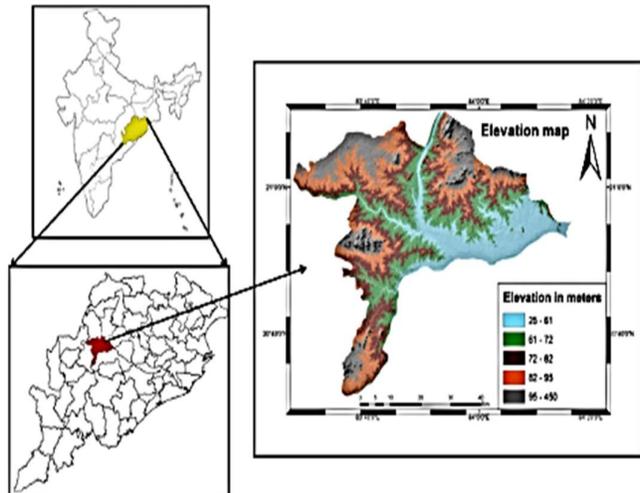




**DISTRICT SURVEY REPORT(DSR)  
OF  
SUBARNAPUR DISTRICT, ODISHA  
FOR  
MORRUM**

(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 SUBARNAPUR**

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**PREAMBLE**

Odisha is one of the Major Mineral rich State in India. Subarnapur comes under 9th Agro-climate zone of Orissa.i.e. Western Central Table Level. It is located in the Mahanadi River Basin. Subarnapur is a unique District in Odisha lies on the Western most part of the State with rich and varied mineral resource. It is a paradise for Geoscientists of India and abroad. It has preserved many important rock groups from the earliest of crust formation to the geologically recent times. The landmass constituting the Subarnapur District, explorers to many Entrepreneurs on account of its diverse geological setting and rich and varied mineral resources.

In pursuance of MoEF & CC Notification S.O. 141(E) dated 15<sup>th</sup> 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 14<sup>th</sup> 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 27<sup>th</sup> 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 13<sup>th</sup> Jan. 2015 the matter regarding Sand, Brick Earth, & Burrowed Earth cutting for Road Construction has to take prior E.C. for Mining Lease irrespective of the fact that whether the area involved is more or less than 5 hectares. They also suggested to make a policy on E.C for minor minerals lease in cluster.

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

DEAC will scrutinize and recommend the prior environmental clearance of mining of minor mineral to DEIAA on basis of District Survey Report. This will model and guiding document which is a compendium of available mineral resources, geographical setup, Environmental and Ecological set up of the District and replenishment of minerals and is based on data of various departments, published reports, Journal and websites. 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 thereof by SEAC and SEAI. 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, Subarnapur 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 the District.
2. Identification of areas of minor minerals having the potentiality where mining can be allowed.
3. Identification of area and proximity to infrastructure and installations where mining should be prohibited.

## 1.0 INTRODUCTION

### Subarnapur at a Glance:

#### 1.1 Location and Geographical Area:

**Subarnapur District**, also called **Sonepur District** or **Sonapur District**, is an administrative district in Odisha state in eastern India. The town of Sonepur is the district headquarters. Sonepur is known as the Mandiramalini town (city of temples) of Odisha with more than hundred temples. The people of the Sonepur region are referred to as Sonepuria. The district spreads over an area of 3634 sq.km lies between 20° 30' North and 20°10' North latitudes and 83°27' and 84°15' East longitudes. The District is surrounded by 4 Districts namely Bolangir(west), Boudh(South), Sambalpur(East) and Bargarh(North). This District consists of two Sub-Divisions namely Sonepur and Birmaharajpur. There are 6 Tahasils for 6 Blocks of the District.

Subarnapur has figured on the political and cultural map of Odisha since pre- historic times as an ancient place of human civilization. The discovery of a large number of stone tools, rock art of Puja Dunguri near Rampur Tahasil and punch marked coins is a testimony to primitive human settlements in this region since the 3<sup>rd</sup> Century B.C.. It was declared a feudatory state by the British in 1867. With the division of Bengal in 1905 it came under the jurisdiction of Lt. Governor of Bengal. This feudatory state merged with Odisha province on 1<sup>st</sup> January, 1948 and became a sub-division under Bolangir district. Subsequently it was created as a separate district and started functioning w.e.f. 01.04.1993 with headquarter at Sonepur as per Revenue and Excise Department Notification No.14218/R dt.27.03.1993 after being carved out from the undivided Balangir District and renamed as Subarnapur.

In the Middle Ages Subarnapur was known as Lanka. The Tibetan historian Taranath refers to Lanka as a place of tantric Buddhism. Buddhist literature of the 8<sup>th</sup> century also speaks of Lanka. Laxminkara, sister of the Vajrayanist king Indrabhuti of Sambalaka is said to have married prince Jalauka of Lanka. Further the Greek geographer Ptolemy underlines Lanka as a diamond prone zone located on the bank of the river Manad or Mahanadi. According to historians the Subarnapur District was known as Paschima Lanka around 11<sup>th</sup> Century A.D.

It is known as second Varanasi of India for its cluster of temples ( nearly 108) having architectural importance and tantric ( sicsic ) mystiques. It is also called second Allahabad for the Meeting Point ( Sangam ) of three rivers Mahanadi, Tel and Suktel. Subarnapur is famous for silk, handloom, prawns, terracotta etc. Textiles and terracotta of Sonapur, Brass metal works and Philigri crafts of Tarva and Binka, Stone carving of Ullunda and Paddy crafts of Dunguripali are recognized all over the state and also in country. In addition, the great poet and prophet of Mahima Dharma, Santh Bhima Bhoi was from this district.



**1.2 Administrative Units:-**

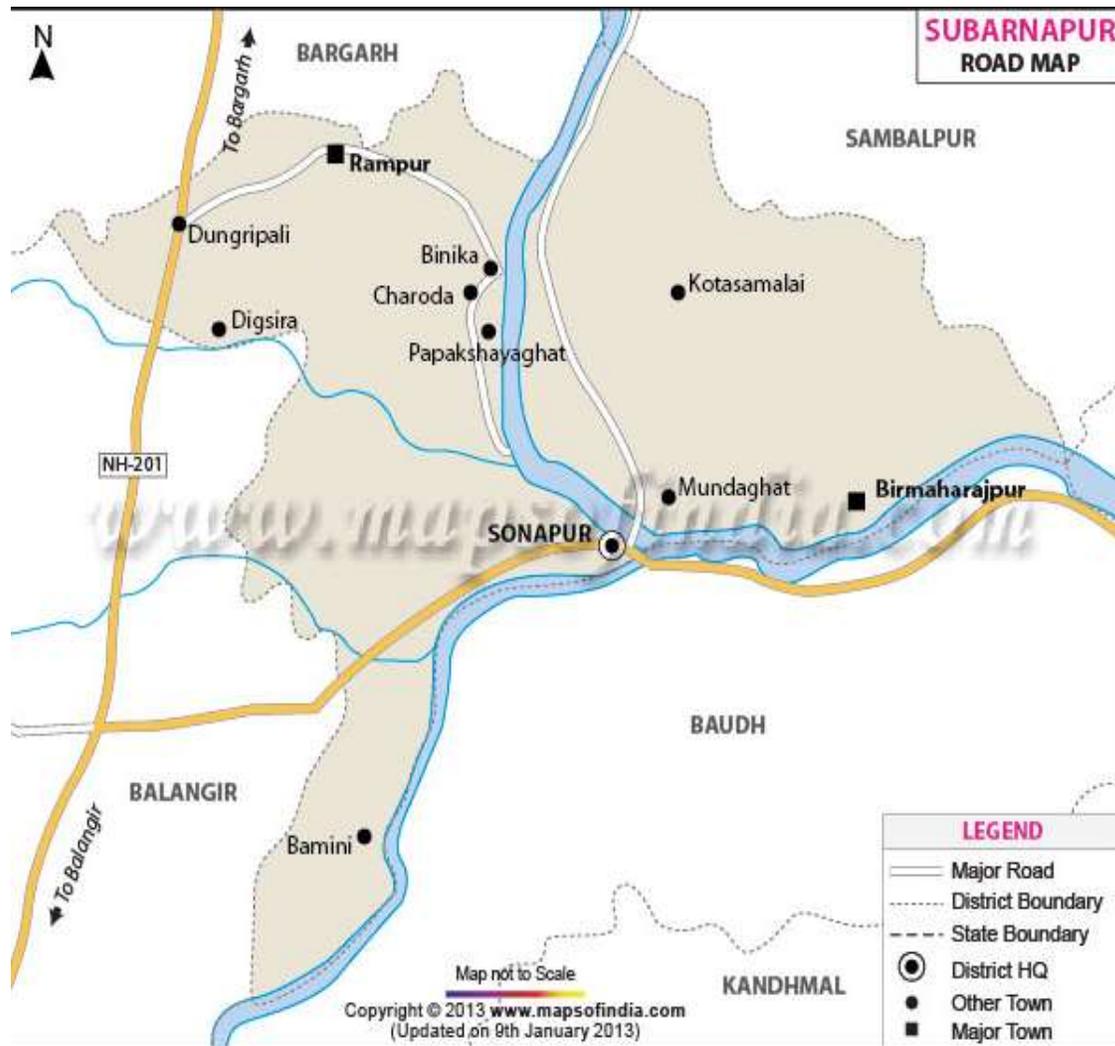
Subarnapur is the administrative headquarter of Subarnapur District. It is located at a distance of 250 km from Bhubaneswar, state capital of Odisha.. It has 962 villages covering 6 Blocks, 6Tahasils and 2 Sub-Divisions. The District is divided into 2 sub-Divisions. The District is divided into 2 Sub- Divisions namely 1) Subarnapur, 2) Birmaharajpur and into 6 Blocks &Tahasils, namely i) Sonapur ii) Binika iii) Rampur iv) Birmaharajpur v) Tarbha vi) Ullunda.The population of the Districtis 610,183 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 260 per square km as against 269 per square km of the state. As per 2011 census, the population of Scheduled Caste is 1,84,682 (25.60%), and Scheduled Tribe is 14,79,576 (9.37%). The literacy percentage of the District covers 74.42% against 75.15 of the state.



### 1.3 Connectivity facilities:-

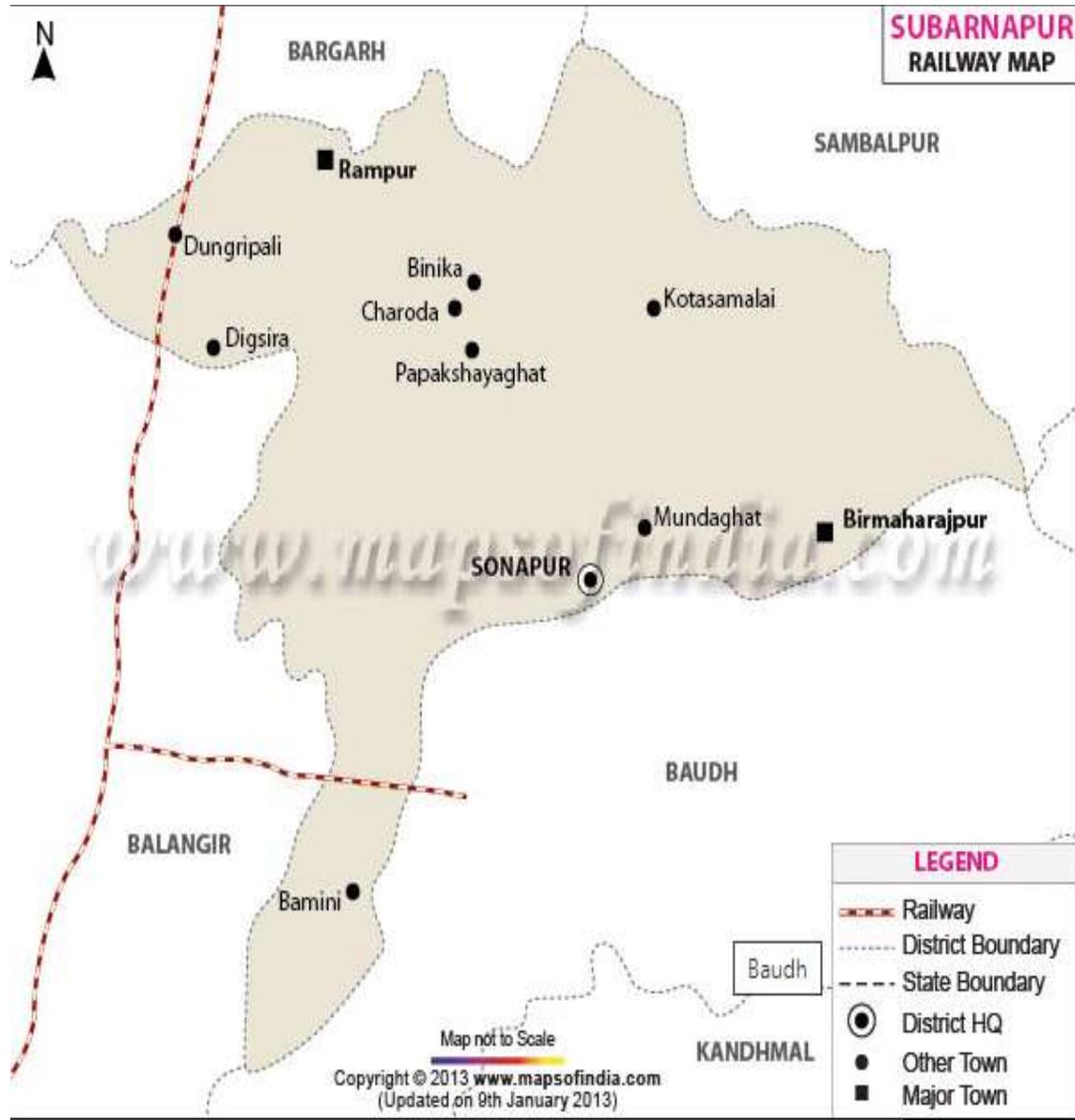
#### Road Network

The District is well served by a network of good roads. The NH-57 originating from NH-26 at Balangir and end at Khurda(NH-16) covering a distance of 299.900km the road is the life line rout for playing of vehicle mainly of Khurda, Nayagarh, Boudh, mostly Subarnapur and Balangir. NH-126A the route of Balangir-Sonapur-Redhakhhol. Subarnapur is 80.3 Kms from Sambalpur, 76.3 Kms from Redhakhhol, 461.4 Kms from Jamshedpur, 258.3 Kms from Cuttack, 271.9 Kms from Bhubaneswar and 152 Kms 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.



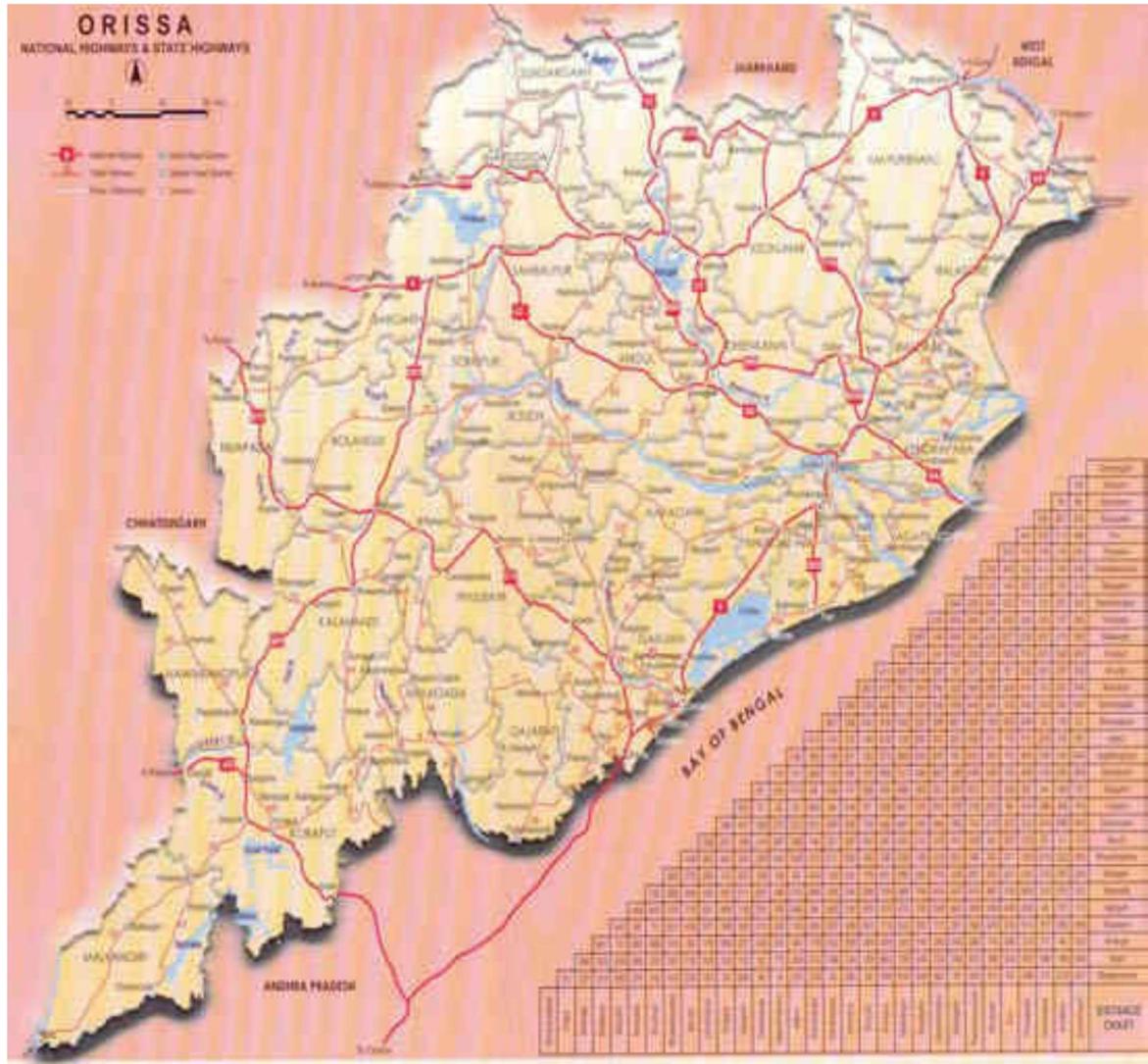
**Rail Network**

Subarnapur District is well connected by Rail link to different places, Subarnapur Railway Station is an important station on the East Coast Eastern Railway. The distance to Bhubaneswar is approximately 444 km, while the distance to Sambalpur is about 278 km; the city of Subarnapur is well connected to many places in Odisha like Talcher, Bhubaneswar, Angul, Hirakud, Barpali, Narasinggarh and Cuttack.



**Air Network**

At present, Subarnapur has no connection by Airway. The site selection for aerodrome is presently under process. Nearest airport is Biju Patnaik International Airport, Bhubaneswar, 132 Kms from Subarnapur. Swami Vivekananda Airport in Ranchi is 141 kms from Subarnapur.



**2. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT:**

In Subarnapur District, there are very few natural mineral deposits scattered throughout the area. Lead and Manganese deposits have been found in Dunguripali area. Manganese ores occur in association with laterites. Manganese content of this ore is low- around 30-35 %, though iron and phosphorus contents are high. These mineral ores are mostly

psilomelane. Bauxite is also found in some parts of the district. Other minerals like Garnet are traced in Birmaharajpur and Binka regions. Gemstones like Aquamarine, Heliodor & Topaz and Rhodolite Garnet are there in Birmaharajpur, Badmal, Siali and Naktamunda belts. High grade quartz is also available in the district .

**3.0 GENERAL PROFILE OF THE DISTRICT:**

**3.1 Demography:**

| <b>Census - 2011</b> |              |
|----------------------|--------------|
| Geographical Area    | 2337 Sq. Km. |
| Total population     | 6,10,183     |
| Male Population      | 3,11,312     |
| Female Population    | 2,98,871     |
| Male Literacy        | 74.01%       |
| Female Literacy      | 56.22%       |
| SC Male              | 79,725       |
| SC Female            | 76,494       |
| ST Male              | 28,794       |
| ST Female            | 28,398       |
| OBC                  | NA           |
| Illiterate Male      | 80,919       |
| Illiterate Female    | 1,30,843     |

Rural Urban Subarnapur



#### 4.0 GEOLOGY OF THE DISTRICT:

The state of Odisha consists of rocks ranging in age from Mesoarchaeon to Recent. The Precambrian terrain in the state can be distributed in the following parts (GSI 2011):

- Eastern Indian craton: northern and northwestern Odisha.
- Part of Bastar craton: western Odisha.
- Part of Eastern Ghats Mobile Belt (EGMB): central and southern Odisha.

The major portion of the study area falls under three supergroups, viz., Bastar cratonic gneiss (BCG), Eastern Ghats Mobile Belt (EGMB) and Lower Gondwana

##### **BCG**

Part of western Odisha consists of Bastar craton. This cratonic strip is delimited by Mahanadi graben in the northeast and EGMB in the east and southeast. The major lithostratigraphic units in this part are: Archaean supercluster of the granite gneisses and granitoids, Bengal and Bailadila groups with age ranging from Neo-Archaean to palaeoproterozoic.

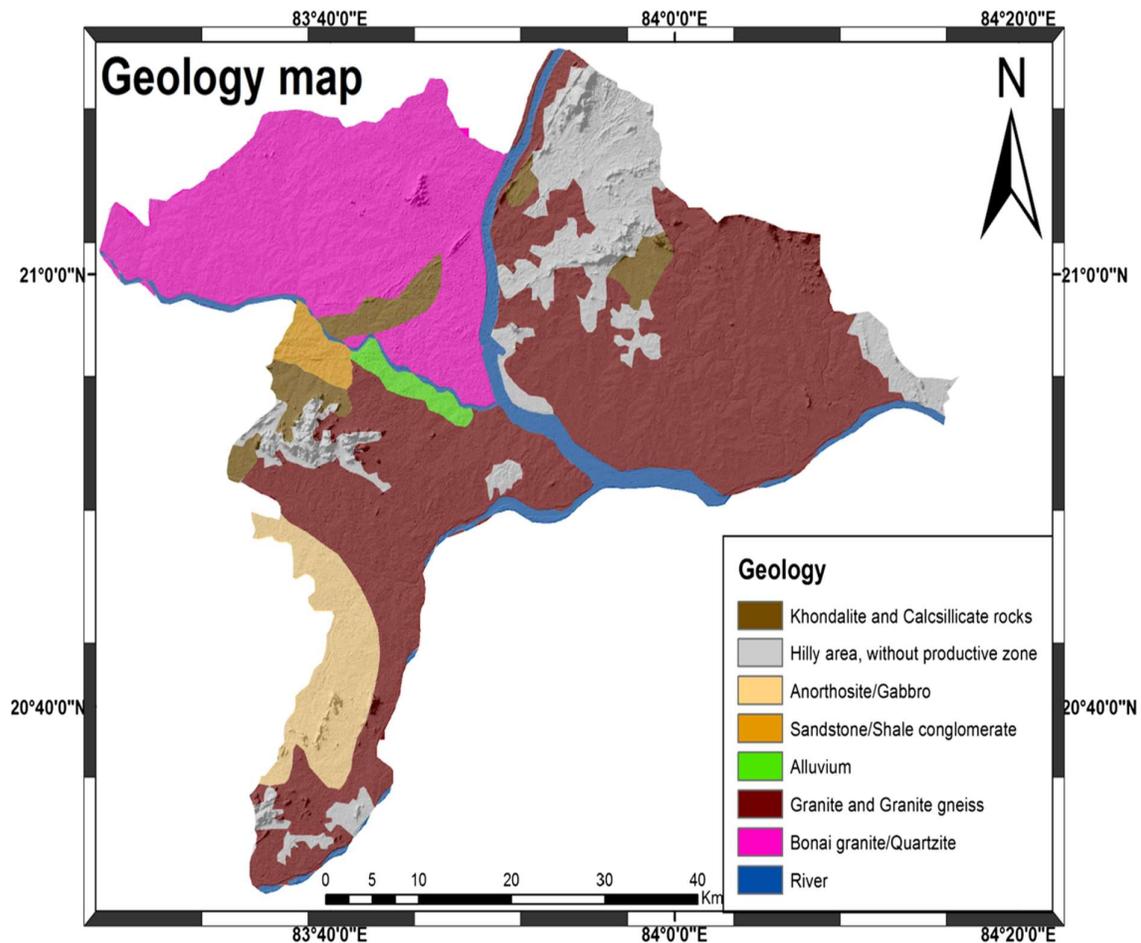
##### **EGMB**

The EGMB extends for over 1000 km from Odisha to southeastern part of Andhra Pradesh along the coastline. It comprises garnetiferous, graphite bearing sillimanite schist and gneiss (Khondalite).

##### **Lower Gondwana**

These rocks rest unconformably on the Precambrian basement comprising granitoids, hornblende gneiss, schist and amphibolites. The base of the Gondwana sequence has been exposed along the southern margin of the basin and it is defined by Talchir formation formed by more than 325 m thick pile of glacial and periglacial deposits. The geology of the study area can also be grouped into consolidated, semi-consolidated and unconsolidated formations. Consolidated formations include granites, gneiss, Khondalite, quartzite, anorthosite and gabbro. Among these formations, granite and granite gneisses form good aquifers due to the presence of weathered and fissured zones. The thickness of the weathered zone ranges from 10 to 15 m and the groundwater yields are up to 10 litres per second (lps). The groundwater development possibility is limited in the Khondalite suite of rocks (up to 10 lps). These types of rocks are mainly formed by quartz–garnet–sillimanite schist and gneiss. Calcsilicates and quartzite are also present in minute amounts. The quartzite group of rocks often does not have good primary porosity and is

very hard in nature, but due to brittle nature of these rocks, fractures and weathering are often observed. These features contribute to secondary porosity and render the formation suitable for holding and transmitting groundwater with typical yields up to 10 lps . Anorthosite rocks are very hard and not suitable for groundwater movement. Hence the yields are low to moderate up to 3 lps. About 78.9% of the total area is contributed by anorthosite, granite/quartzite, khondalite, granite and gneiss rocks. The other types of formations are semi-consolidated in nature and belong to the Lower Gondwana age group. This formation consists of sandstones and conglomerates with typical groundwater yields 5 lps. A very small patch of this formation is observed in the western part of the study area. Recent alluvium and laterites form the unconsolidated formations along the main drainage channels and possess high-water bearing capacity . The groundwater yields in alluvial formations are up to 10 lps.



Subarnapur was awarded the status of a district in April 1993 after being carved out from the erstwhile Bolangir district and was renamed as Subarnapur. The district has a total geographical area of 2344 sq.km, with 2 Subdivision and 6 administrative

blocks. The district is having 3 towns and 80 Gram Panchayats .It is one of the economically backward districts of Orissa and is presently under KBK region.

The district is situated between 20°30' and 21°11' North latitude and 83°27' and 84°16' East longitude covered under survey of India degree sheets no 64O, 64P and 73D. It is bounded on the north by Bargarh and Sambalpur district, on the east by Sambalpur and Angul districts, on the south by Boudh district and on the west by Bolangir district of Orissa.

The Subarnapur district comes under Mahanadi basin.

The river Mahanadi, Tel and their tributaries constitute the main drainage system in the district. The tributaries are ephemeral in nature. The river Mahanadi flows an almost north south course as it enters the district, which changes to south east as it nears Sonapur and finally takes an easterly course after confluence of river Tel with it at Sonapur. River Tel flows in a north easterly course through the border of the district in the south western part before its confluence with Mahanadi. Ong is another important tributary of the river Mahanadi which flows in a south easterly course in the western part of the district and joins Mahanadi a few kilometers north of Sonapur. The drainage is effluent in nature.

The district gets irrigation from major, minor & lift irrigation projects and also from ground water source. The major source of flow irrigation projects is surface water, which mainly depends on rainfall, hence actual area-getting irrigation in different crop seasons in different year varies. The irrigation potential created from all sources aggregates to 97690 Ha in the district.

#### **4.1 Physiography & Geomorphology:**

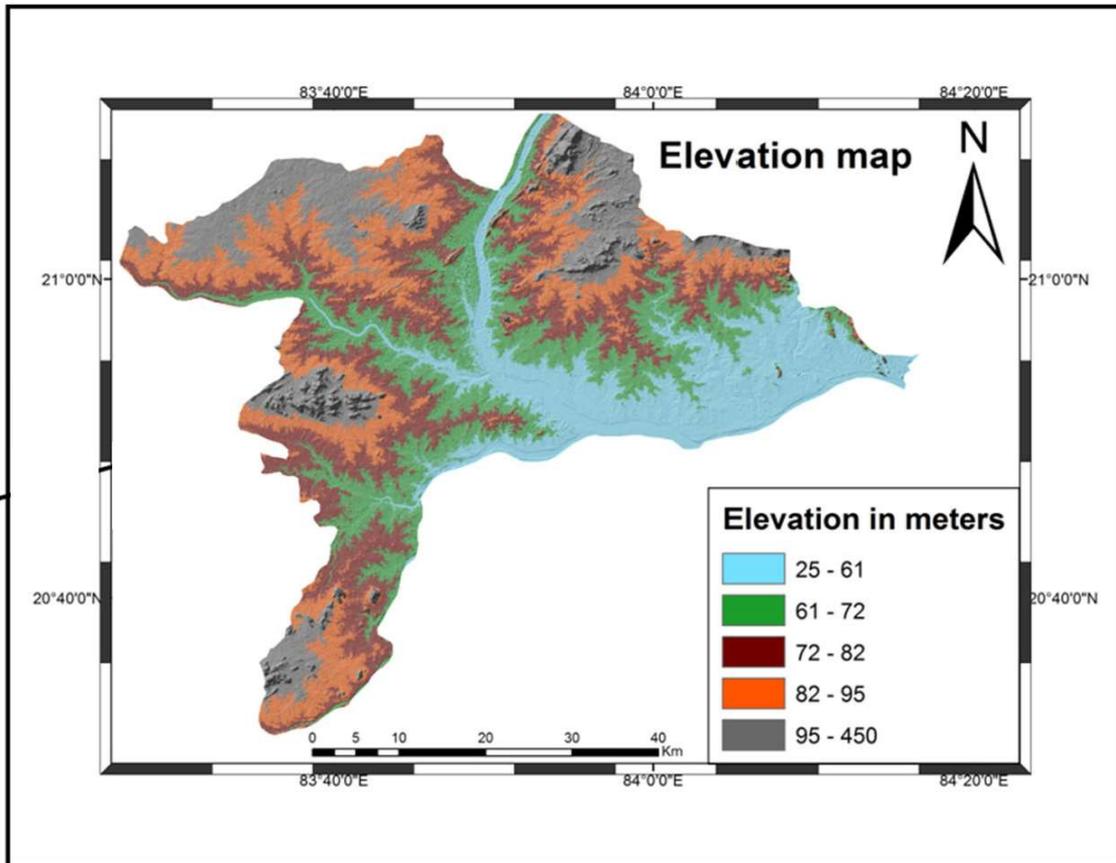
##### **Physiography:**

Physiographically the district comprises undulating plains dotted with residual hills and mounds except for a few patches of scattered hills and high relief areas in the east central and northern parts. A gently undulating terrain with a vast stretch of cultivable land characterizes the major parts of the district, the average elevation being 200m to 300m above mean sea level with a general topographic slope towards east.

Depending upon the mode of origin, occurrence and the physical and chemical characteristics the soils in the district are mainly classified into two major groups 1) Alfisols and 2) Vertisols.

The Alfisols includes Red loamy soil and red Sandy Soil and are generally light textured with a PH ranging from 6.5 to 7.3. These soils are usually deficient in nitrogen, phosphate, organic matter and lime. The soils are in general having average to good fertility. These soil are suitable for cultivation of paddy and other crops.

The Vertisols are medium black soil found around the course of Mahanadi and Tel rivers in the southern part of the district. These soils are highly argillaceous and contain high amount of iron, calcium and magnesium. The PH varies from neutral to alkaline and texture varies from loam to clay loam. These soil are highly argillaceous and contain high amount of iron, calcium and magnesium.

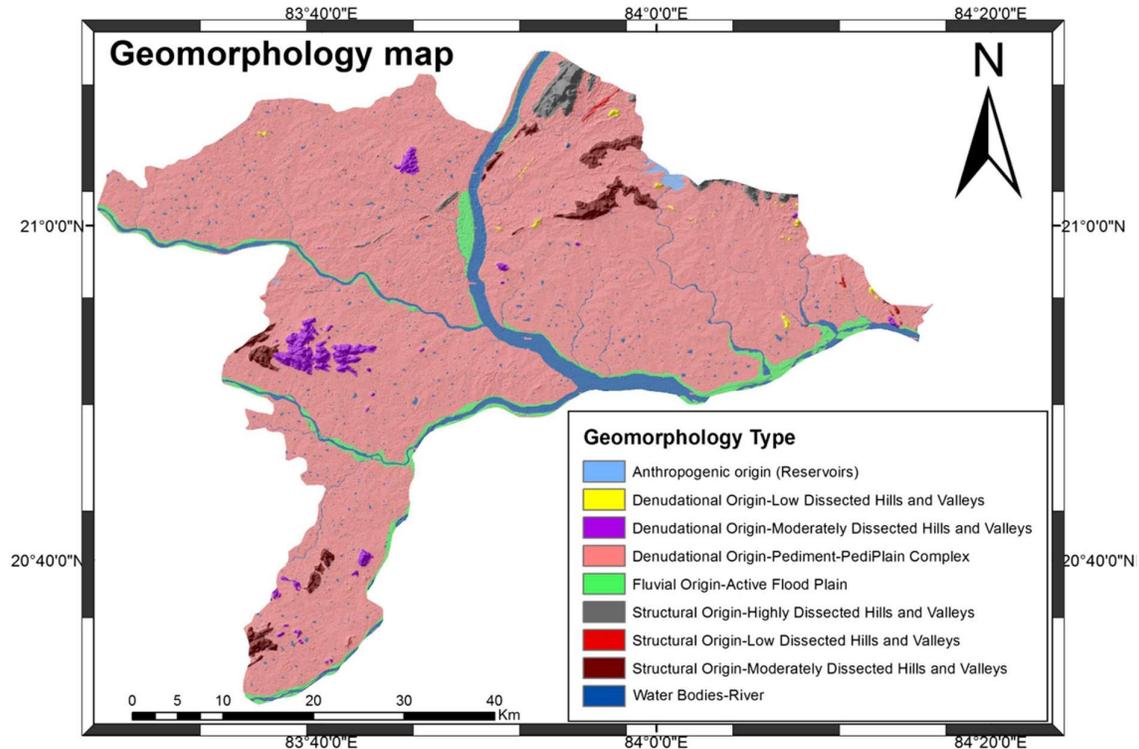


**Geomorphology :**

The identification of different landforms and the preparation of a geomorphic map are very important in evaluating the groundwater prospects. Geomorphological features such as slope, extent of weathering and type of landform play a direct role in determining the groundwater potentiality of a region. The study area is divided into nine major landforms

(according to the NRSC 2012 and ISRO 2013 classification schemes), some of the major features are viz., pediment–pediplain complex (84.4%), low-to-high dissected hills and valleys (3.9%), active flood plains (3.5%) and low to moderately dissected hills and valleys (1.5%). The geomorphic classification is explained as the categorisation and description of the nature, origin and development of landforms.

The fundamental parameters, which are considered for the classification of the geomorphic features are origin and development (process), general structure and shape (landform), dimensions and characteristics (morphometry) and the presence and status of process overprinting (geomorphic generation). Pediments of the denudational origin are gently sloping (0.5–7.0\_) weathered rock surface areas with erosional bedrock characterized by low relief and generally found in hills and plains. It develops due to laminar sheet flows of water. Because of the massive and compact rocky structure with numerous fractures and joints, these are considered as good for groundwater movements and storage. Pediplains are defined as the gently inclined sloping surface of thick weathered granite, gneiss and weathered material formed by coalescence of pediments. This type of landform forms very good recharge and storage zones. The groundwater prospect in these zones depends on the extent of weathering. Denudational hills consist of jointed and fractured granites and gneisses, and are formed due to differential erosion and weathering processes. The presence of fractures, joints and topographic cuts makes infiltration of groundwater possible but with increasing slope the runoff possibility also increases limiting the groundwater recharge process. Therefore, the highly dissected hills process have very less groundwater prospect than the low-dissected hills. Structural hills are formed due to the combined effect of tectonism and denudation. Being compact and hard in nature these types of formations mainly act as runoff zones. The infiltration possibilities are limited only through fractures and faults and so why groundwater potential is very poor in this region. Active flood plains are formed by the lateral movement of a stream and by overbank deposition, which act as good aquifers due to their high permeability. Based on the relative importance of the different landforms with respect to the groundwater potential, different ranks are assigned to each of these landforms .



### Hydrogeology

The district is mostly underlain by Precambrian crystalline, metamorphics, intrusive, sedimentaries of permocarboniferous ages and recent laterites and alluvium. Features like geological set up, rainfall distribution and the degree of primary and secondary porosity controls the hydrogeological framework of a place. As the district is underlain by diverse rock type as already discussed, it results in contrasting water bearing properties of these different geological formation. Depending on the nature of formations and their water bearing capacities etc, the rock formations of the district may be divided broadly into two major hydrogeological units viz -

- 1) Consolidated formations
- 2) Semi-consolidated formation
- 3) Unconsolidated formations

Consolidated formations- Almost the entire district is underlain by the consolidated formation containing granites gneiss, khondalite, quartzite, anorthosite and gabro. These rocks are hard and compact and are devoid of primary porosity. The secondary porosity in these rocks developed as a result of weathering and fracturing due to major & minor tectonic movements along with climatological actions. The secondary porosity forms the conditions for movement of ground water and also act as reservoir of ground water. Groundwater occurs under water table conditions in weathered residuum while it occurs

under semi confined to confined conditions in the fractured & jointed rocks usually two to four water bearing fracture zone occurs down to a depth of 100 mgl.

**Water Bearing Properties Of Major Litho Units**

**Granite and Granite Gneisses** -These rock types in the district occupying the undulating plains, low lying area and sometimes forms hills and hillocks. These rocks are mostly represented by biotite gneiss, porphyritic granitic gneiss etc. They are porphyritic and non porphyritic in nature and are usually grey to light grey in colour. Weathering in granitic rocks is pronounced and fissures and joints etc are also well developed. These rocks are traversed by numerous veins of quartz and pegmatites. The thickness of weathered zone in granitic rocks usually ranges from 10 to 15m and occasionally extends beyond 25m depth. For all the above factors, the granite rocks form the most potential aquifers both at shallow and deeper depths in comparison to other hard rock formation. The available data on existing ground water structures indicate that ground water development is mainly through open wells and to some extent through bore wells. The specific capacity of dug wells tapping weathered zone ranges from 6 to 286 lpm/m drawdown.

The potentiality of the deeper aquifers (Saturated fractures) has been explored by deep drilling down to a maximum depth of 200m. It is found that though saturated fracture was encountered at the depth of 190 m but normally it is restricted within 150 m depth and it has also been noted that the saturated zones are more commonly found within 100m depth. The maximum number of saturated fractures encountered down to 190m depth is five. On an average, down to 150m depth 3 to 5 sets of saturated fracture zones occur. The yield of the wells varied from negligible to maximum of 14.0 lps. with the average yield of 2 to 5 lps. The maximum yield of 14.0 was recorded in the well located at Chun Chun Dungripalli area where 3 sets of saturated fractures were encountered down to 65.0m depth.

**Charnockite suite:** There is very limited occurrence of charnockite in the district. This suite of rocks comprises of pyroxene granulite, hypersthene granite and granodiorite etc. The acid and intermediate group of rocks are more common than other varieties. The charnockites are fine to coarse grained, greenish grey colour having greasy lusture. Texture is mostly granulitic and having gneissic structure. Due to hard and compact nature of the rocks ground water development prospects in charnockite is not good.

**Khondalites:** This suite of rocks comprises of mainly quartz-garnet-sillimanite schist and gneiss and minor occurrence of calcsilicates and quartzites. The rocks usually form hills and have limited ground water development. These rock have well developed joints. The weathered residuum and also fracture zones constitute the main repository of ground water.. The thickness of weathered zone ranges from 5 to 32m. The specific capacity of the dug wells ranges from 2.3 to 13.3 lpm/m drawdown.

**Quartzite:** These rocks occurs as distinct bands and are very resistant to weathering. The weathered mantle is thin and joints are less developed. As such these rocks do not form good aquifers.

**Anorthosite:** These are generally hard and massive in nature. Weathering yields white clayey material, while restricts movement of ground water. Joints and foliations are also not well developed and these rocks do not form good aquifers. Well drilled at Tarbha had a discharge of 1.0 lps.

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

**Semi consolidated formations:** These are represented by the rocks of lower Gondwana formations. These rocks occurs in small patch in the western side of the district in Sonepur block. The friable and loosely connected sandstones form the aquifers. Ground water occurs under water table conditions in the weathered zone and under semi confined condition in the deeper fracture and friable sandstone beds. The depth of open well ranges from 5 to 12 mbgl and depth to water level ranges from 3 to 10 mbgl. The yield of the well in the district is generally limited.

**Unconsolidated Formation:** Laterites and alluvium of Sub-recent to Recent age constitute the unconsolidated formations. Laterites occurring as capping over older formations are highly porous in nature and form good aquifers to be tapped through dug wells. The alluvial deposits of recent origin occur as thin discontinuous patches along the prominent drainage channels. The alluvium varies in thickness from 6 to 12 m. These mainly consist of silt, sand with gravel & pebble, which form potential shallow aquifers tapped through dug wells.

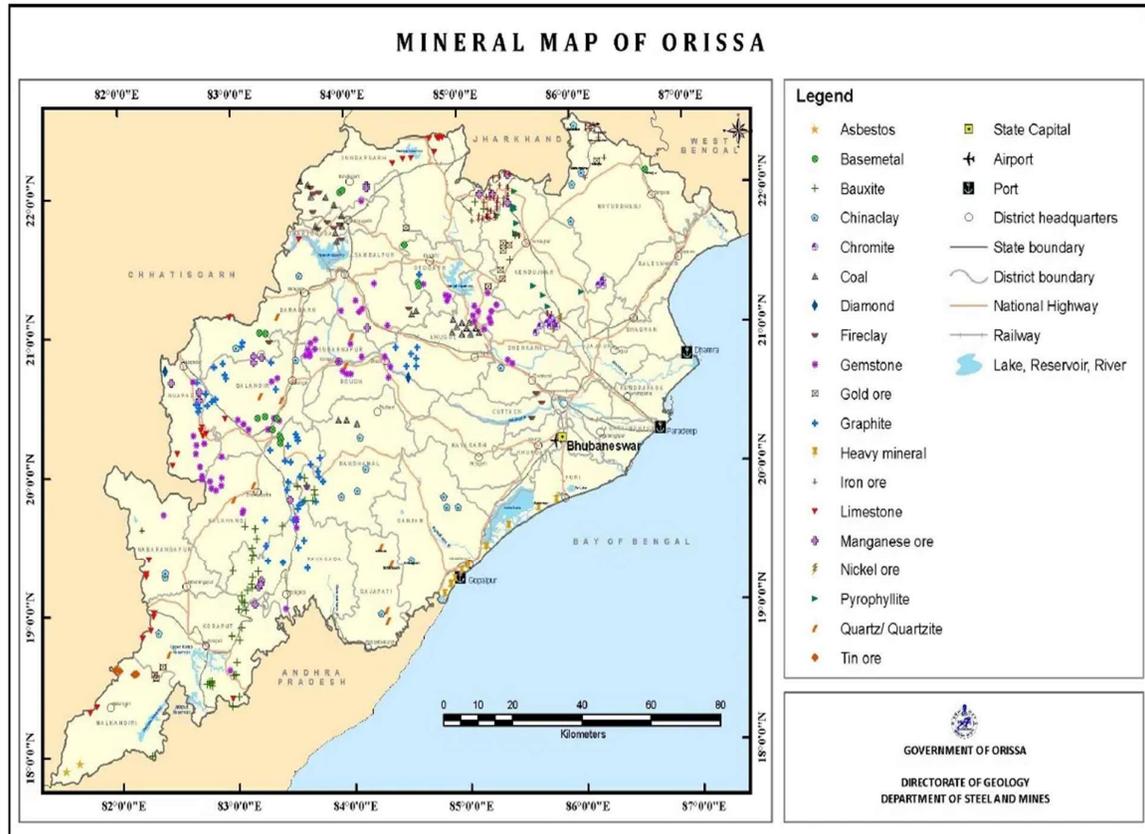
**4.2 Stratigraphy:**

Geologic stratigraphic succession of the study area (GSI 2007, 2009).

|   |                  |                                  |
|---|------------------|----------------------------------|
| Rock Type                               |                  | Group/Supergroup                 |
| Sandstone and Shale                     |                  | (Lower Gondwana)                 |
| -----Unconformity-----                  |                  |                                  |
| Gabbro and anorthosite                  |                  | Eastern Ghats Mobile Belt (EGMB) |
| Garnetiferous granite gneiss            |                  |                                  |
| Calc-silicate                           | Khondalite Group |                                  |
| Quartz-garnet-sillimanite schist/gneiss |                  |                                  |
| Pyroxene granulite-Charnockite suite    |                  |                                  |
| -----Tectonic contact/unconformity----- |                  |                                  |
| Biotite Granite Gneiss                  |                  | Bastar Cratonic Gneiss (BCG)     |

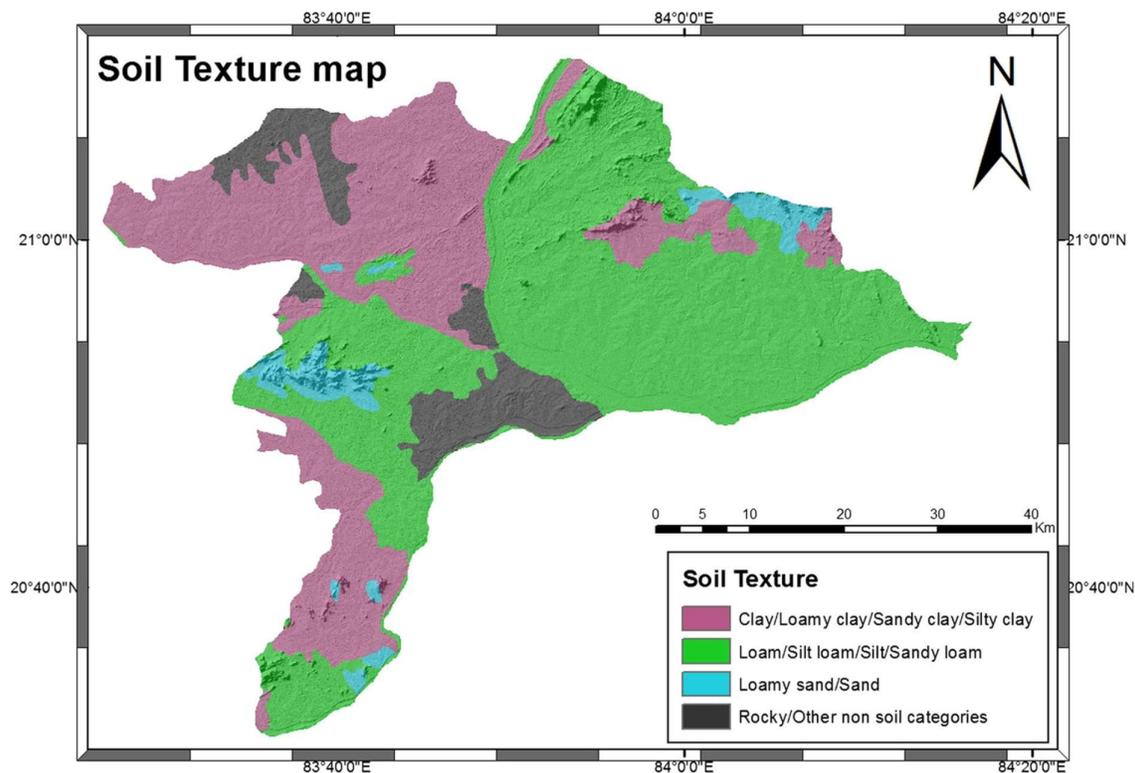
**4.3 Mineral Resources:**

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



#### 4.4 Soil:

The soils in the district are mainly classified into two major groups 1) Alfisols and 2) Vertisols. The Alfisols includes Red loamy soil and red Sandy Soil and are generally light textured with a PH ranging from 6.5 to 7.3. These soils are usually deficient in nitrogen, phosphate, organic matter and lime. The soils are in general having average to good fertility. These soil are suitable for cultivation of paddy and other crops. The Vertisols are medium black soil found around the course of Mahanadi and Tel rivers in the southern part of the district. These soils are highly argillaceous and contain high amount of iron, calcium and magnesium. The PH varies from neutral to alkaline and texture varies from loam to clay loam. These soil are highly argillaceous and contain high amount of iron, calcium and magnesium.

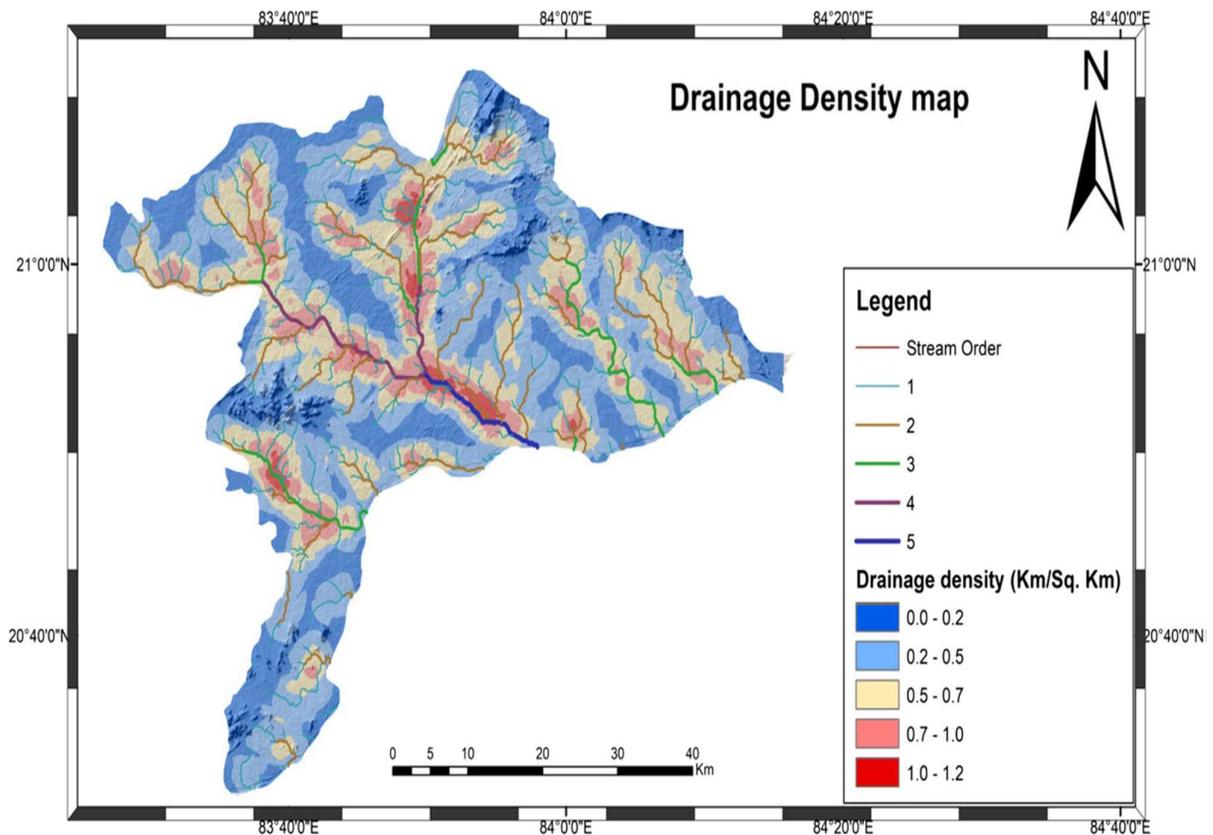


#### 5. DRAINAGE OF IRRIGATION PATTERN

The District has considerable flat land, which provide suitable site for agricultural use. The hilly areas are mostly under forest with patches of cultivation on scarp areas. Major rivers flowing in the District are The Mahanadi, Tel, Ong,. Major crops grown in the District are paddy. major source of irrigations are Canals,Tanks, well and tube wells.

| <b>IRRIGATION BY DIFFERENT SOURCES(Areas and Number of Structures)</b> |                              |                           |                        |   |
|--|------------------------------|---------------------------|------------------------|---|
|  | <b>Sources of Irrigation</b> | <b>Number</b>             | <b>Area in hectare</b> | <b>Percentage of total irrigated area</b> |
|  | Canals                       |                           | 53.1                   | 72.9                                      |
|  | Tanks                        |                           | 5.1                    | 6.9                                       |
|  | Open wells                   |                           | 2.4                    | 3.3                                       |
|  | Bore wells                   |                           | 2.4                    | 3.3                                       |
|  | Lift irrigation schemes      |                           | 9.8                    | 13.4                                      |
|  | Micro-irrigation             |                           | 0.1                    | 0.1                                       |
|  | Other                        |                           | -                      |   |
|  | <b>Total Irrigated Area</b>  |                           | <b>72.8</b>            |   |
|  | Pump sets                    | 1424                      |                        |   |
|  | No. of Tractors              | 100                       |                        |   |
|  | <b>Irrigation</b>            | <b>Area in hectares</b>   |                        |   |
|  | Net irrigated area           | Net irrigated area 44.1   |                        |   |
|  | Gross irrigated area         | Gross irrigated area 72.8 |                        |   |
|  | Rainfed area                 | 92.3                      |                        |   |

Source: SREP and DAO, Subarnapur



### 5.1 River System

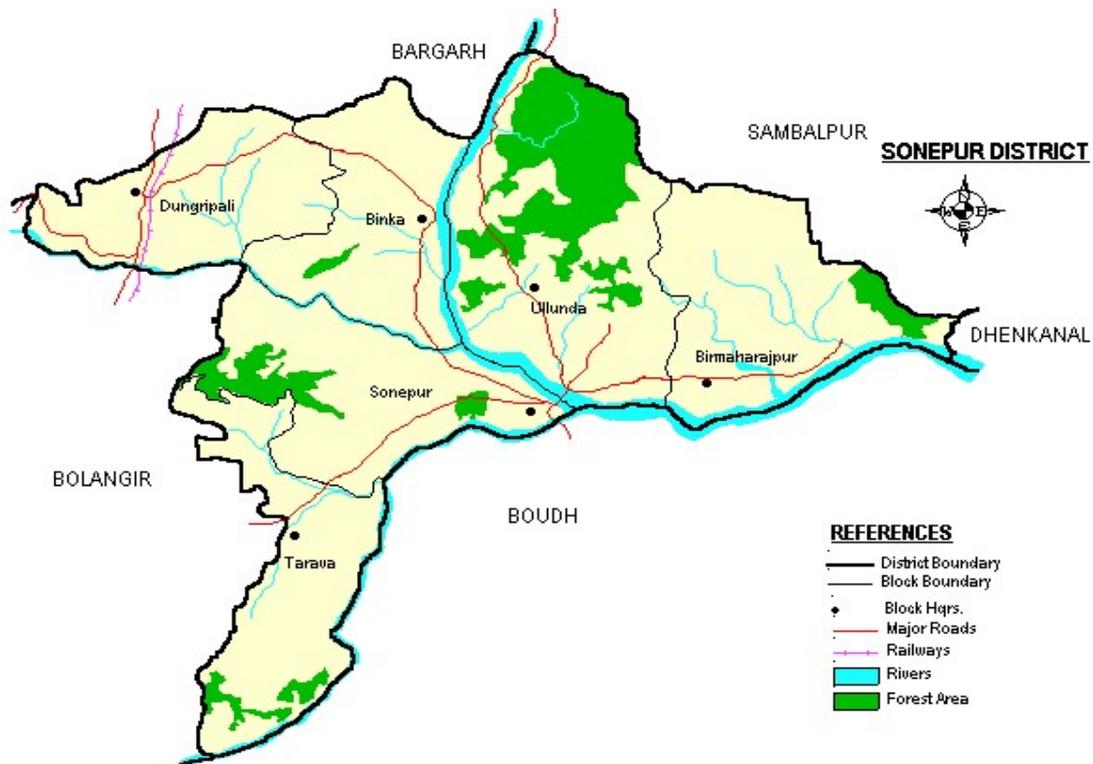
**The Mahanadi** , is the biggest river of Odisha and the sixth largest in India. It is about 851 km long (494 km in Odisha) and its catchment area spreads over 141,600 Sq. Km. out of which 65,580 Sq. Km. (42% of area of the State) lies in Odisha.

The river Mahanadi flows through Subarnapur District and travels for a distance of about 80 kms and drains an area of 2284.89 sq. km. along with its main tributaries river Tel and Ong.

**Tel River** is one of the largest river of Odisha. It's origin is near Jharigaon in Nabarangpur district and flows through Kalahandi, Balangir, Subarnapur district of Odisha and finally merges with Mahanadi near Sonepur. It travels 296 km and has a total catchment area of 22818 sq. km. The river Suktel is a tributary to Tel.

**Ong River** flows across Odisha and joins Mahanadi upstream of Sonepur at Pandkital. The river travels 204 km before it meets Mahanadi. It drains an area of about 5,128 sq. km.. Ong river is tributary of Mahanadi River.

Besides these the district have other important rivers, namely Suktel, the tributary of Tel, Nibrutijore, the tributary of Suktel, Hariharjore and Surubalijore, tributaries of river Mahanadi.



## 6.0 LAND UTILIZATION PATTERN IN THE DISTRICT

### 6.1 Forest and non-forest land

The forests of Subarnapur Division are situated within the dry deciduous zone. Sal trees occur as almost pure crop in a few blocks and in Subarnapur District. There are variety of medicinal plants, neem, Bamboo, Sal, Teak, other timber species and a wide range of carnivorous & herbivorous wild animals. The District has Ainalachhat jungle, Arjunpur Forest, Dahaja Forest Range, Sonapur, Kharapura Jungle, Singjuri jungle, Subarnapur which hosts even elephants. The principal animals that are found are Elephant, Bear, Nilgai, Sambhar, Peacock, Wild Bear and Deer, together with variety of snakes and birds.

**District-wise Forest Cover Area in Odisha (Area in Km<sup>2</sup>)**

| 2019 Assessment   |                                   |                   |                       |             |            |               |           |           |
|-------------------|-----------------------------------|-------------------|-----------------------|-------------|------------|---------------|-----------|-----------|
| District          | Geographical Area Km <sup>2</sup> | 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       |
| <b>Subarnapur</b> | <b>3806</b>                       | <b>23</b>         | <b>127</b>            | <b>234</b>  | <b>380</b> | <b>9.98</b>   | <b>30</b> | <b>48</b> |
| 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          |
| Subarnapur         | 2337          | 2           | 187          | 161          | 350          | 14.98        | 26         | 29          |
| Sundargarh         | 9712          | 1019        | 1814         | 1431         | 4264         | 43.9         | 107        | 89          |
| <b>Grand Total</b> | <b>155707</b> | <b>6967</b> | <b>21730</b> | <b>23008</b> | <b>51345</b> | <b>32.98</b> | <b>885</b> | <b>4306</b> |

(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, Groundnut, mustard, Mung, Red gram, 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 it has already been pointed out, that agriculture is the main livelihood of the people in Subarnapur District. It is therefore also designated as the food bowl of Odisha. Rice is the principal crop grown in this District, followed by other cereals, pulses, oilseeds, vegetables, spices and sugarcane. The agricultural statistics for the District is shown

in subsequent tables below:

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

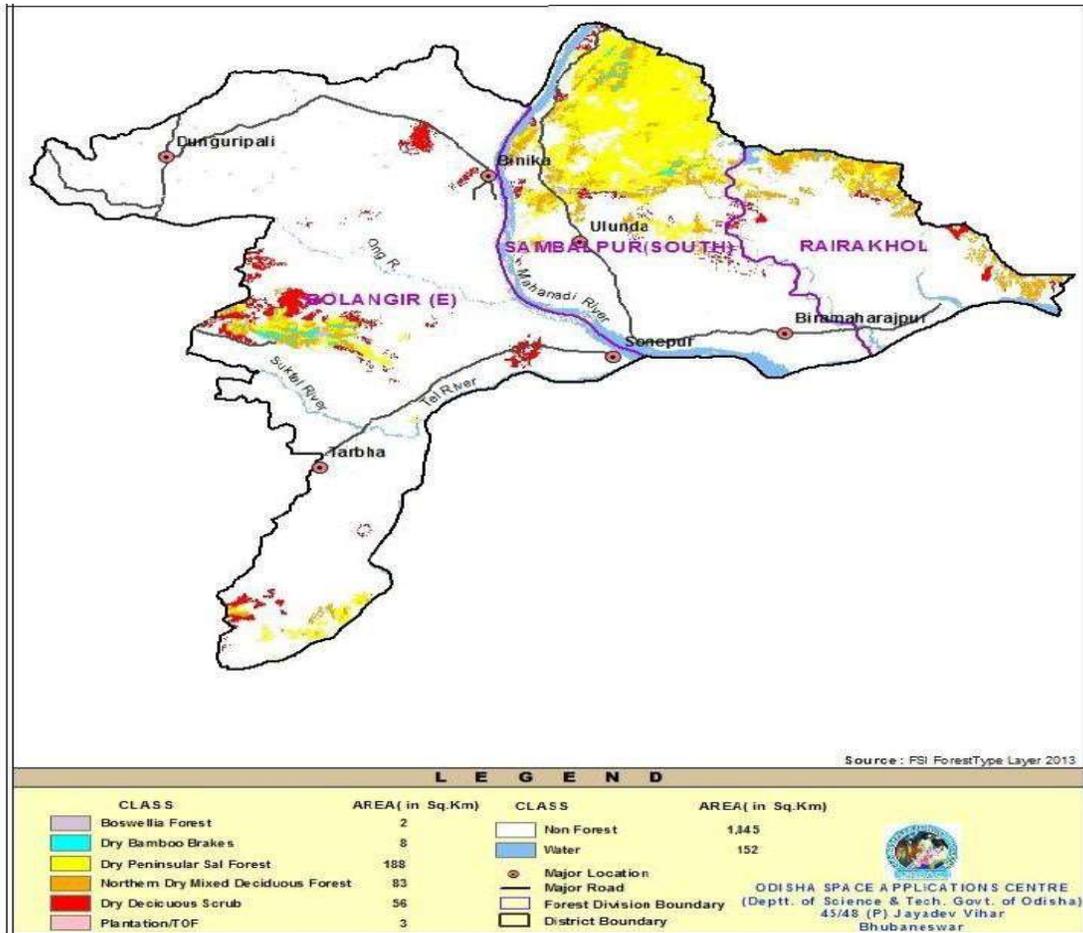
| Major field crops cultivated | Area('000ha) |         |       |           |         |       |        |             |
|------------------------------|--------------|---------|-------|-----------|---------|-------|--------|-------------|
|                              | Kharif       |         |       | Rabi      |         |       | Summer | Grand total |
|                              | Irrigated    | Rainfed | Total | Irrigated | Rainfed | Total |        |             |
| Paddy                        | 62.7         | 34.5    | 97.2  | 28.4      | -       | 28.4  | -      | 121.3       |
| Green gram                   | 0.3          | 7.7     | 8.03  | 1.5       | 11.7    | 13.2  | -      | 21.3        |
| Red gram                     | 0.1          | 3.9     | 4.05  | -         | -       | -     | -      | 4.1         |
| Black gram                   | 0.1          | 3.4     | 3.5   | 0.2       | 2.3     | 2.5   | -      | 6.03        |
| Sesamum                      | 0.03         | 2.5     | 2.5   | 0.04      | 0.8     | 0.8   | -      | 3.3         |
| Ground nut                   | 0.2          | 0.2     | 0.3   | 1.3       | -       | 1.3   | -      | 1.6         |
| Sunflower                    | -            | -       | -     | 0.2       | -       | 0.2   | -      | 0.2         |
| Mustard                      | -            | -       | -     | 0.5       | 2.9     | 3.4   | -      | 3.4         |
| Vegetable                    | 0.7          | 5.6     | 6.3   | 9.2       | 0.2     | 9.4   | -      | 15.8        |
| Spices                       | -            | -       | 0.4   | 1.08      | -       | 1.08  | -      | 1.5         |
| Sugarcane                    | -            | -       | -     | 0.2       | -       | 0.2   | -      | 0.2         |

**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, Potato, 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              | 3.3                   |
| Banana             | 0.6                   |
| Guava              | 0.4                   |
| K.Lime             | 0.4                   |
| Sweet Potato       | 0.3                   |
| Potato             | 0.01                  |
| Onion              | 0.9                   |

Source: SREP, Subarnapur. Orissa Agric.



## **7.0 SURFACE WATER AND GROUND WATER SCENARIO OF THE DISTRICT**

### **7.1 Hydrogeology**

The district was geologically studied by Geological Survey of India and the geological map of the district was prepared. The initial hydrogeological survey on regional scale was carried out by Central Ground Water Board during nineteen eighties. Subsequently the entire district was covered by Central Ground Water Board under reappraisal hydrogeological surveys during nineteen nineties. Under ground water exploration programme and accelerated exploratory drilling programme 46 numbers of exploratory wells including 5 observation wells were drilled by Central Ground Water Board to access the ground water potentials of rock formations at deeper depths. The ground water regime condition is being monitored by quite a large number of permanent hydrograph stations four times a year.

The district is mostly underlain by Precambrian crystalline, metamorphics, intrusive, sedimentaries of permocarboniferous ages and recent laterites and alluvium. Features like geological set up, rainfall distribution and the degree of primary and secondary porosity controls the hydrogeological framework of a place. As the district is underlain by diverse rock type as already discussed, it results in contrasting water bearing properties of these different geological formation. Depending on the nature of formations and their water bearing capacities etc.

### **7.2 Depth of water level:**

The phreatic zone constitutes the most potential ground water reservoir in the district. This zone has been mapped in course of hydro geological surveys. The depth to water table values depend on several factors like rainfall, topography drainage characteristics, lithology, water bearing and water yielding properties of the rocks, as also land use. A total of 30 no. of key wells were monitored during premonsoon (May/June) and post monsoon (Nov/Dec) period. The NHS data for the year 2011 shows that during premonsoon the depth to water level is minimum in Singhijuba (2.12 mbgl) and maximum in Sonapur (8.26 mbgl). During post monsoon the minimum and maximum water level is found in Diksira (1.06mbgl) and Bairasar (3.08 mbgl) respectively. These stations are being monitored on long term basis .A perusal of these data indicates that during post monsoon period (Nov) the depth to Water level in major parts of the district ranges between 0.5-4.81 below ground level. During premonsoon period (April) the depth to water level in major parts of the district ranges between 0.73 to 8.55 m below ground level. Depth to water levels more than 5 m are generally found in minor pockets

### 7.3 Ground Water Quality

Chemical analysis of different parameters are done from the water samples collected, from the national hydrograph stations, during April . The collected water samples were analysed in the chemical laboratory of south Eastern Region as per the standard methods available in literatures. The Ph and electrical conductance (EC at 25.C ) of the water sample were determined by the concerned instrument after calibration. The fluoride, iron and nitrate content of the water samples were determined spectrometrically.

### 7.4 Ground Water Development

Ground water development in the district is being mainly through dug wells; Dug cum bore wells and bore wells. Ground water is mainly used for domestic and irrigation purpose and in a very limited scale for industrial purpose.

**Urban and rural water supply:-** All the urban area ie Sonepur, Binaka and Tarabha gets piped water supply for domestic purpose. In rural area RWS&S, Govt. of Orissa has installed a few piped water supply schemes . Apart from this RWS&S has also constructed hand pump fitted bore wells at different places to provide safe drinking water in rural areas.

**Ground water for irrigation:-** The present draft for irrigation in the district is 2694 HM and there are 5282 ground water extraction structures (dug wells with tenda) and 512(DW with pumpset).

The block wise existing ground water structure for irrigation is given below

#### Block wise existing ground water structure for irrigation use

| Sl no | Block   | Nos of existing structures for irrigation use as on 31.3.2009 |                 |      |    |
|-------|---------|---|-----------------|------|----|
|       |         | DW with tenda   | DW with pumpset | FPTW | BW |
| 1.    | Binaka  | 682   | 24              |      | 6  |
| 2.    | B M Pur | 572   | 8               |      | 2  |

|    |                       |             |            |  |           |
|----|-----------------------|-------------|------------|--|-----------|
| 3. | Dungripalli           | 821         | 55         |  | 10        |
| 4. | Sonepur               | 1472        | 145        |  | 1         |
| 5. | Tarva                 | 1115        | 155        |  | 1         |
| 6. | Ullunda               | 620         | 35         |  | 2         |
|    | <b>District total</b> | <b>5282</b> | <b>512</b> |  | <b>22</b> |

### 7.5 Ground Water Related Issue and Problems

#### Some of key ground water related issues are

**Ground Water Problems :** The ground water problems include water logging, ground water pollution and depletion of ground water level etc.

**Ground water Logging:** An area is considered as water logged if depth to ground water level remains within 0-2m depth range throughout the year. Water logging conditions have developed in limited parts of Hirakud command in the district, in Dungripalli and Binika blocks, where water table is within 2 m from surface. Out of the total 435 sq. km under the Hirakud Command area only 4 sq.km area in Binika block and around 7 sq. km area in Dungripalli blocks are showing water logging conditions. Low topography, unlined canals, indiscriminate use of canal water and the prevailing paddy cultivation in both Kharif and rabi seasons are mainly responsible for excessive seepage of water and water table rise.

**Ground Water Pollution:** Based on the chemical analysis of water samples collected from different aquifers, it is observed that almost all chemical constituents are well within the permissible limit for drinking as well as irrigational purposes, except some pockets where high nitrate values (No<sub>3</sub> at Bairasar-140ppm, Dungripalli-60ppm and Phulmuthi-145 ppm) have been observed.

**Ground water table depletion :** The stage of ground water development in the different blocks varies from 10.20% to 30.97% percent with the district average of 18.40 per cent which is far below the safe withdrawal limit (70%). The analysis of water level trend for 10 years period for both pre monsoon and post monsoon period indicate that there is no noticeable change in water levels. This also indicates that no depletion in water table has taken place in the district.

**Ground water quality problem:** The water samples from shallow aquifers indicates that ground water can be used for irrigation with moderate leaching and moderate salt tolerant crops. The use of C<sub>3</sub>S<sub>1</sub> and C<sub>3</sub>S<sub>2</sub> type water requires suitable soil water management practices and the ground water is also suitable for drinking purpose except for a few places where concentration of NO<sub>3</sub> (Bairasar-140 mg/l), (Phulmuthi-145mg/l),and Dunguripalli-60mg/l and that of fluoride-(Khari-2.06mg/l) is found to exceed the permissible limit, which is due to the local pollution.The ground water from deeper aquifers are suitable for drinking purposes as almost all the constituents are well within the permissible limit. The quality of ground water for irrigation use is also good. Ground water is fresh with the average EC value within the permissible limits. NO<sub>3</sub> and F values are well within the permissible limit except only at a few places

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

NIL

#### **7.7 Area Notified by Cgwb/Sgwa**

None

#### **7.8 RECOMMENDATIONS**

The existing hydrogeological set up and availability of huge ground water resource indicate that there is scope for development of ground water on large scale. But this large scale development requires block as well as Gram Panchayat wise detail hydrogeological maps on large scale. For this purpose intensive hydrogeological survey and exploratory drilling aided by remote sensing studies and geophysical investigation may be taken up jointly by the state and central Govt. agencies. This will help in precise delineation of areas suitable for different ground water development structures and will also facilitate for designing different type of ground water extraction structures and defining specification of pumps etc.

In Hirakud command area, there are conditions of water logging at places and simultaneously scarcity of supplied 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. The demand of water for 200% cropping intensity can be met from surface water 90% and ground water 10% for both the seasons. The existing cropping pattern needs modification. Diversification of crops from paddy to non-paddy crops like oil seeds, pulses and vegetables during Rabi season, at least in the high land and part of medium land areas, is essential.

The major part of the area presents gently sloping undulating topography and dug wells which are best suited ground water structures for this terrain. The yield potential of shallow zone of granitic rocks, pyroxene granulites and meta-basics are better than that of other formations. Hence the undulating plains and valleys which are occupied by above mentioned rock types may be used for extensive ground water development through dug wells and also by dug-cum-bore wells.

In construction of ground water abstraction structures, such as dug wells, dug cum bore wells and bore wells, for irrigation minimum safe spacing should be maintained to avoid interference of the wells.

The yield of existing dug wells may be enhanced by converting those into dug cum bore wells wherever feasible and the wells should be provided with brick lining which will facilitate the free flow of ground water into the well.

Detailed surface geophysical survey aided by photo geological & remote-sensing studies may be taken up in the district to identify the exact thickness of weathered zone and occurrence and extent of lineaments, which form potential aquifer zones.

The agricultural extension services should motivate and guide the farmers to adopt suitable cropping patterns to maximize the benefits of irrigation through dug wells / bore wells.

Construction of check dams, nalla bunds, percolation tanks at suitable locations will help in effecting additional recharge to the ground water reservoir. Sub-surface dams may also be constructed at hydrogeologically suitable sites to arrest sub-surface out flow of ground water in the weathered mantle of hard massive rocks. This will increase the dynamic ground water storage in the adjacent phreatic aquifer.

Ground water monitoring in the district, for water level and water quality, through National Hydrograph Stations should be strengthened to assess the

impact of envisaged ground water development on the ground water regime and to find out the status of water logging in the canal command areas. As there is large scope for development of ground water, suitable schemes may be launched for ground water development to boost agricultural production in the district. The financial institutions should generously finance such schemes.

### 8.0 RAINFALL OF THE DISTRICT AND CLIMATE CONDITION

It is observed that about 90% of the total annual rainfall takes place due to South West monsoon between the middle of June & mid-October. The northeast monsoon gives erratic & insufficient rainfall. The normal annual rainfall is 1443.5mm. The rainfall is highly erratic both in space and time. There is a large spatial variation as observed from the rainfall data of various blocks.

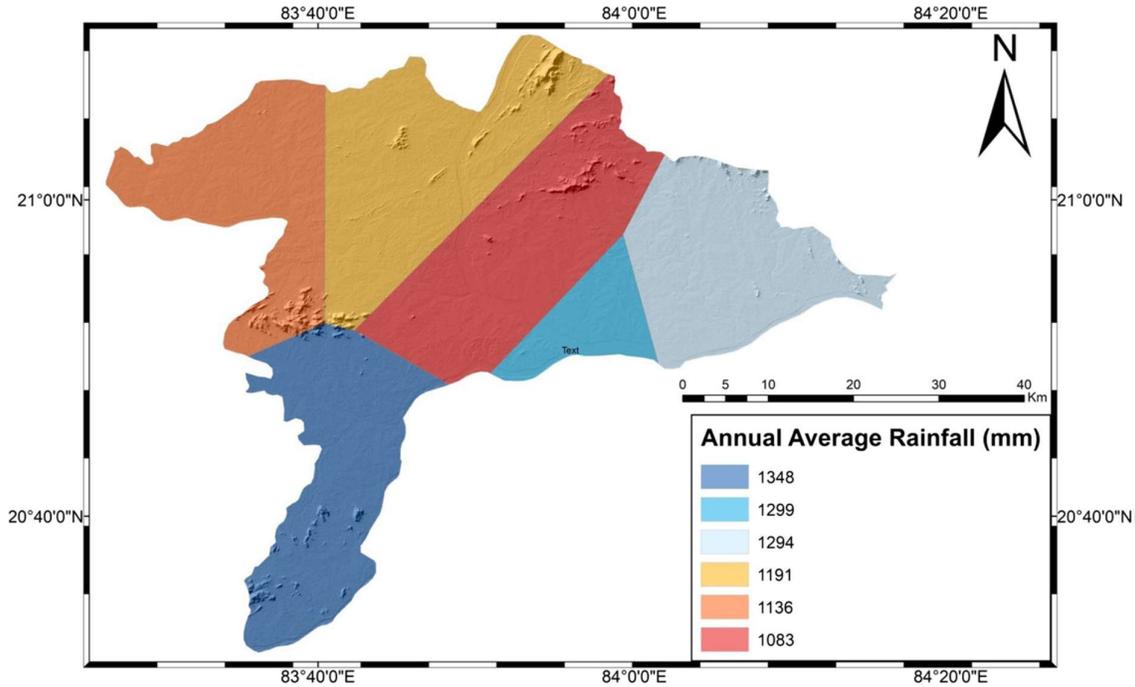
#### 8.1 Month wise rainfall:

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    |       | 2020   | 2022    | 2023    | Average |
|---------|-------|--------|---------|---------|---------|
| Sl. No. | Month | (mm)   | (mm)    | (mm)    | (mm)    |
| 1       | Jan   | 0.00   | 46.70   | 0.00    | 46.70   |
| 2       | Feb   | 0.00   | 0.00    | 4.05    | 4.05    |
| 3       | Mar   | 50.35  | 0.00    | 4.25    | 54.6    |
| 4       | Apr   | 21.47  | 0.00    | 4.05    | 25.52   |
| 5       | May   | 33.90  | 25.70   | 56.67   | 116.27  |
| 6       | Jun   | 141.55 | 136.20  | 209.85  | 487.6   |
| 7       | Jul   | NR     | 406.03  | 359.00  | 765.03  |
| 8       | Aug   | NR     | 439.17  | 149.85  | 589.02  |
| 9       | Sep   | NR     | 93.02   | 444.07  | 537.07  |
| 10      | Oct   | NR     | 44.85   | 38.45   | 83.3    |
| 11      | Nov   | NR     | 0.00    | 0.00    | 0.00    |
| 12      | Dec   | NR     | 0.00    | 0.00    | 0.00    |
| Total   |       | NR     | 1191.67 | 1270.24 | 2709.16 |

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.

**Annual Average Rainfall Distribution Map**



**8.2 Climate**

The district enjoys tropical climate characterized by summer’s cold winters & rainy. The winter season generally commences from late November & continues up to the end of February. The summer season commences from March & continues till middle of June where the maximum temperature varies from 34.3 ° to 47.7 ° C. May being the hottest with the meandaily maximum temperature of 41.4 ° C while December is the coldest month of the year when the temperature drops down to 6 ° C.

**Temperature Graph- Subarnapur**

May being the hottest with the meandaily maximum temperature of 41.4 ° C while December is the coldest month of the year when the temperature drops down to 6 ° C.

Source: Indian Meteorological Department.

**9.0 DETAILS OF MINING LEASE OF BRICK EARTH IN THE DISTRICT**

No Quarry lease has been granted.

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

| Sl. No. | Name of the Tahasil | 2020-21 | 2021-22 | 2022-23 | Total Amount (Lakh) |
|---------|---------------------|---------|---------|---------|---------------------|
| 1       | Binika              | Nil     | Nil     | Nil     | Nil                 |
| 2       | Biramaharajpur      | Nil     | Nil     | Nil     | Nil                 |
| 3       | Rampur              | Nil     | Nil     | Nil     | Nil                 |

|                    |         |     |     |     |     |
|--------------------|---------|-----|-----|-----|-----|
| 4                  | Sonapur | Nil | Nil | Nil | Nil |
| 5                  | Tarbha  | Nil | Nil | Nil | Nil |
| 6                  | Ulunda  | Nil | Nil | Nil | Nil |
| <b>Grand Total</b> |         | Nil | Nil | Nil | Nil |

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

| Sl. No.            | Name of the Tahasil | 2020-21 | 2021-22 | 2022-23 | Total Quantity (Cubic meter) |
|--------------------|---------------------|---------|---------|---------|------------------------------|
| 1                  | Binika              | Nil     | Nil     | Nil     | Nil                          |
| 2                  | Biramaharajpur      | Nil     | Nil     | Nil     | Nil                          |
| 3                  | Rampur              | Nil     | Nil     | Nil     | Nil                          |
| 4                  | Sonapur             | Nil     | Nil     | Nil     | Nil                          |
| 5                  | Tarbha              | Nil     | Nil     | Nil     | Nil                          |
| 6                  | Ulunda              | Nil     | Nil     | Nil     | Nil                          |
| <b>Grand Total</b> |                     | Nil     | Nil     | Nil     | Nil                          |

**12. MINERAL MAP OF THE DISTRICT:**



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

Nil

**14. TOTAL MINERAL RESERVE AVAILABLE IN THE DISTRICT**

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

- (i) Blocks were identified based on geological studies through field observation.
- (ii) Mineable resource was calculated by considering detail prospecting.

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

#### Summary of Identified Mineral Potential:

| Sl. No.            | Name of the mineral | Name of the lessee | Address and contact No. of the lessee | Letter of Intent Grant Order No. and date | Area of mining lease to be allotted | Validity of Lol | Use (Captive / Non-Captive) | Location of the Mining lease (Latitude & Longitude) |
|--------------------|---------------------|--------------------|---------------------------------------|---|-------------------------------------|-----------------|-----------------------------|---|
| 1                  | 2                   | 3                  | 4                                     | 5   | 6                                   | 7               | 9                           | 10  |
| Nil up to till now |                     |                    |                                       |   |                                     |                 |                             |   |

#### 15. QUALITY/GRADE OF MINERAL AVAILABLE IN THE DISTRICT

##### Brick Earth found in District: -

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

##### 16. Use of Mineral:

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

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

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

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

#### 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 LEASES VIZ. NUMBER OF MINING LEASES, LOCATION (LATITUDE AND LONGITUDE)

Nil

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

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

**21. IMPACTS OF MINING ON ENVIRONMENT:**

The most important environmental impact of mining projects are: -

**Acid mine drainage and contaminant leaching**

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

**Transportation sources:**

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 THE ENVIRONMENT:**

- Water sprinkling on haul road, loading and unloading points.
- Plantation along the safety zone and dump area.
- 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 since 1980.
- Mining activities causes physical, chemical, biological and socio-economic changes in the area.
- Surface mining activities disturb the original land profile.
- In India, mineral production comes mostly from opencast mines & hence Land degradation problems is of serious concern.
- An intricate, in-depth and site-specified techniques involving integrated approach Is necessary.

**Reclamation has three vital roles:**

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

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

Proposed future land use after reclamation:

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

**Statutory requirement:**

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

Rule 22, Mine Closure Plan

Rule 23, Submission of Progressive Mine Closure Plan

Rule 24, Submission of Final Mine Closure Plan

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

Rule 35, Sustainable Mining

**24. RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN:**

Mining activity because of the very nature of the operation, complexity of the systems, procedures and methods always involves some amount of hazards. Hazard identification and risk analysis is carried for identification of undesirable events that can lead to a hazard, the analysis of hazard mechanism by which this undesirable event could occur and usually the estimation of extent, magnitude and likelihood of harmful effects. The activities which can cause high risk related to face stability and the person blasting the shots. It was observed that on a working face of the mine, there were large cracks and unsupported rocks were present, which can lead to a serious hazard and injure workers engaged in loading operation and machineries because of rock falls or slides. This type of condition 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 many people. Explosives by nature have the potential for the most serious and catastrophic accident. Planning of round of shots, holes correctly drilled, direction logged, weight of explosive suitable for good fragmentation are the few of the steps necessary to ensure its safe use and if the shots are not properly designed can result in misfires, early ignition and flying rocks. No person is allowed to use explosives without being properly trained in its handling. In the mine a large numbers of heavy vehicles were in operation and the roads were not proper for haulage purpose. The haulage roads were not even and were not wide enough for the crossing purpose and hence the chances of hazards are very high. The main hazards arising from the use large earth moving vehicles are incompetent drivers, brake failure, lack of all-around visibility from the driver position, vehicle movements particularly reversing, roll over, and maintenance. Those most at risk are the driver and pedestrians likely to be struck by the vehicle, and drivers of smaller vehicles, which cannot be seen from the cabs of large vehicles. Edge protection is always necessary to prevent inadvertent movement over the edge of roadway or a bench.

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

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

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

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

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

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

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

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

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

1. Silicosis
2. Tuberculosis

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

| <b>Year</b> | <b>No. of Cases notified/ detected</b> | <b>No. ofTB cases under Treatment.</b> |
|-------------|--|--|
| 2018-19     | 1930                                   | 1709                                   |
| 2019-20     | 1948                                   | 2503                                   |
| 2020-21     | 1604                                   | 1819                                   |
| 2021-22     | 1943                                   | 2103                                   |
| 2022-23     | 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 Subarnapur 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 Subarnapur 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 District Environment Impact Assessment Authority (DEIAA) with the assistance of Irrigation Department, Forest Department, Public Works Department, Mining Department, Ground Water Boards, Remote Sensing Department, Mining Departments. The DSR is being submitted to SEIAA, Odisha, Bhubaneswar for necessary evaluation and approval.

**DETAIL INFORMATION ON ROAD METAL (STONE) IN RESPECT OF SONEPUR DISTRICT**

**ANNEXURE - A**

**DETAIL OF ROYALTY / REVENUE RECEIVED & DETAIL OF PRODUCTION OF MINOR MINERALS (ROAD METAL) 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 |            | Period of Mining Lease 1st/ 2nd renewal |    | Date of Commencement of Mining Operation | Status (working /Non working/ temp. Working for dispatch etc | capti ve/ Non capti ve | Obtained Environmental Clearance(ye s/No). If yes Letter No with Date of grant of EC | Location of the Minor lease(Longitude/L atitude)  | Method of Mining(o pen cast /under ground) | Geologi cal Reserve (MT/Cu ms) | Mineabl e Reserve (MT/Ccu ms) | Royalty/Reve nue Received in last 3 years (In Rupees) |    |    | Production of Mineral in last 3 years (In Cum) |    |    |
|------------------------|---------|--------------------------|---------------------|--|------------------------------------|---|------------------------|------------|---|----|--|--|------------------------|--|---|--|--------------------------------|-------------------------------|---|----|----|--|----|----|
|                        |         |                          |                     |  |                                    |   | From                   | To         | From                                    | To |  |  |                        |  |   |  |                                |                               | 1   | 2  | 3  | 2  | 2  | 2  |
|                        | 1       | 2                        | 3                   | 4  | 5                                  | 6   | 7                      | 8          | 9                                       | 10 | 11                                       | 12   | 13                     | 14   | 15  | 16   | 17                             | 18                            | 19  | 20 | 21 | 22   | 23 | 24 |
| <b>Sonepur Tahasil</b> |         |                          |                     |  |                                    |   |                        |            |   |    |  |  |                        |  |   |  |                                |                               |   |    |    |  |    |    |
| Sonepur                | 1       | Mahulkhunt Morrur Quarry | Sri Dhana mali Podh | S/o- Late Dasarath Podh AT-Mahulkhunt, Po-Khari, PS- Tarbha, Dist-Subarnapur | 02.11.2022 Reg No-1166220 1357     | Khat a-39 Plot-1 Kisa m-Gochar Ac-2.97, Ha-1.20       | 02.11.2022             | 01.11.2027 | NA                                      | NA | NA                                       | Runnin g   | NA                     | SEIAA-257652/631-MINB2/04-2020 Dt-30.07.2022   | Latitudes-20°46'21.43 884"N to 20°46'17.88 135" N and Longitudes-83°44'30.21 016"E to 83°44'26.36 828"E | Open Cast                                  | GR-36057                       | MR-26112                      | NA  | NA | NA | NA   | NA | NA |
| <b>Binika Tahasil</b>  |         |                          |                     |  |                                    |   |                        |            |   |    |  |  |                        |  |   |  |                                |                               |   |    |    |  |    |    |
| Binika                 | 2       | Bisalpali Morrur Quarry  | Sri Sudhir Kar      | At-Dabala(Gulapada) Po/Ps-Binika Dist-Subarnapur Pin-767019 Mob-9937585498   | 13.08.2021 Reg No-1168210 0398     | Khat a-208 Plot-40 Kisa m-Patit a Ac-1.209, Ha-0.5220 | 13.08.2021             | 12.08.2026 | NA                                      | NA | NA                                       | Runnin g   | NA                     | SEIAA-560/09-2020 Dt-17.12.2020  | Latitudes-21°04'26.16 420"N to 21°04'23.41 621" N and Longitudes-83°46'01.86 058"E to 83°45'58.09 152"E | Open Cast                                  | GR-20880                       | MR-13947                      | NA  | NA | NA | NA   | NA | NA |





## Annexure-II

## List of Potential Mining Lease (existing &amp; 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                 |
| <b>Binika Tahasil</b>  |        |                           |                           |               |                                 |                                      |  |   |   |                    |
| Binika                 | 1      | Bisalpali Morrum Quarry   | Bisalpali Morrum Quarry   | 0.5220        | WC-46 KM<br>BR-6.6 KM           | Debrigarh Wildlife Sanctuary-46 KM   | NO   | 450.9 cum   | Morrum                                      | Existing           |
| <b>Sonepur Tahasil</b> |        |                           |                           |               |                                 |                                      |  |   |   |                    |
| Sonepur                | 2      | Mahulkhunta Morrum Quarry | Mahulkhunta Morrum Quarry | 1.20          | WC-79.5 KM<br>BR-1.64 KM        | Debrigarh Wildlife Sanctuary-79.5 KM | NO   | 2000 cum  | Morrum                                      | Existing           |

## Patta Lands/ Khatedairi Land (Existing &amp; Proposed)

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

## De-Siltation Location (lakes/ Ponds/dams etc. (Existing &amp; 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 for Subarnapur District |  |          |          |         |         |           |                     |                    |    |

## d) M-Stone Plants:

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

**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 Subarnapur District |             |           |                        |         |               |                        |

**Contiguous Cluster Details**

| River Name  | Contiguous Cluster No. | Cluster No. | Number of leases 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 Subarnapur 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                     |
| <b>Binika Tahasil</b>  |                           |             |                             |                                       |  |                                  |   |                        |                                      |   |   |                        |
| Binika                 | Bisalpali Morrum Quarry   | 11682100398 | Village Road                | Govt. Land                            | Bisalpali  | 2                                | 3   | 4                      | Unpaved                              | Unpaved   | Lease Owner   |                        |
| <b>Sonepur Tahasil</b> |                           |             |                             |                                       |  |                                  |   |                        |                                      |   |   |                        |
| Sonepur                | Mahulkhunt Morrum Quarry  | 11662201357 | Village Road                | Govt. Land                            | Mahulkhunt   | 1                                | 2   | 6                      | 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 |                             |                                    |   |                        |                                      |   |   |                        |