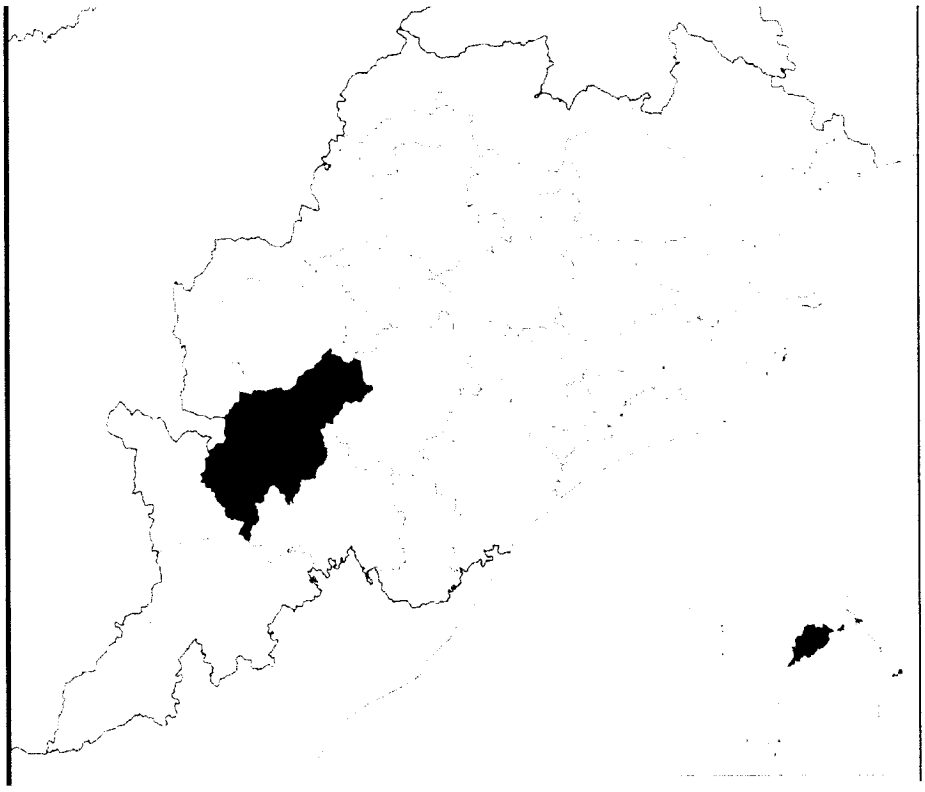
DISTRICT SURVEY REPORT (DSR)
OF
KALAHANDI DISTRICT, ODISHA
FOR
MORRUM

(FOR PLANNING & EXPLOITATION OF MINOR MINERAL RESOURCES)



As per Notification No. S.O. 3611(E) New Delhi

dated 25th July 2018 of

Ministry of Environment, Forest & Climate Change

(MoEF& CC)

COLLECTORATE KALAHANDI

CONTENT

PREAMBLE

Odisha is one of the Major Mineral rich State in India. Archaeological evidence of stone Age and Iron Age human settlement has been recovered from the region. Asurgarh offered an advanced, well civilised, cultured and urban human settlement about 2000 years ago in the region. In South Asia it is believed that the lands of Kalahandi district and Koraput district were the ancient places where people started cultivation of paddy. In ancient time it was known as *Mahakantara* (meaning great forest) and *Karunda Mandal*, which means treasure of precious stones like karandam (corundum/manik), garnet (red stone), beruz, neelam (sapphire/blue stone), and alexandrite, etc. Maa Manikeswari (the goddess of Manikya or Karandam) is the clan deity of Kalahandi may also signify its historical name.

It was a princely state in British India and in post-independence period it merged with Odisha state in India as Kalahandi district comprising current Kalahandi district and Nuapada district. In 1967, Kashipur block from Kalahandi district was transferred to Rayagada district for administrative reasons. Despite its backwardness it is one of the rich regions in history, agriculture, forest resources, gemstone, bauxite, folk dance, folk music, folklore, handicrafts and arts. In 1993, Nuapada sub-division was carved out as a separate district, but Kalahandi (Lok Sabha constituency) continues to constitute present Kalahandi district and Nuapada district together.

The archaeological record of the Tel Valley reveals the presence of the primates in its zones during the Pleistocenephase. Paleolithic is being documented in Kalahandi, like Moter river basin in Dharamgarh region.One of the largest size axe of late Stone Age culture has been recovered from Kalahandi. Tel river civilisation put light towards a great civilisation existing in Kalahandi in the past that is recently getting explored. The discovered archaeological wealth of Tel Valley suggest a well civilised, urbanised, cultured people inhabited on this land mass around 2000 years ago and Asurgarh was its capital. Kalahandi along with Koraput and Bastar was part of Kantara referred in Ramayana and Mahabharata.

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, 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. Subsequently, Hon'ble Supreme Court vide their order dt. 18.01.2022 in connection with Civil Appeal Nos. 3661-3662 of 2020, the State of Bihar and others Vrs- Pawan Kumar and others at Paragraph 14 " We therefore find it appropriate to substitute the directions issued by Tribunal vide judgment and order dated 14th October-2020 with the following directions,

(i). The exercise of preparation of DSR for the purpose of mining of the State of Bihar in all the Districts shall be under taken afresh. The Draft DSRs shall be prepared by the Sub-Divisional Committees consisting of the Sub-Divisional Magistrate, Officers from Irrigation Department, State Pollution Control Board or Committee, Forest Department, Geological or Mining Officer. The same shall be prepared by undertaking site visits and also using by modern technology. After the Draft DSRs are prepared the District Magistrate of the concerned District shall forward the same for examination and evaluation by the SEAC. The same shall be examined by the SEAC and its report shall be forwarded to SEIAA. The SEIAA will thereafter consider the grant of approval such DSRs.

(ii). Needless to state that while preparing DSRs and appraisal thereofby SEAC and SEAII. It should be ensured that a strict adherence to the procedure and parameters laid down in the policy of January-2020 should be followed.

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.

In lieu of above guideline and orders of Hon'ble Supreme Court and in compliance to the orders of Hon'ble NGT, EZ, Kolkata, in connection with O.A No. 63/2020, the Member Secretary, SEIAA, Bhubaneswar issued a Letter on 27th December, 2022 to Collector & District Magistrate, Kalahandi with a direction " the DSR is to be signed afresh by the

Collector and District Magistrate, along with members of the designated sub-committee consisting of Sub-Divisional Magistrate, and District Level Officers from Irrigation Department, State Pollution Control Board, Forest Department, Geology and /or Mining Department. Keeping in view of the orders of Hon'ble Supreme Court, Hon'ble NGT and directions of SEIAA, Bhubaneswar a fresh DSR has been prepared observing all formalities in the year,2023

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

1. Identification of Mineral Resources in theDistrict.
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.

1.0 INTRODUCTION

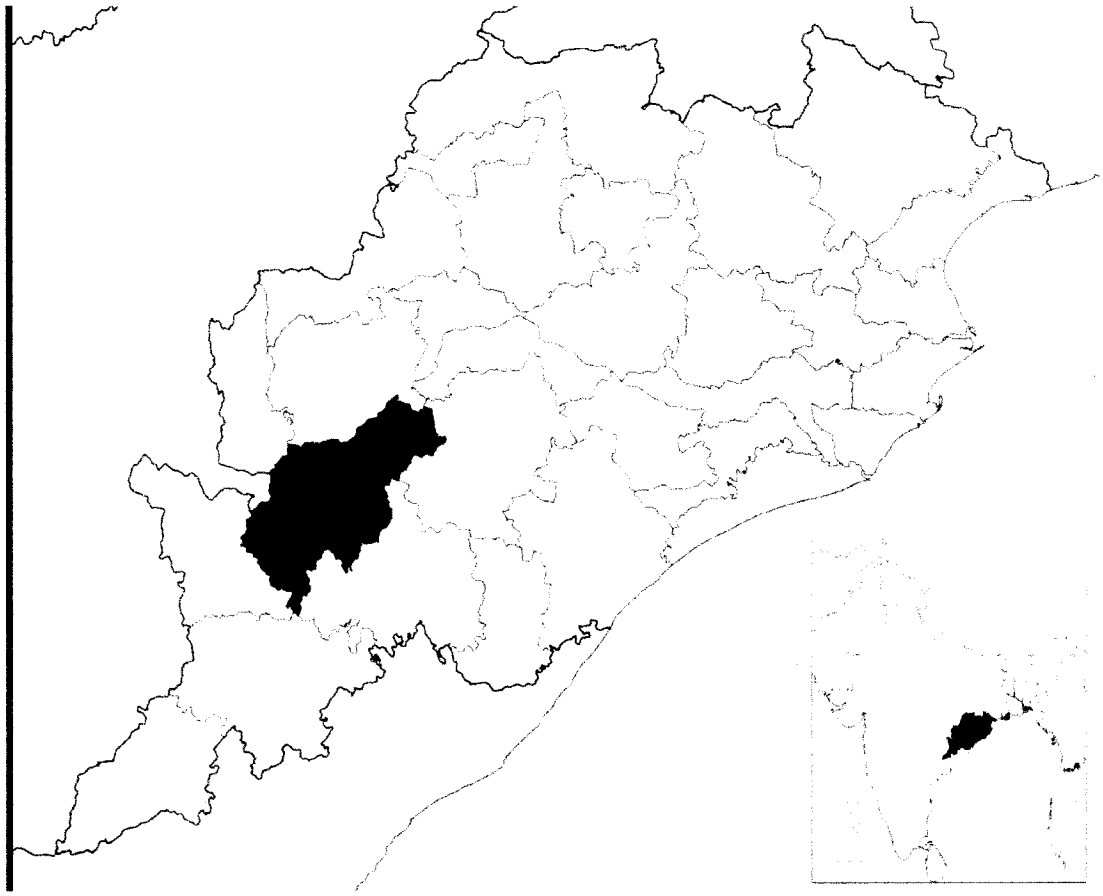
Kalahandi at a Glance:

1.1 Location and Geographical Area:

Kalahandi District, The first gazetteer (15 August 1980) of Kalahandi District says that the district comprised of the ex-State Kalahandi minus Kashipur Police Station (the Zamizari of Khariar as Nuapada Sub-division, now Nuapada District). With the merger of princely States with province of Odisha 1948, the ex-State of Kalahandi together with ex-State Patna and Sonepur formed the District of Kalahandi with headquarters at Balangir. On 1 st November 1949 Patna and Sonepur areas were separated to form District Balangir; Patna (later Bolangir) Sonepur (later Subarnapur district). And ex-State of Kalahandi, together with Nuapada sub-division which formed a part of Sambalpur district since 1st April 1936, was reconstituted a separate District Kalahandi with Headquarters at Bhawanipatna. As the area comprising Kashipur Police station posed administrative difficulties due to lack of direct communications with the district headquarters , it was separated from Kalahandi on 1st August 1962. Further Nuapada Subdivision was separated on 27 March 1993 from Kalahandi to form new District as Nuapada.

Kalahandi lies in between 19.3 N and 21.5 N latitudes and 82.20 E and 83.47 E longitudes and occupies the south western portion of Odisha, bordered to the north by the Balangir district and Nuapada district, to the south by the Nabarangpur district, Koraput district and Rayagada district, and to the east by the Rayagada district, Kandhamal district and Boudh district. It has an area of 8,364.89 square kilometres and ranks 7th in area among the 30 districts of Odisha. The district headquarters is at Bhawanipatna which stands almost in the central location of the district. Bhawanipatna and Dharamgarh are two sub-divisions of Kalahandi. Junagarh, Jaipatna, Kesinga, Lanjigarh and Mukhiguda are other major towns in Kalahandi. *Tel* is the main river of Kalahandi. Other notably rivers are *Indravati, Udanti, Hati, Utei, Sagada, Rahul, Nagabali, Mudra,* etc. The topography of Kalahandi consists of plain land, hills & mountains. Kalahandi is surrounded by hills. Its border with Nabarangpur, Koraput, Rayagada and Kandhamal districts are hilly and

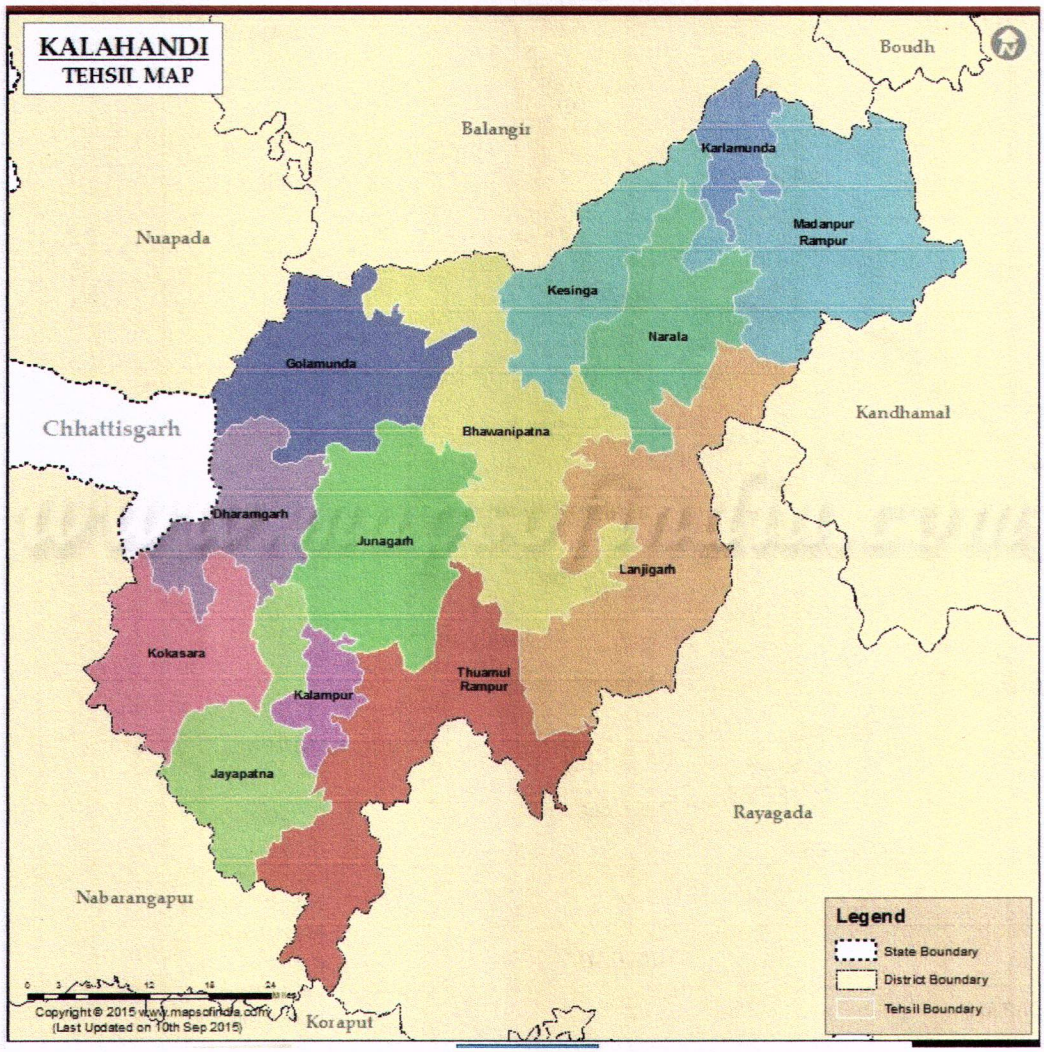
mountainous. The district is primarily agricultural, with over one third of the district area covered with dense jungle forest. Industry is very limited, but bauxite and graphite deposits can be commercially exploited.



1.2 Administrative Units:-

Bhawanipatna is the administrative headquarter of Kalahandi District. It is locatedat adistance of 400 km from Bhubaneswar, state capital of Odisha. It has 2253 villages covering13 Blocks, 13 Tahasils and 2 Sub-Divisions. The District is divided into 2 sub-Divisions. The District is divided into 2Sub- Divisions namely 1) Bhawanipatna, 2) Dharmagarh andinto 13 Blocks&Tahasils, namely i) Kalahand ii)Kesinga iii)Karlamunda iv)M.Rampur v)Narla vi)Th.Rampur vii)Lanjigarh viii)Jaipatna, ix)Junagarh, x)Koksara, xi) Golamunda, xii) Kalampur and xiii) Dharmagarh.The population of the Districtis 1576869 according to the 2011 Census. The District accounts for 1.50% of the State's territory and about 1.45% of

State's population. The density of population of the District is 169 per square km as against 269 per square km of the state. As per 2011 census, the population of Scheduled Caste is (18.17%), and Scheduled Tribe is (28.50%). The literacy percentage of the District covers 59.22%against 75.15 of the state.

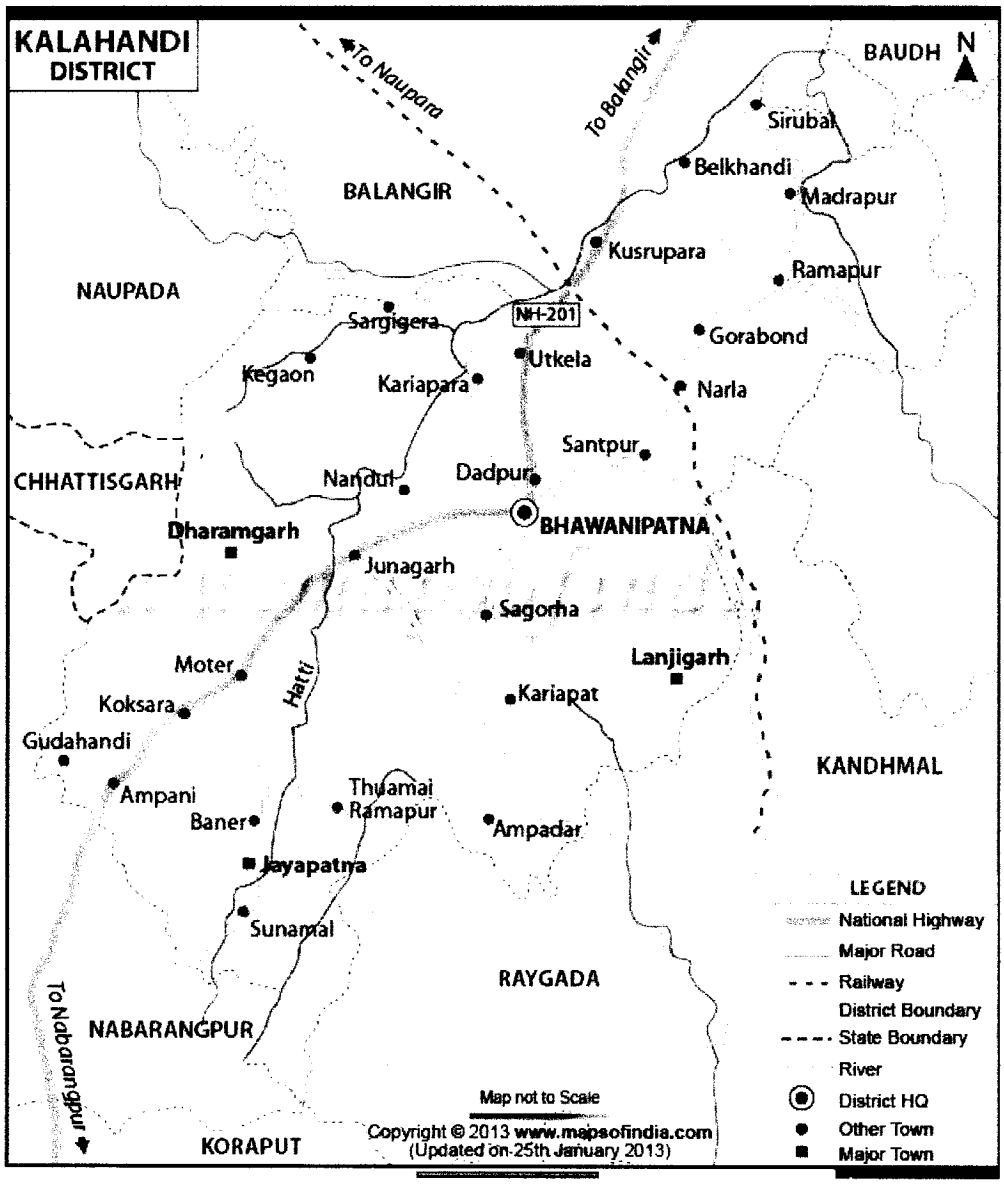


1.3 Connectivity facilities:-

Road Network

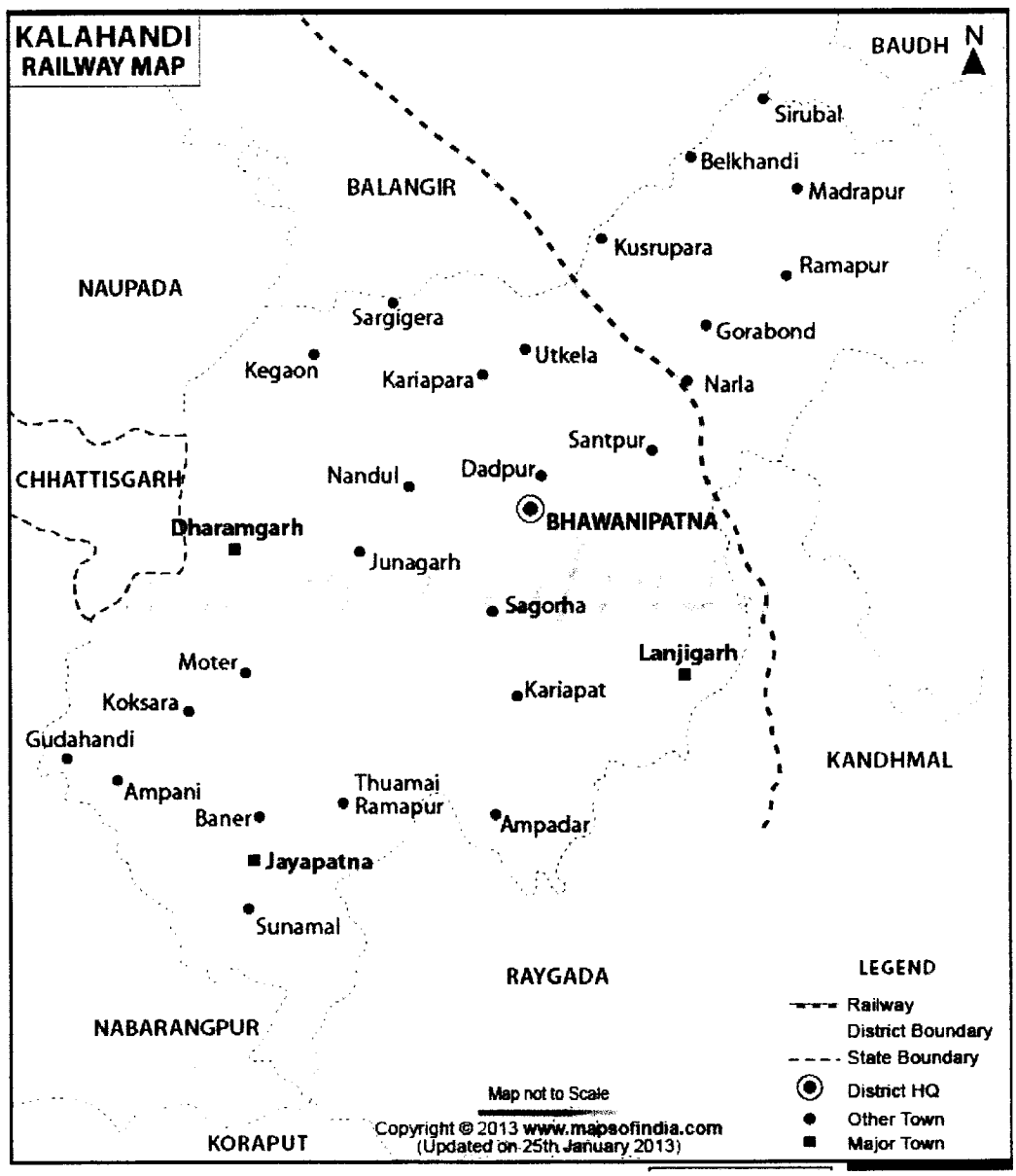
The District is well served by a network of good roads. Kalahandi situated at a distance about 400Km from the state capital & international airport Bhubaneswar and at a distance about 500 Km from the shore line of Bay of Bengal.Highways like NH-26, SH-1 6, SH-06, SH-06A, SH44 etc. passes within the district. Kalahandi is 230.3 Kms from Sambalpur

260.8Kms from Raipur, 409.9Kms from Cuttack, 396.7Kms from Bhubaneswar and 850.0 m from Bhawanipatna. It is also connected with other cities such as Sambalpur, Puri, Bolangir, Nayagarh, Boudh, and other district and state via Odisha State Road Transport Corporation and some private transport services.



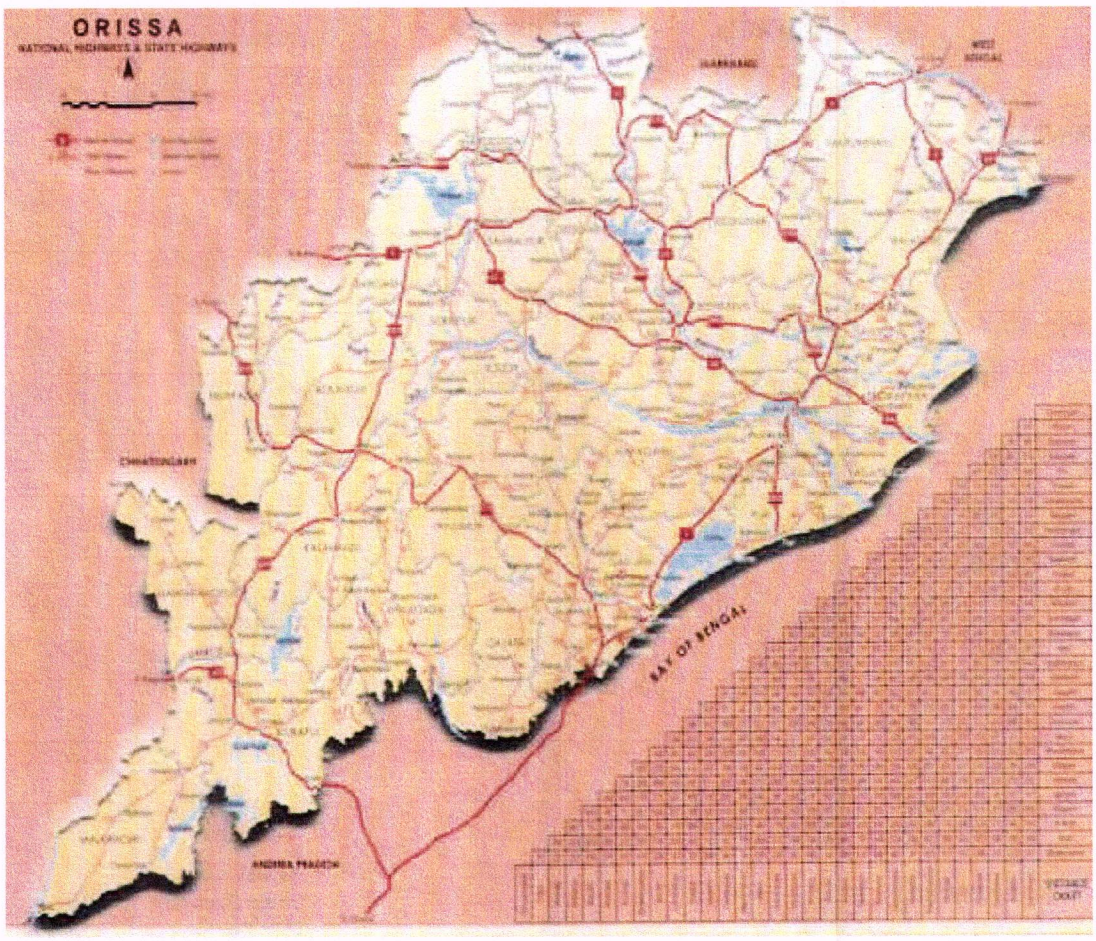
Rail Network

Kalahandi Districtis well connected by Rail link to different places, Kalahandi has 10 Railway Stations (Kesinga, Lanjigarh Road, Rupra Road, Norla Road, Bhawanipatna, Junagarh Road, Dadpur, G Ramchandrapur, Kandel Road, KutrukhamarPhare important stations on the East Coast Eastern Railway. The distance to Bhubaneswar is approximately 400.3 km, while the distance to Sambalpur is about 270 km; the city of Kalahandi is well connected to many places in Odisha like Balangir, Titlagarh, Khurda, Bhubaneswar,Angul, Hirakud, Barpali, Brahmapurand Balugaon.It also connects different states of India



Air Network

At present, Kalahandi has new connection by Airway. The site selection for aerodrome development is presently under process. Nearest International airport is Biju Patnaik International Airport, Bhubaneswar, 398Kms from Kalahandi. Utkela Airport is a domestic airport owned by the Government of Odisha located in Kalahandi District, It is situated 15km north of Bhawanipatna.



2. OVERVIEW OF MINING ACTIVITY IN THEDISTRICT:

A great variety of major mineral potential like Bauxite, Graphite, Galena, Ruby & Iolite and Specified Minor Minerals like Quartz, Feldspar & Decorative Stone (Granite) are available in the district.

Bauxite occurs in Karlapat-Pollingpadar, Kutrumali-Tangridongar, Lanjigarh -Niyamgiri, Keluamali, Krishanmali.

Graphite occurs in Sargipada, Gaidar, Singjharan, Lamer&Badibahal.

Galena occurs in Sisakhal.

Precious Stone (Ruby) occurs in Jhillingdhar, Hinjlibahal, Kerumurda, Sirja, Tandla, Banjipadar, Sargiguda.

Semi-Precious Stone (Iolite) occurs in Dedar, Labanyasar, Bondoguda, Kutingpadar, Ghatpada, Rengali, Dharmagarh, Golamunda and Th.RampurTahasils.

Quartz and Quartzite occurs in Kalahandi, Kesinga, Jaipatna, Junagarh, Dharmagarh, M.Rampur, Narla, Koksara, Golamunda, KalampurTahasils.

Feldspar occurs in Bhikajharan of Kalahandi Tahasil.

Decorative Stone (Granite) occurs in Lanjigarh& Kalahandi Tahasil.

(a) **Major Mineral:-**

In Kalahandi district, presently there are seven nos. of mining leases of semi-precious stone out of which only two nos. of mining leases are working i.e. Ghatpada Garnet Mines over an area of 25.176 hectares of Sri Bijaya Kumar Bansal & Pipalpadar & Sirjapali Cat's eye Mines over an area of 17.122 hectares of Sanjukta Gems Prop:- Sri Shiv Kumar Bansal.

(b) **Specified Minor Minerals:-**

(i) Four nos Quarry leases for Decorative stone (Granite) have been granted in favour of Jay Minerals Pop:- Sri Ajay Agarwal, in village:- Chandanapur over 9.696 hects, and over 3.602 hects in favour of Smt. Ramadevi in village:- Karlasoda over 13.464 hects

and in favour Sri Harendra Kumar Patnaik in village-Nuapada under Kalahandi Tahasil over an area of 8.575 hectares for decorative stone. Now the lease is non-working and the lessee has applied for Renewal of Mining Lease, which is under consideration of the Govt.

Besides this, three nos. of prospecting licenses for decorative stone (Granite) have been granted i.e. Karlasoda Decorative Stone (Granite) Quarry over an area of 1 3.464 hectares in village-Karlasoda under Kalahandi Tahasil in favour of Sr-nt. P.Ramadevi, Chandanpur Decorative Stone (Granite) Quarry over an area of 3.602 hectares & Chandanpur Decorative Stone (Granite) Quarry over an area of 9.696 hectares in village-Chandanpur under Lanjigarh Tahasil in favour of Jay Minerals Prop. Ajay Agrawal.

(ii) There is one nos of non-working Quartz mines in the district had been granted in favour of Shreedhar Minerals, Proprietor Sri Tribhuban Pattjoshi at village Santemri over an area of 3.148 hectares under Jaipatna Tahasil.

(iii) There is one nos of working Quartz Mines in village Sidingpadar over an area of 4.9617 hectares under M-Rampur Tahasit has been granted in favour of Sri Samarendra Pratap Singh Deo and transferred to M/s Max Rampur Fortunea Pvt Ltd.

(iv) LOI have granted for 3 nos of quartz Mines one at - Village Patharla over 3.864 hects in favour of M/s Shreedhar Minerals one at Dulikiband over 4.945 hects at Batigurha over 7.680 hects in favour of M/s Pranati Enterprises.

(v) One Mining lease for Quartz and Feldspar has been granted in favour of M/S Shreedhar Minerals, Proprietor Sri M.N. Pattjoshi over an area of 5.147 hectares on Dt. 14.06.1982. Now the lease is non-working and the lessee has applied for Renewal of Mining Lease which is under consideration of Govt.

(vi) Four no of P.L have been granted in favour of M/S Shreedhar Minerals Proprietor Sri M.N. Patjoshi at village Khinbahali over an area of 2.428 hectares under Junagarh Tahasil, at village Bhalubutra over an area of 2.873 hectares under Jaipatna Tahasil at village

Biripura Dongar over 5.323 hect and at village Bhikajharan over 7.207 in favour of M/s Shreedhar Minerals.

(vii) One Prospecting License has been granted for Quartz and Feldspar in favour of M/S Shreedhar Minerals Proprietor Sri M.N. Patjoshi at village Bhikajharan under KalahandiTahasil over an area of 12.638 hectares.

(c) **Other than specified minor mineral:-**

Other than specified minor minerals such as riverbed sand, ordinary stone (road metal) & Morrum s are also available in the district. But almost Morrum sairat sources are available in Gramya Jungle and Gochar kissam land.

3.0 GENERAL PROFILE OF THE DISTRICT:

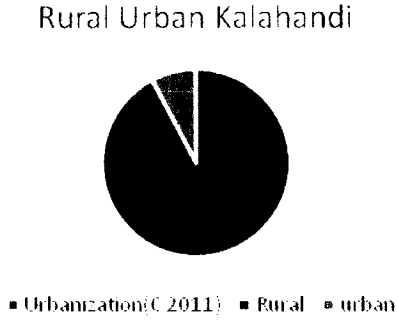
3.1 Demography:

Census - 2011	
Geographical Area	2337 Sq. Km.
Total population	1576869
Male Population	787101
Female Population	789768
Male Literacy	60.37%
Female Literacy	39.63%
SC Male	142133
SC Female	144447
ST Male	221171
ST Female	228285
Other Male	423797
Other Female	417036
Illiterate Male	302924
Illiterate Female	471909

RuralUrbanKalahandi

Urbanization(C 2011)

Rural	1454882
urban	121987



4.0 GEOLOGY OF THE DISTRICT:

The tract is geologically made up of non-fossiliferous rocks, mainly crystalline schists with occassional caps of laterite (or bauxite) on the malis in the southern plateaus Geological succession found in Kalahandi forest division is as follows in order of increasing antiquity:

Laterite, Cuddapah, Hornblende-schist, Charnokite, Garniteferous Gneissose Granite, Khondallite, Crystalline-complex.

The entire Pahilpur region is underlain by rocks of crystalline complex composed mainly of unseparated gneisses and schists usually garnitiferous. The chief rock is a pink, fairly felspathic biotite gneiss with hornblende and frequently monoclinic pyroxene.

Khondallite named after a rock in the Khond tract is composed of quartz, graphite, sillimanite and small particles of red garnet in crushed ground mass. It is sedimentary in origin.

The Granitiferous gneisses and granities are found in the northward stretch of the plains lying between the western border and the eastern hills.

The rock type changes to Charnokite inter-spersed with Laterite in the south eastern slopes of the plateau. It tops the hills which again are formed of Khondalites, Charnokite and are generally coarse and crystalline, brownish black in colour and exhibit porphyritic

felspar and garnets. This rock yields heavy clay of calcarious nature unfavorable to vegetative growth. But it produces rich loamy soil in association with Khondallites and/or gneisses and granites.

Charnokite is found passing into Hornblende - schists on the border area of Pahilpur plains. It also weathers to basic day and incombination with Khondallite produces good forest soil.

The Cuddapah rocks are characterised by grey and choclate colour slates and white and buff quartzites is found in the hills of Sahajkhol block. This rock system on disintegration, produces very poor heavy clay soil.

The rock types in Khariar area are granite gneiss calosilicate rocks, and highly metamorphosed and epidetised basement complex (peninsular gneiss and granite) consisting of rocks belonging to the Khandalllite group and Charnokite group. The Khandallite group is composed of the garnet - sill imanitegraphite schists and gneisses with inter banded quartzites, sillimanite quartzites, crystalline lime stones calciphyres and calgranulites. The Charnokites are hypertenegranite gneisses which have undergone considerable retrogade metamorphism. These rocks are intricately folded and refolded and at places sheared.

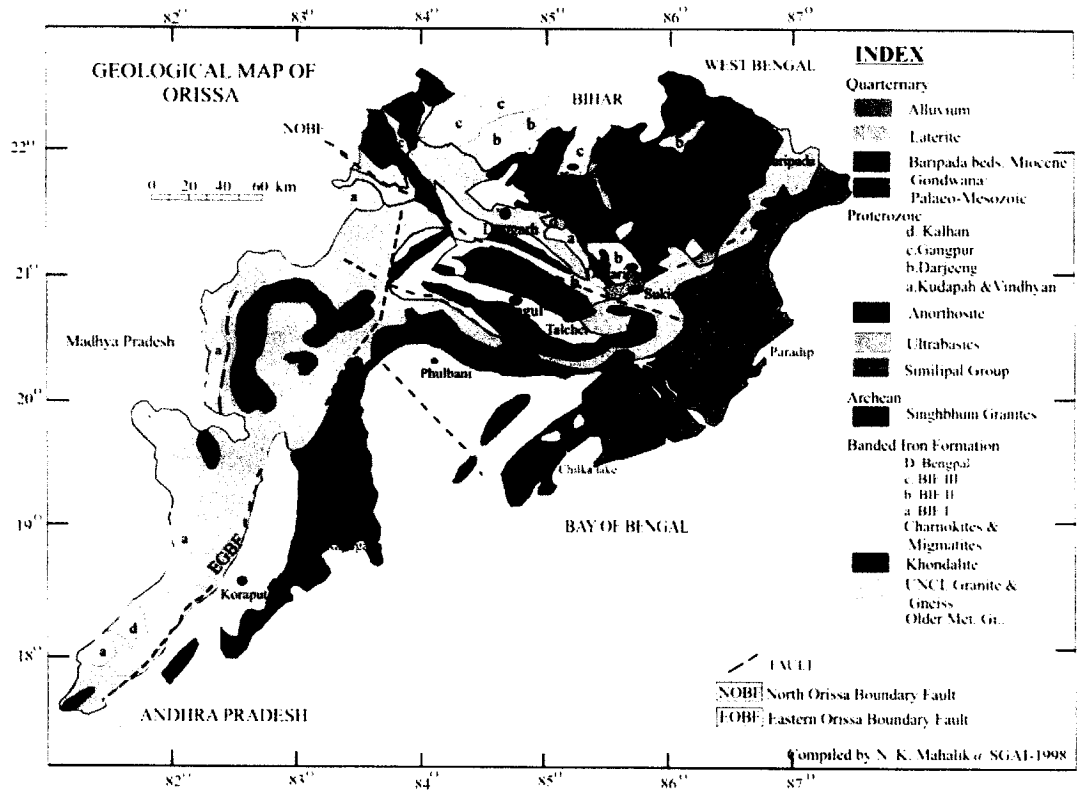
The Padampur area is composed of course grained garnetiferous granite gneiss and migmatic gneiss with members of Khondalite series namely Khondalite, calosilicate rocks and quartzites developed on the surrounding hills and mounds.

The coarse grained garnite gneiss is generally non foliated and massive. The fine grained variation encountered in the drill cores is usually well foliated. Porphyritic granites is extensively developed and sheet like out crops are very common around Padampur, especially along the Koldi and Kumar; nadis. Lenticular zones and banks of hornblende schists and amphibolites occur profusely within the zone of porphyrite granite

Kalahandi District is part of Eastern Ghat Super Group, the Eastern Ghats are a discontinuous range of mountains along India's eastern coast. The Eastern Ghats run from the northern Odisha through Andhra Pradesh to Tamil Nadu in the south passing some parts of Karnataka and in the Wayanad district of Kerala. They are eroded and cut through by four major rivers of peninsular India, viz. Godavari, Mahanadi, Krishna, and Kaveri.

The mountain ranges run parallel to the Bay of Bengal. The Deccan Plateau lies to the west of the range, between the Eastern Ghats and Western Ghats. The coastal plains, including the Coromandel Coast region, lie between the Eastern Ghats and the Bay of Bengal. The Eastern Ghats are not as high as the Western Ghats. The Eastern Ghats are older than the Western Ghats, and have a complex geologichistory related to the assembly and breakup of the ancient supercontinent of Rodinia and the assembly of the Gondwana supercontinent.

The Eastern Ghats on the east coast of India is a largely granulite terrain but also exposes granites, migmatites, anorthosites and alkaline rocks. This granulite belt has had a



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4.1 Physiography & Geomorphology:

Physiography:

The district Kalahandi is situated at the south western part of Odisha constituting part of Western Ghat Mobile Belt normally a rugged hilly terrain. The district covers a number of new series Topo Sheets i.e.F44W16, E44E9, E44E70, E44El l, E44E13, E44E14, E44E15, E44E16, F44X3, F44X4, F44X7,F44X8, 1, F44X16, E44Fl, E44F2, E44F3, E44F5 & E44F6. Kalahandi district is physiologically a complex terrain having numerous numbers of hills, moulds, plane lands, river beds, agricultural lands, forest growth areas etc. In the southern most part of the district there is Indravati Reservoir catchment area which is also shared by Nawarangpur district. Adjacent to reservoir catchment area hilly terrain present which have an elevation range from mean sea level about 700m to 1000m. Hills and mounts are more common in the south to Bhawanipatna where as in the north part is the less hills compared to southern part possesses an elevation range between 250m to 800m from MSL. As the district is a part of Eastern Ghat Mobile Belt so the rock types are mostly homogeneous in nature, so the drainage pattern developed in the region is dendritic pattern. The main drainage trend flows from the south-west to north-east direction within the district. There are several seasonal nala / dry nala& a few perineal natural drainage exists within the district. Main river that touches the district is Tel River, in addition to that a few other small rivers present within the district namely Hati Nadi, Udanti Nadi, Sagada Nadi, Kamal Nadi, Ret Nadi, Uttei Nadi etc etc.

The main township that is developed in the district is Bhawanipatna also is the district head quarter, which is present in the central part of the district and connect to all parts of the district through road ways.

There are a number of reserve forests present within the district a few major RF are namely Benakhamar RE Udaygiri RE Singari RE GopalpurRE Indravati RE Phatadhara RE Machul RE Hatisal RE Kiding RF, Bazargarh RE Benagurha RE Urladani RE Taprang RE Telan RE SatamiRE SUIia Block A RFect. In addition to the reserve forests there is a wild life sanctuary present in the district namely Karlapat Wild life sanctuary.

According to the physiography, the district can be classified into two distinct regions, viz. the plain lands and the hilly tracts. The plain lands region runs southward up to Bhawanipatna and then westward through Junagarh and Dharamgarh district and then further up to the boundary of the district, covering about 59% of the total district area. South-western part of Bhawanipatna subdivision is mostly covered by hilly tracts, and some of the hilly tracts are covered with dense forest.

Eastern and south-eastern areas from, Bhawanipatna are hilly tribal areas known locally as 'dongerla'. Chains and clusters of hills rise towardsthe southern higher plateau which continues into Koraput district forming part of the easternghats. Tel and its tributaries Hati, Sunder and Udanti rivers fom a wide fertile valley attaining a height of 200 meters (654') on the western side.

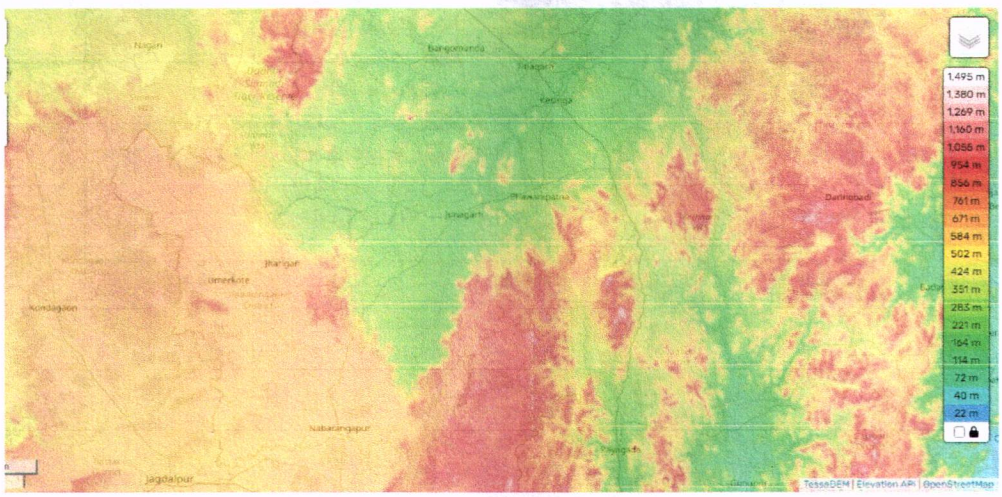
The dongerla in Madanpur - Rampur range cluster closer to the north-east form the slow rising plateau attaining 300 - 500 meters height which ultimately merge with the Balliguda plateau in the north-east. Maximum altitude in this region is between 800 - 900 meters. Flat hi 11 tops known as mali are the characteristic of this region which rise above the general level of the valleys. The highest point in Kalahandi is 1298 meters (4259') on the Niyamgiri hills.

Richly cultivable and fertile plains known as Pahilpur region lie to the west of Junagarh which covers nearly 1200 km^2 (403.32 $mile^2$) of area stretching all the way to the district limits in the South-west. Hill ranges of Ghana, Pariagarh and Parigaon Separate these plains frcm the northern plains. The hill ranges in Sahajkhol block are extension of the Koraput plateau.

The plains between Tel and Sagarda rivers in the south Nawapara sub-division in the west, Bolangir district in the north and the dongerla in the east spread over Borda, Bhawanipatna, Kesinga and Madanpur-Rampur ranges upto Parkel which is the lowest point in the Kalahandi forest division (152 mtr. 499'). This area has scattered clusters' of hills and is slightly less fertile than the pahilpurregionmentioned in the preceedingpara .

The area of Khariar forest division is characterised by a series of long hill ranges running approximtely from north to south. In the West, the long impeneterable wall is formed by the hill ranges of Gatibeda, Patdarha along with those of Koilakhola.

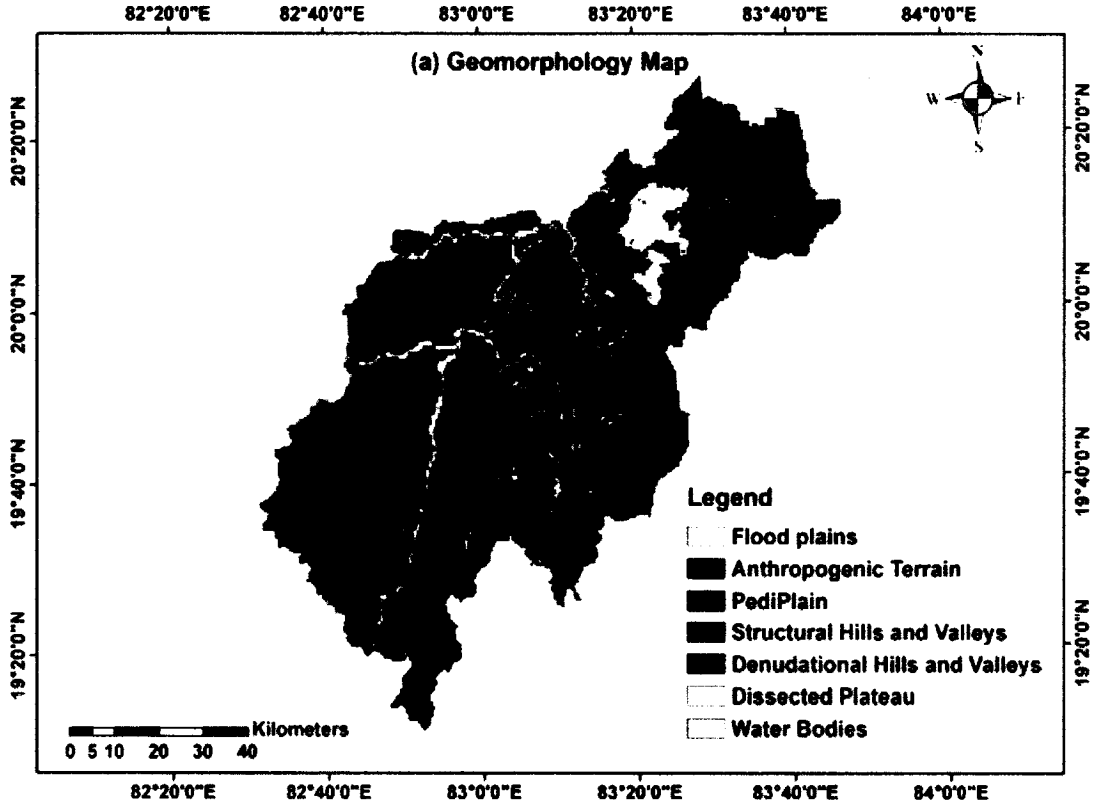
Parallel to this run the hill ranges of Patidongar which meet the Gurudonger block and the Nimna-Adpita hills and finally the outer hill ranges of Kailakhola, intercepted by the Udanti river. This constitutes the second longest high hill range in the western part of the division. A third series of hill range is formed by Chhata and Bajini hills and is joined by Pippalpani and Kumudi hill ranges ending near Bahebir, intercepted bjOllar Jor in the southern outskirt. The fourth series of hill range is formed by Narayan dongri, Kendumunda and Nageshpahad and is perpendicular to the already described hill ranges. Thereafter, the Choura hills form the fifth series of hill ranges in association with the Khasbahal Bundiam Bijli, Budharya Dharmasagar and Tandel hills. There are many prominent hills on the western boundary with height ranging from 109 meters to 815 meters. Besides, there are scattered hills and hill ranges throught the division.



Geomorphology :

Physiographically the district comprises diverse landforms consisting of rugged hill ranges, plateaus, undulating plains dotted with residual hills and mounds and fertile erosional plains and valleys. A gently undulating terrain with a vast stretch of cultivable land characterizes the major parts west of Bhawanipatna in the district. The elevation of the hills located in the southeastern and southern parts ranges from 953 to 1229 m above mean sea level. In Arupani – Koksara – Junagarh tract the elevation of land surface varies from 220 m to 325 m above MSL. In Bhawanipatna – Utkela – Kesinga tract the elevation of land surface

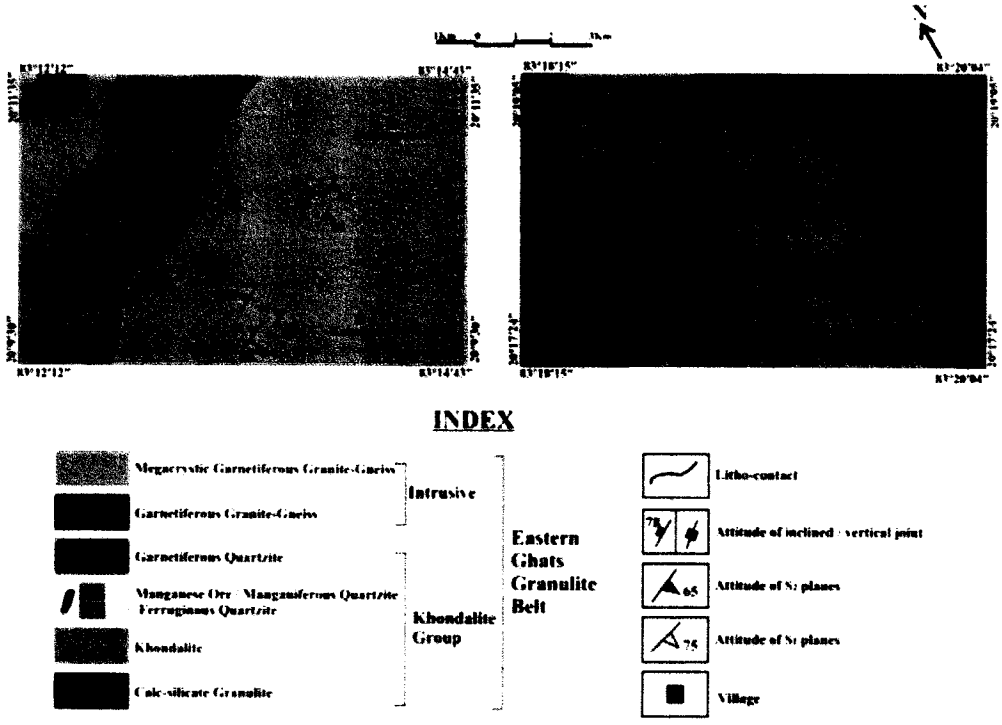
ranges from 186 m to 350 m above MSL. In the undulating plains the general topographic slope is towards northeast.



4.2 Stratigraphy:

Event Stratigraphy of the Eastern Ghat Mobile Belt is as follows;

Age(Ma)	Event
550-650	Exhumation & Stabilisation(Pan-African)
800-850	Emplacement of AnorthositeMassifs,Some Alkaline Rocks(?) Younger Granitoids are Charnokites
950-1100	Main EasternGhat Orogeny(=Grenville)
Khondalite Group	Garnet-Sillimanite-Graphite Gneiss(khondalite)with minor cordierite-Saphrine-Spinel Gneiss(Mg-AI) Calc-silicates rocks & rare Marbles Quartzite(Garnet ±Sillimanite)
~1500	Emplacement of Alkaline rocks along with the rift Margin Evolution of platform (Purana) basins like Cuddahpah,Chhatishgarh, Indravati etc.
1600-1800	Evolution of Nellore-Khemmam schist belt in Dharwar Craton
2600-2800	Charnokite& Gneisses of the basement(WCZ)



Map

4.3 Mineral Resources:

Some commercially exploitable minerals are found in hilly areas of Kalahandi district. Bauxite is found in Gandhmardan plateau area on the interdistrict border of Bolangir and Sambalpur districts, theestimate reserve of which is over 2 million tonnes. In addition to this, Graphite and manganese are alsc, being quarried for a long time in the district. Mica is also present. but is not commercially exploitable. Shales and limestonesoccur as bands within the quartzites and are found exposed in some area.

4.4 Soil:

The distribution of different soil types in the district depends much on its physiographic and lithologic variations. Based on the physical and chemical characteristics, mode of origin and occurrence, soils of the district may be classified into three groups namely Inceptisols, Alfisols, Vertisols, Histosols and Entisols. The detail description is given below:

1)Inceptisols: Red soils are the most predominant soil type in Kalahandi district covering about 45 % of the total area. These soils occur in foothills terrain and as

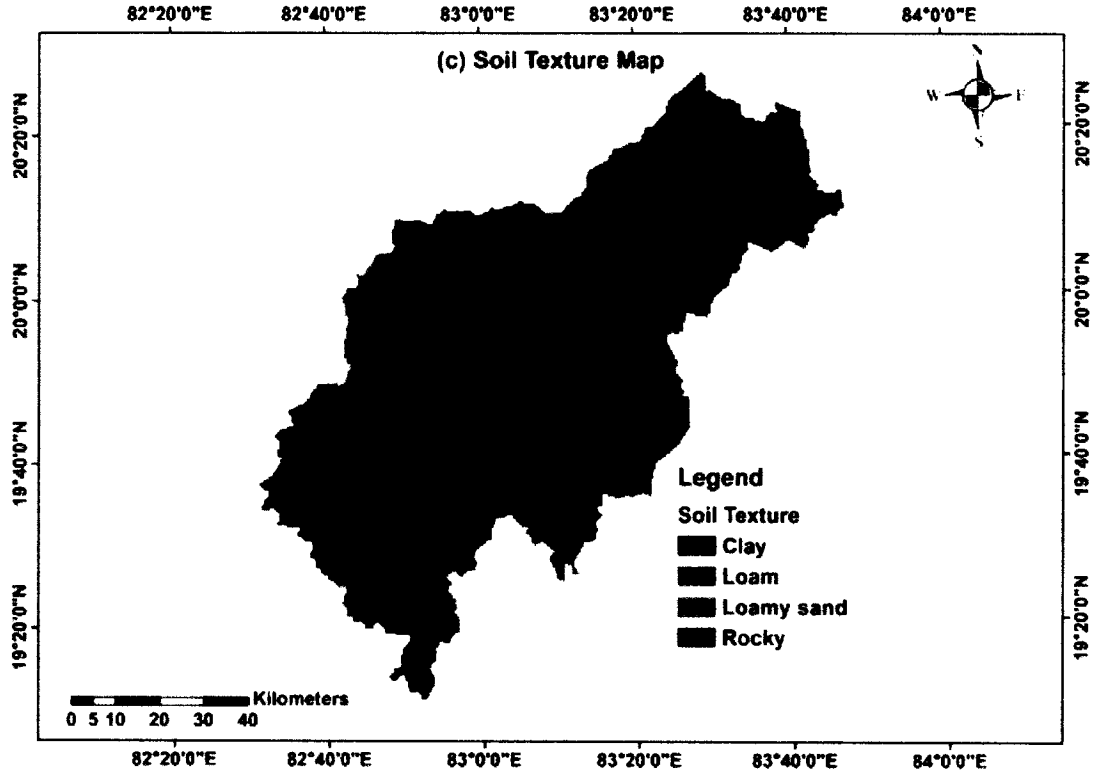
capping over the hillocks. These soils are poor in nitrogen, phosphate, potassium and organic matters. These soils are light textured and the pH ranges from 4.5 to 6.0.

2)Alfisols: The Alfisols include red sandy soils, red loamy soils mixed red and black soils. These soils cover about 27 % of the total area of the district and occur at lower elevations with undulating topography. These soils are neutral to slightly alkaline in nature (pH varies from 5.5 to 8.5). The characteristic features of red soils are (i) light texture, porous and friable structure, (ii) absence of lime kankar and free carbonates and (iii) soluble salts in small quantity usually not exceeding 0.05%. These are usually deficient in nitrogen, phosphate, organic matter and lime. These soils are suitable for cultivation of paddy and other crops.

3)Histosols: Black soil is an important soil type in the district occupying parts of Bhawanipatna, Narla, Kesinga, Dharamgarh, Golamunda and Koksara blocks. These soils are rich in potassium and nitrogen but poor in phosphorus. These soils are most favourable for cotton cultivation which is a generally draught resistant, labour intensive but a highly remunerative crop.

4)Vertisols : These are medium black soils found around the course of Tel river and its tributaries. These soils are highly argillaceous and contain high amount of iron, calcium and magnesium. These are usually poor in 6 nitrogen, phosphate and organic matter but rich in potash and lime. The pH varies from neutral to alkaline and texture varies from loam to clay loam. These are quite fertile soils and suitable for paddy cultivation.

5)Entisols: These consist of alluvial soil occupying the flood plains of major rivers and streams in the district. These are deficient in nitrogen, phosphoric acid and lumbers but not in potash and lime. These soils are alkaline in nature and fertile.

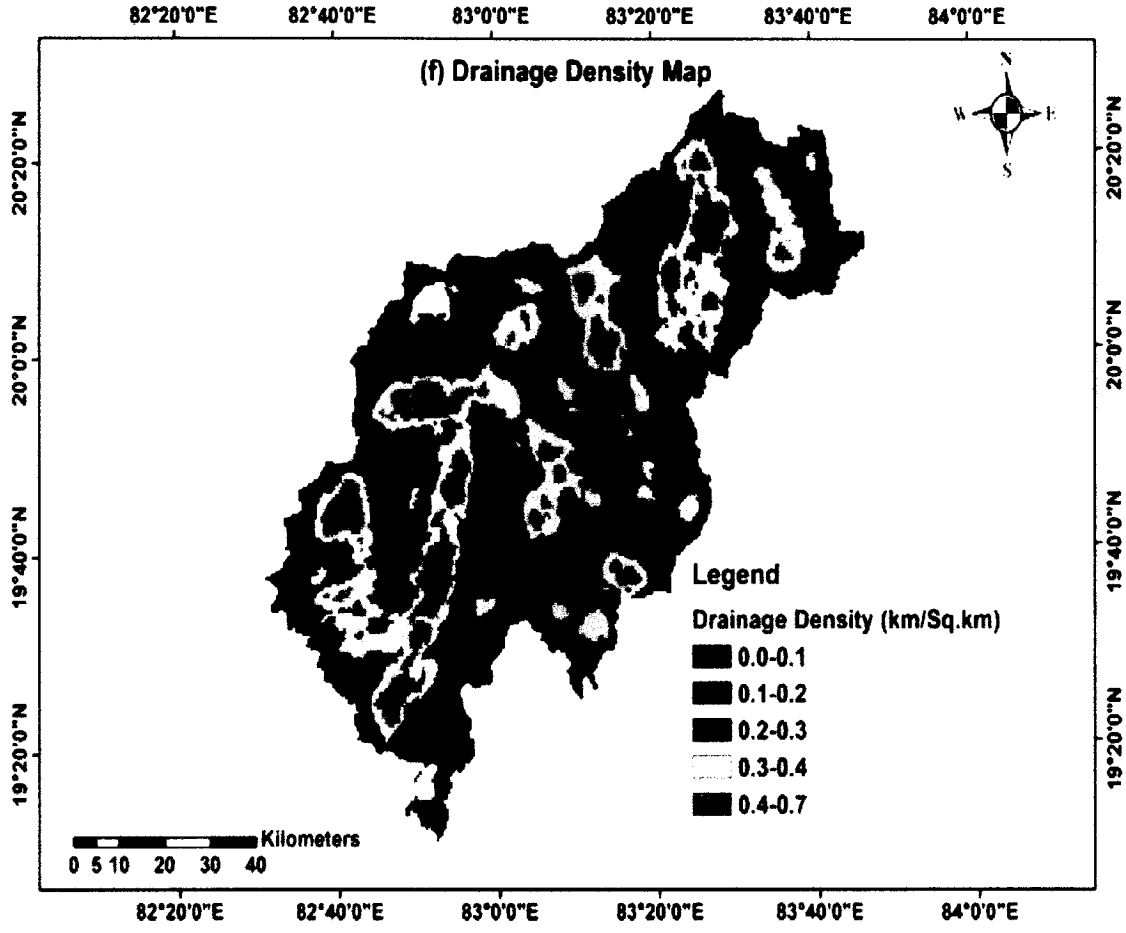


5. DRAINAGE OF IRRIGATIONPATTERN

Kalahandi district is a physically hilly terrain having majorly dendritic drainage pattern, there is only one main river named Tel River flows in the district in the northern part of district, in addition to that several immature rivers namely Hati Nadi, Udanti Nadi, Sagada Nadi, Kama/Nodi, Ret Nodi, Uttei Nadi etc. Originate & flows in the district also few of them act as the tributary to Tel River. The distance of the sources from the river origin is geologically very short, hence this can be concluded that the rate of deposition of sand in Tel River is moderate, while in Rest Rivers within the district the rate of deposit is low.

IRRIGATION BY DIFFERENT SOURCES(Areas and Number of Structures)				
	Sources of Irrigation	**Number**	**Area in hectare**	**Percentage of total irrigated area**
	Canals	142	129118	65.31
	Tanks	-	-	-
	Open wells	13547	10.486	53.04
	Bore wells	4159	7.884	3.99
	Lift irrigation schemes	2127	23.890	12.08
	Micro-irrigation	78	0.058	0.029

	Other	-	8.681	4.39
	Total Irrigated Area	-	190.917	96.56
	Pump sets	253	-	-
	No. of Tractors	56	-	-
	Irrigation	**Area in hectares**		
	Net irrigated area	Net irrigated area 190.9(30.38%)		
	Gross irrigated area	Gross irrigated area 197.7(32.95%)		
	Rainfed area	402.3(67.04%)		
Source: Agriculture Strategy of Kalahandi District, Kharif, 2020-21				



5.1 River System

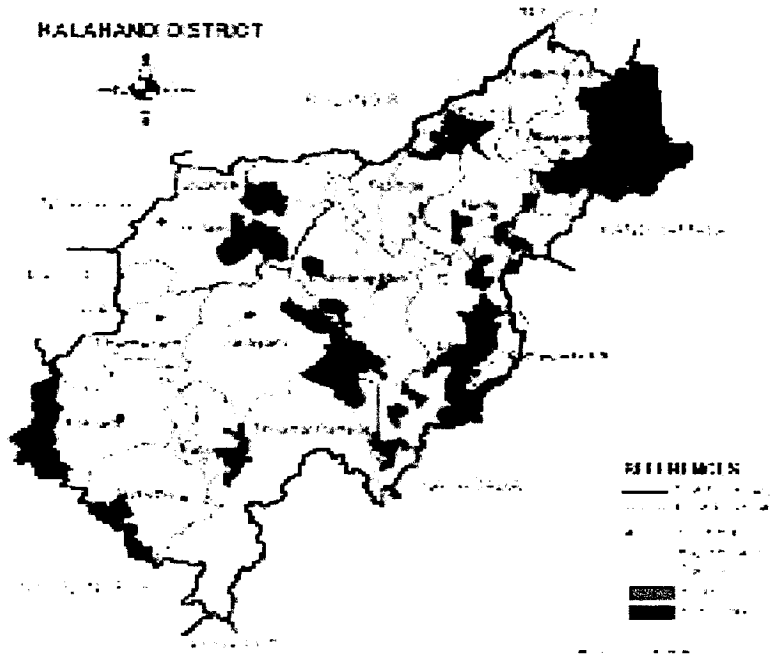
The most, important river system. in this district is of Tel and its tributaries. Large number of small rivers and streams originating from hills in South east portion of Kalahandi and drain in toriver Tel. After flowing along the border of Kalahandi with Bolangir district it separate Bolangir and Phulbani districts along the north western boundary of Phulbani districts and meets Mahanadi river near Sonepur.

The Indravati originates in the north of Thumal Rampur and flows towards the south with practically no tributary during its course in Kalahandi. Finally it flows towards west to descend to the plains in Nowarangpur sub-division of Koraput district It eventually joins the Godawari.

Khariar region has three main perennial rivers namely Jonk, Indra and Sunder and Udanti. Jonk originating from the north-western out-skirts of Patdarha block descends to the plains or the foct hill of Manikgarh block and finally flows into Mahanadi river. Indra originates from Kukar region of Madhya Pradesh and enters Patdarha forest block where it is joined by two prominent streams from the north and south and proceeds eastwards in straight course. Further, it is joined by two perennial hill streams from north and the south called Khalijharia and Durajhor respectively.

River Sunder originates between Patidongar and Tanwatghati blocks and flows to east by the side of Lat - Kanpuda and meets the river Indra at Dargaon after a straight southernly course - The river enters from Madhya Pradesh flowing from west to east, enters the Kalahandi forest division where it joins river Tel near Borda. Substantial areas in the north - west and east and southern parts of Patdarha block are drained by river Indra.

Ong is another prominent perennial river flowing in the Padampur plains in a westernly course upto the inter district boundaries of Sambalpur and Bolangir districts. It meets several nalas from the Tanwatghati and Analjuba hills, then flows to north east and reaches the foot of Arhwal hill, encircling it in a semi- circular way and finally it meets the Mahanadi near Sonepur. Many hill streams and nalas originate from the hill ranges around and flow over the Padampur plains to finally meet the river Ong.



6.0 LAND UTILIZATION PATTERN IN THE DISTRICT

6.1 Forest and non-forest land

The important forest produce of Kalahandi are timber , fuelwood and bamboo while others include Tenduleaves, Charcoal, bramgrass, Mahua flowers and seeds etc.

The forest of Kalahandi district correspond to "Tropical forests" according to Champion's classification. These forests depict generally two main types, viz; moist and dry deciduous, which cover different regions of the tract and indicate the origin of a broad pattern very much in consonance with the configuration and geology of the tract and also to a large extent with its climate and rainfall. The pecuilar situation of the tract,the "Tension Zones" between the Northern and Southern Indian form, represented by sal and teak respectively, isagain an interesting feature of the tract.

Although, as would be expected, local variations due to edaphic factors is quite common in each of the general formations much of the originality in considerable portions of these forests, has been lost due to continued biotic influence, the most deciding of which has been shifting cultivation, locally known as Podu, practised in this tract since many years. Indulged in moderate proportionthis practice has hastened the formation of sal forests which are generally taken as climax types. But when podu is prolonged and over done, the

result has been rapid retrogression and appearance of secondary seral types of much poorer forests. This is amply evident by comparison of similar areas inside reserved forest, protected from podu during the past nearly half a centuary, and those outside reserved forest under active expanding Podu.

The "Moist sal forests" are found in luxuriant climax patches often showing pure pockets of quality class II and I, sheltered inside reserved forests. The entire region of the tract lying on the east and stretching from the north-eastern end of the tract to the southern most limit of the southern high lands, had at one time, most certainly been covered in large continuous stretches by moist deciduous forests predominated by sal. Natural Teak forest is interspersed with big chunks of dry deciduous miscellaneous forest in some forest blocks where patches of sal are alone present in the vicinity. Podu had a considerable hand in shaping the forests of this region before the advent of Forestry. With the beginning of forest consciousness in the ex-state regime, many of those forests, generally less disturbed by podu, got reserved. These form now the control to assess the extent of retrogression that has been the result of repeated podu. The usual process is passage through seconndary seral type of dry deciduous forests, often gradually changing to pure bamboo brakes, which again is replaced by dry scrub jungle area and finally became waste land and hill slopes of which large areas are seen in the southern high lands.

The transition from the Northern to Southern India form is seen in between the "Moist Sal" in the eastern part of the tract and "Dry Teak" in western boarder. In this zone in some isolated pockets sal and teak are seen growing together. The transition from "Moist Sal" to dry mixed deciduous forests is of both, northern and southern form. In the southern high land also the transition from the northern to southern form is indicated by increasing occurrence of various species more akin to South Indian flora.

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

2019 Assessment								
District	**Geographical Area Km2**	**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
Kalahandi	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	so
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
Kalahandi	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 2019-Odisha)

6.2 Agriculture Land:

The primary objective of Agriculture Department is to increase the production as well as productivity of major crops like Paddy, Greengram, Arhar, Cotton, Blackgram & 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 ithas already been pointed out, that agriculture is the main livelihood of the people in Kalahandi District. It is therefore also designated as the food bowl of Odisha. Rice isthe 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: Crop Coverage Area of Kalahandi District, Odisha

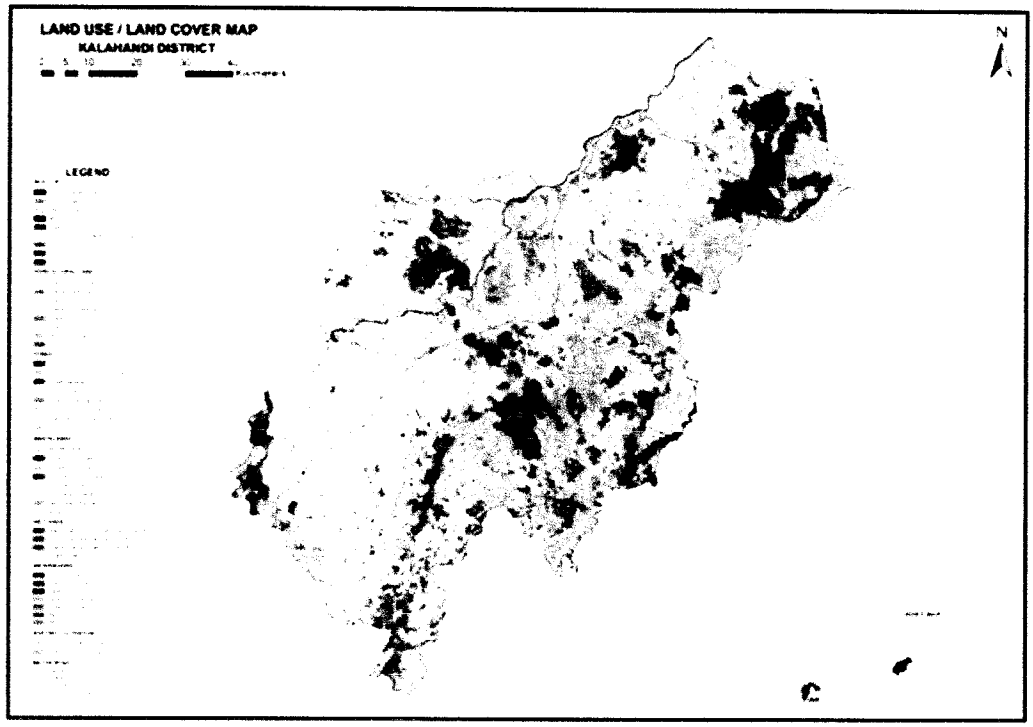
Major field crops cultivated	Area('000ha)							
	Kharif			Rabi				
	Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	Summer	Grand total
Paddy	161097	43361	204.458	61.95	-	61.950	39.42	305.828
Green gram	-	6514	6.514	1.353	71.832	73.185	-	79.699
Black gram	800	19741	20.541	0.238	3.972	4.210	-	24.751
Cotton	-	60988	60.988	-	-	-	-	60.988
Arhar	-	20322	20.322	-	-	-	-	20.322

6.3 Horticulture Land:

The primary objective of Horticulture Department is increase of production as well as productivity of major fruits like Mango, Banana, Guava, Chilli, Onion 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	6.985
Guava	1.009
Banana	0.509
Papaya	0.60
Litchi	0.60
Brinjal	7.690
Tomato	6.260
Onion	2.45
Chilli	1.888
Okra	0.749
Ginger	0.150
Turmeric	0.248

Source: SREP, Kalahandi. Orissa Agric.



7.0 SURFACE WATER AND GROUND WATER SCENARIO OF THEDISTRICT

7.1 Hydrogeology

The hydrogeological framework of the district is mainly controlled by the geological set up, rainfall distribution and the degree of secondary and primary porosities in the geological formations for storage and movement of ground water. Since major parts of the district are underlain by hard rocks of diverse lithological composition and structure, the water bearing properties of the formations also vary to a great extent. The area has undergone several phases of intense tectonic deformations which has been responsible for the development of deep seated intersecting fracture system. Hydrogeological surveys in the district reveals the lithological characteristics and the role of tectonic deformation on the occurrence and distribution of ground water reservoirs and their water bearing and water yielding properties. Lineaments formed due to tensile deformation were picked up from remote sensing studies. The structural elements mainly control the occurrence and movement of groundwater in the typical fractured crystalline basement terrain. The major hydrogeologic units in the district can be subdivided into two broad groups.

(i)Areas underlain by fractured, fissured and consolidated basement rock formations. (ii) Areas underlain by recent unconsolidated alluvial formations.

Water bearing properties of the Consolidated formations : The crystalline rocks like granite gneisses, khondalites, charnockites, quartzites, which are devoid of primary porosity, occupy about 95% of the area of the district. The weathered residuum and jointed & fractured portion of these consolidated rocks constitute principal water bearing horizons. The thickness of the weathered zone is generally more in the topographic lows and undulating plains than in the high land areas. Ground water occurs under phreatic condition in the weathered zone and in semi-confined to confined condition in deeper fractured zones. The water yielding capacity of fractured rocks largely depends on the extent of fracturing openness and size of fracture and nature of their interconnections. Usually two to four water bearing fractures occur down to a depth of 100m below ground level. Potential fracture zone is encountered even at depth of 194 m at Dadpur (Block-Narla).

Granites and Granite Gneisses: These are the most predominant rock types in the district occupying undulating terrain and topographic lows. On weathering these rocks yield sandy residuum and the intensity of weathering is controlled by the presence of open joints and foliations. Joints and fractures are well-connected creating free circulation of ground water. In general these rocks can sustain yield between 3 and 18.6 lps depending on topographic setting, thickness of weathered residuum, number of saturated fracture zones encountered and their interconnection as inferred from the ground water exploration carried out by CGWB in the district. The weathered zones in the granite gneisses can be developed through open wells and bore wells.

Khondalites : The Khondalites, in general occupy the hills and have limited ground water development potentials except when they occupy low laying areas. Due to well-foliated nature of these rocks, weathering is quite deep in low laying areas. These rocks are also well jointed. The thickness of the weathered zone ranges from 12 to 20 m. Ground water development potential of these rocks is meager except in low laying areas. The 7 yield of the bore wells ranges from 1 to 4 lps as revealed by the ground water exploration carried out by CGWB in the district.

Charnockite: In these rocks weathering is not pronounced and foliations and joints are not well developed. These rocks are mostly hard, compact and massive. The thickness of weathered zone ranges from 6 to 10 m. Due to hard and compact nature of the rocks

ground water development prospects in the charnockite is not good and the yield from the bore wells is very poor.

Pegmatite and Quartz veins: These are coarse grained and hard. These form good aquifers when fractured and friable.

Khondalites : These rocks generally form steep linear ridges hence don't form potential aquifers. Well foliated nature of these rocks allows deep weathering. In the pediment areas, the thickness of weathering is varying from 5 to 32m. Ground water occurs under water table condition in the weathered zone and circulates through deeper fractures. The yield of bore wells range from 1 to 5 LPS. The specific capacity of the dug wells ranges from 2.3 to 13.3 LPM/m draw down.

Charnockite : These formations are of very much restricted occurrences in the district. Due to paucity of joints and fractures the thickness of weathering in these formations is limited up to 10m. Due to the compact nature and less weathering, ground water prospects in charnockites are not good.

Gabbro – Anorthosites : The rheologic property of these rocks resembles with charnockite, Barring few locations dismal weathering and lack of fracturing renders these formation as a bad water yielder. The Sp. Capacity of dug wells in anorthosite vary from 16 to 102 LPM/M drawdown.

Quartzites : This unit also less fractured and weathered hence do not form good aquifers. However fractured quartzites along lineaments yield good amount of water.

Pegmatite and quartz vein : These are course grained intrusives and form good aquifers when fractured.

Water bearing properties of the unconsolidated Formation:

Laterites belonging to the Pleistocene age and alluvium of Sub -recent to Recent age constitute the unconsolidated formations in the district.

Laterites and lateritic gravels: Laterites of both high and low level environments occur extensively in the district forming capping over the older formations. Laterites occurring as capping over older formations are vesicular, ferruginous and highly porous in nature and at places form good near surface aquifers to be tapped through dug wells. Ground water generally occurs under phreatic condition in the shallow zone.

Alluvial deposits: The alluvial sediments of recent origin occur as thin discontinuous

patches along the prominent drainage channels and form prolific aquifers under favourable conditions. Of particular interest are the alluvial deposits occurring as discontinuous patches in the flood plains of major rivers such as Tel, Udanti, Ret and the alluvial fan deposits in Indravati, Nagavalli and Vansadhara sub basins. The thickness of alluvial deposits varies from 10 to 30 m in the Indravati and Tel sub basins. These mainly consist of silt, sand with gravel and clay and form potential shallow aquifers. Ground water occurs under phreatic condition and the water table flies at shallow depths. These deposits are very suitable for ground water development through dug wells and shallow tube wells. Yield of tube wells in the alluvium varies from 5 to 10 lps for drawdown ranging from 5 to 8 m.

Aquifer Characteristics of Crystalline: In the hard crystalline rock recharge of ground water from precipitation or seepage from surface water bodies percolate into the weathered (saprolite) zone. In case the 8 underlying basement rocks (both weathered and fresh) are incised by open fractures, the downward movement of the water from the upper regolith zone (comprising the top soil and saprolite horizon) is facilitated. In the saprolite/ regolith horizon ground water generally occurs under unconfined condition where as is the fractured bedrock aquifers it occurs under semi-confined to confined conditions. The ground water potentials of various zones i.e. saprolite (tapped by dug wells), weathered basement rock and shallow fractured basement rock horizon (tapped by the hand pumps) and deeper fractured basement rock (tapped by the deep boreholes by CGWB) vary considerably depending upon their lithological and structural characteristics.

7.2 Depth of water level:

The depth to water level is measured from the National Hydrograph Stations situated in different blocks of the Kalahandi District. The Pre monsoon, 2011 water level data varies from 1.3 mbgl (Ranmalchak) to 9.4 mbgl(Dalguma). The depth to water level map of pre - monsoon, 2011 is displayed in Plate II. The depth to water level data of Post-monsoon, 2011 represents 0.84 mbgl (Ranmalchak) to 4.47 mbgl (Kesinga). Plate III represents depth to water level map of post –monsoon, 2011.

7.3 Ground Water Quality

The chemical quality of ground water in the district has been assessed on the basis of

ground water samples collected during ground water monitoring, hydrogeological surveys and ground water exploration. The range of different chemical constituents in shallow and deeper aquifers is as follows:

Sl. No.	Parameters	Range	
		Shallow aquifer	Deeper aquifer
1	pH	7.32 – 9.07	6.8-8.28
2	Electrical conductivity (In µs/cm at 250C)	110 – 4805	255-1856
3	Carbonate (CO3) (in mg/l)	Nil - 42	0-42
4	Bicarbonate (HCO3)(in mg/l)	37 – 787	93-628
5	Chloride (CL) (in mg/l)	7.1 – 1304	7.1-283
6	Sulphate (SO4)(in mg/l)	Nil – 625	0.5-153
7	Nitrate (NO3)(in mg/l)	Nil – 492	0.3-300
8	Fluoride (F) (in mg/l)	0.26 – 4.0	0.2-5.3
9	Total Hardness as CaCO3 (TH) (in mg/l)	40 – 2130	70-720
10	Calcium (Ca)(in mg/l)	8 – 216	12-194
11	Magnesium (Mg)(in mg/l)	2.4 – 399	1.2-88
12	Sodium (Na)(in mg/l)	4.1 – 432	12-186
13	Potassium (K)(in mg/l)	0.59 – 39	<1-37
14	Total dissolved solids (TDS) (in mg/l)	66 - 976	204-1095
15	Fe(mg/l)		<0.01-5.8
16	SiO2(mg/l)		17-79

The specific conductance and chloride values generated from the chemical analysis of the region are found to be comparatively higher in the Badabasul – Daspur – Narla – Pastikudi. In localized patches of shallow aquifer at Moter, Ranmal, Ladugaon, Baldiamal, Badabasul, Chilpa, Golamunda, Tundia, Santpur, and in deeper aquifer at Nunpur,Madanpur, Ranmal concentration of fluoride is above 1.5 mg/l otherwise

everywhere it is below the permissible limit. The chemical analysis data suggests that the quality of ground water both from shallow and deeper aquifers are well within the permissible limit of utilisation for drinking purposes expect in the pockets of high fluoride. The suitability of ground water for irrigation in shallow aquifer in the district has been assessed by use of US salinity diagram prepared on the basis of sodium absorption ratio (SAR) and specific conductance. The classification of water in the district is given in Table 4.3 below.

Classification based on Salinity diagram	Grade	No. of Samples	
		Shallow aquifer	Shallow aquifer (%)
C_1S_1	Good	5	27.8%
C_1S_2	Moderately Good		
C_1S_3	Unsuitable		
C_1S_4	Highly Unsuitable		
C_2S_1	Good	11	61.1
C_2S_2	Moderately Good		
C_2S_3	Unsuitable		
C_3S_1	Highly Unsuitable	2	11.1

It may be noted that about 100% of the groundwater samples collected from the phreatic and deeper aquifers are good for irrigation purposes.

7.4 Ground Water Development

Ground water development in the district is mainly through dug wells, Dug-cum-bore wells and bore wells. Ground water is mainly used for domestic and irrigation purpose and in limited scale for industrial purposes. The stage of development of Ground Water in the district is low. So far only 14.25% of its resources has been exploited. Hence a strategy for detailed ground water development is required. The hydrogeological, remote sensing studies and ground water exploration so far carried out in the district depict the tentative

possibilities of ground water development through suitable ground water abstraction structures in various hydrogeological settings.

Dugwells : The wells may be sited in the topographic lows and should tap the maximum saturated thickness of the weathered zone. The depth of the dugwells may vary from 9 to 15m with 4.5m to 6m diameter. The wells may be fitted with 1.5 to 2 H.P. centrifugal pumps. The wells may sustain yield maximum up to 2 to 3 lps.

Dug-cum-borewells: The dug cum bore well can be constructed in the areas where the thickness of weathered residuum is less than 15 meters deep. The vertical hole drilled in the dug well increases the yield of the well. Depth of the dug well should be up to 12 metres with diameter of 4.5 to 6 metres. The depth of the vertical borehole should be about 25 to 30 metres. The diameter of the borehole may be 102 or 152 mm.

This dug cum bore well should be facilitated by centrifugal pump or submersible pump, where necessary, for the optimal utilization of their potential. The tentative number of additional dug wells feasible includes the dug cum bore wells, which can be constructed at suitable locations.

Borewells The results of the recent surveys and ground water exploration are quite encouraging for the exploitation of ground water through bore wells in different parts of the district, constructed at suitable locales. Deeper water bearing fracture zones may be tapped through bore wells. Usually two to five water saturated fractured zones are encountered in a depth range of about 150 m and the fractured zones are more common within a depth of about 100m. The bore wells are suitable ground water abstraction structures even in the areas where water level is deeper and hard rocks are encountered at shallow depths. The bore wells may be 100 to 150 m deep having casing in the top weathered zone with diameter of about 152 to 203 mm. Based on the availability of productive fractured zones, the depth of the bore well is decided. Depending upon the discharge and draw down of the bore wells, suitable pumps may be fitted for the optimum utilization of ground water resources. The recommended capacity is 2 to 3 H.P. submersible pumps and the yield of the wells may go up to 10 lps. Since the surface water resources are inadequate and the district often comes under the grip of drought, development of ground water resources may help in expanding irrigated agriculture in the district. An optimal utilisation of ground water in the district requires adoption of a

suitable cropping pattern and energisation of the wells.

7.5 Ground Water Related Issue and Problems

Some of key ground water related issues are

Ground Water Problems: The ground water problems include Ground Water Pollution and Ground Water Depletion. Ground Water Pollution: Based on the chemical analyses of water samples collected from different aquifers, it is observed that almost all chemical constituents are well with in the permissible limit for drinking as well as irrigational purposes, excepting at some localized patches where high fluoride and nitrate values have been observed. As such there is no ground water pollution in the district. Ground Water Depletion: The stage of ground water development in different blocks varies from 5.83 % (Thuamal Rampur) to 29.17 % (Kesinga) with the overall stage of development 14.25% in the district. From the perusal of 10 years of data it has been realized that there is a falling trend in 46.4% of water level measuring wells within the range of 0-2 m during pre monsoon and 13.5% of wells shows fall during post monsoon within range of 0-2 m. Khaprakhol, Muribahal, Patnagarh, Puintala, Saintala blocks show major fall during premonsoonperiod .Agalpur and Puintala blocks shows major fall during postmonsoon. The long term trend (10 years) in water level for the pre-monsoon shows rise in 63% of wells the maximum being 0.633 m/Yr. The average rise in the stations showing water level rise during the decade is 0.219 m/yr. The present rising trend is mainly due to the introduction of canal irrigation in Kalampur, Junagarh and Dharamgarh blocks. The long term trend of (10 years) in water level for both post- monsoon and pre-monsoon season shows fall in water level 37% of wells . The maximum fall in pre-monsoon is 0.633 m/yr. The maximum fall in postmonsoon is around 0.429m/yr with the majority of the values being less than 0.1m/yr

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

NIL

(i) Mass Awareness Programme (MAP), Kalahandi District:

The program was organized on 24-08-2005 at Bhawanipatna town, Kalahandi district. More than 350 persons including farmers, Block Development Officers, District level officers/ officials have participated in program. Deliberations on ground water development protection and conservation were held among the participants and CGWB scientists.

The exhibition was arranged in which the achievements of CGWB were displayed through different models, plates, photographs and instruments. Different posters were displayed for conservation of ground water, ground water pollution and its effects and slogans protecting this valuable resource. The programme have received high appreciation and were widely covered by press as well as electronic media.

(ii)Water Management Training Programme (WMTP), Kalahandi District:

The program was organised on 25-08-05 at Bhawanipatna town, Kalahandi District. More than 100 Block Development Officers, District Level Officers, NGO's have participated in the program. Deliberation on Ground Water development protection and conservation were held among the participants and CGWB scientists.

An exhibition was organized in which the achievements of CGWB were displayed through different models, plates, photographs and instruments. Different posters were displayed for conservation of ground water, ground water pollution and its effects and slogans protecting this valuable resource. The programme have received high appreciation and were widely covered by press as well as electronic media.

7.7 Area Notified by Cgwb/Sgwa

None

7.8 RECOMMENDATIONS

1. Large scale planning for Ground Water Resources development should be preceded by intensive hydrogeological and geophysical survey aided by Remote Sensing studies and ground truth data.

2. Bore wells/dug wells should be located in the vicinity of NE-SW and NW-SE trending lineaments which have been proved to be high yielding & productive and in thickly buried pediment areas.

3. Existing dug wells should be deepened to tap the maximum saturated thickness of the weathered mantle or vertical bores maybe drilled to enhance the yield of the well where normally the dug wells get dried up.

4. Energisation of wells should be stepped up to ensure optimal utilisation of the ground water resources to create additional irrigation potential. 5.

The State Ground Water Organization should render expert guidance for citing ground water structures in favourable hydrogeological settings. 6.

The farmers should be educated through agricultural extension services, Mass Awareness and water management training programme to adopt suitable cropping pattern, conservation of ground water and irrigation practices especially for drought tolerant crops for optimal utilisation of available ground water resources.

7. Programme for artificial recharge may also be taken up in areas where deeper water table condition coupled with high fluctuation is observed for augmentation of ground water resources through construction of percolation tanks, subsurface dykes, check dams, nala bunding and contour bunding and other site specific favourable artificial recharge structures.

8. In areas of shallow water table lying within 0 to 5 m bgl during post monsoon period, surface water bodies like local ponds, farm ponds and small earthen dam along small streams may be constructed to hold water for long duration and for replenishment of soil moisture.

9. For augmentation of drinking water supply to the major towns and villages near the major rivers, infiltration galleries or collector wells may be constructed in suitable locales to fruitfully harness the base flow /subsurface flow which otherwise goes as waste.

10. Growing of sugarcane and cash crops may be encouraged along the thin linear alluvial patches lying adjacent to major rivers where prolific ground water is available throughout the year.

11. In the canal command areas of Indravati and Uttai irrigation projects in the district, there are conditions of steady rising trend of water level, which may lead to water logging in near future at some places. Simultaneously there is scarcity of supplied irrigation water in the tail end areas. These situations can be rectified through conjunctive use of surface water and ground water, which shall also augment irrigation potentials and ensure agriculture in periods of delayed rainfall.

8.0 RAINFALL OF THE DISTRICT AND CLIMATECONDITION

The south-west monsoon is the principal source of rainfall in the district. Average annual rainfall of the district is 1378.2mm. About 80 to 85% of the total rainfall is received during the period from June-September. Droughts are quite common in the district. Block-wise average annual rainfall varies from 1111.8 mm to 2712.9 mm. The south-west monsoon contributes about 80 to 85% of the total rainfall of the district.

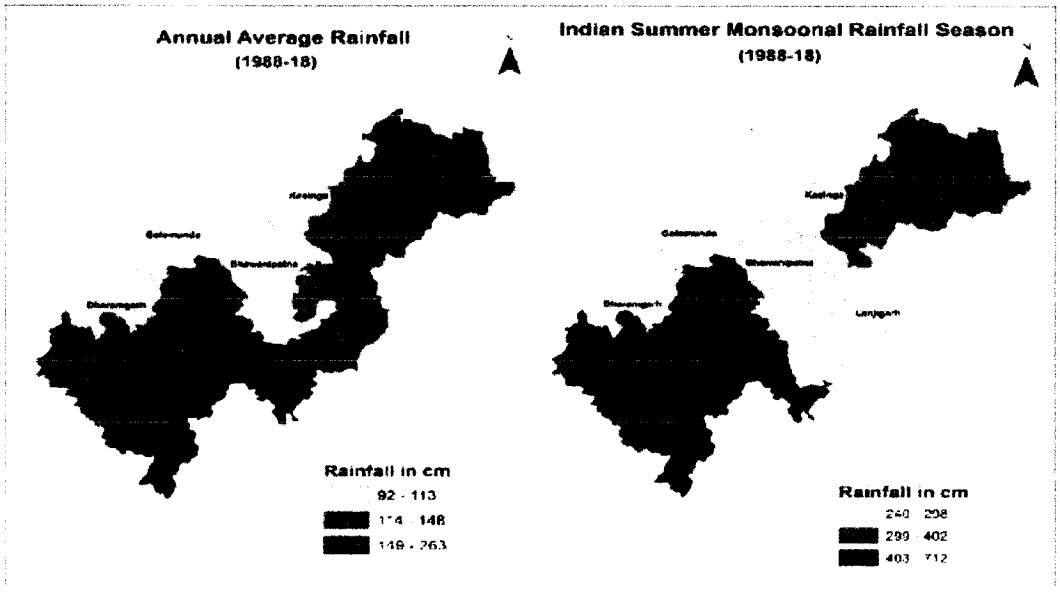
8.1 Month wise rainfall:

The driest month is November, with very less amount of rain. There is on average 15.56 mm of precipitation in January. In July, the precipitation reaches its peak, with an average of 255.01 mm.

Year		2021	2022	2023	Average
Sl.No.	Month	(mm)	(mm)	(mm)	(mm)
1	Jan	0.00	60.24	0.00	60.24
2	Feb	4.23	0.00	0.00	4.23
3	Mar	0.00	0.00	40.35	40.35
4	Apr	9.1	3.22	75.21	87.53
5	May	59.02	42.96	33.86	135.84
6	Jun	158.96	145.89	80.45	385.3
7	Jul	296.32	411.22	338.7	1046.24
8	Aug	201.33	643.61	290.34	1135.28
9	Sep	262.38	171.33	444.07	877.78
10	Oct	21.84	76.57	403.28	501.69
11	Nov	32.88	0.00	27.86	60.74
12	Dec	6.76	0.00	6.18	12.94

Total	1052.82	1555.04	1740.3	4348.16

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 south-west monsoon contributes about 80 to 85% of the total rainfall of the district. The climate of the district is sub-tropical with hot and dry summer and pleasant winter. The summer season, which is very hot and dry, extends from March to the middle of June. It is followed by the monsoon season from June to September. The air is relatively humid during the middle of June, whereas it is mostly dry during the non-monsoon period. The winter season extends from November till the end of February, and it is pleasant. Humidity is high during middle of June and it's less in post-monsoon period. The average relative humidity in the district varies from 27% to 80% through out the year. The mean monthly potential evapo-transpiration value ranges from 45mm in December to 470 mm in May. Wind is

generally light to moderate. During summer and Southwest monsoon months wind velocity increases. The mean annual wind speed is 3.0 km/hr.

The climate of the Kalahandi District is of extreme type. It is dry except during monsoon. The maximum temperature of the District is 45+ degree Celsius, whereas the minimum temperature recorded as4^{0}Celsius.

Temperature Graph- Kalahandi

Maybeingthehottest withthemeandaily maximum temperature of 45° C while December, January is the coldest month of the yearwhen the temperaturedropsdown to 6°C.

9.0 DETAILS OF MINING LEASE OF MORRUM IN THE DISTRICT

Two Nos Quarry lease has been granted.

10.DETAIL OF ROYALTY OR REVENUE RECEIVED IN LAST THREEYEARS:

Sl.No.	Name of the Tahasil	2021-22	2022-23	2023-24	Total Amount (Lakh)
1	Kalahandi	Nil	Nil	Nil	Nil
2	Kesinga	70237	70237	70038	210512
3	Karlamunda	Nil	Nil	Nil	Nil
4	M.Rampur	Nil	Nil	Nil	Nil
5	Narla	Nil	Nil	Nil	Nil
6	Th.Rampur	Nil	Nil	Nil	Nil
7	Lanjigarh	Nil	Nil	Nil	Nil
8	Jaipatna	Nil	Nil	Nil	Nil
9	Junagarh	Nil	Nil	Nil	Nil
10	Koksara	Nil	Nil	Nil	Nil
11	Golamunda	Nil	Nil	Nil	Nil
11	Kalampur	Nil	Nil	Nil	Nil
13	Dharmagarh	Nil	83770	Nil	83770
GrandTotal		70237	154007	70038	294282

11. DETAIL OF PRODUCTION OF MINOR MINERALS IN LAST THREEYEARS:

Sl.No.	Name of the Tahasil	2021-22	2022-23	2023-24	TotalQuantity
1	Kalahandi	Nil	Nil	Nil	Nil
2	Kesinga	1500	1500	1500	4500
3	Karlamunda	Nil	Nil	Nil	Nil
4	M.Rampur	Nil	Nil	Nil	Nil
5	Narla	Nil	Nil	Nil	Nil

6	Th.Rampur	Nil	Nil	Nil	Nil
7	Lanjigarh	Nil	Nil	Nil	Nil
8	Jaipatna	Nil	Nil	Nil	Nil
9	Junagarh	Nil	Nil	Nil	Nil
10	Koksara	Nil	Nil	Nil	Nil
11	Golamunda	Nil	Nil	Nil	Nil
11	Kalampur	Nil	Nil	Nil	Nil
13	Dharmagarh	Nil	2000	Nil	2000
GrandTotal		1500	3500	1500	6500

12. MINERAL MAP OF THE DISTRICT:

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

Nil

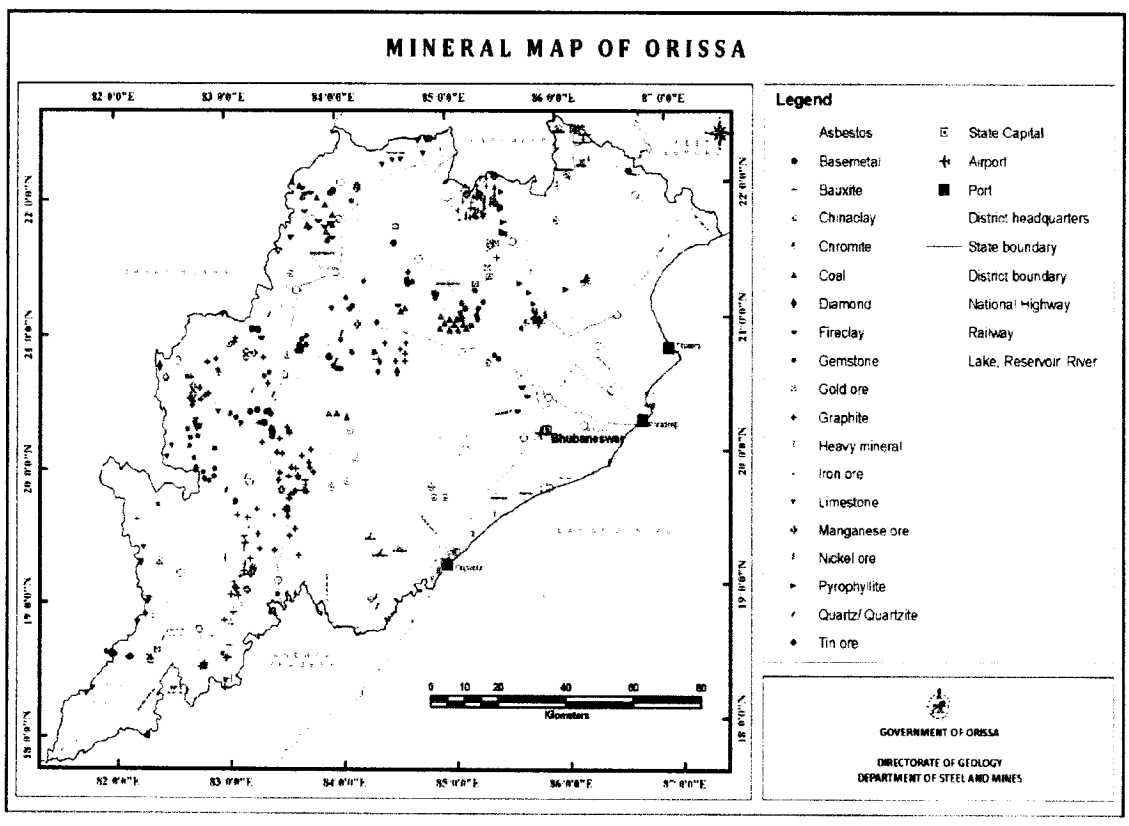
14. TOTAL MINERAL RESERVE AVAILABLE IN THEDISTRICT

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:

51. No.	Name ofthemineral	Name ofthelessee	Addressandcontact No.ofhelessee	Letter ofIntent GrantOrder No.anddate	Areaofmining leasetobeallotted	Validity ofLoI	Use (Captive /Non-Captive	Locationoftheminingle ase (Latitude&Longitude)
1	2	3	4	5	6	7	9	10
Nilluptotillnow								

15. QUALITY/GRADE OF MINERAL AVAILABLE IN THEDISTRICT

Morrum found in District: -

Earthof the Districtis very much suitable for making of Morrum which is used various construction purposes.

16. Use of Mineral:

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

17. DEMAND AND SUPPLY OF THE MINERAL IN THE LAST THREEYEARS:

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 forfor full fill the Requirment 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 LEASEVIZ. NUMBER OF MINING LEASES, LOCATION (LATITUDE AND LONGITUDE)

Nil

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

Eco sensitive zone of Karlapat Wild Life Sanctuary, Kotgarh Elephant Reserve 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:

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 are 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 THEENVIRONMENT:

- Water sprinkling on haul road, loading and unloadingpoints.
- Plantation along the safety zone and dumparea.
- Providing dust masks to workers.
- Regular monitoring of ambient air quality.
- Provision of air conditioned cabin of Excavators and Dumpers.
- Regular and proper maintenance of working equipments.
- Periodic medical examination of the workers and organize medical camp in the area.
- Use Milli Second Delay Detonator in blasting operation.
- Provisions of ear plug to the workers.
- Regular training program to the mine workers and operators.

23. RECLAMATION OF MINED OUT AREA

Necessity of Reclamation & Rehabilitation:

- Exponential growth in mineral production since1980.
- Mining activities causes physical, chemical, biological and socio-economic changes inthearea.
- Surface mining activities disturb the original landprofile.
- In India, mineral production comes mostly from opencast mines & hence Landdegradation problems is of serious concern.
- An intricate, in-depth and site-specified techniques involving integrated approachIs 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 inconformity 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 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 MANAGEMENTPLAN:

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 turns 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 considering 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 tounhygienic 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 properoccupational health measures and engineering control on airborne dust atworkplace.

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 Kalahandi District of last 5 years

Year	No.ofCasesnotified/detected	No.ofTBcasesunderTreatment.
2019-20	1930	1709
2020-21	1948	2503
2021-22	1604	1819
2022-23	1943	2103
2023-24	2159	2587

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:

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 regularly. 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 equipment 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 Kalahandi 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.

The district survey report for Morrum (Minor Mineral) in respect of Kalahandi district in accordance with appendix-X, para-7 (iii) (a) of S.O. 3611(E) dt. 25.07.2018 of Ministry of Environment, Forest and Climate Change, New Delhi, Enforcement & Monitoring Guideline for sand Mining-2020 and in compliance with the orders of Hon'ble Supreme Court dt.10.11.2021 in connection with C.A Nos 3661-3662 of 2020. Before preparation of this report, a survey has been conducted by DSR Committee of Bhawanipatna & Dharamgarh with the assistance of Irrigation Department, Forest Department, Mining

Department & Geology Department. The DSR is being submitted to SEIAA, Odisha, Bhubaneswar for necessary evaluation and approval.

Executive Engineer, Irrigation Division Bhawanipatna, Kalahandi

Regional Officer, SPCB, Rayagada

Mining Officer, Kalahandi District, Bhawanipatna

Sub-Collector,Bhawanipatna-Cum, Sub-Divisional Committee, Kalahandi,

Sub-Collector,Dharamgarh-Cum Sub-Divisional Committee, Kalahandi

Divisional Forest Officer,(North) Bhawanipatna, Kalahandi

Divisional Forest Officer,(South) Kalahandi, Bhawanipatna

Deputy Director of Mines & Member Convener DSR Committee, Kalahandi Circle, Bhawanipatna

Jiont Director Geology Zonal Survey, Bolangir

Collector & District Magistrate, Kalahandi-cum Chairman, DEIAA, Kalahandi

LIST OF EXISTING MORRUM SOURCES IN RESPECT OF KALAHANDI DISTRICT

ANNEXURE - A

DETAIL OF ROYALTY / REVENUE RECEIVED & DETAIL OF PRODUCTION OF MINOR MINERALS (MORRUM) IN LAST THREE YEARS

Name of the Tahasil	Sl. No.	Name of the Quarry Lease	Name of the lessee	Address & Contact number of the Lessee	Mining Lease Grant order No & Date	Area of Mining Lease in (Hc)	Period for Minig Lease		Date & No. of Registration of lease Deed	Date of Commencement of Mining Operation	Status (working /Non working/temp. Working for dispatch etc	captive/ Non captive	Obtained Environmental Clearance(yes/No). If yes Letter No with Date of grant of EC	Location of the Minor lease(Longitude/Latitude)	Method of Mining(open cast /under ground)	Geological Reserve (MT/Cums)	Mineable Reserve (MT/Ccums)	Royalty/Revenue Received in last 3 years (In Rupees)			Production of Mineral in last 3 years (In Cum)		
							From	To										2021-22	2022-23	2023-24	2021-22	2022-23	2023-24
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Dharamgarh																							
Dharamgarh	1	Ainlajore Morrum Quarry	Sri Pravat Kumar Routray, POA Holder-M/s Rajlaxmi Construction Ltd.	AT-Plot No-2273, New Industrial Estate, PO/Ps-Jagatpur, Dist-Cuttack	Quarry Permit	Khata-394 Plot-519 Kisam-Dongar-1 Ac-1.700, Ha-0.688	03.06.2022	02.06.2027	Quarry Permit	03.06.2022	Running		EC22B001OR110519, Dt. 03.06.2022	Latitudes-19°48'06.31173"N to 19°48'11.44708" N and Longitudes-82°45'28.74882"E to 82°45'31.06166"E	Open Cast	GR-54175	MR-20400	NIL	NIL	NIL	NA	NA	NA
Kesinga																							
Kesinga	1	Amtha Morrum Quarry	Sri Abhisek Goel	At/po-utkela PS-Kesinga DIST-Kalahandi ph-9438230033	03.03.2021 11982100298	Khata-427 Plot-2620 Kisam-Dunguri Ac-12.30, Ha-4.977	03.03.2021	02.03.2026	03.03.2021 & 11382 10029 8	03.03.2021	Running		SEIAA-330/07-2020 15.01.2021	Latitudes-20°04'42.17303"N to 20°05'01.96936" N and Longitudes 83°09'20.70969"E to 83°09'28.66542"E	Open Cast	GR-199080	MR-156780	NIL	NIL	NIL	NA	NA	NA

New Minor Mineral for Morrum

Kalahandi

Kalahandi	1	Salebhata Morrum Quarry	NA	NA	NA	Khata-89 Plot-470 Kisam-Dangar Ac-4.00, Ha-1.618	NA	NA	NA	NA	New Source for Future Auction		NA	Latitudes-19°57'35.30314"N to 19°57'30.50614" N and Longitudes 83°13'02.32448"E to 83°13'01.94757"E	Open Cast	135124	94517	NIL	NIL	NIL	NA	NA	NA

ADDITIONAL INFORMATION ON MORRUM IN RESPECT OF KALAHANDI DISTRICT

Annexure - A1

Name of the Tahasil	Sl. No.	Name of the Quarry Lease	Name of the lessee	Address & Contact number of the Lessee	Mining Lease Grant order No & Date	Area of Mining Lease in (Hc)	Period for Minig Lease		Period of Mining Lease 1st/ 2nd renewal		Date of Commencement of Mining Operation	Status (working /Non working/temp. Working for dispatch etc	captive / Non captive	Obtained Environmental Clearance(yes/No). If yes Letter No with Date of grant of EC	Location of the Minor lease (Longitude /Latitude)	Method of Mining(open cast /under ground)	Geological Reserve (MT/ Cums)	Mineable Reserve (MT/Cums)	Distance from Nearest Road/ Railway Bridge	Distance from Nearest Stone Mining Source	Distance from village Road	Distance from School, Temple etc.	Distance from nearest Eco Sensitive Zone /Wild life Sanctury	Whether the site is nonforest land for any forest Kissam	DLC status of the Source	Presently feasible or needs extinction	Whether there is any cluster situation	Geological Reserve	Geological Rserve (MT/ CuMs)	Mineble Reserve (MT/ CuMs)	Production for last three years (Year Wise)			Royalty Collected for last three years (Year Wise)		
							From	To	From	To																					2021-22	2022-23	2023-24	2021-22	2022-23	2023-24
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Dharamgarh																																				
Dharamgarh	8	Ainlajor e Morrum Quarry	Sri Pravat Kumar Routray, POA Holder-M/s Rajlaxmi Construction Ltd.	AT-Plot No-2273, New Industrial Estate, PO/Ps - Jagatpur, Dist-Cuttack	Quarry Permit	Khata-394 Plot-519 Kisam-Dongar-1 Ac-1.700, Ha-0.688	03.06.2022	02.06.2027	NA	NA	NA	Running		EC22B001OR110519, Dt. 03.06.2022	Latitudes-19°48'06.31173"N to 19°48'11.44708" N and Longitudes-82°45'28.74882"E to 82°45'31.06166"E	Open Cast	GR-54175	MR-20400	2.7 km	2.1 km	0.3 km	0.7 km	32 km	NA	NA	NA	No		GR-54175	MR-20400						
Kesinga																																				
Kesinga	2	Amtha Morrum Quarry	Sri Abhisek Goel	At/po-utkela PS-Kesinga DIST-Kalahandi ph-9438230033	03.03.2021 119821002998	Khata-427 Plot-2620 Kisam-Dunguri Ac-12.30, Ha-4.977	NA	NA	NA	NA	NA	NA	NA	SEIAA-330/07-2020 15.01.2021	Latitudes-20°04'42.17303"N to 20°05'01.96936" N and Longitudes 83°09'20.70969"E to 83°09'28.66542"E	Open Cast	GR-199080	MR-156780	1.1 km	2.9 km	0.35 km	0.8 km	46 km	NA	NA	NA	No		GR-199080	MR-156780						

ADDITIONAL INFORMATION ON MORRUM (NEW) IN RESPECT OF KALAHANDI DISTRICT

Annexure - A1

Name of the Tahasil	Sl. No.	Name of the Quarry Lease	Name of the lessee	Address & Contact number of the Lessee	Mining Lease Grant order No & Date	Area of Mining Lease in (Hc)	Period for Minig Lease		Period of Mining Lease 1st/ 2nd renewal		Date of Commencement of Mining Operation	Status (working /Non working /temp. Working for dispatch etc	captive/ Non captive	Obtained Environmental Clearance(yes/No). If yes Letter No with Date of grant of EC	Location of the Minor lease (Longitude/ Latitude)	Method of Mining (open cast /underground)	Geological Reserve (MT/Cums)	Mineable Reserve (MT/Ccums)	Distance from Nearest Road/Railway Bridge	Distance from Nearest Stone Mining Source	Distance from village Road	Distance from School, Temple etc.	Distance from nearest Eco Sensitive Zone/ Wild life Sanctury	Whether the site is nonforest land for any forest Kissam	DLC status of the Source	Presently feasible or needs extinction	Whether there is any cluster situation	Geological Reserve	Geological Rserve (MT/CuMs)	Mineble Reserve (MT/CuMs)	Production for last three years (Year Wise)			Royalty Collected for last three years (Year Wise)		
							From	To	From	To																					2021-22	2022-23	2023-24	2021-22	2022-23	2023-24
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Kalahandi																																				
Kalahandi	1	Salebhata Morrum Quarry	NA	NA	NA	Khata-89 Plot-470 Kisam-Dangar Ac-4.00, Ha-1.618	NA	NA	NA	NA	NA	NA	NA	NA	Latitudes-19°57'35.30314"N to 19°57'30.50614" N and Longitudes 83°13'02.32448"E to 83°13'01.94757"E	Open Cast	NA	NA	1.93 km	1.8 km	1 km	2.5 km	37 km	NA	NA	NA	No	NA	NA	NA						

Annexure-II

List of Potential Mining Lease (existing & Proposed) Morrum

Tahasil	Sl. No	Source details	Lease details	Area (in Ha.)	Distance (in K.M) from PA/BR/WC	Distance from forest area (in K.M)	Mining lease within 500 metres (if yes cluster area	Total excavation in Tonnes/ Annum considering digging depth max as 3 metres	Mineral to be mined (Morrum/Bajri/R BM etc.	Existing/ proposed
1	2	3	4	5	6	7	8	9	1	11
Dharamgarh Tahasil										
Dharamgarh	1	Ainlajore Morrum Quarry	Ainlajore Morrum Quarry	0.688	PA,WC-32 KM BR-1.1 KM	Karlapat Wildlife Sanctuary-32 KM	NO	1200 cum	Morrum	Existing
Kesinga Tahasil										
Kesinga	1	Amtha Morrum Quarry	Amtha Morrum Quarry	4.977	PA,WC-46 KM BR-2.7 KM	Karlapat Wildlife Sanctuary-46 KM	NO	1500 cum	Morrum	Existing

List of Potential Mining Lease (New) Morrum

Tahasil	Sl. No	Source details	Lease details	Area (in Ha.)	Distance (in K.M) from PA/BR/WC	Distance from forest area (in K.M)	Mining lease within 500 metres (if yes cluster area	Total excavation in Tonnes/ Annum considering digging depth max as 3 metres	Mineral to be mined (Morrum/Bajri/R BM etc.	Existing/ proposed
1	2	3	4	5	6	7	8	9	1	11
Kalahandi Tahasil										
Kalahandi	1	Salebhata Morrum Quarry	Salebhata Morrum Quarry	1.618	PA,WC-37 KM BR-1.93 KM	Karlapat Wildlife Sanctuary-37 KM	NO	N/A	Morrum	New Source for Future Auction

Patta Lands/ Khatedairi Land (Existing & Proposed)

Owner	Sl No.	Area	District	Tahasil	Village	Total Reserve (MT)	Total Mineral to be mined(MT)	Existing/ proposed
Not applicable for Kalahandi District								

De-Siltation Location (lakes/ Ponds/dams etc. (Existing & Proposed)

1 | 2 | 3	5	6	7	8	9	10	11	
Name of reservoir /Dams	Maintain/ Collected by State Governm ent/PSU	location	District	Tahasil	Village	Size (Ha)	Quantity (MT /year)	Existing/ proposed
Not applicable ror Kalahandi District								

d) M-Stone Plants:

Plant name	Owner	District	Tahasil	Village	Gee-location	Quantity Tonnes/Annu m	Existing /Proposed
Not applicable for Kalahandi District							

Annexure-III

Cluster & Contiguous Cluster details

Cluster:

Morrum Name	Cluster No.	Lease No.	Location (Morrum Land	Village	Area (in Ha.)	Total excavation (Cum)
No Case Amiable in Kalahandi District						

Contiguous Cluster Details

River Name	Contiguous Cluster No.	Cluster No.	Number of lease in the cluster	Location (River Bed/Patta Land	Distance between clusters	Village	Area of cluster (in Ha.)	Total excavation (Ton)
No contiguous Cluster Situation available in respect of Kalahandi District								

Annexure-IV

Transportation Routes for individual leases and leases in Cluster.

Name of the Tahasil	Name of the Morrum source	Lease No.	Transportation Route number	Whether runs on Govt. or Private Land	Details of village/Forest area/Agricultural land through which the approach road runs if any	Number of tippers / day of lease	Number of tippers / day of all the lease on route	Length of Route in K.M	Type of Road (Black Topped/ unpaved)	Recommendation for road (Black Topped/ unpaved	The road will be constructed by Government /Lease Owner	Route map and location
1	2	3	4	5	6	7	8	9	10	11	12	13
Dharamgarh Tahasil												
Dharamgarh	Ainlajore Morrum Quarry	Quarry Permit	Village Road	Govt. Land	Ainlajore	1	1	4	Unpaved	Unpaved	Lease Owner	
Kesinga Tahasil												
Kesinga	Amtha Morrum Quarry	11982100298	Village Road	Govt. Land	Amtha	1	1	6	Unpaved	Unpaved	Lease Owner	
Kalahandi Tahasil												
Kalahandi	Salebhata Morrum Quarry	NA	Village Road	Govt. Land	Salebhata	2	4	7	Unpaved	Unpaved	Lease Owner	

Cluster No.	Transportation Route number	Number of tippers / day of Cluster	Number of tippers / day of all the Cluster on route	Length of Route in K.M	Type of Road (Black Topped/ unpaved)	Recommendation for road (Black Topped/ unpaved	The road will be constructed by Government /Lease Owner	Route map and location
No Cluster approach of Morrum Sources in this district								