2. THE MAHANADI RIVER BASIN

2.1 Physiography

The Mahanadi is one of the major rivers of India, flowing east and draining into the Bay of Bengal. Among the peninsular rivers, in water potential and flood producing capacity, it ranks second to the Godavari river. The Mahanadi river basin extends over an area of about $1.42 \times 10^5$ km$^2$ upt to Kaimundi (delta head) and lies between longitude $80^\circ 30' - 86^\circ 50'$ East and Latitudes $19^\circ 21' - 23^\circ 35'$ North (Rao, 1975). The basin covers large areas in the states of Madhya Pradesh (75,532 km$^2$), Orissa (55,754 km$^2$) and only small areas in Bihar and Maharastra (Mahanadi Master Plan, 1981).

The Mahanadi basin is bounded on the north by the Central India hills on the south-east by Eastern Ghats and on the West by the Mekala range. The upper basin is a saucer shaped depression known as Chattisgarh. The basin is of circular shape with a diameter of 400 km and an exit passage of about 160 km length and 16 km breadth. There are five well defined physical regions in the basin, namely, the northern plateau, the eastern ghats, the coastal plains, the erosional plains of the central table land and the northern plateau. The northern plateau and eastern ghats are well
forested hilly regions, the coastal plains stretching over the districts of Cuttack and Puri covers the large delta formed by the Mahanadi and is a fertile area well suited for intensive cultivation, the plains of the central table land area is traversed by the Mahanadi and its tributaries.

2.2 The river system

The Mahanadi river rises near Sihawa, which is near Nagri town in Raipur district of Madhya Pradesh. The total length of the river from the source to its outfall into sea is about 851 km, out of which, 357 km is in Madhya Pradesh and the remaining 494 km is in Orissa. Throwing off numerous branches, the Mahanadi falls into the Bay of Bengal near Please Point about 16 km below the confluence of Chitartala and the Mahanadi.

2.2.1 Principal tributaries

The principal tributaries of Mahanadi are the Jonk, the Hasdeo, the Mand, the Ib, the Ong and the Tel (Fig. 3), which are described below.

The Seonath: The Seonath sub-basin covers the districts of Rajnandgaon, Durg, Raipur, parts of Bastar and Mandla districts of Madhya Pradesh and Chandrapur district
Fig. 3. Mahanadi river with its important tributaries and sub-basins
The Mand: The Mand river rises in the Suruguja district at an elevation of about 686 m and flows for a length of about 242 km up to its confluence with Mahanadi near Chandrapur. It has a catchment area of 5237 km$^2$. The sub-basin covers the districts of Raigarh and Suruguja.

The Ib: The Ib river is about 251 km long and rises at an elevation of about 762 m in the Raigarh district of Madhya Pradesh. The river traverses for about 251 km before falling into the Hirakud reservoir and has a total catchment area of 12447 km$^2$. The sub-basin covers districts of Raigarh, Sundargarh and Ranchi.

The Ong: The Ong river rises at an elevation of 457 m on a hill in the northern outskirts of the south-north running range of mountains situated to the right of the Jonk river. The Ong flows for a total length of 204 km to join the Mahanadi, 11 km above Sonepur. It has a total catchment area of 5128 km$^2$.

The Tel: The Tel river rises in the Koraput district in Orissa about 32 km to the west of Jangaon and flows for a total length of 296 km before it joins the Mahanadi about 1.6 km below Sonepur. The total catchment area of this sub-basin is 22818 km$^2$. 

Thesis
550.4(282)
-22-
2.3 Geology

The rock formations that are prevalent in the Mahanadi basin in Madhya Pradesh belong to the following stratigraphical divisions (Mahanadi Master Plan, 1981).

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent, Pleistocene</td>
<td>Alluvium and Laterite</td>
</tr>
<tr>
<td>Lower Eocene</td>
<td>Deccan Trap</td>
</tr>
<tr>
<td>Upper Cretaceous</td>
<td>Post-Gondwana intrusions</td>
</tr>
<tr>
<td>Gondwanas</td>
<td>Mahadeva Formation</td>
</tr>
<tr>
<td></td>
<td>Panchet Formation</td>
</tr>
<tr>
<td></td>
<td>Raniganj Formation</td>
</tr>
<tr>
<td></td>
<td>Barakar Formation</td>
</tr>
<tr>
<td></td>
<td>Talcher Formation</td>
</tr>
<tr>
<td>Cuddapahs</td>
<td>Intrusive rocks in the</td>
</tr>
<tr>
<td></td>
<td>Charnockites</td>
</tr>
<tr>
<td>Archeans</td>
<td>Iron Ore Group</td>
</tr>
<tr>
<td></td>
<td>Gangpur Group</td>
</tr>
</tbody>
</table>

The gneisses form a very widespread type of rocks in Orissa. Some well defined areas of Sambalpur, Puri and Cuttack districts consist of the Gondwanas. Also a fairly large exposure of the upper Gondwana rocks occur in the Mahanadi basin just west of the Delta. The Eastern Ghats through which the Mahanadi passes in Orissa state consist of rock types as khondalites, charnockites, leptynites,
Fig. 4. Geological map of Mahanadi basin (compiled from Geological Survey of India maps)
quartzites and minor basic granulites, gneisses, migmatites, anorthosites, granites and minor basic intrusives of Pecambrian age. The sedimentary rocks in the drainage basin are chiefly conglomerates, sandstones, quartzites, shales and limestones (Ray et al. 1984).

Geological map of Mahanadi basin compiled from Geological Survey of India maps is shown in Fig. 4.

2.4 Soil type

The basin consists mainly of red and yellow soils, mixed red and black soils occurring in parts of Bolangir, Kalahandi, Sambalpur and Sundargarh districts in Orissa. Laterite soil is found in the lower part of the basin lying in Cuttack and Puri districts in Orissa. The coastal plains of the Mahanadi are composed of saline deltaic soils.

2.5 Climate

Four distinct seasons occur in a year in the basin, namely, the cold weather, the hot weather, the south-west monsoon and the post-monsoon season.

In the winter, the winds are generally light and blow either from north or northeast and the atmosphere is bright.
During December and January, very little precipitation occurs but during February, 25 mm to 50 mm of rainfall occurs in association with the passing western disturbances. The precipitation is mostly confined to the northern half of the catchment especially the hilly region. Winter is not severe but pleasant. The hot season commences in March and lasts till the middle of June by which time, the southwest monsoon starts. Thunderstorms are quite frequent during the hot season and some of them result in rains, the intensity of such rainfall being comparatively more in the hills than in the plains. The rains of this season are of great importance to agricultural operations in view of the soil preparation needed for the kharif crops. The southwest monsoon setting by the middle of June over the entire basin continues to be active in the first week of October. During this period, the basin receives about 90% of the annual rainfall. After withdrawal of southwest monsoon, a few thunderstorms continue to occur. The weather clears up by November and it is cold thereafter.

2.5.1 Rainfall

The average annual rainfall in the basin is 155 cm. Rainfall during the period June to September is about 85% of the annual rainfall and about 90% of the annual rainfall
occurs during the period June to October (Mahanadi Master Plan, 1981).

2.5.2 Temperature

Generally, December is the coldest month with minimum temperature ranging between 10°C and 13.7°C whereas, near the coast, it usually does not fall below 15.8°C. May is generally the hottest month of the year when the maximum temperature ranges from 38°C over the hills to 43°C in the plains.

2.6 Mineral resources

A part of the richest mineral belt of the sub-continent falls in the Mahanadi basin. The upper reaches of the basin consisting of the districts Bastar and Durg have huge quantities of iron ore deposits. Iron ore deposits are also found in Sundargarh, Cuttack and Sambalpur districts. Raipur, Suruguja and Bilaspur districts have huge deposits of coal. Limestone deposits are found in Durg, Raipur, Raigarh, Bilaspur, Sundargarh and Sambalpur. Dolomite occurrences are found in Sundargarh district. Deposits of Bauxite have been found in Suruguja, Bilaspur, Bastar and Raigarh districts of Madhya Pradesh. Bauxite is also found
in Kalahandi and Sambalpur districts of Orissa. China clay is found in Durg, Bilaspur, Sambalpur and Sundargarh. Copper deposits are reported from Bastar district. Deposits of alluvial gold have been reported from Khairagarh tehsil of Rajandgaon district in Madhya Pradesh. Lead, zinc deposits are found in Sargipalli in Sundargarh district of Orissa. In the coastal districts of Cuttack and Puri, salt is available though not economically exploitable. Other minerals like talc, soapstone, mica and graphite etc. are reported from some parts of the basin.

2.7 Industries

Rich in forest, agricultural and mineral resources, the industrial potential of the basin is much better than that of many other parts of India. Only a small part of the enormous forest wealth is at present being exploited for timber, paper and other industries. Among agricultural based industries, mention may be made of processing industries like rice-milling, manufacture of textiles, sugar and extraction of oils from groundnut, linseed and other soil seeds. Mining of coal, iron, manganese etc. are other important activities in mineral rich districts. Iron and steel are produced at Bhilai. Many other small engineering industries are spread all over the basin. Cement is
manufactured in Raipur, Bilaspur and Sambalpur districts. Aluminium is produced at Korba and at Hirakud. A large Aluminium Complex has come up in Koraput district of Orissa.

Mahanadi basin has an inhabitation of 28.64 million people with an urban population of 3.96 million (Census, 1981).