. The weather becomes cool with the onset of the monsoon. The night temperature continue to fall from May, reaching the lowest degree in December but the fall in the day temperature is interrupted by a slight temporary rise in October after the withdrawal of the monsoon.

(c) Humidity

Except during the rainy season the relative humidity is generally low especially in the afternoons. The summer months are the driest when relative humidities can be as low as 10%.

(d) Winds

The mean wind speed is 13.4 km per hour, the highest in the month of June, while it is the lowest 3.7 km per hour in the months of November and December.

Flora

Majority of the dense forest is mainly confined to both the sides of the Narmada. Apart from this, patches of forests can be seen in other areas as well in the study area. The vegetation pattern of the area belongs to the dry deciduous type. Apart from original vegetation cover of the area, a large portion of the forest is presently under teak plantation.
Fauna

The area is extremely rich in various kinds of wild fauna. In spite of so much deforestation in recent years and a wide hunting activity, the forests on both the sides of Narmada still preserves a variety of wild fauna, such as panther, tiger, wolf, wild dog, bear, nilgai, langur, etc among the mammals.

Among the ave faunas, mention may be made of a variety of wild fowls, kabutar, blue rock, pigeon, harial, bhat titar, gray partridge, parrots, owls, doves, etc.

Reptiles and amphibians constitute a number of snakes and lizards. A variety of fishes are also available in the Narmada as well as in all its tributaries. Because of this reason, at a number of places in Narmada and its tributaries, regular fishing has been taken as an occupation by many of the villagers.