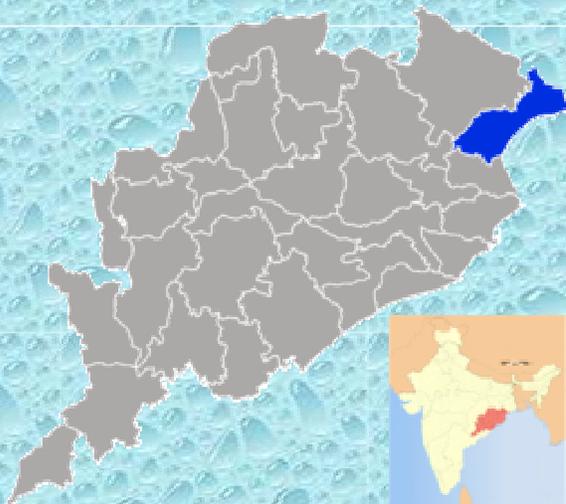




DRAFT DISTRICT SURVEY REPORT (DSR)
OF
BALASORE DISTRICT, ODISHA.
FOR
ROAD METAL/BUILDING SOTNE/BLACK STONE
(FOR PLANNING & EXPLOITATION OF MINOR MINERAL RESOURCES)

ODISHA



BALASORE



As per Notification No. S.O. 3611(E) New Delhi
dated 25th July 2018 of
Ministry of Environment, Forest & Climate Change
(MoEF & CC)

COLLECTORATE BALASORE.

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PREAMBLE

Odisha is one of the Major Mineral rich State in India. Balasore is a unique District in Odisha lies on the Northern most part of the State with rich and varied mineral resource. It is a paradise for Geoscientists of India and abroad. It has preserved many important rock groups from the earliest of crust formation to the geologically recent times. The landmass constituting the Balasore District, explorers to many Entrepreneurs on account of its diverse geological setting and rich and varied mineral resources.

In pursuance of MoEF & CC Notification S.O. 141(E) dated 15th Jan. 2016, District Environment Impact Assessment Authority (DEIAA) & District level Expert Appraisal Committee (DEAC) has been formed for Category –B2 Minor Minerals having area less than or equal to 5 ha. Prior to the formation of Odisha Minor Mineral Concession Rule 2004, (OMMCR -2004) the mining operation for minor mineral were carried out in unscientific manner. Identifying this fact in exercise of power, Conferred by Section 15 by Mines and Minerals (Development and Regulation) Act 1957 as amended in 2015 and all other powers enabling it in that behalf, the industry Mines & Geology Department, Govt. of Odisha framed the aforementioned rule, which has been amended with period of times in the year 2014, 2015 and 2016.

Keeping in view of experience gained in period of decade, the MoEF & CC came out with Environmental Impact Assessment Notification S.O.-1533(E) dated 14th Sept. 2006. It has been made mandatory to obtain environmental clearance for different kinds of development projects as listed in Scheduled -I of notification. Further, pursuance of the order of Hon' ble Supreme Court Petition (C) No. 19628-19629 of 2009, dated 27th Feb. 2012 In the matter of Deepak Kumar etc., Vs State of Haryana and others etc., Prior Environmental Clearance has now become mandatory for mining of Minor Minerals irrespective of the area of Mining Lease. And also in view of the Hon' ble National Green Tribunal, order dated the 13th Jan. 2015 the matter regarding Sand, Brick Earth, & Burrowed Earth cutting for Road Construction has to take prior E.C. for Mining Lease irrespective of the fact that whether the area involved is more or less than 5 hectares. They also suggested to

make a policy on E.C for minor minerals lease in cluster.

MoEF & CC in consultation with State Government has prepared Guidelines on Sustainable Sand Mining & Minor minerals other than sand mining in 2016, detailing the provisions on Environmental Clearance for cluster. Creation of District Environmental Impact Assessment Authority (DEIAA) & proper monitoring of Minor Minerals. Mining, using Information Technology to track the mineral out material from source to destination.

DEAC will scrutinize and recommend the prior environmental clearance of mining of minor mineral to DEIAA on basis of District Survey Report. This will model and guiding document which is a compendium of available mineral resources, geographical setup, Environmental and Ecological set up of the District and replenishment of minerals and is based on data of various departments, published reports, Journal and websites. The District Survey Report will form the basis for application for Environmental Clearance, preparation of reports and appraisal of projects. District Survey Reports are to be reviewed once in every five years as per statue, however this is an interim report, which will be updated at regular intervals. In lieu of above guideline Chief Secretary of Government of Odisha issued a letter to all DEIAA, to prepare a District Survey Report as per guideline of sustainable sand mining & other than sand mining as minor mineral mining guidelines with the assistance of Irrigation Department (Minor Irrigation), Forest Department, Mining & Geology Departments, considering the recent amendment S.O. 3611 (E) dated 25th July, 2018.

The Main objective of the preparation of District Survey Report is to ensure the following:-

1. Identification of Mineral Resources in the District.
2. Identification of areas of minor minerals having the potentiality where mining can be allowed.
3. Identification of area and proximity to infrastructure and installations where mining should be prohibited.

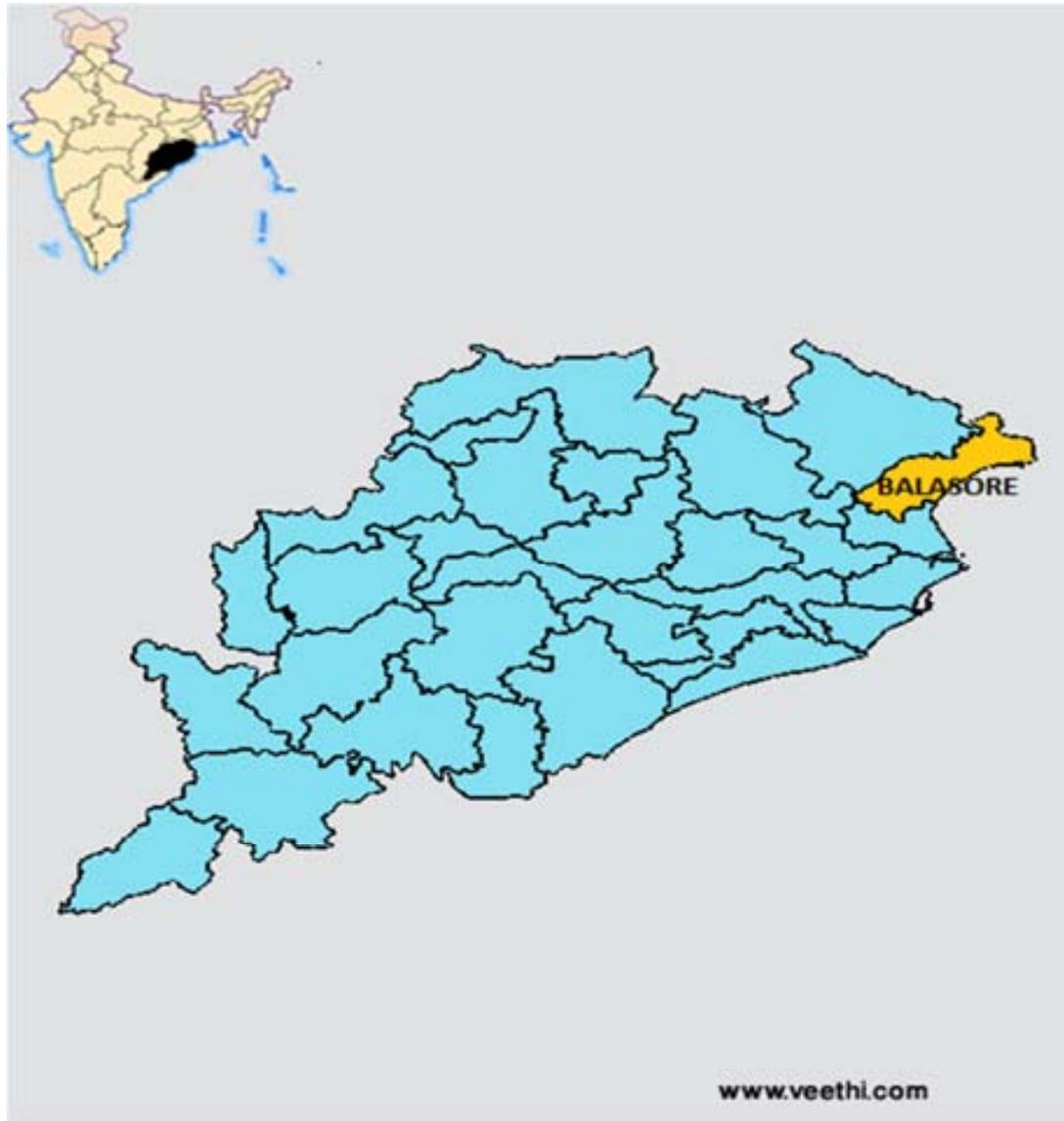
1. INTRODUCTION

Balasore at a Glance:

1.1 Location and Geographical Area:

Balasore is one of the coastal Districts of Odisha. Balasore is the District Head Quarter, spreading over an area of 3634 sq.km lies between 20° 48' North and 21° 59' North latitudes and 86°16' and 87°29' East longitudes. The District is surrounded by Medinipur District of West Bengal in its northern side, Bay of Bengal in its East, Bhadrak District in its South and Mayurbhanj & Keonjhar Districts lie on its Western side. It is best known for Chandipur beach. The Indian Ballistic Missile Defense Program's Integrated Test Range is located 18 km South of Balasore. It is the largest city of North Odisha. This District consists of two subdivisions namely Balasore and Nilgiri. There are 12 Tahasils for 12 Blocks in this District. Balasore is the main town of the District and is also its centre of economic growth. The primary occupation of people in the District is cultivation. This District is mainly known for cultivation of paddy. Because rice is the staple cereal of the local people. Hybrid varieties of seeds are being developed and land reform programs are being planned for the maximum usage of the wastelands, promising to enhance the District's economic stability in the near future. Industries, Agriculture, Fishing and Tourism are the four major Revenue Sources of Balasore District. Birla Tyres, Balasore Alloys Limited, Emami Paper Mills Limited and Polar Pharma India Limited are some of the large-scale industries functioning in this District. Balasore occupies a unique position being endowed with lush green vegetation, different fauna & flora and rich cultural heritage. Being an agrarian economy, agriculture is the main stay of the people of Balasore District. It is in the coastal section of Odisha blessed with hot and humid climate, with alluvium soil and intersected by the perennial rivers, which collectively provides conducive infrastructure for the growth of agriculture in the region. Rice, Pulses, oil seeds like Groundnut, Mustard, Castor and linseed are grown in the District of Balasore. The District has a rich mineral base of soft stones, limestone, stone chips are available in the District, which are mainly used in industrial units in the District. The huge deposits of granite stones at Nilgiri, Khaira, Oupada regions provides tremendous scope for development of few more industries based on this

resources. Except these, no minerals in large quantity which can be explored for commercial purpose found in the District.



1.2 Administrative Units:-

Balasore is the Administrative Headquarter of Balasore District. It is located at a distance of 194 km from Bhubaneswar, State Capital of Odisha. In accordance to the area, the District is the the 2nd largest costal Districts of Odisha. It has 3049 villages covering 12 Blocks, 12 Tahasils and 2 Sub-Divisions. The District is divided into 2 Sub-Divisions namely 1) Balasore, 2) Nilgiri and into 12 Blocks & Tahasils, namely i) Bahanaga ii) Balasore iii) Baliapal iv) Basta v) Bhogarai vi) Jaleswar vii)

Road Metal/Building Stone Mining

DSR of Balasore District.

Khaira viii) Nilgiri, ix) Oupada, x) Remuna xi) Simulia xii) Soro. The population of the District is 23,17,419 according to the 2011 Census. The District accounts for 5.53% of the State's territory and about 5.50% of State's population. The density of population of the District is 532 per square km as against 610 per square km of the State. As per 2011 census, the population of Scheduled Caste is 1,84,682 (7.30%), and Scheduled Tribe is 14,79,576 (58.7%). The literacy percentage of the District covers 79.18 against 84.67 of the State.



1.3 Connectivity facilities:-

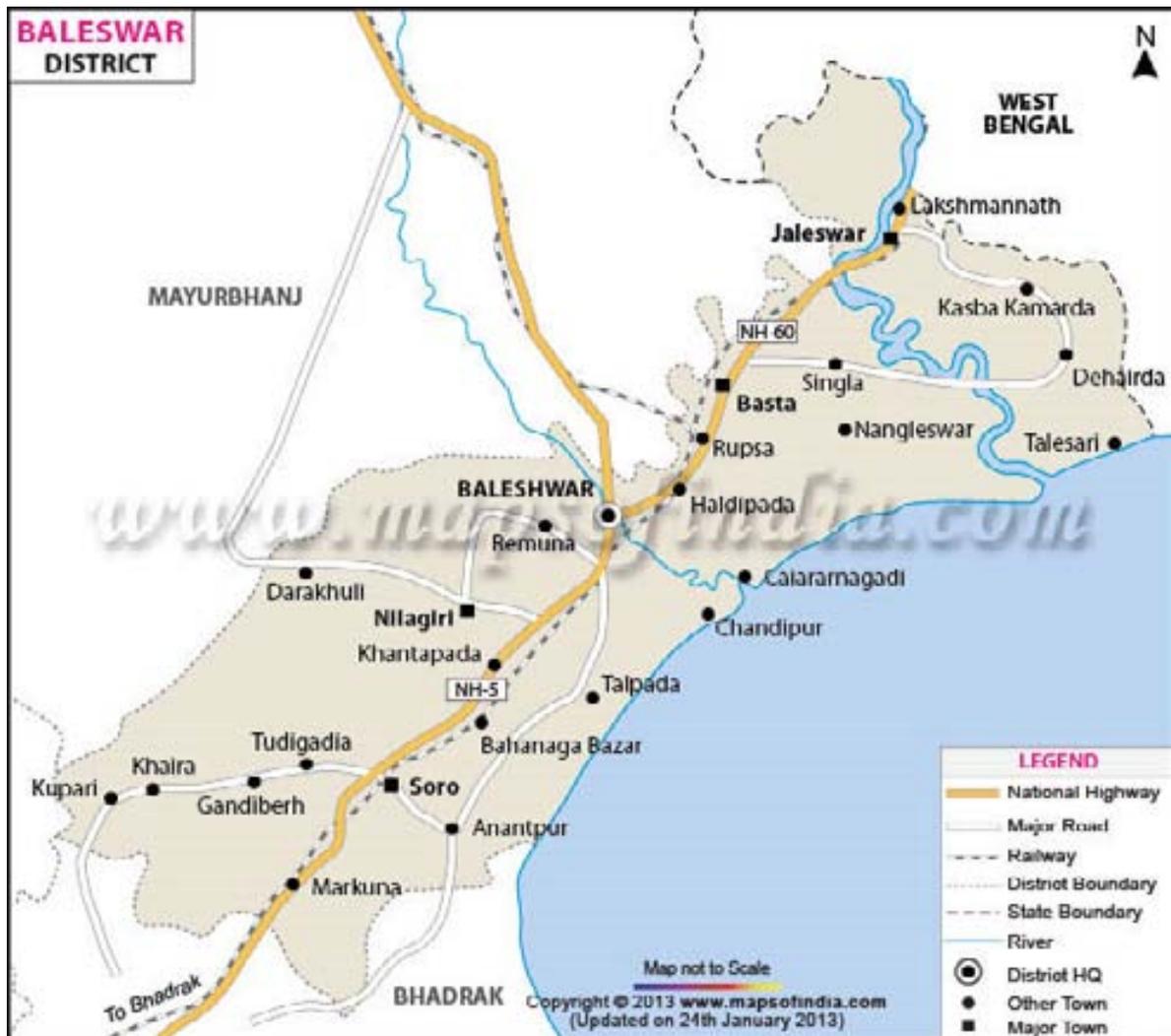
Road Network

The District is well served by a network of good roads and has been called the motorists paradise. The chief roads emanating from Balasore town are NH-16 and NH-60 pass through the District. Balasore Town is about 60 Kms from Baripada, 122 Kms from Kharagpur, 199 Kms from Jamshedpur, 177 Kms from Cuttack, 199 Kms from Bhubaneswar and 226 Kms from Rourkela. It is also connected with other cities such as Sambalpur, Puri, Bolangir, Bhadrak, Jhargram, Angul, Ranchi and Kolkata via Odisha State Road Transport Corporation and some private travel services.



Rail Network

Balasore District is well connected by Rail link to different places, Balasore railway station is an important station on the Howrah-Chennai main line of the South Eastern Railway. The distance to Kolkata is approximately 232 km, while the distance to Bhubaneswar is about 206 km; the city of Balasore is well connected to many places in India like Baripada, Bhubaneswar, Kolkata, Jamshedpur and Cuttack,



Air Network

At present, Balasore has no connection by Airway. The site selection for aerodrome is presently under process. Nearest airport is Biju Patnaik Airport, Bhubaneswar, 200 Kms from Balasore. Netaji Subhas Chandra Bose International Airport in Kolkata is 232 kms from Balasore.



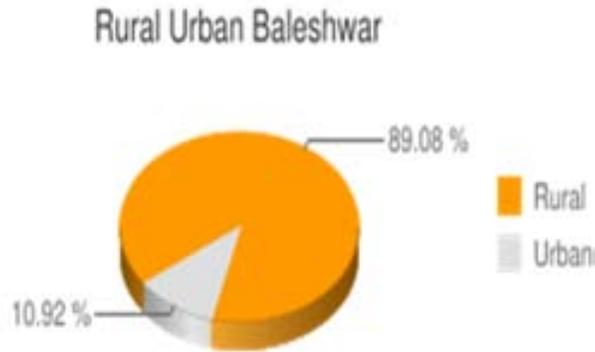
2. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT:

Balasore District is a transition land features of both coastal plain and hilly region. Most of the mineralized area coming under Eco-Sensitive Zone, mining activity only confined out of safety zone of Eco-Sensitive Zone. The mining activity in the District is only restricted to minor minerals i.e. of sand, stone, granite and brick clays. Altogether there are leases of stone, granite and sand which has been granted to the District is regulated as per minerals concession rules of Odisha, there is no lease of major mineral in the District. At present Leases of stone, sand and bricks making units are operational in the District. Stone chips, granite stones, ordinary sand constitute the principal mining activity of Soro, Khaira, Jaleswar, Nilagiri area etc. of Balasore District. Out of these huge granite stones deposits are available near Khaira, Nilgiri, Soro area and major potential sand in Jaleswar, Remuna and Nilgiri area of the District, which have been provides tremendous scope for development of few more Industries based on this resources.

3.0 GENERAL PROFILE OF THE DISTRICT:

3.1 Demography:

Census – 2011	
Geographical Area	3806 Sq. Km.
Total population	23,17,419
Male Population	11,84,371
Female Population	11,33,048
Male Literacy	9,18,417
Female Literacy	7,29,488
SC Male	NA
SC Female	NA
ST Male	NA
ST Female	NA
OBC	855,480
Illiterate Male	9,18,407
Illiterate Female	7,29,488



4.0 GEOLOGY OF THE DISTRICT:

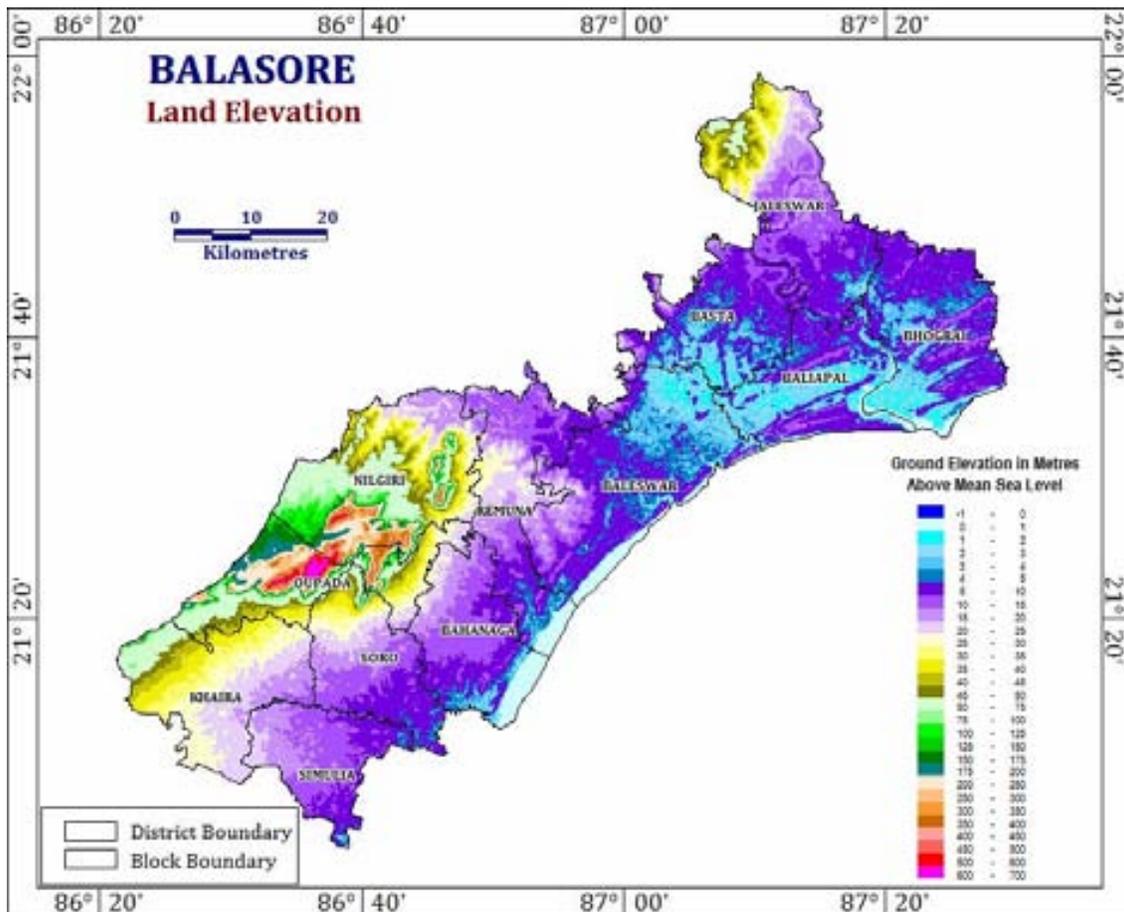
The coastal tract of Orissa is underlain by the Tertiary and Quaternary Formations. Balasore is a unique District in Odisha with varied Geology, of these the Tertiaries are least exposed on the surface, whereas the Quaternaries are extensively developed along the coast and further inland. The Quaternary Formations cover almost the entire study area while the Tertiaries are exposed near Baripada town at about 28 km. NNW of the Northern boundary of the area. The Pre-Cambrian crystalline occur as hills and mounds in the west just outside the present area. Chatterji and Raghava Rao (1960) made studies on the sub-surface geology and tectonic framework of sedimentation in the crescentic coastline of Balasore on the basis of the data obtained from the exploratory drilling operations. Exploratory drilling reveals that in the subsurface the warped Pre-Cambrian basement is overlain by Miocene marine sediments, Mio-Pliocene estuarine sediments, laterites and alluvium. The Mio-Pliocene sediments and alluvial sections contain the principal ground water reservoirs. The marine sediments are dominantly composed of finer elastics and non-clastics (Bhatnagar *et al*, 1970). Small outcrops of ultramafic rocks are exposed in and around Bhalukasoni (21°29': 86°42') area under Nilgiri subdivision of Balasore District. Ultramafic rocks comprising serpentinitised dunite, peridotite and pyroxenite largely under soil and laterite cover occur intermittently spreading over an area of 1.8m × 800m. A 100m long E-W trench has exposed two chromite ore bodies on its either end, the dimensions being 500m × 3.5m × 4.5m and 5.5m × 2m × 3.3m. A reserve of the order of 1550 tonnes was estimated with massive and spotted type of chromite with Cr₂O₃ content ranging from 25.77 to

54.76%. These chromite occurrences along with the associated ultramafic rocks are considered to be xenolithic bodies lying within a plutonic mass of gabbroic rocks.

4.1 Physiography & Geomorphology:

Physiography:

The District of Balasore is having unique physiographic setup. It is bounded by the Bay of Bengal in its southern part and in the north western part it is marked by a set of hillocks and mounds including a north east – south west trending Hilly patch in the Nilgiri, Khaira , Soro & Oupada Blocks. The land elevation varies from as low as near mean sea level in the southern part to as high as about 600 m above mean sea level in the north western part. In between a major part covering more than 75% of the geographical area is having elevation within the range of 2 – 10 metres above mean sea level. In the extreme eastern part of the District, within the alluvial tracts of the River Subarnarekha & Burhabalang, the average elevation is within 1 – 2 metres above mean sea level.



Geomorphology :

Hydrogeomorphological features of Balasore District are mainly attributed to fluviomarine, erosional, denudational and depositional processes. The coastal plain has been developed due to fluviomarine processes. The alluvial plains owe their origin due to various fluvial actions of major rivers. The details of the geomorphic unit as identified are as below:

Coastal Plain: Coastal plain predominantly consist of sand silt and clay is developed all along the coast of Balasore District. It is developed all along the coast of Balasore District. It is gently sloping plain occurring parallel to the coast. The saline marshy tract with shrubby vegetation comes under this coastal plain. Tidal streams are very active during high tide time. Ground water prospect is good but salinity is a major problem in this tract.

Beach: Beach is mainly formed by marine action. Beach ridges are very common and these are formed due to sea waves. They are mainly consisting of sand mixed with silt etc. Ground water prospect is good within a depth of 30-40 m, where fresh ground water pockets are available. Deep tube wells in these areas may lead to sea water ingress.

Mud flat: This is an relatively marshy area covered with fine silt and mud along the shore. Mangroves vegetation is very common. Ground water quality is mostly saline.

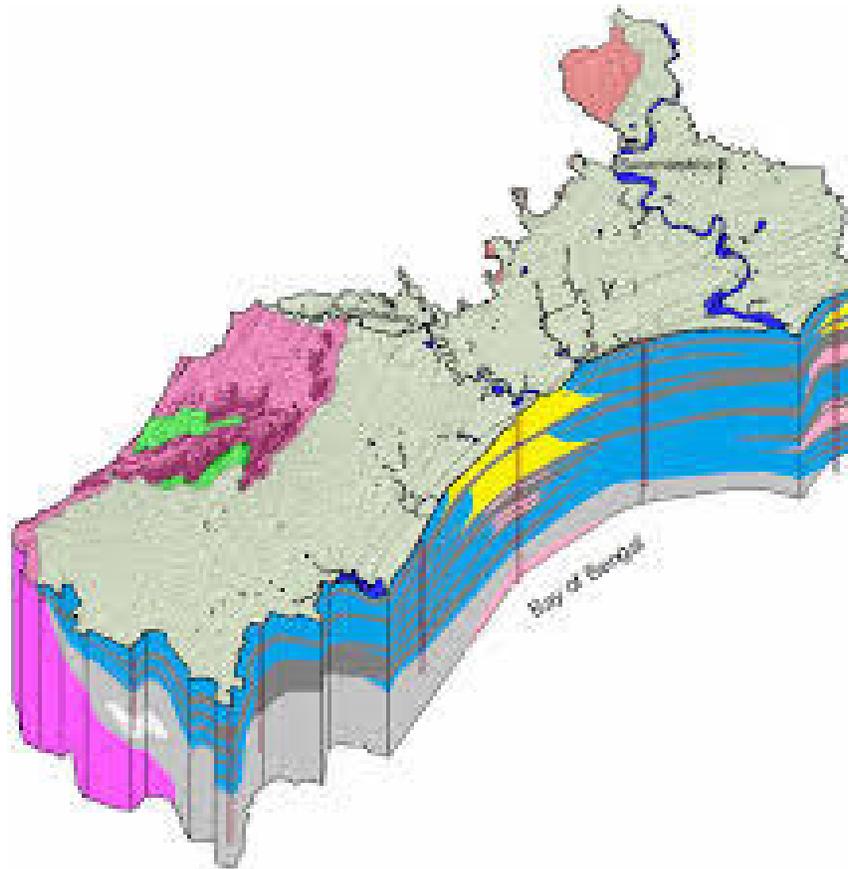
Paleo mud flat: These are the ancient mud flat consisting of fine sand and mud. These are mostly converted to agricultural land in due course of time. Due to marine regression ground water quality is saline.

4.2 Stratigraphy:

The study area comprises the following distinct geomorphic units:

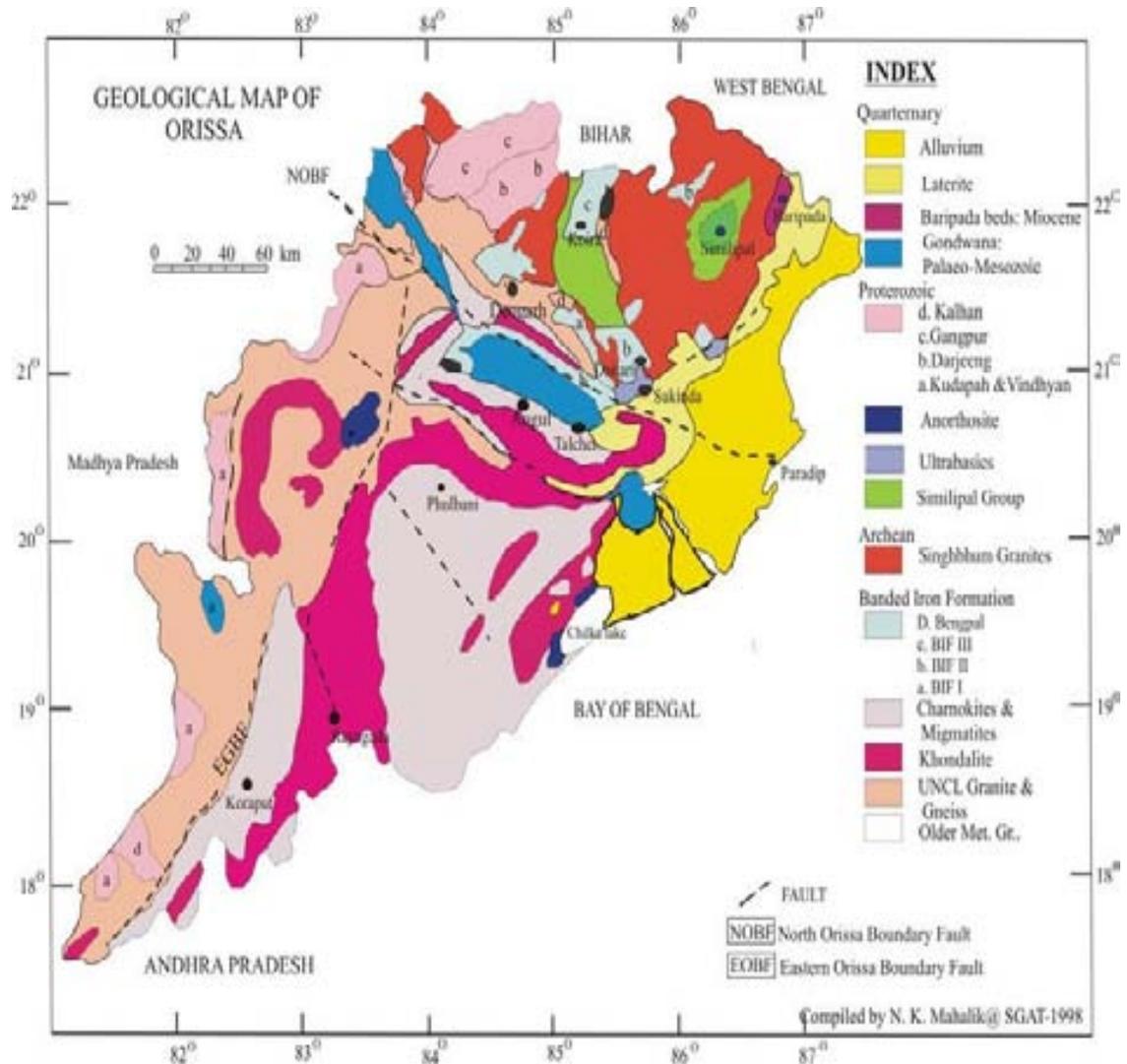
- i) Younger alluvial plain
- ii) Older alluvial plain
- iii) Lateritic upland

↑	<u>Geological Age</u>	<u>Geological Formation / Group</u>
	Quaternary	: Recent Alluvium, Clays, silt, Sand, Gravel
	Tertiary	: Older Alluvium, Laterite, Baripada Beds.
	Mesozoic/ Palaeozoic	: Volcanics / Epidiorite
	Precambrian	: Slate/ Phyllite/ Schist / Gneiss
	Archean	: Granite/ Granite Gneiss



4.3 Mineral Resources:

Minerals like soft stones, limestone, stone chips are available in the District, which are mainly used in industrial units in the District. The huge deposits of granite stones at Nilgiri, Khaira, Soro, area provide tremendous scope for development of few more Industries based on this resources. Except these, no minerals in large quantity which can be explored for commercial purpose found in the District.



4.3 Soil:

The District comprises chiefly of lateritic, sandy loam and clayey loam type of soil (Figure 3). Laterite soil is mostly marked in the area occupied by crystalline rocks. The low lying valley fields are covered with clayey loam type of soil.

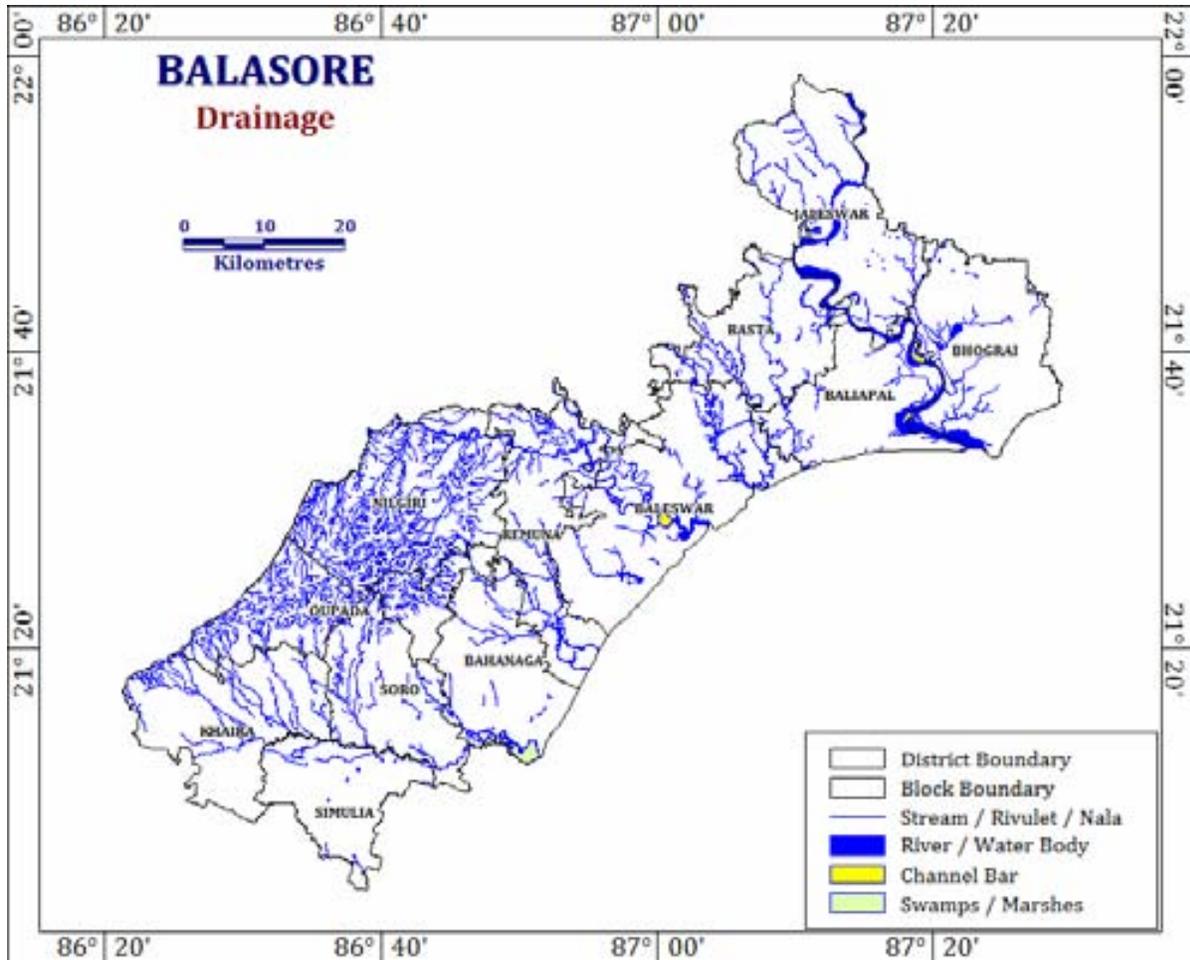
5. DRAINAGE OF IRRIGATION PATTERN

The District has considerable flat land, which provide suitable site for agricultural use. The hilly areas are mostly under forest with patches of cultivation on scarp areas. Major rivers flowing in the District are Budhabalanga, Subernarekha, jambhira, sona. Major crops grown in the District are rice, Only. 12.21 percent area of agricultural use are net irrigated and major source of irrigations are well and tube

wells.

IRRIGATION BY DIFFERENT SOURCES (Areas and Number of Structures)				
	Sources of Irrigation	Number	Area in hectare	Percentage of total irrigated area
	Canals	3	20.8	8.5
	Tanks	35,624	5.6	2.3
	Open wells	-	-	-
	Bore wells	-	-	-
	Lift irrigation schemes	14,034	104.8	43
	Micro-irrigation	75	0.1	0.1
	Shallow tube well	2239	4.4	1.8
	Medium irrigation project	2	3.8	1.6
	MIP	32	6.0	2.5
	Other		98.1	40.2
	Total Irrigated Area		244.0	
	Pump sets	321		
	No. of Tractors	62		
	Irrigation	Area in hectares		
	Net irrigated area	Net irrigated area 177.53 ha (97.1 kharif + 80.3 Rabi)		
	Gross irrigated area	Gross irrigated area 244.01 (138.9 kharif + 105.0 Rabi)		
	Rainfed area	146.3		

Source: SREP and DAO, Balasore



5.1 River System

The **Budhabalanga River** (also called Balanga River) flows through the Districts of Balasore. The Budhabalanga, rises from the Simlipal hills and plunges through Barehipani Falls, the second-highest waterfall in India, located in Simlipal National Park. Perennial Burhabalang is the main river of the study area. It flows from Northwest to Southeast. This river is an 'extended consequent,' since it has maintained its original easterly course in the plains and has reached a mature stage of development. The annual flow of water in river Burhabalang is 637 Mm³. Its total drainage area is 4,847 sq. km. This river maintains a sluggish flow in the pre-monsoon period, but swells menacingly with the onset of monsoon often flooding large tracts. Burhabalang and its tributaries, viz. Sona Nadi, Amrutia Nadi, Gangahar Nadi drain almost round the year in the present area. Sona Nadi receives the watery effluent load through a nalah (Sankh nalah) from the Balgopalpur

Industrial Estate and flows from west to east. Amrutia N. flows from NNW to SSE and carries the waste water load of East Coast Fertilizer at Gadadeulia and water laden solid wastes (particularly in rainy season) from the dumping site of Krebs & CIE Ltd. at Kalma. These tributaries join Burhabalang river downstream at Sahupada and Bhimda (outside present area) respectively. There is another local stream, which flows from Southwest to Northeast, carrying the waste water of Birla Tyres Ltd. at Chhanpur and the Industries located at Ganeshwarpur Industrial Estate. This stream too ultimately joins the Burhabalang river near Nuabazar, Balasore town.



6.0 LAND UTILIZATION PATTERN IN THE DISTRICT**6.1 Forest and non forest land**

The forest of Balasore District is full of variety of medicinal plants, Kendu leaves, Bamboo, Sal, Teak, other timber species and a wide range of carnivorous & herbivorous wild animals. The District has one Wildlife Sanctuaries known as the Kuldiha Wildlife Sanctuary, which hosts even elephants. The area of the sanctuary is 26, 886.23 hectares. In the sanctuary the principal animals that are found are Elephant, Bear, Nilgai, Sambhar, Peacock, Wild Boar and Deer, together with variety of snakes and birds.

District-wise Forest Cover Area in Odisha (Area in Km²)

2017 Assessment								
District	Geographical Area Km ²	Very Dense Forest	Moderate. Dense Forest	Open Forest	Total	Percent of GA	Change	Scrub
Angul	6375	371	1380	1004	2755	43.22	43	84
Bolangir	6575	70	224	837	1131	17.2	151	142
Balasore	3806	23	127	234	380	9.98	30	48
Bargarh	5837	176	371	484	1031	17.66	88	47
Bouda	3098	263	546	480	1289	41.61	27	57
Bhadrak	2505	0	9	66	75	2.99	2	0
Cuttack	3932	53	226	517	796	20.24	11	68
Deogarh	2940	191	667	614	1472	50.07	-3	14
Dhenkanal	4452	174	418	825	1417	31.83	9	82
Gajapati	4325	84	1490	946	2520	58.27	12	262
Ganjam	8206	164	1075	864	2103	25.63	15	655
Jagatsinghpur	1668	0	5	131	136	8.15	6	0
Jajpur	2899	6	72	225	303	10.45	3	50
Jharsugada	2114	3	140	179	322	15.23	9	36
Kalahandi	7920	362	729	1327	2418	30.53	36	362
Kandhamal	8021	661	2588	2143	5392	67.22	16	380
Kendrapada	2644	84	88	133	305	11.54	14	2
Keonjhar	8303	289	1404	1519	3212	38.68	4	55
Khorda	2813	21	186	250	457	16.25	0	92
Koraput	8807	94	740	1255	2089	23.72	120	944
Malkangiri	5791	158	709	1475	2342	40.44	20	45

Road Metal/Building Stone Mining**DSR of Balasore District.**

Mayurbhanj	10418	1335	1718	1027	4080	39.16	42	34
Nabarangpur	5291	168	428	507	1103	20.85	8	47
Nayagarh	3890	189	965	556	1710	43.96	28	173
Nuapada	3852	86	482	705	1273	33.05	33	109
Puri	3479	0	54	160	214	6.15	8	11
Rayagada	7073	422	853	1851	3126	44.2	7	349
Sambalpur	6624	499	1675	1106	3280	49.52	13	40
Subarnapur	2337	2	187	161	350	14.98	26	29
Sundargarh	9712	1019	1814	1431	4264	43.9	107	89
Grand Total	155707	6967	21730	23008	51345	32.98	885	4306

(Source: India state of forest report 2017-Odisha)

The major portion of the District is covered by forest (9.98 % of TGA) and has scattered settlement pattern. The forest is full of variety of medicinal plants, Kendu leaves, Bamboo, Sal, Teak and other timber species. The District has considerable flat land, which provides suitable site for agricultural use. The hilly areas are mostly under forest with patches of cultivation on scarp areas. Major crops grown in the District are rice and pulses. Only 12.50 percent area of agricultural use are net irrigated and major source of irrigations are well and tube wells.

Source: Fertilizer and Agriculture Statistics, Eastern Region (2006-2007).

Tahasil	Forest Area	Misc Tree	Permanent Pasture	Cultivated waste	Non Agricultural uses	Barren land	Current Fallow	Other Fallow	Net area sown
Bahanaga	0	714	992	904	2882	0	525	438	24047
Balasore	4	634	3133	2949	6116	1640	531	553	15185
Baliapal	1008	1813	295	2855	4515	0	638	717	16624
Basta	13	198	892	498	4143	0	551	103	12954
Bhogorai	118	3364	1263	5350	4732	59	1025	510	15794
Jaleswar	1716	2045	1396	2455	5422	43	736	334	18713
Khaira	55	630	1544	1210	3508	0	1173	764	18160
Nilagiri	977	289	1444	2343	2312	435	558	188	28280
Oupada	329	374	855	557	1656	0	177	338	19759
Remuna	108	813	1317	2989	5070	10	1073	114	16363
Simulia	5	438	846	576	2677	0	439	889	17646
Soro	1109	441	1121	564	2066	28	295	564	21476
Total	5442								

6.2 Agriculture Land:

The primary objective of Agriculture Department is to increase of production as well as productivity of major crops like Paddy, Groundnut, Mustard, Mung, Biri & vegetables which is widely covered in this District in both Kharif & Rabi season. Another key objective is to make all round development of the farming community of the District. The Deputy Director of Agriculture is the Head of office so far as agriculture is concerned & he is the Principal Agriculture Officer of the District. There are 5 District Agriculture Officers & the Block Level Officers are working under him. As it has already been pointed out, that agriculture is the main livelihood of the people in Balasore District, it is therefore designated as the food bowl of Odisha. Rice is the principal crop grown in this District, followed by other cereals, pulses, oilseeds, vegetables, spices and sugarcane. The agricultural statistics for the District is shown in subsequent tables below :

Table – 3.6a: Crop Coverage Area of Balasore District, Odisha

Crop	Khariff		Rabi		Annual	TOTAL	
	Area (ha)	(% of Cropped Area)	Area (ha)	% of Cropped Area	Area (ha)	Gross Cropped Area (ha)	% of Gross Cropped Area
Rice	206.14	91.62	33.47	34.38		239.61	72.03
Cereals	0.31	0.14	0.79	0.82		1.10	0.33
Pulses	0.48	0.21	21.64	22.55		22.12	6.65
Oilseeds	0.13	0.06	14.38	20.20		19.51	5.87
Vegetables	13.04	5.80	16.14	16.82		29.18	8.77
Fibres	2.20	0.98	-	-		2.20	0.66
Spices	2.69	1.19	4.08	4.25		6.77	2.04
Sugarcane	-	-	0.46	0.48		0.46	0.14
Tobacco	-	-	-	-		-	-
Fruits	-	-	-	-	11.68	11.68	3.51
TOTAL	224.99	100	95.96	100	11.68	332.63	100

6.3 Horticulture Land:

The primary objective of Horticulture Department is increase of production as well as productivity of major fruits like Mango, Guava, Citrus etc., which is widely covered in this District. Another key objective is the all round development of the farming community of the District. The Deputy Director of Horticulture is the head of office. The horticulture statistics for the District is shown in subsequent tables below:

Horticulture crops	Total Area (hectares)
Mango	4.39
Citrus	0.80
Papaya	0.06
Pineapple	0.04
Guava	0.32
Sapota	0.07

Source: SREP, Balasore. Orissa Agric.

7.0 SURFACE WATER AND GROUND WATER SCENARIO OF THE DISTRICT

7.1 Hydrogeology

Distribution of Saline / fresh water aquifers: The occurrence of fresh water aquifers in coastal tract of Balasore restricted by two important factors-(i) Occurrence of hard rocks in the western side and (ii) Salinity hazard problems in the eastern part. In the narrow tract, close to the coast line extending right from Chandaneswar in the North to Bahanga/ Simulia in the south in the District, salinity problem occurs where both the saline water bearing and fresh water bearing aquifers occurs at different depths. The depth of occurrence of saline water bearing aquifers is not uniform along the entire tract. The study of lithological logs and electrical logs of boreholes and results of zone tests etc. indicate occurrence of saline water either above or below fresh water bearing aquifers and also both above and below the fresh water aquifers,

The width of the coastal saline tract is generally ranging from 4 to 5 km running from Bahanaga to Baliapal Block near Subranarekha river, it encroaches inland ward towards north east. Further its width increases to a range from 5 to 10 km in Bhograi Block.. General the top aquifers up to 150 meter are saline in this District. However, during the detailed studies in the area, it is observed that up to the depth range of 25 to 30m, fresh aquifers are occurring having a thickness of 5 to 15 meters, which are tapped by shallow tube wells, below 150m the aquifers are fresh up to 220m and 250m below the ground level the aquifers are saline. The salinity hazards occur in a narrow tract along the eastern margin adjoining the sea coast and in the rest part of coastal alluvium fresh water occurs all through down to the bed rock. Disposition of fresh and saline water in District is shown as Map No-3.

The occurrence of aquifers and its yield potential etc. are described below.

Non-saline area: The depth of the bore holes varied from 103m to 330 and the depth of the tube wells varied from 96 to 208m. The bed rocks were encountered at Hanspatna (110m) and at Soro (295m).

In the Jaleswar-Basta-Baliapal-Remuna-Balasore tract a group of aquifers usually varies in thickness from 3 to 15m, attains a maximum cumulative thickness of around 40 to 50m. The yield varies from 20 to 66 Ips against the drawdown of pumping water level varying between 5.83 to 15 60m. The static water levels vary from 2.13 to 10.68m bgl. The discharge in general is less in the southern part of this tract.

In the area around Soro and Markona a group of aquifers consisting fine to coarse sands which generally occur below 46m depth attains a cumulative thickness of about 125m and the thickness of aquifers dwindles towards west. The discharge is generally low and varies between 11 to 24 Ips against the draw down more than 15m.

In and around Gopalpur of Bahanaga block aquifers are thin and mixed with finer materials and are low yielding. Also in Kasbajaypur-Bahanga area the formation are predominantly argillaceous in nature and sand horizon are lesser. The yield generally varies between 20 to 30 Ips against the draw down around 20m. In this area auto flowing condition occurs from deeper aquifer blow 200m depths at Saud.

In general in the northern part (north of Balasore town) thickness of aquifers as well as yield is more in comparison to southern part of the District (south of Balasore town).

7.2 Depth of water level:

Categorization of depth to water level of pre-monsoon period (Apr-2015)

No. of wells measured	Depth to water level (m bgl)		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	Max	No.	%	No.	%	No.	%	No.	%
25	2.41	7.81	0		2	8	23	92	0	---

Depth to ground water levels during the post monsoon period (April 2015) varied between 2.41 and 7.81 m bgl Categorization of depth to water level of post-

monsoon period (November 2012) for HNS in Balasore District is presented below in table

Categorization of depth to water level of pre-monsoon period (Nov-2015)

No. of wells measured	Depth to water level (m bgl)		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	Max	No.	%	No.	%	No.	%	No.	%
34	1.08	5.18	6	17	27	79.4	1	2.9	0	

7.3 Ground Water Quality

Ground water in the phreatic aquifers in Balasore District slightly alkaline in nature, which is also colourless, odourless. The specific electrical conductance of ground water in phreatic zone at 25°C. The suitability of ground water for drinking purpose has been evaluated on the basis of pH, Total hardness (T.H), Ca, Cl, F and NO₃. The chemical concentration of these constituents is presented.

7.4 Ground Water Development

In the rural areas the entire water supply is dependent on ground water. Ground water development is mainly carried out in the District through dug wells and Hand pumps. In general dug wells are of 2 m diameter and the depth ranges between 8 to 15 m depending on the thickness of the weathered zone, tapping the shallow aquifer in the weathered zone and uppermost slice of the basement. Large number of dug wells used for drinking water is under private ownership for which there is no reliable data. Over the years Mark II/ Mark III hand pumps are being drilled in large numbers for ground water development. These hand pumps have the following two major advantages i) less susceptible to contamination from surface sources and ii) tap fractures between 20-60m depth which have been found to be less affected by seasonal water level fluctuation and thus have lesser chances of failure even during extreme summer. In rural areas of Balasore District the number of hand pumps drilled by PHED is 12311 of which 9342 are under working condition. There are 574 dug wells constructed by government departments that are under regular use. In the urban areas ground water plays a supplementary role in water supply, the major supply being made through dams, reservoirs or weirs across rivers

or streams. No authentic data is available on the number of ground water structures catering the urban water supply.

As per the latest ground water resource estimation carried out adopting GEC 97 methodology, the overall stage of ground water development in Balasore District has been found to be 41 % indicating enough scope for future development. The ground water resources of Balasore District is given in the table

7.5 Ground Water Related Issue and Problems

Some of key ground water related issues are

- I. Locating suitable sites for bore wells
- II. Suitable design of dug wells and hand pumps
- III. Taking up artificial recharge projects to augment the resource availability in Balasore District.
- IV. Optimal development of irrigation potential by developing ground water available for future uses.
- V. Creating public awareness for conserving ground water through awareness camps, NGO's and mass media.

7.6 Mass Awareness Campaign (MAP) & Water Management Training Programme (WMTP) by CGWB

NIL

7.7 Area Notified by Cgwb/Sgwa

None

7.8 RECOMMENDATIONS

As the District suffers from water scarcity, it is recommended to take artificial recharge at suitable locales. On the basis of the hydrogeological criteria such as post monsoon water level below 7 m bgl indicating availability of sufficient space in the unsaturated zone to retain additional water and availability of surplus surface runoff, 250 Sq kms area in Balasore District has been demarcated as suitable for artificial recharge. Through this 41.25 mcm water can be recharged.

In the hard rock areas, pin pointing suitable sites for bore wells is always a challenge. Considering the anisotropy in distribution of fractures at deeper level, suitable sites may be selected using remote sensing techniques in association with geophysical and hydro- geological investigations.

For deriving optimal benefit from aquifers in areas under fissured formation, the dug wells should be designed to penetrate the weathered zone as well as top part (1-2 m) of the underlying bed rock, so as to get the full benefit, from the total thickness of the shallow aquifer. For hand pumps and shallow tube wells the casing provided against the weathered zone should be slotted at the bottom so that the well can extract shallow ground water also. In urban areas use of shallow aquifers should be encouraged.

The surface run off in urban areas and its peripheral parts should be harnessed to augment the ground water resource through appropriate recharge techniques. For urban areas roof top rain water harvesting and artificial recharge is most suitable. Location and design of the structures should be guided by findings from hydrogeological and geophysical surveys. Sites for artificial recharge should be taken up at places where sufficient thickness of weathered zone as well as fracture/fracture zones is available. The depth of the recharge well should be governed by the depth of occurrence of the fractures.

8.0 RAINFALL OF THE DISTRICT AND CLIMATE CONDITION

8.1 Month wise rainfall:

The driest month is November, with 31 mm of rain. There is on average 3 mm of precipitation in December. In July, the precipitation reaches its peak, with an average of 313.98 mm.

Year		2016	2017	2018	Average
Sl. No.	Month	(mm)	(mm)	(mm)	(mm)
1	Jan	18.33	00	00	6.11
2	Feb	49.92	00	00	16.64
3	Mar	6.42	105.29	6.23	39.32
4	Apr	18.33	18.50	162.62	64.48
5	May	224.33	165.98	144.39	178.23
6	Jun	165.05	164.28	268.94	199.42
7	Jul	303.49	317.98	320.48	313.98
8	Aug	334.98	276.51	341.13	317.54
9	Sep	308.00	198.01	346.48	284.16
10	Oct	153.10	251.58	243.31	215.99
11	Nov	46.43	47.20	00	31.21
12	Dec	00	5.08	4.97	3.35
Total		1628.38	1550.41	1838.55	1672.44

The Indian Meteorological Department, Bhubaneswar, vide letter No. BBS/RMC/CS-312, dated 18th January, 2016 has provided the period of Rainy Season viz. Normal dates of Onset and Withdrawal of South West Monsoon over India as state-wise. The duration for the period is 10th June to 15th October.

8.2 Climate

The climate in Balasore is warm and temperate. In winter, there is much less rainfall in Balasore than in summer. The Köppen-Geiger climate classification is Cwa. The average temperature in Balasore is 24.7 °C.

Temperature Graph- Balasore

May is the warmest month of the year. The temperature in May averages 32.3 °C. January has the lowest average temperature of the year. It is 16.5 °C.

Source: Indian Meteorological Department.

9.0 DETAILS OF MINING LEASE OF ROAD METAL IN THE DISTRICT

Attached as Annexure – I

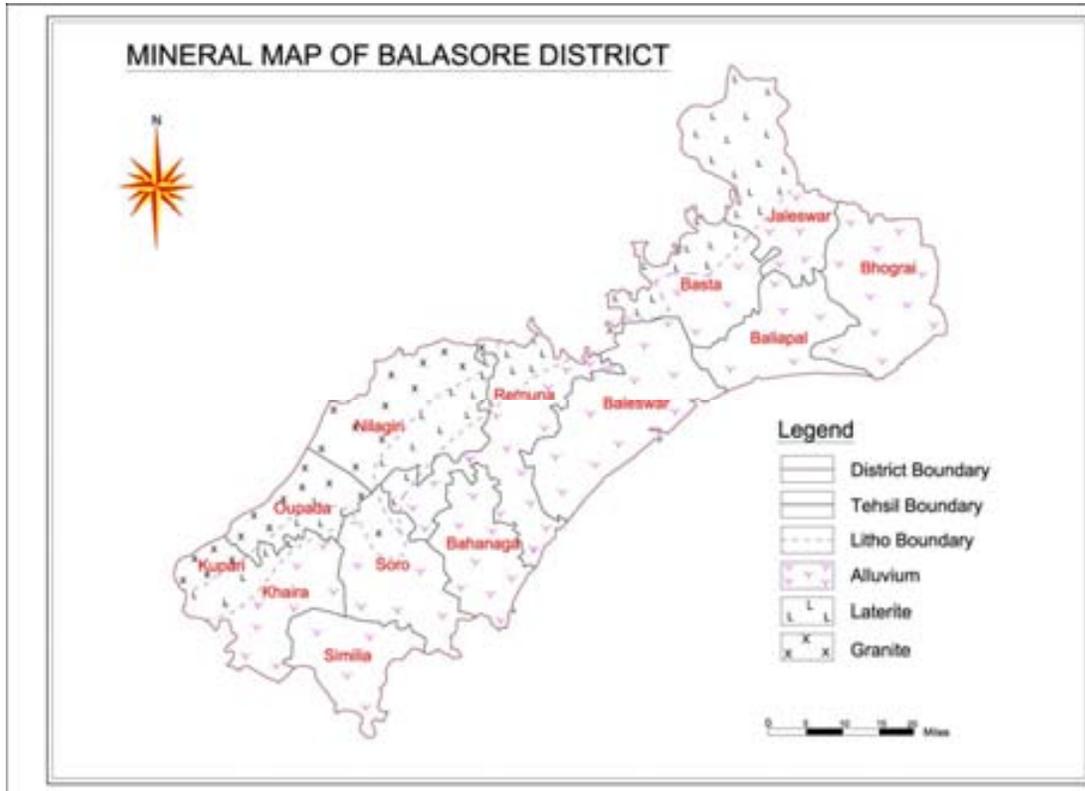
10. DETAIL OF ROYALTY OR REVENUE RECEIVED IN LAST THREE YEARS:

Sl. No.	Name of the Tahasil	2016-17	2017-18	2018-19	Total Amount (Lakh)
1	Bahanaga	Nil	Nil	Nil	Nil
2	Balasore	Nil	Nil	Nil	Nil
3	Baliapal	Nil	Nil	Nil	Nil
4	Basta	Nil	Nil	Nil	Nil
5	Bhogarai	Nil	Nil	Nil	Nil
6	Jaleswar	Nil	Nil	Nil	Nil
7	Khaira	Nil	7289995	46608382	53898377
8	Nilgiri	Nil	348818	706958	1055776
9	Oupada	Nil	Nil	Nil	Nil
10	Remuna	Nil	Nil	Nil	Nil
11	Simulia	Nil	Nil	Nil	Nil
12	Soro	4045207	6716914	25355191	36117312
Grand Total		4045207	14355727	72670531	91071465

11. DETAIL OF PRODUCTION OF MINOR MINERALS IN LAST THREE YEARS:

Sl. No.	Name of the Tahasil	2016-17	2017-18	2018-19	Total Quantity (Cubic meter)
1	Bahanaga	Nil	Nil	Nil	Nil
2	Balasore	Nil	Nil	Nil	Nil
3	Baliapal	Nil	Nil	Nil	Nil
4	Basta	Nil	Nil	Nil	Nil
5	Bhogarai	Nil	Nil	Nil	Nil
6	Jaleswar	Nil	Nil	Nil	Nil
7	Khaira	Nil	23714	181670	205384
8	Nilgiri	Nil	3419	6916	10335
9	Oupada	Nil	Nil	Nil	Nil
10	Remuna	Nil	Nil	Nil	Nil
11	Simulia	Nil	Nil	Nil	Nil
12	Soro	969	44351	29891	344231
Grand Total		969	40932	298911	340812

12. MINERAL MAP OF THE DISTRICT:



13. LIST OF LETTER OF INTENT (LOI) HOLDERS IN THE DISTRICT ALONG WITH ITS VALIDITY

Sl. No.	Name of the Mineral	Name of the Lessee	Address	Letter of Intent Grant Order No. & date	Area of Mining lease to be allotted	Validity of LoI	Use (Captive/ Non-Captive)	Location of the Mining lease (Latitude & Longitude)
1	2	3	4	5	6	7	8	9
Attached as Annexure-I								

14. TOTAL MINERAL RESERVE AVAILABLE IN THE DISTRICT

Total mineral reserve of road metal/Building stone is 10367251 cum which may increase after detail investigation as per details below.

- (i) Blocks were identified based on geological studies through field observation.
- (ii) Mineable resource was calculated by considering detail prospecting.
- (iii) Area calculated as per GPS co-ordinates and information obtained from local people. Land detail need to be verified from revenue record.
- (iv) Since this is an interim report, as per the present requirement of minerals, more such blocks need to be identified and the data should be updated periodically, after certain intervals to update the data bank of DSR.

Summary of Identified Mineral Potential:

Sl. No.	Name of the mineral	Name of the lessee	Address and contact No. of the lessee	Letter of Intent Grant Order No. and date	Area of mining lease to be allotted	Validity of LoI	Use (Captive / Non-Captive)	Location of the Mining lease (Latitude & Longitude)
1	2	3	4	5	6	7		
Attached as Annexure-I								

15. QUALITY/GRADE OF MINERAL AVAILABLE IN THE DISTRICT**Rocks and Minerals found in Balasore District:-**

Road metal/Building stone of the District are very much suitable for various construction purposes after crushing and screening. The granite gneisses are well foliated, jointed and weathered easily. Generally the depth of weathering extends down to a depth of 15 meters with in exceptional cases e.g. at Nilgiri, Khaira, Oupada etc. it was 42.5 m b g l. This weathered zone forms the main repository of ground water in hard rock areas and is tapped by dug wells. The yield of dug wells range from 6 to 10 m³/ day. As the area has undergone several phases of tectonic deformations deep-seated fractures are developed which form a conduit for downward percolation of ground water and form aquifers in deeper conditions.

These deeper fractures are generally encountered in bore wells. Deeper fractures are tapped by bore wells in Nilgiri, Oupada and Simulia blocks.

16. USE OF MINERAL

Uses of granitic rocks-

- **Building Stone:-** Granitic rocks have been extensively used as a dimension stone and as flooring tiles in public and commercial buildings and monuments.
- **Sub base and base material in road and highway construction:-** Crushed stone is the most basic use of granite. Crushed granite is used as a sub base and base material in road and highway construction. It is used as crushed stone media in sewage system drain fields and as a base material for foundations and construction slabs. Crushed granite in attractive colors is used as a landscape stone and in planters. It also makes great railroad ballast, and in larger sizes it makes good riprap.
- **Granite Paving Stone:-** Granite paving stones or "pavers" can make a colorful and interesting way of paving a driveway or patio. The beauty of natural stone combined with expert craftsmanship and design can produce a unique and lasting result. In the past granite blocks were often used to pave city streets.
- **Engineering:-** Engineers have traditionally used polished granite surface plates to establish a plane of reference, since they are relatively impervious and inflexible. Sandblasted concrete with a heavy aggregate content has an appearance similar to rough granite, and is often used as a substitute when use of real granite is impractical. Granite block is usually processed into slabs, which can be cut and shaped by a cutting center. Granite tables are used extensively as bases for optical instruments because of granite's rigidity, high dimensional stability, and excellent vibration characteristics.

17. DEMAND AND SUPPLY OF THE MINERAL IN THE LAST THREE YEARS:

As such there are huge infrastructural activities such as road, building, railways are coming up by Govt. of India & PSUs under "Make In India" programme.

The Granitic rocks are the main raw minerals for the above activities and considering the last three years' actual production of Balasore with respect to the requirement of the state has a huge gap.

It is proposed to start the stone production from larger block/area to at least double the production of the District which will enhance the revenue of the District and also support the livelihood of the local people.

18. MAP OF EXISTING MINING LEASES IN THE DISTRICT:

Enclosed as Plate-I

19. DETAILS OF THE AREA OF WHERE THERE IS A CLUSTER OF MINING LEASE VIZ. NUMBER OF MINING LEASES, LOCATION (LATITUDE AND LONGITUDE)

Currently there are six such clusters of mining leases in Khaira and Soro area of the District (Enclosed as Annexure-II). However, it is proposed to consider the cluster of mining lease while planning for new lease area in coming years.

20. DETAILS OF ECO-SENSITIVE AREA, IF ANY, IN THE DISTRICT:

Eco sensitive zone of Kuldiha wild life sanctuary is located within the District.

21. IMPACTS OF MINING ON ENVIRONMENT:

The most important environmental impact of mining projects are:-

Acid mine drainage and contaminant leaching

Acid mine drainage is considered one of mining most serious threats to water resources. A mine with acid mine drainage has the potential for long-term devastating impacts on rivers, streams and aquatic life. If mine waste is acid-generating, the impacts to fish, animals and plants can be severe. Many streams impacted by acid mine drainage have a pH value of 4 or lower – similar to battery acid. Plants, animals, and fish are unlikely to survive in streams such as this.

Transportation sources:

Transportation sources of air pollutants include heavy vehicles used in excavation operations, cars that transport personnel at the mining site, and trucks that transport mining materials. The level of polluting emissions from these sources depends on the

fuel and conditions of the equipment. Even though individual emissions can be relatively small, collectively these emissions can be of real concern. In addition, mobile sources are a major source of particulate matter, carbon monoxide, and volatile organic compounds that contribute significantly to the formation of ground-level ozone

Stationary sources:

The main gaseous emissions are from combustion of fuels in power generation installations, and drying, roasting, and smelting operations. Many producers of precious metals smelt metal on-site, prior to shipping to off-site refineries. Typically, gold and silver is produced in melting/fluxing furnaces that may produce elevated levels of airborne mercury, arsenic, sulfur dioxide, and other metals

Fugitive emissions:

Common sources of fugitive emissions include: storage and handling of materials; mine processing; fugitive dust, blasting, construction activities, and roadways associated with mining activities; leach pads, and tailing piles and ponds; and waste rock piles. Sources and characteristics of fugitive emissions dust in mining operations vary in each case, as do their impacts. Impacts are difficult to predict and calculate but should be considered since they could be a significant source of hazardous air pollutants.

Noise and vibration:

Noise pollution associated with mining may include noise from vehicle engines, loading and unloading of rock into steel dumpers, chutes, power generation, and other sources. Cumulative impacts of shoveling, ripping, drilling, blasting, transport, crushing, grinding, and stock-piling can significantly affect wildlife and nearby residents.

Vibrations are associated with many types of equipment used in mining operations, but blasting is considered the major source. Vibration has affected the stability of infrastructures, buildings, and homes of people living near large-scale open-pit mining operations. According to a study commissioned by the European Union in 2000: "Shocks and vibrations as a result of blasting in connection with mining can lead to noise, dust and collapse of structures in surrounding inhabited

areas. The animal life, on which the local population may depend, might also be disturbed.”

22. REMEDIAL MEASURES TO MITIGATE THE IMPACT OF MINING ON THE ENVIRONMENT:

1. Following are the remedial measures to mitigate the in Water sprinkling on haul road, loading and unloading points.
2. Plantation along the safety zone and dump area.
3. Providing dust masks to workers.
4. Regular monitoring of ambient air quality.
5. Provision of air conditioned cabin of Excavators and Dumpers.
6. Regular and proper maintenance of working equipments.
7. Periodic medical examination of the workers and organize medical camp in the area.
8. Use Milli Second Delay Detonator in blasting operation.
9. Provisions of ear plug to the workers.
10. Regular training praogram to the mines workers and operators.

23. RECLAMATION OF MINED OUT AREA

Necessity of Reclamation & Rehabilitation:

- Exponential growth in mineral production since 1980.
- Mining activities causes physical, chemical, biological and socio-economic changes in the area.
- Surface mining activities disturb the original land profile.
- In India, mineral production comes mostly from opencast mines & hence Land degradation problems is of serous concern.
- An intricate, in-depth and site-specified techniques involving integrated approach is necessary.

Reclamation has three vital roles:

- i. **Reclamation** – Reclamation means return the mined-out land with useful life. It implies restoring the land to a form and productivity that is useful and inconfromiti with a prior land use. Reclamation always may not be a single- phase operation.

- ii. **Rehabilitation** – Rehabilitation is to bring back the degraded land to a normal stage by a special treatment. It is a process of taking some mitigation measures for disturbed environmental condition created through mining activities.
- iii. **Restoration** – Restoration is the process of returning the mined out land being fit to an acceptable environmental condition. However, the general acceptable meaning of the term is bringing the disturbed land to its original form. Restoration is often used to indicate that biological properties of soil are put back to what they were. This is a rare phenomenon.
- iv. When active mining ceases, mine facilities and the site are reclaimed and closed. The goal of mine site reclamation and closure should always be to return the site to a condition that most resembles the pre-mining condition. Mines that are notorious for their immense impact on the environment often made impacts only during the closure phase, when active mining operations ceased. These impacts can persist for decades and even centuries.

Mine reclamation and closure plans must describe in sufficient detail how the mining company will restore the site to a condition that most resembles pre-mining environmental quality; how it will prevent – in perpetuity – the release of toxic contaminants from various mine facilities (such as abandoned open pits and tailings impoundments); and how funds will be set aside to insure that the costs of reclamation and closure will be paid for.

Proposed future land use after reclamation:

- a. Forestry,
- b. Recreation,
- c. Water Reservoir,
- d. Crop Land,
- e. residential/Commercial,
- f. Fish & wildlife Habitat,
- g. Undeveloped Land,
- h. Grazing/Pasture Land

Statutory requirement:

As per the Mineral Conservation Development Rule, 2017, the following rules must be bare in mind by the mine owner/agent/manager, which is a part of reclamation activities –

Rule 22, Mine Closure Plan

Rule 23, Submission of Progressive Mine Closure Plan
Rule 24, Submission of Final Mine Closure Plan

Rule 26, Responsibility of holder of mining lease
Rule 27, Financial Assurance

Rule 35, Sustainable Mining

24. RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN:

Mining activity because of the very nature of the operation, complexity of the systems, procedures and methods always involves some amount of hazards. Hazard identification and risk analysis is carried for identification of undesirable events that can lead to a hazard, the analysis of hazard mechanism by which this undesirable event could occur and usually the estimation of extent, magnitude and likelihood of harmful effects. The activities which can cause high risk related to face stability and the person blasting the shots. It was observed that on a working face of the mine, there were large cracks and unsupported rocks were present, which can lead to a serious hazard and injure workers engaged in loading operation and machineries because of rock falls or slides. This type of condition turn out because improper dressing of the bench and improper supervision. To avoid the hazards due to fall of rocks the face must be examined, made suitable for working and the remedial measures must be taken to make it safe if there is any doubt that a collapse could take place. Working of the face should be in the direction taking into account the geology of the area such that face and quarry side remain stable. Another major risk identified in mines is due to the firing of explosive by an unqualified person. In the mines there is problem of fly rocks and the village is located close to the mine and so it is rated high as it can affect many people. Explosives by nature have the potential for the most serious and catastrophic accident. Planning of round of shots, holes correctly drilled, direction logged, weight of explosive suitable for good fragmentation are the few of the steps necessary to ensure its safe use and if the shots are not properly designed can result in misfires, early ignition and flying rocks. No person is allowed to use explosives without being properly trained in its handling. In the mine a large numbers of heavy vehicles were in operation and the roads were not proper for haulage purpose. The haulage roads were not even and were not wide enough for the crossing purpose and hence the chances of hazards are very high. The main hazards arising from the use large earth moving vehicles are incompetent drivers, brake failure, lack of all-around visibility from the driver position, vehicle movements particularly reversing, roll over, and maintenance. Those most at risk are the driver and pedestrians likely to be struck by the vehicle,

and drivers of smaller vehicles, which cannot be seen from the cabs of large vehicles. Edge protection is always necessary to prevent inadvertent movement over the edge of roadway or a bench. Seatbelt will protect driver in case of roll. Good maintenance and regular testing are necessary to reduce the possibility of brake failure. Access to the vehicles should always be restricted to those people necessary for the work in hand. The use of personal protective equipment and proper arrangements is essential to check if the person is wearing protective equipment or not. The personal protective equipment includes helmet, non-skid safety boots, safety glasses, earmuffs etc. The required personal protective equipment should be provided and used in a manner that protects the individual from injury. Few minor injuries which can be prevented are slip, trip, or fall hazards; hazards due to rock falls and collapse of unstable rocks, atmosphere containing toxic or combustible gases; protects from chemical or hazardous material etc. A disaster management plan should be prepared for taking care of for any disaster. Other risk which are included in this category are noise, as it occurs and it can lead to permanent disability. There are problems related to road traffic in and out issuers; inappropriate exposure of moving machines; mechanical failure and because of large number of moving trucks and dumpers there is large quantity of dust present in roadways which affects the operators and can lead to accidents causing injury. They are in acceptable range because of precautions measures taken but no step is taken it can cause hazard hence steps should be taken to reduce the hazards such as for dust suppression system should be installed. Other problems like occurrence of lots of mosquitoes in the area due to unhygienic conditions which affect the human health causing malaria, dengue etc. and causing a person to be hospitalized.

Disaster in the mines like fires, explosions, entrapments, and inundations can occur any time, so emergency preparedness is a must. The Disaster Management Plan and risk assessment in the mines will include all sorts of above mentioned emergency and the extent that this plan will be implemented will depend on the nature and scope of the emergency. The basic purpose of Disaster Management Plan and risk assessment to ensure that mine rescue and recovery activities are conducted safely for rescuer and survivors. According to MMR act 1961 a standard

operating procedure should be drawn for involvement different category of staff and officers. The SOP should be updated periodically to reduce the chaos and response to the emergency should be quick and smooth. The responsible person should be familiar with his responsibility during the mock drills. One or two standby should be there to replace the person in Emergency situation. Rescue operations should not include the survivors for any assistance.

First Information of Disaster / Emergency should go to the attendance clerk on duty. Duties of attendance Clerk (Emergency Siren) the attendance clerk or other designated person should on getting information of major accident, sound a hooter or a siren immediately declaring a state of emergency at the mine and then to contact the manager and on his advice to call key personnel using the information listed in the Emergency Organization Chart. It is important that all telephone calls are recorded in a telephone log book. Duties of Other Officials should be displayed and handed over to all concerned. Copy the same should be kept at Manager's Office for ready reference. Establishment of Control Room at Unit Level, Area Level and Company Level is essential. Control Room should keep the contact information about –

- Company Manager
- Company owner/ Administrative officer.
- District Administration
- Govt. Hospitals in Nearby Localities,
- Private Nursing Homes of Localities

Attendance roaster and duty charge register should be properly maintained so the record of missing people can be obtained.

25. DETAILS OF THE OCCUPATIONAL HELTH ISSUE IN THE DISTRICT:

The persons employed in the mines are exposed to a number of hazards at work which adversely affect their health. Some of the important ones are dust, noise, heat, humidity, vibration etc. In recent times, there has been increasing awareness among mining industry and the workers about occupational diseases such as Coal Worker's Pneumoconiosis, Silicosis, Manganese Poisoning, Hearing Impairment etc. caused by exposure to health hazards at work. Almost all occupational diseases are

known to cause permanent disablement and there is no effective treatment. However, most of the occupational diseases can be prevented by adopting proper occupational health measures and engineering control on airborne dust at workplace.

Following diseases have been notified as the diseases connected with mining operations for the purpose of sub-section (1) of Section 25 of the Mines Act, 1952:

S.R.O. 1306 dated the 21st July, 1952

1. Silicosis
2. Tuberculosis

Total Number of TB cases in Balasore District of last 5 years

Year	No. of Cases
2015	2072
2016	1823
2017	1775
2018	1960
2019 till Aug	1374
Total	9004

S.R. O. 2521 dated the 26th June, 1986

Cancer of lung or the stomach or the pleura and peritoneum (i.e. mesothelioma)

25 S.O. 399(E) dated 21st February, 2011

1. Noise Induced Hearing Loss
2. Contact Dermatitis caused by direct contact with chemical.
3. Pathological manifestations due to radium or radioactive substances

System of Detection of Occupational Diseases in Mines In order to detect occupational diseases the industry is required to conduct medical examinations and health surveillance of workers as per the provisions of Mines Act. The present efforts of mines management are concentrated on detection of silicosis, Pneumoconiosis and other notified diseases. Very little attention is paid to other occupational diseases. The essential features of health surveillance programme required to be carried out in mines are:

- (a) Initial Medical Examination of persons to be employed in mines.

- (b) Periodic Medical Examination once every five years. General physical examination, chest radiographs, lung function tests and audiometry.
- (c) Classification of chest radiographs of workers as per ILO Classification.
- (d) Medical examination within one year of superannuation. Evaluation of all cases of suspected pneumoconiosis by Pneumoconiosis Medical Board.
- (f) Maintenance of medical records till the person is in service and 10 years thereafter. The cases of silicosis detected during health surveillance programme are referred to Pneumoconiosis Medical Board of the mining companies for evaluation and certification. If certified, the case is notified to the enforcement authority and evaluated for disability and payment of compensation. Many cases of silicosis and other pneumoconiosis go undetected and a large number of cases of silicosis are misdiagnosed due to lack of training of medical professionals.

26. PLANTATION GREEN BELT DEVELOPMENT IN RESPECT OF LEASE ALREADY GRANTED IN THE DISTRICT:

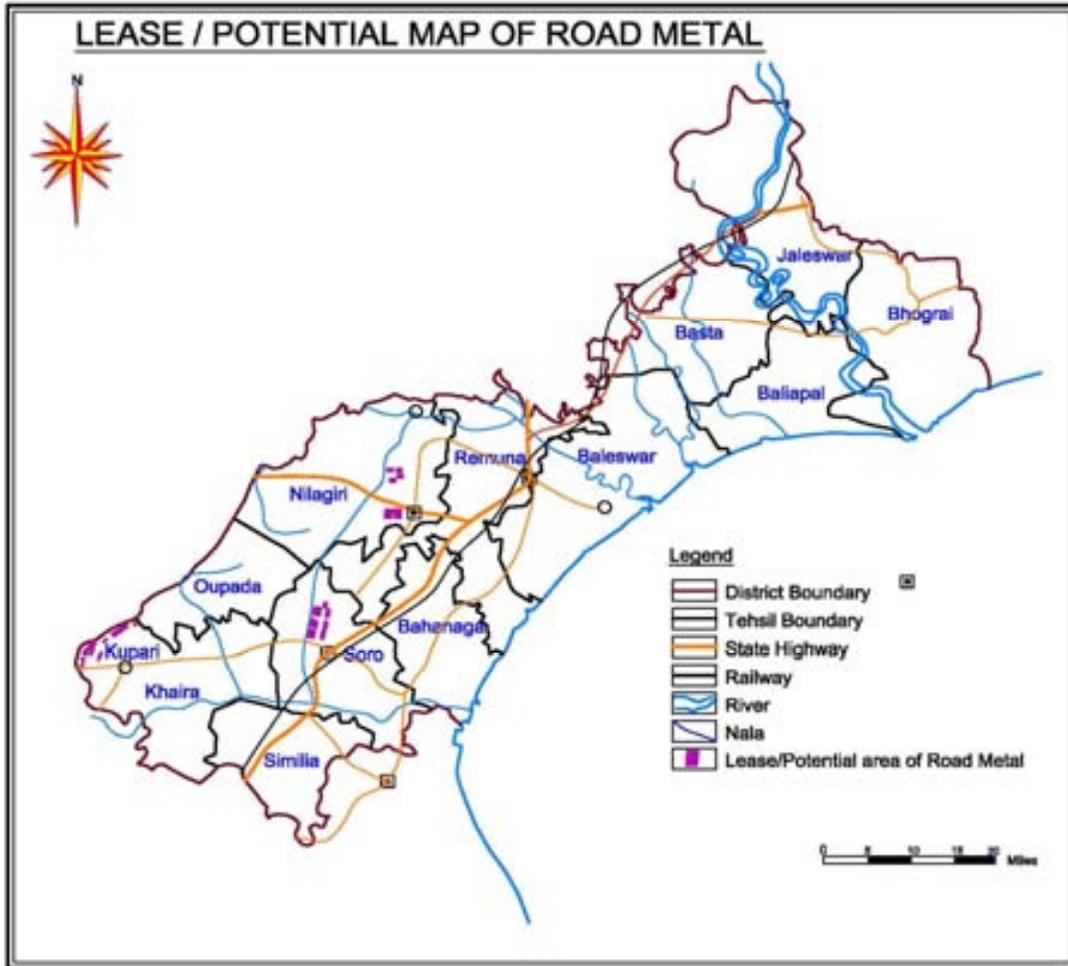
During mining operation green belt development through plantation is most important for environment safe guard, which should be supervision by mining department. Different type of species should be planted near lease periphery to keep environment clean at post mining period through reclamation. Where specific usefulness of land could be decided, afforestation is normally planned through the site could have been considered for better possibilities of land use.

27. CONCLUSION:

Since it is an interim report, to meet the requirement of minerals in the present scenario, it is proposed to identify such potential areas at certain interval and get the data bank of DSR to be updated. The mining activity in any area is on one hand bring revenue and employment (Direct and indirect) and on other hand if not done properly potential pollution and ecological imbalance increases, the ability of the ecosystem can also be reduced. Particulate matter transported by the wind as a result of excavations, blasting, transportation of materials, heavy equipments used raise these particulate levels; and Gas emissions from the combustion of fuels in stationary and mobile sources, explosions, and mineral processing. All these activities indirectly affected the biodiversity of area. Larger potential and smaller

areas have been identified in Balasore District on the basis of geological study carried out during field observation, which can be considered for mining concession after all the parameters for statutory clearances are verified by consulting with concerned authorities.

Plate-I



Khaira	19	24	Snehakata Mishra W/o- Laxman Mishra	At /Po- Apartindha Dist. Bhadrak 9937060370	487/99/ Dt. 28-10-17	Khata-245 Plot No.95 KISSAM- Pahada Ac 0.50	2017-18	2021-22			06-03-18 AGREEMENT DEED	Non-Working	Non-Capitive	112/DEIAA , Dt. 12-02-18	86 22'27.4"E to 86 22'29.6"E 21 18'1.0"N to 21 18'2.9"N	Open Cast	46170	13364	0	113616	0	432	0	
Khaira	20	25	Ajaya Kumar Dash S/o- Markanda Das	A/ /Po- Chandadaka Dist. Maurbhanj	5088/ Dt. 16-11-17	Khata-245 Plot No.95 KISSAM- Pahada Ac 0.50	2017-18	2021-22			-	Non-Working	Non-Capitive	224/DEIAA Dt. 31-8-18	86 22'29.2" E to 86 22'31.2" E 21 18'1.1" N To 21 18'3.5" N	Open Cast	59336	16145	0	0	0	0	0	
Khaira	21	26	Bibekanan da Rout S/o- Binod Bhan Rout	At/Po- Dhanurajpur Dist. Keonjhar 9938526439	4804/ Dt. 28-10-17	Khata-245 Plot No.95 KISSAM- Pahada Ac 0.50	2017-18	2021-22			675/ 28-2-18, 1120/10-4-18, 1131/9-4-19	Working	Non Capitive	114/DEIAA Dt. 12-2-18	86 22'30.7" E to 86 22'32.7" E 21 18'2.2" N To 21 18'4.8" N	Open Cast	57586	16602	0	70558	0	404988	0	2524
Khaira	22	27	Shiba Shankar Mohanty S/o- Harekrushna Mohanty	At-Relpur Po- Soro Dist. Balasore. 9437257008	4881/ Dt. 28-10-17	Khata-245 Plot No.95 KISSAM- Pahada Ac 5.00	2017-18	2021-22			683/ Dt. 8-3-18, 3150/ Dt. 24-8-18, 87/ Dt. 15-1-19	Working	Non-Capitive	116/DEIAA Dt. 12-2-18	86 22'31.5"E to 86 22'39.6"E 21 17'59.4"N to 21 18'39.6"N	Open Cast	428919	173223	0	501417	0	1404	8424	
Khaira	23	28	Mohapatra Jajati Kesori Kar S/o- Rama Chandra	At- Sarasatia Po- Charanmaka S/o- Rama Dist- Bhadrak 9937097161	4883/ Dt. 28-10-17	Khata-245 Plot No.95 KISSAM- Pahada Ac 2.00	2017-18	2021-22			833/ Dt. 16-3-18	Non-Working	Non-Capitive	118/ Dt. 12-2-18	86 22'28.9"E to 86 22'33.8"E 21 17'3.7"N to 21 18'9.2"N	Open Cast	166905	57014	0	505584	0	1008	0	
Khaira	24	29	Brahmana nda Panda S/o- Chakradhar Panda	At-Itanundi Po- Kupari Dist. Balasore. 9937190776	4885/ Dt. 28-10-17	Khata-245 Plot No.95 KISSAM- Pahada Ac 1.00	2017-18	2021-22			-	Working	Non-Capitive	120/DEIAA Dt. 12-2-18	21 18'4.0"N to 21 18'6.4"N	Open Cast	72138	23929	0	127125	0	669	4057	
Khaira	25	30	Brahmana nda Panda S/o- Chakradhar Panda	At-Itanundi Po- Kupari Dist. Balasore. 9937190776	4887/ Dt. 28-10-17	Khata-245 Plot No.95 KISSAM- Pahada Ac 1.00	2017-18	2021-22			921/ Dt. 23-3-18 3681/ Dt. 22-9-18	Working	Non Capitive	122/DEIAA Dt. 12/2/18	86 22'35.9"E to 86 22'40.5" E 21 18'5.8"N to 21 18'8.2"N	Open Cast	77084	29862	0	126819	0	675	4104	
Khaira	26	31	Gajendran ath Barik S/o- Chintamani Barik	At- Baunshagadi a Po- Haripur Dist. Balasore. 9937913109	4814/ Dt. 28-10-17	Khata-245 Plot No.95 KISSAM- Pahada Ac 2.00	2017-18	2021-22			672/ Dt. 28-2-18, 2834/ Dt. 30-6-18	Working	Not-Capitive	124/DEIAA Dt. 12-2-18	86 22'21.3" E to 86 22'25.6" E 21 18'4.7" N to 21 18'8.3" N	Open Cast	121500	54697	0	217242	0	1116	6750	

khaira	27	32	Gajendran ath Barik S/o- Chintamani Barik	At- Baunshagedi a Po- Hatnpur Dist. Balasore. 9937913109	4816/ Dt.28-10- 17	Khata-245 Plot No.95 Kissam- Pahada Ac 0.50	2017- 18	2021- 22			673/Dt.28-2- 18.2524/Dt.3- 0-6-18.	Working	Captive	126/DEIAA Dt. 12-2- 2018	86 22.21.8" E to 86 22.23.9"E 21 18'8.1"N to 21 18'10.1"N	Open Cast	44640	12600	0	97122	564372	0	420	2520
khaira	28	33	Prabhallad Sahoo S/o- Baidyanath Sahoo	At- Purusotamp ur Po- Khairta Dist. Balasore. 9437173871	4800/ Dt.28-10- 17	Khata-245 Plot No.95 Kissam- Pahada Ac 2.50	2017- 18	2021- 22			635/Dt. 27-2- 18. 994/Dt.2- 4-18	Working	Non-Captive	128/DEIAA Dt. 12-2- 18	86 22.24.1"E to 86 22.28.1"E 21 18'6.1"N to 21 18'24.1"N	Open Cast	236034	122917	0	202115	1127655	0	1114	6723
Khaira	29	34	Manash Ranjana Mohapatra S/o- Kalandi Mohapatra	At- Jagamathpur Po-Soro Dist. Balasore. 9337672900	4889/ Dt. 28-10- 2017	Khata-245 Plot No.95 Kissam- Pahada Ac 0.50	2017- 18	2021- 22			2364/ Dt. 26- 07-2019 upto valid 31-07- 2019	Working	Non-Captive	130/DEIAA Dt.12-02- 18	86 22.35.2"E to 86 22.37.6"E 21 18'9.6"N to 21 18'11.7"N	Open Cast	44906	13122	0	109059	0	0	427	0
khaira	30	35	At- Purusotta mpur Po- Khaira Dist. Balasore.	Sanjay Ku. Sahoo S/o- Bishnupada Sahoo	4798/ Dt. 28-10-17	Khata-245 Plot No.95 Kissam- Pahada Ac 1.00	2017- 18	2021- 22			637/Dt.27-2- 18. 1112/Dt.2-4- 18	Working	Non-Captive	132/DEIAA Dt. 12-2- 2018	86 22.5.6 E to 86 22.7.9"E 21 18'9.5" N to 21 18'11.6" N	Open Cast	101276	19815	0	182127	1067265	0	670	4061
khaira	31	36	Narendran ath Dhar Radhu Dhar	At/Po- Mihitani Dist. Balasore 9437077411	4827/ Dt.28-10- 17	Khata-245 Plot No.95 Kissam- Pahada Ac 0.50	2017- 18	2021- 22			871/ Dt.19-3- 19. 3466/Dt.11-9- 19	Working	Not-Captive	134/DEIAA Dt. 12-2- 2018	86 22'32.4" E to 86 22'34.7"E 21 18'4.2" N to 21 18'6.4" N	Open Cast	50543	14515	0	84402	495470	0	468	2851
khaira	32	37	Brahmana nda Panda S/o- Chakradhar Panda	At. Itanudi Po- Kupari Dist. Balasore. 9937190776	4891/ Dt.28-10- 17	Khata-245 Plot No.95 Kissam- Pahada Ac 1.00	2017- 18	2021- 22			923/ Dt.23-3- 18. 3679/Dt.22-9- 18	Working	Non-Captive	126/DEIAA Dt. 12-2- 18	86 22'35.0"E to 86 22'38.5" E 21 18'4.7"N to 21 18'7.8"N	Open Cast	122732	58716	0	168611	974944	0	683	4100
khaira	33	38	Sanjeeb Ku. Das S/o- Shasanha Sekhar Da	s At/Po- Mangalpur Dist. Balasore	4893/ Dt. 28-10-17	Khata-245 Plot No.95 Kissam- Pahada Ac 0.50	2017- 18	2021- 22			-	Non- Working	Non-Captive	138/DEIAA Dt. 12-02- 18	86 22'39.2"E to 86 22'40.5"E 21 18'11.5"N to 21 18'13.7"N	open Cast	44887	13860	0	207522	0	0	450	0
khaira	34	39	Saroj Ku. Babalantary ay/S/o- Rabindranath Babalantary	At/Po- Kupari Dist. Balasore. 9437013711	4895/ Dt. 28-10-17	Khata-245 Plot No.95 Kissam- Pahada Ac 5.00	2017- 18	2021- 22			840/ Dt. 16-3- 18.	Working	Non-Captive	140/DEIAA Dt. 12-2- 2018	86 22'40.0"E to 86 22'43.6"E 21 18'9.2"N to 21 18'16.1"N	Open Cast	868190	412927	0	964640	6078960	0	1386	8392

khaira	43	45	Rajesh Ku. Mohapatra S/o- Nityananda Mohapatra	At- Champo Po- Angula Dist. Balasore.	4802/ Dt- 28-10-17	Khata-245 Plot No.1 KISSAM- Pahada Ac 0.50	2017-18	2021-22			Agreement not done	Non Working	Non-Captive	150/DEIAA , Dt.12-2-18	86 22'56.0"E to 86 22'57.8"E 21 18'5.0"N to 21 18'9.2"N	open Cast	95724	31274	0	0	0	0	0	0
khaira	44	46	Rabindra Prasad Nanda S/o- Kripasindh u Nanda	At- Kochikelli Po/ps. Khaira Dist- Balasore	4452/ Dt- 28-10-17	Khata-245 Plot No.314 KISSAM- Pahada Ac 1.00	2017-18	2021-22			Agreement not done	Non-Working	Non-Captive	152/DEIAA Dt.12-2-18	86 22'57.5"E to 86 22'59.2"E 21 18'5.7"N to 21 18'9.8"N	open Cast	106524	31274	0	126812	0	0	0	0
khaira	45	47	Rajesh Kumar Mohapatra S/o- Nityananda Mohapatra	At- Champo Po- Angula Ps. Soro Dist- Balasore		Khata-245 Plot No.314 KISSAM- Pahada Ac 1.00	2017-18	2021-22			-	Non-Working	Non-Captive	No	86 22'58.5"E TO 86 25'24.7"E 21 18'6.7"N TO 21 19'83.3"N	Open Cast	-	-	0	0	0	0	0	
khaira	46	48	At/Po- Bangura Dist. Keonjhar	Pabitraramoha n Peda S/o- Parsuram Peda 94378 84881	4903/ Dt- 28-10-17	Khata-245 Plot No.314 KISSAM- Pahada Ac 0.50	2017-18	2021-22			679/ Dt. 28-2-18, 1129/ Dt. 9-4-19	Working	Non-Captive	154/DEIAA Dt.12-2-18	86 23'0.02"E to 86 23'1.9"E 21 18'5.5"N to 21 18'7.2"N	Open Cast	41293	12650	0	109092	636192	0	420	2520
khaira	47	49	Kanhel Charan Das S/o- Narahari Das	AtKakderabed Po-Sunahat Dist. Balasore	4905/ Dt- 28-10-17	Khata-245 Plot No.314 KISSAM- Pahada Ac 1.00	2017-18	2021-22			-	Non-Working	Non-Captive	156/DEIAA Dt. 12-2-18	86 23'2.8"E to 86 23'5.1"E 21 18'4.5"N to 21 18'8.2"N	Open Cast	110187	38078	0	120292	65937	0	676	0
khaira	48	50	Amaresh Mohanty S/o- Gangadhar Mohanty	At- Palasa Po- Nachipur Dist. Balasore.	4797/ Dt.28-10-17	Khata-245 Plot No.314 KISSAM- Pahada Ac 1.00	2017-18	2021-22			781/ Dt.9-3-18, 1106/ Dt.10-4-18	Working	Non-Captive	158/DEIAA Dt.12-2-18	86 23'4.1"E to 86 23'6.7"E 21 18'4.9"N to 21 18'8.7"N	Open Cast	113481	35505	0	106243	604719	0	671	4050
khaira	49	52	Pradeep Ku. Jena S/o- Birabhadra Jena	At Mundahata Po- Kaitthagadia Dist. Balasore	4909/ Dt- 28-10-17	Khata-245 Plot No.314 KISSAM- Pahada Ac 5.00	2017-18	2021-22			-	Non-Working	Non-Captive	No	86 23' 22.2"E TO 86 25'24.7E 21 18'14.0"N TO 21 19'53.3"N	Open Cast			0	0	0	0	0	
khaira	50	53	Birabhadra Jena S/o- Upendranath Jena	At- Mundahata Po- Kaitthagadia Dist- Balasore	4911/ Dt- 28-10-17	Khata-245 Plot No.314 KISSAM- Pahada Ac 1.00	2017-18	2021-22			09-03-18 Agreement Deed	Non-Working	Non-Captive	162/DEIAA Dt. 12-02-18	86 23'21.1"E to 86 23'23.6"E 21 18'12.1"N to 21 18'14.6"N	open Cast	100710	100710	0	99819	573291	0	675	4131

khaira	51	54	Madhab Dhata S/o- Naba Dhata	At-Charapur Po- Sorod Dist- Balasore. 9439119421	4868/ Dt.28-10- 17	Khata-245 Plot No.314 Kissam- Pahada Ac 3.00	2017- 18	2021- 22					3759/Dt. 29- 9-2018	Non- Working	Non-Captive	164/DEIA Dt. 12-2- 18	86 2324.2"E to 86 23 27.7" 21 18 13.3"N to 21 18 20.2"N	open Cast	406341	206550	0	188757	1035207	0	1170	7110
khaira	52	55	Ratikanta Roul S/o- Rohit Ku. Roul	At- Balarampur Po-Motiganj Dist- Dhenkanal 9776769601	4913/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 4.00	2017- 18	2021- 22					166/ 19-1-19	Working	Non Captive	226/DEIA Dt. 31-8- 18	86 2338.7"E to 86 23 43.5"E 21 18 25.3" N To 21 18 53.4"N	Open Cast	363347	48345	0	0	657813	0	0	4429
khaira	53	56	Nabaghana Pahl S/o- Kellu Ch. Pahl	At- Panglrasasan Po- Panglrasasan Gobindapur Dist. Bhadrak 9776868688	4915/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 0.50	2017- 18	2021- 22					Agreement Not Done	Non- Working	Non-Captive	228/DEIA , Dt.31-8- 18	86 2341.4"E to 86 23 43"E 21 18 33.9"N to 21 18 35.8"N	Open Cast	42551	13245	0	0	217067	0	0	1524
khaira	54	57	Kamatikan ta Bhoi S/o Rabindrana th Bhoi	At- Achak Po- Maharampur Dist. Bhadrak 9937209974	4839/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 1.00	2017- 18	2021- 22					9-10-18	Working	Non-Captive	230/DEIA Dt. 31-8- 2018	86 2337"E to 86 23 40.3" E 21 18 30.5"N to 21 18 32.9"N	Open Cast	83721	23845	0	0	437634	0	0	2391
khaira	55	58	Ratikanta Roul S/o- Ruhit Ku. Roul	At- Partha Po- Balarampur Dist. Dhenkanal 9776769601	4917/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 1.00	2017- 18	2021- 22					168/Dt. 19-1- 19	Working	Non-Captive	232/Dt.31- 8-18	86 2337.9"E to 86 23 41.2"E 21 18 32.4"N to 21 18 34.6"N	Open Cast	82951	29635	0	0	384667	0	0	2403
khaira	56	59	Rabindrana th Lena S/o Sachindra Jena	At/Po- Dhobasila Dist- Balasore.		Khata-245 Plot No.314 Kissam- Pahada Ac 1.50	2017- 18	2021- 22					-	Working	Non-Captive	NO	86 2339.4"E TO 86 25'24.7"E 21 18 56.9" N TO 21 19 53.3"N	Open Cast	-	-	0	0	0	0	0	
khaira	57	60	Niranjan Sahoo S/o- Gobinda Sahoo	At- Gadapokhari Po- Guapali Dist. Balasore	4861/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 1.50	2017- 18	2021- 22					-	Working	Non-Captive	234/DEIA Dt.31-8-19	86 2330.8"E to 86 23 35.9"E 21 18 34.3"N to 21 18 37.9"N	Open Cast	194597	79632	0	0	503046	0	0	2982
khaira	58	61	Birabhadra Jena S/o- Upendra Jena	At- Mundahata Po- Kathagadia Dist- Balasore 9938699756	4921/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 0.50	2017- 18	2021- 22					3-12-18	Working	Non-Captive	236/DEIA Dt. 31-8- 18	86 2329.6"E to 86 23 31.5"E 21 18 36.8"N to 21 18 38.3"N	Open Cast	54456	15238	0	0	5036720	0	0	20000

khaira	59	62	Narendran ath Dhar S/O- Radhu Dhar	At/Po- Mutuan Dist- Balasore 9437077411	4829/ Dt:28-10- 17	Khata-245 Plot No.314 Kissam- Pahada Ac 2.00	2017- 18	2021- 22			12-10-18 Agreement Deed	Working	Non-Captive	238/DEIAA , Dt. 31-8- 18	86 2327.3"E to 86 2330.6"E 21 1838.5"N to 21 1843.2"N	open Cast	162432	57001	0	0	540360	0	0	3528	
khaira	60	63	Ratikanta Rout S/O- Ruhit Ku. Rout	At- Pataba Po Balarampras ad Dist- Dhenkanal 9776769601	4923/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 3.00	2017- 18	2021- 22			-	Non- Working	Non-Captive	No	86 2330.4"E TO 86 25 24.7"E 21 1837.5"N TO 21 1953.3"N	Open Cast	-	-	0	0	0	0	0	0	
khaira	61	64	Amiya Ku. Mohapatra S/O- Jitendranat h Mohapatra	At /Po- Kishoreprasa d Dist. Bhadrak 9438758272	4925/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 4.00	2017- 18	2021- 22			-	Non- Working	Non-Captive	No	86 2327.2"E TO 86 25 24.7"E 21 1844.8"N TO 21 1953.3"N	Open Cast	-	-	0	0	0	0	0	0	
khaira	62	65	Laxmidhar Nayak S/O- Mannathn ath Nayak	At/Po- Guapal Dist- Balasore 9937611658	4919/ Dt:28-10- 19	Khata-245 Plot No.314 Kissam- Pahada Ac 5.00	2017- 18	2021- 22			-	Non- Working	Non-Captive	No	86 2329.5"E TO 86 25 24.7"E 21 1847.1"N TO 21 1953.3"N	Open Cast	-	-	0	0	0	0	0	0	
khaira	63	67	Arnulyaku. Dhal S/O- Ramakanta Dhal	At- Khordanga Po- Charampa Dist. Bhadrak 9438758272	4927/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 3.00	2017- 18	2021- 22			-	Non- Working	Non-Captive	No	86 2330.6"E TO 86 25 24.7"E 21 1846.0"N TO 21 1953.3"N	Open Cast	-	-	0	0	0	0	0	0	
khaira	64	68	Radharani Balabantar ay W/O- Rabindrana th Balabantar ay	At/Po- Kupari Dist- Balasore	4949/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 3.00	2017- 18	2021- 22			-	Non- Working	Non-Captive	No	86 2336.2"E TO 86 25 24.7"E 21 1848.2"N TO 21 1953.3"N	Open Cast	-	-	0	0	0	0	0	0	
khaira	65	69	Pradeep Ku. Jena S/O- Brahhadra Jena	At- Mundahata Po- Kaitbagadia Dist. Balasore 9178123120	4930/ Dt. 28-10-17	Khata-245 Plot No.314 Kissam- Pahada Ac 1.50	2017- 18	2021- 22			2260/ Dt. 17- 7-19	working	Non-Captive	240/DEIAA Dt. 31-8- 18	86 2336.4"E to 86 2340.3"E 21 1834.2"N to 21 1837.5"N	Open Cast	148102	35229	0	0	418831	0	0	2977	
khaira	66	102	Brahmana nda Panda S/O- Chakradhar Panda	At-Itemundi Po-Kupari Dist. Balasore 9937190776	5084 Dt. 18-11-17	Khata-245 Plot No.314 Kissam- Pahada Ac 0.50	2017- 18	2021- 22			915 / 22-3- 18.	working	Non captive	170/DEIAA Dt. 12-2- 18	86 2323.1"E to 86 2324.7"E 21 1812.4"N to 21 1814.9"N	Open Cast	65124	16497	0	0	150984	1055827	0	432	2592

khaira	67	103	Pradeep Ku. Jena S/o- Birabhadra Jena	At- Mundahata Po- Kathagadia 9178123120	5086/ Dt. 16-11-17	Khata-245 Plot No.314 KISSAM- Pahada AC 0.50	2017-18	2021-22			835/ Dt. 16-03-18 & 1116/ Dt. 10-04-18	Non-Working	Non-Captive	172/DEIA Dt. 12-02-18	86 2324.1"E to 86 2325.7"E 21 18 12.8"N to 21 18 15.5"N	Open Cast	39841	16589	0	63516	362749	0	437	2621
khaira	68	70	Sabitri Nayak W/O Santosh Nayak	At- Uttreswar Po- Sora Dist. Balasore 9938616256	4819/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM- Pahada AC 7.00	2017-18	2021-22			4330/ Dt. 24/11/18 & 1865/ Dt. 17-6-19	working	Von-Captive	242/DEIA Dt. 31-8-18	86 2336.4"E to 86 2344.9"E 21 18 47.7" N to 21 18 54.7" N	Open Cast	136760	62104	0	0	2499413	0	0	5322
khaira	69	71	Abani Kumar Rouli S/o- Upendra Rouli	At/Po-Kunari Dist- Balasore	4845/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM- Pahada AC 1.00	2017-18	2021-22			-	Non-Working	Not-Captive	No	86 2345.8"E to 86 2524.7"E 21 18 51.4" N to 21 19 53.3" N	Open Cast	-	-	0	0	0	0	0	
khaira	70	72	Rabindranath Jena S/O Sachitananda Sahu	At/Po- Dhubasila Dist-Balasore	4863/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM- Pahada AC 1.00	2017-18	2021-22			-	Non-Working	Not-Captive	No	86 2347.3"E to 86 2524.7"E 21 18 51.6" N to 21 19 53.3" N	Open Cast	-	-	0	0	0	0	0	
khaira	71	73	Chintamani Jena S/O- Bhagaban Jena	At- Dharaskak Nubazar, Balasore	4863/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM- Pahada AC 3.00	2017-18	2021-22			-	Non-Working	Not-Captive	No	86 2350.6"E to 86 2524.7"E 21 18 50.6" N to 21 19 53.3" N	Open Cast	-	-	0	0	0	0	0	
khaira	72	74	Sarati Kumar Nayak S/O- Bhagaban Nayak	At/Po- Mahulpankh a Dist. Keonjhar 9937310884	4823/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM- Pahada AC 0.50	2017-18	2021-22			1133/ Dt.9/4/2019	Working	Non-Captive	244/DEIA Dt. 31-8-18	86 2351.7"E to 86 2354.0"E 21 18 52.1" N to 21 18 54.4" N	Open Cast	46440	12946	0	0	209121	0	1470	
khaira	73	75	Bimbadhari Nayak S/O- Manmath Nath Nayak	At-Po-Guapal Dist. Balasore 9937865276	4940/ Dt. 28-10-17	Khata-245 Plot No.314 KISSAM- Pahada AC 1.50	2017-18	2021-22			18-7-19 Agreement Deed	Working	Non-Captive	530/Tz Dt.25-06-19	86 2351.4"E to 86 2355.7"E 21 18 53.3" N to 21 18 56.9" N	open cast	135486	53378	0	0	0	0	0	
khaira	74	76	Gajendra Behera S/O Mahendra Pra. Behera	At- Toranpada Po- Khaira Dist. Balasore	4963/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM- Pahada AC 1.00	2017-18	2021-22			-	Non-Working	Non-Captive	No	86 2352.8"E to 86 2524.7"E 21 18 57.2" N to 21 19 53.3" N	open cast	109800	30195	0	0	0	0	0	

khaira	75	77	Ashesh Ku. Jena S/o- Purna Ch. Jena	At/Po- Kaittagadda Dist. Balasore 9937264290	4810/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM- Pahada Ac 1.00	2017-18	2021-22					1863/Dt. 17-6-2019	Working	Captive	248/DEIAA Dt.31-8-18	86 23'53.2" E to 86 23'56.5" E 21 18'54.4" N to 21 18'58.1" N	Open Cast	103680	31364	0	0	493604	0	0	2349
khaira	76	78	Anshujit Puhana S/o- Gukul Puhana	At- Samraipur Po Prachinagar Dist. Bhadrak	4821/ Dt.26-10-17	Khata-245 Plot No.520 KISSAM- Pahada Ac 0.50	2017-18	2021-22					-	Non-Working	Non-Captive	No	86 23'56.7" E to 86 25'24.7" E 21 18'57.7" N to 21 19'53.3" N	Open Cast	51165	12725	0	0	0	0	0	
khaira	77	79	At- Dahi Po Sundarpur Dist. Balasore	Niranjan Parthi S/o- Ananta Parthi	4859/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM- Pahada Ac 0.50	2017-18	2021-22					-	Working	Non-Captive	250/DEIAA Dt. 31-8-18	86 24'3.1" E to 86 24'5.3" E 21 18'58.1" N to 21 19'0.2" N	Open Cast	47755	12600	0	0	375582	0	0	1470
khaira	78	80	Sanjeeb Ku. Das S/o- Shashanta Sekhar Das	S At/Po- Mangalpur Dist. Balasore	5023/ Dt. 7-1-17	Khata-245 Plot No.520 KISSAM- Pahada Ac 1.0	2017-18	2021-22					-	Non-Working	Non-Captive	No	86 23'55.5" E TO 86 25'24.7" E 21 19'1.2" N TO 21 19'53.3" N	Open Cast	-	-	0	0	0	0	0	
khaira	79	81	Rabindra Ku. Rout S/o- Nabina Rout	At/Po- Kupati Dist. Balasore 9937779501	5025/ Dt. 7-1-17	Khata-245 Plot No.520 KISSAM- Pahada Ac 1.0	2017-18	2021-22					-	Non-Working	Non-Captive	No	86 23'58.2" E TO 86 25'24.7" E 21 19'1.7" N TO 21 19'53.3" N	Open Cast	-	-	0	0	0	0	0	
khaira	80	82	Jayanta Ku. Rout S/o- Nabina Rout	At/Po-Kupati Dist Balasore 9437080814	5009/ Dt. 06-11-17	Khata-245 Plot No.520 KISSAM- Pahada Ac 0.50	2017-18	2021-22					4053/ Dt. -27-10-18	Working	Non-Captive	252/DEIAA Dt.31-08-18	86 24'4.1" E to 86 24'6.4" E 21 18'59.2" N to 21 19'1.1" N	Open Cast	36331	12684	0	0	208329	0	0	1462
khaira	81	83	Mannathinath Nayak S/o- Radhashyam Nayak	At/Po-Gupali Dist. Balasore 9937312961	5033/ Dt. 8-11-17	Khata-245 Plot No.520 KISSAM- Pahada Ac 1.00	2017-18	2021-22					-	Non-Working	Non-Captive	No	86 24'0.4" E TO 86 25'24.7" E 21 19'4.3" N TO 21 19'53.3" N	Open Cast	-	-	0	0	0	0	0	
khaira	82	84	Damburudhar Nayak S/o- Anandabhai Nayak	At/Po- Guajpai Dist. Balasore 9861498515	4849/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM- Pahada Ac 2.00	2017-18	2021-22					-	Non-Working	Non-Captive	No	86 23'59.7" E TO 86 25'24.7" E 21 19'3.9" N TO 21 19' 53.3" N	Open Cast	-	-	0	0	0	0	0	

khaira	83	85	Damburudhar Nayak S/o- Anandabhai Nayak	At/Po- Guapal Dist. Balasore 9861498515	4851/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM-Pahada Ac 1.0	2017-18	2021-22						Non-Working	Non-Captive	No	86 24'2.8"E To 86 25'24.7"E 21 19'7.6"N To 21 19' 53.3"N	Open Cast	-	-	0	0	0	0	0	0
khaira	84	86	Bimbahar Nayak S/o- Mannathn ath Nayak	At/Po- Guapal Dist. Balasore 9937865276	2814/ Dt. 24-7-18	Khata-245 Plot No.520 KISSAM-Pahada Ac 2.00	2017-18	2021-22						Non-Working	Non-Captive	No	86 24'4.4"E To 86 25'24.7"E 21 19'8.1"N To 21 19' 53.3"N	Open Cast	-	-	0	0	0	0	0	0
khaira	85	87	Mannathn ath Nayak S/o- Radhashya m Nayak	At/Po- Guapal Dist. Balasore 9937312961	5035/ Dt. 8-1-17	Khata-245 Plot No.520 KISSAM-Pahada Ac 2.00	2017-18	2021-22						Non-Working	-	No	86 24'3.7"E To 86 25'24.7"E 21 19'9.9"N To 21 19' 53.3"N	Open Cast	-	-	0	0	0	0	0	0
khaira	86	88	Ratanprava Sarma W/o- Srikrishna Sarma	At- Chandan Bazar Dist. Bhadrak 9437046462	4825/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM-Pahada Ac 2.00	2017-18	2021-22						Working	Non-Captive	254/DEIA , Dt-31-8-18	86 24'17.4"E to 86 24'20.9"E 21 19'7.4"N to 21 19'6.5"N	open cast	161609	61458	0	0	0	0	0	3561
khaira	87	89	Mannathn ath Nayak S/o- Radhashya m Nayak	At/Po- Guapal Dist. Balasore 9937312961	5041/ Dt. 9-10-17	Khata-245 Plot No.520 KISSAM-Pahada Ac 2.00	2017-18	2021-22						Non-Working	-	No	86 24'4.3"E to 86 24'7.6"E 21 19'4.3"N to 21 19'12.1"N	Open Cast	99508	33777	0	0	0	0	0	0
khaira	88	90	Rajendra Ku. Das S/o- Ramakrush na Das	At. Dabagadia Po Kipari Dist. Balasore 9937673145	4855/ Dt. 28-10-17	Khata-245 Plot No.520 KISSAM-Pahada Ac 1.00	2017-18	2021-22						Working	Non-Captive	256/DEIA Dt. 31-8-18	86 24'7.4"E To 86 24'9.9"E 21 19'7.3"N To 21 19'10.7"N	Open Cast	45840	20520	0	0	0	0	0	2381
khaira	89	91	Sabitri Nayak W/o Santosh Nayak	At- Utteswar Po-Sora Dist. Balasore		Khata-245 Plot No.520 KISSAM-Pahada Ac 1.00	2017-18	2021-22						Non-Working	Non-Captive	No	86 24'10.2"E To 86 25'24.7"E 21 19'12.2"N To 21 19'53.3"N	Open Cast	-	-	0	0	0	0	0	0
khaira	90	92	Ratikanta Rout S/o- Runit Ku. Rout	At- Patala Po Balarampras ad Dist- Dhenkanal 9776769601	5043/ Dt. 9-10-17	Khata-245 Plot No.520 KISSAM-Pahada Ac 2.50	2017-18	2021-22						Non-Working	Non-Captive	258/DEIA Dt. 31-8-18	86 24'1.7"E to 86 24'5.8"E 21 18'58.4"N to 21 19'4.3"N	Open Cast	142329	55620	0	0	0	0	0	0

Nilgiri	1	Mirginhi-01	Rangan Ku. Pattanaik	AT/Po- Patna,BSSR, Dist-Khurda	-----	Area-A A6.30,Khat a-453, Plot 572, Kism- Hudi	---	---	---	---	---	---	---	---	Non working	Non capitive	NO	86045°21.63" E Lat-21°27'13.0 N	Above Ground	713293	406099						
Nilgiri	2	Mirginhi-02	Rangan Ku. Pattanaik	AT/Po- Patna,BSSR, Dist-Khurda	-----	Area-A 7.70,Khata 453, Plot- 572, Kism- Hudi	---	---	---	---	---	---	---	---	Non working	Non capitive	NO	86045°21.63"E 21°27'13.0N	Above Ground	764549	4422855						
Nilgiri	3	Kathgoch hi	Santunu Ku. Mohapatra	President, Nilgiri Khadan O Patharsipaa Sangathan, Nilgiri,	-----	Area-A Khat-284, Plot- 135,136,1 37,138, Pvt	---	---	---	---	---	---	---	---	Non working	Non capitive	NO	Lat-21°31'39.19"N Lo-86046°56.91"E and others	under Ground	3087141	1644494						
Nilgiri	4	Stone, KPM/HAUL, Pvt.plot	Amaresh Behara,Con tractor	At- Kathapal,Po- Ajodhya, Ps- Nilgiri	T.P. a.No- 4848/18, 12.18	Plot- 05.06/07.0 8.10.13, Area- Ha0.6620, Kisam-SAI-	19.12.1 8	18.03.2 019	---	---	---	---	---	---	Temporar y worked, Now not working	Non capitive	Yes, No- 207/DEIAA /03.08.18,	Lat-21°32'47.00"N to-21032'49.5"N and lo- 86046°22.11"E to85047'27.2"E	under Ground	69124	40348			180863			1458
Nilgiri	5	Stone, Jammudha, Pvt.plot	Falguni Mohapatra Contractor, Rudra Civicon Ltd.	At/Po- Policeine, Ps- Sahadevkun ta, Balasore	T.P. a.No- 4889/31, 12.18	0. Plot- 3553, Area- A0.86, Kisam- SARAO-III, Khat-284	01.01.2 019	31.03.2 019	---	---	---	---	---	---	Temporar y worked, Now not working	Non capitive	Yes, No- 211/DEIAA /03.08.18	Lat-21°29'04.08"N to-21029'01.82"N and lo- 86045°22.45"E to86045°26.15"E	under Ground	50760	4752			174117			1000
Nilgiri	6	Stone, Jammudha, Pvt.plot	Falguni Mohapatra Contractor, Rudra Civicon Ltd.	At/Po- Policeine Ps- Sahadevkun ta, Balasore	T.P. a.No- 4895/31, 12.18	314,311, Plot- 3934,3935 Area- A0.66 Kisam- Khat-284	01.01.2 019	31.03.2 019	---	---	---	---	---	---	Temporar y worked, Now not working	Non capitive	Yes, No- 209/DEIAA /03.08.18	Lat-21°29'04.08"N to-21029'01.82"N and lo- 86045°22.45"E to86045°26.15"E	under Ground	26603	2263	0		172381			1000
Nilgiri	7	Stone, Jammudha, Pvt.plot	Tapan Kumar Sethi, Contractor	At- Sangrampur, Po-Kansa, Ps- Nilgiri, Dist- Balasore	T.P. a.No- 5001/31, 12.18	609, Plot No- 3921,Area- A1.49, Kisam- Sradhil, Khat-284	01.01.2 019	31.03.2 019	---	---	---	---	---	---	Temporar y worked, Now not working	Non capitive	Yes, No- 213/DEIAA /03.08.18	Lat-21°28'51.83"N to-21028'54.20"N and lo- 86045°11.29"E to86045°12.28"E	under Ground	26603	2263			179597			1458
Nilgiri	8	Begunia stone quarry, Govt.plot	Kartik Ch. Sahani, Contractor	Dumaganndra At- Dumaganndra Po- Tikrapal,Ps- Nilgiri,Balaso	P. o.No- TM- 163/17- 18/01.02. 18	451,Plot No- 425,Area- A0.27, Kisam- Pattata(AA) Khat-284	---	---	---	---	---	---	---	Temporar y worked, Now not working	Non capitive	Yes, No- 711/DEIAA (Touz) date 31.5.17.	21°35'55.3"N to-21035°56.2"N and lo- 86048°12.7"E to86048°15.8"E	under Ground	25304	5860			171406			1000	

Nilgiri	9	Machhua stone quarry/Govt plot.	Sanjib K. Naray, Contractor	At/Post- Arapata Dist- Mayurbhanj	P. o.No- TMC- 164/17-18 dated 01.02.18	218 Plot No- 1031, Area- A1.20, Kisan- Patharbhanj									Temporary worked, Now not working	Non captive	Yes, No- 713/DEIAA (Tour) date 31.5.17.	21°33'08.0"N to 21°03'12.1"N and lo- 86°04'16.66"E to 86°04'19.1"E	under Ground	56974	33480	177412				1000	
Nilgiri	10	Jamudha, Stone, Pvt. Plot	Prakash K. Parida	At-Jarada, Post- Pedagadi, Dist- Mayurbhanj		475 Plot No-3, 109, Area- A1.18, Kisan- Sarad-III,										Non captive			under Ground	20520	7247						
Nilgiri	11	Jamudha Morrum, Pvt. Plot	Sanjay K. Sahu	Bril Gopal Construction Pvt. Ltd, Jhikira Mayurbhanj		1164, Plot- 3886, Area- 3887, Area- A1.18 and A1.90, Kisan-										Non captive			under Ground								
Nilgiri	12	Mahisapat a stone, Pvt. Plot	Ruhya Singh, Contractor	At-Murtuda, Post- Khunta, Mayurbhanj		Khata-270, Plot-1587, Area- A0.55, Mouza- Mahisapat										Non captive			under Ground								
Nilgiri	13	KPMahal stone, Pvt. Plot	Ruhya Singh, Contractor	At-Murtuda, Post- Khunta, Mayurbhanj		Plot- 15, 16, 31, 33, 382/145, 4, Area- H80.63, Mouza-										Non captive			under Ground								
Nilgiri	14	Jamudha Stone Pvt. Plot	Arjun Tudu Contractor	At- Shivamarajpur, Post- Tadada PS- Basta, Balasore		Khata- 114 Plot- 3064, 3357, Area- A1.51, Mouza-										Non captive			under Ground								
Nilgiri	15	Jamudha Stone Pvt. Plot	Nana Soren	At- Kauchipol, Post- Sakua, Badasahi Dist- Mayurbhanj		Plot- 3326, 332, 733, 3, 13, 361, Area- A1.50, Mouza-										Non captive			under Ground								
Nilgiri	16	Mahisapat a Stone Pvt. Plot	Basanta K. Behera	At-Bhaladanga Post- Sadadevkhunta, Balasore.		Plot- 668, 670, 665, 1642, Area- A2.78, Mouza-										Non captive			under Ground	77848	43580						

Soro	4	Mahmuh an Stone Quarry/No-4	Gajendra Pradhan	Dharanidhar Pradhan A/Po- Mahmuhhan	9544/21/12/18	0.809	2015-16	2019-20	2016-17	2017-188 2018-19	21/12/18				276/31/8/18	86°39'43.1." to 86°39'47.1" E / 21°20'34.8" to 21°20'39.3" N	Open Cast	45583	840			48718			235	
Soro	5	Mahmuh an Stone Quarry/No-5	Shasikanta Mohalik	S/o- Kashnath Mahalik A/Po Singi Via-Mitrapur P.S Nilgiri	Pending at DEIAA for E.C	Khata-741 Plot 297 A 1.5	2015-16	2019-20	2016-17	2017-188 2018-19								Open Cast								
Soro	6	Mahmuh an Stone Quarry/No-6	Gajendra Pradhan	Information on Preparation of District survey/report	9541/21/12/18	0.202	2015-16	2019-20	2016-17	2017-188 2018-19	21/12/18				278/31/8/18	86°39'41.5" to 86°39'44.4" E / 21°21'32.8" to 21°20'35.8" N	Open Cast	11374	823			37213			235	
Soro	7	Mahmuh an Stone Quarry/No-7	Ajay Agrawal	Dahanigadia Charampa	8704/12/11/18	0.202	2015-16	2019-20	2016-17	2017-188 2018-19	11-12-2018				280/31/8/18	86°39'41.38" to 86°39'42.88" E / 21°21'29.58" to 21°21'32.10" N	Open Cast	27556	3269			65921			441	
Soro	8	Mahmuh an Stone Quarry/No-8	Akhila Ram Jena	Nandakishore Jena at- Bagudi Po- Mahmuhhan P.S Soro	-	0.202	2015-16	2019-20	2016-17	2017-188 2018-19	-				282/31/8/18	86°39'44.5" E / 21°21'3.4" to 21°21'3.5" N	Open Cast	8383	823			36273	61710			
Soro	9	Mahmuh an Stone Quarry/No-9	Aranta Ch. Bhol	Narendra Bhol Mahmuhhan	S.Free not deposited	Khata-741 Plot 324 A 2.00	2015-16	2019-20	2016-17	2017-188 2018-19								Open Cast								
Soro	10	Khanjanah al Sone Quarry/No-34	Lambodhar Parida	S/o- Bikram Parida Mahmuhhan	487/29/1/18	0.607	2015-16	2019-20	2016-17	2017-188 2018-19	29/1/18				7/3/1/18	86°40'13" to 86°40'22.9" E / 21°21'22.2" to 21°21'25.5" N	Open Cast	66339	9608	72480	87449	489094	473	2205		
Soro	11	Khanjanah al Sone Quarry/No-35	Jayram Das	S/o- Jhananjaya Das at/Po- Uttareswar Dist- Bis	Sub- Judge	Khata-144 Plot 168 A 1.50	2015-16	2019-20	2016-17	2017-188 2018-19								Open Cast								

Soro	20	Khanjanmah al Some Quarry/No- 45	Bhramar Bar Nayak	S/o- Lt Arjun Ch Nayak At/po- Mahmuhlan	168/9/1/ 18	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	01-09-2018			13/3/18	86°39'51.7" to 86°39'47.8" E/ 21°21'20.08" to 21°21'16.6" N	Open Cast	59920	29610	613616	303542	1433079	1480	5922
Soro	21	Khanjanmah al Some Quarry/No- 46	Jayram Das	S/o- Jhanjalya Das at/po- Uttareswar Dist- Bis	388/20/1 /18	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	20/1/18			15/3/1/18	86°39'40" to 86°39'46.0" E/ 20°21'14.6" to 20°21'17.4" N	Open Cast	52864	22144		296401	1000378	1107	4480
Soro	22	Khanjanmah al Some Quarry/No- 47	Sunil Ku Swain	S/o- Mahendra Swain Near Balashram Khapuria Po- Madhupatan a	673/8.2.1 9	0.202	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	02-08-2019			288/31/8/ 19	86°39'39.4" to 86°39'42.7" E/ 21°21'18.7" to 21°21'19.8" N	Open Cast	9036	5520			118862		651
Soro	23	Khanjanmah al Some Quarry/No- 48	Prasanta Ku Mohanty	S/o- Hinanshu Sekhar Mohanty At/po- Azimabad	1639/17/ 3/18	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	17/3/18			52/9/2/18	86°39'38.6" to 86°39'42.0" E/ 21°21'14.1" to 21°21'16.7" N	Open Cast	157000	24556	431043	186508	1118808	816	4896
Soro	24	Khanjanmah al Some Quarry/No- 49	Rajesh Ku Mohapatra	S/o- Nityananda Mohapatra Vill- Uttareswar	1797/23/ 3/18	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	23/3/18			54/9/2/18	86°39'38.6" to 86°39'42.0" E/ 21°21'14.1" to 21°21'16.7" N	Open Cast	27456	22896	210736	176160	1111560	760	4800
Soro	25	Khanjanmah al Some Quarry/No- 50	Rabi Nareyan Das	S/o- Lochan Das At/po- Mahmuhlan	212/10/1 /18	0.202	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	01-10-2018			17/3/1/18	86°39'22.53 to 86°39'56.5" E/ 21°21'24" to 21°21'25.1" N	Open Cast	45441	8100		42501	241250	405	1701
Soro	26	Khanjanmah al Some Quarry/No- 51	Pravakar Jena	S/o- Uperdra Jena At/po- Mahmuhlan	3924/21/ 6/18	1.012	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	21/6/18			56/9/2/18	86°39'46.9" to 86°39'50.5" E/ 21°21'5.5" to 21°21'9.6" N	Open Cast	187200	10500			368280		2160
Soro	27	Khanjanmah al Some Quarry/No- 52	Ajay Agrawal	S/o- Ram Das Agrawal Dahanigdia Charanapa	4159/30/ 6/18	0.202	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	30/6/18			58/9/2/18	86°39'40.51" to 86°39'43.09" E/ 21°21'4.87" to 21°21'7.10" N	Open Cast	29295	7533	158796	42126	216396	126	1512

Soro	28	Khanjanmah al Some Quarry/No- 53	Rashmi Ranjana Panda	S/o- Niranjan Panda Vill- Gujadhra Po- Singakhunta	-	0.202	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	-	-	-	-	290/31/8/ 19	86°39'40.0" to 86°39'43.9" E / 21°21'6.2" to 21°21'7.7" N	Open Cast	19398	2376			47895			290
Soro	29	Khanjanmah al Some Quarry/No- 54	Akhila Ram Jena	S/o- Lt Nanda Kishore Jena At- Bagudi Po- Mahumuhan	1557/15/ 3/18	0.202	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	15/3/18				60/9/2/18	86°39'84.9" to 86°39'45.1" E / 21°21'8.1" to 21°21'9.8" N	Open Cast	4076	2016	52895	9935	60885	68	414	
Soro	30	Khanjanmah al Some Quarry/No- 55	Rashmi Ranjana Panda	S/o- Niranjan Panda Vill- Gujadhra Po- Singakhunta	652/3/2/ 18	1.214	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	02-03-2018				19/3/1/18	86°39'55.2. to 86°39'55.5" E / 21°21'02.9" to 21°20'59.2" N	Open Cast	102739	29545		342008	1587505	1474	5909	
Soro	31	Khanjanmah al Some Quarry/No- 56	Bishnu Mohana Sahu	S/o- Surendra Sahu Mahumuhan	1771/23/ 3/18	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	23/3/18				62/9/2.18	86°39'40.0" to 86°39'43.9" E / 21°20'55.6" to 21°20'58.7" N	Open Cast	24836	2380		1882	118836	40	504	
Soro	32	Khanjanmah al Some Quarry/No- 57	Tapas Ku Jena	S/o Anandi Jena At- Ghodasahi	-	1.214	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	-					86°39'40'57.3" to 86°41'00.3" E / 21°20'50.8" to 21°20'55.6" N	Open Cast	45087	27160						
Soro	33	Khanjanmah al Some Quarry/No- 58	Akhila Ram Jena	S/o-Lt Nanda Kishore Jena At- Bagudi	-	0.607	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	-				292/31/8/ 18	86°40'1.3" to 86°40'4.7" E /40 21°21'49.1" to 21°21'51.1" N	Open Cast	31896	5652						
Soro	34	Khanjanmah al Some Quarry/No- 59	Narayan Sahu	S/o- Guru Pr. Sahu At/Po- Angula	19/8/19	0.405	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	19/8/19				294/31/8/ 18	86°40'2.2" to 86°40'4.9" E / 21°20'51.0" to 21°20'53.2" N	Open Cast	13243	5704			231999		2778	
Soro	35	Khanjanmah al Some Quarry/No- 60	Tapas Ku Jena	S/o- Aaradi Jena At- Ghodasahi	-	0.202	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	-				296- 31.8.18	86°40'6.2" to 86°40'7.7" E /40 21°20'54.2" to 21°21'56.4" N	Open Cast	7538	3046			301635			

Soro	36	Khanjanmah al Some Quarry/No- 66	Gajendra Pr. Das	S/o- Chinamani Das At- Bachhada Dist. Bhadrak	1761/22/ 3/19	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	22/3/19			66°9/2/18	Open Cast	41136	4080	282205	21200	133560	136	864
Soro	37	Khanjanmah al Some Quarry/No- 67	Gajendra Pr. Das	S/o- Chinamani Das At- Bachhada, Bhadrak	1763/22/ 3/18	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	22/3/18			66°40'39.5" E / 21°21'26.0" to 21°21'28.8" N	Open Cast	46029	3779		20918	116576	131	717
Soro	38	Khanjanmah al Some Quarry/No- 68	Nirakar Panda	S/o Narayan Panda At/Po- Angula	1347/8/3 /19	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	03-08-2018			70°9/2/18	Open Cast	18560	4788		41031	245848	162	973
Soro	39	Khanjanmah al Some Quarry/No- 69	Hemanata Ku mahapatra	S/o- Barnadev At- Mulising	Pending at DEWA for E.C	Khata-144 Plot 318 A 1.00	2015- 16	2019- 20	2016-17	2017- 18& 2018-19					Open Cast							
Soro	40	Khanjanmah al Some Quarry/No- 70	Rashmi Rangan Panda	S/o- Niranjan Panda Vill- Gujadha Po- Singakhunta	9547/21/ 12/18	0.405	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	21/12/18			298/31/8/ 18	Open Cast	15807	2663		41031	139630		315
Soro	41	Khanjanmah al Some Quarry/No- 71	Niranjan Malik	S/o- Gayahar Malik At- Gobindapur	3872/20/ 6/18	0.607	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	20/6/18			72°9/2/18	Open Cast	14751	4200		52214	132209	840	874
Soro	42	Khanjanmah al Some Quarry/No- 72	Niranjan Malik	S/o- Gayahar Malik At- Gobindapur	3875/20/ 6/18	0.631	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	20/6/18			74°2/9/18	Open Cast	34637	1920		25102	67239	384	402
Soro	43	Khanjanmah al Some Quarry/No- 73	Narendra Nath Dhar	S/o- Radhu Dhar At- Mihiani	1548/15/ 3-18	0.607	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	15/3/18			76°9/2,18	Open Cast	27375	8440	282205	57772	346397	282	1668

Soro	44	Khanjanmah al Some Quarry/No- 74	Akhila Ram Jena	S/o- Lt Nanda Kishore Jena At- Bagudi Po Mahuluhan	8701/12. 1118	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	15/3/18	-	-	300- 31/8/18	80°40'26.2" to 86°40'29.8" E/40 21°21'21.3" to 21°21'14.1" N	Open Cast	34795	2370			152055			678	
Soro	45	Khanjanmah al Some Quarry/No- 75	Ashok Ku Dhal	S/o- Ranakar Dhal patharadi Charampa	1554/15. 3.18	0.607	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	15/3/18	-	-	78/9/2/18	80°40'28.8" to 86°40'27.5" E/40 21°21'10.8" to 21°21'8.7" N	Open Cast	67740	35100							
Soro	46	Khanjanmah al Some Quarry/No- 76	Madhab Dhadra	Naba Dhadra At- Chhatrapur	203/10/1 /18	1.012	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	01-10-2018			21/3/1/18	86°40'22.8" to 86°40'27.8" E/ 21°20'04.7" to 21°20'08.2" N	Open Cast	40786	15768	131480	126561	638820		792	3240	
Soro	47	Khanjanmah al Some Quarry/No- 78	MUSL	Not phisible as per MO		Khata-144 Plot 2 78 & 266 A 1.00	2015- 16	2019- 20	2016-17	2017- 18& 2018-19						Open Cast									
Soro	48	Khanjanmah al Some Quarry/No- 79	Ashok Ku Dhal	S/o- Ranakanta Dhal At- Patharadi Charampapa	349/18.1 18	0.485	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	18/1/18	-	-	23/3/1/18	86°40'28.8" to 86°40'27.5" E/ 21°21'10.8" to 21°21'08.7" N	Open Cast	100840	44000	1203664	3010247	1527000		2200	8800	
Soro	49	Khanjanmah al Some Quarry/No- 80	Budhram Behera	S/o- Anadi Behera At- Kesharpur	1350/8/3 /18	0.405	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	03-08-2018			80/9/2/18	86°40'26.9" to 86°40'26.2" E/ 21°21'2.7" to 21°21'8.0" N	Open Cast	23977	4100		47423	296448		137	853	
Soro	50	Khanjanmah al Some Quarry/No- 81	Unakanta Ghadel	S/o- Bidyabhar Ghadel Gobindapur	3054/22/ 7/19	0.809	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	22/7/19			270/31/8/ 18	86°40'20.8" to 86°40'25.4" E/ 21°21'51.9" to 21°21'18.2" N	Open Cast	39984	4424			317335			1274	
Soro	51	Khanjanmah al Some Quarry/No- 82	Rajesh Mohapatra	S/o- Lt- Nityananda Mohapatra At- Uttareswar	1513/13/ 3/18	1.011	2015- 16	2019- 20	2016-17	2017- 18& 2018-19	13/3/18			82/9/2/18	86°40'17.8" to 86°40'23.6" E/ 21°20'58.5" to 21°20'10.4" N	Open Cast	67320	6750		166438	423720		225	1440	

Soro	52	Khanjanmah al Some Quarry/No- 83	Narendra Nath Dhar	S/o- Radhu Dhar At- Mutani	209/10.1.18	1	2015-16	2019-20	2016-17	2017-18 2018-19	01-10-2018	-	-	#####	86°40'18.5" to 86°40'20.9" E / 21°20'56.0" to 21°20'58.7" N	Open Cast	153590	24556	200382	209617	1020326	1224	4896
Soro	53	Khanjanmah al Some Quarry/No- 84	Akhila Ram Jena	S/o- Lt Nanda Kistore Jena At- Bagudi Po Mahunuhan	200/10.1.0.18	1.012	2015-16	2019-20	2016-17	2017-18 2018-19	10.10.18	-	-	27/3.1.18	86°40'18.5" to 86°40'20.9" E / 21°20'56.0" to 21°20'58.7" N	Open Cast	78445	5654	60332	292673	282	1155	
Soro	54	Khanjanmah al Some Quarry/No- 85	Unakanta Ghadei	S/o- Bidyadhar Ghadei Gobindapur	197/10.1.18	0.809	2015-16	2019-20	2016-17	2017-18 2018-19	01-10-2018	-	-	29/3/1/18	86°40'09.5" to 86°40'15.0" E / 21°20'53.7" to 21°20'56.1" N	Open Cast	23671	4416	70750	326208	222	912	
Soro	55	Khanjanmah al Some Quarry/No- 86	Unakanta Ghadei	S/o- Bidyadhar Ghadei Gobindapur	155/15/3/18	0.809	2015-16	2019-20	2016-17	2017-18 2018-19	15/3/18	-	-	84/9/2/18	86°40'06.3" to 86°40'11.4" E / 21°20'52.4" to 21°20'55.1" N	Open Cast	29609	4445	24008	342600	829	152	960
Soro	56	Khanjanmah al Some Quarry/No- 87	Rabindra Nath Jena		667/8/2/19	1.012	2015-16	2019-20	2016-17	2017-18 2018-19	02-08-2019	-	-	27/2/31/8/18	86°40'4.02" to 86°40'9.48" E / 21°20'48.1" to 21°20'52.2" N	Open Cast	73440	8640		311520			1680
Soro	57	Khanjanmah al Some Quarry/No- 88	Arabindra Sahu	S/o- Lt Ekadasi Sahu Patiharpentha Po- Bahanaga	1636/17.3.18	1.012	2015-16	2019-20	2016-17	2017-18 2018-19	17/3/18	-	-	86-9/2/19	86°39'57.1" to 86°40'03.3" E / 21°20'44.1" to 21°20'46.6" N	Open Cast	50409	5623	68010	419021	188	1154	
Soro	58	Khanjanmah al Some Quarry/No- 89	Tapas Ku Jena	S/o- Anadi Behera At- Keshripur	-	0.607	2015-16	2019-20	2016-17	2017-18 2018-19	-	-	-	88/9/2/18	86°39'52.9" to 86°39'57.3" E / 21°20'42.2" to 21°20'44.6" N	Open Cast	45808	18180	211879	1283508			
Soro	59	Khanjanmah al Some Quarry/No- 90	Rashmi Ranjan Panda	S/o- Niranjan Panda Vill- Gajadha Po- Singakhunta	2174/31/3/18	0.607	2015-16	2019-20	2016-17	2017-18 2018-19	31/3/18	-	-	90/9/2/18	86°39'57.8" to 86°39'56.1" E / 21°20'39.6" to 21°20'42.1" N	Open Cast	19871	7176	60890	372668	120	1472	

Soro	60	Khanjanmah al Some Quarry/No- 91	Rajendra Pc. Nayak	S/o- Lt Krushna Ch. Nayak At/Pc- Mahmudhan	1510/13. 3.18	0.809	2015- 16	2019- 20	2016-17	2017- 188 2018-19	13.3.18	-	-	92-9/2/18	86°39'50.6" to 86°39'55.3" E / 21°20'39.6" to 21°20'41.1" N	Open Cast	41829	18054	144565	114741	693807		602	3641	
Soro	61	Khanjanmah al Some Quarry/No- 93	Rashmi Ranjan Panda	S/o- Niranjan Panda Vill- Gujadhra Pg- Singakhunta	9538/21/ 12/18	2.202	2015- 16	2019- 20	2016-17	2017- 188 2018-19	21/12/18			27/4/31/8/ 18	86°39'41.3" to 86°39'45.0" E / 21°21'6.9" to 21°21'9.1" N	Open Cast	16060	1900			38105			234	
Soro	62	Khanjanmah al Some Quarry/No- 94	Ajay Agrawal	S/o- Ram Das Agrawal Dahanigadia Charanmapa	Pending at DEIAA for E.C	1.618	2015- 16	2019- 20	2016-17	2017- 188 2018-19					86°39'55.51" to 86°40'04.86" E / 21°21'21.49" to 21°21'24.89" N	Open Cast									
Soro	63	Khanjanmah al Some Quarry/No- 95	Ajay Agrawal	S/o- Ram Das Agrawal Dahanigadia Charanmapa	3348/1/6 /18	Khata-144 Plot. 165 A 4.00	2015- 16	2019- 20	2016-17	2017- 188 2018-19	1.6.2018			94/9/2/18		Open Cast	373581	50055		486358	1596525		1668	10013	
																Total			4045207	6716914	23355191	969	17218	110325	

ANNEXURE-II

Cluster of Sarisua Kapilajhari Bandhanata Stone Quarries
Cluster Quarry Lease over 38.5 acres or 15.759 ha
(25 LEASES)

Quarry No.	Village	Tehasil	District	Khata No.	Plot No.	Kissam	Area in Acres	Area in Ha
55	Sarisua kapilajhari Bandhanata	Khaira	Balasore	245	314	Pahad	4.000	1.610
56	-do-	Khaira	Balasore	245	314	Pahad	0.500	0.202
57	-do-	Khaira	Balasore	245	314	Pahad	1.000	0.404
58	-do-	Khaira	Balasore	245	314	Pahad	1.000	0.404
60	-do-	Khaira	Balasore	245	314	Pahad	1.500	0.607
61	-do-	Khaira	Balasore	245	314	Pahad	0.500	0.202
62	-do-	Khaira	Balasore	245	314	Pahada	2.000	0.809
69	-do-	Khaira	Balasore	245	314	Pahada	1.500	0.607
70	-do-	Khaira	Balasore	245	520	Pahada	7.000	2.830
74	-do-	Khaira	Balasore	245	520	Pahada	0.500	0.202
75	-do-	Khaira	Balasore	245	314	Pahada	1.500	0.607
76	-do-	Khaira	Balasore	245	520	Pahada	1.000	0.404
77	-do-	Khaira	Balasore	245	520	Pahada	1.000	0.404
78	-do-	Khaira	Balasore	245	520	Pahada	0.500	0.202
79	-do-	Khaira	Balasore	245	520	Pahada	0.500	0.202
82	-do-	Khaira	Balasore	245	520	Pahada	0.500	0.202
88	-do-	Khaira	Balasore	245	520	Pahada	2.000	0.809
89	-do-	Khaira	Balasore	245	520	Pahada	2.000	0.809
90	-do-	Khaira	Balasore	245	520	Pahada	1.000	0.404
92	-do-	Khaira	Balasore	245	520	Pahada	2.500	1.010
93	-do-	Khaira	Balasore	245	520	Pahada	1.000	0.404
94	-do-	Khaira	Balasore	245	520	Pahada	1.000	0.404
96	-do-	Khaira	Balasore	245	520	Pahada	1.500	0.607
97	-do-	Khaira	Balasore	245	520	Pahada	2.500	1.010
98	-do-	Khaira	Balasore	245	520	Pahada	0.500	0.202
Total							38.5	15.759

Cluster of Sarisua Stone Quarries
Cluster Quarry Lease over 38.0 acres or 15.358 ha
(34 LEASES)

Quarry No.	Village	Tehasil	District	Khata No.	Plot No.	Kissam	Area in Acres	Area in Ha
14	Sarisua Kapilajhari Bandhanata	Khaira	Balasore	245	95	Pahada	2.000	0.809
	-do-	Khaira	Balasore	245	95	Pahada	1.00	0.404
16								
17	-do-	Khaira	Balasore	245	95	Pahada	1.00	0.404
21	-do-	Khaira	Balasore	245	95	Pahada	1.00	0.404
22	-do-	Khaira	Balasore	245	95	Pahada	1.00	0.404
23	-do-	Khaira	Balasore	245	95	Pahada	1.00	0.404
24	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
25	-do-	Khaira	Balasore	245	95	Pahada	0.500	0.202
26	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
27	-do-	Khaira	Balasore	245	95&112	Pahada	0.50	0.202
28	-do-	Khaira	Balasore	245	95	Pahada	2.00	0.809
29	-do-	Khaira	Balasore	245	95	Pahada	1.00	0.404
30	-do-	Khaira	Balasore	245	95	Pahada	1.00	0.404
31	-do-	Khaira	Balasore	245	95	Pahada	2.00	0.809
32	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
33	-do-	Khaira	Balasore	245	95	Pahada	2.50	1.010
34	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
35	-do-	Khaira	Balasore	245	95	Pahada	1.00	0.404
36	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
37	-do-	Khaira	Balasore	245	95	Pahada	1.00	0.404
38	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
39	-do-	Khaira	Balasore	245	95	Pahada	5.00	2.020
41	-do-	Khaira	Balasore	245	95	Pahada	1.50	0.607
42	-do-	Khaira	Balasore	245	95	Pahada	2.00	0.809
43	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
44	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
45	-do-	Khaira	Balasore	245	314	Pahada	1.00	0.404
46	-do-	Khaira	Balasore	245	314	Pahada	1.00	0.404

ANNEXURE-II

48	-do-	Khaira	Balasore	245	314	Pahada	0.50	0.202
49	-do-	Khaira	Balasore	245	314	Pahada	1.00	0.404
50	-do-	Khaira	Balasore	245	314	Pahada	1.00	0.404
51	-do-	Khaira	Balasore	245	95	Pahada	1.50	0.607
100	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
101	-do-	Khaira	Balasore	245	95	Pahada	0.50	0.202
Total							38	15.358

ANNEXURE-II

Cluster of Khanjamahal Stone Quarry
Cluster Quarry Lease over 19.503 ha
(25 LEASES)

Quarry No.	Village	Tehasil	District	Khata No.	Plot No.	Kissam	Area in Acres	Area in Ha
55	Khanjamahal	Soro	Balasore	144	264	Parbat	3.00	1.214
56	Khanjamahal	Soro	Balasore	144	264	Parbat	2.00	0.809
57	Khanjamahal	Soro	Balasore	144	263	Parbat	3.00	1.214
66	Khanjamahal	Soro	Balasore	144	318	Parbat	2.00	0.809
67	Khanjamahal	Soro	Balasore	144	318	Parbat	2.00	0.809
68	Khanjamahal	Soro	Balasore	144	318	Parbat	2.00	0.809
69	Khanjamahal	Soro	Balasore	144	318	Parbat	1.00	0.405
70	Khanjamahal	Soro	Balasore	144	318	Parbat	1.00	0.405
71	Khanjamahal	Soro	Balasore	144	287/266	Parbat	1.50	0.607
72	Khanjamahal	Soro	Balasore	144	266/287	Parbat	1.50	0.607
73	Khanjamahal	Soro	Balasore	144	266	Parbat	1.50	0.607
75	Khanjamahal	Soro	Balasore	144	266(P)	Parbat	1.50	0.607
76	Khanjamahal	Soro	Balasore	144	266	Parbat	2.50	1.012
79	Khanjamahal	Soro	Balasore	144	266(P)	Parbat	1.20	0.485
80	Khanjamahal	Soro	Balasore	144	266	Parbat	1.00	0.405
82	Khanjamahal	Soro	Balasore	144	266	Parbat	2.50	1.011
83	Khanjamahal	Soro	Balasore	144	266	Parbat	2.50	1.011
84	Khanjamahal	Soro	Balasore	144	265	Parbat	2.50	1.012
85	Khanjamahal	Soro	Balasore	144	265	Parbat	2.00	0.809
86	Khanjamahal	Soro	Balasore	144	263/265	Parbat	2.00	0.809
87	Khanjamahal	Soro	Balasore	144	266	Parbat	2.50	1.012
88	Khanjamahal	Soro	Balasore	144	263	Parbat	2.50	1.012
89	Khanjamahal	Soro	Balasore	144	263	Parbat	1.50	0.607
90	Khanjamahal	Soro	Balasore	144	263	Parbat	1.50	0.607
91	Khanjamahal	Soro	Balasore	144	263	Parbat	2.00	0.809
						Total	48.2	19.503

ANNEXURE-II

Cluster of Khanjamahal-Mahumuhan Stone Quarry
Cluster Quarry Lease over 16.384 ha.
(26 LEASES)

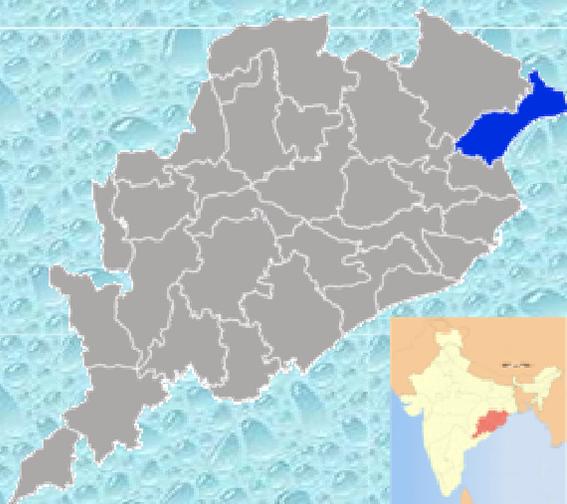
Quarry No.	Village	Tehasil	District	Khata No.	Plot No.	Kisam	Area in Acres	Area in Ha
1	Mahumuhan	Soro	Balasore	741	297	Parbat	1.00	0.404
2	Mahumuhan	Soro	Balasore	741	297	Parbat	0.50	0.202
3	Mahumuhan	Soro	Balasore	741	297	Parbat	2.00	0.809
5	Mahumuhan	Soro	Balasore	741	297	Parbat	1.50	0.607
7	Mahumuhan	Soro	Balasore	741	297	Parbat	0.50	0.202
9	Mahumuhan	Soro	Balasore	741	297	Parbat	2.00	0.810
34	KhanjamahalM	Soro	Balasore	144	161	Pahad	1.50	0.607
37	Khanjamahal	Soro	Balasore	144	161	Pahad	2.00	0.809
39	Khanjamahal	Soro	Balasore	144	161	Parbat	2.00	0.809
41	Khanjamahal	Soro	Balasore	144	161	Parbat	2.50	1.012
42	Khanjamahal	Soro	Balasore	144	161	Parbat	2.50	1.012
43	Khanjamahal	Soro	Balasore	144	161	Pahad	1.00	0.405
44	Khanjamahal	Soro	Balasore	144	168	Parbat	2.00	0.809
45	Khanjamahal	Soro	Balasore	144	168	Parbat	2.00	0.809
46	Khanjamahal	Soro	Balasore	144	168	Parbat	2.00	0.809
47	Khanjamahal	Soro	Balasore	144	168	Parbat	0.50	0.202
48	Khanjamahal	Soro	Balasore	144	168	Parbat	2.00	0.809
49	Khanjamahal	Soro	Balasore	144	168	Parbat	2.00	0.809
50	KhanjamahalM	Soro	Balasore	144	168	Parbat	0.50	0.202
51	KhanjamahalM	Soro	Balasore	144	168	Parbat	2.50	1.012
52	Khanjamahal	Soro	Balasore	144	168	Parbat	0.50	0.202
53	Khanjamahal	Soro	Balasore	144	168	Parbat	0.50	0.202
54	Khanjamahal	Soro	Balasore	144	168	Parbat	0.50	0.202
93	Khanjamahal	Soro	Balasore	144	168	Parbat	0.50	0.202
94	Khanjamahal	Soro	Balasore	144	161	Parbat	2.00	0.809
95	Khanjamahal	Soro	Balasore	144	165(P)	Parbat	4.00	1.618
Total							40.5	16.384



DRAFT DISTRICT SURVEY REPORT (DSR)
OF
BALASORE DISTRICT, ODISHA.
FOR
RIVER SAND
(FOR PLANNING & EXPLOITATION OF MINOR MINERAL RESOURCES)

ODISHA

BALASORE



As per Notification No. S.O. 3611(E) New Delhi
dated 25th July 2018 of
Ministry of Environment, Forest & Climate Change
(MoEF & CC)

COLLECTORATE BALASORE.

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PREAMBLE

Odisha is the major mineral reach in India. Balasore is a unique District in Odisha lies on the Northern most part of the State with varied mineral resources. In pursuance of the order of Hon'ble Supreme Court Petition (C) No. 19628-19629 of 2009, dated 27th Feb. 2012 in the matter of Deepak Kumar Vs State of Haryana and others etc., prior Environmental Clearance has now become mandatory for mining of Minor Mineral irrespective of the area of Mining Lease. And also in view of the Hon'ble National Green Tribunal, order dated the 13th Jan. 2015 the matter regarding Sand, Brick Earth, & Burrowed Earth cutting for Road Construction has to take prior E.C. for Mining Lease area more or less than 5 hectares also suggested making a policy on E.C for Minor Mineral lease in cluster. As per MOEF & CC Notification S.O.-1533(E) dated 14th Sept. 2006 and subsequent MoEF & CC Notification S.O. 141(E) dated 15th Jan. 2016, District Environment Impact Assessment Authority (DEIAA) & District level Expert Appraisal Committee (DEAC) has been formed for Category –B2 Minor Mineral having area less than or equal to 5 ha. In compliance to the notification issued by the Ministry of Environment and Forest and Climate Change Notification no. S.O.3611 (E) New Delhi dated 25-07-2018; the preparation of District Survey Report of River Sand mining has been prepared in accordance with Clause II of Appendix- X of the notification.

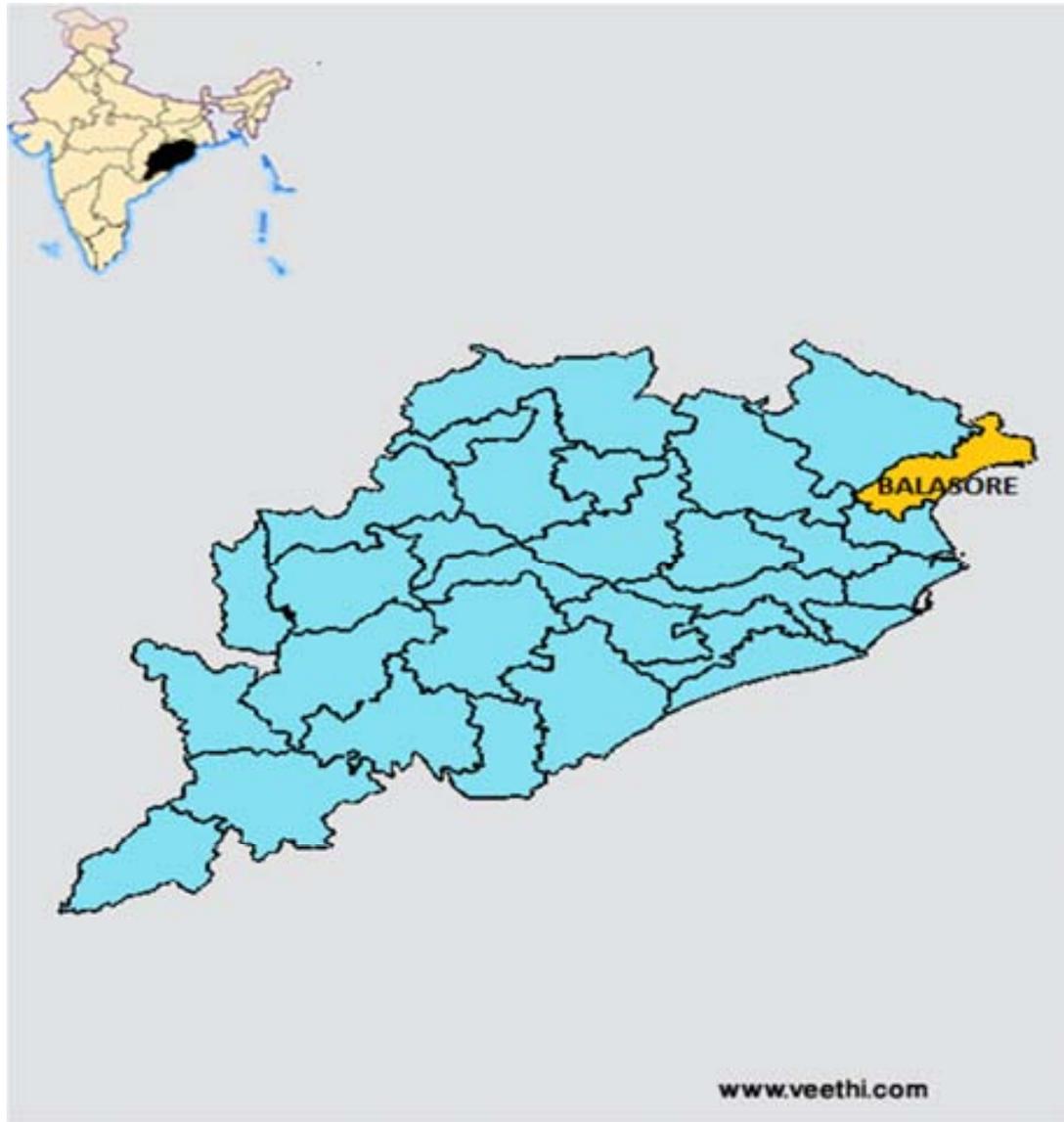
Keeping in view of the prior information of Odisha Minor Mineral Concession Rules, 2004 (OMMCR -2004) the mining operation for Minor Mineral were carried out in unscientific manner. Identifying this fact in exercise of power, Conferred by Section 15 by Mines and Minerals (Development and Regulation) Act 1957 as amended in 2015 and all other powers enabling it in that behalf, the Mining & Geology Department, Govt. of Odisha framed the aforementioned rule. Further, this report will act as a compendium of available mineral resources, geological set up, Environmental and Ecological set up of the District and based on data of various Departments like Revenue, Water Resources, Forest, Geology and Mining in the District as well as Statistical data uploaded by various State Government Departments for preparation for District Survey Report.

1. INTRODUCTION

Balasore at a Glance:

1.1 Location and Geographical Area:

Balasore is one of the coastal Districts of Odisha. Balasore is the District Head Quarter, spreading over an area of 3634 sq.km lies between 20° 48' North and 21° 59' North latitudes and 86°16' and 87°29' East longitudes. The District is surrounded by Medinipur District of West Bengal in its Northern side, Bay of Bengal in its East, Bhadrak District in its South and Mayurbhanj & Keonjhar Districts lies on its Western side. It is best known for Chandipur Beach. The Indian Ballistic Missile Defense Program's Integrated Test Range is located at a distance of 18 km towards South of Balasore. It is the largest city of North Odisha. This District consists of two Sub-Divisions namely Balasore and Nilgiri. There are 12 Tahasils for 12 Blocks of this District. Balasore is the main town of the District and is also its Centre of Economic Growth. The primary occupation of people in the District is cultivation. This District is mainly known for cultivation of paddy. Industries, Agriculture, Fishing and Tourism are the four major Revenue fetching sources of Balasore District. Birla Tyres, Balasore Alloys Limited, Emami Paper Mills Limited and Polar Pharma India Limited are some of the Large-Scale Industries functioning in this District. Balasore occupies a unique position being endowed with lush green vegetation, different fauna & flora and rich Cultural Heritage. The District has a rich mineral base of river sand, and Road Metal which are mainly used in construction units in the District. The huge deposits of granite stones at Nilgiri, Khaira, Soro regions provides tremendous scope for development of few more Industries based on this resources. Except these, no minerals in large quantity which can be explored for commercial purpose found in the District. The location of the District has been given below



1.2 Administrative Units:-

Balasore Town is the Administrative Headquarter of Balasore District. It is located at a distance of 194 km from Bhubaneswar, State capital of Odisha. In accordance to its area, the District is the 2nd largest costal Districts of Odisha. It has 3049 villages covering 12 Blocks, 12 Tahasils and 2 Sub-Divisions. The District is divided into 2 Sub-Divisions namely 1) Balasore, 2) Nilagiri and into 12 Blocks & Tahasils, namely i) Bahanaga N ii) Balasore iii) Baliapal iv) Basta v) Bhogarai vi) Jaleswar vii) Khaira viii) Nilgiri, ix) Oupada, x) Remuna xi) Simulia xii) Soro. The

population of the District is 23,17,419 according to the 2011 Census. The District accounts for 5.53% of the State's territory and about 5.50% of State's population. The density of population of the District is 532 per square km as against 610 per square km of the State. As per 2011 Census, the population of Scheduled Caste is 1,84,682 (7.30%), and Scheduled Tribe is 14,79,576 (58.7%). The literacy percentage of the District covers 79.18 against 84.67 of the State.



1.3 Connectivity facilities:-

Road Network

The District is well served by a network of good roads and has been called the motorists paradise. The chief roads emanating from Balasore town are NH-16 and NH-60 pass through the District. Balasore Town is about 60 Kms from Baripada, 122 Kms from Kharagpur, 199 Kms from Jamshedpur, 177 Kms from Cuttack, 199 Kms from Bhubaneswar and 226 Kms from Rourkela. It is also connected with other cities such as Sambalpur, Puri, Bolangir, Bhadrak, Jhargram, Angul, Ranchi and Kolkata via Odisha State Road Transport Corporation and some private travel services.



Rail Network

Balasore District is well connected by Rail link to different places, Balasore Railway Station is an important station on the Howrah-Chennai main line of the South Eastern Railway. The distance to Kolkata is approximately 232 km, while the distance to Bhubaneswar is about 206 km; the city of Balasore is well connected to many places in India like Baripada, Bhubaneswar, Kolkata, Jamshedpur and Cuttack.



Air Network

At present, Balasore has no connection by Airway. The site selection for Aerodrome is presently under process. Nearest Airport is Biju Patnaik Airport, Bhubaneswar, 200 Kms from Balasore. Netaji Subhas Chandra Bose International Airport in Kolkata is 232 kms from Balasore.

2. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT:

Balasore District is a transition land features of both coastal plain and hilly region. Most of the mineralized area coming under Eco-Sensitive Zone, mining activity only confined out of safety zone of Eco-Sensitive Zone. The mining activity in the District is only restricted to Minor Mineral i.e. of sand, stone, granite and brick clays. Altogether there are leases of stone, granite and sand which has been granted to the District is regulated as per Minerals Concession Rules of Odisha. There is no lease of Major Mineral in the District. At present Leases of stone, sand and bricks making units are operational in the District. Stone chips, granite stones, ordinary sand constitute the principal mining activity of Soro, Khaira, Jaleswar, Nilgiri area etc. of Balasore District. Out of these huge granite stones deposits, the sources are available near Khaira, Nilgiri, Soro area and major potential sand sources are available in Jaleswar, Remuna and Nilagiri area of the District, which have been provided tremendous scope for development of few more Industries based on these Resources.

3.0 LIST OF MINING LEASES WITH LOCTION, AREA, AND PERIOD OF VALIDITY IN THE DISTRICT:**3.1 List of Mines is operation in the District:**

Attached as Annexure-I

3.2 List of Mines is not operation in the District:

Attached as Annexure-I

4.0 DETAIL OF ROYALTY OR REVENUE RECEIVED IN LAST THREE YEARS:

Sl. No.	Name of the Tahasil	2016-17	2017-18	2018-19	Total Amount (Lakh)
1	Bahanaga	Nil	Nil	Nil	Nil
2	Balasore	Nil	2308845	2816060	5124905
3	Baliapal	Nil	Nil	Nil	Nil
4	Basta	1654500	14373408	6952414	22980322
5	Bhogarai	Nil	Nil	Nil	Nil
6	Jaleswar	11566302	19295957	22493913	53356172
7	Khaira	Nil	Nil	Nil	Nil
8	Nilgiri	2142840	2142840	2142840	6428520
9	Oupada	Nil	Nil	Nil	Nil
10	Remuna	700700	2475655	2575755	5752110
11	Simulia	Nil	Nil	Nil	Nil
12	Soro	Nil	Nil	Nil	Nil
Grand Total		16064342	40596705	36980982	93642029

5.0 DETAILS OF PRODUCTION SAND OR BAJRI OR MINOR MINERAL IN LAST THREE YEARS:

Details of Production in Cum:

Sl. No.	Name of the Tahasil	2016-17	2017-18	2018-19	Total in Cum.
1	Bahanaga	Nil	Nil	Nil	Nil
2	Balasore	Nil	40000	40000	80000
3	Baliapal	Nil	Nil	Nil	Nil
4	Basta	1116	13909	5986	21011
5	Bhogarai	Nil	Nil	Nil	Nil
6	Jaleswar	223479	328234	345824	897537
7	Khaira	Nil	Nil	Nil	Nil
8	Nilgiri	51020	51020	51020	153060
9	Oupada	Nil	Nil	Nil	Nil
10	Remuna	700	7313	7413	15426
11	Simulia	Nil	Nil	Nil	Nil
12	Soro	Nil	Nil	Nil	Nil
Grand Total		276315	440476	450243	1167034

6.0 PROCESS OF DEPOSITION OF SAND OR BAJRI OR MINOR MINERAL IN LAST THREE YEARS:

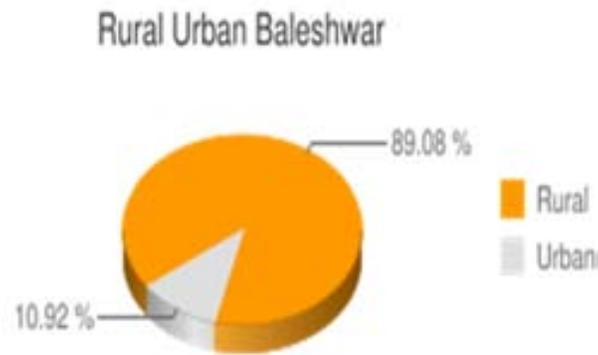
Sl. No.	Name of the River	Financial Year	Process of Deposition of Sediments	Volume of Sand deposited in last three years
1	Subarnarekha	2016-17	moderate	
		2017-18	---do---	
		2018-19	---do---	
Total Volume of Sand in three years				
2	Budhabalanga	2016-17	moderate	
		2017-18	---do---	

		2018-19	---do---	
Total Volume of Sand in three years				
3	Jalaka	2016-17	Slow	
		2017-18	---do---	
		2018-19	---do---	
Total Volume of Sand in three years				
4	Sona	2016-17	Slow	
		2017-18	---do---	
		2018-19	---do---	
5	Kansbans	2016-17	Slow	
		2017-18	---do---	
		2018-19	---do---	
Total Volume of Sand in three years				
Grand Total				

7.0 GENERAL PROFILE OF THE DISTRICT:

7.1 Demography:

Census - 2011	
Geographical Area	3806 Sq. Km.
Total population	23,17,419
Male Population	11,84,371
Female Population	11,33,048
Male Literacy	9,18,417
Female Literacy	7,29,488
SC Male	NA
SC Female	NA
ST Male	NA
ST Female	NA
OBC	855,480
Illiterate Male	9,18,407
Illiterate Female	7,29,488



7.2 Climate:

The climate in Balasore is warm and temperate. In winter, there is much less rainfall in Balasore than in summer. The Köppen-Geiger Climate Classification is Cwa. May is the warmest month of the year. The temperature in May averages 32.3 °C. January has the lowest average temperature is 16.5 °C of the year. There is a difference of 321 mm of precipitation between the driest and wettest months. During the year, the average temperature of Balasore District is 24.4 °C. (Source:- Indian Meteorological Department).

8.0 LAND UTILIZATION PATTERN IN THE DISTRICT

8.1 Forest and non forest land

The forest of Balasore District is full of variety of medicinal plants, Kendu leaves, Bamboo, Sal, Teak, other timber species and a wide range of carnivorous & herbivorous wild animals. The District has one Wildlife Sanctuaries known as the Kuldiha Wildlife Sanctuary, which hosts even elephants. The area of the sanctuary is 26, 886.23 hectares. In the Sanctuary the principal animals that are found are Elephant, Bear, Nilgai, Sambhar, Peacock, Wild Boar and Deer, together with variety of snakes and birds.

District-wise Forest Cover Area in Odisha (Area in Km²)

2017 Assessment								
District	Geographical Area Km ²	Very Dense Forest	Moderate. Dense Forest	Open Forest	Total	Percent of GA	Change	Scrub
Angul	6375	371	1380	1004	2755	43.22	43	84
Bolangir	6575	70	224	837	1131	17.2	151	142
Balasore	3806	23	127	234	380	9.98	30	48
Bargarh	5837	176	371	484	1031	17.66	88	47
Bouda	3098	263	546	480	1289	41.61	27	57
Bhadrak	2505	0	9	66	75	2.99	2	0
Cuttack	3932	53	226	517	796	20.24	11	68
Deogarh	2940	191	667	614	1472	50.07	-3	14
Dhenkanal	4452	174	418	825	1417	31.83	9	82
Gajapati	4325	84	1490	946	2520	58.27	12	262
Ganjam	8206	164	1075	864	2103	25.63	15	655
Jagatsinghpur	1668	0	5	131	136	8.15	6	0
Jajpur	2899	6	72	225	303	10.45	3	50
Jharsugada	2114	3	140	179	322	15.23	9	36
Kalahandi	7920	362	729	1327	2418	30.53	36	362
Kandhamal	8021	661	2588	2143	5392	67.22	16	380
Kendrapada	2644	84	88	133	305	11.54	14	2
Keonjhar	8303	289	1404	1519	3212	38.68	4	55
Khorda	2813	21	186	250	457	16.25	0	92
Koraput	8807	94	740	1255	2089	23.72	120	944
Malkangiri	5791	158	709	1475	2342	40.44	20	45
Mayurbhanj	10418	1335	1718	1027	4080	39.16	42	34
Nabarangpur	5291	168	428	507	1103	20.85	8	47
Nayagarh	3890	189	965	556	1710	43.96	28	173
Nuapada	3852	86	482	705	1273	33.05	33	109
Puri	3479	0	54	160	214	6.15	8	11
Rayagada	7073	422	853	1851	3126	44.2	7	349
Sambalpur	6624	499	1675	1106	3280	49.52	13	40
Subarnapur	2337	2	187	161	350	14.98	26	29
Sundargarh	9712	1019	1814	1431	4264	43.9	107	89
Grand Total	155707	6967	21730	23008	51345	32.98	885	4306

(Source: India State of forest report 2017-Odisha)

The major portion of the District is covered by forest (9.98 % of TGA) and has

scattered settlement pattern. The forest is full of variety of medicinal plants, kendu leaves, bamboo, Sal, teak and other timber species. The District has considerably flat land, which provides suitable site for agricultural use. The hilly areas are mostly under forest with patches of cultivation on scarp areas. Major crops grown in the District are rice and pulses. Only 12.50 percent area of agricultural use are net irrigated and major source of irrigations are wells and tube wells.

Source: Fertilizer and Agriculture Statistics, Eastern Region (2006-2007)

Tahasil	Forest Area	Misc Tree	Permanent Pasture	Cultivated waste	Non Agricultural uses	Barren land	Current Fallow	Other Fallow	Net area sown
Bahanaga	0	714	992	904	2882	0	525	438	24047
Balasore	4	634	3133	2949	6116	1640	531	553	15185
Baliapal	1008	1813	295	2855	4515	0	638	717	16624
Basta	13	198	892	498	4143	0	551	103	12954
Bhogorai	118	3364	1263	5350	4732	59	1025	510	15794
Jaleswar	1716	2045	1396	2455	5422	43	736	334	18713
Khaira	55	630	1544	1210	3508	0	1173	764	18160
Nilagiri	977	289	1444	2343	2312	435	558	188	28280
Oupada	329	374	855	557	1656	0	177	338	19759
Remuna	108	813	1317	2989	5070	10	1073	114	16363
Simulia	5	438	846	576	2677	0	439	889	17646
Soro	1109	441	1121	564	2066	28	295	564	21476
Total	5442								

8.2 Agriculture Land:

The primary objective of Agriculture Department is to increase the production as well as productivity of major crops like Paddy, Groundnut, Mustard, Mung, Biri & vegetables which is widely covered in this District in both Kharif & Rabi season. Another key objective is to bring all round development among farming community of the District. The Deputy Director of Agriculture is the Head of office so far as Agriculture is concerned & he is the Principal Agriculture Officer of the District. There are 5 District Agriculture Officers & the Block Level Officers are working under him. As it has already been pointed out, that agriculture is the main livelihood of the people in Balasore District, it is therefore designated as the food bowl of Odisha. Rice is the principal crop grown in this District, followed by other cereals, pulses, oilseeds, vegetables, spices and sugarcane. The agricultural statistics for the District is shown in subsequent tables below:

Table – 3.6a: Crop Coverage Area of Balasore District, Odisha

Crop	Khariff		Rabi		Annual	TOTAL	
	Area (ha)	(% of Cropped Area)	Area (ha)	% of Cropped Area	Area (ha)	Gross Cropped Area (ha)	% of Gross Cropped Area
Rice	206.14	91.62	33.47	34.38	-	239.61	72.03
Cereals	0.31	0.14	0.79	0.82	-	1.10	0.33
Pulses	0.48	0.21	21.64	22.55	-	22.12	6.65
Oilseeds	0.13	0.06	14.38	20.20	-	19.51	5.87
Vegetables	13.04	5.80	16.14	16.82	-	29.18	8.77
Fibres	2.20	0.98	-	-	-	2.20	0.66
Spices	2.69	1.19	4.08	4.25	-	6.77	2.04
Sugarcane	-	-	0.46	0.48	-	0.46	0.14
Tobacco	-	-	-	-	-	-	-
Fruits	-	-	-	-	11.68	11.68	3.51
TOTAL	224.99	100	95.96	100	11.68	332.63	100

8.3 Horticulture Land:

The primary objective of Horticulture Department is increase of production as well as productivity of major fruits like Mango, Guava, Citrus etc., which is widely covered in this District. Another key objective is the all round development of the farming community of the District. The Deputy Director of Horticulture is the head of office. The horticulture statistics for the District is shown in subsequent tables below:

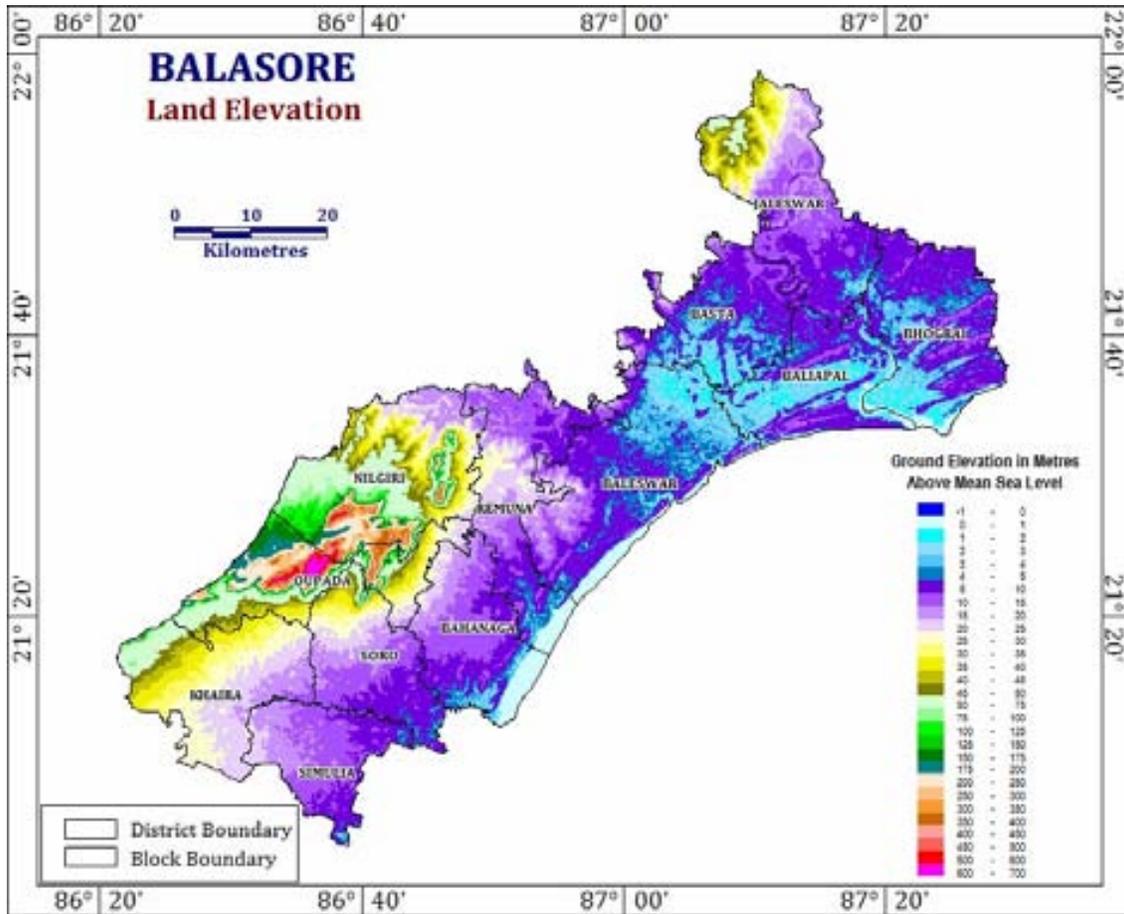
Horticulture crops	Total Area (hectares)
Mango	4.39
Citrus	0.80
Papaya	0.06
Pineapple	0.04
Guava	0.32
Sapota	0.07

Source: SREP, Balasore. Orissa Agric.

9.0 PHYSIOGRAPHY OF THE DISTRICT:

The District of Balasore is having unique physiographic set up. It is bounded by the Bay of Bengal in its Southern part and in the North Western part it is marked by a set of hillocks and mounds including a North East – South West trending Hilly patch in the Nilgiri, Khaira & Oupada Blocks. The land elevation varies from as low as near mean sea level in the southern part to as high as about 600 m

above mean sea level in the North Western part. In between a major part covering more than 75% of the geographical area is having elevation within the range of 2 – 10 metres above mean sea level. In the extreme eastern part of the District, within the alluvial tracts of the River Subarnarekha & Burhabalang, Jalaka, Son etc. the average elevation is within 1 – 2 metres above mean sea level.



10.0 RAINFALL OF THE DISTRICT AND CLIMATE CONDITION

10.1 Month wise rainfall:

The driest month is November, with 31 mm of rain. There is an average 3 mm of precipitation in December. In July, the precipitation reaches its peak, with an average of 313.98 mm.

Year		2016	2017	2018	Average
Sl. No.	Month	(mm)	(mm)	(mm)	(mm)
1	Jan	18.33	00	00	6.11
2	Feb	49.92	00	00	16.64
3	Mar	6.42	105.29	6.23	39.32
4	Apr	18.33	18.50	162.62	64.48
5	May	224.33	165.98	144.39	178.23
6	Jun	165.05	164.28	268.94	199.42
7	Jul	303.49	317.98	320.48	313.98
8	Aug	334.98	276.51	341.13	317.54
9	Sep	308.00	198.01	346.48	284.16
10	Oct	153.10	251.58	243.31	215.99
11	Nov	46.43	47.20	00	31.21
12	Dec	00	5.08	4.97	3.35
Total		1628.38	1550.41	1838.55	1672.44

The Indian Meteorological Department, Bhubaneswar, vide letter No. BBS/RMC/CS-312, dated 18th January, 2016 has provided the period of Rainy Season viz. Normal dates of Onset and Withdrawal of South West Monsoon over India as State-wise. The duration for the period is 10th June to 15th October.

11.0 GEOLOGY AND MINERAL WEALTH OF THE DISTRICT:

11.1 Geology:

The coastal tract of Orissa is underlain by the Tertiary and Quaternary Formations. Balasore is a unique District in Odisha with varied geology, of these the Tertiaries are the least exposed on the surface, whereas the Quaternaries are extensively developed along the coast and further inland. The Quaternary formations cover almost the entire study area while the Tertiaries are exposed near Baripada town at about 28 km. NNW of the Northern Boundary of the area. The Pre-Cambrian crystalline occur as hills and mounds in the west just outside the present area. Chatterji and Raghava Rao (1960) made studies on the sub-surface Geology and Tectonic Framework of sedimentation in the crescent coastline of Balasore on the basis of the data obtained from the Exploratory Drilling Operations. Exploratory Drilling reveals that in the subsurface the warped Pre-Cambrian basement is overlain by Miocene marine sediments, Mio-Pliocene estuarine sediments, laterites and alluvium. The Mio-Pliocene sediments and alluvial sections contain the principal

ground water reservoirs. The marine sediments are dominantly composed of finer elastics and non-elastics (Bhatnagar *et al*, 1970). Small outcrops of ultramafic rocks are exposed in and around Bhalukasoni (21°29': 86°42') area under Nilgiri Sub-Division of Balasore District. Ultramafic rocks comprising serpentinitised dunite, peridotite and pyroxenite largely under soil and laterite cover occur intermittently spreading over an area of 1.8m × 800m. A 100m long E-W trench has exposed two chromite ore bodies on its either end, the dimensions being 500m × 3.5m × 4.5m and 5.5m × 2m × 3.3m. A reserve of the order of 1550 tones was estimated with massive and spotted type of chromite with Cr₂O₃ content ranging from 25.77 to 54.76%. These chromite occurrences along with the associated ultramafic rocks are considered to be xenolithic bodies lying within a plutonic mass of gabbroic rocks.

11.2 Geomorphology:

Hydrogeomorphological features of Balasore District are mainly attributed to fluviomarine, erosional, denudational and depositional processes. The coastal plain has been developed due to fluviomarine processes. The alluvial plains owe their origin due to various fluvial actions of major rivers. The details of the geomorphic unit as identified are as below:

Coastal Plain: Coastal plain predominantly consist of sand silt and clay is developed all along the coast of Balasore District. It is developed all along the coast of Balasore District. It is gently sloping plain occurring parallel to the coast. The saline marshy tract with shrubby vegetation comes under this coastal plain. Tidal streams are very active during high tide time. Ground water prospect is good but salinity is a major problem in this tract.

Beach: Beach is mainly formed by marine action. Beach ridges are very common and these are formed due to sea waves. They are mainly consisting of sand mixed with silt etc. Ground water prospect is good within a depth of 30-40 m, where fresh ground water pockets are available. Deep tube wells in these areas may lead to sea water ingress.

Mud flat: This is an relatively marshy area covered with fine silt and mud along the shore. Mangroves vegetation is very common. Ground water quality is mostly saline.

Paleo mud flat: These are the ancient mud flat consisting of fine sand and mud. These are mostly converted to agricultural land in due course of time. Due to marine

regression ground water quality is saline.

11.3 Stratigraphy:

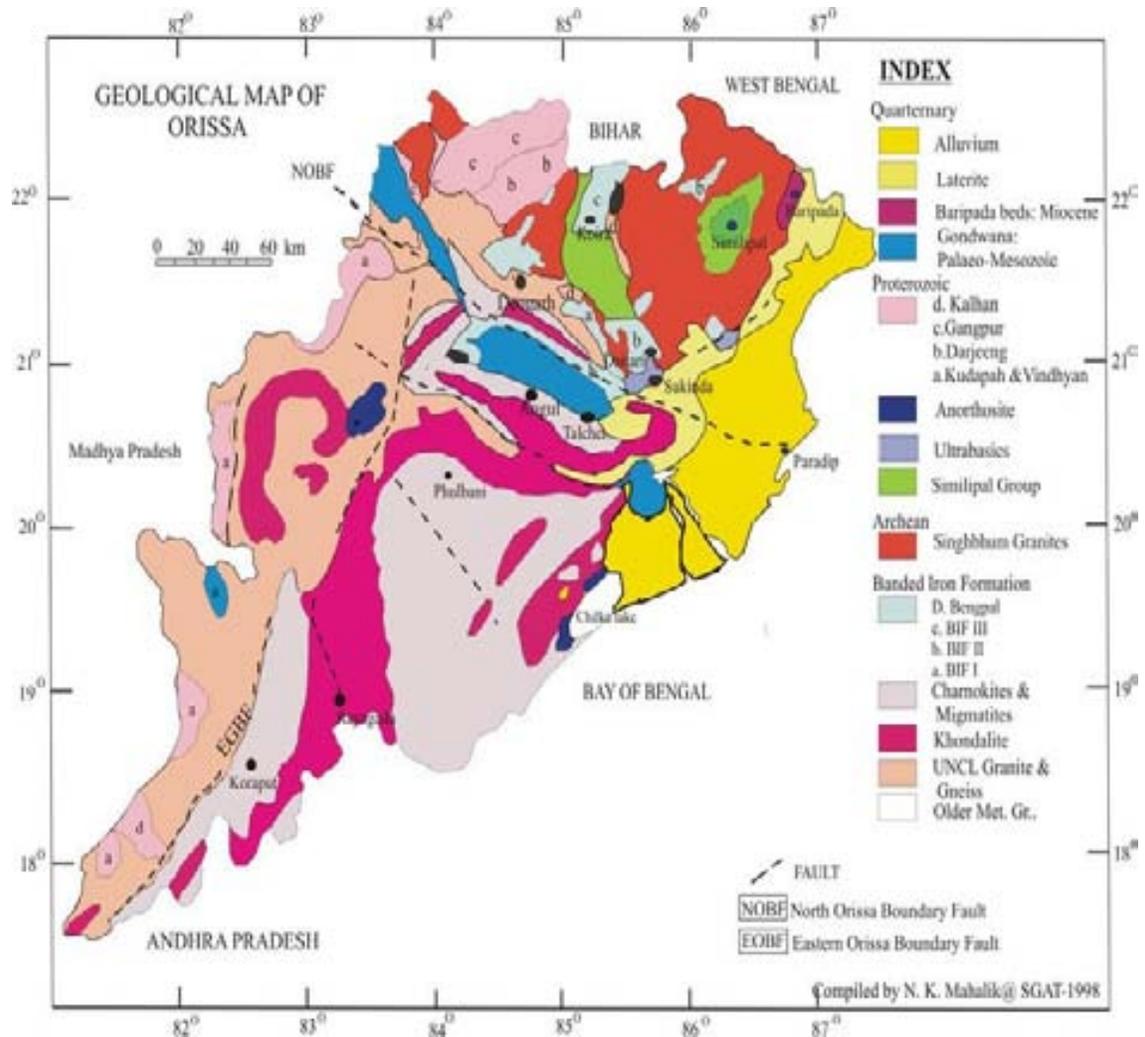
The study area comprises the following distinct geomorphic units:

- i) Younger alluvial plain
- ii) Older alluvial plain
- iii) Lateritic upload

<u>Geological Age</u>	<u>Geological Formation / Group</u>
Quaternary	: Recent Alluvium, Clays, silt, Sand, Gravel
Tertiary	: Older Alluvium, Laterite, Baripada Beds.
Mesozoic/ Palaeozoic	: Volcanics / Epidiorite
Precambrian	: Slate/ Phyllite/ Schist / Gneiss
Archean	: Granite/ Granite Gneiss

11.4 Mineral Resources:

Minerals like soft stones, limestone, stone chips are available in the District, which are mainly used in industrial units in the District. The huge deposits of granite stones at Nilgiri, Khaira, Soro, Jaleswar area provides tremendous scope for development of few more industries based on this resources. Except these, no minerals in large quantity which can be explored for commercial purpose found in the District.



11.5 Soil:

The District comprises chiefly of lateritic, sandy loam and clayey loam type of soil (Figure 3). Laterite soil is mostly marked in the area occupied by crystalline rocks. The low lying valley fields are covered with clayey loam type of soil.

a) DRAINAGE SYSTEM WITH DESCRIPTION OF MAIN RIVERS:

The District has considerable flat land, which provide suitable site for agricultural use. The hilly areas are mostly under forest with patches of cultivation on scarp areas. Major rivers flowing in the District are Budhabalanga, Subernarekha, Jalaka, sona. Major crops grown in the District are rice, only. 12.50 percent area of agricultural use are net irrigated and major source of irrigations are well and tubewells.

Sl. No.	Name of the River	Area drained (Sq.Km.)	% Area drained in the District
1	Budhabalanga	300	8.2 %
2	Subernarekha	1057	29 %
3	Jalaka	330	9 %
4	Sona	255	7 %
5	Kansbans	721	19.8 %

b) Salient Features of Important Rivers and Streams:

The Budhabalanga, Subernarekha, Sona & Jalaka etc. flow through the Districts of Balasore. The Budhabalanga rises from the Simlipal hills and plunges through Barehipani Falls, the second-highest waterfall in India, located in Simlipal National Park. Perennial Burhabalang is the main river of the study area; it flows from Northwest to Southeast. This river is an 'extended consequent', since it has maintained its original easterly course in the plains and has reached a mature stage of development. The annual flow of water in river Burhabalang is 637 Mm³. Its total drainage area is 4,847 sq. km. River Subarnrekha is originated from Nagri District of Jharkhand and major portion of Subarnarekha river lie in the District Balasore. Most part of the river Subarnarekha flows in Jaleswar area and then enters in to West Bengal. This river maintains a sluggish flow in the pre-monsoon period, but swells menacingly with the onset of monsoon often flooding large tracts. Burhabalang and its tributaries, viz. Sona Nadi, Amrutia Nadi, Gangahar Nadi drain almost round the year in the present area. Sona Nadi receives the watery effluent load through a nalah (Sankh nalah) from the Balgopalpur Industrial Estate and flows from west to east. Amrutia Nadi flows from NNW to SSE and carries the waste water load of East Coast Fertilizer at Gadadeulia and water laden solid wastes (particularly in rainy season) from the dumping site of Krebs & CIE Ltd. at Kalma. These tributaries join Burhabalang river downstream at Sahupada and Bhimda (outside present area) respectively. There is another local stream, which flows from southwest to northeast, carrying the waste water of Birla Tyres Ltd. at Chhanpur and the industries located at Ganeshwarpur Industrial Estate. This stream too ultimately joins the Burhabalang river near Nuabazar, Balasore town.

River Sand Mining**DSR of Balasore District**

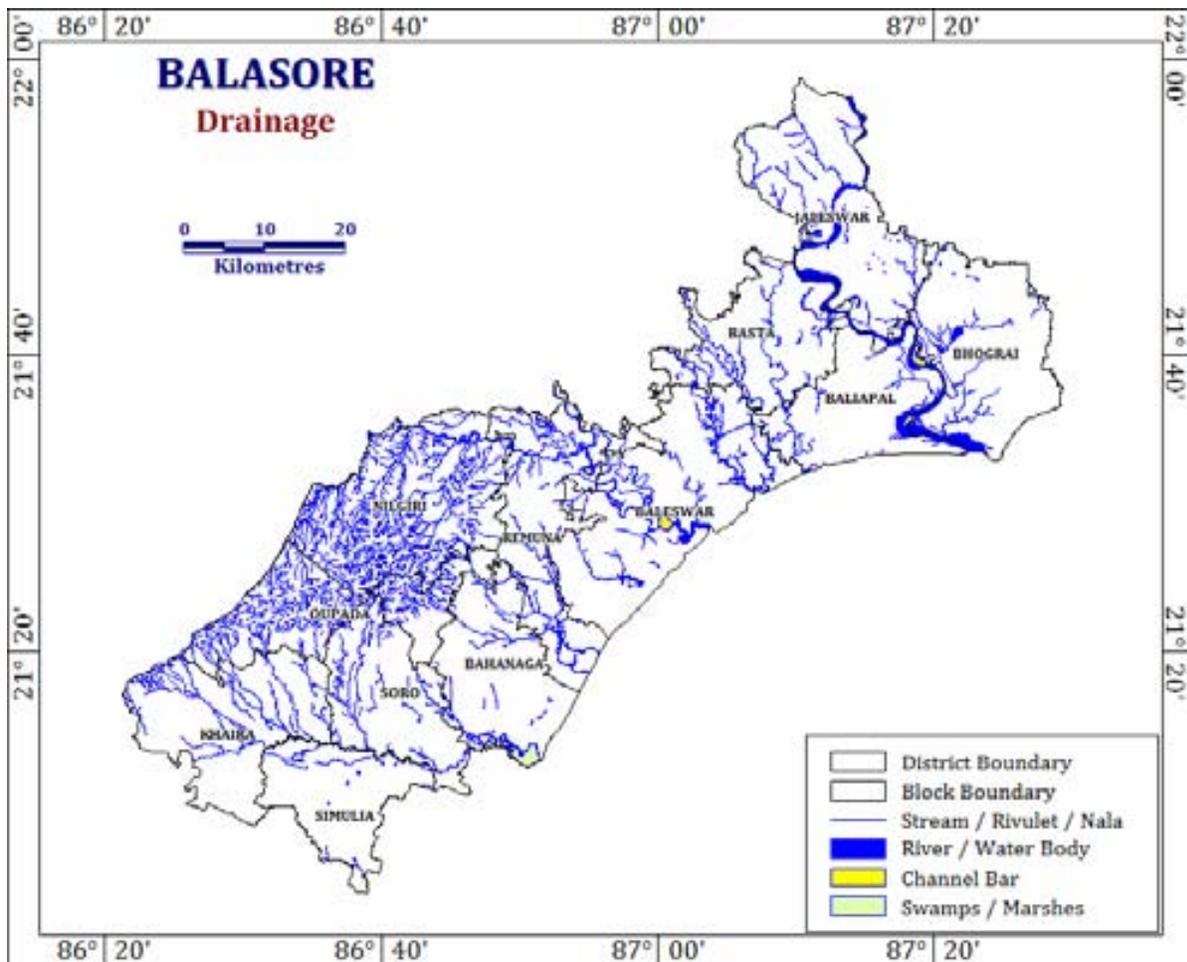
1	2	3	4	5
Sl. No.	Name of the River or Stream	Total Length in District (in Km.)	Place of Origin	Altitude at Origin
1	Budhabalanga	51	Similipal Hill	940 mrl.
2	Subernarekha	90	Nagri, Jharkhanda	610 mrl.
3	Jalaka	35	Chandra R.F. Mayurbhanj	60 mrl.
4	Sona	30	Jaymal hill, Dugdha Mayurbhanj.	340mrl
5	Kansbans	77	Birapada, Balasore	40 mrl

6	7	8	9	10
Portion of River or Stream Recommended for Mineral Concession	Length of area Recommended for Mineral Concession (in Km.)	Average width of area Recommended for Mineral Concession (in metre)	Area Recommended for Mineral Concession (in Sq. meter.)	Mineable mineral potential (in metric tonne) (60%of total mineral potential)
Details enclosed in Annexure-I				

Mineral Potential				
Name of the River or Stream	Boulder (MT)	Bajri (MT)	Sand (MT)	Total Mineable Mineral Potential (MT)
Budhabalanga	Nil	Nil		46538
Subernarekha	Nil	Nil		573445
Jalaka	Nil	Nil		Nil
Sona	Nil	Nil		280195
Kansbans	Nil	Nil		Nil

Annual Deposition				
Name of the River or Stream	Boulder (MT)	Bajri (MT)	Sand (MT)	Total Mineable Mineral Potential (MT)
Budhabalanga	Nil	Nil	--	46538
Subernarekha	Nil	Nil	--	573445
Jalaka	Nil	Nil	--	Nil
Sona	Nil	Nil	--	280195
Kansbans	Nil	Nil	--	Nil

Drainage pattern of Balasore District



**CONCLUSION:**

Since it is an interim report, to meet the requirement of minerals in the present scenario, it is proposed to identify such potential areas at certain interval and get the data bank of DSR to be updated. The mining activity in any area is on one hand bring Revenue and employment (Direct and indirect) and on other hand if not done properly potential pollution and ecological imbalance increases, the ability of the ecosystem can also be reduced. Particulate matter transported by the wind as a result of excavations, blasting, transportation of materials, heavy equipments used raise these particulate levels; and Gas emissions from the combustion of fuels in stationary and mobile sources, explosions, and mineral processing. All these activities indirectly affected the biodiversity of area. Larger potential and smaller areas have been identified in Balasore District on the basis of geological study carried out during field observation, which can be considered for mining concession after all the parameters for statutory clearances are verified by consulting with concerned authorities.

Plate-I



List of Mines is operation in the District & List of Mines is not operation in the District:

LIST OF MINES IS OPERATIONAL & NOT OPERATIONAL IN THE DISTRICT

ANNEXURE-I

S.No	Name of the Mine	Location of the Mine	Length of the Mine	Average width of the Mine	Length of the Mine	Area of the Mine	Depth of the Mine	Type of the Mine	Status of the Mine	Period of Lease			Production (Tons) for Current					
										From	To		2016-17	2017-18	2018-19			
1	Sono	Hatiaganda Khata No-313 Plot No 223, 1121 Kisam Nadi, Mukundapur Khata No-197 PlotNo-3 Kisam Nadi,Patripal Khata No-69 Plot No-1 Kisam Nadi							Regular working (Tr ansit Permit issued)	2016-17	2017-18	2018-19	2016-17	2017-18	2018-19			
													700700	775775	875875	700	775	875

Jaleswar	3	Subarnarekha	Mahammadnagar patna "Ga" Sand Sairat Source Latitude 21°47' 27" N to 21° 47' 36"N, Longitude 87° 10' 25"E to 87° 10' 36.5"E Mouza-M: N Patna, Khata No- 422 Plot No 2 Kissam Nadi	.3km	200mete r	5.665hec	29367	52275cm	Prabir Kumar Pradhan, S/o- Gyanendra Nath Pradhan, At/Po- Mahamma dhagarpath a, Ps- Jaleswar, Dist- Balasore	2015- 15	2019- 20		528000.00	552000.00	576000.00	4400	4600	4800
Jaleswar	4	Subarnarekha	Mahammadnagar patna "Gha" Sand Sairat Source Latitude 21°47' 20.8" N to 21° 47' 29.8"N, Longitude 87° 10' 8.4"E to 87° 10' 24.8"E Mouza-M: N Patna, Khata No-422 Plot No-2 Kissam Nadi	.44km	110mete r	5.261 hec	25590	47600cm	Trilochan Das, S/o- Bhuban Chandra Das At/Po- Mahamma dhagarpath a, Ps- Jaleswar Dist- Balasore	2015- 15	2019- 20	Working	630000	702000	720000	5250	5850	6000
Jaleswar	5	Subarnarekha	Chalanti Sand Source Mouza-Chalanti, Latitude 21°46' 53" N to 21° 47' 2.8"N, Longitude 87° 09' 58"E to 87° 10' 10.2"E Khata No-384 Plot No-738 Kissam Nadi	.06km	120mete r	5.665hec	9000	18130	Soumendra Pattnaik Partner M/s Omm Saitam suppliers At/Po- Junbalda, Ps- Jaleswar, Dist- Balasore	2017- 18	2019- 20	Working	0	4218750	5625000	0	15000	15000

Jaleswar	6	Subarnarekha	Kantapal sand source Latitude 21°40' 49" N to 21° 41' 2.2"N, Longitude 87° 17' 00"E to 87° 17' 17.2"E Mouza- Kantapal, Khata No- 483 Plot No-1662 Kissam Nadi	.1km	50meter	8.093 hec	56153	105209	Niranjan Pradhan, S/o- Ramahari Pradhan At- Datunida po- Debhog, Ps- Ballapal, Dist- Balasore.	2016- 17	2019- 20	Working	3324551	3645035	3973059	70540	77340	84300
Jaleswar	7	Subarnarekha	Sikharpur Sand Source Latitude 21°47' 44.4" N to 21° 47' 58.2"N, Longitude 87° 12' 20"E to 87° 12' 38.9"E Mouza- Sikharpur, Khata No- 496 Plot No- 1910, 1900 Kissam- Nadi	.2km	20meter	5.645 hec	24062	56450cm	Otul Ojha S/o- Nakul Chandra Ojha At- Rajpur, Po/Ps- Jaleswar, Dist- Baleswar.	2016- 17	2019- 20	Working	522000	618000	654000	8700	10300	10900
Jaleswar	8	Subarnarekha	River Block Ka sand source Latitude 21°48'32.9" N to 21° 48' 41.8"N, Longitude 87° 13' 3.8"E to 87° 13' 14.8"E. Mouza-River Block, Khata No- 175 Plot No- 01, Kissam Nadi	.08km	50meter	5.665hec	12000	23525 cm	Sujay Kumar Karan, S/o- Banamali Karan, At- Bhanpur, Po- Mathuranat h, Ps- Jaleswar, Dist- Balasore	2017- 18	2019- 20	Working	0	280000	840000	0	20000	20000

Jaleswar	9	Subarnarekha	River Block Kha Sand Source Latitude 21°48' 51.5" N to 21° 49' 1.9"N, Longitude 87° 12' 56.5"E to 87° 13' 6.1"E. Mouza- River Block, Khata No- 175 Plot No- 1 Kissam - Nadi	.075km	45meter	5.261 hec	12000	23763 cm	Rajesh Kumar Khata, M/s Maa Hingul Enterprises, S/o- Tarakanta Khata, At- Nayabazar, Santia, Ps- Jaleswar, Dist- Balasore	2017-18	2019-20	Working	0	400000	1200000	0	20000	20000
Jaleswar	10	Subarnarekha	Balikhbad Sand Source Latitude 21°42' 39" N to 21° 42' 49"N, Longitude 87° 13' 26.2"E to 87° 13' 40"E. Mouza Balikhbad, Khata No- 399 Plot No- 49 Kissam Nadi	.3km	190 meter	6.01 hec	65208	114400	Sournyadee Chakrabart y, S/o- Sudhanshu Chakrabart y At- Khagadapal, Po- Badasinuli a, Ps- Ballapal, Dist- Balasore	2016-17	2018-19	Working	776250	1031250	0	2420	16500	18500
Jaleswar	11	Subarnarekha	Praharajpur ka Sand Source, Latitude 21°52' 17.5" N to 21° 52' 33.2"N, Longitude 87° 15' 9.7"E to 87° 15' 15.2"E. Mouza- Praharajpur, Khata No- 466 Plot No- 1923 Kissam Nadi	.44km	120meter	5.261 hec	29244	55440	Himanshu Sekhar Pradhan, S/o- Radhashyam Pradhan, At- Gopa, Po- Badasinuli a, Ps- Ballapal, Dist- Balasore	2016-17	2019-20	Working	158046	176252	186030	3325	3510	4600

Jaleswar	12	Subarnarekha	Gobarghata Sand Source Latitude 21°45' 26.1" N to 21° 45' 29.5"N, Longitude 87° 10' 17.8"E to 87° 10' 20.9"E Mouza- Gobarghata, Khata No-1414 Plot No- 3236 Kissam Nadi	.08km	55meter	7.082 hec	12000	26648cm	Rajesh Kumar Khata, M/s Maa Hingul Enterprises , S/o- Tarakanta Khata, At- Nayabazar, Santia, Ps- Jaleswar, Dist- Balasore	2017- 18	2019- 20	Working	0	1575000	2100000	0	20000	20000
Jaleswar	13	Subarnarekha	Makrampur Sand Source Latitude 21°51' 22.21" N to 21° 51' 32.12"N, Longitude 87° 14' 31.16"E to 87° 14' 43.90"E Mouza- Makrampur, Khata No- 01 Plot No- 06 Kissam Nadi	.08km	50 meter	6.070 hec	31646	60496	Prasanta Ku. Mohanty, S/o- Himanshu Sekhar Mohanty, At- Azimabad, Po/Ps- Balasore Town, Balasore	2016- 17	2019- 20	Working	386605	412070	438924	8350	8900	9480
Jaleswar	14	Subarnarekha	Sekhsarai Kha Sand Source Latitude 21°46' 38.9" N to 21° 46' 56.3"N, Longitude 87° 09' 45"E to 87° 09' 58.3"E" Mouza- Sekhsarai, Khata No- 142 Plot No- 2 Kissam Nadi	.014 km	40 meter	6.070 hec	33076	62892 cm	Laxminaray an Das S/o- Gajendra Das At- Rajpur, Po/ps- Jaleswar, Dist- Baleswar.	2016- 17	2019- 20	Working	2374050	2622000	2861400	41650	46000	50200

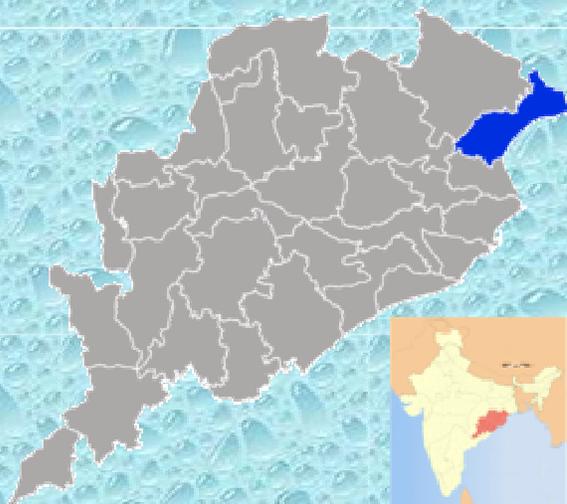
Basta	2	Subarnarekha	Ara 5.88 (Hc), Benapura, Khata- 152, Plot No.285	480 mt	110 mt	10045 sq mt	100706	117520 cum	Pradipta Kishore Chand, S/o- Satyanaray an Chand, Village- Nandika, Po /PS- Jaleswar, Balasore	27.10.2 016	26.10.2 021	Non- Working		12718908	4960307		12907	5298
Basta	3	Subarnarekha	Area 7.40 (Hc) Ambakuduchi, Khata- 304, Plot-1450									Temporary lease to Project Proponents may be settled						
Basta	4	Subarnarekha	Area 34.45 (Hc), Debhog, Khata- 392, Plot- 1178									Permanent lease can be settled						
Basta	5	Subarnarekha	Area 62.60 (Hc), Kadarayan, Khata- 257, Plot-01									Not exiting road available						
Total													1654500	14373408	6952414	1116	13909	5986
Balasore	1	Budhabalanga	Area 41.015 (Hc), kasoba dahapada, Khata No. 143, Plot- 837, Khata- 653, Plot- 124, 210,209,1429 & 1483	2 Km	200 m,t		40000 cum	40000 cum	Karunkar Das, S/o- Balabhadra Das, Vill- Gambharia, samil- kantabania	2015- 16	2019- 20	Working	0.00	2308845	2816060	0	40000	40000
Total													0	2308845	2816060	0	40000	40000
Nilgiri	1	Suno	Khata-266, Plot- 707, Kisam- River	Area- A1.30		Area=Hao .5260	5265	8070	Nilakanth a Swain ,KPRMahal	2015- 16	2019- 20	working	43680	43680	43680	1040	1040	1040

Nilgiri	2	-do-	Vill- Bainchanaranapur- i,Khata-266, Plot- 383,384, Kisan- River	Area- A27.45	Area=Ha1 1.109	90805	166950	Animesh Ghosh, Sahadevk hunta	2015- 16	2019- 20	working	756000	756000	756000	18000	18000	18000
Nilgiri	3	Suno	Pratapapur Sand source,Khata- 814,Mza- Ajodhya,Plot- 388,Kisan-River	Area- A20.00	Area=Ha8 .093	81600	120750	Kailash Ch. Mohantyk ailash Ch. Mohantyy, V/- Podasul	2015- 16	2019- 20	working	587160	587160	587160	13980	13980	13980
Nilgiri	4	-do-	Balipal sand Source,Mouza- ballipal,Khata- 109,Plot-3,Kisan- River	Area- A24.12	Area=Ha9 .76	98550	128550	Animesh Ghosh,Sah adevkhunt a	2015- 16	2019- 20	working	756000	756000	756000	18000	18000	18000
Nilgiri	5	Suno	Pundal Sand Source,Mouza- pundal,Khata-352,Plot- 9521	Area- A1.00	Area=Ha0 .4046						Not working						
Total												2142840	2142840	2142840	51020	51020	51020



DRAFT DISTRICT SURVEY REPORT (DSR)
OF
BALASORE DISTRICT, ODISHA.
FOR
BRICK EARTH/ORDINARY SOIL
(FOR PLANNING & EXPLOITATION OF MINOR MINERAL RESOURCES)

ODISHA



BALASORE



As per Notification No. S.O. 3611(E) New Delhi
dated 25th July 2018 of
Ministry of Environment, Forest & Climate Change
(MoEF & CC)

COLLECTORATE BALASORE.

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PREAMBLE

Odisha is one of the major mineral rich State in India. Balasore is a unique District in Odisha lies on the northern most part of the state with rich and varied mineral resource. It is a paradise for Geoscientists of India and abroad. It has preserved many important rock groups from earliest of crust formation to the geologically recent times. The landmass constituting the Balasore District, explorers to many entrepreneurs on account of its diverse geological setting and rich and varied mineral resources.

In pursuance MoEF & CC Notification S.O. 141(E) dated 15th Jan. 2016, District Environment Impact Assessment Authority (DEIAA) & District level Expert Appraisal Committee (DEAC) has been formed for Category –B2 Minor Minerals having area less than or equal to 5 ha. Prior to the formation of Odisha Minor Mineral Concession Rule 2004, (OMMCR -2004) the mining operation for minor mineral were carried out in unscientific manner. Identifying this fact in exercise of power, Conferred by Section 15 by Mines and Minerals (Development and Regulation) Act 1957 as amended in 2015 and all other powers enabling it in that behalf, the industry Mines & Geology Department, Govt. of Odisha framed the aforementioned rule, which has been amended with period of times in the year 2014, 2015 and 2016.

Keeping in view of experience gained in period of decade, the MOEF & CC came out with Environmental Impact Assessment Notification S.O.-1533(E) dated 14th Sept. 2006. It has been made mandatory to obtain environmental clearance for different kinds of development projects as listed in Scheduled -I of notification. Further, pursuance of the order of Hon'ble Supreme Court Petition (C) No. 19628-19629 of 2009, dated 27th Feb. 2012 In the matter of Deepak Kumar etc., Vs State of Haryana and others etc., prior Environmental Clearance has now become mandatory for mining of Minor Minerals irrespective of the area of Mining Lease. And also in view of the Hon'ble National Green Tribunal, order dated the 13th Jan. 2015 the matter regarding Sand, Brick earth, & burrowed earth cutting for Road Construction has to take prior E.C. for Mining Lease irrespective of the fact that whether the area involved is more or less than 5 hectares. They also suggested to

make a policy on E.C for minor minerals lease in cluster.

MoEF & CC in consultation with State Government has prepared Guidelines on Sustainable Sand Mining & Minor minerals other than sand mining in 2016, detailing the provisions on Environmental Clearance for cluster. Creation of District Environmental Impact Assessment Authority (DEIAA) & proper monitoring of Minor Minerals. Mining, using Information Technology to track the mineral out material from source to destination.

DEAC will scrutinize and recommend the prior environmental clearance of mining of minor mineral to DEIAA on basis of District Survey Report. This will model and guiding document which is a compendium of available mineral resources, geographical setup, environmental and ecological set up of the District and replenishment of minerals and is based on data of various departments, published reports, Journal and websites. The District Survey report will form the basis for application for environmental clearance, preparation of reports and appraisal of projects. District Survey Reports are to be reviewed once in every five years as per statue, however this is an interim report, which will be updated at regular intervals. In line with above guideline Chief Secretary of Government of Odisha issued a letter to all DEIAA, to prepare a District Survey Report as per guideline of sustainable sand mining & other than sand mining as minor mineral mining guidelines with the assistance of Irrigation Department Forest Department, Mining & Geology Departments, considering the recent amendment S.O. 3611 (E) dated 25th July, 2018.

The Main objective of the preparation of District Survey Report is to ensure the following:-

1. Identification of Mineral Resources in the District.
2. Identification of areas of minor minerals having the potentiality where mining can be allowed.
3. Identification of area and proximity to infrastructure and installations where mining should be prohibited.

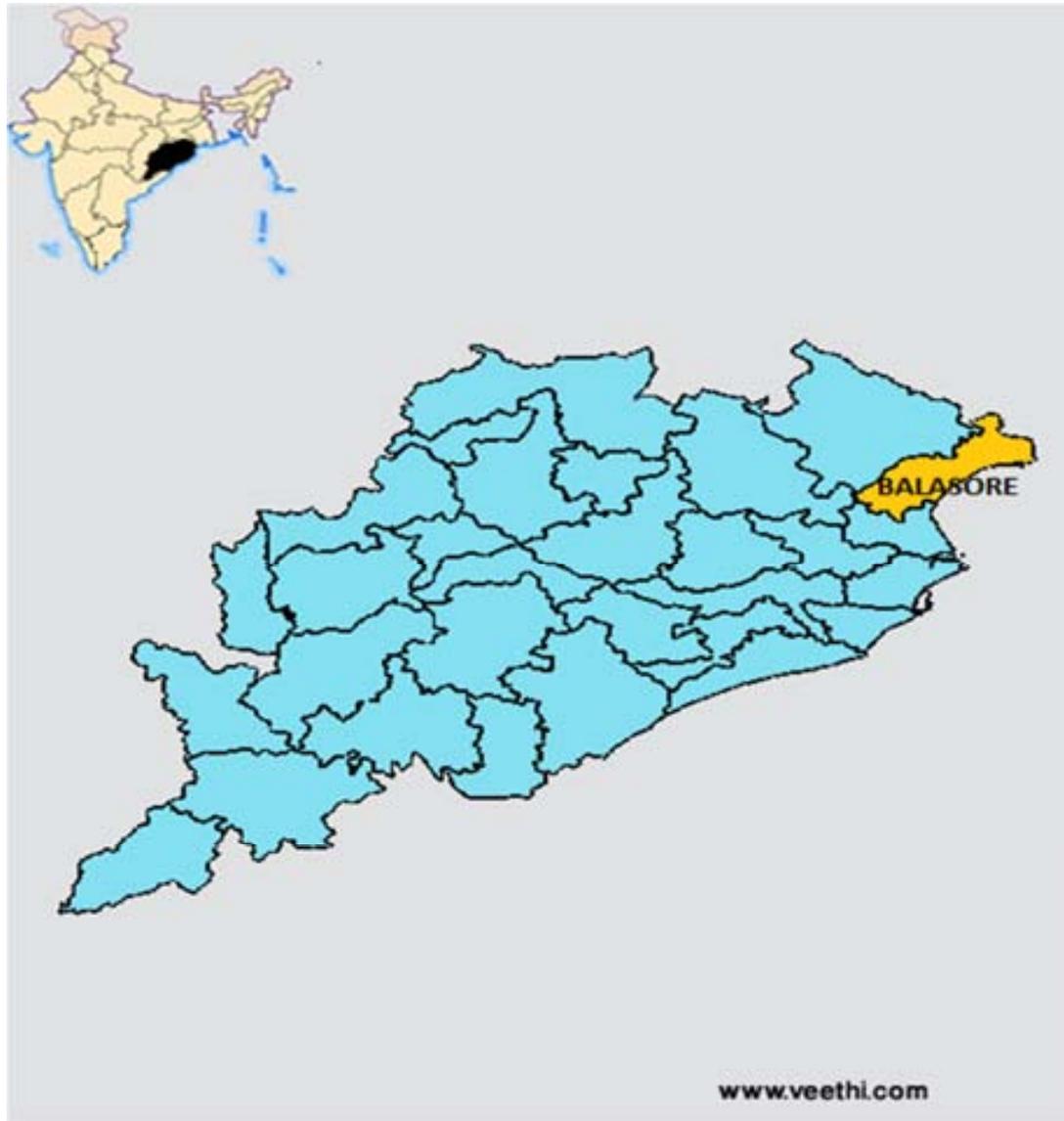
1. INTRODUCTION

Balasore at a Glance:

1.1 Location and Geographical Area:

Balasore is one of the coastal Districts of Odisha. Balasore is the District Head Quarter, spreading over an area of 3634 sq.km lies between 20° 48' North and 21° 59' North latitudes and 86°16' and 87°29' East longitudes. The District is surrounded by Medinipur District of West Bengal in its northern side, Bay of Bengal in its east, Bhadrak District in its south and Mayurbhanj & Keonjhar Districts lies on its western side. It is best known for Chandipur Beach. The Indian Ballistic Missile Defense Program's Integrated Test Range is located 18 km south of Balasore. It is the largest city of North Odisha. This District consists of two Sub-Divisions namely Balasore and Nilagiri. There are 12 Tahasils for 12 Blocks of the District. Balasore is the main town of the District and is also its centre of economic growth. The primary occupation of people in the District is cultivation. This District is mainly known for cultivation of paddy. Because rice is the staple cereal of the local people. Hybrid varieties of seeds are being developed and land reform programs are being planned for the maximum usage of the wastelands, promising to enhance the District's economic stability in the near future. Industries, Agriculture, Fishing and Tourism are the four major revenue sources of Balasore District. Birla Tyres, Balasore Alloys Limited, Emami Paper Mills Limited and Polar Pharma India Limited are some of the large-scale industries functioning in this District. Balasore occupies a unique position being endowed with lush green vegetation, different fauna & flora and rich cultural heritage. Being an agrarian economy, agriculture is the main stay of the people of Balasore District. It is in the coastal section of Odisha blessed with hot and humid climate, with alluvium soil and intersected by the perennial rivers, which collectively provides conducive infrastructure for the growth of agriculture in the region. Rice, Pulses, oil seeds like groundnut, mustard, castor and linseed are grown in the District of Balasore. The District has a rich mineral base of soft stones, limestone, stone chips are available in the District, which are mainly used in industrial units in the District. The huge deposits of granite stones at Nilgiri, Khaira, Soro regions provides tremendous scope for development of few more industries based on this

resources. Except these, no minerals in large quantity which can be explored for commercial purpose found in the District.



1.2 Administrative Units:-

Balasore is the administrative headquarter of Balasore District. It is located at a distance of 194 km from Bhubaneswar, state capital of Odisha. In accordance to area, the District is the 2nd largest costal Districts of Odisha. It has 3049 villages covering 12 Blocks, 12 Tahasils and 2 Sub-Divisions. The District is divided into 2

Brick Earth/Ordinary Soil Mining

DSR of Balasore District.

Sub-Divisions namely 1) Balasore, 2) Nilgiri and into 12 Blocks & Tahasils, namely i) Bahanaga ii) Balasore iii) Baliapal iv) Basta v) Bhogarai vi) Jaleswar vii) Khaira viii) Nilgiri, ix) Oupada, x) Remuna xi) Simulia xii) Soro. The population of the District is 23,17,419 according to the 2011 Census. The District accounts for 5.53% of the State's territory and about 5.50% of State's population. The density of population of the District is 532 per square km as against 610 per square km of the state. As per 2011 census, the population of Scheduled Caste is 1,84,682 (7.30%), and Scheduled Tribe is 14,79,576 (58.7%). The literacy percentage of the District covers 79.18 against 84.67 of the state.



1.3 Connectivity facilities:-

Road Network

The District is well served by a network of good roads and has been called the motorists paradise. The chief roads emanating from Balasore town are NH-16 and NH-60 passes the District. Balasore is 60 Kms from Baripada, 122 Kms from Kharagpur, 199 Kms from Jamshedpur, 177 Kms from Cuttack, 199 Kms from Bhubaneswar and 226 Kms from Rourkela. It is also connected with other cities such as Sambalpur, Puri, Bolangir, Bhadrak, Jhargram, Angul, Ranchi and Kolkata via Odisha State Road Transport Corporation and some private travel services.



Rail Network

Balasore District is well connected by Rail link to different places, Balasore Railway Station is an important station on the Howrah-Chennai main line of the South Eastern Railway. The distance to Kolkata is approximately 232 km, while the distance to Bhubaneswar is about 206 km; the city of Balasore is well connected to many places in India like Baripada, Bhubaneswar, Kolkata, Jamshedpur and Cuttack.



Air Network

At present, Balasore has no connection by Airway. The site selection for aerodrome is presently under process. Nearest airport is Biju Patnaik Airport, Bhubaneswar, 200 Kms from Balasore. Netaji Subhas Chandra Bose International Airport in Kolkata is 232 kms from Balasore.



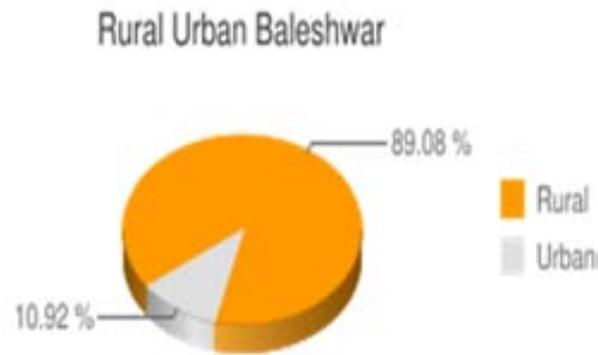
2. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT:

Balasore District is a transition land features of both coastal plain and hilly region. Most of the mineralized area coming under Eco-Sensitive Zone, mining activity only confined out of safety zone of Eco-Sensitive Zone. The mining activity in the District is only restricted to minor minerals i.e. of sand, stone, granite and brick clays. Altogether there are leases of stone, granite and sand which has been granted to the District is regulated as per minerals concession rules of Odisha, there is no lease of major mineral in the District. At present Leases of stone, sand and bricks making units are operational in the District. Stone chips, granite stones, ordinary sand constitute the principal mining activity of Soro, Khaira, Jaleswar, Nilagiri area etc. of Balasore District. Out of these huge granite stones deposits are available near Khaira, Nilgiri, Soro area and major potential sand in Jaleswar, Remuna and Nilagiri area of the District, which have been provides tremendous scope for development of few more industries based on this resources.

3.0 GENERAL PROFILE OF THE DISTRICT:

3.1 Demography:

Census - 2011	
Geographical Area	3806 Sq. Km.
Total population	23,17,419
Male Population	11,84,371
Female Population	11,33,048
Male Literacy	9,18,417
Female Literacy	7,29,488
SC Male	NA
SC Female	NA
ST Male	NA
ST Female	NA
OBC	855,480
Illiterate Male	9,18,407
Illiterate Female	7,29,488



4.0 GEOLOGY OF THE DISTRICT:

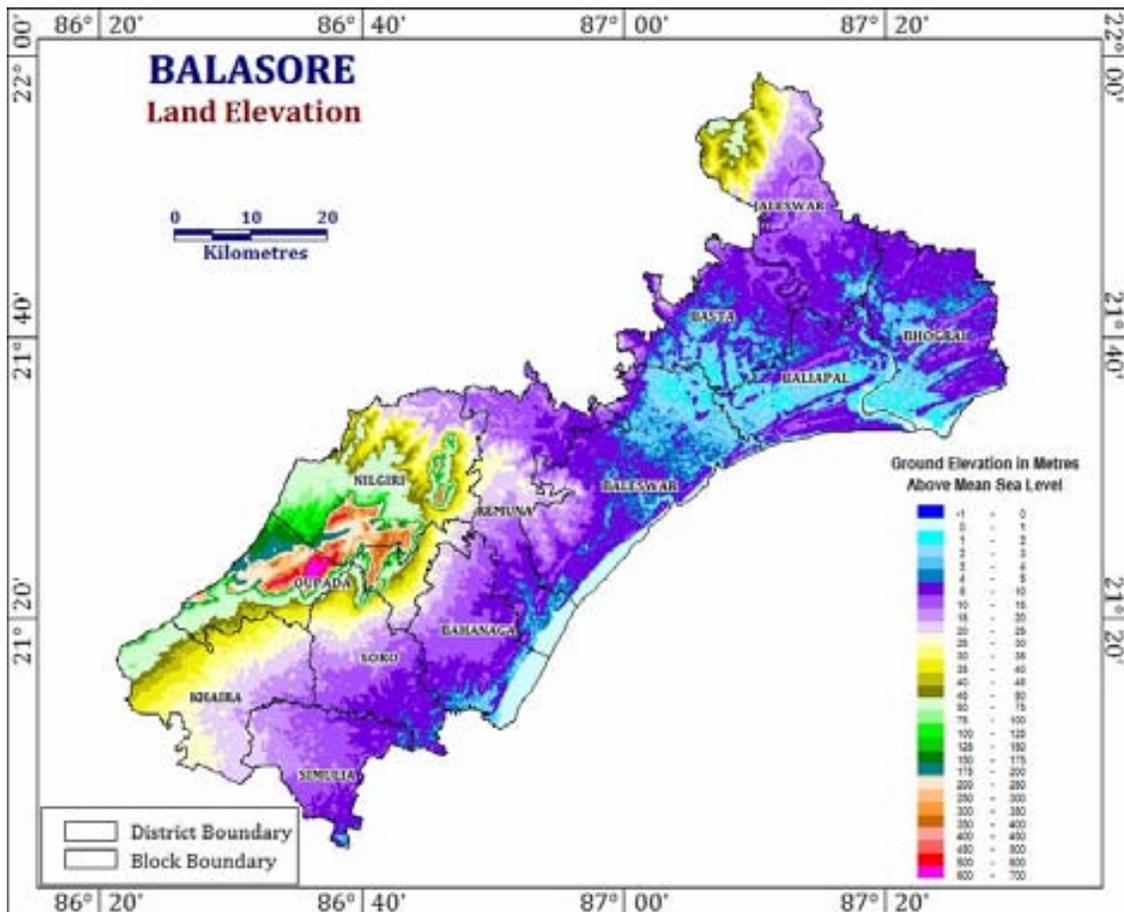
The coastal tract of Orissa is underlain by the Tertiary and Quaternary Formations. Balasore is a unique District in Odisha with varied geology, of these the Tertiaries are least exposed on the surface, whereas the Quaternaries are extensively developed along the coast and further inland. The Quaternary Formations cover almost the entire study area while the Tertiaries are exposed near Baripada town at about 28 km. NNW of the northern boundary of the area. The Pre-Cambrian ciystallines occur as hills and mounds in the west just outside the present area. Chatterji and Raghava Rao (1960) made studies on the sub-surface geology and tectonic framework of sedimentation in the crescentic coastline of Balasore on the basis of the data obtained from the exploratory drilling operations. Exploratory drilling reveals that in the subsurface the warped Pre-Cambrian basement is overlain by Miocene marine sediments, Mio-Pliocene estuarine sediments, laterites and alluvium. The Mio-Pliocene sediments and alluvial sections contain the principal ground water reservoirs. The marine sediments are dominantly composed of finer elastics and non-clastics (Bhatnagar *et al*, 1970). Small outcrops of ultramafic rocks are exposed in and around Bhalukasoni (21°29': 86°42') area under Nilgiri subdivision of Balasore District. Ultramafic rocks comprising serpentinitised dunite, peridotite and pyroxenite largely under soil and laterite cover occur intermittently spreading over an area of 1.8m × 800m. A 100m long E-W trench has exposed two chromite ore bodies on its either end, the dimensions being 500m × 3.5m × 4.5m and 5.5m × 2m × 3.3m. A reserve of the order of 1550 tonnes was estimated with massive and spotted type of chromite with Cr₂O₃ content ranging from 25.77 to

54.76%. These chromite occurrences along with the associated ultramafic rocks are considered to be xenolithic bodies lying within a plutonic mass of gabbroic rocks.

4.1 Physiography & Geomorphology:

Physiography:

The District of Balasore is having unique physiographic setup. It is bounded by the Bay of Bengal in its southern part and in the north western part it is marked by a set of hillocks and mounds including a north east – south west trending Hilly patch in the Nilgiri, Khaira & Oupada Blocks. The land elevation varies from as low as near mean sea level in the southern part to as high as about 600 m above mean sea level in the north western part. In between a major part covering more than 75% of the geographical area is having elevation within the range of 2 – 10 metres above mean sea level. In the extreme eastern part of the District, within the alluvial tracts of the River Subarnarekha & Burhabalang, the average elevation is within 1 – 2 metres above mean sea level.



Geomorphology :

Hydrogeomorphological features of Balasore District are mainly attributed to fluvio-marine, erosional, denudational and depositional processes. The coastal plain has been developed due to fluvio-marine processes. The alluvial plains owe their origin due to various fluvial actions of major rivers. The details of the geomorphic unit as identified are as below:

Coastal Plain: Coastal plain predominantly consists of sand silt and clay is developed all along the coast of Balasore District. It is developed all along the coast of Balasore District. It is a gently sloping plain occurring parallel to the coast. The saline marshy tract with shrubby vegetation comes under this coastal plain. Tidal streams are very active during high tide time. Ground water prospect is good but salinity is a major problem in this tract.

Beach: Beach is mainly formed by marine action. Beach ridges are very common and these are formed due to sea waves. They are mainly consisting of sand mixed with silt etc. Ground water prospect is good within a depth of 30-40 m, where fresh ground water pockets are available. Deep tube wells in these areas may lead to sea water ingress.

Mud flat: This is a relatively marshy area covered with fine silt and mud along the shore. Mangrove vegetation is very common. Ground water quality is mostly saline.

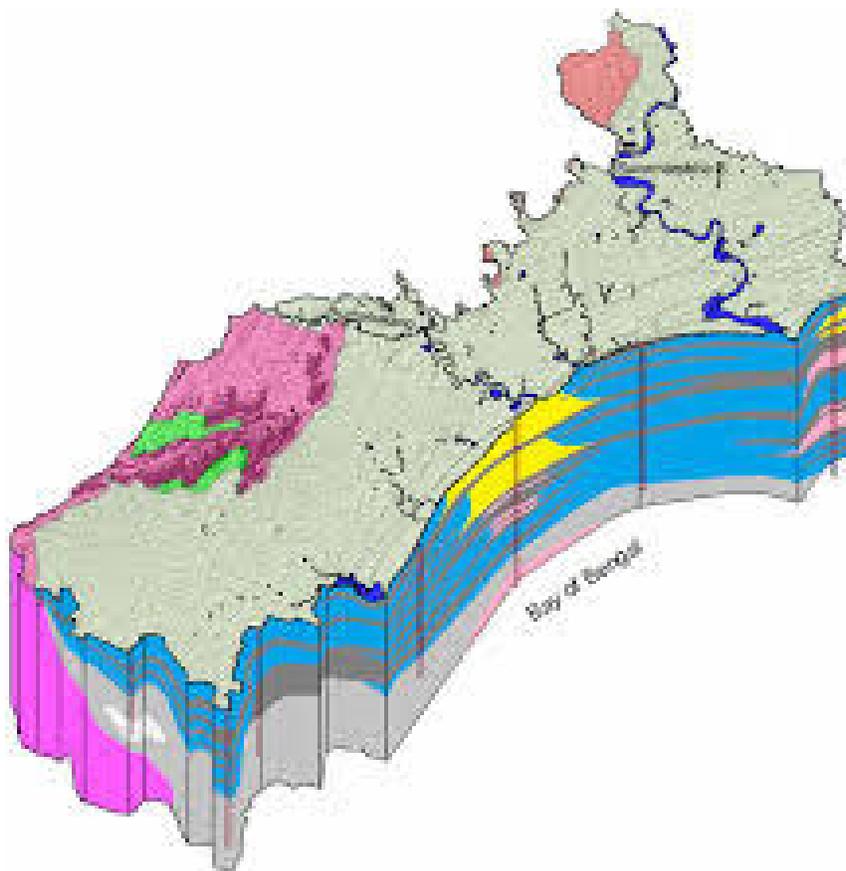
Paleo mud flat: These are the ancient mud flats consisting of fine sand and mud. These are mostly converted to agricultural land in due course of time. Due to marine regression ground water quality is saline.

4.2 Stratigraphy:

The study area comprises the following distinct geomorphic units:

- i) Younger alluvial plain
- ii) Older alluvial plain
- iii) Lateritic upland

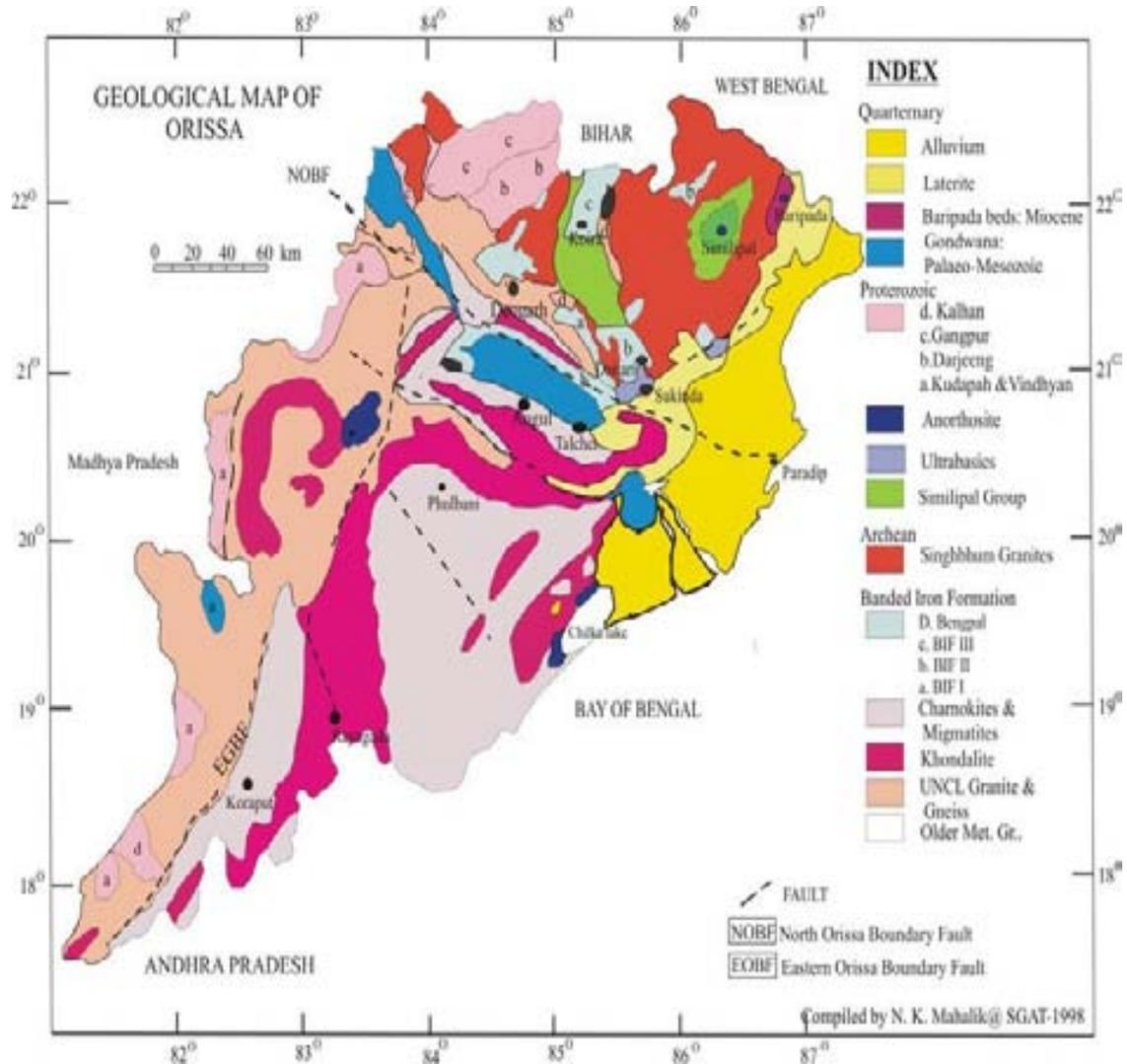
<u>Geological Age</u>	<u>Geological Formation / Group</u>
Quaternary	: Recent Alluvium, Clays, silt, Sand, Gravel
Tertiary	: Older Alluvium, Laterite, Baripada Beds.
Mesozoic/ Palaeozoic	: Volcanics / Epidiorite
Precambrian	: Slate/ Phyllite/ Schist / Gneiss
Archean	: Granite/ Granite Gneiss



4.3 Mineral Resources:

Minerals like soft stones, limestone, stone chips are available in the District, which are mainly used in industrial units in the District. The huge deposits of granite stones at Nilgiri, Khaira, Soro, Jaleswar area provides tremendous scope for development of few more industries based on this resources. Except these, no

minerals in large quantity which can be explored for commercial purpose found in the District.



4.3 Soil:

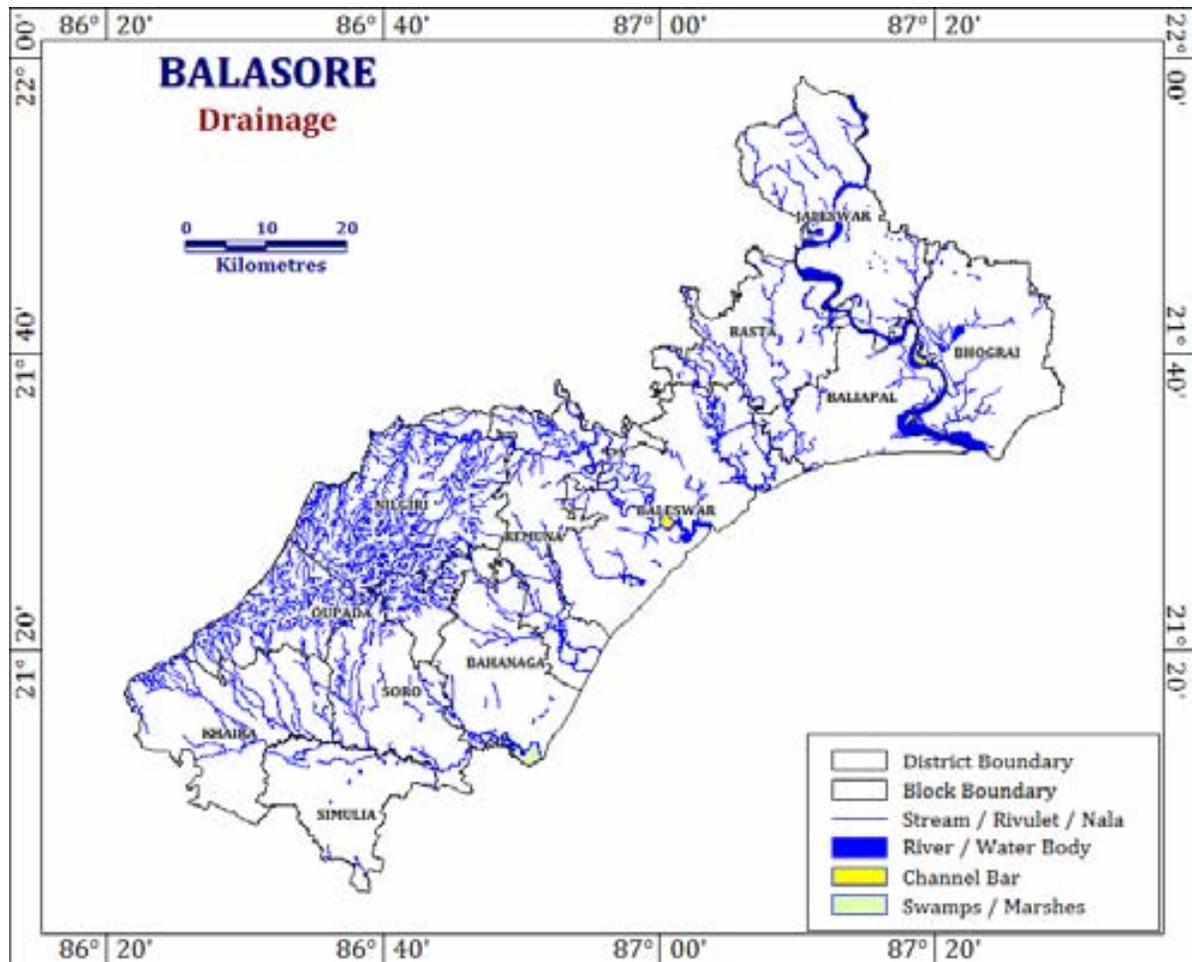
The District comprises chiefly of lateritic, sandy loam and clayey loam type of soil (Figure 3). Laterite soil is mostly marked in the area occupied by crystalline rocks. The low lying valley fields are covered with clayey loam type of soil.

5. DRAINAGE OF IRRIGATION PATTERN

The District has considerable flat land, which provide suitable site for agricultural use. The hilly areas are mostly under forest with patches of cultivation on scarp

areas. Major rivers flowing in the District are Budhabalanga, Subernarekha, jambhira, sona. Major crops grown in the District are rice, Only. 12.21 percent area of agricultural use are net irrigated and major source of irrigations are well and tube wells.

IRRIGATION BY DIFFERENT SOURCES (Areas and Number of Structures)			
Sources of Irrigation	Number	Area in hectare	Percentage of total irrigated area
Canals	3	20.8	8.5
Tanks	35,624	5.6	2.3
Open wells	-	-	-
Bore wells	-	-	-
Lift irrigation schemes	14,034	104.8	43
Micro-irrigation	75	0.1	0.1
Shallow tube well	2239	4.4	1.8
Medium irrigation project	2	3.8	1.6
MIP	32	6.0	2.5
Other		98.1	40.2
Total Irrigated Area		244.0	
Pump sets	321		
No. of Tractors	62		
Irrigation	Area in hectares		
Net irrigated area	Net irrigated area 177.53 ha (97.1 kharif + 80.3 Rabi)		
Gross irrigated area	Gross irrigated area 244.01 (138.9 kharif + 105.0 Rabi)		
Rainfed area	146.3		
Source: SREP and DAO, Balasore			



5.1 River System

The **Budhabalanga River** (also called Balanga River) flows through the Districts of Balasore. The Budhabalanga, rises from the Simlipal hills and plunges through Barehipani Falls, the second-highest waterfall in India, located in Simlipal National Park. Perennial Burhabalang is the main river of the study area. It flows from northwest to southeast. This river is an 'extended consequent,' since it has maintained its original easterly course in the plains and has reached a mature stage of development. The annual flow of water in river Burhabalang is 637 Mm³. Its total drainage area is 4,847 sq. km. This river maintains a sluggish flow in the pre-monsoon period, but swells menacingly with the onset of monsoon often flooding large tracts. Burhabalang and its tributaries, viz. Sona Nadi, Amrutia Nadi, Gangahar Nadi drain almost round the year in the present area. Sona Nadi receives the watery effluent load through a nalah (Sankh nalah) from the Balgopalpur

Industrial Estate and flows from west to east. Amrutia N. flows from NNW to SSE and carries the waste water load of East Coast Fertilizer at Gadadeulia and water laden solid wastes (particularly in rainy season) from the dumping site of Krebs & CIE Ltd. at Kalma. These tributaries join Burhabalang river downstream at Sahupada and Bhimda (outside present area) respectively. There is another local stream, which flows from southwest to northeast, carrying the waste water of Birla Tyres Ltd. at Chhanpur and the industries located at Ganeshwarpur Industrial Estate. This stream too ultimately joins the Burhabalang river near Nuabazar, Balasore town.



6.0 LAND UTILIZATION PATTERN IN THE DISTRICT

6.1 Forest and non forest land

The forest of Balasore District is full of variety of medicinal plants, Kendu leaves, Bamboo, Sal, Teak, other timber species and a wide range of carnivorous & herbivorous wild animals. The District has one Wildlife Sanctuaries known as the Kuldiha Wildlife Sanctuary, which hosts even elephants. The area of the sanctuary is 26, 886.23 hectares. In the sanctuary the principal animals that are found are Elephant, Bear, Nilgai, Sambhar, Peacock, Wild Boar and Deer, together with variety of snakes and birds.

District-wise Forest Cover Area in Odisha (Area in Km²)

2017 Assessment								
District	Geographical Area Km ²	Very Dense Forest	Moderate. Dense Forest	Open Forest	Total	Percent of GA	Change	Scrub
Angul	6375	371	1380	1004	2755	43.22	43	84
Bolangir	6575	70	224	837	1131	17.2	151	142
Balasore	3806	23	127	234	380	9.98	30	48
Bargarh	5837	176	371	484	1031	17.66	88	47
Bouda	3098	263	546	480	1289	41.61	27	57
Bhadrak	2505	0	9	66	75	2.99	2	0
Cuttack	3932	53	226	517	796	20.24	11	68
Deogarh	2940	191	667	614	1472	50.07	-3	14
Dhenkanal	4452	174	418	825	1417	31.83	9	82
Gajapati	4325	84	1490	946	2520	58.27	12	262
Ganjam	8206	164	1075	864	2103	25.63	15	655
Jagatsinghpur	1668	0	5	131	136	8.15	6	0
Jajpur	2899	6	72	225	303	10.45	3	50
Jharsugada	2114	3	140	179	322	15.23	9	36
Kalahandi	7920	362	729	1327	2418	30.53	36	362
Kandhamal	8021	661	2588	2143	5392	67.22	16	380
Kendrapada	2644	84	88	133	305	11.54	14	2
Keonjhar	8303	289	1404	1519	3212	38.68	4	55
Khorda	2813	21	186	250	457	16.25	0	92
Koraput	8807	94	740	1255	2089	23.72	120	944
Malkangiri	5791	158	709	1475	2342	40.44	20	45

Brick Earth/Ordinary Soil Mining**DSR of Balasore District.**

Mayurbhanj	10418	1335	1718	1027	4080	39.16	42	34
Nabarangpur	5291	168	428	507	1103	20.85	8	47
Nayagarh	3890	189	965	556	1710	43.96	28	173
Nuapada	3852	86	482	705	1273	33.05	33	109
Puri	3479	0	54	160	214	6.15	8	11
Rayagada	7073	422	853	1851	3126	44.2	7	349
Sambalpur	6624	499	1675	1106	3280	49.52	13	40
Subarnapur	2337	2	187	161	350	14.98	26	29
Sundargarh	9712	1019	1814	1431	4264	43.9	107	89
Grand Total	155707	6967	21730	23008	51345	32.98	885	4306

(Source: India state of forest report 2017-Odisha)

The major portion of the District is covered by forest (9.98 % of TGA) and has scattered settlement pattern. The forest is full of variety of medicinal plants, Kendu leaves, Bamboo, Sal, Teak and other timber species. The District has considerably flat land, which provide suitable site for agricultural use. The hilly areas are mostly under forest with patches of cultivation on scarp areas. Major crops grown in the District are rice and pulses. Only 12.50 percent area of agricultural use are net irrigated and major source of irrigations are well and tube wells.

Source: Fertilizer and Agriculture Statistics, Eastern Region (2006-2007).

Tahasil	Forest Area	Misc Tree	Permanent Pasture	Cultivated waste	Non Agricultural uses	Barren land	Current Fallow	Other Fallow	Net area sown
Bahanaga	0	714	992	904	2882	0	525	438	24047
Balasore	4	634	3133	2949	6116	1640	531	553	15185
Baliapal	1008	1813	295	2855	4515	0	638	717	16624
Basta	13	198	892	498	4143	0	551	103	12954
Bhogorai	118	3364	1263	5350	4732	59	1025	510	15794
Jaleswar	1716	2045	1396	2455	5422	43	736	334	18713
Khaira	55	630	1544	1210	3508	0	1173	764	18160
Nilagiri	977	289	1444	2343	2312	435	558	188	28280
Oupada	329	374	855	557	1656	0	177	338	19759
Remuna	108	813	1317	2989	5070	10	1073	114	16363
Simulia	5	438	846	576	2677	0	439	889	17646
Soro	1109	441	1121	564	2066	28	295	564	21476
Total	5442								

6.2 Agriculture Land:

The primary objective of Agriculture Department is to increase the production as well as productivity of major crops like Paddy, Groundnut, mustard, Mung, Biri & vegetables which is widely covered in this District in both Kharif & Rabi season. Another key objective is the all round development of the farming community of the District. The Deputy Director of Agriculture is the head of office so far as agriculture is concerned & he is the Principal Agriculture Officer of the District. There are 5 District Agriculture Officers & the Block Level Officers are working under him. As it has already been pointed out, that agriculture is the main livelihood of the people in Balasore District. It is therefore also designated as the food bowl of Odisha. Rice is the principal crop grown in this District, followed by other cereals, pulses, oilseeds, vegetables, spices and sugarcane. The agricultural statistics for the District is shown in subsequent tables below :

Table – 3.6a: Crop Coverage Area of Balasore District, Odisha

Crop	Khariff		Rabi		Annual	TOTAL	
	Area (ha)	(% of Cropped Area)	Area (ha)	% of Cropped Area	Area (ha)	Gross Cropped Area (ha)	% of Gross Cropped Area
Rice	206.14	91.62	33.47	34.38		239.61	72.03
Cereals	0.31	0.14	0.79	0.82		1.10	0.33
Pulses	0.48	0.21	21.64	22.55		22.12	6.65
Oilseeds	0.13	0.06	14.38	20.20		19.51	5.87
Vegetables	13.04	5.80	16.14	16.82		29.18	8.77
Fibres	2.20	0.98	-	-		2.20	0.66
Spices	2.69	1.19	4.08	4.25		6.77	2.04
Sugarcane	-	-	0.46	0.48		0.46	0.14
Tobacco	-	-	-	-		-	-
Fruits	-	-	-	-	11.68	11.68	3.51
TOTAL	224.99	100	95.96	100	11.68	332.63	100

6.3 Horticulture Land:

The primary objective of Horticulture Department is increase of production as well as productivity of major fruits like Mango, Guava, Citrus etc., which is widely covered in this District. Another key objective is the all round development of the farming community of the District. The Deputy Director of Horticulture is the head of office. The horticulture statistics for the District is shown in subsequent tables below:

Horticulture crops	Total Area (hectares)
Mango	4.39
Citrus	0.80
Papaya	0.06
Pineapple	0.04
Guava	0.32
Sapota	0.07

Source: SREP, Balasore. Orissa Agric.

7.0 SURFACE WATER AND GROUND WATER SCENARIO OF THE DISTRICT

7.1 Hydrogeology

Distribution of Saline / fresh water aquifers: The occurrence of fresh water aquifers in coastal tract of Balasore restricted by two important factors-(i) Occurrence of hard rocks in the western side and (ii) Salinity hazard problems in the eastern part. In the narrow tract, close to the coast line extending right from Chandaneswar in the North to Bahanga/ Simulia in the south in the District, salinity problem occurs where both the saline water bearing and fresh water bearing aquifers occurs at different depths. The depth of occurrence of saline water bearing aquifers is not uniform along the entire tract. The study of lithological logs and electrical logs of boreholes and results of zone tests etc. indicate occurrence of saline water either above or below fresh water bearing aquifers and also both above and below the fresh water aquifers,

The width of the coastal saline tract is generally ranging from 4 to 5 km running from Bahanaga to Baliapal Block near Subranarekha river, towards north east it encroaches the inland area but in Bhogarai block its width is to the range from 5 to 10 km . In general the top aquifers up to 150 meter are saline. However, during the detailed studies in the area, it is observed that up to the depth range of 25 to 30m, fresh aquifers are occurring having a thickness of 5 to 15 meters, which are tapped by shallow tube wells. Below 150m the aquifers are fresh up to 220m below which up to 250m below ground level the aquifers are saline. The salinity hazards occur in a narrow tract along the eastern margin adjoining the sea coast and in the rest part of coastal alluvium fresh water occurs all through down to the bed rock. Disposition of fresh and saline water in District is shown as Map No-3. The

occurrence of aquifers and its yield potential etc. are described below.

Non-saline area: The depth of the bore holes varied from 103m to 330 and the depth of the tube wells varied from 96 to 208m. The bed rocks were encountered at Hanspatna (110m) and at Soro (295m).

In the Jaleswar-Basta-Baliapal-Remuna-Balasore tract a group of aquifers usually varies in thickness from 3 to 15m, attains a maximum cumulative thickness of around 40 to 50m. The yield varies from 20 to 66 Ips against the drawdown of pumping water level varying between 5.83 to 15 60m. The static water levels vary from 2.13 to 10.68m bgl. The discharge in general is less in the southern part of this tract.

In the area around Soro and Markona a group of aquifers consisting fine to coarse sands which generally occur below 46m depth attains a cumulative thickness of about 125m and the thickness of aquifers dwindles towards west. The discharge is generally low and varies between 11 to 24 Ips against the draw down more than 15m.

In and around Gopalpur of Bahanaga block aquifers are thin and mixed with finer materials and are low yielding. Also in Kasbajaypur-Bahanga area the formation are predominantly argillaceous in nature and sand horizon are lesser. The yield generally varies between 20 to 30 Ips against the draw down around 20m. In this area auto flowing condition occurs from deeper aquifer blow 200m depths at Soud.

In general in the northern part (north of Balasore town) thickness of aquifers as well as yield is more in comparison to southern part of the District (south of Balasore town).

7.2 Depth of water level:

Categorization of depth to water level of pre-monsoon period (Apr-2015)

No. of wells measured	Depth to water level (m bgl)		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	Max	No.	%	No.	%	No.	%	No.	%
25	2.41	7.81	0		2	8	23	92	0	---

Depth to ground water levels during the post monsoon period (April 2015) varied between 2.41 and 7.81 m bgl Categorization of depth to water level of post-

monsoon period (November 2012) for HNS in Balasore District is presented below in table

Categorization of depth to water level of pre-monsoon period (Nov-2015)

No. of wells measured	Depth to water level (m bgl)		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	Max	No.	%	No.	%	No.	%	No.	%
34	1.08	5.18	6	17	27	79.4	1	2.9	0	

7.3 Ground Water Quality

Ground water in the phreatic aquifers in Balasore District slightly alkaline in nature, which is also colourless, odourless. The specific electrical conductance of ground water in phreatic zone at 25°C. The suitability of ground water for drinking purpose has been evaluated on the basis of pH, Total hardness (T.H), Ca, Cl, F and NO₃. The chemical concentration of these constituents is presented.

7.4 Ground Water Development

In the rural areas the entire water supply is dependent on ground water. Ground water development is mainly carried out in the District through dug wells and Hand pumps. In general dug wells are of 2 m diameter and the depth ranges between 8 to 15 m depending on the thickness of the weathered zone, tapping the shallow aquifer in the weathered zone and uppermost slice of the basement. Large number of dug wells used for drinking water is under private ownership for which there is no reliable data. Over the years Mark II/ Mark III hand pumps are being drilled in large numbers for ground water development. These hand pumps have the following two major advantages i) less susceptible to contamination from surface sources and ii) tap fractures between 20-60m depth which have been found to be less affected by seasonal water level fluctuation and thus have lesser chances of failure even during extreme summer. In rural areas of Balasore District the number of hand pumps drilled by PHED is 12311 of which 9342 are under working condition. There are 574 dug wells constructed by government departments that are under regular use. In the urban areas ground water plays a supplementary role in water supply, the major supply being made through dams, reservoirs or weirs across rivers

or streams. No authentic data is available on the number of ground water structures catering the urban water supply.

As per the latest ground water resource estimation carried out adopting GEC 97 methodology, the overall stage of ground water development in Balasore District has been found to be 41 % indicating enough scope for future development. The ground water resources of Balasore District is given in the table

7.5 Ground Water Related Issue and Problems

Some of key ground water related issues are

- I. Locating suitable sites for bore wells
- II. Suitable design of dug wells and hand pumps
- III. Taking up artificial recharge projects to augment the resource availability in Balasore District.
- IV. Optimal development of irrigation potential by developing ground water available for future uses.
- V. Creating public awareness for conserving ground water through awareness camps, NGO's and mass media.

7.6 Mass Awareness Campaign (MAP) & Water Management Training Programme (WMTP) by CGWB

NIL

7.7 Area Notified by Cgwb/Sgwa

None

7.8 RECOMMENDATIONS

As the District suffers from water scarcity, it is recommended to take artificial recharge at suitable locales. On the basis of the hydrogeological criteria such as post monsoon water level below 7 m bgl indicating availability of sufficient space in the unsaturated zone to retain additional water and availability of surplus surface runoff, 250 Sq kms area in Balasore District has been demarcated as suitable for artificial recharge. Through this 41.25 mcm water can be recharged.

In the hard rock areas, pin pointing suitable sites for bore wells is always a challenge. Considering the anisotropy in distribution of fractures at deeper level, suitable sites may be selected using remote sensing techniques in association with geophysical and hydro- geological investigations.

For deriving optimal benefit from aquifers in areas under fissured formation, the dug wells should be designed to penetrate the weathered zone as well as top part (1-2 m) of the underlying bed rock, so as to get the full benefit, from the total thickness of the shallow aquifer. For hand pumps and shallow tube wells the casing provided against the weathered zone should be slotted at the bottom so that the well can extract shallow ground water also. In urban areas use of shallow aquifers should be encouraged.

The surface run off in urban areas and its peripheral parts should be harnessed to augment the ground water resource through appropriate recharge techniques. For urban areas roof top rain water harvesting and artificial recharge is most suitable. Location and design of the structures should be guided by findings from hydrogeological and geophysical surveys. Sites for artificial recharge should be taken up at places where sufficient thickness of weathered zone as well as fracture/fracture zones is available. The depth of the recharge well should be governed by the depth of occurrence of the fractures.

8.0 RAINFALL OF THE DISTRICT AND CLIMATE CONDITION

8.1 Month wise rainfall:

The driest month is November, with 31 mm of rain. There is on average 3 mm of precipitation in December. In July, the precipitation reaches its peak, with an average of 313.98 mm.

Year		2016	2017	2018	Average
Sl. No.	Month	(mm)	(mm)	(mm)	(mm)
1	Jan	18.33	00	00	6.11
2	Feb	49.92	00	00	16.64
3	Mar	6.42	105.29	6.23	39.32
4	Apr	18.33	18.50	162.62	64.48
5	May	224.33	165.98	144.39	178.23
6	Jun	165.05	164.28	268.94	199.42
7	Jul	303.49	317.98	320.48	313.98
8	Aug	334.98	276.51	341.13	317.54
9	Sep	308.00	198.01	346.48	284.16
10	Oct	153.10	251.58	243.31	215.99
11	Nov	46.43	47.20	00	31.21
12	Dec	00	5.08	4.97	3.35
Total		1628.38	1550.41	1838.55	1672.44

The Indian Meteorological Department, Bhubaneswar, vide letter No. BBS/RMC/CS-312, dated 18th January, 2016 has provided the period of Rainy Season viz. Normal dates of Onset and Withdrawal of South West Monsoon over India as state-wise. The duration for the period is 10th June to 15th October.

8.2 Climate

The climate in Balasore is warm and temperate. In winter, there is much less rainfall in Balasore than in summer. The Köppen-Geiger climate classification is Cwa. The average temperature in Balasore is 24.7 °C.

Temperature Graph- Balasore

May is the warmest month of the year. The temperature in May averages 32.3 °C. January has the lowest average temperature of the year. It is 16.5 °C.

Source: Indian Meteorological Department.

9.0 DETAILS OF MINING LEASE OF BRICK EARTH IN THE DISTRICT

No Quarry lease has been granted.

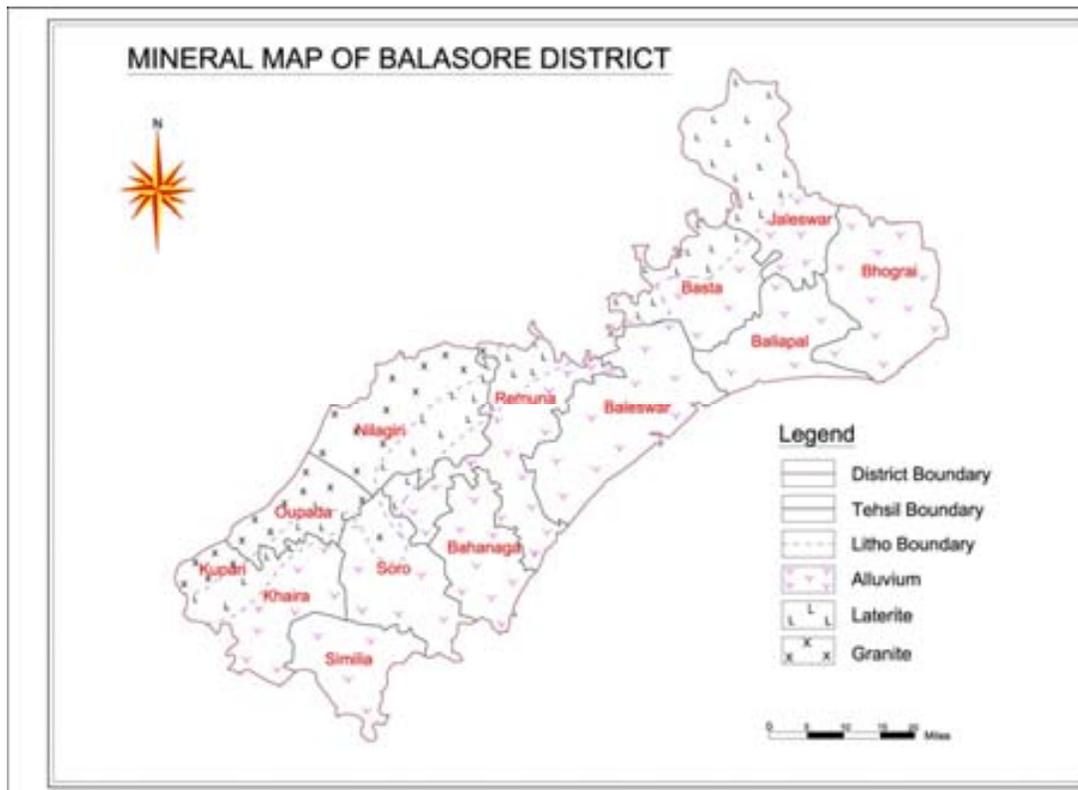
10. DETAIL OF ROYALTY OR REVENUE RECEIVED IN LAST THREE YEARS:

Sl. No.	Name of the Tahasil	2016-17	2017-18	2018-19	Total Amount (Lakh)
1	Bahanaga	Nil	Nil	Nil	Nil
2	Balasore	Nil	Nil	Nil	Nil
3	Baliapal	Nil	Nil	Nil	Nil
4	Basta	Nil	Nil	Nil	Nil
5	Bhogarai	Nil	Nil	Nil	Nil
6	Jaleswar	Nil	Nil	Nil	Nil
7	Khaira	Nil	Nil	Nil	Nil
8	Nilgiri	Nil	Nil	Nil	Nil
9	Oupada	Nil	Nil	Nil	Nil
10	Remuna	Nil	Nil	Nil	Nil
11	Simulia	Nil	Nil	Nil	Nil
12	Soro	Nil	Nil	Nil	Nil
Grand Total				Nil	Nil

11. DETAIL OF PRODUCTION OF MINOR MINERALS IN LAST THREE YEARS:

Sl. No.	Name of the Tahasil	2016-17	2017-18	2018-19	Total Quantity (Cubic meter)
1	Bahanaga	Nil	Nil	Nil	Nil
2	Balasore	Nil	Nil	Nil	Nil
3	Baliapal	Nil	Nil	Nil	Nil
4	Basta	Nil	Nil	Nil	Nil
5	Bhogarai	Nil	Nil	Nil	Nil
6	Jaleswar	Nil	Nil	Nil	Nil
7	Khaira	Nil	Nil	Nil	Nil
8	Nilgiri	Nil	Nil	Nil	Nil
9	Oupada	Nil	Nil	Nil	Nil
10	Remuna	Nil	Nil	Nil	Nil
11	Simulia	Nil	Nil	Nil	Nil
12	Soro	Nil	Nil	Nil	Nil
Grand Total					Nil

12. MINERAL MAP OF THE DISTRICT:



13. LIST OF LETTER OF INTENT (LOI) HOLDERS IN THE DISTRICT ALONG WITH ITS VALIDITY

Nil

14. TOTAL MINERAL RESERVE AVAILABLE IN THE DISTRICT

Total mineral reserve of Brick Earth will access after deatila study or grant of potential area, which may investigate as per details below.

- (i) Blocks were identified based on geological studies through field observation.
- (ii) Mineable resource was calculated by considering detail prospecting.
- (iii) Area calculated as per GPS co-ordinates and information obtained from local people. Land detail need to be verified from revenue record.
- (iv) Since this is an interim report, as per the present requirement of minerals, more such blocks need to be identified and the data should be updated periodically, after certain intervals to update the data bank of DSR.

Summary of Identified Mineral Potential:

Sl. No.	Name of the mineral	Name of the lessee	Address and contact No. of the lessee	Letter of Intent Grant Order No. and date	Area of mining lease to be allotted	Validity of LoI	Use (Captive / Non-Captive)	Location of the Mining lease (Latitude & Longitude)
1	2	3	4	5	6	7		
Nill up to till now								

15. QUALITY/GRADE OF MINERAL AVAILABLE IN THE DISTRICT**Brick Earth found in District:-**

Earth of the District is very much suitable for making of Brick which is used various construction purposes.

Use of Mineral:

Earth of the District is used mainly for making of bricks, also the earth is used in filling in various construction activities.

16. DEMAND AND SUPPLY OF THE MINERAL IN THE LAST THREE YEARS:

As such there are huge infrastructural activities such as road, building, railways are coming up by Govt. of India & PSUs under "Make In India" programme.

It is proposed to start the earth production for captive use in Brick Industry from larger block/area to at least double the production of the District which will enhance the revenue of the District and also support the livelihood of the local people.

17. MAP OF EXISTING MINING LEASES IN THE DISTRICT:

Enclosed as Plate-I

18. DETAILS OF THE AREA OF WHERE THERE IS A CLUSTER OF MINING LEASE VIZ. NUMBER OF MINING LEASES, LOCATION (LATITUDE AND LONGITUDE)

Nil

19. DETAILS OF ECO-SENSITIVE AREA, IF ANY, IN THE DISTRICT:

Eco sensitive zone of Kuldiha wild life sanctuary is located within the District.

20. IMPACTS OF MINING ON ENVIRONMENT:

The most important environmental impact of mining projects are:-

Acid mine drainage and contaminant leaching

Acid mine drainage is considered one of mining most serious threats to water resources. A mine with acid mine drainage has the potential for long-term devastating impacts on rivers, streams and aquatic life. If mine waste is acid-generating, the impacts to fish, animals and plants can be severe. Many streams impacted by acid mine drainage have a pH value of 4 or lower – similar to battery acid. Plants, animals, and fish are unlikely to survive in streams such as this.

Transportation sources:

Transpiration sources of air pollutants include heavy vehicles used in excavation operations, cars that transport personnel at the mining site, and trucks that transport mining materials. The level of polluting emissions from these sources depends on the fuel and conditions of the equipment. Even though individual emissions can be relatively small, collectively these emissions can be of real concern. In addition, mobile sources are a major source of particulate matter, carbon monoxide, and volatile organic compounds that contribute significantly to the formation of ground-level ozone

Stationary sources:

The main gaseous emissions are from combustion of fuels in power

generation installations, and drying, roasting, and smelting operations. Many producers of precious metals smelt metal on-site, prior to shipping to off-site refineries. Typically, gold and silver is produced in melting/fluxing furnaces that may produce elevated levels of airborne mercury, arsenic, sulfur dioxide, and other metals

Fugitive emissions:

Common sources of fugitive emissions include: storage and handling of materials; mine processing; fugitive dust, blasting, construction activities, and roadways associated with mining activities; leach pads, and tailing piles and ponds; and waste rock piles. Sources and characteristics of fugitive emissions dust in mining operations vary in each case, as do their impacts. Impacts are difficult to predict and calculate but should be considered since they could be a significant source of hazardous air pollutants.

Noise and vibration:

Noise pollution associated with mining may include noise from vehicle engines, loading and unloading of rock into steel dumpers, chutes, power generation, and other sources. Cumulative impacts of shoveling, ripping, drilling, blasting, transport, crushing, grinding, and stock-piling can significantly affect wildlife and nearby residents.

Vibrations are associated with many types of equipment used in mining operations, but blasting is considered the major source. Vibration has affected the stability of infrastructures, buildings, and homes of people living near large-scale open-pit mining operations. According to a study commissioned by the European Union in 2000: "Shocks and vibrations as a result of blasting in connection with mining can lead to noise, dust and collapse of structures in surrounding inhabited areas. The animal life, on which the local population may depend, might also be disturbed."

22. REMEDIAL MEASURES TO MITIGATE THE IMPACT OF MINING ON THE ENVIRONMENT:

1. Following are the remedial measures to mitigate the im Water sprinkeling on haul road, loading and unloading points.
2. Plantation along the safety zone and dump area.

3. Providing dust masks to workers.
4. Regular monitoring of ambient air quality.
5. Provision of air conditioned cabin of Excavators and Dumpers.
6. Regular and proper maintenance of working equipments.
7. Periodic medical examination of the workers and organize medical camp in the area.
8. Use Milli Second Delay Detonator in blasting operation.
9. Provisions of ear plug to the workers.
10. Regular training praogram to the mines workers and operators.

23. RECLAMATION OF MINED OUT AREA

Necessity of Reclamation & Rehabilitation:

- Exponential growth in mineral production since 1980.
- Mining activities causes physical, chemical, biological and socio-economic changes in the area.
- Surface mining activities disturb the original land profile.
- In India, mineral production comes mostly from opencast mines & hence Land degradation problems is of serous concern.
- An intricate, in-depth and site-specified techniques involving integrated approach is necessary.

Reclamation has three vital roles:

- i. **Reclamation** – Reclamation means return the mined-out land with useful life. It implies restoring the land to a form and productivity that is useful and inconfromiti with a prior land use. Reclamation always may not be a single- phase operation.
- ii. **Rehabilitation** – Rehabilitation is to bring bach the degraded land to a normal stage by a special treatment. It is a process of taking some mitigation measures for disturbed environmental condition created through mining activities.
- iii. **Restoration** – Restoration is the process of returning the mined out land being fit to an acceptable environmental condition. However, the general acceptable meaning of the term is bringing the disturbed land to its original form. Restoration is often used to indicate that biological properties of soil are put back ot what they were. This is a rate phenomenon.

iv. When active mining ceases, mine facilities and the site are reclaimed and closed. The goal of mine site reclamation and closure should always be to return the site to a condition that most resembles the pre-mining condition. Mines that are notorious for their immense impact on the environment often made impacts only during the closure phase, when active mining operations ceased. These impacts can persist for decades and even centuries.

Mine reclamation and closure plans must describe in sufficient detail how the mining company will restore the site to a condition that most resembles pre-mining environmental quality; how it will prevent – in perpetuity – the release of toxic contaminants from various mine facilities (such as abandoned open pits and tailings impoundments); and how funds will be set aside to insure that the costs of reclamation and closure will be paid for.

Proposed future land use after reclamation:

a. Forestry, b. Recreation, c. Water Reservoir, d. Crop Land, e. residential/Commercial, f. Fish & wildlife Habitat, g. Undeveloped Land, h. Grazing/Pasture Land

Statutory requirement:

As per the Mineral Conservation Development Rule, 2017, the following rules must be bare in mind by the mine owner/agent/manager, which is a part of reclamation activities –

Rule 22, Mine Closure Plan

Rule 23, Submission of Progressive Mine Closure Plan Rule 24, Submission of Final Mine Closure Plan

Rule 26, Responsibility of holder of mining lease Rule 27, Financial Assurance

Rule 35, Sustainable Mining

24. RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN:

Mining activity because of the very nature of the operation, complexity of the systems, procedures and methods always involves some amount of hazards. Hazard identification and risk analysis is carried for identification of undesirable events that can leads to a hazard, the analysis of hazard mechanism by which this undesirable event could occur and usually the estimation of extent, magnitude and likelihood of harmful effects. The activities which can cause high risk related to face stability and

the person blasting the shots. It was observed that on a working face of the mine, there were large cracks and unsupported rocks were present, which can lead to a serious hazard and injure workers engaged in loading operation and machineries because of rock falls or slides. This type of condition turn out because improper dressing of the bench and improper supervision. To avoid the hazards due to fall of rocks the face must be examined, made suitable for working and the remedial measures must be taken to make it safe if there is any doubt that a collapse could take place. Working of the face should be in the direction taking into account the geology of the area such that face and quarry side remain stable. Another major risk identified in mines is due to the firing of explosive by an unqualified person. In the mines there is problem of fly rocks and the village is located close to the mine and so it is rated high as it can affect may people. Explosives by nature have the potential for the most serious and catastrophic accident. Planning of round of shots, holes correctly drilled, direction logged, weight of explosive suitable for good fragmentation are the few of the steps necessary to ensure its safe use and if the shots are not properly designed can result in misfires, early ignition and flying rocks. No person is allowed to use explosives without being properly trained in its handling. In the mine a large numbers of heavy vehicles were in operation and the roads were not proper for haulage purpose. The haulage roads were not even and were not wide enough for the crossing purpose and hence the chances of hazards are very high. The main hazards arising from the use large earth moving vehicles are incompetent drivers, brake failure, lack of all-around visibility from the driver position, vehicle movements particularly reversing, roll over, and maintenance. Those most at risk are the driver and pedestrians likely to be struck by the vehicle, and drivers of smaller vehicles, which cannot be seen from the cabs of large vehicles. Edge protection is always necessary to prevent inadvertent movement over the edge of roadway or a bench. Seatbelt will protect driver in case of roll. Good maintenance and regular testing are necessary to reduce the possibility of brake failure. Access to the vehicles should always be restricted to those people necessary for the work in hand. The use of personal protective equipment and proper arrangements is essential to check if the person is wearing protective equipment or not. The personal protective equipment includes helmet, non-skid safety boots,

safety glasses, earmuffs etc. The required personal protective equipment should be provided and used in a manner that protects the individual from injury. Few minor injuries which can be prevented are slip, trip, or fall hazards; hazards due to rock falls and collapse of unstable rocks, atmosphere containing toxic or combustible gases; protects from chemical or hazardous material etc. A disaster management plan should be prepared for taking care of for any disaster. Other risk which are included in this category are noise, as it occurs and it can lead to permanent disability. There are problems related to road traffic in and out issuers; inappropriate exposure of moving machines; mechanical failure and because of large number of moving trucks and dumpers there is large quantity of dust present in roadways which affects the operators and can lead to accidents causing injury. They are in acceptable range because of precautions measures taken but no step is taken it can cause hazard hence steps should be taken to reduce the hazards such as for dust suppression system should be installed. Other problems like occurrence of lots of mosquitoes in the area due to unhygienic conditions which affect the human health causing malaria, dengue etc. and causing a person to be hospitalized.

Disaster in the mines like fires, explosions, entrapments, and inundations can occur any time, so emergency preparedness is a must. The Disaster management plan and risk assessment in the mines will include all sorts of above mentioned emergency and the extent that this plan will be implemented will depend on the nature and scope of the emergency. The basic purpose of Disaster management plan and risk assessment to ensure that mine rescue and recovery activities are conducted safely for rescuer and survivors. According to MMR act 1961 a standard operating procedure should be drawn for involvement different category of staff and officers. The SOP should be updated periodically to reduce the chaos and response to the emergency should be quick and smooth. The responsible person should be familiar with his responsibility during the mock drills. One or two standby should be there to replace the person in Emergency situation. Rescue operations should not include the survivors for any assistance.

First Information of Disaster / Emergency should go to the attendance clerk on duty. Duties of attendance Clerk (Emergency Siren) the attendance clerk or other

designated person should on getting information of major accident, sound a hooter or a siren immediately declaring a state of emergency at the mine and then to contact the manager and on his advice to call key personnel using the information listed in the Emergency Organization Chart. It is important that all telephone calls are recorded in a telephone log book. Duties of Other Officials should be displayed and handed over to all concerned. Copy the same should be kept at Manager's Office for ready reference. Establishment of Control Room at Unit Level, Area Level and Company Level is essential. Control Room should keep the contact information about –

- Company Manager
- Company owner/ Administrative officer.
- District Administration
- Govt. Hospitals in Nearby Localities,
- Private Nursing Homes of Localities

Attendance roaster and duty charge register should be properly maintained so the record of missing people can be obtained.

25. DETAILS OF THE OCCUPATIONAL HELTH ISSUE IN THE DISTRICT:

The persons employed in the mines are exposed to a number of hazards at work which adversely affect their health. Some of the important ones are dust, noise, heat, humidity, vibration etc. In recent times, there has been increasing awareness among mining industry and the workers about occupational diseases such as Coal Worker's Pneumoconiosis, Silicosis, Manganese Poisoning, Hearing Impairment etc. caused by exposure to health hazards at work. Almost all occupational diseases are known to cause permanent disablement and there is no effective treatment. However, most of the occupational diseases can be prevented by adopting proper occupational health measures and engineering control on airborne dust at workplace.

Following diseases have been notified as the diseases connected with mining operations for the purpose of sub-section (1) of Section 25 of the Mines Act, 1952: S.R.O. 1306 dated the 21st July, 1952

1. Silicosis

2. Tuberculosis

Total Number of TB cases in Balasore District of last 5 years

Year	No. of Cases
2015	2072
2016	1823
2017	1775
2018	1960
2019 till Aug	1374
Total	9004

S.R. O. 2521 dated the 26th June, 1986

Cancer of lung or the stomach or the pleura and peritoneum (i.e. mesothelioma)

25 S.O. 399(E) dated 21st February, 2011

1. Noise Induced Hearing Loss
2. Contact Dermatitis caused by direct contact with chemical.
3. Pathological manifestations due to radium or radioactive substances

System of Detection of Occupational Diseases in Mines In order to detect occupational diseases the industry is required to conduct medical examinations and health surveillance of workers as per the provisions of Mines Act. The present efforts of mines management are concentrated on detection of silicosis, Pneumoconiosis and other notified diseases. Very little attention is paid to other occupational diseases. The essential features of health surveillance programme required to be carried out in mines are:

- (a) Initial Medical Examination of persons to be employed in mines.
- (b) Periodic Medical Examination once every five years. General physical examination, chest radiographs, lung function tests and audiometry.
- (c) Classification of chest radiographs of workers as per ILO Classification.
- (d) Medical examination within one year of superannuation. Evaluation of all cases of suspected pneumoconiosis by Pneumoconiosis Medical Board.
- (f) Maintenance of medical records till the person is in service and 10 years thereafter. The cases of silicosis detected during health surveillance programme are referred to Pneumoconiosis Medical Board of the mining companies for evaluation

and certification. If certified, the case is notified to the enforcement authority and evaluated for disability and payment of compensation. Many cases of silicosis and other pneumoconiosis go undetected and a large number of cases of silicosis are misdiagnosed due to lack of training of medical professionals.

26. PLANTATION GREEN BELT DEVELOPMENT IN RESPECT OF LEASE ALREADY GRANTED IN THE DISTRICT:

During mining operation green belt development through plantation is most important for environment safe guard, which should be supervision by mining department. Different type of species should be planted near lease periphery to keep environment clean at post mining period through reclamation. Where specific usefulness of land could be decided, afforestation is normally planned through the site could have been considered for better possibilities of land use.

27. CONCLUSION:

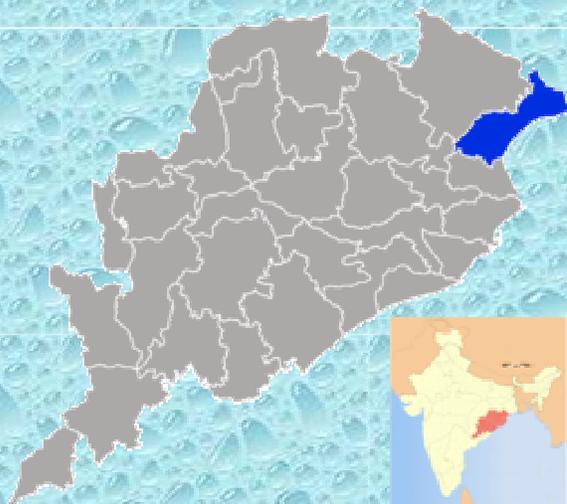
Since it is an interim report, to meet the requirement of minerals in the present scenario, it is proposed to identify such potential areas at certain interval and get the data bank of DSR to be updated. The insitu mining activity in any area is on one hand bring revenue and employment (Direct and indirect) and on other hand if not done properly potential pollution and ecological imbalance increases, the ability of the ecosystem can also be reduced. Particulate matter transported by the wind as a result of excavations, blasting, transportation of materials, heavy equipments used raise these particulate levels; and Gas emissions from the combustion of fuels in stationary and mobile sources, explosions, and mineral processing. All these activities indirectly affected the biodiversity of area. Larger potential and smaller areas have been identified in Balasore District on the basis of geological study carried out during field observation, which can be considered for mining concession after all the parameters for statutory clearances are verified by consulting with concerned authorities.



DRAFT DISTRICT SURVEY REPORT (DSR)
OF
BALASORE DISTRICT, ODISHA.
FOR
MORRUM
(FOR PLANNING & EXPLOITATION OF MINOR MINERAL RESOURCES)

ODISHA

BALASORE



As per Notification No. S.O. 3611(E) New Delhi
dated 25th July 2018 of
Ministry of Environment, Forest & Climate Change
(MoEF & CC)

COLLECTORATE BALASORE.

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PREAMBLE

Odisha is one of the major mineral rich State in India. Balasore is a unique District in Odisha lies on the northern most part of the State with rich and varied mineral resource. It is a paradise for Geoscientists of India and abroad. It has preserved many important rock groups from earliest of crust formation to the Geologically recent times. The landmass constituting the Balasore District, explorers to many Entrepreneurs on account of its diverse geological setting and rich and varied mineral resources.

In pursuance MoEF & CC Notification S.O. 141(E) dated 15th Jan. 2016, District Environment Impact Assessment Authority (DEIAA) & District level Expert Appraisal Committee (DEAC) has been formed for Category –B2 Minor Minerals having area less than or equal to 5 ha. Prior to the formation of Odisha Minor Mineral Concession Rule 2004, (OMMCR -2004) the mining operation for minor mineral were carried out in unscientific manner. Identifying this fact in exercise of power, Conferred by Section 15 by Mines and Minerals (Development and Regulation) Act 1957 as amended in 2015 and all other powers enabling it in that behalf, the industry Mines & Geology Department, Govt. of Odisha framed the aforementioned rule, which has been amended with period of times in the year 2014, 2015 and 2016.

Keeping in view of experience gained in period of decade, the MoEF & CC came out with Environmental Impact Assessment Notification S.O.-1533(E) dated 14th Sept. 2006. It has been made mandatory to obtain Environmental Clearance for different kinds of development projects as listed in Scheduled -I of notification. Further, pursuance of the order of Hon'ble Supreme Court Petition (C) No. 19628-19629 of 2009, dated 27th Feb. 2012 In the matter of Deepak Kumar etc., Vs State of Haryana and others etc., prior environmental clearance has now become mandatory for mining of Minor Minerals irrespective of the area of Mining Lease. And also in view of the Hon'ble National Green Tribunal, order dated the 13th Jan. 2015 the matter regarding Sand, Morrum, & burrowed earth cutting for Road Construction has to take prior E.C. for Mining Lease irrespective of the fact that whether the area involved is more or less than 5 hectares. They also suggested to make a policy on

E.C for minor minerals lease in cluster.

MoEF & CC in consultation with State Government has prepared Guidelines on Sustainable Sand Mining & Minor minerals other than sand mining in 2016, detailing the provisions on Environmental Clearance for cluster. Creation of District Environmental Impact Assessment Authority (DEIAA) & proper monitoring of Minor Minerals. Mining, using Information Technology to track the mineral out material from source to destination.

DEAC will scrutinize and recommend the prior environmental clearance of mining of minor mineral to DEIAA on basis of District Survey Report. This will model and guiding document which is a compendium of available mineral resources, geographical setup, environmental and ecological set up of the District and replenishment of minerals and is based on data of various departments, published reports, Journal and websites. The District Survey Report will form the basis for application for Environmental Clearance, preparation of reports and appraisal of projects. District Survey Reports are to be reviewed once in every five years as per statue, however this is an interim report, which will be updated at regular intervals. In line with above guideline Chief Secretary of Government of Odisha issued a letter to all DEIAA, to prepare a District Survey Report as per guideline of sustainable sand mining & other than sand mining as minor mineral mining guidelines with the assistance of Irrigation Department, Forest Department, Mining & Geology Departments, considering the recent amendment S.O. 3611 (E) dated 25th July, 2018.

The Main objective of the preparation of District Survey Report is to ensure the following:-

1. Identification of Mineral Resources in the District.
2. Identification of areas of minor minerals having the potentiality where mining can be allowed.
3. Identification of area and proximity to infrastructure and installations where mining should be prohibited.

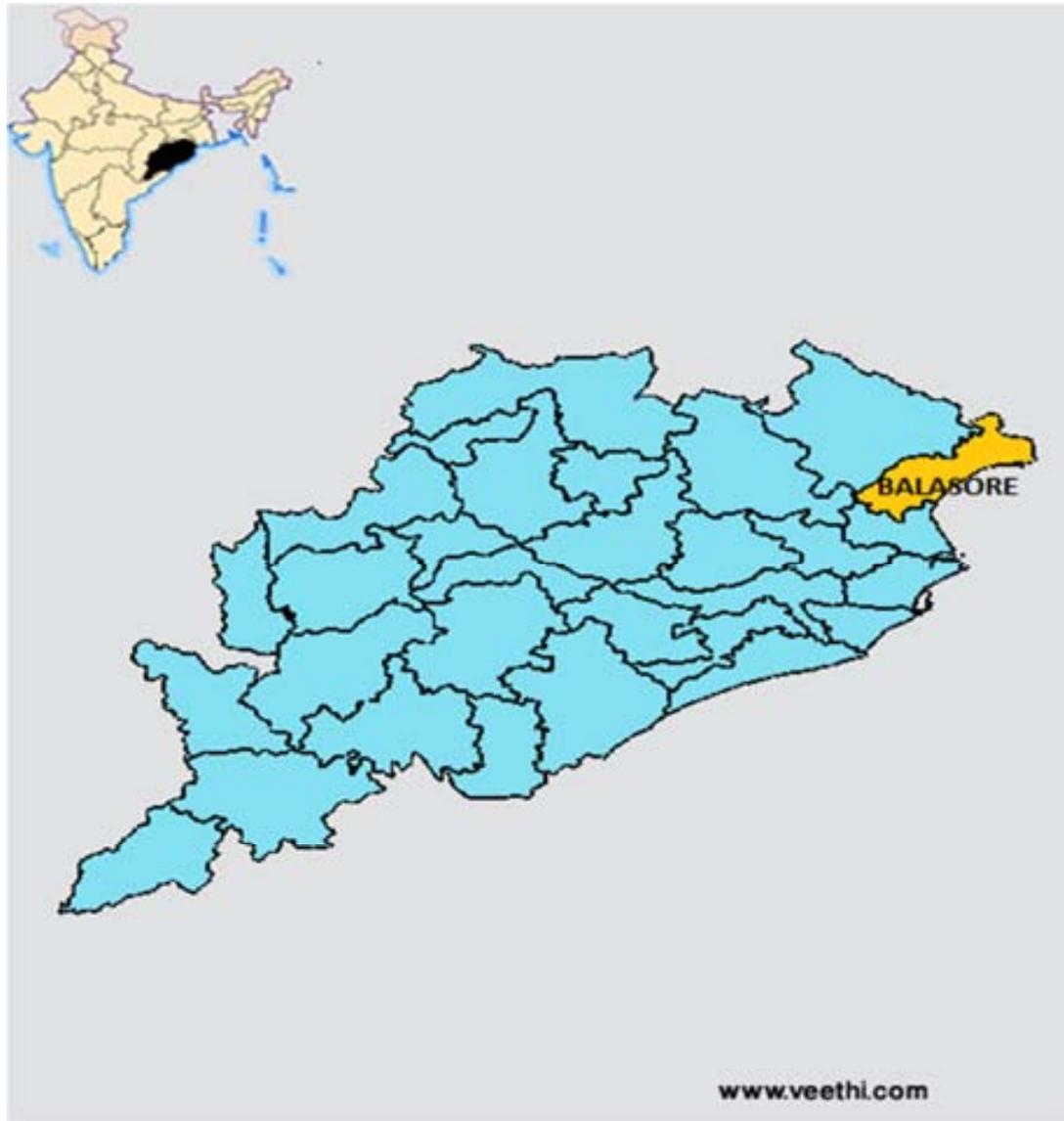
1. INTRODUCTION

Balasore at a Glance:

1.1 Location and Geographical Area:

Balasore is one of the coastal Districts of Odisha. Balasore is the District Head Quarter, spreading over an area of 3634 sq.km lies between 20° 48' North and 21° 59' North latitudes and 86°16' and 87°29' East longitudes. The District is surrounded by Medinipur District of West Bengal in its Northern side, Bay of Bengal in its East, Bhadrak District in its South and Mayurbhanj & Keonjhar Districts lies on its Western side. It is best known for Chandipur Beach. The Indian Ballistic Missile Defense Program's Integrated Test Range is located 18 km south of Balasore. It is the largest city of North Odisha. This District consists of two Sub-Divisions namely Balasore and Nilagiri. There are 12 Tahasils for 12 Blocks of the District. Balasore is the main town of the District and is also its centre of economic growth. The primary occupation of people in the District is cultivation. This District is mainly known for cultivation of paddy, because rice is the staple cereal of the local people. Hybrid varieties of seeds are being developed and land reform programs are being planned for the maximum usage of the wastelands, promising to enhance the District's economic stability in the near future. Industries, Agriculture, Fishing and Tourism are the four major revenue sources of Balasore District. Birla Tyres, Balasore Alloys Limited, Emami Paper Mills Limited and Polar Pharma India Limited are some of the large-scale industries functioning in this District. Balasore occupies a unique position being endowed with lush green vegetation, different fauna & flora and rich cultural heritage. Being an agrarian economy, agriculture is the main stay of the people of Balasore District. It is in the coastal section of Odisha blessed with hot and humid climate, with alluvium soil and intersected by the perennial rivers, which collectively provides conducive infrastructure for the growth of agriculture in the region. Rice, Pulses, oil seeds like Groundnut, Mustard, Castor and Linseed are grown in the District of Balasore. The District has a rich mineral base of soft stones, limestone, stone chips are available in the District, which are mainly used in industrial units in the District. The huge deposits of granite stones at Nilgiri, Khaira, Oupada regions provides tremendous scope for development of few more Industries based on this

resources. Except these, no minerals in large quantity which can be explored for commercial purpose found in the District.



1.2 Administrative Units:-

Balasore is the administrative headquarter of Balasore District. It is located at a distance of 194 km from Bhubaneswar, state capital of Odisha. In order of size, the District is the one of the 2nd largest costal Districts of Odisha. It has 3049 villages covering 12 Blocks, 12 tahasils and 2 sub-divisions. The District is divided

Morum Mining

DSR of Balasore District.

into 2 sub-divisions namely 1) Balasore, 2) Nilagiri. And into 12 Blocks & Tehasils, namely i) Bahanaga ii) Balasore iii) Baliapal iv) Basta v) Bhogarai vi) Jaleswar vii) Khaira viii) Nilgiri, ix) Oupada, x) Remuna xi) Simulia xii) Soro. The population of the District 23,17,419 according to the 2011 Census. The District accounts for 5.53% of the state's territory and about 5.50% of state's population. The density of population of the District is 532 per square km as against 610 per square km of the state. As per 2011 census, the population of Scheduled Caste is 1,84,682 (7.30%), and Scheduled Tribe is 14,79,576 (58.7%). The literacy percentage of the District covers 79.18 against 84.67 of the state.



1.3 Connectivity facilities:-

Road Network

The District is well served by a network of good roads and has been called the motorists paradise. The chief roads emanating from Balasore town are NH-16 and NH-60 passes the District. Balasore is 60 Kms from Baripada, 122 Kms from Kharagpur, 199 Kms from Jamshedpur, 177 Kms from Cuttack, 199 Kms from Bhubaneswar and 226 Kms from Rourkela. It is also connected with other cities such as Sambalpur, Puri, Bolangir, Bhadrak, Jhargram, Angul, Ranchi and Kolkata via Odisha State Road Transport Corporation and some private travel services.



Rail Network

Balasore District is well connected by Rail link to different places, Balasore Railway Station is an important station on the Howrah-Chennai main line of the South Eastern Railway. The distance to Kolkata is approximately 232 km, while the distance to Bhubaneswar is about 206 km; the city of Balasore is well connected to many places in India like Baripada, Bhubaneswar, Kolkata, Jamshedpur and



Cuttack,

Air Network

At present, Balasore has no connection by Airway. The site selection for Aerodrome is presently under process. Nearest airport is Biju Patnaik Airport, Bhubaneswar, 200 Kms from Balasore. Netaji Subhas Chandra Bose International Airport in Kolkata is 232 kms from Balasore.



2. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT:

Balasore District is a transition land features of both coastal plain and hilly region. Most of the mineralized area coming under Eco-Sensitive Zone, mining activity only confined out of safety zone of Eco-Sensitive Zone. The mining activity in the District is only restricted to minor minerals i.e. of sand, stone, granite and brick clays. Altogether there are leases of stone, granite and sand which has been granted to the District is regulated as per minerals concession rules of Odisha, there is no lease of major mineral in the District. At present Leases of stone, sand and bricks making units are operational in the District. Stone chips, granite stones, ordinary sand constitute the principal mining activity of Soro, Khaira, Jaleswar, Nilagiri area etc. of Balasore District. Out of these huge granite stones deposits are available near Khaira, Nilgiri, Soro area and major potential sand in Jaleswar, Remuna and Nilagiri area of the District, which have been provides tremendous scope for development of few more industries based on this resources.

3.0 GENERAL PROFILE OF THE DISTRICT:

3.1 Demography:

Census - 2011	
Geographical Area	3806 Sq. Km.
Total population	23,17,419
Male Population	11,84,371
Female Population	11,33,048
Male Literacy	9,18,417
Female Literacy	7,29,488
SC Male	NA
SC Female	NA
ST Male	NA
ST Female	NA
OBC	855,480
Illiterate Male	9,18,407
Illiterate Female	7,29,488



4.0 GEOLOGY OF THE DISTRICT:

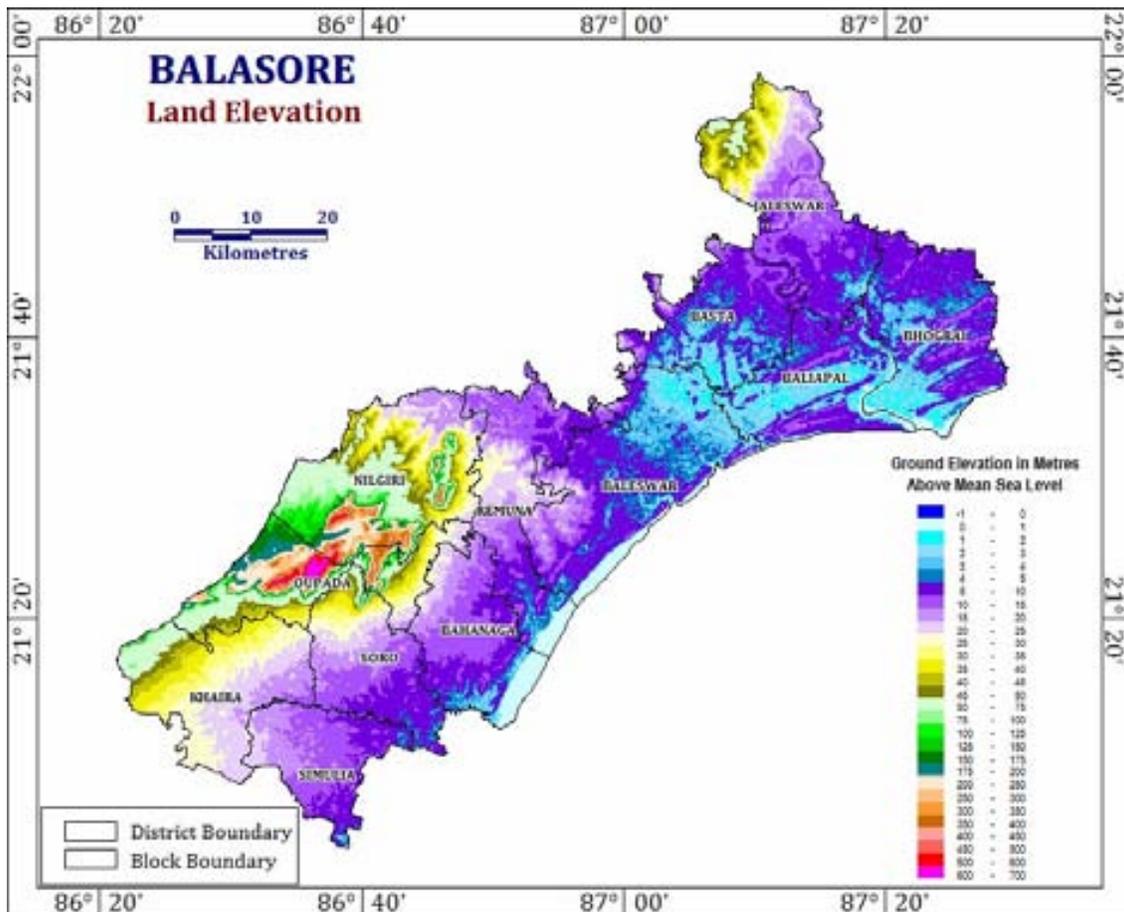
The coastal tract of Orissa is underlain by the Tertiary and Quaternary Formations. Balasore is a unique District in Odisha with varied geology, of these the Tertiaries are least exposed on the surface, whereas the Quaternaries are extensively developed along the coast and further inland. The Quaternary Formations cover almost the entire study area while the Tertiaries are exposed near Baripada town at about 28 km. NNW of the northern boundary of the area. The Pre-Cambrian ciystallines occur as hills and mounds in the west just outside the present area. Chatterji and Raghava Rao (1960) made studies on the sub-surface geology and tectonic framework of sedimentation in the crescentic coastline of Balasore on the basis of the data obtained from the exploratory drilling operations. Exploratory drilling reveals that in the subsurface the warped Pre-Cambrian basement is overlain by Miocene marine sediments, Mio-Pliocene estuarine sediments, laterites and alluvium. The Mio-Pliocene sediments and alluvial sections contain the principal ground water reservoirs. The marine sediments are dominantly composed of finer elastics and non-clastics (Bhatnagar *et al*, 1970). Small outcrops of ultramafic rocks are exposed in and around Bhalukasoni (21°29': 86°42') area under Nilgiri Sub-Division of Balasore District. Ultramafic rocks comprising serpentinitised dunite, peridotite and pyroxenite largely under soil and laterite cover occur intermittently spreading over an area of 1.8m × 800m. A 100m long E-W trench has exposed two chromite ore bodies on its either end, the dimensions being 500m × 3.5m × 4.5m and 5.5m × 2m × 3.3m. A reserve of the order of 1550 tonnes was estimated with massive and spotted type of chromite with Cr₂O₃ content ranging from 25.77 to

54.76%. These chromite occurrences along with the associated ultramafic rocks are considered to be xenolithic bodies lying within a plutonic mass of gabbroic rocks.

4.1 Physiography & Geomorphology:

Physiography:

The District of Balasore is having unique physiographic setup. It is bounded by the Bay of Bengal in its southern part and in the north western part it is marked by a set of hillocks and mounds including a north east – south west trending Hilly patch in the Nilgiri, Khaira & Oupada Blocks. The land elevation varies from as low as near mean sea level in the southern part to as high as about 600 m above mean sea level in the north western part. In between a major part covering more than 75% of the geographical area is having elevation within the range of 2 – 10 metres above mean sea level. In the extreme eastern part of the District, within the alluvial tracts of the River Subarnarekha & Burhabalang, the average elevation is within 1 – 2 metres above mean sea level.



Geomorphology :

Hydrogeomorphological features of Balasore District are mainly attributed to fluviomarine, erosional, denudational and depositional processes. The coastal plain has been developed due to fluviomarine processes. The alluvial plains owe their origin due to various fluvial actions of major rivers. The details of the geomorphic unit as identified are as below:

Coastal Plain: Coastal plain predominantly consist of sand silt and clay is developed all along the coast of Balasore District. It is developed all along the coast of Balasore District. It is gently sloping plain occurring parallel to the coast. The saline marshy tract with shrubby vegetation comes under this coastal plain. Tidal streams are very active during high tide time. Ground water prospect is good but salinity is a major problem in this tract.

Beach: Beach is mainly formed by marine action. Beach ridges are very common and these are formed due to sea waves. They are mainly consisting of sand mixed with silt etc. Ground water prospect is good within a depth of 30-40 m, where fresh ground water pockets are available. Deep tube wells in these areas may lead to sea water ingress.

Mud flat: This is an relatively marshy area covered with fine silt and mud along the shore. Mangroves vegetation is very common. Ground water quality is mostly saline.

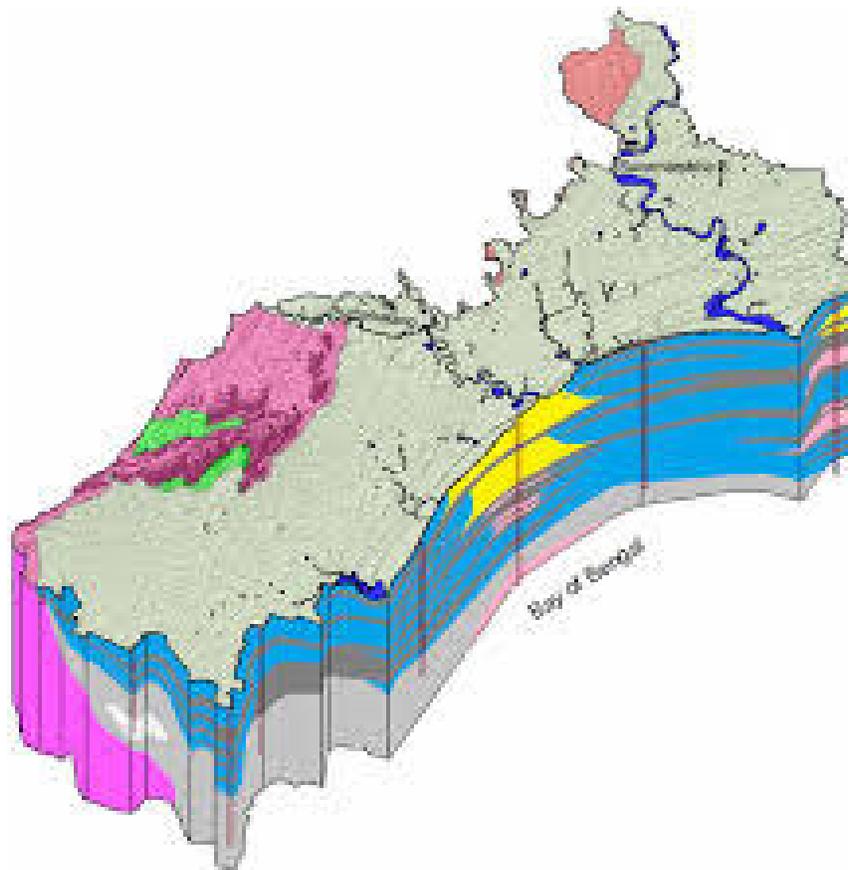
Paleo mud flat: These are the ancient mud flat consisting of fine sand and mud. These are mostly converted to agricultural land in due course of time. Due to marine regression ground water quality is saline.

4.2 Stratigraphy:

The study area comprises the following distinct geomorphic units:

- i) Younger alluvial plain
- ii) Older alluvial plain
- iii) Lateritic upland

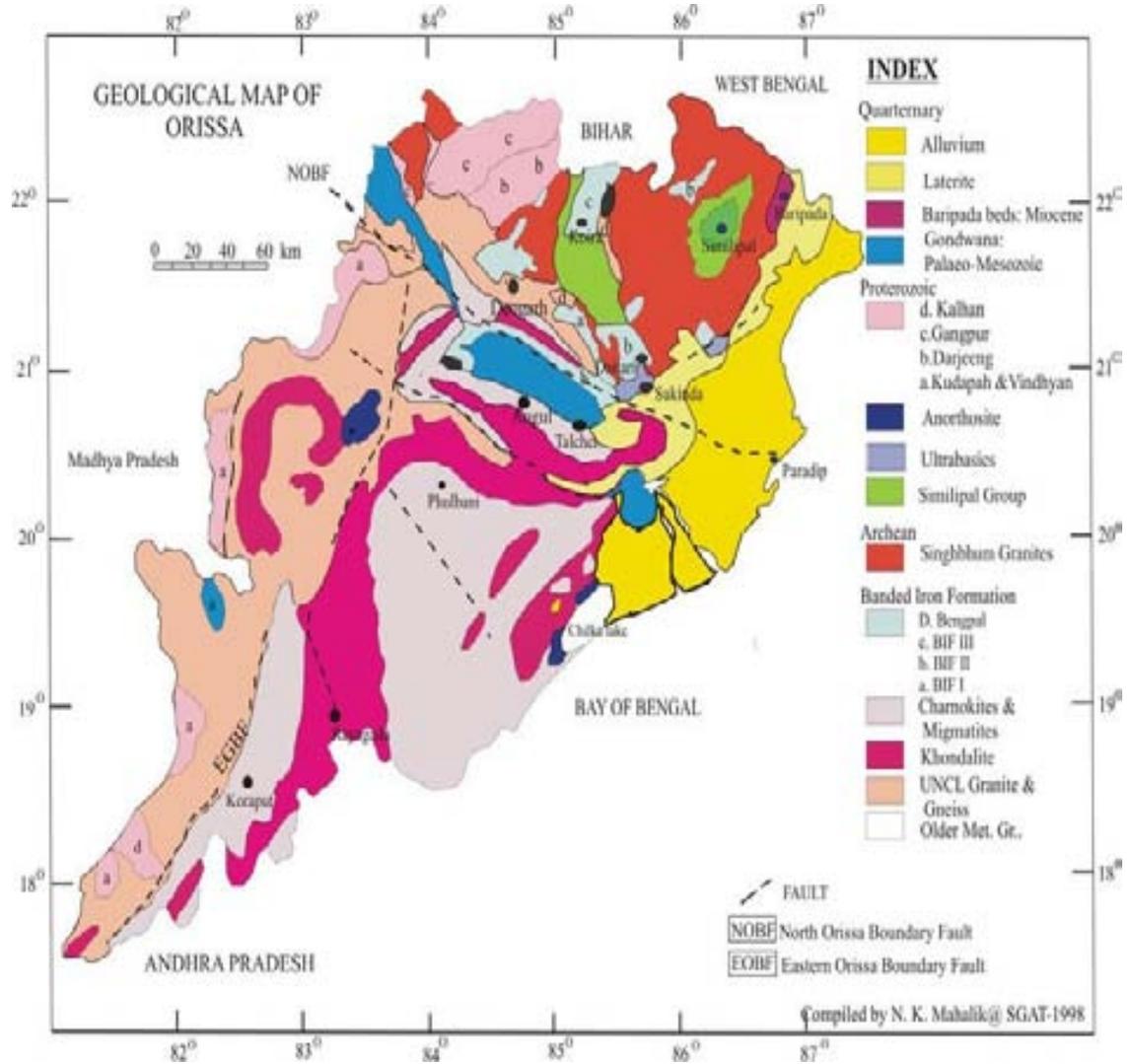
<u>Geological Age</u>	<u>Geological Formation / Group</u>
Quaternary	: Recent Alluvium, Clays, silt, Sand, Gravel
Tertiary	: Older Alluvium, Laterite, Baripada Beds.
Mesozoic/ Palaeozoic	: Volcanics / Epidiorite
Precambrian	: Slate/ Phyllite/ Schist / Gneiss
Archean	: Granite/ Granite Gneiss



4.3 Mineral Resources:

Minerals like soft stones, limestone, stone chips are available in the District, which are mainly used in industrial units in the District. The huge deposits of granite stones at Nilgiri, Khaira, Soro, Jaleswar area provides tremendous scope for development of few more industries based on this resources. Except these, no

minerals in large quantity which can be explored for commercial purpose found in the District.



4.4 Soil:

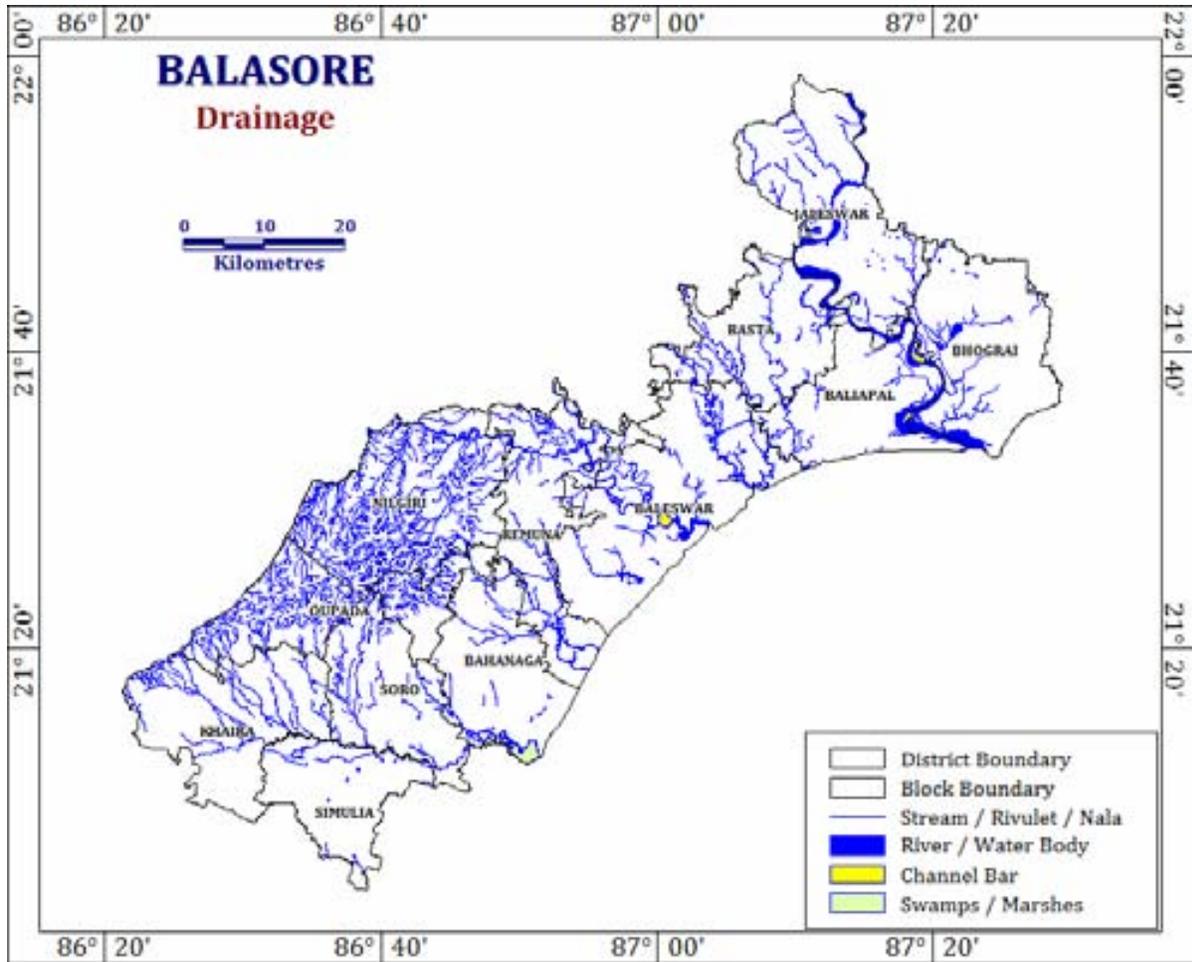
The District comprises chiefly of lateritic, sandy loam and clayey loam type of soil (Figure 3). Laterite soil is mostly marked in the area occupied by crystalline rocks. The low lying valley fields are covered with clayey loam type of soil.

5. DRAINAGE OF IRRIGATION PATTERN

The District has considerable flat land, which provide suitable site for agricultural use. The hilly areas are mostly under forest with patches of cultivation on scarp

areas. Major rivers flowing in the District are Budhabalanga, Subernarekha, jambhira, sona. Major crops grown in the District are rice, Only. 12.21 percent area of agricultural use are net irrigated and major source of irrigations are well and tube wells.

IRRIGATION BY DIFFERENT SOURCES (Areas and Number of Structures)				
	Sources of Irrigation	Number	Area in hectare	Percentage of total irrigated area
	Canals	3	20.8	8.5
	Tanks	35,624	5.6	2.3
	Open wells	-	-	-
	Bore wells	-	-	-
	Lift irrigation schemes	14,034	104.8	43
	Micro-irrigation	75	0.1	0.1
	Shallow tube well	2239	4.4	1.8
	Medium irrigation project	2	3.8	1.6
	MIP	32	6.0	2.5
	Other		98.1	40.2
	Total Irrigated Area		244.0	
	Pump sets	321		
	No. of Tractors	62		
	Irrigation	Area in hectares		
	Net irrigated area	Net irrigated area 177.53 ha (97.1 kharif + 80.3 Rabi)		
	Gross irrigated area	Gross irrigated area 244.01 (138.9 kharif + 105.0 Rabi)		
	Rainfed area	146.3		
Source: SREP and DAO, Balasore				



5.1 River System

The **Budhabalanga River** (also called Balanga River) flows through the Districts of Balasore. The Budhabalanga, rises in the Similipal hills and plunges through Barehipani Falls, the second-highest waterfall in India, located in Simlipal National Park. Perennial Burhabalang is the main river of the study area. It flows from northwest to southeast. This river is an 'extended consequent,' since it has maintained its original easterly course in the plains and has reached a mature stage of development. The annual flow of water in river Burhabalang is 637 Mm³. Its total drainage area is 4,847 sq. km. This river maintains a sluggish flow in the premonsoon period, but swells menacingly with the onset of monsoon often flooding large tracts. Burhabalang and its tributaries, viz. Sona Nadi, Amrutia Nadi, Gangahar Nadi drain almost round the year in the present area. Sona Nadi receives the watery effluent load through a nalah (Sankh nalah) from the Balgopalpur

Industrial Estate and flows from west to east. Amrutia N. flows from NNW to SSE and carries the waste water load of East Coast Fertilizer at Gadadeulia and water laden solid wastes (particularly in rainy season) from the dumping site of Krebs & CIE Ltd. at Kalma. These tributaries join Burhabalang river downstream at Sahupada and Bhimda (outside present area) respectively. There is another local stream, which flows from southwest to northeast, carrying the waste water of Birla Tyres Ltd. at Chhanpur and the industries located at Ganeshwarpur Industrial Estate. This stream too ultimately joins the Burhabalang river near Nuabazar, Balasore town.



6.0 LAND UTILIZATION PATTERN IN THE DISTRICT

6.1 Forest and non forest land

The forest of Balasore District is full of variety of medicinal plants, Kendu leaves, Bamboo, Sal, Teak, other timber species and a wide range of carnivorous & herbivorous wild animals. The District has one Wildlife Sanctuaries known as the Kuldiha Wildlife Sanctuary, which hosts even elephants. The area of the sanctuary is 26, 886.23 hectares. In the sanctuary the principal animals that are found are Elephant, Bear, Nilgai, Sambhar, Peacock, Wild Boar and Deer, together with variety of snakes and birds.

District-wise Forest Cover Area in Odisha (Area in Km²)

2017 Assessment								
District	Geographical Area Km ²	Very Dense Forest	Moderate. Dense Forest	Open Forest	Total	Percent of GA	Change	Scrub
Angul	6375	371	1380	1004	2755	43.22	43	84
Bolangir	6575	70	224	837	1131	17.2	151	142
Balasore	3806	23	127	234	380	9.98	30	48
Bargarh	5837	176	371	484	1031	17.66	88	47
Bouda	3098	263	546	480	1289	41.61	27	57
Bhadrak	2505	0	9	66	75	2.99	2	0
Cuttack	3932	53	226	517	796	20.24	11	68
Deogarh	2940	191	667	614	1472	50.07	-3	14
Dhenkanal	4452	174	418	825	1417	31.83	9	82
Gajapati	4325	84	1490	946	2520	58.27	12	262
Ganjam	8206	164	1075	864	2103	25.63	15	655
Jagatsinghpur	1668	0	5	131	136	8.15	6	0
Jajpur	2899	6	72	225	303	10.45	3	50
Jharsugada	2114	3	140	179	322	15.23	9	36
Kalahandi	7920	362	729	1327	2418	30.53	36	362
Kandhamal	8021	661	2588	2143	5392	67.22	16	380
Kendrapada	2644	84	88	133	305	11.54	14	2
Keonjhar	8303	289	1404	1519	3212	38.68	4	55
Khorda	2813	21	186	250	457	16.25	0	92
Koraput	8807	94	740	1255	2089	23.72	120	944
Malkangiri	5791	158	709	1475	2342	40.44	20	45

Morum Mining**DSR of Balasore District.**

Mayurbhanj	10418	1335	1718	1027	4080	39.16	42	34
Nabarangpur	5291	168	428	507	1103	20.85	8	47
Nayagarh	3890	189	965	556	1710	43.96	28	173
Nuapada	3852	86	482	705	1273	33.05	33	109
Puri	3479	0	54	160	214	6.15	8	11
Rayagada	7073	422	853	1851	3126	44.2	7	349
Sambalpur	6624	499	1675	1106	3280	49.52	13	40
Subarnapur	2337	2	187	161	350	14.98	26	29
Sundargarh	9712	1019	1814	1431	4264	43.9	107	89
Grand Total	155707	6967	21730	23008	51345	32.98	885	4306

(Source: India state of forest report 2017-Odisha)

The major portion of the District is covered by forest (9.98 % of TGA) and has scattered settlement pattern. The forest is full of variety of medicinal plants, kendu leaves, bamboo, sal, teak and other timber species. The District has considerable flat land, which provide suitable site for agricultural use. The hilly areas are mostly under forest with patches of cultivation on scarp areas. Major crops grown in the District are rice and pulses. Only 12.50 percent area of agricultural use are net irrigated and major source of irrigations are well and tube wells.

Source: Fertilizer and Agriculture Statistics, Eastern Region (2006-2007).

Tahasil	Forest Area	Misc Tree	Permanent Pasture	Cultivated waste	Non Agricultural uses	Barren land	Current Fallow	Other Fallow	Net area sown
Bahanaga	0	714	992	904	2882	0	525	438	24047
Balasore	4	634	3133	2949	6116	1640	531	553	15185
Baliapal	1008	1813	295	2855	4515	0	638	717	16624
Basta	13	198	892	498	4143	0	551	103	12954
Bhogorai	118	3364	1263	5350	4732	59	1025	510	15794
Jaleswar	1716	2045	1396	2455	5422	43	736	334	18713
Khaira	55	630	1544	1210	3508	0	1173	764	18160
Nilagiri	977	289	1444	2343	2312	435	558	188	28280
Oupada	329	374	855	557	1656	0	177	338	19759
Remuna	108	813	1317	2989	5070	10	1073	114	16363
Simulia	5	438	846	576	2677	0	439	889	17646
Soro	1109	441	1121	564	2066	28	295	564	21476
Total	5442								

6.2 Agriculture Land:

The primary objective of Agriculture Department is to increase of production as well as the productivity of major crops like Paddy, Groundnut, Mustard, Mung, Biri & vegetables which is widely covered in this District in both Kharif & Rabi season. Another key objective is the all round development of the farming community of the District. The Deputy Director of Agriculture is the head of office so far as agriculture is concerned & he is the Principal Agriculture Officer of the District . There are 5 District Agriculture Officers & the Block Level Officers are working under him. As it has already been pointed out, that agriculture is the main livelihood of the people in Balasore District. It is therefore also designated as the food bowl of Odisha. Rice is the principal crop grown in this District, followed by other cereals, pulses, oilseeds, vegetables, spices and sugarcane. The agricultural statistics for the District is shown in subsequent tables below :

Table – 3.6a: Crop Coverage Area of Balasore District, Odisha

Crop	Khariff		Rabi		Annual	TOTAL	
	Area (ha)	(% of Cropped Area)	Area (ha)	% of Cropped Area	Area (ha)	Gross Cropped Area (ha)	% of Gross Cropped Area
Rice	206.14	91.62	33.47	34.38		239.61	72.03
Cereals	0.31	0.14	0.79	0.82		1.10	0.33
Pulses	0.48	0.21	21.64	22.55		22.12	6.65
Oilseeds	0.13	0.06	14.38	20.20		19.51	5.87
Vegetables	13.04	5.80	16.14	16.82		29.18	8.77
Fibres	2.20	0.98	-	-		2.20	0.66
Spices	2.69	1.19	4.08	4.25		6.77	2.04
Sugarcane	-	-	0.46	0.48		0.46	0.14
Tobacco	-	-	-	-		-	-
Fruits	-	-	-	-	11.68	11.68	3.51
TOTAL	224.99	100	95.96	100	11.68	332.63	100

6.3 Horticulture Land:

The primary objective of Horticulture Department is increase of production as well as productivity of major fruits like Mango, Guava, Citrus etc., which is widely covered in this District. Another key objective is the all round development of the farming community of the District. The Deputy Director of Horticulture is the head of office. The horticulture statistics for the District is shown in subsequent tables below:

Horticulture crops	Total Area (hectares)
Mango	4.39
Citrus	0.80
Papaya	0.06
Pineapple	0.04
Guava	0.32
Sapota	0.07

Source: SREP, Balasore. Orissa Agric.

7.0 SURFACE WATER AND GROUND WATER SCENARIO OF THE DISTRICT

7.1 Hydrogeology

Distribution of Saline / fresh water aquifers: The occurrence of fresh water aquifers in coastal tract of Balasore restricted by two important factors-(i) Occurrence of hard rocks in the western side and (ii) Salinity hazard problems in the eastern part. In the narrow tract, close to the coast line extending right from Chandaneswar in the North to Bahanga/ Simulia in the south in the District, salinity problem occurs where both the saline water bearing and fresh water bearing aquifers occurs at different depths. The depth of occurrence of saline water bearing aquifers is not uniform along the entire tract. The study of lithological logs and electrical logs of boreholes and results of zone tests etc. indicate occurrence of saline water either above or below fresh water bearing aquifers and also both above and below the fresh water aquifers,

The width of the coastal saline tract is generally ranging from 4 to 5 km running from Bahanaga to Baliapal Block near Subranarekha river, towards north east it encroaches the inland and in Bhogarai Block its width generally to a range from 5 to 10 km . In general the top aquifers up to 150 meter are saline. However, during the detailed studies in the area, it is observed that up to the depth range of 25 to 30m, fresh aquifers are occurring having a thickness of 5 to 15 meters, which are tapped by shallow tube wells. Below 150m the aquifers are fresh up to 220m below which up to 250m below ground level the aquifers are saline. The salinity hazards occur in a narrow tract along the eastern margin adjoining the sea coast and in the rest part of coastal alluvium fresh water occurs all through down to the bed rock. Disposition of fresh and saline water in District is shown as Map No-3. The

occurrence of aquifers and its yield potential etc. are described below.

Non-saline area: The depth of the bore holes varied from 103m to 330 and the depth of the tube wells varied from 96 to 208m. The bed rocks were encountered at Hanspatna (110m) and at Soro (295m).

In the Jaleswar-Basta-Baliapal-Remuna-Balasore tract a group of aquifers usually varies in thickness from 3 to 15m, attains a maximum cumulative thickness of around 40 to 50m. The yield varies from 20 to 66 Ips against the drawdown of pumping water level varying between 5.83 to 15 60m. The static water levels vary from 2.13 to 10.68m bgl. The discharge in general is less in the southern part of this tract.

In the area around Soro and Markona a group of aquifers consisting fine to coarse sands which generally occur below 46m depth attains a cumulative thickness of about 125m and the thickness of aquifers dwindles towards west. The discharge is generally low and varies between 11 to 24 Ips against the draw down more than 15m.

In and around Gopalpur of Bahanaga Block aquifers are thin and mixed with finer materials and are low yielding. Also in Kasbajaypur-Bahanga area the formation are predominantly argillaceous in nature and sand horizon are lesser. The yield generally varies between 20 to 30 Ips against the draw down around 20m. In this area auto flowing condition occurs from deeper aquifer blow 200m depths at Soud. In general in the northern part (north of Balasore town) thickness of aquifers as well as yield is more in comparison to southern part of the District (south of Balasore town).

7.2 Depth of water level:

Categorization of depth to water level of pre-monsoon period (Apr-2015)

No. of wells measured	Depth to water level (m bgl)		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	Max	No.	%	No.	%	No.	%	No.	%
25	2.41	7.81	0		2	8	23	92	0	---

Depth to ground water levels during the post monsoon period (April 2015) varied between 2.41 and 7.81 m bgl Categorization of depth to water level of post-

monsoon period (November 2012) for HNS in Balasore District is presented below in table

Categorization of depth to water level of pre-monsoon period (Nov-2015)

No. of wells measured	Depth to water level (m bgl)		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	Max	No.	%	No.	%	No.	%	No.	%
34	1.08	5.18	6	17	27	79.4	1	2.9	0	

7.3 Ground Water Quality

Ground water in the phreatic aquifers in Balasore District slightly alkaline in nature, which is also colourless, odourless. The specific electrical conductance of ground water in phreatic zone at 25°C. The suitability of ground water for drinking purpose has been evaluated on the basis of pH, Total hardness (T.H), Ca, Cl, F and NO3. The chemical concentration of these constituents is presented.

7.4 Ground Water Development

In the rural areas the entire water supply is dependent on ground water. Ground water development is mainly carried out in the District through dug wells and Hand pumps. In general dug wells are of 2 m diameter and the depth ranges between 8 to 15 m depending on the thickness of the weathered zone, tapping the shallow aquifer in the weathered zone and uppermost slice of the basement. Large number of dug wells used for drinking water is under private ownership for which there is no reliable data. Over the years Mark II/ Mark III hand pumps are being drilled in large numbers for ground water development. These hand pumps have the following two major advantages i) less susceptible to contamination from surface sources and ii) tap fractures between 20-60m depth which have been found to be less affected by seasonal water level fluctuation and thus have lesser chances of failure even during extreme summer. In rural areas of Balasore District the number of hand pumps drilled by PHED is 12311 of which 9342 are under working condition. There are 574 dug wells constructed by government departments that are under regular use. In the urban areas ground water plays a supplementary role in water supply, the major supply being made through dams, reservoirs or weirs across rivers

or streams. No authentic data is available on the number of ground water structures catering the urban water supply.

As per the latest ground water resource estimation carried out adopting GEC 97 methodology, the overall stage of ground water development in Balasore District has been found to be 41 % indicating enough scope for future development. The ground water resources of Balasore District is given in the table

7.5 Ground Water Related Issue and Problems

Some of key ground water related issues are

- I. Locating suitable sites for bore wells
- II. Suitable design of dug wells and hand pumps
- III. Taking up artificial recharge projects to augment the resource availability in Balasore District.
- IV. Optimal development of irrigation potential by developing ground water available for future uses.
- V. Creating public awareness for conserving ground water through awareness camps, NGO's and mass media.

7.6 Mass Awareness Campaign (MAP) & Water Management Training Programme (WMTP) by CGWB

NIL

Area Notified by Cgwb/Sgwa

None

7.8 RECOMMENDATIONS

As the District suffers from water scarcity, it is recommended to take artificial recharge at suitable locales. On the basis of the hydrogeological criteria such as post monsoon water level below 7 m bgl indicating availability of sufficient space in the unsaturated zone to retain additional water and availability of surplus surface runoff, 250 Sq kms area in Balasore District has been demarcated as suitable for artificial recharge. Through this 41.25 mcm water can be recharged.

In the hard rock areas, pin pointing suitable sites for bore wells is always a challenge. Considering the anisotropy in distribution of fractures at deeper level, suitable sites may be selected using remote sensing techniques in association with geophysical and hydro- geological investigations.

For deriving optimal benefit from aquifers in areas under fissured formation, the dug wells should be designed to penetrate the weathered zone as well as top part (1-2 m) of the underlying bed rock, so as to get the full benefit, from the total thickness of the shallow aquifer. For hand pumps and shallow tube wells the casing provided against the weathered zone should be slotted at the bottom so that the well can extract shallow ground water also. In urban areas use of shallow aquifers should be encouraged.

The surface run off in urban areas and its peripheral parts should be harnessed to augment the ground water resource through appropriate recharge techniques. For urban areas roof top rain water harvesting and artificial recharge is most suitable. Location and design of the structures should be guided by findings from hydrogeological and geophysical surveys. Sites for artificial recharge should be taken up at places where sufficient thickness of weathered zone as well as fracture/fracture zones is available. The depth of the recharge well should be governed by the depth of occurrence of the fractures.

8.0 RAINFALL OF THE DISTRICT AND CLIMATE CONDITION

8.1 Month wise rainfall:

The driest month is November, with 31 mm of rain. There is on average 3 mm of precipitation in December. In July, the precipitation reaches its peak, with an average of 313.98 mm.

Year		2016	2017	2018	Average
Sl. No.	Month	(mm)	(mm)	(mm)	(mm)
1	Jan	18.33	00	00	6.11
2	Feb	49.92	00	00	16.64

3	Mar	6.42	105.29	6.23	39.32
4	Apr	18.33	18.50	162.62	64.48
5	May	224.33	165.98	144.39	178.23
6	Jun	165.05	164.28	268.94	199.42
7	Jul	303.49	317.98	320.48	313.98
8	Aug	334.98	276.51	341.13	317.54
9	Sep	308.00	198.01	346.48	284.16
10	Oct	153.10	251.58	243.31	215.99
11	Nov	46.43	47.20	00	31.21
12	Dec	00	5.08	4.97	3.35
Total		1628.38	1550.41	1838.55	1672.44

The Indian Meteorological Department, Bhubaneswar, vide letter No. BBS/RMC/CS-312, dated 18th January, 2016 has provided the period of Rainy Season viz. Normal dates of Onset and Withdrawal of South West Monsoon over India as state-wise. The duration for the period is 10th June to 15th October.

8.2 Climate

The climate in Balasore is warm and temperate. In winter, there is much less rainfall in Balasore than in summer. The Köppen-Geiger climate classification is Cwa. The average temperature in Balasore is 24.7 °C.

Temperature Graph- Balasore

May is the warmest month of the year. The temperature in May averages 32.3 °C. January has the lowest average temperature of the year. It is 16.5 °C.

Source: Indian Meteorological Department.

9.0 DETAILS OF MINING LEASE OF MORRUM IN THE DISTRICT

No Quarry lease has been granted.

10. DETAIL OF ROYALTY OR REVENUE RECEIVED IN LAST THREE YEARS:

Sl. No.	Name of the Tahasil	2016-17	2017-18	2018-19	Total Amount (Lakh)
1	Bahanaga	Nil	Nil	Nil	Nil
2	Balasore	Nil	Nil	Nil	Nil
3	Baliapal	Nil	Nil	Nil	Nil

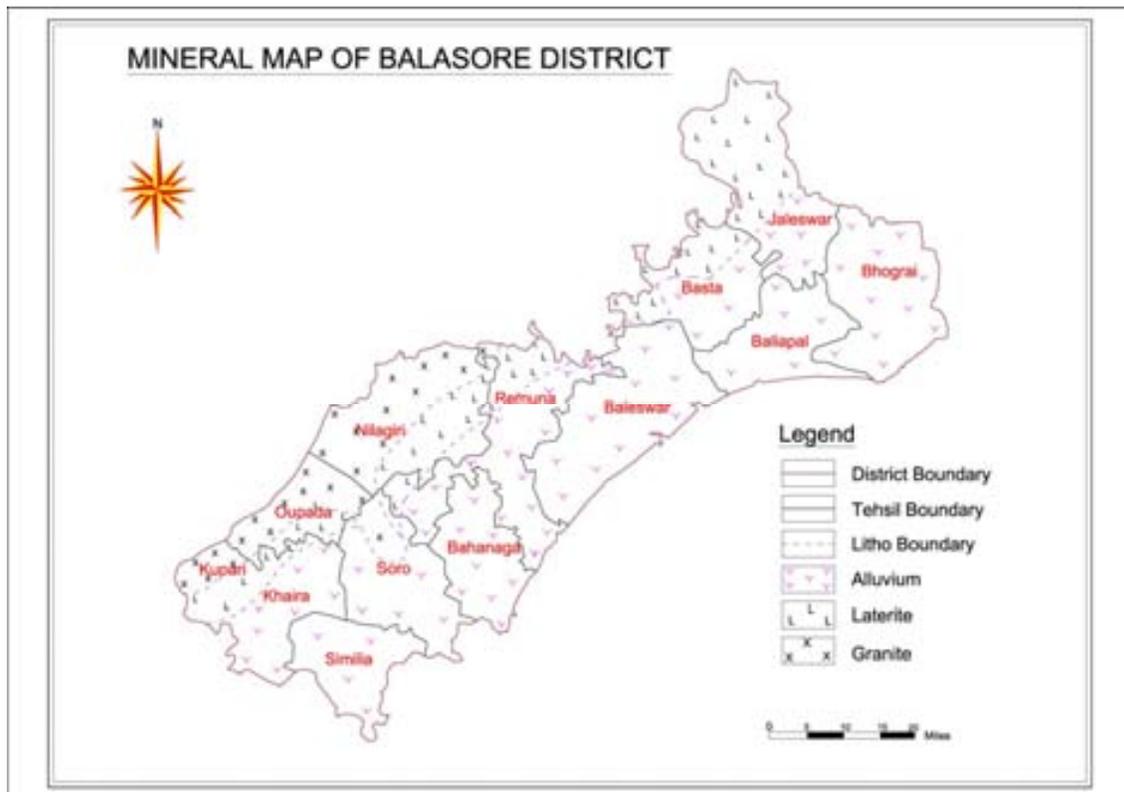
Morrum Mining**DSR of Balasore District.**

4	Basta	Nil	Nil	Nil	Nil
5	Bhogarai	Nil	Nil	Nil	Nil
6	Jaleswar	Nil	Nil	Nil	Nil
7	Khaira	Nil	Nil	Nil	Nil
8	Nilgiri	Nil	Nil	Nil	Nil
9	Oupada	Nil	Nil	Nil	Nil
10	Remuna	Nil	Nil	Nil	Nil
11	Simulia	Nil	Nil	Nil	Nil
12	Soro	Nil	Nil	Nil	Nil
Grand Total				Nil	Nil

11. DETAIL OF PRODUCTION OF MINOR MINERALS IN LAST THREE YEARS:

Sl. No.	Name of the Tahasil	2016-17	2017-18	2018-19	Total Quantity (Cubic meter)
1	Bahanaga	Nil	Nil	Nil	Nil
2	Balasore	Nil	Nil	Nil	Nil
3	Baliapal	Nil	Nil	Nil	Nil
4	Basta	Nil	Nil	Nil	Nil
5	Bhogarai	Nil	Nil	Nil	Nil
6	Jaleswar	Nil	Nil	Nil	Nil
7	Khaira	Nil	Nil	Nil	Nil
8	Nilgiri	Nil	Nil	Nil	Nil
9	Oupada	Nil	Nil	Nil	Nil
10	Remuna	Nil	Nil	Nil	Nil
11	Simulia	Nil	Nil	Nil	Nil
12	Soro	Nil	Nil	Nil	Nil
Grand Total					Nil

12. MINERAL MAP OF THE DISTRICT:



13. LIST OF LETTER OF INTENT (LOI) HOLDERS IN THE DISTRICT ALONG WITH ITS VALIDITY

Nil

14. TOTAL MINERAL RESERVE AVAILABLE IN THE DISTRICT

Total mineral reserve of Morrum will access after detail study or grant of potential area, which may investigate as per details below.

(i) Blocks were identified based on geological studies through field observation.

- (ii) Mineable resource was calculated by considering detail prospecting.
- (iii) Area calculated as per GPS co-ordinates and information obtained from local people. Land detail need to be verified from revenue record.
- (iv) Since this is an interim report, as per the present requirement of minerals, more such Blocks need to be identified and the data should be updated periodically, after certain intervals to update the data bank of DSR.

Summary of Identified Mineral Potential:

Sl. No.	Name of the mineral	Name of the lessee	Address and contact No. of the lessee	Letter of Intent Grant Order No. and date	Area of mining lease to be allotted	Validity of LoI	Use (Captive / Non-Captive)	Location of the Mining lease (Latitude & Longitude)
1	2	3	4	5	6	7		
Nill up to till now								

15. QUALITY/GRADE OF MINERAL AVAILABLE IN THE DISTRICT**Morrum found in District:-**

Morrum of the District is very much suitable for making of various construction purposes.

Use of Mineral:

Morrum of the District is used mainly for Road construction, also the Morrum is used in filling in various construction activities.

16. DEMAND AND SUPPLY OF THE MINERAL IN THE LAST THREE YEARS:

As such there are huge infrastructural activities such as road, building, railways are coming up by Govt. of India & PSUs under "Make In India" programme.

It is proposed to start the Morrum production for full fill the Requirement of the District which will enhance the revenue of the District and also support the livelihood of the local people.

17. MAP OF EXISTING MINING LEASES IN THE DISTRICT:

Enclosed as Plate-I

18. DETAILS OF THE AREA OF WHERE THERE IS A CLUSTER OF MINING LEASE VIZ. NUMBER OF MINING LEASES, LOCATION (LATITUDE AND LONGITUDE)

Nil

19. DETAILS OF ECO-SENSITIVE AREA, IF ANY, IN THE DISTRICT:

Eco sensitive zone of Kuldiha wild life sanctuary is located within the District.

20. IMPACTS OF MINING ON ENVIRONMENT:

The most important environmental impact of mining projects is:-

Acid mine drainage and contaminant leaching

Acid mine drainage is considered one of mining most serious threats to water resources. A mine with acid mine drainage has the potential for long-term devastating impacts on rivers, streams and aquatic life. If mine waste is acid-generating, the impacts to fish, animals and plants can be severe. Many streams impacted by acid mine drainage have a pH value of 4 or lower – similar to battery acid. Plants, animals, and fish are unlikely to survive in streams such as this.

Transportation sources:

Transportation sources of air pollutants include heavy vehicles used in excavation operations, cars that transport personnel at the mining site, and trucks that transport mining materials. The level of polluting emissions from these sources depends on the fuel and conditions of the equipment. Even though individual emissions can be relatively small, collectively these emissions can be of real concern. In addition, mobile sources are a major source of particulate matter, carbon monoxide, and volatile organic compounds that contribute significantly to the formation of ground-level ozone

Stationary sources:

The main gaseous emissions are from combustion of fuels in power generation installations, and drying, roasting, and smelting operations. Many producers of precious metals smelt metal on-site, prior to shipping to off-site refineries. Typically, gold and silver is produced in melting/fluxing furnaces that may produce elevated levels of airborne mercury, arsenic, sulfur dioxide, and other

metals

Fugitive emissions:

Common sources of fugitive emissions include: storage and handling of materials; mine processing; fugitive dust, blasting, construction activities, and roadways associated with mining activities; leach pads, and tailing piles and ponds; and waste rock piles. Sources and characteristics of fugitive emissions dust in mining operations vary in each case, as do their impacts. Impacts are difficult to predict and calculate but should be considered since they could be a significant source of hazardous air pollutants.

Noise and vibration:

Noise pollution associated with mining may include noise from vehicle engines, loading and unloading of rock into steel dumpers, chutes, power generation, and other sources. Cumulative impacts of shoveling, ripping, drilling, blasting, transport, crushing, grinding, and stock-piling can significantly affect wildlife and nearby residents.

Vibrations are associated with many types of equipment used in mining operations, but blasting is considered the major source. Vibration has affected the stability of infrastructures, buildings, and homes of people living near large-scale open-pit mining operations. According to a study commissioned by the European Union in 2000: "Shocks and vibrations as a result of blasting in connection with mining can lead to noise, dust and collapse of structures in surrounding inhabited areas. The animal life, on which the local population may depend, might also be disturbed."

22. REMEDIAL MEASURES TO MITIGATE THE IMPACT OF MINING ON THE ENVIRONMENT:

1. Following are the remedial measures to mitigate the water sprinkling on haul road, loading and unloading points.
2. Plantation along the safety zone and dump area.
3. Providing dust masks to workers.
4. Regular monitoring of ambient air quality.
5. Provision of air conditioned cabin of Excavators and Dumpers.

6. Regular and proper maintenance of working equipments.
7. Periodic medical examination of the workers and organize medical camp in the area.
8. Use mill Second Delay Detonator in blasting operation.
9. Provisions of ear plug to the workers.
10. Regular training praogram to the mines workers and operators.

23. RECLAMATION OF MINED OUT AREA

Necessity of Reclamation & Rehabilitation:

- Exponential growth in mineral production since 1980.
- Mining activities causes physical, chemical, biological and socio-economic changes in the area.
- Surface mining activities disturb the original land profile.
- In India, mineral production comes mostly from opencast mines & hence Land degradation problems is of serous concern.
- An intricate, in-depth and site-specified techniques involving integrated approach is necessary.

Reclamation has three vital roles:

- i. **Reclamation** – Reclamation means return the mined-out land with useful life. It implies restoring the land to a form and productivity that is useful and inconfromiti with a prior land use. Reclamation always may not be a single- phase operation.
- ii. **Rehabilitation** – Rehabilitation is to bring bach the degraded land to a normal stage by a special treatment. It is a process of taking some mitigation measures for disturbed environmental condition created through mining activities.
- iii. **Restoration** – Restoration is the process of returning the mined out land being fit to an acceptable environmental condition. However, the general acceptable meaning of the term is bringing the disturbed land to its original form. Restoration is often used to indicate that biological properties of soil are put back ot what they were. This is a rate phenomenon.
- iv. When active mining ceases, mine facilities and the site are reclaimed and closed. The goal of mine site reclamation and closure should always be to return the site to a condition that most resembles the pre-mining condition. Mines that are notorious

for their immense impact on the environment often made impacts only during the closure phase, when active mining operations ceased. These impacts can persist for decades and even centuries.

Mine reclamation and closure plans must describe in sufficient detail how the mining company will restore the site to a condition that most resembles pre-mining environmental quality; how it will prevent – in perpetuity – the release of toxic contaminants from various mine facilities (such as abandoned open pits and tailings impoundments); and how funds will be set aside to insure that the costs of reclamation and closure will be paid for.

Proposed future land use after reclamation:

a. Forestry, b. Recreation, c. Water Reservoir, d. Crop Land, e. residential/Commercial, f. Fish & wildlife Habitat, g. Undeveloped Land, h. Grazing/Pasture Land

Statutory requirement:

As per the Mineral Conservation Development Rule, 2017, the following rules must be bare in mind by the mine owner/agent/manager, which is a part of reclamation activities –

Rule 22, Mine Closure Plan

Rule 23, Submission of Progressive Mine Closure Plan Rule 24, Submission of Final Mine Closure Plan

Rule 26, Responsibility of holder of mining lease Rule 27, Financial Assurance

Rule 35, Sustainable Mining

24. RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN:

Mining activity because of the very nature of the operation, complexity of the systems, procedures and methods always involves some amount of hazards. Hazard identification and risk analysis is carried for identification of undesirable events that can leads to a hazard, the analysis of hazard mechanism by which this undesirable event could occur and usually the estimation of extent, magnitude and likelihood of harmful effects. The activities which can cause high risk related to face stability and the person blasting the shots. It was observed that on a working face of the mine, there were large cracks and unsupported rocks were present, which can lead to a serious hazard and injure workers engaged in loading operation and machineries

because of rock falls or slides. This type of condition turn out because improper dressing of the bench and improper supervision. To avoid the hazards due to fall of rocks the face must be examined, made suitable for working and the remedial measures must be taken to make it safe if there is any doubt that a collapse could take place. Working of the face should be in the direction taking into account the geology of the area such that face and quarry side remain stable. Another major risk identified in mines is due to the firing of explosive by an unqualified person. In the mines there is problem of fly rocks and the village is located close to the mine and so it is rated high as it can affect may people. Explosives by nature have the potential for the most serious and catastrophic accident. Planning of round of shots, holes correctly drilled, direction logged, weight of explosive suitable for good fragmentation are the few of the steps necessary to ensure its safe use and if the shots are not properly designed can result in misfires, early ignition and flying rocks. No person is allowed to use explosives without being properly trained in its handling. In the mine a large numbers of heavy vehicles were in operation and the roads were not proper for haulage purpose. The haulage roads were not even and were not wide enough for the crossing purpose and hence the chances of hazards are very high. The main hazards arising from the use large earth moving vehicles are incompetent drivers, brake failure, lack of all-around visibility from the driver position, vehicle movements particularly reversing, roll over, and maintenance. Those most at risk are the driver and pedestrians likely to be struck by the vehicle, and drivers of smaller vehicles, which cannot be seen from the cabs of large vehicles. Edge protection is always necessary to prevent inadvertent movement over the edge of roadway or a bench. Seatbelt will protect driver in case of roll. Good maintenance and regular testing are necessary to reduce the possibility of brake failure. Access to the vehicles should always be restricted to those people necessary for the work in hand. The use of personal protective equipment and proper arrangements is essential to check if the person is wearing protective equipment or not. The personal protective equipment includes helmet, non-skid safety boots, safety glasses, earmuffs etc. The required personal protective equipment should be provided and used in a manner that protects the individual from injury. Few minor injuries which can be prevented are slip, trip, or fall hazards; hazards due to rock

falls and collapse of unstable rocks, atmosphere containing toxic or combustible gases; protects from chemical or hazardous material etc. A disaster management plan should be prepared for taking care of for any disaster. Other risk which are included in this category are noise, as it occurs and it can lead to permanent disability. There are problems related to road traffic in and out issuers; inappropriate exposure of moving machines; mechanical failure and because of large number of moving trucks and dumpers there is large quantity of dust present in roadways which affects the operators and can lead to accidents causing injury. They are in acceptable range because of precautions measures taken but no step is taken it can cause hazard hence steps should be taken to reduce the hazards such as for dust suppression system should be installed. Other problems like occurrence of lots of mosquitoes in the area due to unhygienic conditions which affect the human health causing malaria, dengue etc. and causing a person to be hospitalized.

Disaster in the mines like fires, explosions, entrapments, and inundations can occur any time, so emergency preparedness is a must. The Disaster management plan and risk assessment in the mines will include all sorts of above mentioned emergency and the extent that this plan will be implemented will depend on the nature and scope of the emergency. The basic purpose of Disaster management plan and risk assessment to ensure that mine rescue and recovery activities are conducted safely for rescuer and survivors. According to MMR act 1961 a standard operating procedure should be drawn for involvement different category of staff and officers. The SOP should be updated periodically to reduce the chaos and response to the emergency should be quick and smooth. The responsible person should be familiar with his responsibility during the mock drills. One or two standby should be there to replace the person in Emergency situation. Rescue operations should not include the survivors for any assistance.

First Information of Disaster / Emergency should go to the attendance clerk on duty. Duties of attendance Clerk (Emergency Siren) the attendance clerk or other designated person should on getting information of major accident, sound a hooter or a siren immediately declaring a state of emergency at the mine and then to contact the manager and on his advice to call key personnel using the information

listed in the Emergency Organization Chart. It is important that all telephone calls are recorded in a telephone log book. Duties of Other Officials should be displayed and handed over to all concerned. Copy the same should be kept at Manager's Office for ready reference. Establishment of Control Room at Unit Level, Area Level and Company Level is essential. Control Room should keep the contact information about –

- Company Manager
- Company owner/ Administrative officer.
- District Administration
- Govt. Hospitals in Nearby Localities,
- Private Nursing Homes of Localities

Attendance roaster and duty charge register should be properly maintained so the record of missing people can be obtained.

25. DETAILS OF THE OCCUPATIONAL HELTH ISSUE IN THE DISTRICT:

The persons employed in the mines are exposed to a number of hazards at work which adversely affect their health. Some of the important ones are dust, noise, heat, humidity, vibration etc. In recent times, there has been increasing awareness among mining industry and the workers about occupational diseases such as Coal Worker's Pneumoconiosis, Silicosis, Manganese Poisoning, Hearing Impairment etc. caused by exposure to health hazards at work. Almost all occupational diseases are known to cause permanent disablement and there is no effective treatment. However, most of the occupational diseases can be prevented by adopting proper occupational health measures and engineering control on airborne dust at workplace.

Following diseases have been notified as the diseases connected with mining operations for the purpose of sub-section (1) of Section 25 of the Mines Act, 1952: S.R.O. 1306 dated the 21st July, 1952

1. Silicosis
2. Tuberculosis

Total Number of TB cases in Balasore District of last 5 years

Year	No. of Cases
2015	2072
2016	1823
2017	1775
2018	1960
2019 till Aug	1374
Total	9004

S.R. O. 2521 dated the 26th June, 1986

Cancer of lung or the stomach or the pleura and peritoneum (i.e. mesothelioma)

25 S.O. 399(E) dated 21st February, 2011

1. Noise Induced Hearing Loss
2. Contact Dermatitis caused by direct contact with chemical.
3. Pathological manifestations due to radium or radioactive substances

System of Detection of Occupational Diseases in Mines In order to detect occupational diseases the industry is required to conduct medical examinations and health surveillance of workers as per the provisions of Mines Act. The present efforts of mines management are concentrated on detection of silicosis, Pneumoconiosis and other notified diseases. Very little attention is paid to other occupational diseases. The essential features of health surveillance programme required to be carried out in mines are:

- (a) Initial Medical Examination of persons to be employed in mines.
- (b) Periodic Medical Examination once every five years. General physical examination, chest radiographs, lung function tests and audiometry.
- (c) Classification of chest radiographs of workers as per ILO Classification.
- (d) Medical examination within one year of superannuation. Evaluation of all cases of suspected pneumoconiosis by Pneumoconiosis Medical Board.
- (f) Maintenance of medical records till the person is in service and 10 years thereafter. The cases of silicosis detected during health surveillance programme are referred to Pneumoconiosis Medical Board of the mining companies for evaluation and certification. If certified, the case is notified to the enforcement authority and evaluated for disability and payment of compensation. Many cases of silicosis and

other pneumoconiosis go undetected and a large number of cases of silicosis are misdiagnosed due to lack of training of medical professionals.

26. PLANTATION GREEN BELT DEVELOPMENT IN RESPECT OF LEASE ALREADY GRANTED IN THE DISTRICT:

During mining operation green belt development through plantation is most important for environment safe guard, which should be supervision by mining department. Different type of species should be planted near lease periphery to keep environment clean at post mining period through reclamation. Where specific usefulness of land could be decided, afforestation is normally planned through the site could have been considered for better possibilities of land use.

27. CONCLUSION:

Since it is an interim report, to meet the requirement of minerals in the present scenario, it is proposed to identify such potential areas at certain interval and get the data bank of DSR to be updated. The mining activity in any area is on one hand bring revenue and employment (Direct and indirect) and on other hand if not done properly potential pollution and ecological imbalance increases, the ability of the ecosystem can also be reduced. Particulate matter transported by the wind as a result of excavations, blasting, transportation of materials, heavy equipments used raise these particulate levels; and Gas emissions from the combustion of fuels in stationary and mobile sources, explosions, and mineral processing. All these activities indirectly affected the biodiversity of area. Larger potential and smaller areas have been identified in Balasore District on the basis of geological study carried out during field observation, which can be considered for mining concession after all the parameters for statutory clearances are verified by consulting with concerned authorities.