

CHAPTER I

GENERAL

INTRODUCTION

Origin of the name of the district

Baleshwar, the extreme north-eastern border district of the state of Orissa, is said to be a local derivation of "Baneswar"—Lord Baneswar, the presiding deity of a Siva temple in Puruna Baleshwar. The principal town which is also the administrative headquarters of the district also bears the same name of Baleshwar.

Location, general boundaries, total area and population

The district is situated between $20^{\circ}44'$ and $21^{\circ}57'$ N. latitude and $86^{\circ}16'$ and $87^{\circ}29'$ E. longitude. It is bounded on the north by the Midnapore district of West Bengal, on the east by the Bay of Bengal, on the south by the district of Cuttack from which it is separated by the river Baitarani and on the west by the districts of Kendujhar and Mayurbhanj.

It extends over an area of about 6308.42* sq. km. and ranks 13th, the smallest among the districts of Orissa in size. The district consists of a long strip of alluvial land between the hills and the sea and excluding the plains of Nilagiri subdivision, it looks somewhat like an hour-glass in shape, very narrow in the centre, but growing broader towards the north and south. This tract varies in breadth from about 48.30 km. at the north-eastern extremity to a little more than 16.10 km. at the centre and 64.40 km. in the south. The district, thus hemmed in by a surf-beaten coast on one side and a barrier of hills on the other comprises four belts of country extending from north to south in lines roughly parallel to the coast and rising slowly as they recede from it. The first is a narrow maritime strip of land in many places impregnated with salt and unfit for cultivation which has been formed by the silt-laden rivers debouching from the hills and the sand-burdened currents of the bay. The second is the delta proper, an alluvial plain thickly inhabited and covered with great stretches of rice, which constitutes the greater part of the district. The third belt consists of the undulating tract which gradually ascends into the wooded glens and the fourth division consists of the mountainous tract of Nilagiri subdivision. The headquarters town Baleshwar stands almost to the eastern border and is thus far removed from the northern and south-western parts of the district.

The population of the district was 2,252,808 persons as per 1981 Census comprising 1,139,355 males and 1,113,453 females. In terms of population the district ranks sixth in the state. The

*Source: Survey of India, S. E. Division, Bhubaneswar.

population of the district is 2,796,321 persons as per the Census of 1991 (provisional) consisting of 1,420,708 males and 1,375,613 females.

History of the district as an administrative unit and changes in its parts

Baleshwar was administered from Cuttack from 1805 to 1821 and had no separate Revenue Officer. A Joint Magistrate was stationed at Baleshwar as the deputy of the Magistrate of Cuttack. In 1827, Baleshwar was constituted an independent Collectorate and in the subsequent year Jajpur and Bhadrak were attached to it. Jajpur was again transferred to Cuttack subsequently. On the north of the district, a perplexing series of transfers and re-transfers of fiscal divisions went on for a long time between Baleshwar and Midnapore, some being transferred backward and forward as many as three times. The district finally acquired a definite dimension in 1870 when the northern boundary was defined and the Baitarani and Dhamra were made its southern limits. The following changes have occurred to the district boundary after 1870.

(1) The area once occupied by the French remained as French territory till 1947. A more elaborate account of this territory is given by D. H. Kingsford in the Final Report of the Provincial Settlement. The area of the lodge was held to be 18.45 hectares (45 acres) by Dalziel in his Final Report on the Revision Settlement of Orissa. This area consisting of a population of 264 persons was released from French possession and annexed to Baleshwar police-station in 1947.

(2) The administration of the ex-state of Nilagiri belonging to the Eastern States Agency was taken over on the 14th November, 1947. It was the first tributary state in the country whose administration was taken over by the Government of Orissa on behalf of the Government of India. It formally merged with Orissa on the 1st January, 1948 and was constituted into a regular subdivision of the district on the 15th December, 1949.

(3) About 37 villages comprising an area of 19.84 sq. km. (12.32 sq. miles) and a population of 5,936 belonging to Olmara police-station and 4 villages of Parganas Narangabad with an area of 1.1 sq. km. (0.68 sq. mile) and a population of 174 constituting part of the district of Mayurbhanj were added to Baleshwar on the 15th December, 1949.

(4) The village Tillo belonging to the district Kendujhar having an area of 7.51 sq. km. was added to the district on the 15th December, 1949 and on the same date a number of villages of Killa Ambo with an area of 9.06 sq. km. was transferred from Baleshwar district to Kendujhar district.

Thereafter, there has been no change in the boundary of the district, though minor changes have occurred in its component parts. Two police-stations namely Sergar and Raibania have been formed by carving out portions from Baleshwar Sadar and Jaleshwar police-stations respectively. In Bhadrak subdivision, Bansada police-station was created by taking out a portion of Chandbali police-station.

Subdivisions, Tahasils and Police-stations

The district is divided into three subdivisions, ten Tahasils and twenty-eight police-stations. The names of subdivisions, Tahasils and the component police-stations are furnished in the following table.

Subdivision	Tahasil	Police-station
Baleshwar	Jaleshwar	1. Bhograï 2. Jaleshwar 3. Raibania
	Basta	1. Basta 2. Baliapal 3. Singla
	Baleshwar	1. Baleshwar Town 2. Sadar 3. Khantapada *4. Chandipur 5. Remuna
	Soro	1. Soro 2. Simulia 3. Khaira
Nilagiri	Nilagiri	1. Nilagiri 2. Berhampur 3. Oupada
Bhadrak	Bhadrak	1. Bhadrak Town 2. Bhadrak (R) 3. Bant
	Basudebpur	1. Basudebpur 2. Naikanidihi
	Tihidi	1. Tihidi
	Chandbali	1. Chandbali 2. Bansada
	Dhamnagar	1. Dhamnagar 2. Bhandaripokhari 3. Dhusuri

*Opened in 1986

Baleshwar subdivision has three Tahasils, viz., Baleshwar, Jaleshwar and Soro till 31.3.1967. On the 1st April, 1967 a fourth Tahasil namely Basta came into being by reconstitution of the three existing Tahasils in Revenue Department notification No. 21080, dt. 24.4.1967.

Until 31st October, 1975 Bhadrak subdivision had three Tahasils, viz., Bhadrak, Chandbali and Dhamnagar. It was divided into four Tahasils namely, Bhadrak, Chandbali, Dhamnagar and Basudebpur with effect from 1st November, 1975 under Revenue Department notification No. II-J-6/76/74568/R., dated the 22nd September, 1975. The new Tahasil Tihidi is added to this subdivision.

Nilagiri subdivision constitutes only one Tahasil of the same name.

As per the Census of 1991 the district has as many as six towns of which two have the status of Municipality and the rest are Notified Area Councils. The area, population and classification of these towns are given in the following table :

Name of the town	Classification	Population	Area in sq. km.
(1)	(2)	(3)	(4)
1. Jaleshwar	Notified Area Council (N. A. C.)	16,790	17.6
2. Baleshwar	Municipality	86,116	19.4
3. Soro	N. A. C.	22,726	23.6
4. Bhadrak	Municipality	76,390	31.1
5. Basudebpur	N. A. C.	20,031	..
6. Nilagiri	N. A. C.	12,800	20.4

TOPOGRAPHY

The district is a long strip of alluvial land stretching along the seashore from north to south and growing broader towards the latter. It may be broadly divided into three distinct natural divisions (1) Littoral saline tract, (2) Arable alluvial tract and (3) Montane and Sub-montane tract.

(1) Littoral saline tract—This tract runs almost the entire way down the coast and forms a very narrow strip, varying in breadth from 3.22 km. to 9.66 km. and rising at places into sandy ridges about

15.24 to 24.38 metres high. It slopes on either side and is covered with a vegetation of low scrub jungle. Sluggish brackish streams creep along between banks of fetid black mud. The tract is purely alluvial and has a distinctly saline taste. Further inland, the plain which once spread out into prairies of coarse long grass and scrub jungle providing ideal pasture lands for the cattle herds has now been greatly reclaimed by the cultivators, many from outside the state. Today only a few small narrow patches of grass lands lie scattered in this region. It is primarily a fertile alluvial zone and the contiguous inland comprises the major part of the district.

(2) Arable alluvial tract—The arable tract lies beyond the salt lands and embraces the rest of the district but for the whole submontane tract which lies to the west of the district. It is a long dead level of rice fields with a soil light in colour, friable and apt to split up into small cubes with a rectangular cleavage. It is a treeless region except round the villages which are encircled by fine mango, pipal, banyan, bamboo and tamarind trees. A common feature of this tract is the Patas literally the cups or depressed lands near the river banks. These lands bear the finest crops.

(3) Sub-montane tract—The sub-montane tract is an undulating country with a red soil much broken up into ravines along the foot of the hills. Masses of laterite buried in hard ferruginous clay crops up as rocks or slabs. At Kupari in Bhadrak subdivision, about 3.22 km. are almost paved with such slabs, dark red in colour perfectly flat and polished like plates of iron. Black stone and granite quarry also lie in the hills close to Nilagiri. Large tracts are covered with Sal jungles, which nowhere attains any great height. Near the hills there are patches of cultivated lands and the soil is often of great fertility on account of the rich vegetable matter brought down by the mountain torrents.

To the south of Nilagiri, a range of hills which is a part of the Eastern Ghats runs north-west towards Darkhull and then towards south-west and running up to the border of Mayurbhanj and Kendujhar it becomes continuous with the hill ranges of these two districts.

Hills

All the mountain ranges in the district lie within the Nilagiri subdivision and as stated earlier belong to the Eastern Ghats range of mountains. To the north of the Nilagiri town a few hills rise to a height of more than 304.80 metres. The peaks in those hills that need mention are Machhua Pahad (299.62 m.), Dhobasila Pahad (438.30 m.), and Swarnachuda (544.37 m.). The nature of vegetation is open mixed forests consisting of Sal, Piasal, Asan, Bamboo, etc.

To the south and west of Nilagiri lie a continuous range of hills with open Sal and Bamboo forests. These hills rising from the plains reach a height of 304·80 metres and above. The main peaks are Sunchut Parbat (453·54 m.), Katillia Parbat (494·69 m.), Debigiri Pahad (682·45 m.), Jhanuadi Pahad (626·97 m.), Bamanihuli Pahad (682·45 m.) and Jugjuri Pahad (408·13 m.).

Sea coast

The district has a coastline of 136·85 km. through which several great rivers make their way to the sea. In spite of the existence of these estuaries and of the extent of its sea face, the district does not contain a single harbour capable of sheltering ships of any great size. In the words of William Hunter "an eternal war goes on between the rivers and the sea, the former struggling to find vent for their columns of water and the latter repelling them with its sand laden currents". These forces counteract each other, and the sea deposits bar outside the river mouth, while the river pushes out its delta to right and left inside. These rivers consequently silt up at the mouth, and though they are generally of sufficient depth each is blocked up by a bar of sand or mud, which prevents the entrance of large sea-going vessels except at tide time. Silt, the common enemy of waterways in Orissa has been fatal to the prosperity of almost every port in the district.

In the year 1871 there were seven ports in the district, Subarnarekha, Saratha, Chanuya, Baleshwar, Laichanpur, Churaman, and the Dhamra including Chandbali. Some of these ports were, however, very insignificant. Saratha and Chanuya were merely demarcated portions of the rivers known by these names, deep slimy and it was most difficult to land owing to the soft muddy banks. Laichanpur, 37·03 km. south of Baleshwar and Churaman 9·66 km. further on, were also parts of two nullahs, the mouths of which were so nearly closed that to steer a small jolly boat into them and out to sea again required careful watching of the tide while they were so completely concealed by a dense fringe of jungle that it was difficult to discover them from the sea. Churaman, was however, once considered the safest and the most convenient port on the coast of Orissa, largely owing to the facilities afforded by the extraordinarily soft and yielding nature of the mud bottom of the river. The rice sloops penetrated as near the coast as high water would allow them to push their way, and the receding tide left the greater part of their hulls resting securely on a soft cushion of mud. It was a well-known fact on the coast that, should there be any doubt as to the possibility of weathering a dangerous storm, the safest plan was to run the ship straight into the bay of Churaman, where the thick half liquid mass of mud in solution counteracted the violence of the winds and waves.

Owing to the silting up of the river mouths, to the construction of the Coast Canal, and the abandonment of the old salt manufacture, many of these ports have now ceased to exist, while the position of others has been changed. A few centuries ago the Subarnarekha was a noble estuary which was admirably suited for a harbour and was consequently one of the first places to attract European mercantile enterprise. Here at the close of the 16th century Portuguese established themselves at Pipili; that harbour was also the rendezvous of the Arakanese pirates; and later the English appear to have made a settlement there. But the Subarnarekha, in spite of its overwhelmingly superior length, the vast area of its catchment basin and volume of discharge, was the first to silt up. By the beginning of the 18th century A.D. the silting up of its mouth had ruined Pipili, and the settlement was abandoned. The place lingered on as a ruined and silt-locked place till the early years of the 19th century, but no trace of it now remains. The Subarnarekha port, once most important in the district is in virtual disuse except that fishing boats still anchor here. The sands stretching across its mouth are almost bare at low water but beyond the bar there is a magnificent deep channel. It is, however, quite unsafe during the south-west monsoon; it presents a deadly shore with breakers right across the mouth.

Further down the coast is the estuary of the Burhabalanga river. The port consisted of a portion of the river fronting the town of Baleshwar and was about 1.2 km. in length. The river goes along a sinuous course till it joins the sea. A project undertaken in 1863 to render the course of the river shorter was later abandoned.

The Dhamra which formed part of the boundary line between Baleshwar and Cuttack is a fine estuary formed by the junction of the Brahmani and the Baitarani rivers.

RIVER SYSTEM AND WATER RESOURCES

Main rivers and distributaries

The district is watered by six distinct river systems. Proceeding from north to south, these principal rivers are the Subarnarekha, the Panchpara, the Burhabalanga, the Jamka, the Kansbans and the Baitarani. During the hot weather the upper channels of these rivers dwindle to insignificant streams dotted here and there with stagnant pools but in the rainy season they bring down an enormous mass of water from the hills from which they take their rise. They drain a large area and the rapidity of the current acquired among the mountains sweeps down a vast quantity of silt in suspension. As soon as the river leaves the

broken hilly region for the level delta, its current is checked and being unable to carry down the sand with which it is charged, it deposits it in its bed. By degrees, therefore, the channel becomes shallower, the bed is raised, and the river flows at a level higher than the surrounding country. The rivers and their various channels consequently become less and less able to carry off the water supply to the sea and frequently prove inadequate to furnish an outlet for the volume of water with which they are charged during the rainy season. The result is that though in the cold and hot weathers they are small streams winding through long expanses of sand, in the rains they are formidable torrents which often overflow their banks and flood the country far and wide.

These rivers are scarcely navigable as they dry up during the summer.

The following is a brief description of each of these principal rivers with their most important tributaries and offshoots.

Subarnarekha

The Subarnarekha takes its rise 16·10 km. south-west of Ranchi in the Chota Nagpur plateau. It flows towards the north-east, leaving the main plateau in a picturesque waterfall and then forms the boundary with Hazaribag, its course being eastwards to the trijunction point with the Manbhum district. From this point the river veers southwards into Singhbhum, then passes into the district of Mayurbhanj and enters Midnapore from the north-west. It traverses the jungle in the western part of the district till it reaches Baleshwar, through which it flows for 96·60 km., in a tortuous southern course with great windings east and west until it finally discharges into the Bay of Bengal, after a course of 536·56 km., during which it drains an area of 29,267 sq. km. The river banks are high and steep on the outer curve of the bends against which the water cuts and flat or sloping on the inner. It has no tributaries within the district except a small stream, the Guchida which joins it at Bhograi and another Khaljori Nala which joins it near Paschimbad. Although studded by islands as old as the oldest map, it has long ceased any operations of diluvion or alluvion on a large scale. The country along the banks is cultivated upto a few kilometres of the sea, where it enters the saline tract. The Subarnarekha is nowhere fordable within the district during the rainy season.

The river carried the early European trade in the province from and to the port of Pipili, which was occupied by the Portuguese at the end of the 16th century. The silting up of the

mouth of Subarnarekha during the next century led to the decline of the port of which no vestige now remains. The river is still however, navigable by country crafts as far as Kalikapura, about 25.76 km. from its mouth, up to which point it is tidal, 40.25 km. further up it is spanned by the railway bridge and the Orissa Trunk Road at Rajghat. The name Subarnarekha which means a streak of gold is said to be derived from the fertility of the land on either bank. Others, however, trace the origin of the name to the particles of gold occasionally found in its sandy bed.

Haskura

It rises as a stream in the hills of Mayurbhanj and flowing across the bridge on the old Grand Trunk Road, below Rajghat passes south over the Basta-Baliapal Road to Tepabulang, where it communicates through an inlet with the Coast Canal. At least two channels drain the flood waters of the Subarnarekha into this river. Between the Coast Canal and the sea, the river branches off into a network of some of the channels connecting Saratha to the south. This stream contains very little water during the summer months, but has been known to cause considerable damage in the rains, when it carries a great volume of the Subarnarekha flood.

Saratha

In its upper reaches, it is known as Jamira, Baura, Surud, Maharti and Gulpha which are some of the tributaries that go to swell its main stream. After forming the boundary line between Baleshwar and Mayurbhanj districts for some distance, it is bridged by the railway a few kilometres south of Basta railway station. A little beyond this, it passes under the old Grand Trunk Road and then takes a course almost parallel to that of Haskura forming two large loops on the way. At the second loop it crosses the Orissa Coast Canal and gets interland through tiny channels with Haskura to its north and Panchpara to its south. It then falls into the sea at the mouth of the Panchpara. It is tidal as far as the Coast Canal, 16.10 km. from the sea.

Jalaka

The Jalaka takes its rise from a spring in Sunaposi of Suliapada police-station in the district of Mayurbhanj, where it is named as Jambhira. It has three tributaries, namely, Bauranala, Mahantinala and Gulphanala. It turns into a turbulent river and ravages mainly the areas of Morada and Rasgobindpur police-stations during floods. The river then enters into the district of Baleshwar near Basta where it is known as Jalaka. Generally, it inundates eight Grama Panchayats in this district, viz., Baharda,

Sadanandpur, Brahmanda, Rautapada, Srirampur, Sahada, Mukulasi and Mathani covering the areas of Basta and Singla police-stations. Being joined by the Pejagala Nala, it meets the river Panchpara and then flows down to the Bay of Bengal.

The river is only 85 kilometres long. About 10 kilometres of the river is navigable largely due to tidal waters. Normally it does not change its course, but swells in case of heavy rains in the catchment area.

Panchpara

This seems to be the name given to the river Bans in Baleshwar district which higher up has its origin in the Mayurbhanj district. Uniting with Bhairingi and a few other small tributaries, it enters into Baleshwar district a few kilometres to the west of the railway line. The intermediate country between this river and the Jamira after the former crosses the railway line is drained by a series of channels and also by a cut from the Saratha. The Panchapara then winds its course into the sea. The name of the river means five villages believed to have been existing at the spot where it enters the sea. The tide runs up only 16·10 km. and the interlacings of these streams constantly spread out into shallow swamps.

Burhabalanga

It rises among the hills of Mayurbhanj and flows for its greater length within this district. After receiving a number of tributaries among whom the Madhabi, Gangahor and Sone are important, it winds its way into the sea near Chandipur after a course of 56·35 k.m., through the district. In the upper part of its course the banks are sandy, steep and cultivated, in the lower part they are of firm mud covered to high water mark with black ooze and surrounded by jungle or open grassy plains. It is tidal and sloops and small steamers could navigate its tortuous course as far as the town of Baleshwar but the sand bar across the mouth of the river, has rendered the entrance difficult. It is liable to floods but the area exposed to inundation, which lies to the north and north-west of the town is not large. The name which means literally the old twists has been given to the river because of the extraordinary way in which its course winds and bends. It is known to have changed its course, at places, considerably during the past decades. Though Baleshwar is merely 11·27 km. from the sea as the crow flies along this river the distance becomes 28·98 k.m. Considerable fishing activities through gill-net, trawlers, etc., is carried out at its mouth at Balaramgadi. This has helped building up of fishing infrastructure like a fishing jetty, ice and cold storage plants and hotels, both in public and private sectors.

Jamka

On the south of the Burhabalanga a network of rivers, known as the Jamka find their way down from the Nilagiri hills and enter the sea by many channels along the coast of the Dasmalong Pargana. There is little or no navigation, as their mouths have been closed up by the construction of the Coast Canal. There is no maritime traffic on their banks and the most important of these channels, the Jamka, has a sluice built about a mile (1.6 km.) from its mouth.

Paga

To the south of Burhabalanga is the Paga, a small stream of 16.10 km. long. The name is said to be a corruption of Prayag, the old name of the village near which it rises.

Nembu

The Nembu or Kantiachera rises in the Nilagiri hills and runs a course of 24.15 km. in the district. The name is said to mean the lemon river, and to be derived from the lemon groves which formerly used to fringe its banks. It forms along with Sapua a network before it joins the sea.

Kansbans

This is so called from a jungle of Kans grass and bamboos amid which it rises. It runs in a south-easterly direction, at first almost parallel to the Nilagiri hills and receives from them a number of nameless drainage streams on its northern bank. After passing under the bridge on the National Highway a few kilometres to the south of Soro, it bifurcates at Birpara, the northern branch retaining its original name and flowing into the sea 48.30 km. from the point where it enters the district.

Gamai

The southern branch of the Kansbans receives the name of Gamai and falls into the sea 9.66 km. south of the latter. Due to the Coast Canal, the river has been silted up with its passage to the sea almost closed. About 4.83 km. from its mouth is situated the old port of Chudaman, once an important centre of export trade but now an insignificant village. Like the Kansbans, the Gamai is liable to heavy floods but a great part of its flood water runs south-westwards along the old Churaman or Ricketts Canal into the Matai which drains the country east of Bhadrak.

Baitarani

It rises among the hills in the north-west of Kendujhar district and enters Baleshwar near the village Balipur. After flowing in a winding easterly course across the delta where it

marks the boundary line between Cuttack and Baleshwar it passes by Chandbali and joins its water with the Brahmani. After their confluence the united stream is named Dhamra which meets the sea after 8.05 km. It is navigable as far as Olekh, 24.15 km. from its mouth but beyond this point, it is not affected by the tide and is fordable during the hot season. The river is subject annually to heavy floods which travel inland to an average distance of 6.44 km. to 19.32 km. when it causes considerable damage to the standing crop. A large weir has been constructed across the stream at Akshuapada in order to dam the water during the dry season and supply water to the High Level Canal between that place and Bhadrak.

The river is identified as the styx of Hindu mythology but the name is possibly a corruption of Avitarani meaning difficult to cross. A legend relates that Lord Rama when marching to Lanka to rescue his wife Sita halted on its bank on the boarder of Kendujhar and in commemoration of this event large number of people visit the river every year in January.

The Baitarani receives two important tributaries in Baleshwar, the Salandi and the Matai.

Salandi

The Salandi possibly a corruption of Sal Nadi takes its name from the Salforest through which it traverses. It rises on the southern slope of the Meghasani mountain of Mayurbhanj and throughout its upper course is a black-water river with high banks and a bottom of muddy sand. In January, it scarcely exceeds anywhere one metre in depth. Luxuriant vegetation clothes its banks which at places rise almost to the dignity of cliffs and for kilometres, the river runs through continuous groves of mangoes, palms and bamboos. It has no tide but it is navigable for country boats as high as 9.66 km. (6 miles) from its junction with the Baitarani. Its lower course breaks up into a network of channels which are interlaced with those of the Matai. Among its tributaries mention may be made of the Reb which joins it before it meets the Baitarani.

Matai

The Matai brings down the drainage of the country between the Kansbans and the Salandi, and after a tortuous course over a muddy bed and between densely wooded banks, enters the Dhamra near its mouth. This river attains a considerable volume at Charbatia, where it is joined by the Coast Canal. It is tidal as far as Ruknadeipur, 12.88 km. east of Bhadrak and is navigable up to that point by country boats.

GEOLOGY

Antiquity

The geology of the district is rather simple in view of the fact that only a limited number of rock types are met within the north-western hilly tract of the district. The vast coastal tract in the south-east portion of the district is devoid of any rock types.

The various formations exposed in the district of Baleshwar belong to Archaean, middle proterozoic, pleistocene and recent groups. The unclassified gneisses exposed in the north-western part of the district are probably oldest and acted as basement. The iron-ore group rocks is not exposed in the district. Granites, peridotites Anorthosite-gabbro-granophyre complex and dolerites were later intruded into the unclassified gneiss during middle proterozoic time. This probably took place during the last phase of iron-ore orogeny. The intrusive phase was followed by formation of laterite during pleistocene period and finally by alluvium during recent period. From the available data, the tentative stratigraphic sequence of the district is as follows:

Alluvium	Recent
Pleistocene	Laterite
Middle Proterozoic	{ Dolerite dykes Anorthosite Epidiorite (gabbro) Granophyre complex Enstatite peridotite
Archaean	{ Unclassified gneisses Singhbhum granite

Distribution and description of individual rock units are as follows :

Unclassified Gneisses

These are exposed in the western part of Baleshwar bordering Mayurbhanj district. Generally two types of gneiss are present in the district. These are (1) fine grained grey gneiss and (2) coarse grained gneiss. The fine grained variety forms a featureless country which is usually flat or undulating and is generally covered by thick soil mantles and is used as paddy fields. The rock is usually biotiterich. The coarse type forms bare hill masses and contains xenoliths of grey gneisses. At places augens are seen to have been developed within the coarser gneiss. They are seen in the Nilagiri hills.

Granite

These rocks are mostly intrusive into unclassified granite gneiss and are mostly hornblende granite type. These have been traced in the hill portions of the area east of longitude $86^{\circ}40'$ and also at 181 ($20^{\circ}57' : 86^{\circ}07'$) covered by toposheet 73 K/11. The granophyre gradually grades into the granite with an increase in grain size. Hornblende granite consists of quartz, microcline, perthite and albite-oligoclase with hornblende, sphene, biotite and apatite as accessories.

Enstatite Peridotites

East of 1064 ($21^{\circ}27' : 86^{\circ}42'$) and north-west of 1056 ($21^{\circ}26' : 86^{\circ}44'$) in 73 K/11 a band of enstatite peridotite about one and a half kilometres long and 800 m. wide has been noted. The junction between these rocks and hornblende granite is sheared and covered by talc-chlorite schists. Small bands of enstatite peridotite in the hornblende granite which are almost altered into steatite are traced on the flat tops of the ridge north-east of 1685 ($21^{\circ}23' : 86^{\circ}40'$), east of 1636 ($21^{\circ}24' : 86^{\circ}41'$), south of 1114 ($21^{\circ}21' : 86^{\circ}40'$) in the gentle sloping area. These patches are in various stages of alteration into chlorite-serpentine and talc bearing rocks. Anthophyllite asbestos is also seen developing at places.

There are several patches of enstatite peridotite in the biotite gneiss area covered by the north-western portion of toposheet 73 K/11. They are all altered into schists.

Chromite

As a result of investigations conducted by the Directorate of Mining and Geology, two small lodes of chromite have been discovered around Bhalukasuni ($21^{\circ}29'25'' : 86^{\circ}42'15''$) in Nilagiri subdivision within the ultrabasics. The chromite bodies are concealed and occur in cultivated land below a soil cover ranging from 0.5 mt. to as much as 14 mt. There may be hidden chromite lodes in the area. The results of the investigation indicate that the chromite deposit at Bhalukasuni occur as pediform and in association with peridotite and serpentinised dunite. The total reserves of 1,550 tonnes has been estimated both for massive and spotted variety of chromite with Cr_2O_3 content ranging from 25.77 to 54.76 per cent. Chromite float is also noticed in the plains on either side of the magnetite deposits near Rangamatia in association with small ultrabasic bodies. The float chromite of the Rangamatia area is found to be high grade, crystalline, massive and contain 44.57 to 54.27 per cent Cr_2O_3 . Chromite has also been noticed in the northern foot hills of Asto Pahar SW of Rangamatia.

Vanadiferrous magnetite

Vanadiferrous magnetite has been discovered around Rangamatia ($21^{\circ}21' : 86^{\circ}39'$) and Betei ($21^{\circ}24' : 86^{\circ}42'$) in Nilagiri subdivision by the Directorate of Mining and Geology. The deposit at Rangamatia occurs on the eastern slope of hillock 620 as two small pockets. The magnetite is massive, crystalline and greyish black in colour. The analysis result of the samples revealed that the percentage of V_2O_5 content varies from 0.38 per cent to 1.238 per cent.

The other magnetite deposit at Betei constitutes three small lodes. The lodes are found on the eastern flank of Jhatikasuni, western flank of Daliasuni hillock and south-east of Dohihudia hillock lying to the eastern side of the road leading Gadasahi. This deposit is located south of Nilagiri-Udala road about 18 km. from Baleshwar. The ore is hard and massive and analysis results indicate that the percentage of V_2O_5 varies from 0.044 per cent to 1.446 per cent.

Epidiorite (gabbro)

These rocks are found at the following places of the district in sheet No. 73 K/11, at .900, from south of .900 to .1450 ($21^{\circ}24' : 86^{\circ}33'$); .1050 ($21^{\circ}24' : 86^{\circ}32'$) and the hill south-west of it, .1360 ($21^{\circ}28' : 86^{\circ}40'$) and its westward ridge, .630 ($21^{\circ}29' : 86^{\circ}40'$) and its westward ridge. The rock is essentially composed of plagioclase and hornblende, both minerals showing slight elongation. At the junction between granite and epidiorite the latter is highly sheared and schistose.

Granophyre

Granophyres which form the entire hill masses, extend from .1339 ($21^{\circ}22' : 86^{\circ}30'$) eastwards upto .1850 ($21^{\circ}24' : 86^{\circ}30'$) and from there northwards upto .2052 ($21^{\circ}27' : 86^{\circ}38'$). Another major band of banded granophyre is seen extending from .1425 ($21^{\circ}27' : 86^{\circ}48'$) to .221 ($21^{\circ}27' : 86^{\circ}42'$). Towards the contact with epidiorite and biotite gneiss, the granophyre is banded and fine grained. South of .1450 and several other places along the epidiorite granophyre junction, the granophyre includes several patches of epidiorite.

The granophyres are generally riebeckite bearing and consist essentially of phenocrysts showing granophyric intergrowth of quartz and felspar in a fine grained ground mass. The banded granophyre contains flakes of biotite in addition to the above minerals.

Younger Dolerites

Dykes of dolerite belonging to the Singhbhum newer dolerite sequence are found on almost all the linear ridge tops in the northern and northwestern parts of toposheet 73 K/11. They are flanked on either side by biotite granite gneiss. The prominent strike of dolerites in the district is N 30° E 30° S. W. The dykes are seen among the hornblende-granit \bar{e} also, as at .779 (21°22' : 86°41'), Hathikhola (21°24' : 86°40') and .1623 (21°25' : 86°43') in sheet No. 73 K/11.

The dolerites in the above area show subophitic texture and consist of labradorite and titan augite. The augite shows twinning and is partially altered into hornblende. Augite also alters to sphene leucoxene and chlorite. Most of the plagioclase is fresh. At places it alters into zoisite.

Laterite

Laterites are seen to have been developed over biotite gneiss and granites, and are also locally found.

Mineral Resources

The district is practically devoid of any important mineral deposit. Some of the minerals of the district which are used economically are as follows :

Road and building materials

Granitic gneiss and basic rocks around the Nilagiri town (21°27' : 86°46') and Machhana (21°33' : 86°47') are quarried for use as road metal and ballast. Kankar suitable for lime burning occurs extensively around Jamuna (21°29' : 86°35') and Rangamatia (21°29' : 86°39').

Steatite/Soapstone

Potstone occurring at Mahamuhan (21°21' : 86°40') is worked in a small way. The old workings on the hills here illustrate the extent of mining in the past. A kind of magnesian rock, intermediate in composition between potstone and serpentinite, approaching the former in appearance but less greasy in lustre, occurs interfoliated with gneiss, a few kilometres south of Nilagiri (21°27' : 86°46') and near Santragodia (21°23' : 86°46') and Goojaduha (21°23' : 86°39'). Small deposits of talc occur near Rangamatia Pahar (21°27' : 86°38').

Clay

Highly decomposed gneisses north of Arabandha have given rise to white plastic, gritty clay. The deposit is extensive but the clay content is only about ten per cent. North of Gardihi (21°34' : 86°40') a 2-3 m. thick white clay deposit occurs beneath a laterite capping. The clay is banded in appearance and is slightly gritty.

Monazite

Occurrence of monazite is reported from the sea sand in the coastal area of the district.

FORESTS

Except in Nilagiri subdivision, there is hardly any natural forest area in Baleshwar district. The total area under forests is 359.673 square kilometres which is 5.64 per cent of the geographical area of the district as against the minimum of 20 per cent and 60 per cent prescribed respectively for plain areas and hilly areas in the National Forest Policy. Baleshwar district comes partly under the administrative jurisdiction of Baripada Forest Division and the balance under the Wildlife Conservation Division, Chandbali. The forest area of the district in the two divisions mentioned above, as per the records available with the Chief Conservator of Forests, Orissa, is as follows :

(Area in sq. km.)

Name of the Division	Reserved Forest	Demarcated Protected Forest	Undemarcated Protected Forest	Unclassified Forest	Total Forest area
(1)	(2)	(3)	(4)	(5)	(6)
Baripada	204.33	125.46	..	..	329.79
Wildlife Conservation, Chandbali	..	21.00	8.88	0.003	29.883
	204.33	146.46	8.88	0.003	359.673

Most of this area is concentrated in Nilagiri subdivision only. The entire reserved forest area is in Nilagiri subdivision except 116 acres (46.40 hectares) of casuarina plantation in Chandipur Range of Baleshwar subdivision which was declared as reserved forest only with effect from 10th February, 1986. Besides, an area of 17.26 sq. km. of sea-coast casuarina plantation^o is under reservation proceedings in respect of which noti-

fication under section 4 of the Orissa Forest Act, has already been issued. Another area of 2.14 sq. km. in Raibania ex-zamindari forest has been resurveyed for notification under section 4 of the Orissa Forest Act, 1972 to constitute it as a Reserved Forest.

Systematic exploitation of forest in Nilagiri subdivision prior to any scientific management was first attempted during the later part of the 19th century when construction of the East Coast Railway was taken up. Prior to this, the people had free access to all kinds of forest produce without any payment. Consequently the forest area began to shrink due to over exploitation. In the year 1900, the ex-Durbar administration of the Nilagiri ex-state for the first time, framed rules for regulation, management and protection of forests. The forests were divided into four ranges for convenience of management. Permits were issued for taking small quantities of fuel and bamboo. Systematic regulated felling was introduced in the year 1904. A simple Working Plan of 1932, which remained in force till 1947, provided the basis for scientific management of all demarcated forests. The Revised Working Plan for the period 1948-58, drawn up by Dr. H. F. Mooney, the then Forestry Advisor of the Eastern States Agency, was followed even after the merger of Nilagiri ex-state in Orissa Province. Exploitation of annual coupes through contract system was carried on till the year 1979 when forest exploitation was nationalised and the Similipal Forest Development Corporation, a Government of Orissa Undertaking, was assigned the exclusive authority to exploit the forests.

The main forest products are timber, firewood, Mahua flower and seed, Sal seeds and leaves, myrobalan, tamarind, Bani leaves in coastal Chandbali range, nux vomica, Sunari bark, tassar, minor minerals such as stones, ballasts, chips, etc. The Kuldiha forests, under Nilagiri subdivision, cater to the daily needs of the people of Nilagiri and Baleshwar area in respect of firewood and small timbers. Huge quantities of black granite chips are supplied to Railway Department and for this leases have been granted to various contractors who operate quarries on long term basis.

FLORA

The following account is based on the information from the old Balasore gazetteer (1907) regarding flora of the district.

"Along the coast as far north as the Burhabalanga river are large grassy plains with occasional sparse patches of cultivation and low jungle on the sand ridges and near the tidal streams.

North of the Burhabalanga, and specially round the mouth of the Haskura and Subarnarekha are numerous tidal creeks fringed with heavy jungle. The banks of these sluggish rivers and creeks, which wind through the swampy low-lying country near the sea exhibit the vegetation of a mangrove forest.

These tidal or mangrove forest of the coastal areas are considered to be a seral sub-type under the northern tropical moist deciduous forest. The common species are *Rhizophora mucronata* (Rai), *Heritiera minor* (Sundri), *Excoecaria agallocha* (Guan), *Acanthus ilicifolius* (Harkunchi), *Phoenix paludosa* (Hental), *Avicennia alba* (Bani), *Ceriops*, *Sonneratia*, etc.

Where sand-dunes intervene between the sea and the cultivated land behind, a littoral vegetation uncommon in Bengal is met with, which includes *Spinifex*, *Hydrophyllax*, *Geniosporum prostratum* and similar species. These sand hills stretching between the fertile rice plains and the sea constitute the only really distinctive feature of Orissa from a botanical point of view and present not a few of the littoral species characteristic of the Madras sea coast. The cultivated land which occupies the central alluvial tract has the usual rice-field weeds, while ponds and ditches are filled with floating water weeds or submerged water plants. Near human habitations shrub berries containing various semi-spontaneous shrubs are common. This undergrowth is loaded with a tangled mass of climbing *Naravelia*, various *Menispermaceae*, many *Apocynaceae*, several species of *Vitis*, a number of *Cucurbitaceae*, and several *Convolvulaceae*. The arborescent portion of these village-shrubberies includes the red cotton tree (*Bombax malabaricum*), *Odina wodier*, *Tamarindus indica*, *Moringa pterygosperma*, the Pipal (*Ficus religiosa*), the Banyan (*Ficus bengalensis*), the Palmyra (*Borassus flabellifer*) and date palm (*Phoenix sylvestris*). There are no forests, but in the west of the district, where the boundary approaches the hills and the lands are higher, patches of jungle occur, including a little Sal (*Shorea robusta*) which rarely attains any size. The usual bamboo is *Bambusa arundinacea*. Open glades are filled with grasses sometimes of a reedy character ; sedges are abundant and farms are fairly plentiful."

Botanical Divisions and rare types of flora

The natural vegetation of the district is restricted to small areas of the outlying hills of Nilagiri in the north-west and the mangrove forests near Chandbali along Dhamra river and to the estuaries of Burhabalanga and Subarnarekha. The cultivated plains present a flora of seasonal aspects and weeds in many varied habitats.

The Nilagiri hills have laterite soil bearing dry deciduous mixed forests comprising *Terminalis tomentosa* (Asan), *Pterocarpus marsupium* (Piasal), *Anogeissus latifolia* (Dhau), *Xylia xylocarpa* (Kangada), *Dalbergia latifolia* (Sisu), *Cleistanthua colliuns* (Karada), *Bridelia retusa* (Kashi), *Diospyros sylvatica* (Mankada Kendu), *Firmiana colorata*, *Mangifera indica* (Mango), *Ougeinia dalbergioides* (Bandhana), and *Strychnos potatorum* (Kadakala). On the rocky places are found *Nyctanthes arbor-tristis* (Gangasiuli), *Petalidium barlerioides*, *Hemigraphis latebrosa* var. *heyneana*, *Justicia betonica*, *Leucas montana*, *Dicliptera roxburghiana*, *Flacourtia indica* and *Maba buxifolia*. The common bamboo *Dendrocalamus strictus* occupies valleys and lower slopes of the Nilagiri hills.

The alluvial plains of Baleshwar-Bhadrak belt represent chiefly rice fields supporting both "Abi" and "Tabi", crops of paddy (*Oryza sativa*) and few oil-seed crops like mustard and sesamum. On the bunds of the black cotton soils of rice fields are often found a few tree species, *Narengi crenulata*, *Soymida febrifuga* (Rohini), *Butea monosperma* (Palash), *Acacia nilotica* (Babul), Subsp. *indica*, *A. leucophaea* (Gobira), *Dichrostachys cinerea*, *Parkinsonia aculeata*, *Mitragyna parvifolia* (Godi kurum), and *Borassus flabellifer* (Tata). Several grasses like *Dichanthium annulatum*, *Heteropogon contortus*, *Sehima nervosum*, *Chionachne koenigii*, *Themeda quadrivalvis*, *Iseilema laxum*, *Sacciolepis indica*, *Paspalidium flavidum* and *Triumfetta rhomboidea*, *Sida acuta*, *Urena lobata*, *Malachra capitata*, *Corchorus aestuana*, and *Cyanotis axillaris* are found along the field bunds, while a few herbs like *Striga euphrasioides*, *Polygonum plebejum*, *Eriocaulon quinquangulare*, *Limnophila heterophylla*, *Lindernia ciliata*, *Vendellia crustacea*, *Utricularia coerulea*, *Caesulia axillaris*, *Ammannia baccifera* and *Commelina benghalensis* are weeds in the moist fields along with the main crop. On the other hand, the tanks or lakes and roadside swamps adjoining fields have floating/ rooting aquatic vegetation, etc. *Ottelia alismoides*, *Nymphaea nouchali*, *Nymphoides cristata*, *Ipomoea aquatica*, *Pistia stratiotes*, *Eichornia crassipes* and *Hygrophiza aristata*, etc., and the marginal vegetation comprising *Sphaeranthus indicus*, *Hygrophila auriculata*, *Polycarpon prostratum*, *Alternanthera sessilis*, *Rumex dentatus* and *Gnaphalium luteo-album*, etc.

The Pteridophytic flora of the Nilagiri hills is represented by *Th. parasitica*, *Doryopteris ludens*, *Adiantum caudatum*, *Hemionitis arifolia*, *Pteris vittate*, *Pteris eretica*, *Ceratopteris thalictroides*, *Lygodium flexuosum*, *Marsilia minuta*, *Salvinia cucullata* and *Azolla pinnata* amongst others.

In the plains are often found a few wastelands and pastures which show a distinct flora. In the moist places near the house-sites in the villages, many herbs, such as *Launaea nudicaulis*,

Tridax procumbens, *Ageratum conyzoides*, *Trichodesma zeylanicum*, *Cleoma gynandra*, *Cleome viscosa*, *Commelina benghalensis*, *Coleus forskohlii*, *Zeuxine Sulcata*, *Imperata cylindrica*, *Panicum repens*, *Dichrostachys cinerea*, *Eragrostis gangetica* and *Vetiveria zizanioides* abound while *Waltheria indica*, *Coldenia procumbens*, *Heliotropium indicum*, *Evolvulus alsinoides*, *Euphorbia hirta*, *Solanum surattense*, *Achyranthes aspera*, *Calotropis gigantea* (Anka), *Datura fastuosa* (Dudura), *Elephantopus scaber*, *Burmanna coelestis*, *Scoparia dulcis*, *Argemone mexicana* (Agara) and *Hyptis suaveolens*, many grasses and sedges are found in the drying puddles and village grazing lands.

Mangifera indica (Ambo), *Aegle marmelos* (Bel), *Albizia lebbek* (Siris), *Pongamia pinnata* (Karanj), *Syzygium cumini* (Jamu), *Tamarindus indica* (Tentuli), *Azadirachta indica* (Neem), *Limonia elephantum*, *Terminalia arjuna* (Arjuna), *Bambusa tulda* (bamboo), *Bambusa arundinacea* (Daba bamboo), *Flacourtia ramontchi*, *Streblus asper*, *Gardenia* spp., *Euphorbia terucalli* constitute important trees and shrubs in the village groves. *Pandanus tectorius* (Kia) and of late, *Ipomoea fistulosa* (Amari), *Euphorbia nivulia*, (Siju), *Jatropha curcas* (Gaba), etc., form extensive hedges between the rice fields and the village grazing lands or to protect gardens and fields. *Nymphaea stellata*, *Nymphaea rubra*, *Pistia stratiotes*, *Trapa bispinosa*, *Panicum paludosum*, *Hygrophiza aristata*, *Eleocharis* spp., *Cyperus globosus* and *Neptunia oleracea* form some of the many aquatics in the tanks and swamps in the area.

In some places the cultivated fields give way to sandy wastes dotted over with palms (*Phoenix sylvestris*), *Salopo*, *Borassus flabellifer* (Tal), and in the villages, *Cocos nucifera* (cocoanut palm).

The coastal area of the district extends from the Subarnarekha river in the north to the Baitarani river in the south, alternating with deltaic and tidal alluvium. The region represents a straightly curved coastline interrupted by the estuaries at the mouth of the rivers Subarnarekha, Burhabalanga and the Baitarani. It is characterised by sand dunes, sandy wastes and strips of open beach washed daily by the high tides from the Bay of Bengal.

The sand-flora and the development of strand forests along the coastline are, however, very much disturbed due to recent massive programmes for cultivating rice, despite sub-saline habitats. However, under favourable climatic conditions, prevailing in the hinterland one notices the sequential pattern of development of sand-flora, from the pioneer mat formations to that of undershrub stages.

The coastal sands present a characteristic vegetation comprising *Spinifex littoreus* (a perennial spring creeper with long horizontal runners), *Cyperus stolaniferus*, *Cyperus arenarius*, *Ipomoea pes-caprae*, *Bulbostylis subspinescens*, *Leunaea pinnatifida*, *Stylosanthes mucronata*, *Desmodium biarticulatum*, *Hydrophylax maritima*, *Oldenlandia areanaria*, *Euphorbia rosea*, *Panicum repens*, *Fimbristylis polytrichida*, and *Phyllanthus rotundifolius*, *Calotropis* spp., *Strychnos nuxvomica*, etc., of which many species are soil-binders or grow in stabilized sandy relief.

In localities with rocks a little away from the Bay of Bengal are found a few scrubby patches representing the effect of poor soil conditions and of strong sea winds. *Gymnosporia emarginata*, *Scutia myrtina*, *Azima tetracantha*, *Pisonia aculeata*, *Euphorbia caducifolia* and *Cissus quadrangularis*, etc., are the common elements.

The characteristics flora on the sand dunes stretching between the fertile rice fields and the sea are very poor mainly due to biotic effects. *Spinifex littoreus*, a perennial spring creeper with long horizontal runners is found here as a sand binder. *Aristolochia indica*, *Perotis indica*, *Portulaco tuberosa*, *Calotropis procera*, *Polycarpea corymbosa*, *Oldenlandia stricta*, *Zornia gibbosa*, *Tephrosia villosa*, *Bulbostylis barbata*, *Desmodium biarticulatum* and *Fimbristylis polytrichidae* are found growing on some small sand dunes, which intervene between the sea and the cultivated land behind. Some slacks and sand-flats are also found along the lee-side of the sand dunes and are covered extensively by *Phoenix paludosa*, the coastal palm. Outermost part of the coastline is covered with *Borassus flabellifer* (Tal), *Cocos nucifera* (coconut), *Calophyllum inophyllum* (Polang), *Thespesia populnea*, *Pandanus* sp. (Kia), semi-naturalized plantations of *Casuarina equisetifolia* (Jhanu), *Anacardium occidentale* (cashew), *Pandanus tectorius*, etc., flourish well.

The mouth of the rivers Subarnarekha, Burhabalanga and Dhamra exhibit the flora of an estuarine complex. *Avicennia marina*, *A. officinalis*, *A. alba*, *Sonneratia apetala*, *Premna obtusifolius*, *Aegiciras majus*, *Rhizophora mucronata*, *Bruguiera gymnorhiza*, *Caesalpinia nuga*, *Excoecaria agallocha*, *Hibiscus tiliaceus*, *Clerodendron inerme* and *Acanthus ilicifolius* are the main floristic components in this area. In the salt marshes *Suaeda maritima* and *Salicornia brachiata* are found frequently behind the coastline. Along the river banks scattered bushy trees, shrubs and grasses make the landscapes more or less riverine scrub jungle type with *Tamarix gallica*, *Zizyphus oenocleia*, *Carissa spinarum*, *Eleocharis geniculata* and others as dominant components.

Character of forests and types of vegetation

The forests of Nilagiri range may be described as deciduous coastal Sal forest. The species generally found are Sal (*Shorea robusta*), Piasla (*Pterocarpus marsupium*), Asan (*Terminalia tomentosa*), Dhau (*Anogissu latifolia*), Sisoo (*Dalbergia latifolia*), Teak (*Tectona grandis*), Gambhari (*Gmelina arborea*), Kurm (*Adina cordifolia*), Kangala (*Xylocarpus*), Kasi (*Bridelia retusa*), Karla (*Cleistanthus collinus*), Amba (*Mangifera indica*), Moi (*Lannea*), Tentara (*Albizia stipulata*), and Casuarina. Teak and casuarina are planted and do not occur as natural vegetation in the forests of this district.

The forest of Chandbali Forest Division is broadly classified as coastal mangrove swamp forest.

Forest Management

The reserved forests of Nilagiri range is being managed under the prescription of Working Scheme prepared by B. Mishra, A.I.F.C., Assistant Working Plan Officer, Anugul Circle, covering a period of 20 years from 1969-70 to 1988-89. The entire forests of Nilagiri range have been grouped into six Working Circles for the purpose of scientific management as follows,

1. Coppice Working Circle	..	11,996.00 hectares
2. Selection Working Circle	..	4,039.20 Ditto.
3. Teak Plantation Working Circle	..	1,022.80 Ditto.
4. Rehabilitation Working Circle	..	1,743.60 Ditto.
5. M.F.P. Working Circle	..	(Overlapping)
6. Wildlife Working Circle	..	(Overlapping)

The Coppice Working Circle chiefly comprises the plain and valley portion of Kuldiha Block containing Sal forest. The Selection Working Circle includes the areas of high forest working circle excluding the plain and valley portion of Kuldiha Block. The Teak Plantation Working Circle includes the areas planted with teak in Kuldiha Block. The Rehabilitation Working Circle mainly embraces the eroded areas of Kuldiha Block and degraded forest areas of Arabandha, Mitrapur, Ayodhya and Debagiri Blocks, which have not been included under Coppice Working Circle. The Minor Forest Produce Working Circle is an overlapping working circle all over the coppice and selection working circles. The Wildlife Working Circle is chiefly meant for development and protection of wildlife in Kuldiha Wildlife Sanctuary. There is no plan or schemes for the casuarina forests (plantation) in the coastal areas. It is being worked out by 10 years rotation, and the first rotation period began in the year 1973-74.

Rights and Concessions

In Nilagiri ex-state the Forest Rules of 1940 was in force. Some features of these rules were that Khesra forest did not include individual trees or groups of trees within the village limits. Reserved trees of less than three feet girth on cultivated lands could be cut without permission. Before merger the tenants had no right over trees on their holdings. No trees could be cut without permission or sold without payment of royalty. For every reserved tree cut the cultivator was bound to plant two trees on his holdings—a rule which in the interest of ecology is now being sought to be in force throughout India but which on merger of the ex-state was given a go-by. There were A class and B class reserves in addition to village or Khesra forest. Nistar cess or commutation fee was levied at $1\frac{1}{2}$ anna (about 10 paise) per *man* (0.62 acre) of land on persons holding rent free lands and one anna (6 paise) per *man* by raiyats. They were entitled to take trees of species not declared reserved tree for their own use from Khesra forests. From certain other forests timber was allowed to be cut at half the royalty from the 15th December to the 30th June. Firewood was allowed at one anna (Re 0.06) per bullock load for cess payers. Non-cess payers were allowed to take unreserved species free but there were very few non-cess payers. Full royalty was charged to outsiders. The Nistar forests of some villages were about five miles (equivalent to about 8 km.) distant from the villages. All cess payers did not actually avail themselves of the timber as the areas allotted for Nistar was in sufficient. The rules also provided for sale of timber from Khesra forests to traders. Reserved species of trees were said to be found in large numbers in the Khesra forest but there was not enough of unreserved species in the Khesra forests. There were formally 24 reserved species but subsequently this was limited to eleven.

Under the Forest Rules all residents of the ex-state were bound to render assistance in clearing forest boundary lines and it was the special duty of villagers living within five miles of the reserved forests on payment of daily wages at prescribed rates.

In the case of reclamation of forest land no definite period was prescribed. Assessment was made after a reasonable period. If the land was waste land which did not require clearing, only one year was allowed in practice. Salami was levied at rates varying from Rs. 10 to Rs. 25 per *man* ($\frac{2}{3}$ acre) according to the quality of the land.

Forest species declared reserved species were (1) Sal, (2) Bija, (3) Kendu, (4) Harida (5) Kusum, (6) Mahul, (7) Kochila, (8) Bandhan, (9) Asan, (10) Sunari and (11) Char.

The report of the Forest Enquiry Committee, Orissa, 1959 enumerates the rights and concessions of Nilagiri ex-state as follows:

Nistar cess or other cesses—Re. 0-1-6 and Re. 0-1-0 per man of land by Lakhrajars and raiyats respectively.

Demand—Rs. 7,500/—

In 'A' class Reserved Forests :

Timber—Allowed from an area of 40 acres from Ayedhya and 14 acres from Debgiri 'A class reserved forests at concessional rate to people of neighbouring villages.

Firewood—Ditto

Bamboo—Nil

Minor Forest—Edible fruits, roots, flowers, leaves and creepers
Products free for personal consumption.

Grazing—No free grazing

Re. A. P.

Buffalo 0-8-0

Cow or bullock . . . 0-6-0

In 'B' class Reserved Forests or D. P. Fs.

Timber—At half the royalty

Firewood—One anna per bullock load

Bamboo— Nil

Minor Forest—Edible fruits, roots, flowers, leaves and
Products creepers free for personal consumption.

Grazing—No free grazing

In Khesra or unreserved or U. D. P. Fs.

Timber—Unreserved species free. Reserved species at concessional rate.

Firewood—Ditto

Bamboo—Free

Minor Forest—Free

Products

Grazing—Free

The remaining areas of Baleshwar district were either permanently settled or temporarily settled zamindari areas except a few acres of Khasmahal lands. Therefore the forests were controlled and managed by the zamindars as full proprietors in their respective zamindaries until their rights were restricted by passing of two legislations, viz., The Orissa Preservation of Private Forests Act, 1947 which provided for preservation of private forests

to prevent their indiscriminate deforestation and The Orissa Communal Forest and Private lands (Prohibition of Alienation) Act, 1948 (Act I of 1948) which aimed at preventing alienation of forest land, etc., without prior permission of the Collector retrospectively with effect from the 1st April, 1946. Each zamindary had its own forest rules or practice whether written or unwritten. Most of the zamindari were small except a portion of Kanika ex-estate, a part of which was in Baleshwar district to the extent of 453.00 sq. km. Most of the forests of that zamindary were situated in Cuttack district. In Baleshwar district there was only one Forest Block called Bony Jungle. The zamindar had prescribed a forest rule called "Kanika State Forest Rules" for management of his forests. The rights and concessions in Kanika zamindary as enumerated in the Report of the Forest Enquiry Committee, Orissa, 1959 are given below:

Reserved species	..	Nil
Cesses	..	Nil
In Zamindary Zapti	..	no rights or concessions.
In open forests—		

- (1) The tenants can get firewood, thatching materials, agricultural implements, etc., from Ghar jungle for their personal use on obtaining permits within the period 1st October to 31st December on payment of Re. 1-0-6 and for permits after the said period at Rs. 2-0-0.
- (2) The Kumbhar, Kamar and Bania tenants for their profession can remove firewood for preparing charcoal on payment of Re. 0-2-0 per maund and charcoal on payment of Re. 0-12-0 per maund with special permits. Others may also get the above materials on payment of the above fees.
- (3) The *pahi* tenants who require for their *pahi* cultivation, can be allowed firewood, thatching materials, agricultural implements, etc., on obtaining permits within 30th June on payment of fee Re. 0-12-6. After this period they shall have to pay Re.1-9-0 for each permit.
- (4) Outsiders of the estate, who come for cultivation purposes in the estate, can be allowed firewood for their own use on payment of annual permit fee of Re.2-0-0. Those who are boat merchants can be allowed firewood and certain boat materials for their profession on payment of annual fee of Re.4-0-0 for each boat from "ghar jungle."

On vesting of the estate, the Tahasildars managed the zamindari forests also called "Anchal forests" under the Revenue Department. Subsequently Government ordered in 1957 that all the forests in the ex-state areas should be transferred to the control of Forest Department. By that time bulk of Bony Jungle Block had been encroached upon.

Inhabitants of a village or town close to a protected forest exercise their right of taking forest products at concessional rates which are known as "Schedule of Rates". This was very low compared to the prevailing market rates. But in November 1977 the State Government prescribed a set of rules called the "Schedule of Rate for Forest Produce in Orissa Rules, 1977" under the Orissa Forest Act which effected some increase in the previous Schedule of Rates for forest produce including minor forest produce which the inhabitants of towns and villages in the vicinity of the protected forests will have to pay on issue of permit by the Forest Officer for their own use and not for trade. Though these rates superceded the previous Schedule of Rates, still they were much below the prevailing market price for forest produce.

Forest Development

Forests play a vital and important role in the economy and ecology not only of this district but also for the entire country as a whole. 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 purposes. This led to large scale deforestation throughout the country. Whatever forest was there in Baleshwar was largely deforested owing to indiscriminate leases given by the ex-zamindars and also due to large scale encroachments. The damage caused by such providence has been realised somewhat lately. This has led to the change in the Government policy from mere consolidation, protection and conservation to development which includes afforestation and plantation activities not only by the Forest Department but also by other organisations like Soil Conservation and Horticulture under Agriculture Department, and state undertakings such as Orissa Forest Corporation and Orissa Plantation Development Corporation. Plantation activities of the Forest Department is no longer confined to reserved forests through territorial forest divisions but also in community and road-side lands and marginal lands which are not suitable for agriculture through Afforestation and Social Forestry Divisions. A special project with international assistance (Swedish International Development Authority) is operating in this district from 1984-85.

In the year 1971 the Cyclone Distress Mitigation Committee, Orissa, recommended to the Government of India to raise a coastal belt plantation along the entire coast of the district to a width of about 1 km. from the high tide line to prevent sand-dunes, cyclones and tidal water damaging agricultural fields and villages. According to the decision of the Government of India, the coastal shelter belt scheme had been taken up in the district, along with the districts of Cuttack, Puri and Ganjam. For casuarina plantation work, a Coastal Shelter Belt Afforestation Division was created at Baleshwar and it started functioning in the district in 1979 under the administrative control of the Coastal Shelter Belt Afforestation Circle, with headquarters located at Cuttack. Some plantations were also raised through Baripada Territorial Forest Division along this coastal belt prior to 1979. By the end of 1979, an area of 534.80 hectares was covered by plantation in the coastal belt of the district. Between 1979-80 and 1985-86 through the Coastal Shelter Belt Division, 163,575 lakh seedlings were planted over 5145.20 hectares along the coastal areas, mainly with casuarina species at a cost of Rs. 142.66 lakhs. In addition to this in-land plantation in Nilagiri range over 4190 hectares were taken up with 64.68 lakh seedlings at a cost of Rs. 46.17 lakhs, mainly with species such as acacia, sissou, eucalyptos, etc. Besides the above, another 1595.50 hectares of private land were planted with 41.23 lakh seedlings between 1979-80 and 1985 as per provisions of the "Orissa Forest (Management of Coastal Shelter Belt Plantation raised on Private Lands) Rules, 1980." Avenue plantations were taken up in different years along important roads with funds available from District Rural Development Agency. Annually casuarina coupes are opened and the wood is mainly sold in auction sale for purpose of firewood which is in great demand. The average annual revenue from sale of casuarina coupe is about Rs. 15 to Rs. 16 lakhs.

In case of the bilaterally aided Social Forestry Project (SIDA), 51 per cent of the expenditure is made available from the state budget and the balance 49 per cent constitutes Swedish assistance through the Central Government as a Plan additionality. During 1985 to 1987, with the available funds under SIDA, 591 hectares of village forest, 521 hectares of reforestation and 554 hectares of rehabilitation of degraded forests and 23.5 hectares of Forest Farming for Rural Poor were achieved in the district besides distribution of 9.34 lakh seedlings free of cost to local people for planting under Farm Forestry. This project is different from departmental plantation in the sense that the plantation works are executed through people's participation for which Village Forest Committees are constituted and a Joint Management Plan is prepared for each plantation with the involvement of village committee.

Game laws and Prevention of wildlife

Previously shooting permits were issued on payment of a fee of Rs. 10 for a week for games from one shooting Block. Laws for preservation of wildlife had also been enforced in the district.

The Orissa Forest Act, 1972 (Act 14 of 1972) and the Orissa Forest Shooting Rules, 1973 and the Orissa Wildlife (Protection) Rules, 1974 made thereunder, are promulgated in the entire state. They apply to all the reserved and protected forests of Orissa. The various provisions embodied in the above statutes are strictly enforced for the protection of the wildlife in the district throughout the year. Although the Orissa Forest Shooting Rules, 1973 is in force, yet issue of permit under the Shooting Rules, in a sense, has been abolished. The Kuldiha Forests have been declared a sanctuary area with effect from the 2nd January, 1984, in order to protect the forest habitat.

FAUNA

It appears from the account in the old Balasore gazetteer (1907) that during the advent of British rule the district abounded in wild animals. A traveller who visited Orissa in 1806 found himself in danger of the wild beasts which haunted the jungle from the moment he entered the province and between Baleshwar and Cuttack, he passed through a dense jungle infested by tigers and required a guard of Sepoys to protect him from the dangers of the journey. Even as late as 1840 elephants were common, tigers and leopards were found all over the district being especially numerous in the heavy jungle near the coast to the south, while immense herds of wild buffalo that were found near the sea had become so large and numerous that they did incalculable mischief and were a terror to the country.

Things had changed greatly, cultivation was expanded to the extent when the wild animals ranging over the countryside had given way before the advance of the plough. The fauna as they were in the district in early part of the century is given below:

"Wild elephants are occasionally met with in the jungle tracts to the west, but these are only stray visitors from the Keonjhar Hills. There are also a few wild buffaloes left; and tigers, though not common, are found along the Dhamra below Chandbali and in the waste tracts to the north-east round Baliapal and Bhograi, but the jungle is so dense that they are out of reach of the sportsmen's gun. The latter tract is also the haunt of leopards and black bear are common near Panchapalli and Jamkunda. Wolves do some damage among the cultivators' cattle and hyenas are found all over the district, wherever there is shelter for them in patches of waste land. In the sandy tracts adjoining the sea there are a number of deer, spotted deer, mouse deer and antelope; and here too there are large herds of wild pig which do great damage to the cultivator's crops.

A herd of wild buffaloes was reported to be roaming in the Chandinipal forest of Baleshwar on the coast some thirty years ago. Apparently it got domesticated by contact with domestic herds.

King crab a marine animal was found on the sea-shore at Chandbali in Baleshwar district. It was a relic of life as it existed millions of years ago.

Zoological types

Mammal

The following are the animals found in the forests of Nilagiri subdivision of the district.

Wild Elephant (Hati)—The wild elephant (*Elephas maximus indicus*) is common in the Nilagiri hills and is found in paddy fields in the harvest season.

Spotted Deer (Chital)—The Spotted deer (*Axis axis*) known as Chital is very common. Gregarious in habit, it is less nocturnal than the Sambar. Preferring low lying lands close to water resources, it is careless of the neighbourhood of man and therefore falls an easy prey to Shikaris aiming from a water hole. Shedding of horns, said to be in July and August, is extremely irregular. They seldom choose more hilly tracts for their habitat.

Barking Deer (Kutra)—The barking deer (*Muntiacus muntjak*) is also found in the forests of Nilagiri subdivision. It is often heard and easily recognised by its dog-like bark.

Wild Boar (Baraha)—The wild boars (*Sus cristatus*) are found in the jungle area of Nilagiri hills. They are extremely destructive to crops.

Panther (Kalarapatia Bagha)—The panther or leopard (*Panthera pardus*) is found in the dense forest of the district, specially in Nilagiri area. The panther is a very cunning animal and can easily climb trees. It lifts cattle and other domesticated animals freely from villages. When a panther becomes a man-eater it is to be more dreaded than a tiger. Then it will quickly pounce over the walls of huts in villages and seize the inmates while asleep and also attacks men in *manchan* watching their fields.

Leopard Cat (Felis bengalensis)—Leopard cat is also found in the district.

Sloth Bear (Bhalu)—The sloth bear (*Melursus ursinus*) is found all over the forests generally in caves and plain area of Nilagiri hills. It lives on the Mahua (*Basia latifolia*) flowers, berries and white ants but now and again one develops carnivorous tendencies. They seldom attack people except when taken by surprise.

Jackal (Bilua)—The jackal (*Canis aureus*) is very common. It avoids heavy forests and chiefly inhabits the scrub-jungle near villages.

Fox—The fox (*Vulpes bengalensis*) is common in the open areas as it avoids heavy woods. It is known to become tame in captivity.

Game birds

In game and other birds the district is not fairly rich. Among the game birds mention may be made of peacock, snipe, golden plover, wild duck, wild geese, quail, red partridge, black partridge (*Francolinus francolinus*), jungle fowl (*Gallus gallus*), etc. The common green pigeon (*Treron phoenicopterus*) is numerous in the Nilagiri hills.

Reptiles—It appears from the account in the old Balasore gazetteer (1907) that alligators and crocodiles were found in all the largest rivers of the district and the mugger or snub-nosed crocodiles were often very destructive. Among snakes Naga, cobra (Tampa and Gokhara), Krait and *squirrel* are most common in the district. Principal among the non-poisonous snakes in the district are the Dhamana (*Ptyas mucosus*) and the Dhanda (*Natrix piscator*).

Fish

A large variety of fresh water fish are found in tanks, water reservoirs and rivers intersecting the district. Marine fish swarm up the tidal rivers. The district having a long sea coast sea-fishing is an important industry which is still confined to the fore-shore.

A list of fresh water fish and marine fish found in the district is given below.

Fresh water fish

Bhakur (*Catla-catla*), Rohi (*Labeo-rohita*), Mirkali (*Cirrhina mrigala*), Kalabainsi (*Labeo calbasu*), Pohala (*Cirrhina reba*), Ghusurimuha Pohala (*Labeo pangusia*), Raj Pohala (*Labeo bata*), Khurusa (*Labeo gonius*), Kerandi (*Barbus stigma*), Serna (*Barbus sarana*), Chitala (*Notopterus chitala*), Phali (*Notopterus*), Balia (*Wallago attu*), Magur (*Clarius batrachus*), Singhi (*Heteropneustis fossilis*), Adi (*Mystus aor*), Kantia (*Mystus cavasius*), Baikantia (*Mystus tengara*), Mohurali (*Amblypharyngodon mola*), Jallha (*Chela bacaila*), Dandikari (*Esomus danricus*), Bombi Todi (*Mastacembelus pancalus*), Todi (*Mastacembelus pancalus*), Chenga (*Ophicephalus*

gachua marulus), Sola (*Ophicephalus marulius*), Gardhei (*Ophicephalus punctatus*), Seula (*Ophicephalus striatus*), Kau (*Arebus niacandens*), Khosua (*Colisa chuna*) and Balikidi (*Gobio giuris*),

Marine fish

Ilishi (Hilsa ilisha), Bhukti (*Lates calcarifer*), Khanda (*Chirocentrus dorab*), Phriki/Chandi (*Stromateus sp.*), Hunda Kantia (*Arius sp.*), Rudhakantia (*Osteogenisis militaris*), Kantia (*Mystus sp.*), Khasala (*Mugil corsula mugilpersia*), Kora (*sp. polynemus tetedactylus*), Champa (*Samber spp.*), Gujikadma (*Sillago sihawa*), Sila (*Sciencocoxor*), Sapua (*Trichiurus savela*), Paniakhia (*Megalops cyprinoides*), Khainga (*Mugil cephalus*), Bagda chinguri (*Penaeus carinatus*), Kantal Chinguri (*Penaeus indicus*) Telia, Tapsi, etc.

Mortality from reptiles and wild animals

The wild animals, especially the reptiles claim fairly a large toll of human lives annually. Figures of mortality in the district from reptiles and wild animals during the period 1979—85 is given in Appendix I of the chapter.

CLIMATE

The district lies between the Bay of Bengal and the north-eastern corner of the Deccan plateau. Its climate is characterised by lesser extremes of temperature and high humidities all the year round. The cold season from December to February is followed by the hot season from March to May. The period from June to September constitutes the south-west monsoon. The next two months form the post-monsoon season.

Rainfall

Records of rainfall in the district are available for 11 stations for periods ranging from 43 to 81 years. The details of the rainfall at these stations and for the district as a whole are given in Appendix II of the chapter. The average annual rainfall in the district is 1583.3 mm. A decrease of rainfall is generally marked when one proceeds from the coastal region towards the interior. The Nilagiri-Soro region gets the highest annual rainfall. The south-west monsoon commences early in June and continues till the end of September. July is the month with the heaviest rainfall. The rainfall during

the south-west monsoon season accounts for 70 per cent of the annual rainfall. The variation in the annual rainfall in the district is not large. In the fifty years period from 1901 to 1950. the highest annual rainfall was received in 1917 when it amounted to 136 per cent of the normal. The very next year 1918 had the lowest annual rainfall which was 68 per cent of the normal. In the same fifty years period, there were only 6 years when the annual rainfall of the district was less than 80 per cent of the normal, none of them being consecutive years. But at some individual stations consecutive two or three years with rainfall less than 80 per cent of the normal have occurred on two or three occasions. At Soro during the whole of the nine years period from 1904 to 1912 the annual rainfall was less than 80 per cent of the normal. It may be seen from Appendix III that the annual rainfall in the district was between 1200 and 1700 mm. in 32 years out of 50 years.

On an average there are 77 rainy days (i.e., days with rainfall of 2.5 mm. or more) in a year in the district. This number varies from 71 at Bant to 84 at Raj Nilagiri.

The highest rainfall recorded in 24 hours at any station in the district was 514.6 mm. at Chandbali on 16th September 1879.

Temperature

There are two meteorological observatories in the district— one at Baleshwar and the other at Chandbali. Their records extend to a long period of years. The data at these two stations may be taken as quite representative of the climatic conditions in the district as a whole, except that in the coastal strip temperatures are lower particularly in the hot season due to strong sea breeze. The period from March to May is one of steady rise in temperatures. May is usually the hottest part of the year when the mean daily maximum temperature is about 36.4°C and the mean daily minimum is about 26.6°C. In May and the early part of June before the onset of the south-west monsoon temperature may on some occasions go up to about 46°C and the weather becomes oppressive. With the onset of the monsoon there is an appreciable drop in day temperatures, while night temperatures continue to be as in the summer season. From October temperatures gradually decrease and by December, which is the coldest month, the mean daily maximum temperature is about 26.9°C and the mean daily minimum temperature is about 14.1°C. In the interior of the district the temperatures may be slightly lower. In association with the western disturbances the minimum temperature on a few occasions may go down to about 7°C to 8°C.

The highest maximum temperatures ever recorded at Baleshwar and Chandbali was 46.7°C on the 30th May, 1895 and on the 12th June, 1942 respectively. The lowest minimum temperature recorded was 6.7°C at Baleshwar on the 3rd February, 1905 and 17th December, 1897 and 7.7°C at Chandbali on the 12th December, 1974.

Humidity

Relative humidities are generally high about 70 per cent all the year round. But in the Winter season and in Summer they are slightly less than in the monsoon season.

Cloudiness

Overcast to heavily clouded skies prevail during the monsoon season. The cloudiness is moderate with occasionally overcast skies in May and in October. In the rest of the year skies are mainly clear or lightly clouded.

Winds

Winds are generally light to moderate in the post-monsoon and Winter seasons. In the Summer and south-west monsoon seasons winds are stronger. The winds in the coastal strip are generally stronger than in the interior. In the south-west monsoon season the direction of winds are mainly between south-east and south-west. In the northern part of the district winds in the post-monsoon and Winter seasons are predominantly northerly or north-westerly both in the mornings and afternoons but in the southern part they are northerly or north-westerly in the mornings and north-east and south-east in the afternoons.

Special weather phenomena

The district is directly on the track of most of the cyclonic storms and depressions which form in the body of the Bay of Bengal in the monsoon season and cross the Orissa coast. These cause widespread heavy rain and strong winds. A few of the storms and depressions in the post-monsoon season also affect the district. Thunder-storms, sometimes violent, occur in the summer season and in October. Even during the monsoon season rainfall is often associated with thunder. The thunder-storms in the Summer season are occasionally accompanied with squall and hail. During the Winter season fog or mist occur particularly in the coastal region.

Appendice IV, V and VI give the temperature and humidity, mean wind speed, and frequency of special weather phenomena respectively for Baleshwar and Chandbali.

APPENDIX I

**Death due to snake bite and attack of wild animals
during the period 1979 to 1985**

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)
1979	28	..	..	..	..	28
1980	28	..	..	..	..	28
1981	23	1	..	..	2	26
1982	17	1	..	1	..	19
1983	7	..	..	..	..	7
1984	24	..	..	..	..	24
1985	22	..	..	..	..	22

APPENDIX II
Normals and Extremes of Rainfall

Station	No. of years of data	January	February	March	April	May	June	July	August
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Chandbali	22 a b	11.7 1.0	23.4 1.4	25.7 1.7	50.5 3.4	102.4 4.7	194.5 9.7	410.7 16.0	341.1 14.5
Akhuapada	50 a b	12.9 1.0	26.4 1.8	23.1 1.9	61.0 3.1	100.1 6.3	216.4 11.4	344.2 15.3	309.5 15.3
Bhadrak	48 a b	17.0 1.1	32.5 1.9	27.4 2.1	53.9 3.6	111.5 6.6	222.0 11.5	332.0 15.5	300.5 15.1
Soro	49 a b	20.3 1.1	43.7 2.2	45.5 2.4	78.5 3.9	137.7 6.6	255.0 11.4	390.1 14.9	385.6 15.1
Baleshwar	50 a b	19.1 1.2	38.6 2.3	42.2 2.6	50.3 3.8	93.5 5.4	211.8 11.1	315.5 14.3	309.4 14.7
Jaleswar	50 a b	16.3 1.3	30.2 2.2	31.7 2.1	39.9 2.8	101.1 5.9	232.2 10.9	268.0 14.3	271.0 15.1
Baliapal	47 a b	15.0 1.1	34.5 2.1	28.2 2.0	40.4 2.7	107.2 5.6	232.4 10.7	295.4 14.3	286.8 14.5

(Contd.)

Station	No. of years of data	Septem-ber	October	Nove-mber	Dece-mber	Annual	Highest Annual rainfall as % of normal and year*	Lowest Annual rainfall as % of normal and year*	Heaviest rainfall in 24 hours*	
									(1)	(2)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Chandbali	22 a b	264.2 12.7	210.6 8.6	65.3 2.0	8.4 0.5	1,708.6 76.2	137(1946)	59(1947)	514.6	1879, Sept., 16
Akhuaapada	50 a b	251.2 13.4	139.2 6.9	46.5 1.5	6.9 0.3	1,537.8 78.2	144(1917)	68(1908)	342.9	1941, July, 9
Bhadrak	48 a b	234.7 12.0	147.6 6.7	40.9 1.3	5.1 0.5	1,525.1 77.9	173(1917)	66(1935)	428.7	1907, Aug., 20
Soro	49 a b	305.8 13.2	228.3 7.2	46.5 1.7	6.9 0.4	1,943.9 80.1	186(1933)	48(1918)	479.3	1943, Aug., 1
Baleshwar	50 a b	267.7 13.0	185.2 6.8	46.7 6.1	6.3 0.4	1,586.3 77.2	143(1913)	69(1911)	347.2	1940, July, 1
Jaleswar	50 a b	205.0 11.9	140.7 6.2	34.5 1.5	3.3 0.4	1,373.9 74.6	156(1913)	64(1938)	393.7	1894, July, 23
Baliapal	47 a b	244.3 12.7	179.8 6.5	38.3 1.4	5.3 0.4	1,507.6 74.0	155(1913)	69(1923)	371.6	1946, Oct., 18

(Contd.)

Station	No. of years of data	January	February	March	April	May	June	July	August
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Basudebpur	... 47 a	15.2	32.0	34.8	71.4	119.4	206.8	312.4	302.3
	b	1.1	1.9	2.0	3.9	5.9	10.2	14.5	13.7
Turigaria	... 42 a	14.0	37.3	30.0	46.5	111.8	228.1	325.1	318.8
	b	0.9	1.9	2.3	2.7	6.8	11.2	15.1	16.2
Bant	... 45 a	16.8	25.9	29.5	42.4	86.9	205.5	290.1	284.7
	b	1.0	1.7	1.9	3.1	5.8	10.8	14.4	13.7
Raj-Nilagiri	.. 40 a	21.8	39.9	34.3	69.1	118.1	239.5	347.7	337.8
	b	1.2	2.5	2.4	4.2	6.5	11.9	15.4	16.5
Baleshwar (District)	a	16.4	33.1	32.0	54.9	108.2	222.2	330.1	313.4
	b	1.1	1.9	2.1	3.4	6.0	11.0	14.9	14.9

(Contd.)

Station	No. of Years of data	Sept.	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 (mm)	Date
(1)	(2)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Basudebpur	a	232.7	179.8	43.7	6.3	1556.8	147(1933)	49(1918)	261.6	1941, Aug., 9
	b	11.9	6.7	1.3	0.4	73.5				
Turigaria	a	255.3	159.0	30.7	4.6	1561.2	153(1933)	60(1918)	254.0	1917, May., 3
	b	13.8	7.4	1.2	0.3	79.8				
Bonth	a	221.0	115.1	39.6	25.1	1382.6	135(1933)	62(1908)	228.6	1915, Nov., 17
	b	11.2	5.8	1.0	0.3	70.7				
Raj-Nilagiri	a	279.7	191.0	49.3	4.3	1732.5	146(1913)	76(1908)	317.3	1952, June., 26
	b	13.8	7.3	1.6	0.3	83.6				
Baleshwar (District)	a	251.1	170.6	43.8	7.5	1583.3	136(1917)	68(1918)		
	b	12.7	6.9	1.5	0.4	76.8				

(Concid.)

(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 upto 1960

** Years given in brackets

APPENDIX III

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

Range in mm. (1)	No. of years (2)	Range in mm. (3)	No. of years (4)
1001—1100	1	1601—1700	4
1101—1200	1	1701—1800	7
1201—1300	5	1801—1900	2
1301—1400	6	1901—2000	4
1401—1500	10	2001—2100	1
1501—1600	7	2101—2200	2

* (Data available for 50 years only)

APPENDIX IV
Normal temperature and relative humidity
Baleshwar

(1) Month	(2) Mean daily maximum Temperature °C	(3) Mean daily minimum Temperature °C	(4) Highest ever °C	(5) Maximum recorded** (date)	(6) Lowest ever °C	(7) Minimum recorded** (date)	Relative Humidity	
							08:30 %	17:30* %
January	27.1	14.1	33.3	1958, Jan., 17	7.2	1934, Jan., 19	68	61
February	29.5	16.8	38.3	1934, Feb., 28	6.7	1905, Feb., 3	65	60
March	33.9	21.3	40.6	1955 Mar., 31	11.7	1927, Mar., 1	64	62
April	36.2	24.8	45.0	1872, Apr., 21	16.7	1905, Apr., 2	68	68
May	36.4	26.7	46.7	1895, May, 30	19.4	1893, May, 8	71	72
June	34.3	26.6	46.1	1926, June, 14	20.0	1900, June, 3	78	77
July	31.3	26.1	38.3	1897, July, 1	20.0	1913, July., 23	84	83
August	31.2	26.1	35.6	1955, Aug., 13	21.7	1933, Aug., 19	85	84
September	31.3	25.8	35.6	1922, Sept., 10	21.9	1965, Sept., 9	84	84
October	30.8	23.4	36.1	1925, Oct., 2	15.5	1966, Oct., 28	78	79
November	28.8	17.7	34.4	1896, Nov., 3	8.9	1892, Nov., 28	69	68
December	26.9	14.1	32.1	1975, Dec., 4	6.7	1897, Dec., 17	67	63
Annual	31.5	22.0	..	..	..	..	73	72

(Contd.)

Chandbali

Month	Mean Daily Maximum Tempera- ture °C	Mean Daily Minimum Tempera- ture °C	Highest ever °C	Maximum recorded date	Lowest ever °C	Minimum recorded date	Relative humidity	
							08.30** %	17.30* %
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
January	.. 27.0	14.8	37.4	1973, Jan., 2	7.8	1962, Jan., 4	76	62
February	.. 29.9	17.5	39.3	1973, Feb., 19	10.0	1942, Feb., 7	76	58
March	.. 33.9	21.6	40.9	1968, March., 29	14.0	1971, March, 3	75	57
April	.. 36.4	25.0	43.3	1947, Apr., 26	17.2	1943, April, 6	71	64
May	.. 36.4	26.6	44.4	1961, May, 22	17.8	1931, May, 8	72	68
June	.. 34.3	26.3	46.7	1942, June, 12	18.3	1931, June, 15	79	75
July	.. 31.4	25.7	42.8	1959, July, 29	21.0	1964, July, 11	84	83
August	.. 31.3	25.9	35.9	1972, Aug., 1	20.0	1969, Aug., 24	84	83
September	.. 31.5	25.7	37.7	1968, Sept., 10	20.0	1972, Sept., 27	83	82
October	.. 30.8	23.6	35.6	1951, Oct., 20	17.8	1952, Oct., 28	82	79
November	.. 28.8	18.4	33.9	1949, Nov., 28	11.0	1970, Nov., 29	77	67
December	.. 26.9	14.7	32.8	1949, Dec., 2	7.7	1974, Dec., 12	76	64
Annual	.. 31.5	22.1	..	..	..	..	78	70

* Hours 1. S. T.

**Data updated up to 1976.

(Concl'd.)

APPENDIX V
Mean wind speed in km./hr.

Baleshwar

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
4.0	5.5	8.5	11.8	13.5	10.6	10.3	8.8	6.2	4.4	3.8	3.7	7.6

(Contd.)

Chandbali

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
5.7	7.3	9.7	14.5	16.9	12.8	11.2	10.2	8.2	6.1	5.1	5.3	9.4

(Concl'd.)

APPENDIX VI
Special Weather Phenomena
Balেশwar

Mean No. of days with*	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Thunder	0.6	3	5	9	12	13	9	9	13	9	0.5	0.1	83
Hail	0	0	0.4	0.2	0	0	0	0	0	0	0	0	0.6
Dust-storm	0	0.1	0.3	0.5	0.6	0.3	0	0	0	0	0	0	1.8
Squall	0	0	0	0.1	0.1	0	0	0	0.1	0.4	0	0	0.7
Fog	0.4	1	0.9	0.1	0.1	0	0	0	0	0	0	0.1	2.6

No. of days 2 and above are given in whole numbers.

(Contd.)

Chandbali

Mean No. of days with*	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Thunder	0.2	2	1.6	5	7	10	8	7	10	7	1.0	0	59
Hail	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0.2
Dust-storm	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1
Squall	0	0.1	0.1	0.1	0.3	0.2	0.2	0.5	0.2	0.2	0.1	0	2
Fog	3	0.5	3	0.1	0.1	0	0	0	0.1	0.1	0.9	2	10

*No. of days 2 and above are given in whole numbers.

(Concl'd.)