

CHAPTER I

GENERAL

Kendujhar is an interesting district from the geological and anthropological point of view. Its mineral contents are varied and rich. Its iron-ore, manganese ore and chrome ore are rich as well as extensive. Anthropologically its two main tribes, the Juangs and the Bhuyans, have an interesting past. Although today they have acquired the modern ways of wearing cotton clothes, only less than hundred years ago the Juangs wore nothing except shields of leaf for ceremonial occasions. Today they may appear before visitors wearing these leaf shields mainly to show what they wore in the past, but leaf shields have completely gone out of use. Both Juangs and Bhuyans insist on their right of shifting cultivation which is known by different names such as Rama, Biringa and Podu. Bhuyans have almost been Hinduised. When a distinguished visitor arrives in a Bhuyan village the women according to Hindu tradition insist that the visitor should stand on a low wooden pedestal, so they could wash his feet. Their hospitality would not be complete if they do not wash his feet.

INTRODUC-
ING THE
DISTRICT

For natural beauty Kendujhar is as varied as the whole of Orissa with waterfalls of varied sizes to roaring gorges with rolling boulders and rocks of varying hue which are rare elsewhere. Wild animals in the have become rare nowadays. Unfortunately many wild species are being killed indiscriminately.

Kendujhar has the distinction of containing one of the oldest rocks of the world covering an area of 100 sq. km. at Asanpat. The rock is 38,000 million years old. It must have been there before peninsular India broke away from Antarctica and moved north.

Sequel to the integration of the feudatory States with Orissa on the 1st January, 1948, the erstwhile princely state of Kendujhar emerged as one of its thirteen districts with headquarters at Kendujhargarh. The district was named after the name of its headquarters, Kendujhar. Various attempts at the exposition of the origin of the name Kendujhar, which follows, is merely speculative.

Origin of the
name of the
district

According to local tradition Yoti Bhanja, the earliest Bhanja King of Kendujhar, first founded his capital at a place called Yotipur named after him. From this town he shifted his capital later to a more

centralised place and built his fort near a perennial spring (*jhara* or *jhar*) which originated from the foot of a Kendu (ebony) tree. The new capital town was thus named as Kendujhar (Kendu+Jhar) after this accidental physical feature. According to Cobden-Ramsay the name of the ex-State of Kendujhar was corrupted into Keonjhar. Kendujhar, as stated by him, means the Kendu (ebony) tree, Jhara or Jhar—a spring.

Some scholars hold that Kendujhar was the Tantrik land of Jahor which finds prominent mention in Tibetan work like *pag-sam-zon-zang*. But their opinion is seldom reliable. The name of both the town and the ex-State as pronounced by the local people is Kenjhar which has been sanskritised as Kendujhar by the ex-Durbar Government. In medieval Sanskrit inscriptions we find the representation of this name as Kenjhar which goes to prove that the place was known as Kenjhar long before the time of Yoti Bhanja. This place was made the headquarters of the Bhanja rulers in the 12th century A. D. and the State was known as Kenjhar after this. In spite of the attempt at sanskritising the name as Kendujhar the English writers used to call it as Keonjhar which more correctly represented the early name Kenjhar.

Location,
general
boundaries,
total area
and popu-
lation of the
district

The district lies between 21° 1' N and 22° 10' N latitude and 85° 11' E and 86° 22' E longitude. It is bounded on the north by the district of Singhbhum in Bihar, on the east by the districts of Mayurbhanj and Baleswar, on the south by the districts of Cuttack and Dhenkanal and on the west by the districts of Dhenkanal and Sundargarh. It extends over an area of 8,240 square km. (Geographical area supplied by Surveyor-General of India) and contained, according to the Census of 1981, a population of 11,14,622 (Male 5,62,157 and Female 5,52,465). In order of both size and population it ranks 12th among the districts of Orissa.

History of
the district
as an
administra-
tive unit

The whole of the district of Kendujhar was a princely state before its merger with Orissa. The early history of the State is not adequately known. It was most probably a part of the old Khijjinga territory with headquarters at Khijjinga Kota, identified with modern Khiching. It became a separate state with Jyoti Bhanja as its ruling chief, sometime during the first half of the 12th century A. D. The then State of Kendujhar comprised only the northern half of the modern district for a long time prior to the installation of Jyoti Bhanja. During the latter part of the 15th century the southern half was occupied by king Govinda Bhanja, under whose rule Kendujhar

extended from Singhbhum in the north to Sukinda (a Zamindari in Cuttack district) in the south and from Mayurbhanj in the east to the borders of the States of Bonai, Pal-lahara and Dhenkanal in the west. During the rule of Pratap Balabhadra Bhanja (1764-1792 A. D.) two small areas of Tillo and Jujhpada were purchased from the Zamindar of Kantajhari and were added to the State. These were recognised as parts of Kendujhar in the Sanad granted by the East India Company to Raja Janardan Bhanja in 1804. Since then there had been no territorial changes of the State till its merger with the Province of Orissa. But after merger largely for the reasons of administrative expediency the areas of Tillo (7.51 sq.km.) and Jujhpada (9.06 sq. km.) were transferred to the districts of Baleshwar and Cuttack respectively, while a number of villages called Ambo group (14.84 sq. km.) of Baleshwar district were added to Kendujhar district.

The district is divided into three subdivisions, five Tahsils and fifteen ¹ police-stations. The names of the subdivisions, Tahsils with their area and population (1981) and their component police-stations are furnished in the following table*.

Subdivisions,
Tahsils and
Thanas

Subdivisions with area in sq. km. and population (1981)	Tahsils, area in sq. km. and population (1981)	Police-Stations
1	2	3
Kendujhar A. 5,350.17 P. 5,39,482	.. Kendujhar .. A. 3,446.0 .. P. 3,99,046	Kendujhar Patana Ghatagan Harichandanpur Daitari
	Telkoi A. 1904.17 P. 1,40,436	Kanjipani Telkoi Pandapada
Champua A. 1,585.23 P. 2,76,852	.. Champua .. A. 700.60 .. P. 1,25,007	Champua (Portion) Baria
	Barbil A. 884.74 P. 1,51,845	Barbil Joda Champua (Portion)
Anandapur A. 1,395.23 P. 2,98,288	.. Anandapur .. A. 1,395.23 .. P. 2,98,288	Anandapur Sainkula Soso

¹ Presently 19

* In the meantime on 1st April 1982 a new Tahsil, Ghatagan, under Kendujhar subdivision, and on 1st December 1982 another Tahsil, Hatadihi, under Anandapur subdivision have been created.

The district has six towns. Their area and population (1981) are as follows*

Towns	Area (in sq. km.)	Population
Kendujhar (M)	15.54	28,059
Barbil (M)	41.44	33,030
Joda (N. A. C.)	26.42	26,303
Anandapur (N. A. C.)	9.32	24,605
Daitary		4,844
Balagoda (Balani)		9,515

TOPOGRAPHY

The district consists of a compact area and its extreme length from north to south is nearly 145 km. and the average breadth from east to west is about 65 km. It is divided into two widely dissimilar tracts—the lower Kendujhar and the upper Kendujhar. The former is a region of valleys and low lands, while the latter includes mountainous highlands with a general slope from north to south. The highlands consisting of clusters of rugged crags afforded a safe retreat to its inhabitants in troublous times. The mountain tops appear from the low lands to be sharply ridged or peaked, but in reality they have extensive table-lands on their summits, fit both for pasture and for tillage. The average elevation in its central part is about 500 m. At places, isolated hills rise abruptly from the plains. But most of the areas have a general elevation of over 600 m. which forms the watershed of some rivers. The Baitarani river takes its rise in the hilly north-western division. In between these two natural divisions passes the State Highway from Chaibasa to Jajpur Road through the headquarters, Kendujhar.

Hills, mountain system to which they belong, etc.

Wide ranges of lofty hills and dense jungles form the boundary between Kendujhar and the neighbouring district of Dhenkanal. From the eastern side of this range a large plateau extends to Mayurbhanj and Singhbhum on the one hand and to the borders of lower Kendujhar on the other, varying in height from 244 to 457 metres. With the exception of isolated hills and undulating tracts, this vast plateau is generally open and occupied by large villages and numerous hamlets; it is well watered by streams which in the rains are raging torrents, hurrying to discharge their waters into the Baitarani. In the source of the Baitarani at Gonasika a temple has been built. The range of

* The urban areas of Kendujhargarh, Barbil, Joda and Anandapur are furnished according to 1971 Census. The present areas of all those above mentioned towns are not yet available.

hills in which the Baitarani rises, develops on the south-east into lofty peaks and wide ridges till it strikes the Sukinda border, formerly a zamindari in the Cuttack district.

Below this belt towards the east is the lower Kendujhar comprising Anandapur subdivision and a portion of Kendujhar subdivision. For the first 16 km. this tract emerges in a gentle slope from the belt of hills and then spreads out into an open plain towards Cuttack district flanked by two long ranges of hills to Sukinda and Mayurbhanj borders. This tract is similar to the adjoining districts of Baleshwar and Cuttack containing little jungle and is dotted with a few low isolated hills. It is well cultivated and thickly populated.

The crescent-shaped watershed which runs from north to the south is the home of the primitive tribes, chiefly the Bhuyans and the Juangs. On the west of this range there is one Pargana and the former zamindari of Kaliahata which, unlike the plateau on the otherside, is of no particular elevation. Though the valleys consist of rich alluvial soil, the uplands consist mainly of detritus and is intersected here and there by hill streams which eventually discharge their waters into the Brahmani.

The principal peaks are Gandhamardan (1,060 m.) about 10 km. from the headquarters with a wide ridge on the top, Mankadnacha (1,117 m.) on the Bonai border, Gonasika (978 m.), Thakurani (915 m.), Tomaka (785 m.), Bolat (554 m.), Khajaru (918 m.), Ranga (897 m.), Mahaparnbat (716 m.), Khandadhar Parbat (915 m.), situated near the border of Bonai and Pal-lahara; and Sitabinji (670 m.) situated at a distance of 19 km. from Kendujhargarh in an easterly direction. Chakratirtha or Baula Parbat is situated at a distance of 16 km. from Anandapur in north-easterly direction. The height of the highest cliff of this hill is 183 m.

The rivers of the district emerge out of the hilly tracts into the plain country with great velocity and are charged with large volumes of water during monsoon. In summer they become almost dry. Their beds are usually rocky which render them unfit for navigation. There are a large number of hill streams in the district which form the major water resource. The following is a poetic description of these hill streams as given by Cobden-Ramsay : "In the highlands.....clear pellucid hill streams flow perennially, babbling over stones and rushing in tinkling waterfalls between grass-clad banks and sedgy shores, shaded by towering trees: many are the deep silent pools with the banks fringed with masses of white lilies, and the silence broken only by the gentle gurgle of the stream as it slowly trickles from the pools or by the splash of some rising fish: here the

RIVER-
SYSTEM AND
WATER
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kingfisher darts to and fro in all his glory and birds of every hue imaginable brighten the scene; in the rains these streams become wild tearing torrents sweeping all before them".

Baitarani

The river Baitarani is the largest river of the district. It rises from the Kendujhar subdivision among the hills in the south-west of the district and flows due north as a hill stream until the Singhbhum border where it abruptly turns to the south. It forms during part of its course the boundary between this district and Mayurbhanj for certain distance. In the dry season the river is navigable by small boats, but with difficulty, as far as Anandapur, the subdivisional headquarters on its north bank. Of the places standing on its bank are Champua, Rajanagar, Udayapur, Fakirpur, Balibarua and Habaleswar.

Almost every year in the rainy season the river is heavily charged with flood water. The high floods which caused great damages to life and property during the present century were recorded in 1913, 1927 and 1960. During 1927 flood the river changed its course near Champua and inundated a considerable area surrounding it.

At a distance of about 40 km. from Karanjia (in Mayurbhanj district) there occurs a deep pool in the river Baitarani known as Bhimkund. According to a legend Bhima, the second Pandava, took his bath here in this pool when the Pandavas lived in disguise in Biratnagar, which by local belief, is supposed to be the present Kaptipada. Before it reaches the pool the Baitarani flows through a gorge in steps forming a series of picturesque rapids. At one place the gorge is hardly 4 feet wide in winter when the river disappears underground and emerges at the pool. In the flood of 1927 the top rock of the tunnel was blown off and the present gorge appeared. Bhimkund is encircled by precipitous stone walls. The natural scenery of the site is exquisitely beautiful. According to another legend Rama on his march to Lanka to rescue his wife Sita from the ten-headed demon Ravana stayed on the banks of the Baitarani on the border of Kendujhar. During Makar festival in mid-January large number of people gather here to take bath on the auspicious day in commemoration of this legend.

Aradei or Ororai

The Aradei or Ororai rises in the hill regions near Bararoan Pahar in the south-east of Kendujhar and flowing northward meets with the Machhakandana river about 3 km. south of Palasapanga. It then proceeds further in a northerly direction and meets the river Baitarani about 8 km. south of Champua. The river Machhakandana has two waterfalls named Badaghagara and Sanaghagara, 23 m. and 18 m. in height respectively. The other tributaries of Aradei are Kadai and Sotli or Kasia which are two important hill streams of the district.

The Kanjhari rises in the hills near about Gonasika and flowing in a north-easterly direction meets with the Baitarani south of Udayapur. It is about 56 km. in length and important villages like Ramachandrapur, Raghunathpur and Poipani are situated near its course.

Kanjhari

The Seeta takes its rise in the Sarupata hills situated near Dhenkikote. After flowing about 16 km. it meets the river Kukurkata.

Seeta

It rises in the forest near Jhalbera and flowing in easterly direction falls into the river Baitarani. It is about 32 km. in length and flows through densely wooded tract. Some important relics of historical interest are found in its upper valley. The noteworthy relics being those of fresco paintings and inscriptions at Dangaposi and Sitabinji.

Kukurkata

The Kusai rises from the Rebna Reserved forests south of Meghanada Parbat and flows in south-easterly direction till it meets the river Kukurangi. Then it takes almost an easterly direction and follows a zigzag course until it finally debouches into the river Baitarani. Its important tributaries are Remal, Sendhei and Ganda. On the bank of the river is located the village Deogan which is famous for the temple of Kosaleswar Siva of the medieval period.

Kusai

The Musal rises in Meghanad Parbat. Flowing for a certain distance due north it abruptly turns east and south-east and then debouches into the Baitarani near Simria. It receives tributes from numerous hill streams during its 53 km. course in the district.

Musal

The Samakoi takes its origin near Gendachua hill. It pursues a zigzag course almost in a westerly direction and falls into the river Brahmani in the Dhenkanal district. Telkoi is situated on its bank. Its length in the district is about 50 km.

Samakoi

The Machhakandana rises in Bararaon Pahar south of Kendujhar, flows in an almost northerly direction and meets the Aradei north of Kendujhargarh.

Machhakan-
dana

The Karo rises in the Bonai subdivision in the Sundargarh district and enters into Kendujhar from the north-western corner of Champua subdivision and flows towards Singhbhum in Bihar. The town of Barbil is situated on its bank.

Karo

The Salandi rises in the Similipal hills of Mayurbhanj district. It enters the district of Kendujhar at Champapal village. Therefrom

Salandi

taking a south-easterly course it flows about 19 km. inside Padhiari-palli and Soso area. At last it falls into the river Baitarani in Bhadrak subdivision. The average width of the river is about 30 metres. The important villages situated on its bank are Soso and Balibarei.

Among other tributaries of Baitarani mention may be made of Mermeda, Neorjal and Kaliapaljar, all of which are flowing inside the district. The river Deo, another tributary of the Baitarani, takes its origin from the Similipal range of the Mayurbhanj district. Nearly from Karanjia it flows in a north-westerly direction and forms the boundary between Kendujhar and Mayurbhanj till it falls into the river Baitarani.

Waterfall

Among the waterfalls in the district mention may be made of the Murga fall which occurs in Champua subdivision. A perennial spring about a kilometre up among the high hills and thick forests descends from a height of about 25 metres. Underneath the fall is situated the shrine of Lord Shiva known as Murga Mahadev. The place makes a fine picnic spot. Thousands of pilgrim from surrounding villages gather there on the Makar Sankrati day.

The Handibhanga fall, about 30 metres in height, occurs in the Handibhanga hill ranges near a village of the same name at a distance of 3 km. from Joda-Basantapur road. Being surrounded by a stiff cliff of about 30 to 45 metres in height it is almost inaccessible except by a *kutch*a but difficult road from Dhubna-Kalimati village. During extreme summer one would feel the chill of winter at the foot of the fall.

Besides these, there are some other minor waterfalls in the district famous for their scenic beauty.

GEOLOGY

Forming a part of the northern extension of the Deccan plateau the district (and the State of Orissa as a whole) is mostly underlain by Precambrian rocks. A very small percentage of the total area of the district is constituted of the Quaternary to Recent formations. These latter formations are chiefly confined to the wide river valleys.

The sequential order established on the basis of field observations is tentative until a corroborative evidence of concordant radiometric age data on systematically collected samples is available. In recent years, however, some efforts have been made for obtaining radiometric age data from the rocks in northern part of the Kendujhar district and the adjoining Singhbhum district of Bihar. The alternative succession for the

different groups of rocks which has been established on the basis of the geological and radiometric age data so far available (Dunn, 1940; Prasada-rao and others 1964; Sarkar, Saha and Miller, 1969) is given below:

Recent to Sub-recent	Quaternary	Alluvium, soil and laterite
Middle/Mesozoic	Kolhan Group	Sandstone, Quartzite, conglomerate-breccia, purple shale (limestone)
Lower to Middle Proterozoic	unconformity	Clay shales with lenses of chert, dolomite banded hematite jasper, iron-ore and manganese.
	Koira-Noamundi Group	Black and red and white banded shale. Interbedded black shale and chert. Banded iron Formation.
		Tuffaceous shale, Basic lava
	Newer Dolerite Shingbhum Granite	Dolerite Granite and Gneiss
Archean	Iron-Ore Group	Banded chert, banded hematite/magnetite quartzite, quartzite, quartz-micaschist, talc tremolite schist, hornblende schist, amphibolite, meta-volcanics.
Archean	Unconformity	
	Older Metamorphic Group	Granite Gneisses and magnetites Metamorphosed arenaceous, argillaceous, calc, magnesian and volcanic rocks.

The oldest rock units exposed in this district comprise mica, sillimanite, hornblende, chlorite and quartz schist with some calc-magnesian gneisses and metavolcanic rocks grouped together in the Older Metamorphics. These rocks are exposed around Champua. Characterised by high metamorphism these rocks are intensely magnetised.

The Iron-Ore Group rocks, which are exposed well in the Gorumahisani and Badampahar areas of Mayurbhanj district occur as enclaves and rafts in the Shingbhum granite terrain in Kendujhar district. The iron bearing rocks of the Daitari area belong to this group. Fuchsite bearing quartzites, mica-schists and phyllites with chromite bearing ultrabasic

rocks occur around Nuasahi in the southern part of the Kendujhar district. These rocks are intruded by granites and gneisses which may be equated with the Singhbhum Granite.

The Koira-Noamundi group comprising the basal gritty sandstone-quartzite with interbedded conglomerate, basic lava and tuff, excellent development of banded iron formation, cherts, clay shale, black and banded shale overlies the Singhbhum Granite unconformably. Best development of this group is seen in the western and north-western part of the district. The iron formation of Gandhamardan hill, (west of Kendujhar) with associated quartzites, ferruginous shale, basalt and tuff forms the south-eastern boundary of this group in the district. This group forms the chief source of large iron-ore and manganese ore deposits of the district.

The rocks of the Kolhan Group comprising sandstone conglomerate with purple shale occur as small outliers on the Koira group of rocks with an unconformity at the base.

The fewer dolerite dykes intrusive partly into the Iron-ore and partly into Koira-Noamundi Group form prominent lineal topographical features in an otherwise flat granite terrain to the north and east of Kendujhargarh.

Laterite, alluvium and soil cover all the formations of the district.

Structure and Tectonics

Some geologists believe that the earliest Eastern Ghats Orogen which occurs to the south in the districts of Cuttack and Puri was already stabilised before the deposition of Iron-Ore Group rocks (Chatterjee et al, 1964, Banerji, 1972). Chromiferous ultrabasic rocks which were pre-orogenic in the Iron-Ore Group, were emplaced into the Eastern Ghats Group along zones of dislocation confirming the idea that the Iron-Ore Group existed as a mobile belt when the Eastern Ghats Orogen was already a stable craton. Others, however, believe that either the Eastern Ghats Orogeny is younger to (Sarkar and Saha, 1962) or correlatable with (Sarkar 1972) the Iron-Ore orogeny. Although the data on this problem is still meagre, it may be stated without any doubt that the Eastern Ghats and Iron-Ore Orogenic craton was subjected to one or more epiorogenic movements, probably in the Quaternary period, which complicated the problem all the more. The structural frame-work of the Iron-Ore Group rocks is highly complicated with the development of refolded folds and reclined folds at places. However, the broad regional disposition of the Iron-Ore Group is suggestive of its having been moulded around the stable Eastern Ghats Orogen.

Tectonically, the lithological assemblage of Koira-Noamundi Group represents a stable shelf association deposited on the craton made up of Iron-Ore Group of rocks and granite. The sedimentary history of the basin terminated at the end of manganese shale deposition with onset of minor diastrophic activity after which Kolhans were probably deposited in discrete basin. In the Koira area (Bonai-Kendujhar belt) the rocks form a major low north-plunging synclinorium the eastern limb of which is exposed in the Kendujhar district. Remnants of lateritised planation surfaces found above 1,000 m. may be related to epiorogenic movements resulting in the uplift probably in the Quaternary period.

The district is bestowed with extensive deposits of iron-ores and manganese-ores with chromite and a few other minor mineral occurrences.

Mineral
Resources

Orissa, endowed with a vast reserve of high grade iron-ore ranks second in the country's iron-ore production. Kendujhar district plays a major role in contributing sizable production of iron-ore. The most important Singhbhum-Kendujhar-Bonai iron-ore belt runs through this district. Out of the 50 km. strike length of this belt, only 14.5 km. fall in this district. The chief protores which gave rise to iron-ore deposits by supergene residual enrichment are the banded hematite quartzites jaspers of the Iron-Ore Group and the Koira-Simlipal Group. The iron formations of the Koira-Simlipal Group associated with basic lavas and shales are exposed as a major low north-plunging horse-shoe shaped syncline in the Bonai-Kendujhar belt. The deposits form a series of ridges striking north-east south-west, dipping towards north-west. The lower levels are occupied by phyllites, lavas and shales. The overfolded western limb of the north-plunging syncline contains the most important iron-ore deposits of Kendujhar. The maximum thickness of hematite-jasper formation is about 305 m. (Jones 1934) found in the main iron-ore range on the border of Kendujhar and Singhbhum, Bihar. The banded hematite-jasper is frequently seen to change into hard massive iron-ore when followed laterally. It occasionally passes also into a laminated ore with shaly appearance or into lenses or pockets of powdery ore. The usual type of ore is massive, hard and compact, steel grey to dark and brownish black in colour. The varieties include (1) hard ores (steel grey to brownish, massive and laminated), (2) moderately hard ore (laminated), (3) soft ores (flaky, friable and powdery) and (4) lateritic ores.

Iron-ore

High grade iron-ore deposits also occur on the Daitari hill along the boundary between Kendujhar and Cuttack districts. The total reserve of this deposit are of the order of 50 million tonnes. This deposit, however, falls within the administrative boundary of Cuttack district.

The estimated reserves of 1927 million tonnes of iron-ore of all grades and types found in different areas/blocks of the Kendujhar district are as follows :—

Areas/Block	Estimated Reserves (in million tonnes)	Average Grade (% Fe)
1. Thakurani Group	197	64
2. Balani	489	62
3. Deposits north of Banspani	38	64
4. Joda east and Khondbandh	200	64
5. Deposits south of Bansapani	211	65
6. Gandhamardan	124	64
7. Deposits between Bhadrasahi and Koira	59	64
8. Malangtoli Group	609	60

A part of this ore is being utilised in the Pig Iron Factory at Barbil, while bulk of the ore is either exported or consumed indigenously in the steel plants. The Bolani ores are supplied to the Durgapur Steel Plant.

Manganese-ore

More than 90 per cent of Orissa's production comes from the Kendujhar-Bonai area. The manganese ore deposits are scattered over an area of 500 sq. km. defined by Barbil (22°07' : 85°23') in the north, Dhubna (21°51' : 85°24') in the south, and Bhutura 21°48' : 85°09') in the south-western part. There are about 200 individual deposits of different dimensions most of which are under active exploitation.

The workable manganese ore deposits of this district occur as small lenses, irregular pockets, thin bands and reefs associated with shales which are seen in different stages of laterisation. Some of the important ore bodies also occur within laterite proper. A few high grade deposits occur as veins, fraction, fillings and irregular bodies in brecciated chert.

The shales and cherts from the core region of a major north-plunging synclinorium preserve the little metamorphosed Iron-Ore Group rocks. Manganese being confined to a restricted thickness of the stratigraphy in the upper part of the Group is considered to be of syngenetic origin with modification under supergene conditions.

The grade of the ore is variable from deposit to deposit as also from body to body within the same deposit. Out of the total production, about 10 to 15 per cent forms the High Grade (more than 46 per cent Mn.), 25 to 30 per cent Medium Grade (36-45 per cent Mn.) and the rest Low (less than 30-35 per cent Mn.) and still lower (less than 30 per cent Mn.) grades. The main impurity that affects the quality of ores is iron which occurs in high quantities (over 30 per cent) in the low grade ores. One unique feature of the ores is their very low phosphorus content. Silica is also low. But some silicious and rarely some high aluminous ores also occur in the area.

Important deposits in the Kendujhar district are located in the areas of Gurda, Raida, Bhadrasai, Sidhamatha, Nalda, Belkundi, Barbil, Kora, Joda, Kalimati, Dhubna, etc.

The total inferred reserves of all grades of manganese ore in the Bonai-Kendujhar belt are of the order of 30.95 million tonnes, bulk of which occur in the Kendujhar district.

A part of the high grade ore produced in the district is utilised in the Ferro-Manganese plant at Joda.

Orissa holds the first place in the production of chromite ore contributing over 90 per cent of all India output. Chromite

The chromite deposits of this district are associated with the ultramafic rocks of Nausahi, Boula and Phulinjhorhuli area. The ultramafic complex here is composed of an earlier dunite-chromitite pluton invaded by later chrome-poor ultramafite. Chromite deposits are restricted to the former which is a layered elongated mass mostly altered to talc-schist. This pluton is about 3 km. in length and 600m. in width.

The rock formations belong to Iron-Ore Group/Koira-Simlipal Group. Three series of metasedimentaries are noticed. The lowermost is kyanite-quartzite, andalusite-quartzite and grey quartzite associated with metavolcanics. The middle group is composed of banded cherty formations and shales. An unconformity divides the lower two groups with the uppermost group which is composed

mainly of arenaceous formations like conglomerate, sandstone and orthoquartzites. The lower two groups are intensely folded and faulted. They are intruded by two generations of ultramafic rocks, one prior to the unconformity and the other at a later period. All these rocks have been affected by high angle thrusts.

The chromite bodies are tabular in form and occur in three levels interlayered with thick zones of dunite and pure chromitite. Their thickness varies from 0.5 m. to 4.0 m. The ore is also of metallurgical grade with +48% Cr_2O_3 and Cr/Fe ratio ranging between 2.0 and 3.6, Charge chrome Cr_2O_3 and Inferior grade (30-40 % Cr_2O_3). The total reserves are about 0.33 million tonnes in this district.

China Clay (Kaolin)

Fairly good deposits of kaolin are found at several places in the district. The kaolin deposit near Kendujhargarh ($21^\circ 34' : 85^\circ 35'$) is about 1.6 km. west of the town. It occurs on the slopes of a hill comprising Newer Dolerite suite of rocks. There are two patches of clay occurring side by side and separated from each other by a band of weathered epidiorite. A total reserve of 0.17 million tonnes of clay is estimated to be available from this deposit.

The Taranipukuri-Amuapara ($21^\circ 35' : 85^\circ 47'$) deposit contains three patches of kaolin. Assuming the depth of economic workability to be between 9 m. and 15 m. the reserves of clay are about 1.4 million tonnes.

The Sundi Murrua ($21^\circ 52' : 85^\circ 34'$) deposit contains a reserve of 0.7 million tonnes of clay.

A bed of white plastic clay yielding a reserve of 4000 tonnes is reported to the south of Dengura ($21^\circ 52' : 85^\circ 15'$).

Thus, a total of 2.274 million tonnes of estimated clay reserves of crude and refined types have been found in the district.

Vanadiferous Manganese

Deposits of vanadiferous magnetite occur in association with gabbro-anorthosite suite of rocks in the Precambrian metamorphic. A deposit of vanadiferous Magnetite is seen near Phulinhorhuli ($21^\circ 17' : 85^\circ 18' 20''$) in Anandapur subdivision. The mineral occurs in a band of ultrabasic rocks about 4 km. long. Other deposits occur at hill no. 604 east of Phulinhorhuli and on the north-western slope of hill no. 587.

The reserves of the deposits are about half a million tonnes of 0.9 per cent V_2O_5 .

Within 1.5 km. north-northwest of Kodagadia (22° 02' : 85° 34') in Champua subdivision just to the southeast of the saddle between the two hills, gravel and soil overlying the decomposed hornblende schists have been worked for gold on a small scale by local gold washers. Occurrences of placer gold associated with granite is recorded along Bangir nala, Sunapentha (21° 15' : 85° 45') and Birunipal (21° 07' : 85° 55'). The gravels in the nalas passing through all these areas are washed for its gold content.

Gold

This is reported from the northern slope of hill ranges immediately south and west of Kendujhargarh and Dalimpur (21° 42' : 85° 32'). The talc-schists occur as gently undulating slabby layers underlying the Kolhan sandstones. The highly foliated talc-schists are traversed by veins of quartz as impurities. The total reserves have been estimated at 0.1 million tonnes.

Talc and Soapstone

Pyrite crystals have been recorded in dark grey shaly formations underlying the Kolhan sandstones west of Balibandha (21° 54' : 85° 35'), on the Kendujhar-Chaibasa road. The occurrence is of no economic importance.

Pyrite

Minor occurrences of bauxite and aluminous laterite along the Kendujhar-Bonai belt have been reported. Most of them are pockety or poddy in nature. The occurrences are located around Kodalia (21° 52' : 85° 21'), Khajurdi pahar (21° 51'30" : 85° 17'30"), east of Kasira (21° 55'30" : 85° 15') and around Jaladihi (21° 50' : 85° 14'). Bauxite is generally seen as float amidst aluminous laterite and sometimes as small in situ pockets. The occurrences are of no economic importance.

Bauxite

Some of the Kolhan sandstones in the northern portion of the district (near Baragam) is suitable for glass industry.

Glass sands

Granite gneisses, aplites, dolerites and quartzites are being used as road metal and in concrete mixtures. Laterite blocks are extensively used as a very common building material. All these materials are found in plenty.

Building stones and Road Metal

The entire State of Orissa is underlain by the northeastern extension of the perinsular shield of the Precambrians, which is tectonically a very stable zone of the earth's crust. For this reason, the State is less exposed to earthquakes or tremors.

Earth quakes and tremors

The forests are of monsoon type locally classified as (a) Tropical moist deciduous forest and (b) Tropical semi-evergreen forest. The Sal (*Shorea robusta*) forest with mixed community of species represents the climatic climax whereas the dry deciduous vegetation and thorny xerophytic communities characterise various stages of degradation or edaphic climaxes. Within these broad divisions of monsoon forest occur characteristic vegetation types depending upon local habitat or niche.

Tropical moist deciduous forest is chiefly characterised by *Shorea*, *Terminalia*, *Diospyros* and *Schleichera*. The species largely comprise *Shorea robusta*, *Terminalia tomentosa*, *Diospyros melanoxylon*, *Schleichera oleosa*, *Anogeissus latifolia*, *Ougeinia cojenensis*, *Adina cordifolia* and *Protium serratum*.

Tropical semi-evergreen forest is confined to hilly area and characterised by *Diospyros*, *Macaranga*, *Dillenia*, *Mesua* and *Strychnos*. The association comprises *Diospyros peregrina*, *Macaranga peltata*, *Dillenia pentagyna*, *Mesua ferrea*, *Strychnos potatorum*, *Syzygium cumini*, *Terminalia belerica*, etc.

In parts of Baula, Atai, Kalapat, Santosapur and Barabank the top canopy is dominated by *Anogeissus latifolia*, *Lannea grandis*, *Ougeinia cojenensis*, *Hymenodictyon excelsum*, *Miliusa velutina*. second storey of small trees and woody climbers like *Ixora arborea*. *Ochna squarrosa*, *Meyna laxiflora*, *Butea monosperma*, *Memecylon umbellatum*, *Jasminum arborescens*, *Ehretia laevis*, *Helicteres isora* and a ground community of perennial and seasonal herbs occur. This community is serial in character and gives way to Sal (*Shorea robusta*) association. On the exposed hill slopes where soil is derived from shales and is infertile the top canopy is composed of *Shorea robusta*, *Anogeissus latifolia*, *Gardenia latifolia* and *Kydia calycina*. The undergrowth consists of *Woodfordia fruticosa*, *Wendlandia tinctoria*, *Cipadessa fruticosa*, *Bridelia retusa* and *Antidesma diandrum*. *Phoenix acaulis* and several grasses like *Eragrostis brachyphylla* and *Heteropogon contortus* predominate the much eroded slopes. The peculiar plant *Premna herbacea* is found in clearings where forest fires occur.

On flat topped plateaus the laterite soils bear the community of *Shorea robusta*, *Gardenia latifolia*, *Terminalia tomentosa* and *Diospyros melanoxylon*. The undergrowth is composed of *Bauhinia retusa*, *Grewia aspera*, *Cassia tomentosa*, *Buettneria herbacea*, *Crotalaria prostrata*, *Blumea flava*, *Vicoa indica*, and *Casearia tomentosa*. Open grasslands of *Themeda triandra*, *Apluda mutica*, *Arundinella setosa*, *Dimeria connivens* characterise the Pats. *Bauhinia vahlii* (Palas), *Combretum decandrum* and *Olex scandens* are common lianas in the Savannah type of forest.

In the Sidhamatha and Karo blocks *Shorea robusta* is associated with *Buchanania lanzan*, *Protium serratum*, *Careya arborea*, *Mitragyna parvifolia* and *Wendlandia tinctoria*. A few species of grasses, *Heteropogon cantortus*, *Panicum montanum*, *Eragrostis unioloides* are found on forest floor. *Bothriochloa glabra*, *Pseudopogonatherum contortum*, *Eulalia trispicata* and *Imperata cylindrica* are conspicuous grasses in Savannah type which is predominantly scattered with *Terminalia tomentosa*, *Sygyzium cumini*, *Salmaalina malabarica* (Simul) and *Schleichera oleosa* (Kusum) and where shrubby layer of *Polyalthia cerasioides*, *Ardisia solenacea*, *Glochidion lanceolarium* and *Casearia tomentosa* occurs.

In Baula, Santosapur and Anandapur ranges the Sal (*Shorea robusta*) is mixed with *Dillenia pentagyna* (Rai), *Anogeissus latifolia* (Dhaura), *Adina cordifolia* (Kurum) and *Millettia auriculata*. Common shrubs are *Moghania chappar*, *Ochna squarrosa*, *Leea edgeworthii*, *Securinega leucopyrus*, *Embelia tjeriam-cottam* and *Dipteracanthus suffruticosus*. The species generally occurring along forest streams are *Homonoia repens*, *Linociera malabarica*, *Natsiatum herpeticum*, *Macaranga peltata*, *Hyptianthera stricta* and *Cleistanthus patulus*.

A fern, *Cyathea spinulosa*, generally occurring in monsoon forests is found in Palaspal area. The "Birds nest" fern, *Drynaria quercifolia* and many *Epiphytes* like *Pyrrosia adnascens* (fern), *Dendrobium* sp. *Cymbidium* and *Aerides* sp. of orchids occur and indicate humid tropic conditions and primeval forests.

The reserved forests of this district consist mostly of steep hills and narrow winding valleys. It is indeed a pity that most of the wide valleys which offered optimum conditions for the growth of fine Sal (*Shorea robusta*) forests were alienated from the reserved forests at the time of demarcation and brought under regular cultivation.

Character of forests, the type of vegetation, etc.

Part of south Kendujhar enjoys a coastal climate which is characterised by the development of a distinct plant community. The climatic climax is no doubt a Sal forest but its percentage is relatively low, while miscellaneous species form a considerable proportion of the crop.

The pre-monsoon showers which fall during April-May have a beneficial effect on Sal regeneration as this period coincides with the ascent or rise of sap in the Sal stems. The showers also minimise the fire hazards and reduce transpiration by maintaining the humidity of the atmosphere.

The post-monsoon showers reduce the mortality among Sal seedlings due to drought and thereby create conditions suitable for Sal regeneration.

The general character of the vegetation of the district is trophophilous but with distinct tendency to xerophilic structure in many of its species. There are no true rain forests but a number of Eastern Himalayan and Assam species occur locally in the cool moist valleys. Sal is by far the most conspicuous species and represents the present climatic climax.

According to Champion's classification the following types of Sal occur in the district.

- A .. 3 Dry Peninsular Sal
- B. .. 2 a Moist Peninsular high level Sal
- B .. 2 b Moist Peninsular low level Sal
- C .. Coastal Sal

Champion's classification followed a broad line since it covered the entire Sal bearing forests of India, and although these types are easily recognised and more or less well defined, they include numerous variations and embrace a number of minor plant communities which, being of local importance, merit description in some detail.

The following description of the vegetation is given on an ecological basis.

1. Dry mixed forest.

It occurs in parts of Baula, Atai, Kalapat, Santosapur and Barabank blocks. *Dendrocalamus strictus* occurs either gregariously or intermingled with miscellaneous species. The characteristic species in the top canopy are *Anogeissus latifolia*, *Adina cordifolia*, *Lannea grandis*, *Ougeinia dalbergioides*, etc. Typical shrubs are *Helicteres*, *Ixora*, etc., and a herb rather typical of the bamboo areas is *Rungia parviflora*. Of the climbers *Butea superba* is most conspicuous.

2. Open grassy dry Sal forest.

This is found on exposed hill slopes in all aspects where the soil is shallow and not fertile. The top canopy is generally under 9 metres in height and consists of *Sal*, *Zizyphus xylopyra*, *Anogeissus latifolia* and *Gardenia gummifera*. The undergrowth consists of *Woodfordia fruticosa*, *Wendlandia tinctoria*, *Phoenix acaulis* and the grasses *Arundinella setosa* and *Eulaliopsis binata*. When the shales have been eroded as in parts of Karo block, the proportion of miscellaneous species tends to decrease and although *Sal* attains a higher proportion, the crop is very poorly stocked.

3. High level plateau Sal.

This type comprises the forests growing on flat-topped hills which are a characteristic feature of Kendujhar. The elevation of these plateau ranges from 610 to 915 metres. In this region *Sal* tends to be pure and of very poor quality. It is, in fact, unusual to find trees exceeding 12 metres in height. The undergrowth consists of *Indigofera hamiltonii* species. Grasses are abundant especially in Savannah type and consists of *Arundinella setosa* species. The typical climber is *Bauhinia vahlii*.

4. Moist Hill Sal.

It is widely distributed in Kendujhar especially in the Sidhamatha and Karo blocks. The highest growth of *Sal* is about 21 metres. Its characteristic associates are *Buchanania latifolia* and *Terminalia tomentosa* and the typical shrubs are *Wendlandia tinctoria*, and *Woodfordia tinctoria*, and *Woodfordia fruticosa*. Grasses are numerous, the most conspicuous being *Sabai*.

5. Valley Sal.

It occurs in Sidhamatha and Karo blocks. The over-wood consists of *Sal*, *Terminalia tomentosa*, *Anogeissus latifolia*, *Bridelia retusa*, *Adina cordifolia* species. Large climbers are abundant, conspicuous of them being *Bauhinia vahlii* and *Butea parviflora*.

6. Moist mixed forest.

It is differentiated from the valley *Sal* forest solely in geological and pedological conditions. The flora is remarkable for the diversity of its composition and luxuriance of its growth. The canopy is invariably closed and exceeds 30 metres in height. *Sal* is seldom entirely absent, although it forms only insignificant proportion of the total crop. *Asan* (*Terminalia tomentosa*) and *Kurum* (*Adina cordifolia*) are most conspicuous. Other typical species are *Rai* (*Dillenia pentagyna*), *Siris* (*Albizia lebbek*), *Simul* (*Bombax malabaricum*), *Kasi* (*Bridelia retusa*), etc. They occur in Rebana block.

7. Santal Sal.

Typically coastal Sal is now developed but a transition to the Moist Peninsular Sal can be seen in the Boula and Santosapur blocks. The Sal is mixed with a high proportion of miscellaneous species such as, Rai, Asan, Dhaura (*Anogeissus latifolia*), Kasi and Kurum.

Past system
of manage-
ment

The biotic factors especially human interference, direct or indirect, have considerably modified the pristine vegetation and are solely responsible for the present degraded condition of the forests. The Bhuyans and the Juangs are a people of very primitive instincts. Their chief instinct is hunting and a craving for unfettered freedom. They consider themselves to be the lords of the soil and live in a simple arcadian fashion. Shifting cultivation is an immemorial and traditional custom with these aboriginal tribes which had been followed by them uninterruptedly. The areas of shifting cultivation may rightly be termed as 'Jhumer's Paradise. The jhuming represents truly the aboriginal method of shifting cultivation followed by the Bhuyans and the Juangs.

Prior to 1892, there was no semblance of forest conservancy. Probably about this time it received the attention of Maharaja Dhanurjay Narayan Bhanj who in 1896 introduced disposal of forest produce.

Prior to this the tenants of the State used to get their requirements free from any part of the State, provided they exercised their rights within a radius of 6.44 km. (four miles) from their homes in case of large villages, and 3.22 km. (two miles) in case of small hamlets. Permission was necessary for taking forest produce from forests situated at greater distance. The Bhuyans were almost free in respect of the area they might *jhum*, except some nominal restrictions as to the area within the limits of which they were entitled to do so. "Foreigners" were permitted to take forest produce on payment, but the rates and conditions were not prescribed. People with no land in the ex-State and non-agriculturists were considered as "foreigners".

The Boula forest in Anandapur subdivision was worked under "Ghati System" whereby a contractor purchased the right to sell forest produce from a certain area of the forest each year. Permits were issued to outside purchasers to procure forest products according to their requirement.

In 1906 a Dehradun trained ranger was appointed on a monthly salary of Rs. 100 and it was due to him that the department could be placed on an organised basis. The forest of the ex-State of Kendujhar came under Government management in 1907 and the work of selecting forests for reservation was taken up. At first Atai block was selected and some of its boundaries cut in 1908. But the progress was slow until the appointment of the Agency Forest Officer and the first visit of Grieve in 1911 when the work was pushed on and completed in 1924.

The selection and demarcation of the protected forests were taken up at the close of the settlement in 1915 and completed not long afterwards.

The sleeper operations by the Bengal Timber Trading Company was done in 1910. This lease was primarily taken up by B. Baruah in 1906, but probably owing to some difficulties he could not execute the work and later disposed of his rights to the first named company. The lease did not embody any clause relating to the proper management of the forests. The exploitable girth of the timber was fixed at about 1.5 metres (5') but no limit with regard to the number of trees to be felled in any one year or during the period of the contract was set forth.

For twenty years the operation went on in full swing with little regard to the capacity of the forests. Consequent on the unrestricted fellings for such a long period the forests were denuded of their large trees and reduced, in many instances, to a pole crop. The deficiency in the nature of forests noticeable at present, may be largely attributed to the sleeper operation made by the B. T. T. Co.

Mooney's plan came into force from the 1st April 1930, on the expiry of the lease of the B. T. T. Co. Prior to this, there had been practically no attempt at systematic management or properly controlled fellings in the reserved forests, although the protected forests had been worked under a system of coppice with standards since 1915. No doubt some climber cutting and improvement in fellings were carried out in the reserved forests since 1920, but they were done mostly in a desultory and half-hearted manner and had little advantageous effect on the forest growth.

In Mooney's plan the reserved forests were allotted to three working circles, the High Forest Working Circle, the Coppice Working Circle and the Miscellaneous Working Circle.

To the High Forest Working Circle were allotted the Rebana, Kalapat, Sidhamatha, Karo, Thakurani and Barabank blocks. However, in his inspection note for 1937 some minor alternations were made by Hart, the then Agency Forest Officer. In view of the shortage of trees of the exploitable girth and the preponderance of younger-age-classes the Thakurani block was transferred to the Coppice Working Circle.

To the Coppice Working Circle were allotted the Baula (part), Thakurani, Uteburu, and Santosapur blocks. Except the Santosapur block, which could not be worked owing to the absence of a local market for fuel and small size poles, the coppice system has given very satisfactory results both financially and silviculturally.

A total area of about 0.55 lakh hectares consisting of Atai, Nayagarh, Baitarani, Barabank (part), Benamunda, Bandhanjhari and Ranibeda blocks were allotted to the Miscellaneous Working Circle.

Present
system of
management

After the formation of the district in 1948, certain changes in the sphere of forest management largely with a view to maintaining administrative uniformity were effected. Accordingly, some working circles like Sal Conversion Working Circle, Selection Working Circle, Coppice Working Circle, etc., were formed with a view to (i) obtaining complete regeneration of economically valuable species, (ii) satisfying the local needs of the cess paying tenants, (iii) maintaining the forest vegetation in the catchment areas of the streams in order to conserve the water supply as well as to minimise flood hazards and (iv) exploiting the minor forest products. More stress was laid on consolidation, afforestation of barren land, enrichment of the existing forests of low value, development of communication in the forests, and conservation of nature and wild life for scientific study of flora and fauna. For Kendujhar Division, a working plan covering years 1969-70 to 1988-89 was prepared, but before its finalisation another working plan covering the years 1984-85 to 1993-94 is under preparation and is almost in the stage of finalisation.

That forests play a vital and important role in the economy and ecology not only of the district but also of the country as a whole needs no reiteration. Until recently there was no consciousness either on the part of the administration or on the part of the society that forests have an intrinsic right to land. Forestry as such was permitted on residual land not required for any other purpose. The mischief caused by such improvidence has been realised, somewhat lately. No doubt a National Forest Policy was first evolved as early as in 1894. Even this policy envisaged regulation of rights and the restriction of the privileges of the user in the forest by the neighbouring population. Though it envisaged management of forests of inferior species in the interest of the local population, it recommended to Government to take such steps to see that "the user is not exercised so as to annihilate its subject and the people are protected against their own improvidence." But Kendujhar being a feudal state remained outside the purview of the National Forest Policy and no effective step was taken to prevent denudation of its forests or its encroachment for other various needs of the society. Besides giving contracts to unscrupulous contractors for extraction of timber, a very liberal policy regarding giving rights and concessions to tenants was also followed. Such rights and concessions given to the tenants in Kendujhar ex-State are given in the Appendix I. It is really a matter of concern that the same rights and concessions are also being allowed even today except that

the schedule of rates have been slightly revised upwards by the Forest Department with effect from the 14th November 1977. To prevent further depletion of forest materials, a Government order was issued on the 18th January 1980 to abolish the *nistar* cess keeping in view the recommendations of various forest expert committees such as the partially Excluding Area Committee, the Forest Enquiry Committee and the National Commission on Agriculture and the concessions given in several areas to take forest material either free of charge or on half or 1/4th of the schedule of rate, as the case may be, was simultaneously withdrawn with effect from the 1st April 1980. All tenants were to pay the full schedule of rate which was itself a great concession; as per example the full schedule of rate prescribed in 1977 for Kendujhar is Rs. 6.45 and Rs. 8.60 for 100 Salia and Daba bamboos respectively which is roughly 1% of the normal market value of bamboos. Similar comparison can be made in respect of timber and other forest products. But this order was kept in abeyance due to public pressure and has never since been revived. So the wish expressed in the National Forest Policy of 1894 that "people should be protected against their own improvidence and that the user should not be exercised so as to annihilate its subject" still remains a distant goal.

Owing to far reaching developments having taken place in the economic and political life of the country, the National Forest Policy was reoriented in 1952 keeping the fundamental concepts underlying the existing Forest Policy in tact., It suggested 4 classifications of forests on a functional basis i. e. protection of forests (Reserved and Protected Forests), National Forests (to be maintained and managed to meet national needs like defence, communication and industry, etc.), Village Forests (to meet local needs) and tree-lands (privately owned).

To quote from the 1952 policy "The fact must be realised that the country as a whole has a vast stake in the conservation of all forests, irrespective of their functions and ownership and therefore all of them should be administered from the point of view of national well-being.

* * * * *

While, therefore the needs of the local population must be met to a reasonable extent, national interests should not be sacrificed because they are not directly discernible, nor should the rights and interests of the future generations be subordinated to the improvidence of the present generation". It, therefore, discarded the two widely prevalent considerations, "plausible no doubt, at first sight, but if given undue weight to, destructive of national well-being in the long run" i.e.,

(1) Neighbouring areas are entitled to a prior claim over a forest and its produce, and

(2) Agricultural requirement has a preferential claim over forest land"

It recommended 60 per cent of the geographical area of a mountainous tract and 20 per cent of plains area to be under perpetual legal cover (i. e., reserved forests).

"Forest" was included in the "State List" in the Constitution of India, 1950. So that National Forest Policy enunciated in 1952 could not be implemented. Owing to its national importance it was included in the "Concurrent List" by the 42nd Constitution Amendment Act, 1976 with effect from the 3rd January 1977. Thereafter, the Forest (Conservation) Act, 1980 was passed which prohibited dereservation of any reserved forest and use of any "forest land" for non-forestry purpose without prior approval of Government of India. Government of India clarified in their letter, dated the 26th March 1982 that "forest land" mentioned in the Act refers not only to reserved forests and protected forests, but also to any area recorded as "forest" in the Government records.

A major source of income from forest produce is timber and fire-wood. While fire-wood is taken away mostly by tenants in exercise of their *nistar* right, the timber of the incremental yield of the forest is taken by contractors mostly through auction sale. The system of auction through contractors has proved ruinous to forest wealth. The National Commission on Agriculture recommended working of forest coupes through Labour Co-operatives or through State Forest Corporations. After formation of the Orissa Forest Corporation in the year 1962, some forest coupes in Kendujhar had been leased out to the Corporation, but bulk of the coupes were given to the contractors on the basis of the highest bid. As this also proved detrimental to forest economy, the system of auction through contractors was abolished and all the forest coupes were given on negotiated basis to the Orissa Forest Corporation with effect from the year 1975. It has since been decided by Government that all the forest coupes of Kendujhar Division will be worked out by the Similpal Forest Development Corporation which is also a parallel State Government undertaking, and the contractors will be completely eliminated from the forest coupes.

Most of the forest contractors were taking forest coupes to provide captive raw material for their saw mills. The saw mills at Jajpur Road provide natural outlet for Kendujhar timber. This led to huge pilferage from the forest, sometimes with the connivance of the lower

forest staff. Raids conducted in some neighbouring saw mills showed that saw-mill owners could not account for all the timber stored in their mill premises. Therefore the Orissa Saw Pit and Saw Mill (control) Rules, 1980 framed under Section 45 of the Orissa Forest Act were promulgated from the 24th March 1980 to enforce compulsory licensing of the saw mills by the Divisional Forest Officer to enable him to inspect the saw mills to find out unaccounted-for timber in his mill. This has resulted in stoppage of illicit felling and trade to a great extent.

To check large-scale pilferage of timber and other forest produces the anti-Smuggling Wing of the Vigilance Department was strengthened in the year 1980 with the induction of both Forest and Police Officers who were armed with weapons and necessary legal powers along with vehicles to check organised smuggling of timber which has yielded dividends.

Two important major policy decisions were taken with regard to minor forest produce viz, Kendu leaf and sal seeds. Kendu leaf provides raw material for Bidi industry which affords employment to a large number of persons. In the pre-merger days Kendu leaf contracts were given on long term basis to contractors on nominal royalty and no distinction was made between private land and Government land as the tenants had no right to forest produces on their own holdings. On merger of the ex-State, the tenants got right over trees on their holdings. Kendu Leaf Control Order called the Orissa State Kendu Leaf (Control and Distribution) Order, 1949 was issued on the 19th April 1949 under which only a licensee could engage himself in any undertaking which involves collection, purchase, sale or storage of Kendu leaf for sale but it did not apply to Kendu leaf on private land except that the owner could sale his produce only to a licensee in Orissa. Kendu leaf trade was monopolised by a few merchants who were holding lease on long or short term basis. As it was important to State's economy Government enforced Orissa Kendu Leaf (Control of Trade) Act, 1961 with the intention of introducing State trading in Kendu leaf. Under this system Government directly dealt with collection and processing, etc., through commissioned agents and sale was made to purchasers appointed by Government through tenders. The above arrangement was also not free from complaint. So Government decided to completely nationalise the Kendu leaf trade with effect from 1973 crop-year. To implement this

decision of Government a scheme in the name of "Joint Scheme of Operation of Kendu Leaf Trade" was drawn up under which Forest Department remained in charge of collection and processing of Kendu leaf and the Orissa Forest Corporation was entrusted with the task of sale of Kendu leaf collected by the Department. The production and sale value of Kendu leaves in Kendujhar district during the last four years is given in Chapter IV.

For collection of sal seeds the Kendujhar Forest Division was leased out to M/s. Utkal Contractors Joinary (P) Ltd., on long term lease till the 30th September 1979 and it had been extended for another period of 10 years, with effect from the 1st October 1979 on a royalty of Rs. 65.00 per Metric Tonne with 10 per cent increase at the end of every two years for its solvent extraction plant located at Rairangpur in Mayurbhanj district. In the interest of getting more revenue and also for giving more remunerative price to the tribals engaged in collection of sal seeds, the sal seed trade was also nationalised under the Orissa Forest Product (Control of trade) Act, 1981 with effect from 1983 crop-year. The Orissa Forest Corporation is entrusted with the task of collection and sale of all sal seeds in Kendujhar district. Production, expenditure and sale value of sal seeds obtained for last two crop-years are given below:—

Year	Total production	Total expenditure (Rs.)	Total sale value (Rs.)
1983	13,445,031 MT	1,56,04,015.91	1,95,96,426.27
1984	3,978,516 MT	48,43,841.26	69,86,827.10

Unlike coal and oil, 'forest' is a renewable source of energy and asset. To mitigate the effects of large scale denudation the National Commission on Agriculture recommended Social Forestry including farm forestry to be taken up on a massive scale. Previously plantation by Forest Department was taken up on very limited scale and that too in reserved forests. There was hardly any central allocation and whatever small allocation was given under the State Sector the plantation activity was limited to economic plantation or rehabilitation of degraded forests and not extended to social forestry to meet the needs of the society. From the 5th Five Year Plan onwards plantation activity was boosted up which accelerated in the 6th Five Year Plan and is poised for a greater acceleration in the 7th Plan period. Not only the Centre gave liberal assistance for afforestation schemes, but also the State Government's allocation was substantially increased. Under the

social forestry Scheme plantation is to be taken up not only in the reserved forests, but also in the wasteland, community land, village forests, etc., and people are also encouraged to take up plantation in their private land for which seedlings are distributed free of cost and technical guidance is provided by Forest Extension Officers posted in Blocks. Afforestation is also taken up under the ITDA, DRDA, MADA and all other special schemes. In the 5th Five Year Plan ending 1979-80 plantation under various afforestation schemes in the district has been done by the Forest Department in an area of 3,458 hectares with funds provided under State sector, Central sector, ITDP, DRDA, etc. Corresponding figure for the 6th Plan period ending March 1985 is 5,300 hectares. Besides, tea plantation has been taken up on experimental basis in an area of about 800 hectares as a joint-sector project since 1982 in Taramakanta in Bhuyanpirh area.

Forests of most of the Ex-States were under the Forest Adviser of the political agent Mr. Monney. Forests of Kendujhar were divided as (1) 'A' class reserve where reservation was considered absolute (Even in these forests some rights were conceded as can be seen from Appendix I (2) 'B' class reserves meant for the Nistar of the villagers. 'B' class reserved forest were also known as Demarcated Protected Forests. In addition to 'B' class reserved forests, there were village forests, also called Khesra forests which were neither surveyed nor demarcated but were managed by the Forest Department.

Forest Area
and Law

From a report on "Working Scheme for protected forests of Kendujhar State" prepared in 1927, it appears that there was 95,909 acres (388.13 sq. km.) of protected forests in Kendujhar Ex-State. Another report on "Working Plan for the reserved Forests of Kendujhar State" prepared in 1929 shows the following area :

- "1. Area of State—3,096 sq. miles (8,018.64 sq. km.)
2. Reserved Forest—606.50 sq. miles (1570.84 sq. km.)
3. Protected Forest—150 sq. miles (388.50 sq. km.)

It is, however, to be borne in mind that the Bhuyan and Juang *pirhs* cover an area of 486 sq. miles possessing neither reserved nor protected forests. If this area is excluded from the calculation, the reserved forest constitutes 23.2 per cent and the protected forest 5.75 per cent of the remainder of the State".

It may be seen that even in 1930, the total forest area of the ex-State was 24.4 per cent of the total geographical area which is much below than what was envisaged in the National Forest Policy of 1952. Kendujhar being partly mountainous and partly plains, should have atleast 40 per cent of its geographical area under perpetual cover. A revised working plan on the reserved forests of Kendujhar state prepared in 1945-46 shows the area of reserved forest to be 588 sq. miles (1,143 sq. km.) and that of demarcated protected forest to be 102 sq. miles (264 sq. km.) and the area of Khesra forest to be 210 sq. km. So according to this report the total forest area of the district immediately before the merger was 1,617 sq. km. whereas 1929 Working Plan shows the area of the reserved and protected forests to be 1959.34 sq. km. excluding village forests and forests of Bhuyan and Juang *pirhs*. Forest Enquiry Committee Report published in 1959 shows the reserved forest area (A and B class together) to be 701.56 sq. miles (1,817 sq. km.). Information available in the office of the Chief Conservator of Forests shows that an area of 25.29 sq. km. has been legally de-reserved after Independence due to various reasons, particularly for irrigation, resettlement and industrial projects and during the same period an area of 415.94 sq. km. have been legally reserved under the Indian Forest Act/Oriassa Forest Act. The net addition to the area of the reserved forest, therefore, comes to 390.65 sq. km. The present position of the forest area of the district (1984) as reported by the Chief Conservator of Forests is as follows:

1. Reserved Forest	.. 1,829.97 sq. km.
2. Demarcated Protected Forest	.. 637.55 sq. km.
3. Undemarcated Protected Forest	.. 26.60 sq. km.
4. Unclassed	.. 0.24 sq. km.
5. Total	.. 2,494.36 sq. km.

(Orissa Agricultural Statistics for 1982-83 published by the Director of Agriculture and Food Production shows the forest area of the district to be 4,070 sq. km. and its geographical area to be 8,310 sq. km. vide statement on land utilisation pattern in Orissa 1982-83. This statistics is obviously incorrect).

The present forest area as reported in 1984 thus works out to 30 per cent of the total geographical area of the district which as stated above is economically unbalanced though it is above the national average (22.75 per cent) but below the State average (38.48 per cent). The area of the reserved forest comes to 22.20 per cent of the geographical area of the district against the State average of 16.03 per cent. It may further

be stated that much of what is stated as reserved or protected forest does not contain forest growth worth the name due to large scale encroachments and pilferage of timber by contractors and local people. Local enquiry reveals that tribal migrants from Singhbhum and Mayurbhanj districts have cleared about 3,237 hectares of reserved forests in Atai, Rebana, Kalapat, Padapur reserved forest. Extensive encroachments have also been done by local Adivasis in Boula and other reserved forests. Both migrants and local people have also been made extensive encroachments in Telkoi and Bhuyanpirh ranges. Besides, extensive forest area in Telkoi, Harichandanpur and Banspal Blocks are affected by shifting cultivation by Bhuyans and Juangs. According to the opinion of the local forest officials, though legal forest area has somewhat increased, its density and yield has considerably decreased over the years.

As in case of tenancy, there was no law governing forest management during the Durbar period. After merger, the Indian Forest Act, 1927 was extended to this ex-State, with effect from 1-4-48 by the Administration of Orissa State's Order, 1948. The Merged States (Laws) Act, 1950 which repealed the Administration of Orissa State's order, 1948 also extended the Indian Forest Act to this district for effective management of the forests. The India Forest Act was amended by the Orissa Amendment Act 11 of 1954 which inserted section 20-A to the Act. Under this provision of law, any forest land or wasteland in the merged territories which had been recognised by the ruler as reserved forest in pursuance of any law, custom, rule, order, working plan or register, etc., immediately before the merger shall be deemed to be reserved forest for the purposes of the Indian Forest Act. All other forests which were recognised in the merged territories as Khesra forest, village forest or protected forest, etc. by whatever name, designated or locally known shall be deemed to be protected forest under the Indian Forest Act. This Indian Forest Act remained in force till it was replaced by the Orissa Forest Act, 1972 which came into force with effect from 14-7-72 which contained provisions similar to those of the Indian Forest Act regarding forest reservation, protection, contracts and control, etc. Under the Indian Forest Act/Orissa Forest Act, there is no legal distinction between 'A' Class reserve or 'B' Class reserve or between depmarcated protected forest (DPF) and undemar-cated protected forest (UDPF). A forest is either a reserved forest or a protected forest under the law.

Minor Forest
Produce

Minor forest produce plays a vital role in forest management and bring in a sizeable revenue to the State besides providing gainful employment to the local people, particularly tribals. They play a very important role in the rural economy of the district. There is ample scope to establish forest based small-scale industries for the uplift of the socio-economic standard of the poor villagers of the area. The rural population who hardly get their food from cultivation depend on the forest for the collec-

tion of minor forest produce. The important items of minor forest produce in this Division are Kendu leaf, sal seed, Mohwa flower and seeds, honey and wax, resin, tasar, myrabolan, tamarind and siali leaves and fibres. Unlike other ex-State areas bamboos sparsely occur in isolated patches here and there and therefore it has no industrial use in the district. Most of the minor forest produce items are collected from the reserved forest as well as from the Khesra forests. Items like tamarind, Mohwa flowers and seeds and Kendu leaf are mostly collected from Khesra forests, being nearer to habitation, whereas items other than Kendu leaf, Mohwa flowers and seeds, etc. are usually collected from the reserved forest areas. The collection of most of the minor forest produce items is usually diffused over a wider area due to scattered trees in the forests and therefore cannot provide fulltime employment to the people.

Mohwa Flowers and Seeds

Since large number of Mohwa trees occur in private holdings and Khesra forests and the people use these as items of food and for other domestic uses, no lease is being granted for these commodities but royalty is collected on the quantity exported by the traders outside the State. The control of trade in Mohwa flowers vests on the Excise Department under the direct supervision of the Collector of the District. Mohwa flowers are used for food, manufacture of liquor and as cattle feed whereas the oil from the seed has industrial use and is also used as edible oil.

Sal Seed

Towards the latter part of nineteen sixties sal seed collection assumed importance to the tribal economy when its industrial use as oil for making soap, chocolate, etc. was discovered. With its nationalisation in the year 1983 and fixation of remunerative price under the Minimum Wages Act by the Government, substantial income accrues to tribals engaged in collection of sal seeds in April, May and June.

Game Law and Wild Life

During the Durbar Administration of the Kendujhar ex-State adequate protective measures were being taken by the rulers to save the wild animals from irregular killing except for organised Shikar by the members of the royal family or their distinguished guests. Due to rigid enforcement of rules and keen interest by the ruler in protecting and preserving the wild life, one could see any sort of wild animal in almost all the wild area and in the near vicinity of the villages. After merger, poaching of wild animals in the forests of Kendujhar Division was rather rampant. Killing of wild animals in the name of crop protection, for sale of meat, trophy, tusks, hides and skins and organized "Akhandha Shikara" by the tribal was rather frequent. Tribal groups normally come to the forest during April every year following Pana Sankranti in the name of Akhandha Shikar in batches consisting of 20 to 200 marksmen with bow and arrows and kill any wild life that comes on their way. In spite of various rules and protective measures this pernicious practice still continues.

Now the lowest point in wild life population has been reached. Efforts have been made during the past decade to afford protection to the fauna and check wanton destruction of wild life throughout the State. Issue of shooting licence has completely been stopped and the State Wild Life Organisation is taking steps to create more sanctuaries, wild life parks and game reserves in the State while providing adequate personnel in supplementing protection measures taken by the territorial staff to save wild animals. Enforcement of the Wild Life (Protection) Act, 1972 and the Rules framed thereunder has been of great help. Presently the Divisional Forest Officer, Kendujhar, acts as the *ex-Officio* Wild Life Warden of the Division. Besides the Wild Life Protection Act, 1972, legal protection is also available to wild animals under the following Acts and Rules:

1. The Elephant Preservation Act, 1879 with (Orissa) Rules, 1958
2. The Wild Bird and Animals Protection Act, 1912
3. The Orissa Government Reserved Forest Shooting Rules, 1938
4. The Orissa Forest Shooting Rules, 1973

Of late wild life has assumed tremendous importance. Both the Central and the State Government have shown extra interest in protection and development of this most neglected branch of nature. Though the number of wild animals in the forest of Kendujhar has considerably decreased because of mining activities, indiscriminate poaching, road development and opening of the remote areas, setting up of new villages, rehabilitation and construction of developmental projects including industries and irrigation projects, still the most common species seen in the forest are given below:

The common mammals are the Hanuman (*Presbytes entellus*) and Pati (*Macaca mulatta*), the two primates, Bagha (*Panthera tigris*) and Kalarapatria Bagha (*Panthera pardus*), Heta Bagha (*Hyaena hyaena*), Bilua (*Canis aureus*), Dhinkia Bagha (*Canis lupus*), Banabiradi (*Felis chaus*), Salia Patini (*Viverricula indica*), Katasa (*Paradoxurus hermaphroditus*), Kuji Neula (*Herpestes auropunctatus auropunctatus*), Odha (*Lutra perspicillata*), Bhalu (*Melursus ursinus*), and ungulates like Hati (*Elephas maximus*), Gayala (*Bos gaurus gaurus*), Sambar (*Cervus unicolor niger*), Chital (*Axis axis*), Kutra (*Muntiacus muntjak*), Khuranti (*Moschiola memina*), Nilagai (*Boselaphus tragocamelus*), and Barha (*Sus scrofa cristatus*), all herbivorous. The common class of rodents like Nepali Musa (*Ratufa indica*), Gunduchi Musa (*Funambulus pennanti*), Jhinka (*Hystrix indica indica*), Thekua (*Lepus nigricollis*), Musa (*Tatera indica*), and Gatua Musa (*Bandilota bengalensis*) are often met with while Bajrakapta (*Manis crassicaudata aurita*) is rare.

FAUNA

Tigers (Bagha) are occasionally met within Rebana and Kalapata Blocks. There is no information about their exact number. There are reports of cattle lifting by the animals in both the forest blocks.

Leopards (Kalarapatria Bagha) are quite common in Santospur, Atai, Kalapata, Rebana and Barabanka reserved forests. Most of the villages are in close vicinity of the forests. Blocks often complain of interference and lifting of small domestic animals in their area by the leopard. The total number of the species has not yet been correctly estimated.

Elephants (Hati) are frequently seen in small herds in forests like Baula, Kalapata, Rebana, Atai and occasionally in Sidhamatha and Karo reserved forests. Though the herds move from place to place it seems they have permanent habitats in Baula, Atai, Rebana and Kalapata reserved forests. The elephants usually damage agricultural crops and create occasional havoc in the mining huts and in small villages on the periphery of the forest blocks.

Bison (Gayala) herds are occasionally seen in Kalapat and Rebana reserved forests. These bisons are occasionally seen visiting neighbouring villages of Dhenkanal district.

Sambaras are quite common in hilly forest area and are more often seen in the Kalapat and Rebana reserved forests. Spotted deer (Harina), Barking deer (Kutura), Percupines (Jhinka) and wild boar (Barha) are found throughout the district.

Monkeys (Hanuman and Pati) are quite common and are seen in the villages in the periphery of the reserved forest. There are no reports of wild dogs (Balia Kukura) but bears (Bhalu) are quite common in the area. The bears have created lots of problems and reports of bear-bite and fatal accidents caused by the bear are very common, particularly during their breeding season and in the hot summer when Mahula and mango are ripe.

Birds

Common peafowl (*Pavo cristatus*) are numerous. Being the national bird of India they are protected under law throughout the year. Red jungle fowl (*Gallus gallus*) and common red spurfowl (*Galloerdix spadicea*) are also numerous. The painted spurfowl occurs but is uncommon. The partridge, black or grey, are comparatively rare. The hornbill is often found in the forest tracts. In cold weather flocks of geese, ducks and teal are found in swampy lands and near irrigation reservoirs. The whistling teal and the little cotton-teal are common residents. The pigeons, open billed stork, the Indian pond heron and the Bhrungraj, a rare species, are also met with.

The principal fish are rohi (*Labeo rohita*), mirkali (*Cirrhina mrigala*), bhakur (*Catla catla*), sal (*Ophicephalus marulius*) and seul (*Ophicephalus striatus*). Besides, a large number of other varieties are also found. Fish

The principal poisonous snakes like cobra, vipers and kraits are met with. Snake

The following table gives figures of mortality in the district from reptiles and wild animals during 1969 to 1978. Earlier, mortality due to these causes was much higher. In 1943-44, death toll due to tiger, snake bite, bear and elephant was respectively 42,58, 14 and 4.

Year	Death due to snake bite	Death due to attack of wild animals				Total
		Elephant	Tiger, Leopard and others	Bear and wolves	Other wild animals	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1969	50	1	2	9	1	63
1970	51	..	..	7	1	59
1971	40	1	..	7	1	49
1972	36	5	1	1	..	43
1973	40	3	..	6	1	50
1974	46	3	..	3	3	55
1975	62	4	..	10	..	76
1976	40	..	1	7	..	48
1977	33	..	1	9	1	44
1978	49	..	1	3	1	54

The climate of Kendujhar is characterised by an oppressive hot summer, high humidity and well distributed rainfall during the monsoon season. The year may be chiefly divided into four seasons, the hot season lasts from March to May, the period from June to September is the south-west monsoon season. October and November constitute the post-monsoon season and the cold season is from December to February. CLIMATE

Rainfall

Records of rainfall in the district are available for only three stations for periods ranging from 27 to 68 years. The details of the rainfall at these stations and for the district as a whole are given in appendices II and III. The average annual rainfall in the district is 1534.5 mm. The northern part of the district gets more rain than the southern part. About 76 per cent of the annual rainfall in the district is received during the south-west monsoon season, July being the rainiest month. Some rain in the form of thunder-showers occurs during the summer season and in October. The variation in the annual rainfall from year to year is not large. In the fifty-year period from 1901 to 1950, the highest annual rainfall occurred in 1946 when it amounted to 136 per cent of the normal. Similarly 1912 witnessed the lowest rainfall which was 63 per cent of the normal. In seven out of the above mentioned fifty years the rainfall was less than 80 per cent of the normal and two of them were consecutive. It will be seen from Appendix III that the rainfall in the district was between 1300 and 1800 mm. in 32 years out of 48.

On an average there are 79 rainy days (i.e. days with rainfall of 2.5 mm. or more) a year. The number of rainy days is nearly the same throughout the district.

The heaviest rainfall recorded in 24 hours at any station in the district was 343.4 mm. at Anandapur on July 9, 1941.

Temperature

The only meteorological observatory in the district is at Kendujhar and this was started recently. The following account of the climate is, therefore, mainly based on the records of the observatories in the adjoining districts and on the meagre data available for Kendujhar. The hot season commences by about the beginning of March when temperature begins to rise rapidly. May is the hottest month when the mean daily maximum temperature is about 38°C. and the mean daily minimum temperature is about 25°C. The maximum temperature may sometimes reach 46°C with oppressive heat. With the onset of monsoon in early June, day temperature drops appreciably and throughout the south-west monsoon season the weather is pleasant. After the withdrawal of the monsoon by the first week of October, both day and night temperature decrease progressively. December is usually the coldest month of the year, with the mean daily minimum temperature recorded at about 12°C. In the cold season, occasionally short spells of chilly weather occur in association with the passage of western disturbances across North India and the minimum temperature may drop to about 3°C. The highest maximum temperature recorded at Kendujhar in the district was 46.4°C on the 3rd May, 1974. The lowest minimum temperature recorded at Kendujhar was 2.2°C on the 21st December, 1966.

Humidity

The relative humidity is generally high i. e., about 75 per cent in the south-west monsoon and post-monsoon months. In the other months, the afternoons are comparatively drier. In the summer afternoons the relative humidity varies between 35 to 40 per cent.

Cloudiness

During the south-west monsoon season, skies are generally heavily clouded to overcast. In the summer and post-monsoon months, there prevails moderate cloudiness, the afternoons being more cloudy than the mornings. In other months, the skies chiefly remain clear or lightly clouded.

Winds

Winds are generally light to moderate with some increase in force in the summer and monsoon seasons. The morning winds are generally from south or south-west during summer and monsoon season and from north-west, north, north-east during other seasons. In the afternoons winter winds are mainly calm and they blow from directions south-east or south. During monsoon season the winds blow predominantly from the directions of south-east, south and south-west.

Special Weather Phenomena

The district is affected by storms and depressions in the monsoon and in October, when winds increase in force and widespread heavy rain occurs. Thunderstorms, mostly in the afternoons, occur in the summer season and in September. Rain in the south-west monsoon season is also often associated with thunder.

On the 16th April, 1978 at about 16.30 hours a devastating tornado lashed some villages of the districts of Kendujhar and Cuttack. The village Purunabandhagoda in Sainkula police-station was worst affected. An elaborate account on the damages caused by it in the district finds mention in Chapter IV—Agriculture and Irrigation, Natural Calamities.

Appendices IV, V and VI give the temperature and humidity, mean wind speed and special weather phenomena respectively for Kendujhar.

APPENDIX I

In 'A' Class
R. F.

Rights and concessions in Kendujhar Forest Division

Timber	Free to cesser payers with previous sanction, if not available in Khesra Forests.
Firewood	Nil
Bamboo	Free with permission, if not available in Khesra Forests.
Minor Forest produce	Fibre—free if not available in the Khesra Forests, with permission.

Aboriginal tribes, landless, or poorer classes are allowed to remove for the purpose of sale naturally fallen firewood; bamboos, fibres, leaves and grasses, honey and wax on payment as follows :—

Firewood,	}	Re. 0-12-0 per annum for one headload a day
Grass,		
Fibres, leaves		Rs. 1-8-0 per annum for one <i>bahangi</i> -load a day
Honey and Wax		According to the rates in force.

Hadis, Dombs; Gonds and other tribes are permitted to take bamboos on payment of following rates :—

	Rs.	A.	P.	
Headload, a day	1	8	0	per annum
<i>Bahangi</i> -load, a day	3	0	0	per annum

Kandras are permitted to remove trees for making combs and other articles on payment of royalty at half rates.

Aboriginal tribes are permitted to remove for their own consumption edible fruits, roots, flowers and leaves free.

Grazing No free grazing

	Tenant's rates per head			Outsider's rates per head		
	Re.	A.	P.	Re.	A.	P.
Cow or Bullock	0	2	0	0	4	0
Buffalo	0	4	0	0	8	0
Elephants or Camel	0	8	0	1	0	0
Horse Poney	0	3	0	0	6	0
Donkey	..	..	..	..	..	..

For cess paying villages situated within a convenient radius of 'B' class R. F. timber for agricultural implements free according to fixed scale. Excess over the scale at 1/4 schedule of rate

In 'B' Class
R. Fs. or
D. P. Fs—
Timber

Firewood Free according to the scale prescribed excess over the scale at 1/4 schedule of rate.

Minor Forest Produce Free

Grazing No free grazing

	Tenant's rates				Professional rates			
	Re. A. P.				Re. A. P.			
	per head				per head			
Cow or Bullock	0	0	1	Ditto	0	2	0	Ditto
Buffalo	0	2	0	Ditto	0	4	0	Ditto
Elephant or Camel	0	4	0	Ditto	0	8	0	Ditto
Horse, Donkey and Poney	0	2	0	Ditto	0	4	0	Ditto

In Khesra or Unreserved or U. D. P. Fs:—

Unreserved and reserved species for agricultural implements free. Timber
Reserved species for personal use at $\frac{1}{4}$ schedule of rate. All Pans and members of the indigenous tribes and all persons of poorer classes and landless labourers are allowed unreserved trees for their personal use as well as for sale and reserved trees for personal use.

Firewood Free

Bamboo, M. F. P. and Grazing Free

Rate of Nistar Cess :

Re. 0—2—0 per acre on wet land royati, Re. 0—1—0 per acre of goda land royati, Re. 0—3—0 per acre of wet land lakhrai, Re. 0—4—6 per acre of goda land lakhraj.

Chandana cess Re. 0—4—0 per household.

*Conversion Rate.... 1 *anna* (old)=4 *paisa* (old)=6 *paise* (new)

After the introduction of decimal coinage the old system of *anna* and *paisa* are no more in use.

KENDUJHAR

APPENDIX II

Normals and Extremes of Rainfall

Station	No. of years of data	Jan.	Feb.	March	April	May	June	July	Aug.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Kendujhar ..	50 a	23.1	35.6	19.1	48.0	94.7	195.1	366.8	299.7
	b	1.5	2.4	1.6	3.1	5.9	10.7	16.9	15.6
Anandapur ..	50 a	17.0	33.8	26.2	51.8	92.7	212.1	325.1	298.2
	b	1.2	2.1	2.1	4.0	6.7	11.1	16.1	15.7
Champua ..	29 a	26.4	44.5	23.6	30.2	79.3	221.2	483.4	407.9
	b	1.6	2.5	1.7	2.2	4.9	10.5	18.6	17.1
Kendujhar (District) ..	a	22.2	38.0	23.0	43.3	88.9	209.5	391.8	335.3
	b	1.4	2.3	1.8	3.1	5.8	10.8	17.2	16.1

Station	No. of years of data	Sep.	Oct.	Nov.	Dec.	Annual	Highest annual rainfall as % of normal and year **	Lowest annual rainfall as % of normal and year **	Heaviest rainfall in 24 hours * Amount Date (mm.)
(1)	(2)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18) (19)
Kendujhar ..	50 a	213.4	91.4	30.0	5.3	1422.2	153 (1946)	66 (1948)	273.1 1945 July 3
	b	12.8	5.4	1.5	0.4	77.8			
Anandapur ..	50 a	241.3	119.4	37.1	4.3	1459.0	149 (1946)	61 (1905)	343.4 1941 July 9
	b	13.2	6.4	1.4	0.4	80.4			
Champua ..	29 a	244.3	127.3	27.9	5.8	1721.8	153 (1937)	63 (1945)	245.4 1941 July 9
	b	11.8	5.9	1.4	0.5	78.7			
Kendujhar (District) ..	a	233.0	112.7	31.7	5.1	1534.5	136 (1946)	63 (1912)	
	b	12.6	5.9	1.4	0.4	78.8			

(a) Normal rainfall in mm. (b) Average number of rainy days (days with rain of 2.5 mm. or more)

* Based on all available data up to 1967

** Years given in brackets

APPENDIX III
Frequency of Annual Rainfall in the District
(Data 1901—1950)*

Range in mm.	Number of years
901—1000	2
1001—1100	2
1101—1200	3
1201—1300	4
1301—1400	8
1401—1500	6
1501—1600	8
1601—1700	6
1701—1800	4
1801—1900	3
1901—2000	0
2001—2100	2

* Data available for 48 years

APPENDIX IV
Normals of Temperature and Relative Humidity

Month		Mean/ Daily Maximum Temperature °C	Mean/ Daily Minimum Temperature °C	Highest Maximum ever recorded **		Lowest Minimum ever recorded		Relative Humidity	
				°C	Date	°C	Date	0830	1730*
								%	%
January	..	25.4	11.7	33.9	1974 Jan. 11	3.0	1976 Jan. 9	62	51
February	..	28.3	14.4	40.4	1974 Feb. 25	2.7	1967 Feb. 2	59	43
March	..	33.2	18.6	41.9	1972 Mar. 29	8.7	1967 Mar. 1	51	35
April	..	36.9	22.7	43.0	1973 Apr. 16	10.4	1967 Apr. 4	53	41
May	..	38.2	24.6	46.4	1974 May 3	9.7	1969 May 1	56	42
June	..	34.2	24.7	43.4	1976 June 9	12.2	1969 June 25	70	65
July	..	29.7	23.1	34.4	1976 Jul. 9	13.2	1969 Jul. 3	82	80
August	..	29.6	23.6	40.9	1975 Aug.	15.6	1973 Aug. 9	83	81
September	..	29.8	22.5	37.9	1969 Sep. 7	13.7	1966 Sep. 29	82	81
October	..	29.2	20.2	33.9	1966 Oct. 5	7.2	1966 Oct. 30	77	70
November	..	27.0	14.8	31.4	1976 Nov. 16	8.2	1966 Nov. 9	64	55
December	..	25.1	11.7	34.9	1973 Dec. 4	2.2	1966 Dec. 21	63	54
Annual	..	30.5	19.4	46.4	1974 May 5	2.2	1966 Dec. 21	67	58

* Hours I. S. T.

** Extremes updated up to 1976

Normals based on data from 1955 to 1967

KENDUJHAR

APPENDIX V

Mean Wind Speed in km./hr.

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
3.4	4.7	5.6	6.9	7.8	8.5	7.9	6.8	5.0	3.6	2.9	2.9	5.5

APPENDIX VI

Special Weather Phenomena

Mean No. of days with (1)	Jan. (2)	Feb. (3)	Mar. (4)	Apr. (5)	May (6)	Jun. (7)
Thunder	..	0.0	0.1	0.3	2.0	1.4
Hail	..	0.0	0.0	0.0	0.0	0.0
Dust storm	..	0.0	0.0	0.0	0.0	0.0
Squall	..	0.0	0.0	0.0	0.0	0.0
Fog	..	0.3	0.1	0.6	0.1	0.0

Mean No. of days with (1)	Jul. (8)	Aug. (9)	Sep. (10)	Oct. (11)	Nov. (12)	Dec. (13)	Annual (14)
Thunder	..	0.3	0.4	1.7	0.4	0.0	8.5
Hail	..	0.0	0.0	0.0	0.0	0.0	0.0
Dust storm	..	0.0	0.0	0.0	0.0	0.0	0.0
Squall	..	0.0	0.0	0.0	0.0	0.0	0.0
Fog	..	0.0	0.0	0.0	0.1	0.0	1.5