CHAPTER II.

PHYSICAL AND STATISTICAL ACCOUNTS OF THE CUTTACK DISTRICT.

Situation and Boundaries.

7. Cuttack, or Katak, the central of the three districts of Orissa, is bounded on the north by Balasore, on the south by Puri, on the west by the Tributary states of Keonjhar, Dhenkanal and Athagara, and on the east by the Bay of Bengal. The boundary between Balasore and Cuttack is the river Baitarani* which, issuing from the Keonjhar hills, flows in to the Dhamra estuary.

Between Puri and Cuttack there is no natural boundary; it has been proposed to make the right banks of the Mahanadi river and of its branches, the Kathjuri, and, lower down, the Deb, the dividing line, thus transferring to Puri about 327 square miles comprising the whole of *Killas* Banki, Patia and Domapara, and of pargannas Sauri, Bahurupa, and portions of pargannas Bakhrabad, Sujanagar, Kodinda, Saibiri, Sailo, Deogaon, Kate, and Benahar. The transfer would have the effect of equalising the size of the two districts, but, if we expect *Killas* Domapara and Banki, which might be attached to the sub-division of Khurda, the remaining area is more readily accessible from Cuttack than from Puri.

Village.

8. The number of villages or "Mauzas" in the district is, according to the census of 1881, 12, 841, and according to the census of 1891, only 5,429. In the present Settlement the number was found to be 6,347 *viz*—

Thana		
Tirtol	....	817
Kendrapara	....	665
Patamundai	....	394
Aul	....	553
Dharmasala	....	1,306
Cuttack	....	416
Salepur	....	699
Jajpur	....	703
Jagatsingpur	....	794
Total		6,347

Out of these, 4,665 are dealt with in this report. They have an average area of 300 acres each.

Population.

9. In 1872 the population was returned at 14,94,784, in 1881 at 17,38,165, and in 1891 at 19,37,671 persons.

That is to say in the first ten years it increased by more than 16 percent, and in the next decade by nearly 12 percent. Assuming, then, an increase of 1 percent per annum as a safe amount, we get the present population as nearly 21,00,000 of which, taking the proportion of males and females, viz., 95 to 100, found at the last census to still subsist, the number of males is about 10,25,000 and of females, 10,75,000.

The average number of persons to the square mile is 573; and population is densest in Salepur, Jagatsingpur and Jajpur thanas, and least so in Aul, Dharmasala and Tirtol.

Roughly, we may take the distribution by religions to be :—

Hindus, 97.1 percent	....	20,39,000
Mahommedans 2.7 percent	....	57,000
Christians ·14 percent	....	3,000
Others	..	1,000

Area.

10. The total area of Cuttack District is 3,663 square miles, of which 752 square miles, contained in Kujang, Kanika and Banki, have already been dealt with in previous Settlement Reports. For another 717 square miles in the permanently settled estate of Sukinda, Darpan, Kalkala, Patia, Domapara, Harispur and Bishnupur, details of the cultivated and uncultivated area are not available. For the remaining 2,194 square miles comprising all the temporarily settled estates, besides parganna Derabisi (of *Killa* Aul) *Killa*

* See Notification No. 2395 of the 18th May 1896 which transferred several villages from Cuttack to Balasore and vice versa.

Madhupur, *Killa* Chhedra and the revenue free and permanently-settled lands within the temporarily settled parganas, the following figures have been compiled * :—

	Acres	
Total area	14,03,600	
Cultivated (including homestead lands)	9,75,600	or 70 Percent.
Culturable	68,300	or 5 Percent.
Uuculturable	3,59,700	or 25 Percent.

Map No. VI shows the extent to which the several parganas are cultivated. As might be expected, it is generally along the western border, where there are large areas still under jungle, that the percentage is lowest. In a few also of the central parganas, such a Karimul and Cuttack Haveli, the large area covered by the bed of the Mahanadi keeps down the proportion of cultivated land.

Details of the culturable are as follows :—

Culturable lands.

	Acres		Acres
New fallow	31,300	Thatching grass	1,900
Old fallow	24,400	Culturable jungle	10,700

Nearly a quarter of the new fallow lies in Cuttack thana and consists mostly of high lands capable of growing crops in favourable seasons only; and the next largest area is in Jajpur, where it is to a great extent now cultivated with *dalua* or spring rice (see paragraph 11).

The old fallow may or may not be culturable at present, but if some of it is not, there are probably protions of the so-called unculturable waste that may eventually be reclaimed. Nearly a third of it is in Jajpur Thana, where it is low-lying and heavily inundated and somewhat saline, but affords grazing to large herds of cattle throughout the cold and hot weather. The thatching grass forms a valuable property, and is chiefly found in parganas Bakhrabad and Tapankhand, and in Madhupur and the neighbouring *Killajat* estates. The culturable jungle consists chiefly of low scrub at the foot of the Bakhrabad, Dalijora and Sukinda hills and it is very doubtful if much of it will come under the plough during the next thirty years, but it might be used for orchards or plantations.

From this 68,300 acres of culturable land we have, however, to deduct at least half the area reserved for grazing and other purposes.

Altogether the reserved lands consist of :—

		Acres
Grazing lands		
Grazing grounds	....	48,808
Cremation grounds	....	6,180
Tanks, &c.	....	341

The last two are generally unculturable, but taking half the grazing ground to be culturable we have only 43,900 acres left to be brought under the plough, and it is to be hoped in the interests of the cattle that most of this land may be spared to them.

The unculturable lands are made up as follows :—

				Acres
Houses		....	....	10,300
Tanks and rivers	....	....	...	1,00,700
Canals	....	....	....	5,000
Embankments	....	....	...	6,500
Jheels	....	....	....	5,300
Government roads	....	....	....	4,050
Other roads	....	....	....	9,600
Burning ghats	....	....	....	3,450
Waste, &c.	....	....	....	2,14,800

Cropped areas.

11. Rice † is by far the most important crop, and is grown in three distinct ways as—*sarad* or winter rice sown in June-July and reaped in November-January; *biali* or autumn rice sown in May-June and harvested in August and September, and *dalua* or spring rice sown in November-December and harvested in March. Map No. VI will show

* See Appendix E.

† See Paragraph 130

at a glance the proportion under rice-*sarad* and *biali* combined - in different parts of the district, and further details will be found in Appendix F.

After rice, the most important cereal is *mandia*[1], a millet grown both as an autumn[2] and as a spring[3] crop. Wheat and barley are cultivated but to a very small extent. *China*[4] is more largely grown but is not of much importance, and after rice it is on the pulses sown in the autumn and harvested from January to April that the people mostly depend.

Of these the commonest is *kulthi*[5] grown on very inferior lands (often after *mandua*), and birhi[6] a small plant somewhat resembling *Kulthi* in its habit but producing quite a different grain. The *Kulthi* seed is a dark, flat and pointed bean which makes an excellent food for cattle and horses and is boiled and eaten with rice by the poorer classes and even taken alone in time of scarcity. *Birhi* produces a little round reddish pea largely used as *dal*; it is a more valuable plant and generally follows *biali* rice. *Muga* or *mung*[7] is one of the most valuable pulses and resembles *birhi*, except that it is usually grown on *sarad* lands. It is chiefly found in the flooded tracts.

On riverside lands *harar*[8] is sown and gives a valuable crop, though it is said to be too indigestible to be taken alone as food.

Oil seeds, *viz*, linseed *til* and mustard are raised on silt-covered lands after a crop of rice, and the castor seed is sown for choice in a mixture of sand and silt, as it will grow in a depth of sand that would kill almost any other crop.

Sugarcane is grown on irrigable fields, and so are to some extent jute and cotton; dyes are of small importance, though there is an indigo factory at Kenduapatna; but condiments and spices are very generally grown in garden lands, especially coriander and turmeric.

Tobacco is an important and valuable crop, being grown every-where on silt-covered lands, but more especially along the lower basin of the Katjuri in parganas Deogaon, Kate and Saibir.

Pan[9], though covering but a small area, is very valuable. It is not grown every where but is found chiefly in Kodinda, in Kate, in Sungra, and in Tisania.

Among vegetable the *saru*[10] and the brinjal, pumpkins of many kinds, and onions, are the most important. Potatoes have been introduced, but are not yet widely known. Arrowroot is said to be grown by Native Christians only.

Among fruits, plantains are found in most villages and mangoes grow freely and from a valuable food during the hot weather, though very inferior in taste to those of Bombay or Malda; pineapples are also common throughout the district. Other fruits are the bael, jack, tamarind, Indian plum and custardapple.

Area under crops.

In round figures the areas under the several crops, (excluding Kanika, Kujang, Banki, and 717 square miles not under Settlement) are as follows[11] :—

Winter rice— 6,85,000 acres or 70 percent of the nett cropped area, grown in every part of the district.

Autumn Rice— 1,28,000 acres or 13 percent of the nett cropped area. The distribution of the *Winter* and *autumn* rice is shown in map No. VI.

Spring Rice— 17,000 acres or 2 percent, chiefly in the low lands near the estuaries of the Kharsua and Brahmani rivers.

Mandua — 29,000 acres or 3 percent, chiefly in central Cuttack.

Other Cereals— 1,000 acres.

Pulses and other food grains— 1,63,000 acres or 17 percent. Found every-where, but most general on high river side lands.

Castor—1,000 acres. Most common in the country between the Brahmani and Kharsua.

Other oil seeds—8,000 acres. Chiefly in Deogaon and Saibir and the valley of the Katjuri; also along the lower reaches of the Chitratola and Nuna rivers.

Tibres— 2,500 acres, of which two-thirds is cotton. Chiefly in the irrigated tracts.

1. Eleusine coracana.
2. Bhadai.
3. Rabi.
4. Paricum miliaceum.
5. Dolichus biflorus.
6. Phaseolus radiatus.
7. Pheseolus mungo.
8. Cajanus indicus.
9. Betel.
10. A variety of Arum.
11. See Appendix F.

Tobacco—3,200 acres. Of this nearly 2,000 in Jagatsingpur Thana alone.

Pan and other Drugs— 200 acres. Chiefly in Salepur, Jagatsingpur and Cuttack thanas.

Yamas, Brinjals and other vegetables—2,000 acres, besides what is included in the 52, 000 acres of homestead land.

Garden Produce and Fruit Trees — 21,000 acres.

The figures given in the last two paragraphs refer only to the 2,194 square miles shown in the ***Milan Khasras.***

In Banki, Kanika, and Kujang the cultivated area is 317 Square miles and we may take the Cultivated Area of the reminder at one half of 717 square miles, thus making the total area of the district under cultivation 2,200 square miles.

12. Numerous as they are, the rivers are not now very largely used as waterways. From Sambalpur to Cuttack boats come down the Mahanadi, and there is some little traffic on the upper waters of the Brahmani, but on the whole the rivers are, except in the tidal reaches, too shallow and too uncertain to be very much used.

Communications. (a) By water.

The bulk of the heavy passenger traffic between Cuttack and the neighbouring districts was carried by road and canal; I say "was" for a new route, the East Coast Railway, was opened in 1899.

The Kendrapara and Gobri Extension Canals connect Cuttack with the Brahmani at Alba, and from there boats go down the river to Chandbali, where cargo is transhipped and carried by steamer to Calcutta.

The Taldanda Canal between the Mahanadi and Katjuri rivers connects Cuttack with False Point, from which rice is shipped chiefly to the Mauritius. The High Level Canal supplies a direct route between the marts of Cuttack and Bhadrak.

There has been some talk of making the Machgaon Canal available for navigation and of extending it to Machgaon so as to obtain a third route to the sea *via* the Deb river, but it is doubtful whether the Deb would prove fit for the entry of any but very small boats, and there is no reasonable prospect of the scheme being carried into execution. I do not myself consider that there is now much need for further extension of the canal system, the district being already remarkably well served.

13. Roads * of three classes are maintained :—

Communications. (b) Roads.

(1) *Provincial Roads*, paid for out of provincial funds and in charge of the Public Works Department.

(2) *District Board Roads* paid for from the District Road fund and in the immediate charge of the District Engineer. Total length 464 miles, of which 25 are metalled.

(3) *Local Board Roads*— Roads of purely local utility paid for out of the District Road Fund but in charge of Local Boards.

First among the Provincial Roads ranks the Grand Trunk, the highway from Midnapore in Bengal to Ganjam in the Madras Presidency. It enters the District at Akhoyapada, 46 miles from Cuttack. It is raised and metalled, and crosses the Baitarni, Kharsua, Brahmani, and Mahanadi rivers by ferries, and is provided with bungalows at Akhoyapada, Khandetar, Dharmsala, Barchana, Tanghi, and Cuttack.

Skirting the western hills it reaches Cuttack town, where it divides into two, the Cuttack to Puri road and the Cuttack to Ganjam road, the former being generally known as the Jagannath Road †. This road was constructed between 1811 and 1819 in place of the old Pilgrim Road, of which traces are yet visible in ruined but massive bridges in the Hindu style of architecture standing in solitude over streams where there is neither road nor traffic.

There are 2 other Provincial Roads; the first, from Cuttack to Sonepur, is mostly unmetalled. It lies up the valley of the Mahanadi and along the right bank through Banki. The other, from Cuttack to Sambalpur, is a new road through Atgarh up the left-hand valley of the Mahanadi.

The principal District Board roads leading to Cuttack are :—

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* See Appendix H

† See Toynbee's History page 82, Paragraph 42 below.

(1) *Cuttack to Taldanda*—44 miles along the south of the Mahanadi 13½ miles metalled with laterite; a fair road all the year round.

(2) *Cuttack to Machgaon*—Leaves the last road at the 11th mile, and runs 32 miles to Machgaon on the Deb river. Metalled to 14th mile from Cuttack. Carries a heavy grain and salt traffic.

(3) *Cuttack to Chandbali*—63 miles, of which two are metalled. Crosses the Mahanadi at Cuttack and the Brahmani at Patamundai on the 50th mile. Passes by Salepur, Kendrapara, Aul and Patamundai Thanas.

(4) *Fulnakhera—Madhab road.* From 10th mile of Puri road along the border of the district to Madhab, 25 miles, and so on to Puri. A fair road to the 15th mile.

The above are the chief roads by which the produce of the country is brought to Cuttack; the principal cross and feeder roads are the following :—

(5) *Tangi to Haripur*—Connects the Garhjats with Tangi on the Grand Trunk road; 10th mile.

(6) *Jajpur to Kuakhia*—9 miles from Jajpur, through Beruan to Kuakhia, at the 30th mile of the Grand Trunk road. A fair road with two ferries.

(7) *Jajpur to Kendrapara*-25 miles; Kharsua and Brahmani unbridged. A very bad road in parts, and impassable in high floods.

(8) *Beruan to Kalamatia* - 16 miles, joining the last two roads. A bad road in the rains.

(9) *Jajpur to Pachikot* -19 miles to Ragri in the extreme north-west. A fairly good road partly bridged.

(10) *Jajpur to Kyanti* - 17 miles in a south-easterly direction. A fair-weather road, Bengu *nala* being unfordable when high.

(11) *Beruan to Balichandrapur* -14 miles through the hills of Alti; four unbridged rivers to cross.

(12) *Salepur to Chatia* - From Salepur on the Kendrapara road at Chatia on the Grand Trunk road; 18 miles with two rivers to cross. Is almost impracticable for carts in the rains.

(13) *Patamundai to Sudipur* - 11 miles. A good road; unmetalled.

(14) *Jagatsingpur to Jaipur*-8 miles, joining the Taldanda and Machgaon roads.

(15) *Jagatsingpur to Tirtol*-9 miles, joining the Taldanda and Machgaon roads.

This is by no means a complete list, but the above are the principal roads under the District Board; and the accompanying map will give a fair idea of the road system of the district. On the whole it is very well supplied, and there has been a very great advance since the time of the last Settlement. There are, however, still many villages accessible only to pack bullocks, and many only by boats in the rainy season.

In the east parganas Benahar and Khandi are poorly supplied, so is the strip of country between the Taldanda and Kendrapara canals. Generally, however, the District Board appear to have done their best, and if there are large areas very difficult of access, the nature of the country, intersected as it is by rivers, sufficiently accounts for this.

Village roads, however, leading to the district roads are very badly kept, and a great improvement would be effected if the villagers would combine to keep in repair fair weather paths to their houses and fields.

Accommodation of travellers.

14. The District is very well supplied with staging and inspection bungalows. There are bungalows at every stage (about 10 miles) along all the provincial roads - the Cuttack-Chandbali road, the Fulnakhera-Madhab road, the Taldanda road, and the Machgaon road; also along all the canals, and at Beruan and other central positions.

A list of these bungalows is given in Appendix I.

The Railway.

15. The year 1899 saw the opening of the Bengal-Nagpur Railway line, which, when complete, will connect Cuttack directly with Madras and Calcutta. Within the District there will be stations at Cuttack, Tangi (Kapilas Road), Jenapur, and Jajpur Road.

What its ultimate effect on the prosperity of the country may be it is impossible to say. Already the demand for labour created by it has sent up wages, and it is unlikely that they will ever again fall to quite their former level.

It is doubtful whether it can hope to compete successfully with steamers in the rice export traffic unless branch feeder lines are extended in to the rice-growing districts, towards Taldanda to the east and Sambalpur to the west. The stations on the main line are so placed that they may receive all the grain now brought in to Cuttack town and all that is brought down from tne Tributary States, but it is by no means certain that they will get the river-carried rice from Sambalpur, and it is highly improbable that the railway can seriously interfere with the Chandbali or False Point trade.

16. There are only three towns of any importance in the District.

Towns.

Cuttack.

Cuttack, the present capital of the District, first sprang in to importance in the tenth century, when the protecting dykes were built and the fort constructed by the Hindu king ***Makar Kesari.*** It was the head-quarters of both the Mogul and Mahratta administration, and for many years after its first occupation by the British gave its name to the whole Province.

It contains, besides the district Offices, the offices of the Commissioner of the Division and of the Superintending Engineer in charge of the canals and embankments of the province. In the old fort, a wing of a Madras regiment is still stationed.

It had a population, according to the last census, of 47,186, and now probably holds little less than 60,000 souls. It stands at the apex of the delta formed by the Mahanadi and Katjuri rivers, and is protected from inundation by embankments solidly revetted with stone.

The Grand Trunk road and the new railway line pass through,. and almost all the principal roads of the District converge on, it, and it has a large and steadily increasing trade.

It is curiously devoid of fine public buildings. The little English Church, the Collector's offices, and the Lallbagh House are all handsome buildings in their way, and standing on the river banks present a fine view to the approaching visitor's eye; but there is not a single ancient temple of interest, and but for the old fort gate and moat and the river revetment there is hardly any sign of the town's antiquity.

Jajpur

Jajpur, the ancient capital of Orissa, and now the head-quarters of the sub-division of that name stands on the right bank of the Baitarni. The population, according to the last Census was 11,992. The chief importance of the town is as a resort of pilgrims, there being comparatively little trade. It contains many interesting buildings, among which the most striking are the temples of ***Biroda Devi,*** of the ***Boar*** * incarnation of ***Vishnu,*** and the great sun pillar that stands a mile outside the town. This latter consists of a huge and beautifully proportioned column of stone raised on a solid pedestal, and if the temple was in proportion, it must have been of remarkable size. All traces of it have, however, disappeared, and the column has only escaped owing to its great weight, which prevented its would-be destroyers from moving it. Tradition says that the stone was brought from the hills of Alti ; but how such a heavy mass was carried across rivers and fields remains a puzzle to the cleverest engineers.

Besides these there are some ancient heroic figures of Gods and Goddesses standing and lying in the compound of the subdivisional office. They are considered to be very fine specimens of Hindu art, but all bear traces of Mahomedan vandalism in their mutilated features, from which the noses were cut by the renegade Kalapahar. Indeed, the idol of ***Biroda*** is said to be the only one who escaped the fury of that iconoclast, she having taken refuge in the belly of a crocodile until the danger had passed. Interesting, too, are the grim features of the seven mothers of the earth in a dark little gallery by the river bank; but there is little beauty in any of these early works, and it is rather the crudeness and grotesqueness of the sculpture that attract. The Mahomedan mosque built by Nawab Abu Nasir in the seventeenth century is an elegant building and has lately been restored by the Public Works Department.

Kendrapara.

Kendrapara, the head-quarters of the other sub-division and the second town of importance in the District, was also a place of considerable sanctity. It had a population, at the

* Boraho. For an account of this see pages 268, Vol.—I of Hunter's Orissa.

last census, of 17,647 persons, and its position on the Kendrapara Canal and in the centre of rich grain-producing country gives it a considerable trade. It is connected by road with Cuttack, Jajpur, and Chandbali, and is the residence of many well to-do persons. Besides the sub-divisional buildings, it has a good school and dispensary, and a public library has lately been opened for the supply of English and vernacular literature.

Harbours.

17. In spite of the extent of sea face and the many estuaries by which its rivers flow in to the Bay of Bengal, the District does not contain a single harbour capable of sheltering ships of any size. As late as 1866, the export trade was carried on from False Point at the mouth of the Mahanadi, where ships have to anchor in a comparatively exposed roadway, and loading and unloading can only be done in fair weather. At present there is still a considerable export of rice, chiefly in sailing shops from False Point to the Mauritius, but most of the trade passes through Chandbali in the Balasore District at the mouth of the Baitarni. There is a deep channel up the Devi river as far as Machgaon, but, like all the other estuaries, this too has a bar of sand across the mouth that prevents the entrance of vessels of any size except at high tide.

Trade and Manufacture.

18. Cuttack imports large quantities of Kerosine oil, salt, cotton twist and piece-goods, spices, gunny bags, sugar and other miscellaneous articles. The total value it is very difficult to estimate, as the returns for Chandbali port to do differentiate between the imports for Balasore and those for the Cuttack District.

Allowing that two-thirds of the trade of Chandbali is on account of Cuttack, the total value of the imports in to Cuttack was about Rs. 50,00,000 in 1897-98.

The principal exports are rice and hides, making up, with brass ware, timber, and stonewares, and grains of various sorts, a total value of about Rs. 60,00,000/-.

There are no manufactures of great importance. Salt, which was manufactured to the value of about 4 lakhs annually, has been discontinued; country cloth is woven in many villages and is largely used by the people, but is not exported. The brass work is said to be good its kind, and some is exported both in the form of household utensils and in the shape of small bells and figures used in Hindu worship.

Blankets are mada in some villages of Tapankhand, and silk is spun in places along the foot of the hills. Cuttack silver filigree work is speciality, but the manufacture is confined to but a few persons.

Administrative division.

19. For administrative purposes the District is divided in to three sub-divisions; (1) the Sadar or Cuttack Sub-divion, (2) the Kendrapara Sub-division, (3) the Jajpur Sub-division. Each of the last two is under a Deputy Collector, who is immediately subordinate to the Magistrate and Collector of the District. The sub divisions are for Police purposes divided in to *thanas* viz :-

Sadar Sub-divison.....	1.- Cuttack	Thana
	2.- Banki	,,
	3.- Jagatsingpur	,,
	4.- Tirtol	,,
Kendrapara Sub-division.....	1.- Kendrapara	,,
	2.- Patamundai	,,
	3.- Aul	,,
Jajpur Sub-division....	1.- Jajpur	,,
	2.- Dharmsala	,,

Revenue division.

For revenue purposes the District is divided in to 77 parganas, besides the permanently-settled estates of Aul, Kanika, Kujang, Kalkala, Darpan, Sukinda, Harispur, Marichpur, Dompara, Patia and the Khas Mahal of Banki.

The ultimate unit of division is the estate, of which there are 4,465, besides about 73,000 revenue free estates.

The revenue-paying esates may be classified as follows :-

Class.	Number.	Area in Sq.miles.	Revenue. Rs.
Permanently-settled	11*	1,835·1 †	79·700
Temporarily-settled with revenue of over Rs. 10,000	5	150·2	1,09,600
Revenue of-			
Rs. 1,000 to Rs. 10,000	208	897·8	5,20,900
Rs. 100 to Rs. 1,000	1,204	603·1	3,82,500
Rs. 50 to Rs. 100	594	68	42,700
Rs. 10 to Rs. 50	1,457	55·8	37,500
Rs. 10 and under	981	7·9	5,200
Killajat	3	49·7	Not yet settled. ‡
Tanki Bahal Estates	2	0·3	22
Total	4,465	3,667·9	11,78,122

The whole of this land revenue will not become due for ten years, owing to the ***rasadi*** terms allowed in the case of large increments.

Physical Divisions.

20. The surface § of the District falls according to its natural features in to three main divisions.

To the west a strip of high sterile land and rocky hills covered with throny bamboo or scrub jungle and intersected by narrow valleys. The greater part of this region is occupied by the permanently-settled estates of Sukinda, Darpan, Kalkala, Patia, and the *Killajat* estates of Balarampur, Ragri, Chausatipara and Kantajhar, once the strongbholdes of almost independent border chieftains and still known as ***killas*** or forts. Dalijora and Bakhrabad are the only temporarily-settled parganas having any considerable area within this zone. Shergarah, though even more westerly, is a high, dry plateau, in no way resembling the neighbouring ***killas***. East of this region lie the wide alluvial plains forming the delta of the Mahanadi, Brahmini, and Baitarni rivers. They have a gradual but steady slope from the high lands of the west to the sea, and a composition varying greatly according to the relative proportion of the sand and silt of which they are formed.

The surface is generally level, but is broken by the hills of Alti and Matkatnagar in the centre, and is cut up by numerous river channels.

It is fairly wooded, especially in the centre portion; mango, banyan, and pipal trees being common and cocoanut, toddy, and date palms found in most well-to-do villages. The banyan trees particular are very fine; one at Kuhunda in Jajpur under which a cattle fair is held, covering about a$_n$ acre.

East again from this area are the low lands of the sea coast, treeless expanses of rice land and grass, full of swamps and saline creeks, sloping down in to penetrable morasses, the haunt of wild hog and deer; and enormous crocodiles. Almost the whole of this third divison is contained in the permanently-settled estates of Kujang, Kanika, Aul, Harispur and Bishnupur, though the parganas of Bara, Kaima, Bautara, Hatimunda and Utikan, belong rather to this than to the central division.

For an account of the geological formation of the District, I would refer to Messrs. Blandfords' report on the portion of the Cuttack District examined by them in 1855-56, from which I here quote the following :—

"From the plain, small isolated steep hills rise in a few places to the north of Cuttack and taken in connection with the bases and whaleback ridges which stud the surrounding country present all the features of an up-raised archipelago, and lead to the belief that at no very remote geological period the sea of the western portion of Bay of Bengal dashed against many a rugged cliffand rolled around clusters of islands which studded over what is now the Province of Cuttack; indeed, a comparatively trifling depression of the country might repoduce the same

* Excludes two petty *tanki bahal* estates, tauzi numbers 1852 and 1853, with a revenue of Rs. 22.

† Includes a part of Kanika, situated in Balasore.

‡ See Paragraph 610.

§ A fuller description of the geological formation may be found in Section 2 of Mr. N. N. Banerjee's report on the agriculture of the Cuttack,

phenomena. Upon entering the hills they are seen to consist not of long continuous ranges, but generally of insulated and rugged ridges seldom than 10 to 15 miles length and having one uniform direction nearly due east and west, parallel with the lamination of the gneiss and with the main faults of the District. This is better seen near the coast than inland. As to the west of Ungul, the hill ridges, though preserving the same general direction are longer than near Cuttack."

"The hills as well as the low country are for the most part well-wooded and present few naked bluffs (even amongst the almost precipitous sandstone escarpments of the Talcher field). Their outline, however abruput, is always more or less rounded, and it is evident that they owe their present form principally to marine action".

"Wherever the sandstone of sedimentary deposits rise into hills it presents a totally different aspect; these hills, though generally appearing flat-topped, being found on ascending them to consist of a series of sharp steep ridges separated by deep precipitous valleys, evidently due to the denuding action of fresh water, of the effects of which upon a considerable scale they afford a fine example".

"Laterite has but little extension in Orissa; it occurs to some extent round Cuttack, and frequently borders the hills between that station and Balasore, besides occurring in small patches upon the plains".

"The alluvium of the District contains, so far as observed, no fossils, and having been investigated over a comparatively small area, it is impossible to specify its age. The surface is probably a fresh water accumulation, since during the rains the greater portion of it is subjected to inundations from the numerous rivers flowing through the district; but to what depth this character extends and whether at greater depths any change takes place in its mineral character and composition, are points remaining for future investigation".

Rivers.

21. Through gorges in the mountain system of the Tributary Estates flow three large rivers * the Mahanadi, the Brahmini and the Baitarani and the greatest of these is the Mahanadi.

The Mahanadi.

(1) The Mahanadi, literally, "the great river" has a catchment basin of 48,200 square miles and flowing down through the Barmul Pass debouches in to the plains just above Naraj, some 7 miles above Cuttack and 70 from the sea; at Naraj it bifurcates the northern branch being known as the Mahanadi and the other as the Katjuri.† The latter appears originally to have been a comparatively small stream but during the present century the volume of water passing down its channel increased very considerably, and to regulate the flow, a weir and a training embankment were constructed at Naraj between the years 1860 and 1865; but in spite of this measure, the volumes of water passing down the Katjuri and the Mahanadi channels in the high flood of 1872 were found to be almost exactly the same, whereas in 1855 the ratio of the discharge of the two rivers was, according to Rhind's calculation, as 8 to 10.

Opposite Cuttack the Katjuri throws off to the south a branch called the Kawakhai (or the crow's pool). Its mouth is closed by a bar so that there was no flow of water in it save in flood time. It supplies the district of Puri and has but little effect on Cuttack.

The Katjuri.

The main stream of the Katjuri gives off a little below Cuttack another branch, the Sirua, which however rejoins it 5 miles lower down. The river then divides again, forming the Sankharisahi island; the main body of water passing down. The Deb and afterwards by the Kundal channel through parganas Sailo, Deogaon and Kate, while the Deb and Tampua, taking a more northerly course, rejoin the Kundal near the Binishpur Hat. The two most northerly branches the Katjuri proper and the Alanka, have been cut off at their head by the Deb left embankment, and the water originally carried by them has been diverted in to the Deb and Tampua.

To retutn to the Mahanadi. This stream passes to the north of Cuttack and opposite the town gives off a branch called the Birupa.

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* See map No. III

† Implying that it could at one time be corossed on a plank "*Kat*" long and "*Jury*" joining.

Just below the bifurcation both rivers are dammed by anicuts which control the supply of water to the head sluices of the High Level and Kendrapara Canals. The Birupa about 12 miles farther down throws off a branch called the Bara Ganguti, the two streams enclosing between them the island of Kuhunda Jaipur.

The Birupa.

About 18 miles below this bifurcation the Ganguti meets the Kimiria a branch of the Brahmani, and a mile lower down rejoins its parent stream.

The Birupa, thus increased in volume, meets the main stream of the Brahmani a little above Indipur, and the two flow on together, being joined lower down by the Kharsua, and finally debouching in to the Dhamra.

The Mahanadi proper, after passing Cuttack, divides into three branchs-to the north the Chitratola, in the centre the Mahanadi, and to the South the Paika. Ten miles further down, the Mahanadi and Paika rejoin, only to separate again into the Sukhpaika and Mahanadi, which meet and pass into the sea near False Point through a number of channels.

The Mahanadi proper.

The Chitratola throws off one branch, the Nuna, which eventually rejoins it, and the two flow into the Mahanadi, and so down to the sea.

The Brahmani has a catchment basin of 13,700 square miles and enters the plains of Orissa near Janapur, where it throws off a branch called the Kharsua which again divides into the Kharsua and the Patia.

The Brahmini.

The main stream is crossed by an anicut at Janapur, and a little below this gives off the Kimiria river which falls into the Ganguti, and their united waters again join the Brahmani above Indipur.

The head of the Kharsua is dammed by a cross embankment, and there is an anicut across the Patia at Jakadia to keep a supply of water for the second range of the High Level Canal. The two channels unite a little lower down, and the river flowing through parganas Tisania, Beruan, Kalamatia, and Hatimunda falls into the Dhamra.

The Kharsua and Patia.

The Baitarni, with a catchment basin of 3,900 square miles, forms the boundary between the Cuttack and Balasore districts, and, passing by Chandbali, falls into the Dhamra. At Jakadia it throws off a branch, the Bura, which joins the Kharsua near Beruan.

The Baitarni.

All these rivers have broad, shallow, sandy beds, very little below the level of the surrounding country. They have but a very gradual fall, that in the Mahanadi and Baitarni varying from about 2 feet per mile, where they enter the plains, to 9 inches at tidal water that of the Brahmini is still less and does not exeed 14 inches per mile anywhere in the plains.

In the hot weather they are nearly dry, the minimum recorded discharge being 70 cubic feet per second in the Baitarni, 129 cubic feet per second in the Brahmani, and 400 cubic feet per second in the Mahanadi.

In flood time, on the other hand, the channels are not sufficient to carry off the whole discharge, which amounts to a maximum of about 1,600,000 cubic feet per second in the Mahanadi, the average of the rainy season being about a third of this amount. In the Brahmini the maximum flood discharge is about 600,000 cubic feet per second and in the Baitarni 315,000 cubic feet.

From June to October floods are of common occurrence in all three rivers. The source of the Baitarni supply being local, it both rises and falls more rapidly than the other two, the floods in it rarely lasting above three days. Floods in the Brahmini commonly last three to five days, and do, on the whole, more damage than those of the other rivers. The Mahanadi takes longest to rise and remains longer in flood than the others.

22. For its protection from inundation a portion of the District has from time immemorial been guarded by embankments, and under British rule this protection has been systematised, and large sums have been expended on the perfecting of the embankments, especially after the disastrous and famines of 1865-66. The law as to the Orissa Embankments is contained in Act III of 1865.

Embankments

So much has been written by experts on the subject of protection in Orissa that it would be out of place to attempt in a Settlement report to give a detailed account of the constructing, condition, and effect of each and every embankment; but I propose to describe briefly the protected and unprotected areas and then to place on record the conclusions drawn from my observation as to the conditions of the several parganas according as they are more or less exposed to flood. The map. No. I, will show areas liable to flood, and the embankments are shown in map No. III. For a more detailed account, I would beg to refer to Captain Harris' report on the Orissa inundations, 1858; the report on the inundation of 1866; Mr. Taylor's report of 1870 on the Orissa embankments; the reports on the floods of 1882 and 1896; to Mr. Inglis' report now in course of preparation; and to the pargana reports prepared in this settlement.

Historical Sketch,

Under the Mahratta Government the zamindars were bound to maintain embankments, and for this purpose were allowed certain deductions from their *jama*. This system had, however, proved so unsuccessful in Orissa, that from the time of the conquest the British Government undertook itself the maintenance and repair of the embankments, and very large sums were expended for the purpose; but there was no attempt to systematise and down to 1855 it does not appear that more had been done by the Public Works engineers than to maintain and improve the existing embankments. In that year very destructive floods occured, and Captain Harris, after an elaborate enquiry, pointed to the remarkable coincidence between the rise in the destructive power of the floods since 1831 and the development of the embankment system during the same period, and expressed his opinion that they must be related as cause and effect. In the following years great changes were caused by the protective works in connection with the canals, and it was not until after the disastrous floods of 1866-67 that steps were taken to remodel the system.

In that year the late Mr. W.C. Taylor was deputed to make an accurate record of all existing Government and zamindari embankmets, and of the extent to which Government and the zamindars were respectively bound to maintain them. He reported that there were about 510½ miles of Government embankments and 248 miles of the zamindari embankments in Cuttack District, that most of the latter had been as originally constructed of insufficient height and section to withstand heavy floods, and that they were now disrepair and useless. He considered that another 498 miles were required to complete the system, but that, by regulating some of the rivers and closing others entirely, many of the bunds and sluices proposed in the report could be dispensed with and some of the existing embankments abandoned. His proposals were never given effect to.

In 1881 it was decided that, for the time being, the embankments should be maintained as they were until the expiry of the settlement Proceedings.

In 1894 Mr. C.W. Odling, the Chief Engineer of the Irrigation Department, prepared a complete list of embankment to be maintained and abandoned. He divided them all into the following five classes :—

Class I— Embankments mostly constructed in connection with the canals which are intended to be kept intact against high or extraordinary floods.

Class II— Embankments, chiefly on large rivers, which are mostly above high flood level, and which it will probably be desirable to maintain permanently at their present height.

Class III— Embankments which it will probably be eventually desirable to abandon, but which it is proposed to retain until the fuel effects of abandoning the embankments shown in Classes IV and V are known.

Class IV— The embankments in this class are maintained simply because they were in the charge of Government in December 1881, and not because they are supposed to be of any real use to the country. In some cases there is no doubt they are actually harmful, though they may afford some partial protection to particular places, and in all their utility is questionable.

Class V— The embankments in this class have already been practically abandoned, as the country they were supposed to protect is now covered by embankments included in Class I.

The total length of embankments in Orissa is 969 miles, of which it was proposed at the commencement of the new settlement to abandon 372 and to retain 597 miles. Of the 597 miles retained, 141 miles are shown in Class III. These Mr. Odling proposed to abandon gradually after careful enquiries in each case. There would thus remain 456 miles of embankments, which it will probably be possible to maintain in an efficient condition. It was not, in Mr. Odling's opinion, likely that it would be necessary for thirty years at least to abandon any embankment included in Class I or II, but there might be alterations in the rivers which would render it necessary to do so.

In Cuttack alone the embankments * to be maintained measured—

	Miles
Class I	158
Class II	139
Class III	35

Another 50 miles under Class IV have also up to date been maintained, making a total of 382 miles against the 510 found by Mr. Taylor. This would give as abandoned 128 miles against 179 according to Mr. Odling's list, the reason for the difference being that many embankments shown as zamindari by Mr. Taylor were actually on the Government list. I understand that Mr. Odling's list has been considerably altered in consequence of the enquiries made in the year 1896-99.

Expenditure. The expenditure on embnkments has been very large.

From 1803 to 1930 the total expenditure in the Province was Rs. 8,09,986, of which half may be debited to Cuttack.

From 1830 to 1866 Rs. 7,66,777 was spent in Cuttack alone. Since the expenditure has been as follows :—

	Rs.
First ten years	8,83,575
Second ten years	4,88,133
Third ten years	5,39,000

These latter figures include a small expenditure on account of embankments in Balasore and exclude an estimated expenditure of Rs. 1,50,000 in Puri from 1895 to 1897-98.

The average annual expenditure has been at different times :—

For—	Rs.	For—	Rs.
1803-30	17,308	1860-66	59,247
1831-45	10,794	1867-76	58,357
1846-52	13,700	1877-86	48,813
1853-59	40,807	1887-96	53,900

The saving since 1876 may be attributed in part to the policy of abandonment of superfluous embankments, and in part also to the large capital expenditure in the preceding decade on the canal embankments which to a great extent supplanted the existing protective works.

I now proceed to consider the embankments in detail, beginning with those on the south of the district. The numbers quoted refer to Mr. Odling's schedule printed as Appendix G.

23. The Kathjuri begins at Naraj and in spite of the anicut, which is built at an angle so as to divert the main body of the stream down the Mahanadi, its channel hardly suffices to carry off all the water it receives in high floods.

Embankments of the Katjuri and its branches.

The first of its branches, the Baranga *Nala,* has been closed by an embankment (No. 152) at its head, but this has in former years been breached and much damage has been done by deposits of sand, chiefly in the *lakhiraj* estate of Patia. Lower down, the right banks of the Katjuri and Kawakhai are unprotected, and the water spills over the fields of a few villages of Bakhrabad and is steadily encroaching on the land, while the head of the Kawakhai is still widening.

The country between the Katjuri and Kawakhai rivers is protected by embankments maintained above high flood level (Katjuri right No. 153 and Sirua right No. 188). I am very doubtful whether this protection has proved beneficial;

* See appendix (G)

for there has been little or no increase in the rental and a general falling off in rent rates since the last Settlement, which the people attribute to the more valuable crops grown when there was a regular overflow from the Teljuri river now closed. I find that this part of the embankment was constructed in 1867-68, the floods of 1866 having proved very destructive; the crops now grown appear to be inferior to those of 1842.

Deb Right Embankments.

In continuation of this for some 8 miles the right bank of the Deb is protected by embankments of which a portion (Nos. 162 to 168) belongs to Government, but the most is maintained by the Zamindars, a cess being collected from the tenants for the purpose. The result is that practically the whole of Sailo pargana is protected from the direct rush of water, but the lower end is still covered by the backing up of the floods from below. This embankment was badly breached about thirty years ago and the people of the riparian villages in Bakhrabad and Kodinda still complain of the damage caused by the deposits of sand.

Katjuri Left.

The left bank of the Katjuri is continuously protected by embankments Nos. 90 to 119, and below that by the Machgaon Canal and the Deb left embankments. These embankments were in former years badly breached and much damage was thereby caused. They are now maintained above high flood level as part of the Taldanda-Machgaon irrigation system, and with the Mahanadi right embankments and the Taladanda canal protect from all floods part of parganas Kodinda, and the rick tracts of Hariharpur, Jhankar, Kurania, Gandito, and most of Tiran, Khandi, and Benahar; about 200 square miles.

Kodinda Islands.

Between the Katjuri and the Sirua lies an island partly protected by the Katjuri right and Sirua left embankments, Nos. 188 M. A. or 154 to 161.

These embankments are in bad order, and should, in my opinion, be maintained continuously from Kalpara to Berhampur and from Berhampur to Sarchuan; the lower end of the island will not suffer by being left open, but the rush of water through the gaps and frequent breaches in Govindpur and other villages have caused, and will continue to cause, very serious loss of crops and deterioration of soil unless the embankment is made continuous and kept in repair.

Sankharisahi island.

Sankharisahi island, comprising the western half of pargana Saibir, lies between the Deb, the Katjuri and Biluakhai and is exposed to their floods, the old embankments having been abandoned.

I would not recommend the reconstruction of these embankments, but the breaches in the river bank require to be repaired. Much of the land in the island is very rich and, save where there is an exceptionally strong rush of water through a *ghai* or breach, the benefits of the silt deposit appear to counter-balance the risk of loss of the rice crop by flood.

Deb left embankment.

The Deb left embankment No. 261 A., starting from Balia closes the channels of the Alanka and Katjuri and diverts the water down the Biluakhai, along the left bank of which it runs to its junction with the Deb. From there another embankment, No. 261, follows the course of the river down to the end of pargana Kate, where the Kandal joins it to form the Debi river.

These embankments protect from flood that part of Parganas, Saibir, Deogaon, Kate, and Gandito which lies between the Alanka and Deb rivers, and canal water is now available for irrigation in most villages of this tract, some 50 square miles. There is no doubt that this tract has been greatly benefited, probably at the expense of the villages on the opposite side of the river; I do not, however, consider that it requires irrigation beyond the already existing system of irrigation from tanks and streams.

The branches of the Deb.

The branches of the Deb are so numerous and perplexing that I shall not attempt any detailed account of them.

The Kandal.

The most important of them, indeed of all branches of the Katjuri, is the Kandal river which, starting in pargana Sailo, flows southward through Deogaon and Kate, where

under the name of the Taunla it again meets the Deb. The left bank is throughout Deogaon unembanked, and the water overflows the whole country but does not generally do much harm. To the right a zamindari *bund* partially protects the villages of pargana Sailo, and lower down there is a Government embankment of the fourth class (Nos. 266 to 283, in Mr. Odling's list) from Anlo to Baharana in pargana Deogaon. It is in very bad order and through, if properly maintained, a valuable protection to a limited number of villages, is, in its present state, productive of more harm than good.

The only other embankment of importance on the Kandal are Nos. 265 and 250, protecting a large area in Kate between the Taunla and the Debi. I have no doubt but that these should be maintained, as the direct rush of water from the Kandal would probably cover the whole of this tract with sand.

Minor channels of the Deb.

Between the Kaldal and the Deb left embankment the whole country is a net work of steams—the Goda, the Biluakhai, the Dahikhai, and many others. Formerly these were all more or less embanked, but the policy of Government has, of late years, been to sacrifice these small *bunds* to the maintenance of the big irrigation embankments intact. Most of the embankments have been abandoned, and only here and there remains one that protects a village site or, for some other reason, has been kept up by the zamindars.

From what I have seen of the country I do not think it would be much, if at all, benefitted by the embanking of all the streams, but embankments which keep off the direct rush of the current or protect village sites should, I think, be preserved, and I particulary recommend the followlng :—

(1) Embankment in Sasanpada, pargana Deogaon, between the Tampua and Deb rivers now abandoned and badly breached, Nos. 225 to 227 in Mr. Odling's list.

(2) Embankment protecting mauzas Balada and Rahamba, in pargana Saibir, from the Deb, No. 260 in Mr. Odling's list.

(3) Gardhua left, No. 257.

In other places embankments are required to close, or sluices to control, the *ghais* or spill channels formed by the floods, as in Palsudha in pargana Deogaon. The zamindars have in parts constructed embankments for such purposes, but they are generally inefficient, and I do not think the Public Works Department would find the cost of keeping the river banks in order prohibitive if they did not attempt to raise the banks above the general level of the country.

It is said that the greater volume of water now passing down the Katjuri, together with the contracting of the waterway due to the closing of the Alanka and Katjuri channels, has caused the loss of crops to be more frequent than it was at the last Settlement. I have myself seen ample evidence of the serious damage done by the deposits of sand, but the *ruidads* * show that inundation was the rule in most of these parganas before 1840 and the country now said to be gradually rising owing to the annual deposits left by rivers.

The numerous channels, too, afford facilities for irrigation which the people avail themselves of freely for the growing of valuable *rabi* crops; and uncertain though the harvest be, it is, in favourable seasons most abundant.

Embankments of the Mahanadi and its branches.

24. Above Cuttack the left bank was formerly partly protected by embankments. The river, has, however, so far encroached on the land that in place the embankment has now disappeared and the water pours over the villages of Panikhand and Atgarh, which are also inundated by a spill from the Sapuanala a tributary of the Mahanadi. Lower down also the villages of Cuttack Haveli and some of those of Tapankhand are heavily inundated, but the total area affected is small and much of the land very inferior; so that I am not sure that to put the embankments in good order would be financially justifiable, though in 1870 Mr Taylor, recommended that the embankments should be made continuous down to Chasapara and the *nalas* sluiced.

(a) Mahanadi right Cuttack Town.

Cuttack town is protected by a high revetted embankment said to have been originally constructed by Markat Keshari in A.D. 1006.

* Vernacular report of the last Settlement.

(b) Taldanda system.

Below this the right bank of the Mahanadi and Sukpaika rivers is continuously embanked (Nos. 47 to 55 and Nos. 69 to 86) to Jaipur, and from there to Taldanda the country is protected by the canal. Between this line of embankment and the Machgaon Canal there lies about 200 square miles of country protected from flood and generally within reach of irrigation.

The embankments have been completely remodelled in recent years, but in 1870 Mr. Taylor reported that the embankments below Jaipur are very ancient, and that the old Raj *bund* was far superior to the Government embankment. It is interesting to notice his conclusion that in former years the floods in the Mahanadi ranged higher than those of which we have any record. This fact may be set off against the increasing currents of the Katjuri floods.

Mahanadi Left system
(c) Kendrapara

The left bank of the Mahanadi from Cuttack to Marsaghai follows the Kendrapara canal to the north of which the country is protected from all floods. Between the Kendrapara and Taldanda canals is a long strip of country more or less exposed to the floods of the Mahanadi and its branches and including parganas Paenda, Suhang, Kusmandal, Suknai, Balubisi, Abartak, Anabartak and Paena.

(d) Sukpaika

The Sukpaika leaves the Mahanadi at Aitpur, pargana, Kodinda, rejoining it at Arang in pargana Balubisi 18 miles lower down. In the island thus enclosed lie portions of parganas Paenda and Balubisi. They suffer a good deal from floods, though partly protected by embankments. Mr. Taylor recommended the closing of this channel, but I would rather recommend the strengthening of the embankments at the western end of the island, Nos. 56, 72, and 73.

(e) Chitratola and Nuna.

The western end of the traingle lying between the Mahanadi and Chitratola and containing portions of parganas Paenda and Suhang suffers a great deal from the frequent loss of crops; it is almost unportected, but I do not think that much can be done to better it. Lower down, the country between the Nuna and Chitratola rivers containing portions of the parganas Suhang, Kusmandal, Suknai, Balubisi, and Paena, is one of the richest and most highly assessed in the District. It is protected by second class embankments numbered 43 to 45 and 46 to 61, and by a third class embankment Nos. 62 and 63 and some fourth and fifth class embankments, so that the water only overflows in high floods. It suffered very badly in 1896, but the embankment at the upper end of the island is now in good repair and is not likely to be breached. The lower eastern end of the island, containing portions of parganas Suknai, Balubisi and Paena, is open to the floods of the Nuna, which have been aggravated by the construction of the Kendrapara canal.

This part of the country grows comparatively little paddy, the people depending almost entirely on the *rabi* crops ***Kulthi, birhi,*** caster ***arhar*** etc.

I believe that some of flood channels in this part might be canalised and would be of great value for winter irrigation.

(F) The Sukpaika

Between the Chitratola and the Sukpaika is a strip of land containing the greater part of pargana Balubisi and portions of Paena and Abartak. It is protected from floods by second class embankments bearing Nos. 7 to 14 and 17 to 28, but they are not continuous, and in the flood time the rivers overflow their high banks with, on the whole, a most beneficial effect. Splendid crops are reaped in these parts and rent are almost the highest in the Province.

The island between the Paika and Mahanadi containing lands of Balubisi, Barpala, and Abartak is similar to the last, being partially protected by embankments of the second class Nos 1, 2 and 3 and by the fourth class embankments Nos. 25 to 46. I cannot estimate the effect of abandoning the latter, but the country is now so prosperous that I would not advocate any change.

The Kendrapara-Patamundai Canal system.

North again from this area the whole tract between the Kendrapara and Patamundai canal, containing the greater part of parganas Saraswati, Karimal, Padampur, Sungra, Matkatnagar, Asureswar, Derabisi, Nahakhand. Tikan, Chhedra, and Utikan is protected from floods by canal embankments.

The total area so protected is about 300 square miles ; it is drained by the old Gobri river and by artificial channels. The drainage is not considered by

the people satisfactory, and I have heared many complaints, especially against the Patuali in Matkatnagar which is said to need sluices to prevent the water escaping too freely.

In a few villages the floods of the Gobri still do a little harm, but not much.

Embankment of the Birupa and its branches.

25. The next tract we come to is the basin of the Birupa. The right bank of this river is continuously embanked from its source branches to Patamundai, 50 miles below. On the left, again, hills and first class embanknents. (Nos. 110 to 113) line the channel as far as pargana Kerualkhand, and from there protect the left bank of the Ganguti down to pargana Dihi Arakhpur, cutting off at its source the Chota Ganguti. In between the right and left embankments lie parganas Kuhunda Jaipur, Dihi-Arakhpur and Western Alti. All over these the water flows deeply in floods of any extent and its escape being checked by the hills of Manduka and Osia, lies long enough to drown all the crops. Kuhunda Jaipur suffers most, more indeed than almost any pargana in the District. There are but a few remains of Old *bunds* in this area, and I understand that it is out of the question to construct more.

Speaking with all deference as a layman I do not quite see why something should not be done; for Mr. Taylor, in his report on the Orissa Embankments in 1872 proposed to cut off the Ganguti at its head, and thus force the whole stream down the channel of the Birupa and through the narrow gorge between the Manduka hill and the right embankment. It is also apparent that the damage done is not due to the insufficiency of the channels so much as to the banking up of the waters on meeting the flood of the Brahmini and the hills of Alti. As all the stream has eventually to pass through the channels left by the hills I do not see why the traingular block formed by Kuhunda Jaipur, with its apex at Nandakisharpur and its base in the Manduka and Osia hills, should not be completely protected. Financially, I presume, it would not pay, but it would be a boon to the people.

High Level Canal irrigated area,

Between the left bank of the Birupa and the high lands on the west of the District the country is irrigated from the High Level Canal, and area is protected from all serious floods.

Embankments of the Brahmini and its branches.

26. From Indalva in Killa Balarampur where the Brahmini enters the plains to Kotpur in pargana Atli, the right bank of the Brahmin and its branch the Kimiria is lined by the High Level Canal and the first class, embankments numbered 107, 109, and 116. The low lands of Killas Balarampur and Madhupur and the north-western corner of Alti are thereby protected, and are to some extent irrigated from the High Level Canal.

Below this there are no embankments on the right of the Kimiria, and its waters joining those of the Ganguti and banked up against the hills inundate the central portion of Alti pargana. Loss of crops is frequent, the water sometimes standing for days at a depth of several feet but I have seen only a few traces of sand deposits in this area, and the silt enables fair *rabi* crops to be grown.

Between the Brahmini and the Kimiria lie portions of parganas Alti, Bargaon, and Beruan. In this area are some Government embankments of the third and fourth class bearing Nos. 247 to 261. They are not continuous, but with the aid of a few zamindari lands, protect the villages of Alti and Beruan from serious damage. In Bargaon loss of crops is more common, but good *rabi* is obtained.

It has been estimated that the loss of revenue consequent on the abandonment of these embakments would be Rs. 1,000/-.

Utikan embankments.

To the east of pargana Bargaon the Brahmini flowing down the Sankara channel joins the Kelua, as the united Birupa and Kimiria are called, and under name of the Brahmini falls into the Dhamra below Chandbali. As far as Alba the Patamundai canal protects all the country on the right bank, and cuts off at its head the Chhota Brahmini channel. In the island enclosed by the Brahmini and Chhota Brahmini rivers lies the pargana of Utikan formerly surrounded by protective embankments, but the supply of water in the Chhota Brahmini has been so much diminished that those on the south said have been abandoned and only the second class embankment No. 100 along the Bara Brahmini is to be maintained. The water, however, backs up in the Chhota Brahmini and being salt, the result of even a small overflow is injurious. The only remedy that I see is by a system of sluices

on the Chhota Brahmini to inundate the country with fresh water in flood time. This would be beneficial to the riparian lands in both Tikan and Utikan.

Brahmini Left.

This disposes of the right bank of the Brahmini so for as it concerns the areas under settlement, and we must now return to Janapur where the Kharsua and Patia branch off to the left. The head of the former has been dammed by the embankment connecting to Brahmini-Patia anicuts, and it now forms a spill channel for the waters of the Janardhan and other ***ghais*** down to its junction with the Patia where the combined stream takes the name of Kharsua.

Between the Brahmini and the Patia lies one of the most heavily inundated tracts in the district, comprising parganas Olas, Beruan, Kalamatia and Hatimunda. For some distance below the Janapur anicut the left bank of the Brahmini is unembanked; for the most part it is high and sandy, but there are some bad breaches in it, through which the flood-water spills over the country. The most notorious of these is the Janardhan ghai which, starting a few miles below the anicut, flows through Olas and eventually falls into the Dudhai, a branch of the Kharsua in pargana Beruan.

This is an old channel, and I understand that it is out of the question to close its in takes, but there can be doubt but that it has done great harm and will continue to do so in years of exceptional floods. The attempt of the Madhupur estate to protect some of their villages by a circular embankment at Gopalpatna proved disastrous, for when the ***bund*** gave way in 1896 the whole country suffered to an exceptional degree by the sudden rush of water.

A little above Dharmasala, the country is protected by embankments of classes I, II, and IV, Nos. 240 and 241, extending for a distance of about 5 miles. I am not sure that these embankments are of much value, as the country they project is annually inundated by water from the ***ghais*** higher up. Below this, the left bank of the Brahmini is open, except for a couple for miles in the west of Kalamatia, where the Dudhai ***nala*** is embanked by the third class embankments Nos. 242 to 244, and again between Kalamatia and Andara villages, where the country is protected by embankments, Nos. 245. and 246. In floods of any height the river overflows its banks, but I have not found that much harm is thereby caused, and I would not recommend the construction of any more embankments. The existing embankments I consider to be useful in so far as they prevent the formation of ***ghais,*** which always do a lot of harm.

Patia Right.

Except for the short canal embankment closing the head of the Kharsua, the Patia river is practically open for the whole of its length, and I have not the knowledge on which to form an opinion as to the utility of the few fourth class embankments on its right. Generally it may be said that the most singular characteristic of this river is the great number of spill channels formed by it, of which I may enumerate the Dudhai nala, the Similia ***ghai,*** the Santi ***ghai,*** the Raipur ***ghai,*** the Kani nadi.

These ***ghais*** when first formed are every destructive, running in shallow channels, scouring out the fields and depositing sand. Later on, they usually cut channels deep enough to carry off the water and only do serious damage in exceptional years. When they reach this stage they should be provided with sluices and canalised, as is being done with the Dudhai; but breaches newly formed should, I think, be at once closed.

Of the several parganas between the Brahmini and the Patia, it is Olas and Upper Beruan, where the ***ghais*** take their start, which suffer most from floods and sand deposits. Lower down the water gets more spread out, and the ***rabi*** and ***dalua*** crops go far to compensate the raiyats for the occasional loss of ***sarad*** rice

Patia Left.

Above Jakadia the Brahmini and Patia spill over their banks into a saucer like plain known as the Sukinda Pat. The inundation is beneficial and the flood-water is kept in by an embankment maintained, I believe, by the estate.

Below Jakadia the Shergarha villages are high and the river basin is bounded on the north west by the High Level Canal. For the protection of pargana Jodh between the High Level Canal and the Kharsua, a few second class embankments, Nos. 173 to 175, have been constructed, but they do not serve for much more than to preserve the village sites. The pargana suffers much from

erosion of the soil and frequent loss of crops, but as the people are unwilling to accept the offers of the Public Works Department to canalise the Baidi Nala Sahi and supply water for *dalua*, they are probably not so badly off as they allege, and rents are highest in the flooded portions of the pargana.

Bara Kharsua Left

Further down, parganas Tisania and Dolgram are protected by the Bara Kharsua left embankment, class 1, No. 178, and there can be no doubt that the country to the north has greatly benefited by its construction; but, on the other hand, the people allege, and the local officers support their contention that this embankment has aggravated the floods in Southern Tisania, in Beruan, and Kalamatia, and is the cause of the breaches that have done so much harm.

Below Binjharpur again there are second class embankments, Nos. 186, 187, 169, 191, 192, 195, 211, 213, 214, 215. These have been breached in many places, but with the exception of the Bachol *ghai*, none of the breaches are alleged to cause more harm than good. In Dolgram the riparian villages are high, and the low lands grow *dalua*; in Bara the soil is saliferous, and requires to be thoroughly washed out by the freshets, and the opinion of the officers on the spot was that the breaches should be left open or the embankments abandoned below Singhpur, if not below Binjharpur. The question of the maintenance of that lower portion of the Kharsua left embankment is a difficult one. The floods undoubtedly do much harm to the low lands in Ahyas, Bautara, and North Dolgram, especially since the water-way has been closed by the Baitarni embankments, but, on the other hand, many villages benefit largely by the silt deposits, and there is some fear of the country suffering if the salt is not annually washed out.

Embankments of the Baitarni and its branches.

27. The right bank of the Baitarni is embanked above Roria to a distance of 7 miles, and above this the country in pargana Shergarha is so high as to be but little liable to inundation.

At ***Roria*** the Baitarni bifurcates, the sourthern branch, the Bura, joining the Kharsua in pargana Beruan, while the main stream joins the boundary of the Cuttack and Balasore districts.

Bura River.

On the right the Bura floods pargana Jodh, doing some harm; but I understand that this is inevitable, and rents do not appear to have been much lowered in consequene.

Bura left.

On the left Bura is embanked continuously with the Kharsua as part of the Jajpur Canal irrigation scheme. The embankment has proved of great benefit to the country protected, but it is said, and I think with justice, to have aggravated the floods on the right bank. The balance of profit and loss it would be difficult to strike, but the general opinion of the Assistant Settlement Officers is that the country as a whole has benefited.

Baitarni Right.

Since 1893 the Baitarni has been continuously embanked on the right down to pargana Ahyas, and the whole tract between the Bura, Kharsua, and this embarkment, embracing most of parganas Jajpur, Dolgram, and Tisania, part of Ahyas, protected from flood. Formerly the embankments were low and frequently breached; now they are above high flood level and secure. Below Ahyas the banks are high and partly embanked, but in high floods the river overflows them and this part of the country is also inundated through the breaches in the Kharsua embankment.

I am not here concerned with the effect of this embankment on the floods in Balasore, but in Cuttack also the people complain :

(1) That the embankment has cut off at their head the Benga and other streams which used to supply water for irrigation.

(2) That it prevents the escape of the accumulated rain water and of the water from the Kharsua.

As to the former of these objections much of the land may now be irrigated from canals, and I understand that the Public Works Department are canalising the closed canals so that they may be used for *dalua* and *rabi* irrigation. As to the second objection, it has not been shown that the drainage is seriously obstructed, and the local officers report that it is only

in the very low lands that the water lies deep. Mr. Carey writes: "I think there can be no question that benefits of the protection far outweigh its disadvantages, but I would strongly suggest that the attention of the Irrigation Department should be drawn to the value of canalising streams that have been cut off."

Irrigation.

28. Having now given a short account of the extent to which the principal rivers in the temporarily-settled area are embanked, I propose to pass on to the question of irrigation. In the figures quoted I include those of the High Level Canal, Range III, in Balasore.

History of Irrigation.

While the embankments have existed from the earliest times, canals are of but recent construction in Orissa, and owe their origin to the private enterprise of the East India Irrigation Company. This company started with a most ambitious scheme for a system of canals for navigation and irrigation extending from Calcutta to Puri.

The works were begun in the early sixties and were but partly completed in 1867-68, when the Company being unable to carry it on any longer, Government took over from them at a valuation, and completed the scheme with very great modifications.

The works sanctioned included the Taldanda and Machgaon Canals for the irrigation of the lands between the Mahanadi and Katjuri rivers; the Kendrapara and Patamundai Canals for the irrigation of the area between the Chitratola and the Birupa, and three ranges of the High Level Canal for the irrigation of the strip of country lying at the foot of the hills from Cuttack to Bhadrak.

By 1874 the greater part of this modified scheme was complet, but the collections prove very disappointing, and in 1884 a revised scheme was approved for the extension of the Taldanda and Machgaon Canals and the constructions of new distributaries, bringing the total estimate up to Rs. 3,23,00,000, of which Rs. 2,02,00,000 had already been expended.

The scheme then approved has been completed with the addition of 5 miles of the Machgaon Extension Canal beyond the village of Nagpur; and one additional canal with a total length of 7 miles, from Jajpur to the junction of the Baitarni and Bura was completed in 1895. The total expenditure up to the end of the year 1897-98 was Rs. 2,63,02,141 and to show for this there are seven weirs across river channels with an aggregate length of 3½ miles, which constitute, with canal head sluices and entrance locks, the most extensive head works of any canal system in India. There are 205 miles of canal available both for irrigation and navigation, and 75 miles of canal for irrigation only, besides nearly 1,100 miles of distributaries and village channels. The maximum discharge of the canals in 1895-96 was 6,058 cubic feet per second and the area commanded was 5,71,000 acres; the area now shown as actually irrigable is about 4,01,000 acres, and the area leased for irrigation is 2,00,000 acres.

Machgaon Canal.

29. Beginning from the south of the district, we meet first with the Machgaon Canal which, leaving the Taldanda Canal at Fakirpara, 7 miles south of Cuttack, runs along the north bank of the Katjuri river and of its branch the Alanka, for a distance of 32 miles. It stops short by 6 miles of Machgaon, the terminal station at first proposed, and there is not much probability of its further extention unless circumstances should render it desirable to make a new route from Cuttack to the sea *via* to Devi river. To do this it would be necessary to deepen the canal and provide it with locks, as it is not now navigable; and I apprehend that a branch railway line to Machgaon would be more likely to pay its way.

The canal has a discharge of 776 cubit feet* per second and commands about 97,000 acres, for 82,000 of which distributaries had been completed in 1897. It irrigates the portions of parganas Kodinda, Hariharpur and Karania south of the Hansua drainage channel; and distributaries have been recently made to command the portion of pargana Kate east of the Deb river and part of pargana Benahar. In the latter there is room for a great extension of canal irrigation, but Kate is already well supplied with creeks and tanks, and it is not certain that canal water will be wanted.

* Figures in this and the following paragrphs are taken from the Irrigation Manual of 1897.

Taldanda Canal.

30. The Talanda canal takes off from the right bank of the Mahanadi at Jobra, immediately above the anicut and runs in a south-easterly direction to Fakirpara where it gives off the Machgaon branch. Thence it skirts the southern bank of the Sukhpaika river to Jaipur and from Jaipur to Taladanda it follows to course of the Mahanadi river, forming also a protective embankment. It has a total length of 52 miles, is navigable by both of a considerable size and provides an alternative route from Cuttack to Chandbali *via* the Hansua creek.

It has a discharge of 1,342 cubic feet per second, of which about half is taken off by the Machgaon canal, and commands 75,000 acres lying in the north of parganas Kodinda, Hariharpur, Jhankar, Tiran and Kandhi. The first three have always been more or less protected and were at the last Settlement fertile and highly assessed, but last two were formerly very backward, being liable to inundation and inaccessible, and they have been most markedly improved.

Kendrapara Canal.

31. The oldest and most important of the Orissa canals is the Kendrapara Canal which, taking off from the Birupa river at Jagatpur just above the anicut, skirts the northern bank of the Mahanadi and its tributary the Nuna river for a distance of 39 miles. It irrigates the country between the Mahanadi and the Gobri drainage channel, its right bank forming at once to protective embankment and a thorough-fare for the people. The country it commands comprises some of the most highly assessed parganas of the district, such as Sungra, Matkatnagar and Derabisi and the water is now, owing to the system of drainage, absolutely indispensable.

The discharge is 1,067 cubic feet per second. The area commanded is 1,08,000 acres and the 23 distributaries are capable of supplying water to 97,000 acres. Nearly all lands requiring irrigation from this canal are already under lease. It is provided throughout with locks, and is navigable to Marsaghai.

Gobri Canal.

32. The Gobri Canal is a branch of the Kendrapara Canal. Taking off from the 32nd mile it runs 15 miles in an easterly direction to the Gundakia river. It is navigable and forms part of the main route from Cuttack to Chandbali. The area irrigated lies chiefly in parganas Tikan, Derabisi, and Chedra, a part of the country requiring much systematic drainage before the canal water can be extensively used. Its discharge is 373 cubic feet per second and the area commanded is 21,000 acres; but the distributaries completed can only irrigate 9,200 acres.

Gobri Extension.

33. This canal is only 6 miles long and forms the connecting link between the terminus of the Gobri Canal on the Gandakia river and the Bramhmani at Albha. It derives its water supply partly from the Patamundai Canal and partly from rivers, and irrigates the pargana of Utikan.

The discharge is 648 cubic feet per second and the area commanded 32,000 acres; but distributaries have been constructed for only 7,600 acres, and this canal is more used for navigation than for irrigation.

Patamundai Canal.

34. This canal leaves the Kendrapara Canal just below the head works at Jagatpur and skirts the southern bank of the Birupa river down to Indipur, where it begins to turn southward, and falls into the Gobri Extension near Albha after a circuitous course of 47 miles.

It is provided only with weirs and is not therefore available for navigation, but it irrigates some of the richest rice-lands of the province in Sungra, Matkatnagar, and Chaudakulat, and its left bank protects a large tract from the floods of the Birupa and Brahmini rivers. In the lower reaches some of the lands are too low to need artificial irrigation, but higher up the country is well drained and most villages are under lease.

The discharge is 885 cubic feet per second and the area commanded is 51,000 acres; the distributaries are capable of irrigating nearly 44,000 acres.

35. This canal forms part of the original scheme for connecting Puri with Calcutta by canal.

High Level Canal.

There ranges only have been completed. Range I, from the Birupa to the Brahmani river, a distances of 33 miles; Range II, from the Brahmani to the Baitarni river, a distance of 12½ miles; and Range III, from the Baitarni to Bhadrak in the Balasore district, a distance of 39 miles.

It is the most picturesque of all the canals of Orissa, skirting the very base of the wooded hills of Darpan and Balarampur. The traveller, by the launches that ply on it, looks eastwards over almost boundless rice plains whose level surface is broken only by a few hills that here and there rise steeply from the sorrounding country, while to the west his eyes see nothing but range upon range of rugged hill and valley in endless confusion. As an irrigation canal it is not a success and the newly, constructed railway will detract much from its value as a navigation route.

The first range commands 49,000 acres, the whole being irrigable by the existing channels. Only a portion of this is, however, under lease, and in some parts the natural irrigation from hill streams is difficult to replace. The second range commands about 10,000 acres, but only a very small area is irrigated and its most likely use is for *dalua* irrigation through spill channels.

By the Balasore Range 57, 500 acres are said to be commanded but the distributaries are only capable of irrigating 44,000 acres.

Jajpur Canal.

36. The Jajpur Canal, the youngest member of the Orissa System, starting from the fork of the Baitarni and Bura rivers, runs 6½ miles in an easterly direction to Jajpur town, up to which it is navigable. It has a discharge of 700 cubic feet per second, and commands 70,000 acres. The area for which water could actually be given in 1896-97 was 37,000 acres.

The canal secures from drought the valuable lands between the Baitarni and Kharsua rivers, and has been a great boon to the low-lying villages, growing spring rice, which formerly were irrigated with brackish water from the creeks.