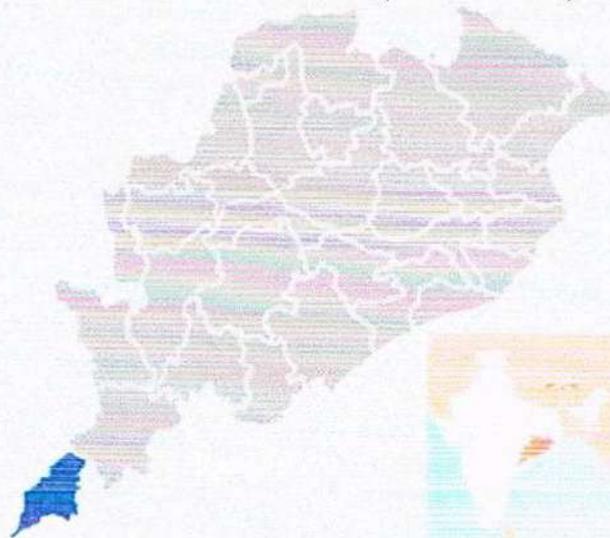




DISTRICT SURVEY REPORT (DSR) OF MALKANGIRI DISTRICT, ODISHA ON STONE (ROAD METAL) MINING

As per Notification No. S.O. 141(E), 15th January, 2016 & S.O. 3611(E),
25th July, 2018, New Delhi, MINISTRY OF ENVIRONMENT, FOREST &
CLIMATE CHANGE (MoEF & CC)



**DISTRICT ENVIRONMENT IMPACT
ASSESSMENT AUTHORITY (DEIAA)
MALKANGIRI, ODISHA
OCTOBER-2019**

FOREWORD

The **District Survey Report (DSR)**, Malkangiri for Stone mineral has been prepared in accordance with the guideline issued by the Ministry of Environment, Forests & Climate Change (MoEF&CC), Government of India vide the notification S.O. 141(E) Dated 15th January, 2016 and the amended notification S.O. 3611(E) Dated 25th July, 2018.

This DSR for Stone mineral which is a compendium of available mineral resources, geographical set up, environmental and ecological condition of the district and is based on survey made on the sairat sources of the different Tahasils of the District and data of various departments like Geology & Mining, Forests, Irrigation, Agriculture, Horticulture, Health Departments ; published reports & websites. Earlier the report was web hosted from 06.11.2019 to 28.11.2019 in the district website www.malkangiri.nic.in to invite any comments from the public.

It will no doubt, form the basis for application for environmental clearance, preparation of reports and appraisal of projects. The DEIAA and DEAC will scrutinize the applications and recommend for environmental clearance of mining of minor minerals on the basis of this District Survey Report. As per guideline the Report will be updated once in every five years.

D. Prasad
... 10.12.19

Divisional Forest Officer-cum
Member, DEIAA, Malkangiri

C. H. P.
10/12/19

Collector & District Magistrate-
Cum- Chairperson, DEIAA,
MALKANGIRI

Debadutta Mohanty
10.12.2019

Representative of PCB, Rayagada-cum-
Expert Member, DEIAA, Malkangiri

J. M. S.
10/12/19

Sub -Collector, Malkangiri-cum
Member Secretary, DEIAA, Malkangiri.

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0. PREFACE

The Erstwhile Ministry of Environment and Forests(MoEF), (the Government of India, made Environmental Clearance (EC) for mining of minerals mandatory through its Notification of 27th January, 1994 under the provisions of Environment Protection Act, 1986. Keeping in view the experience gained in environmental clearance process over a period of one decade, the Ministry came out with Environmental Impact Notification, SO 1533 (E), dated 14th September 2006. The Ministry of Environment, Forests & Climate Change (MoEF&CC), Government of India had amended the said vide notification S.O. 141(E) Dated 15th January, 2016. Now again Ministry of Environment, Forests & Climate Change (MoEF&CC), Government of India amended the notification S.O. 141(E) Dated 15th January, 2016 vide S.O. 3611(E) Dated 25th July, 2018. It has been made mandatory to obtain environmental clearance for different kinds of development projects as listed in Appendix-X of the Notification.

Further, in pursuance to the order of Hon'ble Supreme Court dated the 27th February, 2012 in I.A. No.12- 13 of 2011 in Special Leave Petition (C) No.19628-19629 of 2009, in the matter of Deepak Kumar etc. Vs. State of Haryana and Others etc., prior environmental clearance has now become mandatory for mining of minor minerals irrespective of the area of mining lease; And also in view of the Hon'ble National Green Tribunal, order dated the 13th January, 2015 in the matter regarding sand mining has directed for making a policy on environmental clearance for mining leases in cluster for minor Minerals, The Ministry of Environment, Forest and Climate Change in consultation with State governments has prepared Guidelines on Sustainable Sand Mining detailing the provisions on environmental clearance for cluster, creation of District Environment Impact Assessment Authority(DEIAA) and proper monitoring of minor mineral mining using information technology and information

technology enabled services to track the mined out material from source to destination.

The DEIAA and DEAC will scrutinize and recommend the prior environmental clearance of mining of minor minerals on the basis of District Survey Report. This will be a model and guiding document which is a compendium of available mineral resources, geographical set up, environmental and ecological set up of the district and replenishment of minerals and is based on data of various departments, published reports, journals and websites.

The District Survey Report (DSR) shall form the basis for application for environment clearance, preparation of reports and appraisal of projects. The Report will be updated every five years.

Accordingly, a survey has been carried out by the **District Level Environment Impact Assessment Authority (DEIAA), Malkangiri** with the assistance of Geology and Mining Department and involvement all other related Departments like Revenue Department, Irrigation Department, Forest Department, etc. in the district as per the MoEF, New Delhi, notification S.O. 141(E) dated 15th January 2016 to prepare the District survey Report (DSR) of Malkangiri District (For Sand) in the year 2019. District Survey Report of Sand mining has been prepared in accordance with Clause-II of Appendix X of the said notification.

OBJECTIVES

The main objective of the preparation of District Survey Report is to ensure the following –

- Identification of mineral wealth in the district.
- Identification of areas of Minor Mineral having the potential mineral where mining can be allowed. And
- Identification of areas of proximity to infrastructural structures and installations where mining should be prohibited.

01. INTRUCTION.

Malkangiri is the southernmost district of Orissa. The district is bordered in the North and West by Bastar district of Chhattisgarh and in the south by Bhadradi kothagudam district of Telegana , in the east by Koraput district, Orissa. The district lies between 17 degree 45'N to 18 degree 40'N latitudes and 81 degree 10' E to 82 degree E longitude falling in Survey of India Degree sheet Nos. 65 F,G,J.

The district has geographical area of 5791 sq km accounting for 3.72% of the state's territory. The district consists of only one sub-division namely Malkangiri, seven numbers of Tahasils namely, Malkangiri, Chitrakonda, Motu, Mathili, Khairput, Kudumulugumma and Kalimela and seven Development Blocks for administrative and development point of view. There are 111 Gram Panchayats and 1055 villages in the district having total population of 6.13 lakhs as per census 2011.

Malkangiri District is connected to major parts of Odisha and other Districts by National Highway- 326. The Malkangiri town, the district headquarter is approachable from adjacent districts through State Highways. SH-25 & SH-4 crosses within the district. The important towns of the district are well connected by road. Malkangiri is not connected with rail network. Nearest major railway stations are Koraput, Jeypore, and Jagdalpur.

It is one of the most economically backward tribal district of Orissa.

The General drainage pattern in the district is dendritic to sub-parallel. The Kolab river along with its tributaries, the Potteru and Sileru Rivers are the most prominent rivers of the region. The Kolab River issues from the Sinkaram hills and follows a south westerly course after passing over Malkangiri district. The river joins the Godavari river in Khammam district of Andhra Pradesh.

The South Eastern Ghat occupies almost the entire Malkangiri district. It is characterized by warm climate with maximum temperature of 47°C and minimum temperature of 13°C.

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02. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT.

Other than ordinary stone & Sand a great variety of major mineral potential like Bauxite, Tin, Asbestos, Limestone and Specified Minor Minerals like Quartz, Talc/Soap Stone & Decorative Stone (Granite) are available in the district.

MAJOR MINERALS

SI No	MINERAL	LOCATION	RESERVE IN MT	REMARKS
1	Bauxite	Korukonda	0.018	
2	Limestone	Kottameta-Nandiveda-Uksalvagu	240	
3	Tin	Salimi and Mundaguda	0.000347	
4	Asbestos	Bejingwada	-	Not estimated

Minor Mineral:-

Specified Minor Mineral:-

SI NO	MINERAL	LOCATION	RESERVE IN MT	REMARKS
1	Quartz	Gorespalli, saradaput, Ramvaram, Kotapalli, MV-79, MV-127, MV-96	-	Not estimated
2	Talc/Soap stone	Saradaput, pandripani	-	Not estimated

Dimension Stone:-

Details of decorative/dimension stone in the district are given in the following table

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DISTRICT- MALKANGIRI

Sl. No	Name of Concession	Type of Concession	Status (Running/ Temp- closed)	Name of the concession Holder	Village	Tahasil	Co-ordinate all boundary points		Area in Ha	Validity of concession	
							Latitude	Longitude		From	To
1	Peta	ML	Working	Ch. Venugopal, HIG-I Pahse-I BD colony, Pokhariputi, Bhubaneswar-751020	Peta	Motu	17° 55' 00" to 17° 52' 30"	81° 25' 00" to 81° 30' 00"	19.425	07.06.2018	20.06.2048
2	Peta	ML	Working	K. Srinivasa Rao, Plot No-13, Nutan colony New Bowenpally, Secunderabad	Peta	Motu	18° 54' 48" to 18° 54' 54"	81° 27' 28" to 81° 27' 44"	9.981	02.04.2019	02.04.2049
3	Peta	ML	Non-working	P. Vengal Rao 16-2-836/3 Madhavnagar, Saidabad, Hyderabad	Peta	Motu	17° 55' 27" to 17° 55' 51"	81° 27' 36" to 81° 27' 46"	4.917	01.01.2004	31.12.2034
4	Ponarguda	ML	Non-working	M/S Karunei granites, No-8, 2nd block, Koramangala, Madivala Post, Bangalore-560068	Ponarguda	Malkangiri	18° 20' 00" to 18° 15' 00"	81° 45' 00" to 81° 50' 00"	9.134	27.07.2004	26.07.2034
5	Jagannathpali	ML	Non-working	M/S Karunei granites, No-8, 2nd block, Koramangala, Madivala Post, Bangalore-560069	Jagannathpali	Malkangiri	18° 20' 00" to 18° 15' 00"	81° 45' 00" to 81° 50' 00"	8	27.07.2004	26.07.2034

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6	Potteru	PL	applied for mining leases	M/S Aakash Stone industries Ltd. Santacruz Airport side, Marble Market, W.E. Highway Vile Parle (East) Mumbai-400099	Potteru	Kalimela	17° 56' 56" to 17° 57' 02"	81° 01' 20" to 81° 01' 27"	2,958	20.12.2006	19.12.2008
7	Potteru	PL	applied for mining leases	M/S Oriental Timex Ltd . 26/25 Bazar Marg Old Rajendra Nagar New Delhi-110060	Potteru	Kalimela	17° 56' 52" to 17° 57' 08"	81° 40' 13" to 81° 40' 32"	10,279	07.05.2007	06.05.2009
8	Majhiguda	PL	applied for mining leases	M/S KPK Granites, H. No.-39-47/D Old Bypass Road Nandigama Dikrishna (AP)	Majhiguda	Khairput	18° 28' 18.7" to 18° 28' 28.5"	81° 15' 00.6" to 81° 15' 22.7"	19,29	23.08.2016	22.08.2018
9	Majhiguda	PL	applied for mining leases	M/S Sri Bhubaneswari Granites, Flat No. 528 C-Block, Rajendra Vihar Forest Park, Bhubaneswar	Majhiguda	Khairput	18° 28' 28.5" to 18° 28' 36.5"	82° 15' 00.9" to 81° 15' 22.8"	10,522	23.08.2016	22.08.2018

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MINERAL RESOURCES

The total good quality Limestone reserves near Kotameta, Nandiveda and Uskalgugu estimated around 240 million ton and Bauxite deposits are recoded near Korkunda estimated 0.018 Million Ton and Tin is occurred near village Salimi and Mundaguda around 0.000347 MT.

In the Minor mineral categories the specified minor minerals like quartz occurred in the viallges of Gorespalli, Saradaput, Ramavaram, Kotapalli and MV-79,127,96 and Talc/soap stone are the resources of these minerals are not estimated by DG(O), BBSR.

The Dimension stone are located around the village Sargiguda, Goliaguda, Padmagiri, but the reserves are not estimated by DG (O), BBSR.

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03. GENERAL PROFILE OF THE DISTRICT.

Malkangiri District is named after its headquarters town, Malkangiri. During formation of Odisha Province in 1936, Malkangiri was a 'Taluk' of Nabrangpur sub-division of Koraput District of Odisha. In 1962 it was upgraded to a subdivision of Koraput District. The present Malkangiri got its identity as an independent district due to reorganization of districts of Odisha as per a notification on 1st October, 1992 and with effect from 2nd October 1992. Covering an area of 5,791 sq. kms, it lays between 17 degree 45'N to 18 degree 40'N latitudes and 81 degree 10' E to 82 degree E longitude.

Demography of Malkangiri District:-

This District is sparsely populated with not much of a difference between the numbers of males and females. As per Census 2011, Malkangiri has population of 6,13,192 of which male and female were 3,03,624 and 3,09,568 respectively. In 2001 census, Malkangiri had a population of 5,04,198 of which males were 2,52,507 and remaining 2,52,691 were females. Malkangiri District accounts for 3.72 % of state's territory and shares 1.46 percent of the state's population. The density of population is 106 per sq.KM as against the 270 for Odisha. The Schedule caste population is 22.6 % (138295) and scheduled tribe population is 57.24 % (354614)

This District is sparsely populated with not much of a difference between the numbers of males and females. Almost the whole of the district is a vast dense jungle, with a very small percentage of the population residing in the urban areas. The district is divided into two distinct physical divisions. The eastern part is covered with steep ghats, plateaus and valleys, sparsely inhabited by primitive tribes, notable among who are Bondas, Koyas, Porajas and Didayis. The District is moderately literate, with the number of literate males far out numbering the number of literate females. The climate in the district is generally cold during winter

and hot in summer with temperature ranging from 13 degree C to 47 degree C. The average annual rainfall is about 1700 mm. Relative humidity is generally high, especially in the monsoon and post-monsoon months. During the rainy season, most areas of the District become impassably swampy and heavy floods isolate it from the outer world. This district lies within the malaria prone belt.

The district Malkangiri is situated at the south western part of Odisha constituting part of Western Ghat Mobile Belt normally a rugged hilly terrain. The district covers a number of new series Topo Sheets i.e. E44P5, E44P9, E44P13, E44J8, E44J11, E44J12, E44J14, E44J15, E44J16, E44K2, E44K3, E44K4, E44K6, E44K7, E44K8 etc.

Malkangiri district is physiologically a complex terrain having numerous numbers of hills, moulds, plane lands, river beds, agricultural lands, forest growth areas etc. In the eastern part of the district there is Machhkund Reservoir catchment area. Adjacent to reservoir catchment area hilly terrain present which have an elevation range from mean sea level about 400m to 900m. Hills and mounts are more common in the east to Malkangiri district headquarter where as in the north-west part there is less hills compered to east part. As the district is a part of Eastern Ghat Mobile Belt so the rock types are mostly homogeneous in nature, so the drainage pattern developed in the region is dendritic pattern. The main drainage trend flows from the south-west to north-east direction within the district. There are several seasonal nala / dry nala & a few perineal natural drainage exists within the district. Main river that touches the district is Sileru River & Kolab River, in addition to that a few other small rivers present within the distict namely *Potteru River, Gorla Ghar, Satigura Nala, River etc.*

The main township that is developed in the district is Malkangiri also is the district head quarter, which is present in the central part of the district

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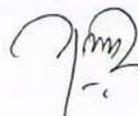
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and connect to all parts of the district through road ways. SH-25 & SH-47 crosses within the district.

Based on the physical and chemical characteristics, mode of origin and occurrence, soils of the district may be classified into two groups namely Alfisols (Red Soil) and Ultisols (Lateritic soil). Soil texture is sandy loam.

The agricultural activity is by and large confined to the traditional Kharif cultivation due to lack of adequate irrigation system. The principal crops of the district are Paddy, Gnut and Sesamum. Besides crops like Maize, Ragi, Jowar, Bajara, Arhar, Moong, Biri, other pulses, sweet potato and other vegetables are also grown in the district.

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04. GEOLOGY OF THE DISTRICT.

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

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

The Eastern Ghats on the east coast of India is a largely granulite terrain but also exposes granites, migmatites, anorthosites and alkaline rocks. This granulite belt has had a prolonged history of mountain building from late Archaean to late Proterozoic. During this long period the Eastern Ghats mobile belt witnessed repeated folding and possibly polycyclic metamorphism. Some recent findings suggest breaks between orogenic cycles and a proterozoic reworking of Archaean granulites. Extreme-temperature crustal metamorphism under fluid-absent conditions and crustal anataxis in huge thickness of pelitic to psammitic protoliths producing leptynites are some of the important results of recent investigations of the Eastern Ghats mobile belt. Different generation of charnockites are present in the Eastern Ghats belt, but charnockitisation of granitic gneisses is yet to be documented. Some apparently nascent growths, the patchy charnockites in the Chilka area are shown to be

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relict of older charnockitic rocks that suffered granulite-facies metamorphism and attendant migmatisation.

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

Age(Ma)	Event		
550-650	Exhumation & Stabilisation(Pan-African)		
800-850	Emplacement of Anorthosite Massifs, Some Alkaline Rocks(?) Younger Granitoids are charnokites		
950-1100	Main Eastern Ghat Orogeny(=Grenville)		
	<table border="1"> <tr> <td>Khondalite Group</td> <td> Garnet-Sillimanite- Graphite Gneiss(Khondalite) with minor cordierite-Saphrine-Spinel Gneiss(Mg-Al) Calc- Silicate rocks & rare Marbles Quartzite (Garnet ± Sillimanite) </td> </tr> </table>	Khondalite Group	Garnet-Sillimanite- Graphite Gneiss(Khondalite) with minor cordierite-Saphrine-Spinel Gneiss(Mg-Al) Calc- Silicate rocks & rare Marbles Quartzite (Garnet ± Sillimanite)
Khondalite Group	Garnet-Sillimanite- Graphite Gneiss(Khondalite) with minor cordierite-Saphrine-Spinel Gneiss(Mg-Al) Calc- Silicate rocks & rare Marbles Quartzite (Garnet ± Sillimanite)		
~1500	Emplacement of Alkaline rocks along with the rift Margin		
	<table border="1"> <tr> <td>1800-1600</td> <td> Evolution of platform(Purana) basins like Cuddahpah, Chhatishgarh, Indravati etc. Evolution of Nellore-Khemmam schist belt in Dharwar Craton </td> </tr> </table>	1800-1600	Evolution of platform(Purana) basins like Cuddahpah, Chhatishgarh, Indravati etc. Evolution of Nellore-Khemmam schist belt in Dharwar Craton
1800-1600	Evolution of platform(Purana) basins like Cuddahpah, Chhatishgarh, Indravati etc. Evolution of Nellore-Khemmam schist belt in Dharwar Craton		
2600-2800	Charnokite & Gneisses of the basement(WCZ).		

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05. DRAINAGE AND IRRIGATION PATTERN.

Malkangiri district is a physically hilly terrain having majorly dendritic drainage pattern to sub-parallel, there is only one main river named Sileru, Kolab River along with its tributaries, the Potteru and Saptadhara Rivers are the most prominent rivers of the region. The Kolab River originates from the Sinkaram hills and follows a south westerly course after passing over Malkangiri district. The river joins the Godavari river in Khammam district of Andhra Pradesh. The distance of the sources from the river origin is geologically very short, hence this can be concluded that the rate of deposition of sand in Sileru & Kolab River is moderate, while in rest rivers within the district the rate of deposit is slow. Additional river source details are given in the following table

Sl no.	Name of river	Area (sq. km drained)	% area drained in the District
01	Saberi / Kolab	20427.00	28.34
02	Sileru / Machhkund	6477	75.80
03	Potteru	2188	100

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06. LAND UTILISATION PATTERN IN THE DISTRICT: FOREST, AGRICULTURAL, HORTICULTURAL, MINING ETC.

Forest:

Forest land use as per the concern authority is as follows;

Malkangiri division covers a geographical area of 5791.00 sq km which has 40.79% Forest cover area (2017). This Division lies between 17°-50' to 18°-45' North latitudes and 81° -23' to 82°-25' East longitudes. This Division has six ranges, 23 sections and 116 beats. In terms to Forest Canopy Density classes, the division has 159.93sq km under very dense forest, 765.502sq km under moderately dense forest, 1496.66 sq km under open forest and 44.16 sq km under scrub. In this Division, forest types are Moist Deciduous Forest, Southern Tropical Moist Deciduous Forests, Southern Moist Mixed Deciduous Forests, Orissa Tropical Semi Evergreen Forests, Dry Deciduous Scrub Forests and Central India South Tropical Hill Forests. There are 71 Reserve Forests Blocks (RFs) in this Division with a total area of 35256.24 ha, 105 Proposed Reserved Forests (PRFs) of area 72561.60ha, Six Protected Forests of area 22615.7ha, 51 Village Forests of area 268.2 ha, 75 Demarcated Protected Forests of area 18865.1 ha and Un-demarcated Protected Forests of area 63663.8 ha.

Type of Forest Cover	FC Date -2015 Date Area in ha	FC Date -2017 Data Area in ha	Forest Cover change between 2015 and 2017.
Very Dense Forest(VDF)	15952.10	15993.67	41.58
Moderately Dense Forest(MDF)	76660.03	76550.17	-109.86
Open Forest(OF)	147617.44	149666.25	2048.81
Total	240229.57	242210.09	1980.52
% of G.A	40.46	40.79	0.33
Scrub	4020.31	4416.83	396.52
Non-Forest	325895.37	327644.94	1749.57

Agriculture:

Land utilization pattern in the district as per the department of agriculture Malkangiri is as follows;

LAND UTILIZATION PATTERN OF MALKANGIRI DISTRICT (Area in Ha.)														
Sl. No.	Name of the Block	Geographical area	Forest Area	Cultivated Area	Land under Non-Agril. use	Barren & Non-Cultivable land	Permanent Pastures & other Grazing land	Land under Misc. tree, crop & groves not included in net area sown	Cultivable waste	Old Fallows	Current Fallows	Net sown area	Gross cropped area	Cropping intensity %
1	Malkangiri	77054	14490	16227	3091	1849	2564	166	325	973	599	16219	20140	124
2	Korukonda	87441	27437	35188	5736	4562	4464	103	521	3140	3244	35196	44455	126
3	Mathili	89276	20119	21884	5145	2888	3552	285	1601	816	3626	21874	24059	110
4	Kalimela	81982	27292	26859	4913	12074	3361	37	822	6982	4244	26279	48331	184
5	Podia	80688	21720	21905	3827	2475	3647	15	345	1836	8460	21747	26253	121
6	Khairput	63900	19762	10162	687	14204	2924	16	518	201	1369	10162	11045	109
7	K. Gumma	98759	24705	10515	1472	13131	2218	17	1025	1356	1517	10515	11260	107
TOTAL		579100	155525	142740	24871	51183	22730	639	5157	15304	23059	141992	185543	131

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The agricultural activity is by and large confined to the traditional Kharif cultivation due to lack of adequate irrigation system. The principal crops of the district are Paddy, pulses and oilseeds.

Horticulture:

In Malkangiri District, Mathili, Khairput, Malkangiri parts of Chittrakonda blocks are suitable for fruit orchards as most part of the land are upland. Plantations of cashew, mangos have been taken up in these areas. Other vegetables are also grown throughout the district as well. The crop coverage in the District both for kharif and rabi for the last four years as received from Dy Director Horticulture, Makangiri is given in the following tables.

Season: Kharif

*(in ha)

Crop	Year			
	2015	2016	2017	2018
Vegetables	8665	9355	9350	10219
Others	2683	2445	2450	2404
Total	11348	11800	11800	12623

Season: Rabi

(in ha)

Crop	Year			
	2015	2016	2017	2018
Vegetables	8984	5133	10336	12952
Others	1108	981	934	1220
Total	10092	6114	11270	14172

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Mining:

Incidence of major mineral resources is not quite encouraging in the district. Leaving aside the above major minerals, some Specified Minor Minerals like Quartz, Talc/ soap stone, Decorative stones are also available in certain areas of the District. Besides, the district is rich in minor minerals like river sand, road metals, morrum, laterite stone etc.

The total area considered for mining activity for all minerals shall be the mining area within the district.

As per the provided data presently 858.910Ha area is considered for Major mineral leases,

For specified minor mineral 94.506 Ha area is given for decorative stone Mining purpose.

Total Area for considered for Sand mining shall be 120.589 Ha.

Total Area for considered for Stone mining shall be 80.214 Ha.

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07. SURFACE WATER AND GROUND WATER SCENARIO OF THE DISTRICT.

(Source CGWB, Also refer Plate-III).

The general drainage pattern in the district is dendritic to sub-parallel. The Kolab river along with its tributaries, the Potteru and Sileru rivers is the most prominent river of the region. The Kolab river issues from the Sinkaram hills and follows a south westerly course after passing over Malkangiri district. The river joins the Godavari river in Khammam district of Andhra Pradesh.

The major surface water bodies are reservoirs, rivers, streams and ponds etc. The river Potteru which is a tributary of Kolab is generally perennial in nature with a sufficient flow during summer months. The Balimela reservoir is the major irrigation project and its canal command is around 61034-Ha There are substantial numbers of tanks, ponds and water harvesting structures exist in the district, which hold considerable quantity of surface water as storage which serve the purpose for irrigation, bathing, drinking and industrial purposes. •

The hydrogeology of the district varies widely depending upon the geological and geomorphic set up and soil characteristics. The major hydrogeological units may be categorized as – Consolidated formations and Unconsolidated to Semi-consolidated formations

Consolidated formations - Almost the entire district is underlain by the consolidated formations, comprising granites, granite gneiss and its variants, charnockites, Khondalites, Schists, Quartzites, Limestones etc. These formations lack primary porosity and are rendered porous and permeable only

when weathered and fractured. The weathered residuum forms the main repositories of groundwater, which occurs under water table conditions and circulates through deeper fractures and fissures.

Unconsolidated Formations- Alluvium –Alluvium is not well developed in the area. Small and local patches occur along the Sabari river. It is generally 2-5 m in depth. Its width varies from Zero to less than a Km. Most part of the banks of Sabari, Sileru and Potteru rivers are rocky with no tendency to deposit alluvium on either side. As such these are not useful for groundwater development because of its limited areal extent and thickness.

Ground Water Occurrence: The nature of occurrence and movement of ground water were studied through periodical monitoring of ground

water and well inventory conducted during the systematic and reappraisal hydrogeological surveys in the district. The phreatic zone constitute the most potential groundwater storage in the district. The depth to water table values depend upon several factors including rainfall, topography, drainage characteristics, lithology, depth and nature of weathering, water bearing and water yielding properties of the rocks as also surface irrigation.

The aquifer parameters of various hydrogeological units were evaluated through pumping tests of representative dug wells and slug tests/compressor tests of borewells. The aquifer parameters include Transmissivity and specific capacity Index. Transmissivity indicates aquifers property to transmit water and specific capacity Index ($K=C/A$) of the formations is expressed in terms of flow of groundwater per meter depression of head over unit cross sectional area of inflow offered by the aquifer. Transmissivity has been calculated for borewells and specific capacity Index for open wells.

Deeper Aquifers- CGWB carried out Ground Water Exploration in the district by deploying one Down The Hole Hammer (DTH) Rig. The study was aimed at identification of deeper potential fracture zones and for assessing yield potentials. In total 8 exploratory wells and 2 observation wells have been drilled in Malkangiri District. The sites for exploration were selected taking into account the hydrogeological characteristics of formations, favourable topography and tectonic features.

All the wells were drilled in Granite Gneisses except one borewell in Kalimela. The depth of drilling ranged from 38 m to 200 m below ground level. The top 8 to 20 m of the bore wells are cased with 178 mm diameter M.S pipe to prevent collapse of the loose overburden. Rest of the borewell is left uncased to tap the water bearing fractured. The discharge of the wells as tested by compressor varied widely from negligible to 10.6 lps.

Transmissivity values ranged from 2.6 m²/day to 27.5 m²/day. Exploratory drilling has been carried out in all the blocks of the district. At Mathili in the North East Corner of the district fracture zones were encountered in the Hornblende Mica Schist and Granite Gneiss at depths of 100 m and 13.7 m below ground level with a cumulative discharge of 2 LPS. However towards south at Khairpur, a number of fracture zones were encountered in depth range of 24 m to 107 m below ground level. The cumulative yield of the well was 2.8 LPS. The formation continues to be Granite Gneisses, at Kudumulgumma south of Khairput.

High yielding fracture zones, eleven in number were encountered within a depth of 130 m below ground level. The aquifer is Granite Gneiss with maximum discharge recorded at 10.6 lps. The high yielding fractured granite gneisses extend southwards and at Balimela the discharge of the exploratory

well was 5.16 lps. In this well also a number of fracture zones have been encountered at various depths. However the formations are compact towards west and yield of the exploratory well at Korukunda has been negligible down to 200 m depth. Similar formations continue in the adjacent block and at Malkangiri the exploratory well yielded hardly 0.88 lps, though a number of fracture zones were encountered within a depth of 144 m. In the south western part of the district at Kalimela six fracture zones were encountered in the exploratory well down to a depth of 195.3 meter below ground level during which the yield of the well was 2.54 lps. In this well charnockite was encountered in the deeper zones. At Podia in the western most corner of the district a number of fractures were encountered within a depth of 159 meter below ground level with a cumulative discharge of 3.59 lps.

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08. RAINFALL OF THE DISTRICT AND CLIMATIC CONDITION.

The climate in the district is generally cold during winter and hot in summer with temperature ranging from 13 degree C to 47 degree C. The average annual rainfall is about 1700 mm. Relative humidity is generally high, especially in the monsoon and post-monsoon months. During the rainy season, most areas of the District become impassably swampy and heavy floods isolate it from the outer world.

MONTH WISE RAINFALL DATA OF MALKANGIRI DISTRICT FOR 2018 Fig. in MM

Month	Total	Average	Normal
Jan .2018	0.00	0.00	2.70
Feb .2018	0.00	0.00	4.10
March .2018	0.00	0.00	8.90
April.2018	445.00	63.57	34.80
May. 2018	329.96	47.14	49.10
June .2018	1336.27	190.90	212.20
July .2018	5331.10	761.59	465.70
Aug. 2018	5212.17	744.60	472.80
Sept. 2018	2639.60	377.09	281.20
Oct. 2018	409.40	58.49	109.50
Nov. 2018	0.00	0.00	23.60
Dec. 2018	116.30	16.61	3.00
TOTAL	15819.80	2259.97	1667.60
BLOCK WISE RAINFALL DATA OF MALKANGIRI DISTRICT FOR 2019			
Jan .2019	8.00	1.14	2.70
Feb .2019	0.00	0.00	4.10
March.2019	13.00	1.86	8.90
April. 2019	38.00	5.43	34.80
May.2019	236.00	33.71	49.10
June .2019	1060.40	151.49	212.20
July .2019	4436.90	633.84	465.70
Aug.2019	5343.40	763.34	472.80
Sept,2019	2379.20	339.89	281.20
Oct,2019	1194.30	170.61	109.05
TOTAL	14709.2	2101.31	1640.55

09. DETAILS OF THE MINING LEASES IN THE DISTRICT AS PER THE FOLLOWING FORMAT. (Please Refer Table In Annexure-I.)

10. DETAILS OF ROYALTY OR REVENUE RECEIVED IN LAST THREE YEARS

Revenue collected for *Stone/Road metal*.

Sl. No.	Name of the Tahasil	Name of Source	Revenue Collected for last three years		
			2016-17	2017-18	2018-19
1	Malkangiri	Dhariguda	0	0	112800
2	Malkangiri	Dhariguda	296168	422813	347948
3	Malkangiri	kichivelly	220792	255801	261807
4	Malkangiri	Korukonda	118943	206661	249522
5	Malkangiri	Koilipari	237120	319410	327600
6	Malkangiri	Mariwada	270000	127764	128856
7	Malkangiri	Dhariguda	320120	320724	321328
8	Malkangiri	Malkangiri	539000	709800	737100
9	Malkangiri	Malkangiri	120750	174720	170625
10	Malkangiri	Gandhipalli	266868	429702	458504
11	Malkangiri	Rangabandha	0	0	112800
12	Malkangiri	Pedawada	0		113600
13	Malkangiri	Gandhipalli	0	0	409500
14	Mathili	Pangam	93991	73446	80164
15	Mathili	Kadamguda	198022	216476	0
16	Mathili	Saradhaput	139300	70000	0
17	Mathili	Challanguda	-	-	-
18	Mathili	Gadiali	-	-	-
19	Mathili	Udaygiri	-	-	-
20	Chittrakonda	Kamwada	94237	380429	145133
21	Chittrakonda	Nilakumberu	31675	20863	579086
22	Chittrakonda	Maliguda	-	-	272088
23	Chittrakonda	Chitapari-I	178550	200766	134112
24	Kalimela	Nalaguthi	0	110723	196080
25	Kalimela	Kuasiguda	0	376183	424807
26	Kalimela	Kuasiguda	0	49219	44244
27	Kalimela	Tendrajipali	0	0	306091
28	K.Guma	-	0	0	0
29	Motu	-	0	0	0
30	Khairput	-	0	0	0
	TOTAL		3125536	4465500	5933795

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11. DETAILS OF PRODUCTION OF MINOR MINERAL IN LAST THREE YEARS.

Production of **Stone/Road metal**.

Sl. No.	Name of the Tahasil	Name of source	Production of stone in previous years (in m ³)				
			2015-16	2016-17	2017-18	2018-19	2019-20 (allowed)
1	Malkangiri	kichivelly	1885	2123	1874	1918	2112
2	Malkangiri	Pedawada	0	700	800	900	900
3	Malkangiri	Malkangiri (A)	3232.51	5000	5200	5400	5100
4	Malkangiri	Malkangiri (B)	960	1150	1280	1250	1280
5	Malkangiri	Dhariguda(C)	0	2120	2124	2128	2146
6	Malkangiri	Dhariguda(B)	0	1980	2120	1880	2140
7	Malkangiri	Dhariguda(A)	0	600	700	800	900
8	Malkangiri	Mariwada	0	928	936	944	958
9	Malkangiri	Rangabandha	0	900	1000	1100	1100
10	Malkangiri	Gandhipalli(A)	0	2532	2680	2800	3000
11	Malkangiri	Gandhipalli (B)	917.10	3294	3148	3359	4723
12	Malkangiri	Korukonda	0	1310	1514	1828	2000
13	Malkangiri	Koilipari	1820	2280	2340	2400	2430
14	Mathili	Pangam	396	414	324	360	342
15	Mathili	Kadamguda	1000	850	950	0	0
16	Mathili	Challanguda	0	0	0	0	0
17	Mathili	Gadiali	0	0	0	0	0
18	Mathili	Saradhapat	0	0	0	0	0
19	Mathili	Udaygiri	0	0	0	0	0
20	Kalimela	Nalaguthi	0	0	923	910	4500
21	Kalimela	Kuasiguda	0	0	574	656	738
22	Kalimela	Kuasiguda	0	0	175	144	162
23	Kalimela	Tendrajpali	0	0	0	0	1900
24	Chittrakonda	Kamwada	0	2200	2800	2400	2200
25	Chittrakonda	Nilakumberu	0	2100	2140	2170	2400
26	Chittrakonda	Maliguda	0	4060	4275	4165	2000
27	Chittrakonda	Chitapari-I	0	279.9	286.65	295.95	0
28	K.Guma	-	-	-	-	-	-
29	Motu	-	-	-	-	-	-
30	Khairput	-	-	-	-	-	-
	TOTAL		10210.61	34820.90	38163.65	37807.95	43031.00

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12. MINERAL MAP OF THE DISTRICT.

Please refer Plate-IV.

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

Please refer Table in Annexure-II

14. TOTAL MINERAL RESERVE AVAILABLE IN THE DISTRICT.

Reserve & Resource potential Evaluation:

As per UNFC (*United Nations Framework Classification*) of potentials of minerals, A '**Mineral Reserve**' is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is justified.

The mineability (Economic Viability) is demonstrated in consecutive Feasibility Assessment stages which may be, in order of increasing detail, Prefeasibility Study and Feasibility Study/Mining Report. A Probable Mineral Reserve may derive from a Prefeasibility study and a Proved Mineral Reserve from a Feasibility Study or mining activity documentation. Hence for the Reserve Potential estimation of the Malkangiri district, the approved Mining Plans of each existing Quarry has been referred as it provides a details of the Mineable & Geological Reserve potentials of the Quarry lease.

As per the approved Mining Plans of the quarry leases till October-2019 in Malkangiri District the Total mineral potential are as follows;

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Potential Reserve as per Approved Mining plan of Existing Sources of Stone

Sl No.	Name of tahasil	Name of Source with Location	Geological reserve as per approved Mining Plan of existing quarries (in m ³)	Mineable reserve as per approved Mining Plan of existing quarries (in m ³)	Total production from 2015-16 to 2019-20 (in m ³)	Balance Mineable reserve (in m ³)
01	Malkangiri	Kichively Stone Quarry 18°16'32.4" N to 18°16'25.0" N 81°57'03.9" E to 81°57'03.5" E	321000	226930	9912	217018
02	Malkangiri	Pedawada Stone Quarry 18°23'55.9" to 18°24'03.8" E 82°05'57.8" E to 82°06'04.8"	418180	347123.2	3300	343823.2
03	Malkangiri	Malkangiri Stone Quarry(A) Khata No-1005 Plot No-5446,5447 18°21'13.508"N to 18°21'23.787" E 81°54'35.259"E to 81°54'49.65"E	116712	83695	23932.5	59762.5
04	Malkangiri	Malkangiri Stone Quarry(B) Khata No-1005 Plot No-5448 18°21'38.4" to 18°21'38.6" E 81°54'30.7" to 81°54'57.6"	155965	86130	5920	80210
05	Malkangiri	Dhariguda Stone Quarry(c) Khata No-199 Plot No-438 18°16'49.1"N to 18°16'49.0" E 81°50'27.7"E to 81°50'27.8"E	214830	207760	8518	199242
06	Malkangiri	Dhariguda Stone Quarry(B) Khata No-199 Plot No-580 18°16'250"N to 18°16'14.8" E 81°50'44.1"E to 81°50'33.8"E	199744	147520	8120	139400
07	Malkangiri	Dhariguda Stone Quarry(A) Khata No-199 Plot No-654 18°18'03.7"N to	64915.2	26136	3000	23136

		18° 18'06.5" 81°49'42.7"E to 81°49'46.1"E				
08	Malkangiri	Mariwada Stone Quarry 18°13'22.1"N to 18° 13'27.4" 81°54'17.3"E to 81°54'23.7"E	124410	90045	3766	86279
09	Malkangiri	Rengabandha Stone Quarry 18°22'35.03"N to 18°22'41.2" 81°47'59.5"E to 81°48'05.3"E	389484	285040	4100	280940
10	Malkangiri	Gandhipalli Stone Quarry Khata No-167, Plot No-141,142 18°22'55.8"N to 18°22'44.7" 81°51'13.8"E to 81°51'06.5"E	482244.7	391571.95	11012	380559.9
11	Malkangiri	Gandhipalli Stone Quarry Khata No-167, Plot No-126,139 18°22'49.7"N to 18°22'41.8" 81°51'00.3"E to 81°51'00.1"E	165490	112420	15441.10	96978.9
12	Malkangiri	Korukonda Stone Quarry 18°15'32.9"N to 18°15'25.5" 81°58'42.9"E to 81°58'36.5"E	199540	101200	6652	94548
13	Malkangiri	Koilapari Stone Quarry 18°19'30.2"N to 18°19'25.1" 82°03'55.5"E to 82°04'00.1"E	102600	11640	11270	370
14		Pangam Stone Quarry 18°30'46.1" to 18°30'51.54" 82°07'39.376" to 82°07'46.200	7020	3187.25	1836	1351.25
	Mathili					
15	Mathili	Kadamguda Stone Quarry	21775	14650	2800	11850
16	Mathili	Challanguda Stone Quarry 18°28'25.87" N 82°6'08.40" E	26074	2647	0	2647
17	Mathili	Gadiali Stone Quarry	14859	6111.4	0	6111.4

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		18°34'29.23" N 82°14'49.02" E				
18	Mathili	Saradhapat Stone Quarry 18°35'35.36" N 82°9'36.20" E	206425	117835	0	117835
19	Mathili	Udayagiri Stone Quarry 18°39'07.4" N 82°07'35.2" E	136458	62419.5	0	62419.5
20	Kalimela	Nalagunthi Stone Quarry 18°41'48.02"E to 18°01'01.43N 81°41'48.02"E to 81°42'00'18"	444690	363528	6333	357195
21	Kalimela	Kuasiguda Stone Quarry-1 0.810 Ha N 18°03'40.2" to 18°03'44.7" 81°43'15.3" to 81°43'32.0"	541380	421200	2449	418751
22	Kalimela	Kuasiguda Stone Quarry-2 3.690 Ha N 18°03'40.2" to 18°03'44.7" 81°43'15.3" to 81°43'32.0"				
23	Kalimela	Tendrajalli Stone Quarry N17°52'39.9" to 17°52'47.2" 81°35'25.5" to 81°35'31.7"E	310029.6	190163.2	1900	188263.2
24	Chittrakonda	Kamwada Stone Quarry 18°14'15.79"N 81°59'02.92" E	165248	112326	8610	103716
25	Chittrakonda	Nilakamberu Stone Quarry 18°13'15.53"N 82°02'22.97" E	20880	10440	9800	640
26	Chittrakonda	Maliguda Stone Quarry 18°28'11.92"N 82°06'29.80" E	22964	20666	14500	6166
27	Chittrakonda	Chitapari Stone Quarry Khata No-134, Plot No-1175/02, 18°14'56.30"N 82°02'12.8"E	1250000	750000	862.50	749137.5
Total			6122917.5	4192384.5	164034.1	4028350.

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Total Mineral Reserve as per the Approved Mining Plan is in the above table, but to get the Mineral Reserve after March, 2020 the production of Stone in the previous financial years including the year 2019-20 need to be deducted from the total reserve, hence the calculation is as follows;

Category	Reserve as per Mining Plan (in m ³)	Production up to 2019-20 (in m ³)	Balance Reserve (in m ³)
Geological Reserve	6122917.50	164034.10	5958883.4
Mineable Reserve	4192384.50	164034.10	4028350.4

Similarly, as per UNFC (*United Nations Framework Classification*) of potentials of minerals A '**Mineral Resource**' is a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such form, quality and quantity that these are reasonable prospects for eventual economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge.

The resource figures are quoted as being of intrinsic economic interest, depending on the results of a Prefeasibility Study and feasibility Study. Generally, only in-situ resource figures are reported at this stage of geological assessment. Mineral Resources are subdivided, in order of increasing geological confidence, into inferred, indicated and measured categories. Portions of a deposit that do not have reasonable prospects for eventual economic extraction must not be included in a Mineral Resource.

For assessment of potential resources of *New sairat sources of Stone*, a joint field survey has been done and sources has been identified. At this stage of survey, a detail study of each source is not feasible, hence the area of proposed quarry lease has been multiplied with the average height of the respective source to obtain the tentative Geological

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resources whereas for Mineable resources has been considered about 60% of geological Resources.

Potential resources of New Sairat Sources for Stone

Sl No.	Name of Tahasil	Name of Proposed source with area & Location.	Proposed source area in Hectare.	Average height of proposed source as per field observation in meter	Tentative geological Resource of Proposed Source in m ³	Tentative Mineable Resource of Proposed Source i.e 60% of geological Resource in m ³
01	Kudumulugumma	Bhutojhola Stone Quarry Khata No-10, Plot No-52 18°12'49.95"N 82°06'95.87"E	1.160	20	232000	139200
02	Malkangiri	Korukunda Stone Quarry Khata No-623, Plot No-1918 18°15'28.00"N 81°58'40.37"E	2.00	20	400000	240000
03	Malkangiri	Dudametta Stone Quarry Khata No-110, Plot No-493, 18°14'34.13"N 81°55'51.41"E	2.880	20	576000	345600
04	Kalimela	Bhejangiwada Stone Quarry-A Khata No-929, plot No-43/1 18°07'44.05"N 81°53'51.60"E	4.50	20	900000	540000
05	Kalimela	Bhejangiwada Stone Quarry-B Khata No-929, plot No-43/2 18°07'39.33"N 81°53'53.58"E	4.50	20	900000	540000
Total					3008000	1804800

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The total Tentative Geological & Mineable sand potential of the district shall be the sum of existing reserve and the proposed resource calculated in the above tables, the potentials are as follows;

Category	Tentative Geological potential in m ³	Tentative Mineable Potential in m ³ (after deduction of production up to 2019-20)
Existing sources	6122917.50	4028350.40
Proposed sources	3008000.00	1804800.00
Total potential	9130917.50	5833150.40

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

We know Malkangiri district is part of Eastern Ghat Province, hence the area is rich in hilly terrains composed of various meta-igneous group of rocks like Granite gneiss, charnokite, Khondalite etc. the colour of the rocks exposures within the district varies from light grey to dark grey, grain size of the rocks varies from medium to coarse. The rocks are normally composed of mainly feldspar, quartz, and mild amphibole, pyroxene, olivine, biotite etc all these physical properties signifies its good cementing property and higher resistance which indicate its suitability for construction stone as the source areas have numerous fractures & joints. A very few areas are there which are devoid of fractures & joints, those can be suggested as decorative stone.

16. USE OF MINERAL.

Stone Aggregates represent about 98% of quarry output, most of which is used in road construction, maintenance and repair. Much of this goes to the production of road metal, to provide a sturdy base for roads. Only the harder more resilient rocks can be employed for most road surfacing requirements. Apart from road usage, substantial amounts are mixed (coarse gravel sized stone with finer stone particles or sand) with cement and water to make concrete. This may be carried out at the quarry or materials supplied to truck-mixers (for mixing en route) or to remote plants. An important local 'downstream' industry is that of concrete product (blocks, pipes, kerbs, pavers, etc). Not only do these produce 'added value' to the raw aggregate, they often make use of 'fines' which are a by-product of general aggregate processing, and without this market would often have to be dumped.

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

As per the data provided by the concerned Tehsils the production or supply of the stone/road metal in the district is as follows,

2016-17	2017-18	2018-19
35512.9	38163.65	37807.95

Out of the total production about 90% of the supply is utilized in government works, while rest is consumed by the private purposes. The certainty of the exact demand in the district depends upon various Govt projects & schemes etc, hence quite not possible to quantify the exact demand. Certainly there is an unavoidable gap between the demand and supply of road metal/stone in the district, hence to balance the demand-supply gap a few number of stone quarries have been proposed in certain areas.

18. MINING LEASES MARKED ON THE MAP OF THE DISTRICT.

Please refer Plate-V

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

Quarries existing within 500m radius are considered as cluster of Mining Leases as per the MoEF guide lines.

SI No.	Details of the area	Number of Mining leases	Location
01	Malkangiri Stone Quarry Khata No-1005 Plot No-5446,5447	02	18°21'13.508"N to 18°21'23.787" 81°54'35.259"E to 81°54'49.65"E
	Malkangiri Stone Quarry Khata No-1005 Plot No-5448		18°21'38.4" to 18°21'38.6" 81°54'30.7" to 81°54'57.6"
02	Gandhipalli Stone Quarry Khata No-167, Plot No-141,142	02	18°22'55.8"N to 18°22'44.7" 81°51'13.8"E to 81°51'06.5"E
	Gandhipalli Stone Quarry Khata No-167, Plot No-126,139		18°22'49.7"N to 18°22'41.8" 81°51'00.3"E to 81°51'00.1"E
03	Kuasiguda Stone Quarry-1 0.810 Ha	02	N 18°03'40.2" to 18°03'44.7" 81°43'15.3" to 81°43'32.0"
	Kuasiguda Stone Quarry-2 3.690 Ha		
04	Korukunda Stone Quarry	02	18°15'32.9"N to 18°15'25.5" 81°58'42.9"E to 81°58'36.5"E
	Korukunda Stone Quarry Khata No-623, Plot No-1918		18°15'28.00"N 81°58'40.37"E
05	Bhejaniwada Stone Quarry-A Khata No-929, plot No-43/1	02	18°07'44.05"N 81°53'51.60"E
	Bhejaniwada Stone Quarry-B Khata No-929, plot No-43/2		18°07'39.33"N 81°53'53.58"E

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

Eco-Sensitive Zones or ecologically fragile areas are notified by the Ministry of Environment, Forest and climate Change, Government of India around protected areas, National Parks and Wildlife sanctuaries. But there are no Eco-sensitive zones exists in Malkangiri District.

21. IMPACT ON THE ENVIRONMENT (AIR, WATER, NOISE, SOIL, FLORA & FAUNA, LAND USE, AGRICULTURE, FOREST ETC.) DUE TO MINING ACTIVITY.

Mining is the extraction of minerals and other geological materials of economic value from deposits on the Earth. Mining adversely affects the environment by inducing loss of biodiversity, soil erosion, and contamination of surface water, groundwater, and soil. Mining can also trigger the formation of sinkholes. The leakage of chemicals from mining sites can also have detrimental effects on the health of the population living at or around the mining site.

As mentioned above, mining activities can harm the environment in several ways.

Mining of major minerals in the Division is not a common feature, though forests areas are rich in Tin ore in Tulsli RL of Mathili Range and Quartzite in Challanguda and Mendikuli area of Mathili. This Division is receiving Prospecting License Application for Granite in Motu Area from Deputy Director, Mines, and Koraput. But till date no mining work has been started. Recently the Mining Department has approached this Division for DGPS Survey of Limestone area for mining purpose at Kotamateru, Uskalbag, Nandiguda and Daranpalli. Other minor mineral like murum and boulders are collected by the contractor and in some case private too on a regular basis, in some area by the local people also to earn their livelihood. This collection is destructive to forests. Mainly stone quarry are going on in the District. Several serious environmental impacts related to quarrying activities on and near the river, such as vibration,

land degradation, land subsidence and landslides, water pollution and air pollution, will lead to health related problems and loss of biodiversity.

Impacts on Air

Air quality is adversely affected by mining operations. Unrefined materials are released when mineral deposits are exposed on the surface through mining. Wind erosion and nearby vehicular traffic cause such materials to become airborne. Lead, arsenic, cadmium, and other toxic elements are often present in such particles. These pollutants can damage the health of people living near the mining site. Diseases of the respiratory system and allergies can be triggered by the inhalation of such airborne particles.

Impacts on Water

Mining also causes water pollution which includes metal contamination, increased sediment levels in streams, and acid mine drainage. Pollutants released from processing plants, tailing ponds, underground mines, waste-disposal areas, active or abandoned surface or haulage roads, etc., act as the top sources of water pollution. Sediments released through soil erosion cause siltation or the smothering of stream beds. It adversely impacts irrigation, swimming, fishing, domestic water supply, and other activities dependent on such water bodies.

High concentrations of toxic chemicals in water bodies pose a survival threat to aquatic flora and fauna and terrestrial species dependent on them for food. The acidic water released from metal mines or coal mines also drains into surface water or seeps below ground to acidify groundwater. The loss of normal pH of water can have disastrous effects on life sustained by such water.

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Noise impacts

Noise pollution mainly due to operation of machineries , occasional plying of machineries and drilling & blasting. These actives will create noise pollution in the surrounding area that affects the life of the near by habitats.

Impact on Soil

Soil disruptions can contribute to the deterioration of the area's flora and fauna. There is also a huge possibility that many of the surface features that were present before mining activities cannot be replaced after the process has ended. The removal of soil layers and deep underground digging can destabilize the ground which threatens the future of roads and buildings in the area.

Impacts on Flora & Fauna

Often, the worst effects of mining activities are observed after the mining process has ceased. The destruction or drastic modification of the pre-mined landscape can have a catastrophic impact on the biodiversity of that area. Mining leads to a massive habitat loss for a diversity of flora and fauna ranging from soil microorganisms to large mammals. Endemic species are most severely affected since even the slightest disruptions in their habitat can result in extinction or put them at high risk of being wiped out. Toxins released through mining can wipe out entire populations of sensitive species.

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

The major potential environmental impacts associated with mining and associated mineral processing operations are related to erosion-prone landscapes, soil and water quality, and air quality. These potential impacts are recognized and addressed in current mining operations as well as in some former mining operations by reclaiming areas of physical disturbance to prevent erosion, stabilizing soils containing metals or chemicals to prevent unwanted metal releases into the environment, preventing and/or treating water contamination, and controlling air emissions.

Mine closure and a number of activities to mitigate the impacts of mining are an integral part of all mine planning and mineral development from the discovery phase through to closure:

Reclamation

Soil treatment

Water treatment

Preventing acid rock drainage

Controlling gas emissions

Air

Mitigation measures suggested for air pollution controls are to be based on the baseline ambient air quality of the project/cluster area and would include measures such as:

- Dust generation shall be reduced by using sharp teeth of shovels.
- Wet drilling shall be carried out to contain the dust particles.
- Controlled blasting techniques shall be adopted.
- Water sprinkling on haul roads, service roads and overburden dumps will help in reducing considerable dust pollution.
- Proper and regular maintenance of mining equipment's have to be undertaken.
- Transport of materials in trucks are to be covered with tarpaulin.

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- The mine pit water can be utilized for dust suppression in and around mine area.
- Information on wind direction and meteorology are to be considered during planning, so that pollutants, which cannot be fully suppressed by engineering techniques, will be prevented from reaching the nearby agricultural land, if any.
- Comprehensive greenbelt around overburden dumps and periphery of the mining projects/clusters has to be carried out to reduce to fugitive dust transmission from the project area in order to create clean & healthy environment.

Water

- Construction of garland drains and settling tanks to divert surface run-off of the mining area to the natural drainage.
- Construction of checks dams/ gully plugs at strategic places to arrest silt wash off from broken up area.
- Retaining walls with weep hole are to be constructed around the mine boundaries to arrest silt wash off.
- The mined out pits shall be converted in to the water reservoir at the end of mine life. This will help in recharging ground water table by acting as a water harvesting structure.
- Periodic analysis of mine pit water and ground water quality in nearby villages are to be undertaken.
- Domestic sewage from site office & urinals/latrines provided within ML/QL areas is to be discharged in septic tank followed by soak pits.

Noise

- Periodic maintenance of machineries, equipments shall be ensured to keep the noise generated within acceptable limit.

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- Development of thick green belt around mining/cluster area, haul roads to reduce the noise.
- Provision of earplugs to workers exposed to high noise generating activities like blasting, excavation site etc. Worker and operators at work sites will be provided with earmuffs.
- Conducting periodical medical checkup of all workers for any noise related health problems.
- Proper training to personnel to create awareness about adverse noise related effects.
- Periodic noise monitoring at locations within the mining area and nearby habitations to assess efficacy of adopted control measures.
- During blasting optimum spacing, burden and charging of holes will be made under the supervision of competent qualified mines foreman, mate etc.

Biological Environment

- Development of green belt/gap filling saplings in the safety barrier left around the quarry area/ cluster area.
- Carrying out thick greenbelt with local flora species predominantly with long canopy laves on the inactive mined out upper benches.
- Development of dense poly culture plantation using local floral species in the mining areas at conceptual stage if the mine is not continued much below the general ground level.
- Adoption of suitable air pollution control measures as suggested above.
- Transport of materials in trucks covered with tarpaulin.

Smoking

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23. RECLAMATION OF MINED OUT AREA (BEST PRACTICE ALREADY IMPLEMENTED IN THE DISTRICT, REQUIREMENT AS PER RULES AND REGULATION, PROPOSED RECLAMATION PLAN).

Mine reclamation is the process of restoring land that has been mined to a natural or economically usable state. Although the process of mine reclamation occurs once mining is completed, the planning of mine reclamation activities occurs prior to a mine being permitted or started. Mine reclamation creates useful landscapes that meet a variety of goals ranging from the restoration of productive ecosystems to the creation of industrial and municipal resources. Modern mine reclamation minimizes and mitigates the environmental effects of mining.

In Malkangiri district no stone Quarry has been reported as exhausted of mineral, hence no reclamation approach has been implemented in present date. Mainly two types of reclamation proposal are normally proposed i.e. Firstly Back filling of the exhausted mine by mine generated waste and capping of top soil for forest plantation and growth. Secondly proper fencing of quarried area and can be developed as water reservoir, fishery development or tourist attraction points after the life of the mine.

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24. RISK ASSESSMENT & DISASTER MANAGEMENT PLAN.

Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat. Activities requiring assessment of risk due to occurrence of most probable instances of hazard and accident are both onsite and off-site.

It must be realized that any incident may develop into a major emergency even with the best safety measures and programmes in any industry. Hence, an Emergency procedure will be planned properly and documented to help in reducing time loss, chaos and confusion at the hour of need by assigning person who will engage in meeting emergency smoothly and effectively. Any accident which has potential to develop into a major emergency can threaten large number of person or large area of the industries on the site may affect safety of the public, property and environment. Hence, it is absolutely essential that emergency procedures will be properly planned and documented.

Stone quarry mining is an opencast practice in the district, hardly cause disastrous situation except bench failure if the slope of the benches are not well maintained and height of the benches are exceptionally high not executed as per the approved Plan. Any disastrous situation raised in the mining area must be reported to the concern authorities as soon as possible.

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25. DETAILS OF THE OCCUPATIONAL HEALTH ISSUES IN THE DISTRICT. (LAST FIVE-YEAR DATA OF NUMBER OF PATIENTS OF SILICOSIS & TUBERCULOSIS IS ALSO NEEDS TO BE SUBMITTED).

As per the data provided by CDMO, Malkangiri Tuberculosis patients cases of last 5 years is as follows;

Sl No	Year	TB Cases
01	2015	1058
02	2016	1104
03	2017	1288
04	2018	1041
05	2019	965(up to Aug-2019)

No case of Silicosis recorded in the district.

26. PLANTATION AND GREEN BELT DEVELOPMENT IN RESPECT OF LEASES ALREADY GRANTED IN THE DISTRICT.

As the stone quarry lease within the district are non-forest lands rather revenue lands. As per the guidelines prescribed by OMMCR-2016 a safety zone of 7.5m has been considered for all quarry leases all along the inside of boundary line. Plantation proposal has been usually stated in the approved Mining Plans for all quarry leases. Saplings of local plants has been proposed to be planted in the safety zone area of quarries.

Forest Division could not take up the Plantation works in mining areas due to non-receipt of any fund for the same. But large numbers of plantations have been raised under different schemes in and outside the Reserved Forest and Proposed Reserved Forest. Year wise area planted w.e.f 2007-8 to 2018-19 produced below for reference.

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AR (BLOCK PLANTATION)

Year	Area Planted (in Ha)	Component	Remarks
2007-08	115	AR Block Plantation	Under State Plan & CAMPA
2008-09	239	AR Block Plantation	
2009-10	280	AR Block Plantation	
2010-11	285	AR Block Plantation	
2011-12	50	AR Block Plantation	
2012-13	65	AR Block Plantation	
2013-14	300	AR Block Plantation	
2014-15	270	AR Block Plantation	
2015-16	270	AR Block Plantation	
2016-17	200	AR Block Plantation	
2017-18	275	AR Block Plantation	
2018-19	-0.00	No Block Plantation	
	2349 Ha		

ANR (GAP PLANTATION)

Year	Achievement (in Ha)	Component	Remarks
2007-08	155	ANR work	Under State Plan & CAMPA
2008-09	1190	ANR work	
2009-10	520	ANR work	
2010-11	1556.76	ANR work	
2011-12	50	ANR work	
2012-13	265	ANR work	
2013-14	1130	ANR work	
2014-15	555	ANR work	
2015-16	1570	ANR work	

2016-17	1000	ANR work	
2017-18	60	ANR work	
2018-19	500	ANR work	
	8551.76		

27. ANY OTHER INFORMATION.

Malkangiri district has a glorious rich cultural past, rich in agriculture. It is at the northern marginal area of Eastern Ghat Province having potential of several valuable minerals like Tin, Quartzite, Limestone, gem stones, dimension stones, ordinary stones, sand etc. Systematic & scientific application of technologies in all fields will definitely enhance the livelihood of the common man of the area and the district can contribute a major part in thriving of the state as well as the nation.

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ANNEXURE-I

As per Point-09 of notification the details of the leases in the district as per the following format are:

In this case only Stone/Road metal has been considered.

Sl.No.	Name of the Mineral	Name of the Lease	Address & Contact No. of lessee	Mining lease Grant Order No. & date	Area of Mining lease (in Hc)	Period of Mining lease (Initial)		Date of commencement of mining operation	Status (Working Non Working/Temp p. working for despatch etc.)	Captive/N on captive	Obtained Environmental clearance (Y/N) if Y letter No. with date of grant of E.C	Location of the mining lease (Latitude & Longitude)
						From	To					
1	Name of the Tahasil:- Chitrakonda											
1	Kamwada Stone Quarry	Loknath Sabat	At:- Korukonda Dist:- Malkangiri Mob No. 9437094578	558/ 04.07.2016	5.000	2016-17	2019-20	2016-17	Working	Captive	558/04.07.2016	18°14'15.79" N 81°09'02.92" E
2	Nilakamberu Stone Quarry	A.Surya Prakash	At:- M.Y-51 Dist:- Malkangiri Mob No. 9502587983	248/06.05.2017	2.000	2016-17	2019-20	2016-17	Working	Captive	248/06.05.2017	18°13'15.53" N 82°02'22.97" E
3	Maliguda Stone Quarry	Y.Sravan Kumar	At:- Chitrakonda Dist:- Malkangiri Mob No. 7655948990	1002/22.12.2016	0.810	2016-17	2019-20	2016-17	Working	Captive	1002/22.12.2016	18°28'11.92" N 82°06'29.80" E

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Name of the Tahasil: - Malkangiri

4	Kichivelly Stone Quarry	Sri. G. Balaraju	At:- Malkangiri	04.07.2015	3.100	2015 -16	2019 -20	01.05.2015	Working	Non-Captive	4428/17.8.2015	18°16'32.4" N to 18°16'25.0" N 81°57'03.9" E to 81°57'03.5" E 18°23'55.9" to 18°24'03.8" E E82°05'57.8" E to 82°06'04.8" E 18°21'38.4" to 18°21'38.6" E E81°54'30.7" to 81°54'57.6" E 18°16'250"N to 18°16'14.8" E 81°50'44.1"E to 81°50'33.8"E
5	Pedawada Stone Quarry	Sri. Rama Rao	At:- Malkangiri	14.07.2015	4.300	2016 -17	2020 -21	01.04.2016	Working	Non-Captive	234/10.04.2018	18°18'03.7"N to 18°18'06.5" E 81°49'42.7"E to 81°49'46.1"E
6	Malkangiri Stone Quarry	Sri. Chidananda Sahu	At:- Malkangiri	04.07.2015	2.000	2015 -16	2019 -20	01.04.2015	Working	Non-Captive	268/14.01.2016	
7	Dhariguda Stone Quarry	Sri. Pravakar Pradhan	At:- Malkangiri	04.07.2015	5.160	2015 -16	2019 -20	01.04.2015	Working	Non-Captive	4506/17.8.2015	
8	Dhariguda Stone Quarry	Sri. Sunil Kumar Samani	At:- Malkangiri	25.10.2016	0.510	2015 -16	2019 -20	01.04.2015	Working	Non-Captive	239/10.04.2018	

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9	Dhariguda Stone Quarry	Sri. D. Nilakantha Rao	AI:- Malkangiri	14.07.2015	4.358	2015 -16	2019 -20	01.04.2015	Working	Non-Captive	533/04.07.2016	18°16'49.1"N to 18°16'49.0" N to 81°50'27.7"E to 81°50'27.8"E
10	Mariwada Stone Quarry	Sri Sunil Kumar Somani	AI:- Malkangiri	22.09.2015	2.000	2015 -16	2019 -20	01.04.2015	Working	Non-Captive	538/04.07.2016	18°13'22.1"N to 18°13'27.4" N to 81°54'17.3"E to 81°54'23.7"E
11	Rengabandha Stone Quarry	Sri. Bijaya Ku. Sahu	AI:- Challanguda Malkangiri	25.06.2016	2.563	2016 -17	2020 -21	01.04.2016	Working	Non-Captive	224/10.04.2018	18°22'35.03" N to 18°22'41.2" N to 81°47'59.5"E to 81°48'05.3"E
12	Gandhipalli Stone Quarry	Sri. R.V.N. Pattnaik	AI:- Malkangiri	04.07.2015	3.983	2015 -16	2019 -20	01.04.2015	Working	Non-Captive	543/04.07.2016	18°22'49.7"N to 18°22'41.8" N to 81°51'00.3"E to 81°51'00.1"E
13	Malkangiri Stone Quarry	Sri. J. Srinivas	AI:- Malkangiri	08.06.2015	3.000	2015 -16	2019 -20	01.04.2015	Working	Non-Captive	4170/17.08.2015	18°21'13.508" N to 18°21'23.787" N to 81°54'35.259" E to 81°54'49.65" E

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14	Korukonda Stone Quarry	Sri. Simanchala Sabat	At:- Korukonda Malkangiri	04.07.2015	1.927	2015-16	2019-20	01.04.2015	Working	Non-Captive	548/04.07.2016	18°15'32.9"N to 18°15'25.5" 81°58'42.9"E to 81°58'36.5"E
15	Koilapari Stone Quarry	Sri. G. Nilkantha RAO	At:- Malkangiri	04.07.2015	4.547	2015-16	2019-20	01.04.2015	Working	Non-Captive	4630/17.08.2015	18°19'30.2"N to 18°19'25.1" 82°03'55.5"E to 82°04'00.1"E
16	Gandhipalli Stone Quarry	Sri. G. Babu Rao	At:- Malkangiri	14.07.2015	5.080	2016-17	2020-21	01.04.2016	Working	Non-Captive	2261/30.11.2016	18°22'55.8"N to 18°22'44.7" 81°51'13.8"E to 81°51'06.5"E
Name of the Tahasil:- Mathili												
17	Pangam Stone Quarry	Sri. Damburudh ar Swain	At:- Pangam	331/06.04.2015	1.201	2015-16	2019-20	2015-16	Working	Non-Captive		18°30'46.1" to 18°30'51.54" 82°07'39.376 to 82°07'46.200
Name of the Tahasil:- Kalimela												
18	Nalagunthi Stone Quarry	Sri. Surendranath Bisoi	At:- Kalimela Malkangiri Mob No. 9437820186	428/03.06.2015	2.005	2015-16	2016-17	03.04.2017	Working	Captive	553/4.7.2016	18°41'48.02" E to 18°01'01.43 N 81°41'48.02" E to 81°42'00.18"

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19	Kuasiguda Stone Quarry-I	Smt. Rajeswari Pradhan	AI:- Kalimela Malkangiri Mob No. 9437784320	369/24.04.2017	3.690	2016	2017	2017	23.05.2017	Working	Captive	144/06.04.2017	N 18°03'40.2" to 18°03'44.7" 81°43'15.3" to 81°43'32.0"
20	Kuasiguda Stone Quarry-II	Lalit Somani	AI:- Malkangiri Mob No. 9437094409	1022/24.10.2017	0.810	2017	2018	2018	01.04.2018	Working	Captive	144/06.04.2017	N 18°03'40.2" to 18°03'44.7" 81°43'15.3" to 81°43'32.0"
21	Tendrapalli Stone Quarry	Sri. D. Biswanath Reddy	AI:- Kalkonda Malkangiri Mob. No. 9438619223	354/24.04.2017	2.130	2017	2018	2018		Working	Captive	259/10.04.2018	N 17°52'39.9" to 17°52'47.2" 81°35'25.5" to 81°35'31.7"E

NB: in the above table omitted Columns are,
 Column 10 & 11 Period of Mining lease (1st/2nd....renewal) -NA
 Column 16 Method of Mining (Opencast/Underground) - All Open cast

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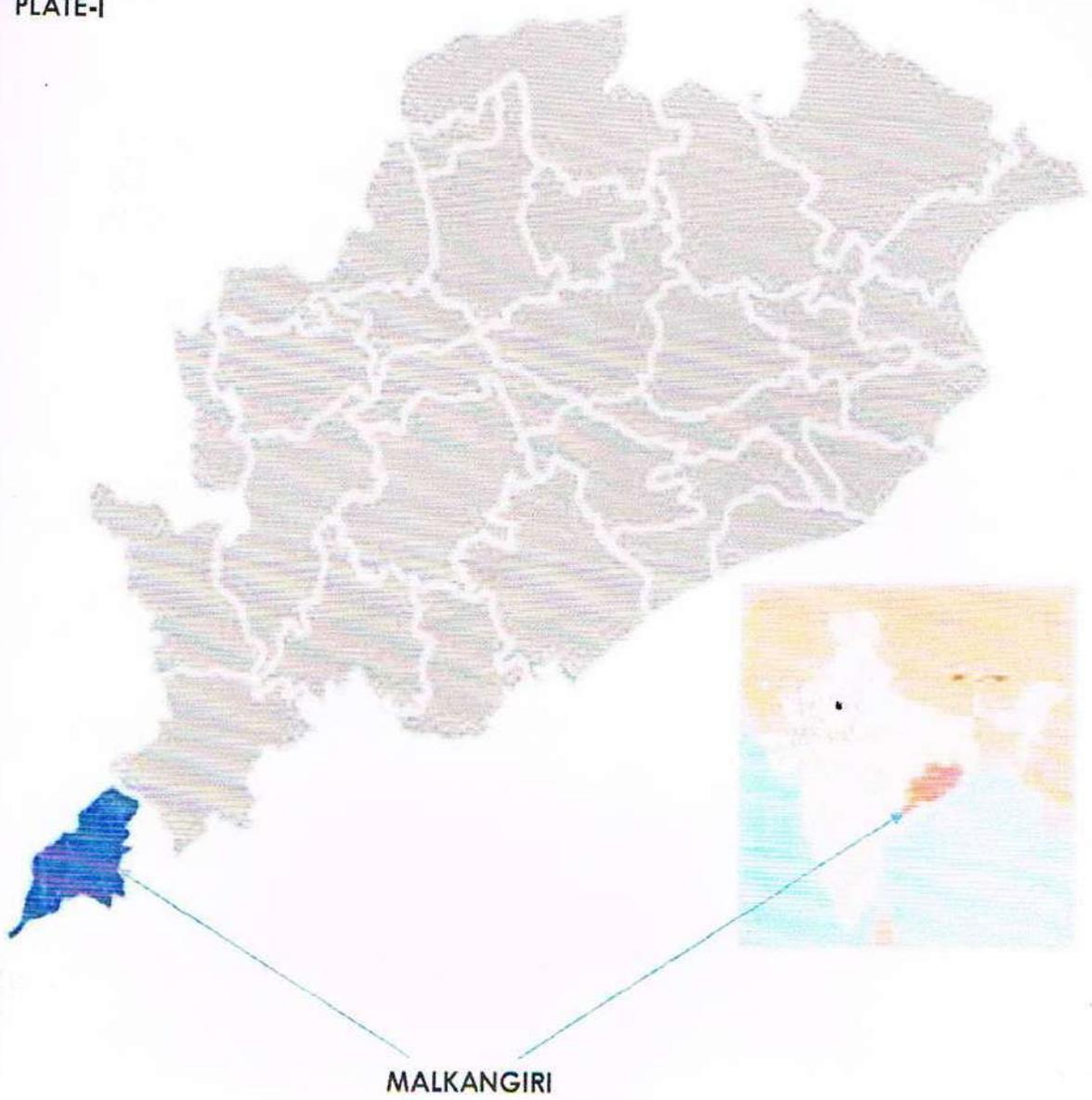
As per the point-13 of notification list of LOI holders in the district along with validity as per the following format are: ANNEXURE-II

In this case only Stone/Road metal has been considered.

Sl. No	Name of the Tahasil	Name of the Mineral	Name of the Lessee	Address & Contact No. of Letter of Intent Holder	Letter of Intent Grant Order No. & date	Area of Mining lease to be allotted (ha.)	Validity of LOI	Location of the Mining lease (Latitude & Longitude)
1	Mathili	Challanguda Stone Quarry	Sri Pratyuptanna Chhatoi	At-Udulibeda, Malkangiri	322/ 06.04.2015	0.188	2 years	18°28'25.87" N 82°6'08.40" E
2	Mathili	Sardhaput Stone Quarry	Sri Sadhucharan Barik	M/s IVRCL Ltd, Hyderabad	280/ 27.02.2018	2.292	2 years	18°35'35.36" N 82°9'36.20" E
3	Mathili	Kadamguda Stone Quarry	Sri Bikram Kesari patra	At-Nayakguda Malkangiri	06.04.2015	1.292	2 years	
4	Mathili	Gadiali Stone Quarry	Sri J. Srinibas	Malkangiri	320/ 06.04.2015	17.750	2 years	18°34'29.23" N 82°14'49.02" E
5	Mathili	Udaygiri Stone quarry	Tahasildar Mathili on behalf of Successful bidder	Mathili	932/ 12.07.2016	0.810	2 years	18°39'07.4" N 82°07'35.2" E

NB: in the above table omitted Column is, **Column-9 Use (Captive/ Non Captive) - All Non Captive**

PLATE-I



Dr. M. K. Ghosh

Dr. K. K. Ghosh

Dr. C. H. Ghosh



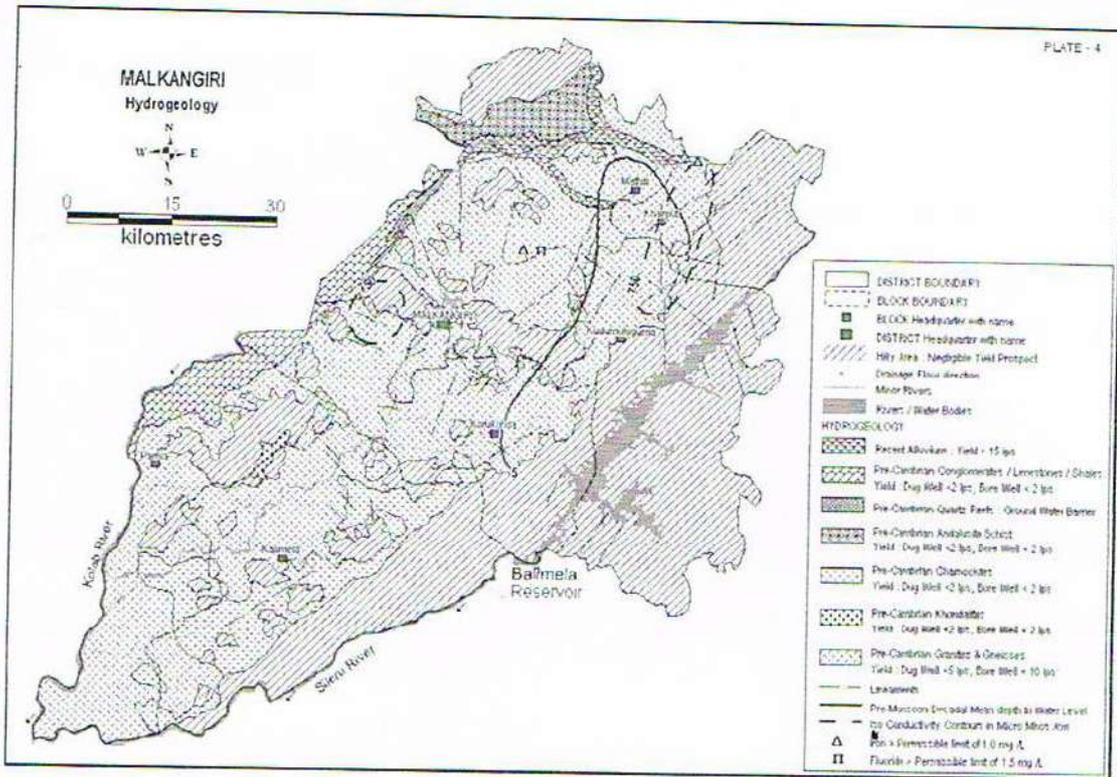
Tehsil Map of Malkangiri
MALKANGIRI
TEHSIL MAP

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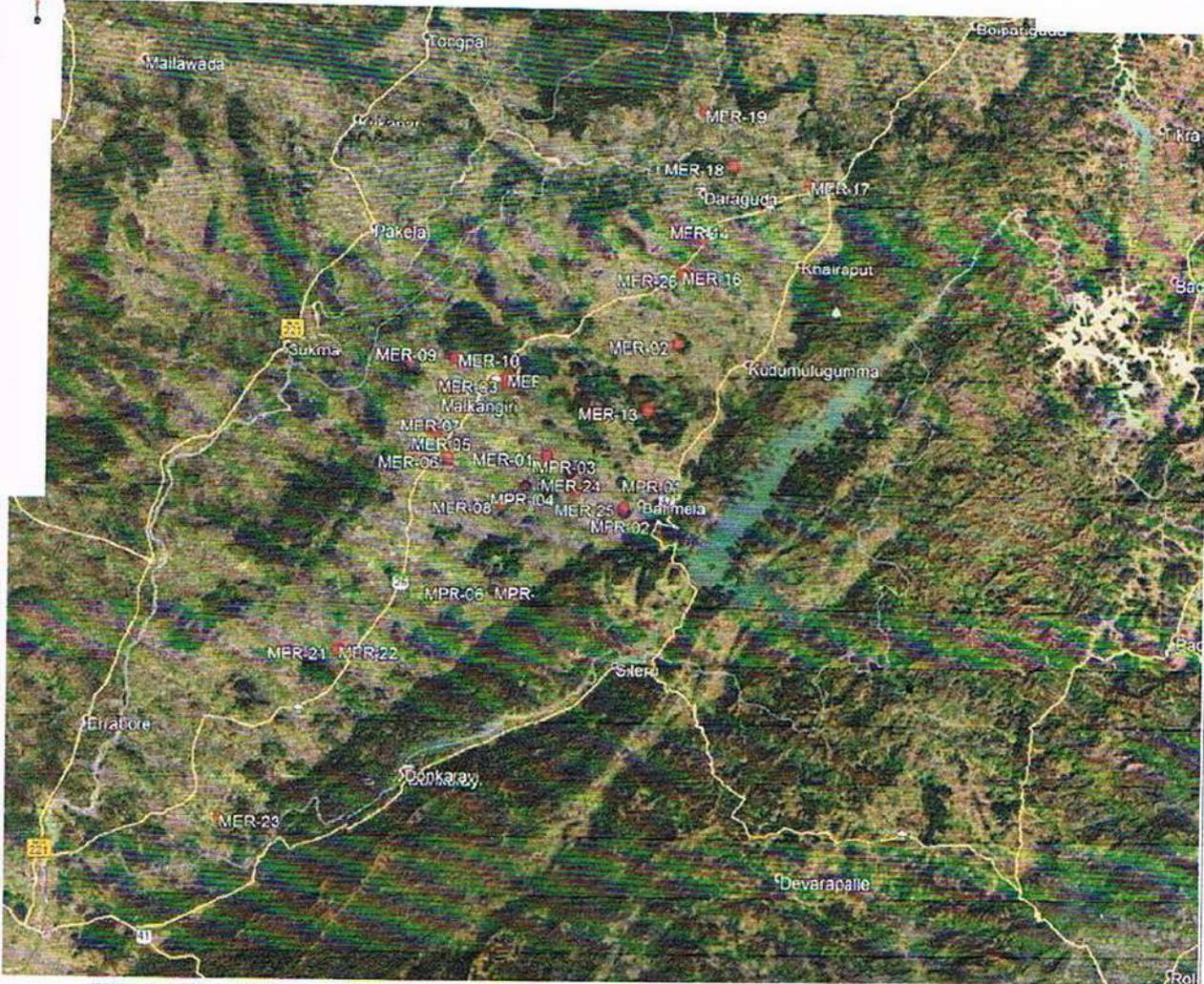
CHP



SCALE
30Km

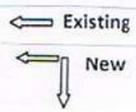
MAP SHOWING LOCATION OF THE STONE SOURCES, ROADS, RIVERS ETC

PLATE-V



SI Index No.	Name of Existing Stone Quarry	SI Index No.	Name of Existing Stone Quarry
MER-01	Kichivelly Stone Quarry	MER-14	Challanguda Stone Quarry
MER-02	Pedawada Stone Quarry	MER-17	Gorilal Stone Quarry
MER-03	Malkangiri Stone Quarry Khata No-1005 Plot No-5441, 5447	MER-18	Saradhapat Stone Quarry
MER-04	Malkangiri Stone Quarry Khata No-1005 Plot No-5445	MER-19	Udayagiri Stone Quarry
MER-05	Dhariguda Stone Quarry Khata No-1177 Plot No-420	MER-20	Nalagunthi Stone Quarry
MER-06	Dhariguda Stone Quarry Khata No-1199 Plot No-580	MER-21	Kusaliguda Stone Quarry-1 0.810 Ha
MER-07	Dhariguda Stone Quarry Khata No-1199 Plot No-454	MER-22	Kusaliguda Stone Quarry-2 3.670 Ha
MER-08	Mailawada Stone Quarry	MER-23	Tendrapalli Stone Quarry
MER-09	Bengabandha Stone Quarry	MER-24	Kamwada Stone Quarry
MER-10	Gandhipalli Stone Quarry Khata No-147, Plot No-141, 142	MER-25	Nisakamburu Stone Quarry
MER-11	Gandhipalli Stone Quarry Khata No-147, Plot No-126, 131	MER-24	Malliguda Stone Quarry
MER-12	Karikonda Stone Quarry		
MER-13	Kokapali Stone Quarry		
MER-14	Fangam Stone Quarry		
MER-15	Kodanguda Stone Quarry		

SI Index No.	Name of Proposed Stone Quarry
MPR-01	Chalapat Stone Quarry Khata No-124, Plot No-1175/01
MPR-02	Shajankonda Stone Quarry Khata No-10, Plot No-02
MPR-03	Karukunda Stone Quarry Khata No-023, Plot No-1018
MPR-04	Dudamanna Stone Quarry Khata No-110, Plot No-493
MPR-05	Shajankonda Stone Quarry - A Khata No-929, plot No-491
MPR-06	Shajankonda Stone Quarry - B Khata No-929, plot No-492



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GEOMORPHOLOGY

I. UNITS OF DENUDATIONAL ORIGIN DENUDATION STRONGLY CONTROLLED BY STRUCTURE

DA6 Ridges / Hills with or without valleys

DENUDATION WITH MINIMAL CONTROL OF STRUCTURE

DB9a Undissected Plateaus

DB9b Dissected Plateaus

DB15 Planation surface (Pediments / Pediplains and Peneplains)

II. UNITS OF FLUVIAL ORIGIN

F21 Colluvial Footslopes

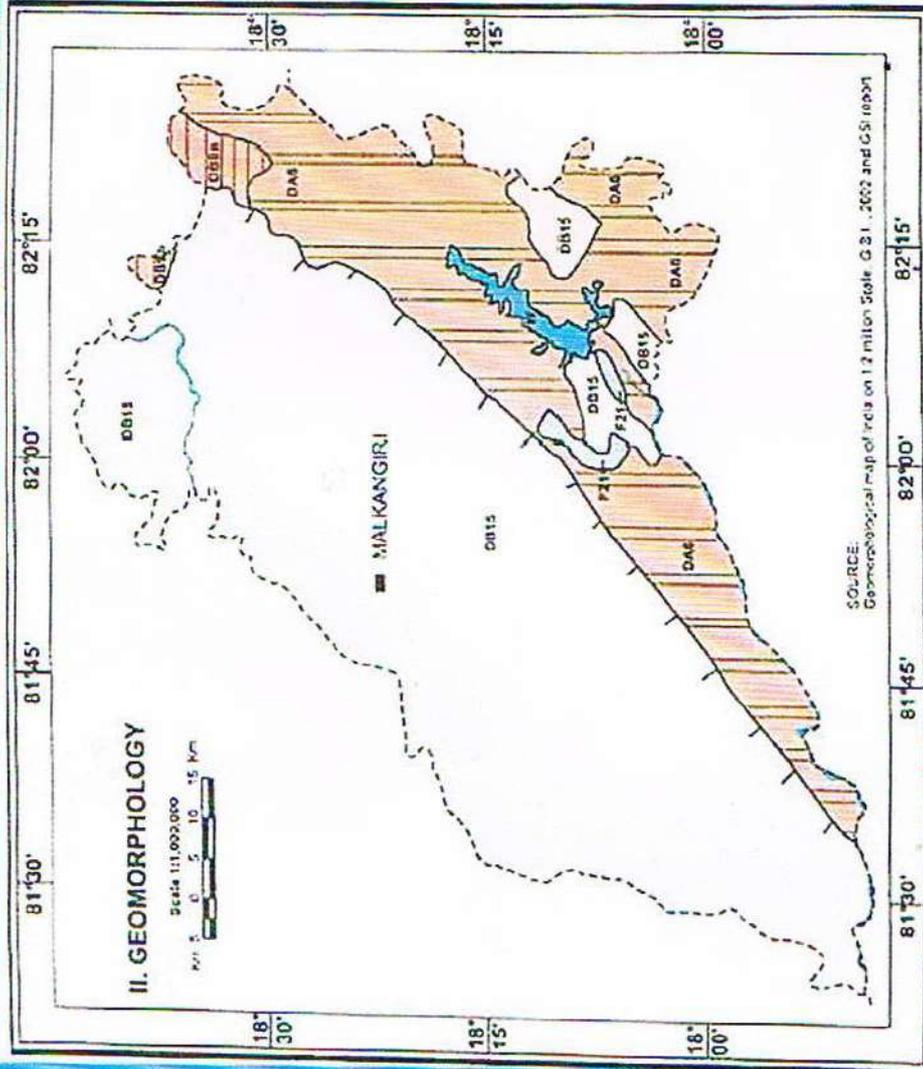
GEOMORPHIC FORMS FORMS OF DENUDATIONAL ORIGIN

Escarpment

FORMS OF FLUVIAL AND LACUSTRINE ORIGIN

W Waterbody

River



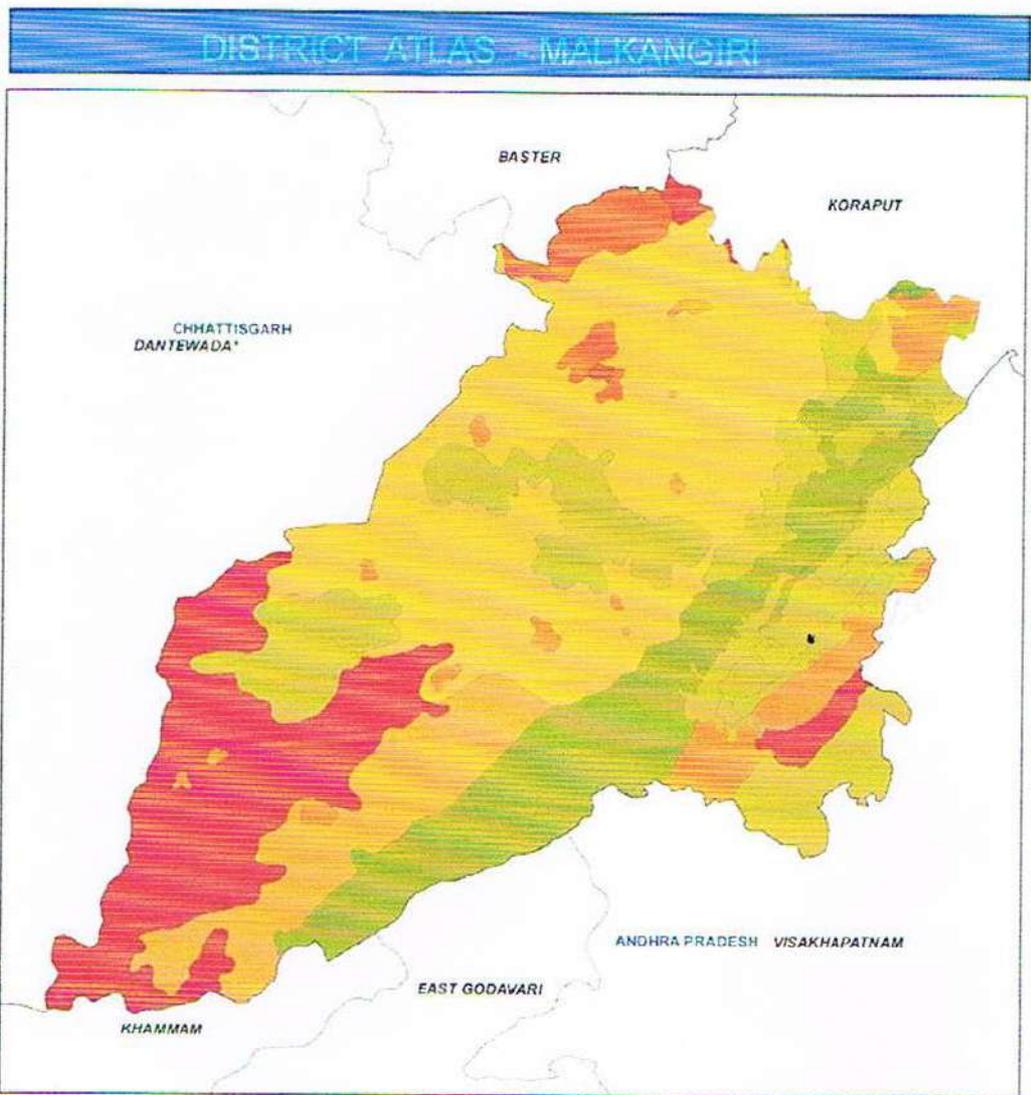
SOURCE: Geomorphological map of India on 1:2 million Scale, G.S.I., 2002 and G.S.I. report

Dr. Mohanty

Dr. Mohanty

Dr. Mohanty

Dr. Mohanty



Legend

- State Boundary
- District Boundary



SOIL MAP

2

0 3.5 7 14 21 28 35 km

Source : SOI

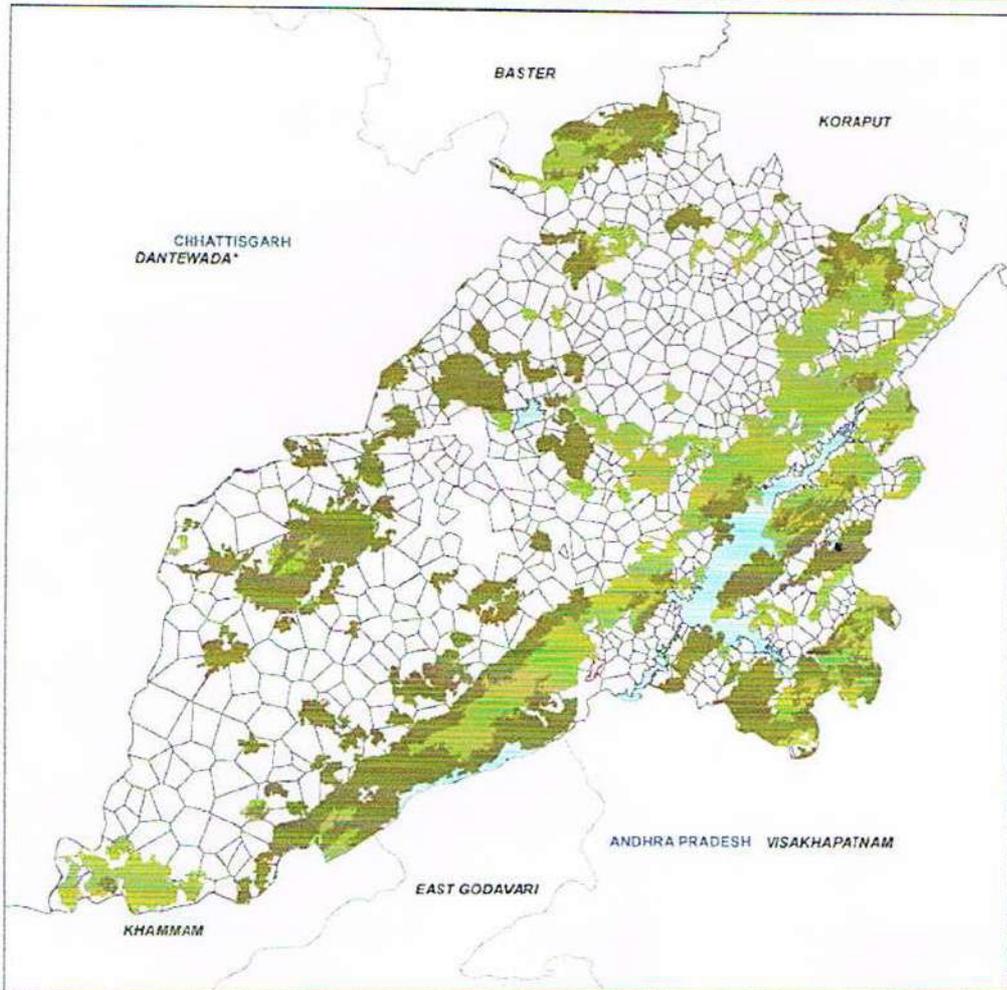
Maps Composed by NIC

Debadutta Mohanty

Signature

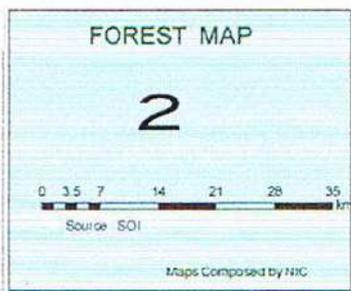
C-172

DISTRICT ATLAS - MALKANGIRI



Legend

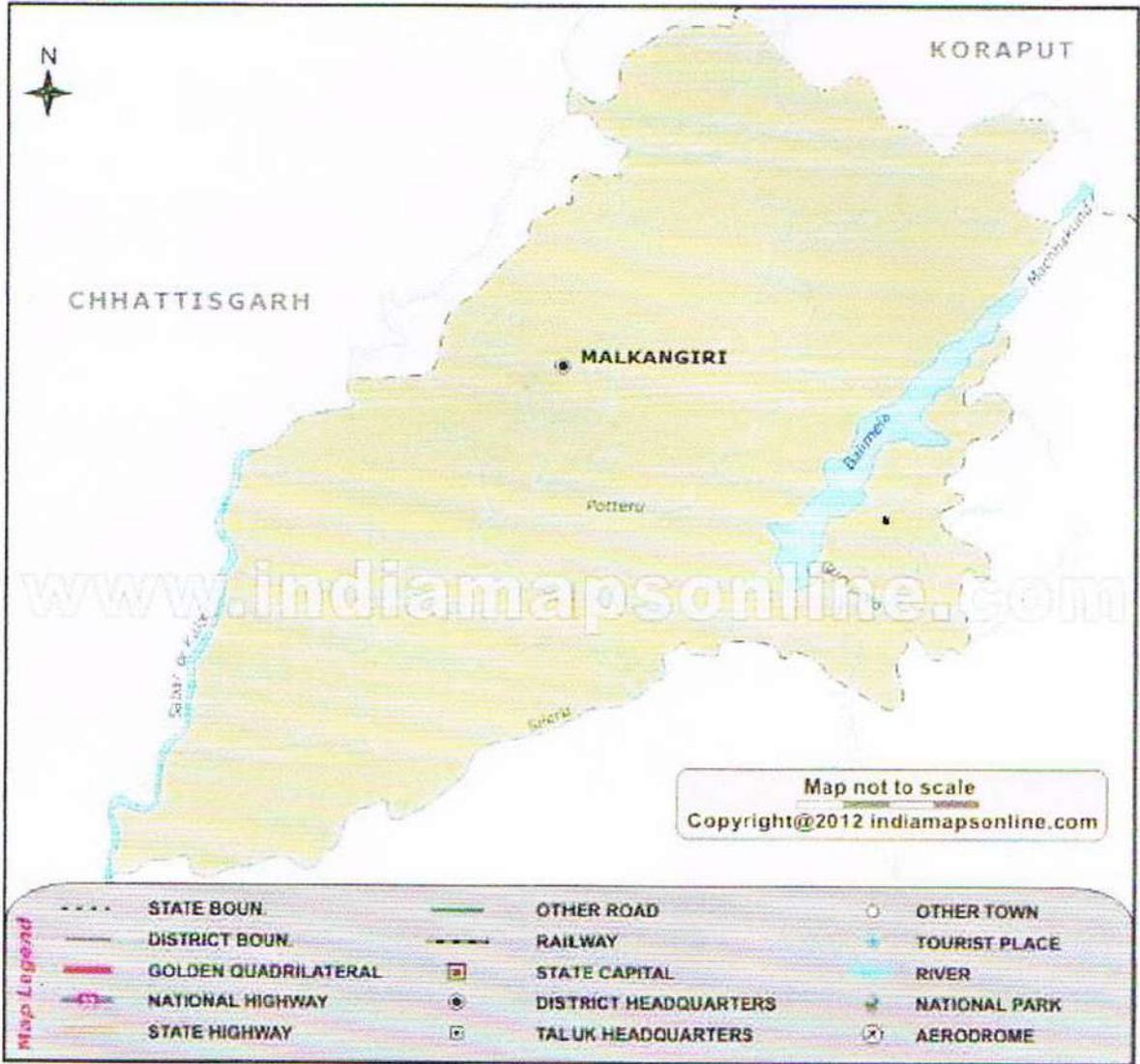
	Dense Forest
	Non Forest
	Open Forest
	Scrubland
	Waterbody
	State Boundary
	District Boundary
	VILLAGE BOUNDARY



Signature

Signature

Signature CPH



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