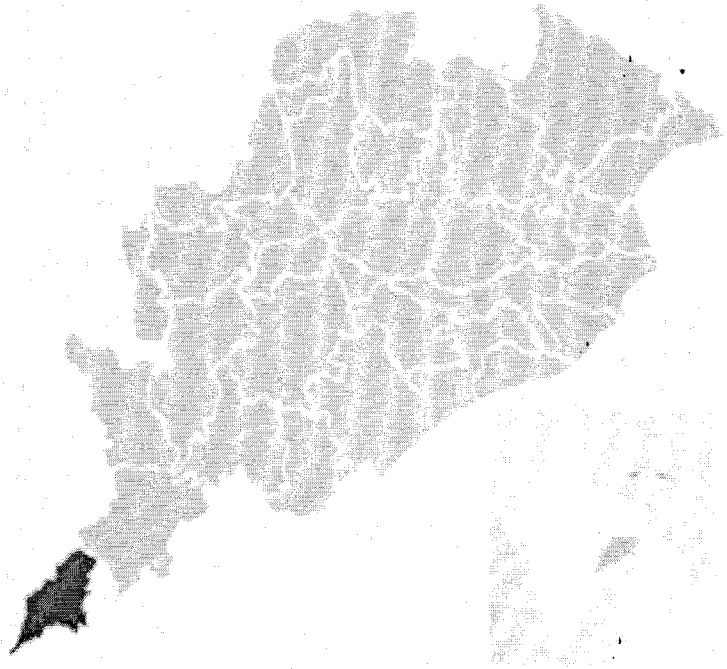
DRAFT COPY

DISTRICT SURVEY REPORT (DSR) OF MALKANGIRI DISTRICT, ODISHA ON SAND MINING / RIVER BED 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-2020

CONTENTS

In addition to the above points, the report contains the following:

(a) District wise details of river or stream and other sand source; ***Annexure-I***

(b) District wise availability of sand or gravel or aggregate resources; ***Annexure-II***

(c) District wise details of existing mining leases of sand and aggregates,***Annexure-III***

LIST OF PLATES

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 25thJuly,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-I 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. INTRUDUCTION.

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 Bhadradri kothagudam district of Telegana , in the east by Koraput district, Orissa. The district lies between north latitudes 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 Pradedsh

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.

02. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT.

Other than ordinary stone 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

Sl No	MINERAL	LOCATION	RESEREVE 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:-

Sl No	MINERAL	LOCATION	RESEREVE 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

DISTRICT- MALKANGIRI

NAME OF MINERAL- DECORATIVE STONE

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			From	To
1	Peta	ML	Working	Ch. Venugopal. HIG-I Pahse-I BD colony, Pokhariput, 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, Secuderabad	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 Rao16-2-836/3 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 granaites . 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 granaites . 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

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	17⁰ 56' 56" to 17⁰ 57' 02"	81⁰ 01' 20" to 81⁰ 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 MargOld Rajendra Nagar New Delhi-110060	Potteru	Kalimela	17⁰ 56' 52" to 17⁰ 57' 08"	81⁰ 40' 13" to 81⁰ 40' 32"	10.279	07.05.2007	06.05.2009
8	Majhiguda	PL	applied for mining leases	M/S KPKGranaites . H. No-39-47/D Old Byepass RoadNandigama Dit-Krishna (AP)	Majhiguda	Khairput	18⁰ 28' 18.7" to 18⁰ 28' 28.5"	81⁰ 15' 00.6" to 81⁰ 15' 22.7"	19.29	23.08.2016	22.08.2018
9	Majhiguda	PL	applied for mining leases	M/S sri Bhubaneswari Granaites . Flat No. 528 C- Block, Rajendra Vihar Forest Park , Bhubaneswar	Majhiguda	Khairput	18⁰ 28' 28.5" to 18⁰ 28' 36.5"	82⁰ 15' 00.9" to 81⁰ 15' 22.8"	10.522	23.08.2016	22.08.2018

MINERAL RESOURCES

The total good quality Limestone reserves near Kotameta, Nandiveda and Uskalvagu 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 villages 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.

03. LIST OF MINING LEASES IN THE DISTRICT WITH LOCATION, AREA & PERIOD OF VALIDITY.

All required Lease details are given in the prescribed format, Please refer (Annexure-III , Table No. 11.C.01).

04. DETAILS OF ROYALTY OR REVENUE RECEIVED IN LAST THREE YEARS. *(for Sand)*

Sl. No.	Name of the Tahasil	Name of Source	Revenue Collected for last three years (in Rs)		
			2016-17	2017-18	2018-19
1	**Malkangiri**	KodelMetla	0	0	50880
2	**Malkangiri**	Chidupali	0	0	84641
3	**Malkangiri**	Chidupali	0	0	88770
4	**Mathili**	Dhungiaput	-	105781	68386
	Mathili	Chaulamendi	0	0	0
5	**Khairput**	Govindapalli	0	0	0
6	**Khairput**	Podaghat	0	0	0
7	**Chitrakonda**	Orkel	0	0	0
8	**K.Guma**	Maheswarpur & Kondelguda	0	0	0
9	**Motu**	Motu Saberi river Ghat	0	35200	35400
10	**Kalimela**	Venkatapallam Sand Bed	0	0	0
11	**Kalimela**	Maharajpalli Sand Bed	0	0	0
12	**Kalimela**	Girkanpalli Sand Bed	0	0	0
13	**Kalimela**	Teliguda Sand Bed	0	0	0
Total			**0**	**140981**	**328077**

05. DETAIL OF PRODUCTION OF SAND.

Sl. No.	Name of the Tahasil	Name of source	Production of sand for last three years (in cum)		
			2016-17	2017-18	2018-19
1	**Malkangiri**	KodelMetla	758	761	765
2	**Malkangiri**	Chidupali	730	760	820
3	**Malkangiri**	Chidupali	834	848	860
4	**Mathili**	Dhungiaput	1225	1330	1400
	Mathili	Chaulamendi	0	0	0
5	**Khairput**	Govindapalli	0	0	0
6	**Khairput**	Podaghat	0	0	0
7	**Chitrakonda**	Orkel	0	0	0
8	**K.Guma**	Maheswarpur & Kondelguda	0	0	0
9	**Motu**	Motu Saberti river Ghat	0	880	885
10	**Kalimela**	Venkatapallam Sand Bed	0	0	0
11	**Kalimela**	Maharajpalli Sand Bed	0	0	0
12	**Kalimela**	Girkanpalli Sand Bed	0	0	0
13	**Kalimela**	Teliguda Sand Bed	0	0	0
	TOTAL		**3547**	**4579**	**4730**

06. PROCESS OF DEPOSITION OF SEDIMENTS IN THE RIVERS OF THE DISTRICT.

Fluvial Process of deposition is a geological process on the face of earth, normally controlled by various factors like gradient of the river, velocity of the flowing water, amount of discharge, change in the river channel pattern & chemical precipitation etc. Sediment in rivers gets deposited as the river slows down. Larger, heavier particles like pebbles and sand are deposited first, whilst the lighter silt and clay only settle if the water is almost still. The flow of water is strongest on the outside of river bends, eroding the bank, but is slowest on the inside of the bends, allowing deposition of sand and gravel. When a river "bursts its banks" after heavy rain, flood water spreads out across the floodplain and, because this water hardly moves, finer silt and clay are deposited – often making good farmland.

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 Pradedsh.

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, Goria Ghar, Satigura Nala, River etc.* 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 tables Please refer (Table No. 11.A.01) & (Table No. 11.B.01)

07. 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, platues 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 compared 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 perennial 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 district namely *Potteru River, Goria 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 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.

08. LAND UTILIZATION PATTERN IN THE DISTRICT: FOREST, AGRICULTURE, HORTICULTURE, 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 Data -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 in the following table;

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 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

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 Chitrakonda 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**

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.

09. PHYSIOGRAPHY OF THE DISTRICT.

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 compared 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 perennial 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, Goria 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 and connect to all parts of the district through road ways.

10. RAINFALL: MONTH-WISE.

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**

11. GEOLOGY AND MINERAL WEALTH.

Geology:

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 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)
	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
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).

Mineral welth:

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.

The total good quality Limestone reserves near Kotameta, Nandiveda and Uskalvagu 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.

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;

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

Sl No.	Name of Tahasil	Name and location of Source	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)
01	**Malkangiri**	Kodelmetla Sand Bed Khata No-446 Plot No-3377 18°12'38.3"N to 18°13'11.6" 81°50'33.6"E to 81°50'41.9"E	25100	16541.5
02	**Malkangiri**	Chidupalli Sand Bed. Khat no- 625, Plot-4607 18°14'06.9"N to 18°14'01.0" 81°52'55.9"E to 81°52'49.0"E	6685.9	4024.4
03	**Malkangiri**	Chidupalli Sand Bed Khat no- 625, Plot-4421/4389 18°14'50.1"N to 18°1432.9" 81°52'26.5"E to 81°5221.0"E	8168	5672
04	**Malkangiri**	Pulimetla Sand Bed Khat no- 306 Plot-2171 Kisam-nadi latitude of 18°10'43.34"N to 18°10'58.04"N and longitude of 81°47'46.87''E to 81°47'56.05''E	6421	5004

05	**Malkangiri**	Puspalli Sand Quarry Khat no- 22 Plot-993 Kisam-nallo latitudes of 18°18'01.06"N to 18°18'18.10"N and longitude of 82°02'06.10"E to 82°02'19.23"E	5097	718
06	**Kudumulugumma**	Maheswarpur & kondelguda Sand bed Khata No-103&70 Plot No-358, 433, 410, 615, 411 18'17"13.2" to 18'17"55.2"N and 81'06".20.0" to 81'06"48.1"E	6380	3250
07	**Kudumulugumma**	Bansulbhata Sand Bed Khata No-6 Plot No-35 Kisam-nadi latitude of 18°18'37.05"N to 18°18'49.76"N and longitude of 82°07'01.02''E to 82°07'09.94''E	2397	1385
08	**Mathili**	Chaulamendi Sand Bed Khata No-361 Plot No-444 18°30'13.3" N to 18°30'25.1"N 82°9'38.2"E to 82°9'48.8" E	32400	19602.8
09	**Mathili**	Dhungiaput Sand Bed Khata No-253 Plot No-1530,1590 18'35"01'3" to 18'35"15'1"N 82'14"58'9" to 82'15"05'8"	31010	19968.9

10	**Motu**	Motu Sand Bed Khata No-220 Plot No-571/1 17"49'31.5" to N17"49"48.0" E81"23"20.7" to E81"23"26.5"	25000	20107.5
11	**Motu**	Uskalbag Sand Bed Khata No-148 Plot No-1 Kisam-River latitude of 18°18'38.90"N to 18°18'50.14"N and longitude of 81°37'24.37''E to 81°37'34.74''E	8429	6419
12	**Kalimela**	Venkatapallam Sand Bed 18°07'22.12"N 81°42'55.14"E	20920	4566
13	**Kalimela**	Maharanpalli Sand Bed 17°57'13.13"N 81°34'43.04"E	20560	4052
14	**Kalimela**	Girkanpalli Sand Bed 18°03'11.36"N 81°39'17.19"E	23440	9979
15	**Kalimela**	Teliguda Sand Bed	20000	3694
16	**Kalimela**	Tamanpalli Sand Bed Khata No-224 Plot No-25/1 Kisam- Nadi latitude of 18°03'17.15"N to 18°03'33.25"N and longitude of 81°35'27.09''E to 81°35'42.10''E	4658.4	3106.4
17	**Chitrakionda**	Orkel Sand Bed Khata No-51 Plot No-426 18°13'4.20"N 82°03'1.5"E	10260	6120

18	**Khairput**	Podhghat Sand Bed Khata No-178 Plot No-1330 18°28'49.2" N 82°10'49.0"E	76500	7897.5
19	**Khairput**	Govindpalli Sand Bed Khata No-452 Plot No-596, 1300, 1309 18°34'14.30"N 82°16'43.71"E	54770	16828

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 Sand*, 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 sand area of proposed quarry lease has been multiplied with the average sand bed thickness of the respective source to obtain the

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

Potential Resource of *New Sairat Sources for Sand*

Sl No.	Name of Tahasil	Name of Proposed source with Land Schedule & Location.	Area covered with sand within the lease, normally varies from 40% to 90% as per field observation in m^2	Average sand Bed thickness of proposed source in meter	Tentative geological Resource of Proposed Source in m^3	Tentative Mineable Resource of Proposed Source i.e. 60% of geological Resources in m^3
01	**Kudumulugumma**	Chitapari Sand Bed Khata No-57, Plot No-394,370, 1.367Ha 18°24'53.10"N 82°10'08.13"E	50% sand area i.e.6835	0.5	3417	2050
02	**Kudumulugumma**	Ghatikaguda Sand Bed, Khata No-158, Plot No-1162, 2.500Ha	50% sand area i.e.12500	1.0	12500	7500
03	**Mahtili**	Mecca Sand Bed Khata No-167, Plot No-2457/1, 2458, 2702/1, 5.00Ha 18°32'53.05"N 82°05'37.90"E	50% sand area i.e. 25000	1.0	25000	15000
04	**Mathili**	Pangam Sand Bed Khata No-163, Plot No-152, 5.00Ha 18°32'03.29"N 82°07'52.44"E	60% sand area i.e. 30000	0.5	15000	9000
05	**Mathili**	Podaguda Sand Bed Khata No-47, Plot No-195, 5.00Ha 18°31'27.91"N 82°08'58.93"E	60% sand area i.e. 30000	0.5	15000	9000
06	**Mathili**	Maliguda Sand Bed Khata No-44, Plot No-254, 356, 5.00Ha 18°28'45.67"N 82°07'48.20"E	60% sand area i.e. 30000	0.5	15000	9000
07	**Mathili**	Khairpali Sand Bed, Khata No-131, Plot No-1169,418, 3.760Ha 18°26'44.54"N 82°06'47.21"E	50% sand area i.e. 18800	0.5	9400	5640

08	**Mathili**	Gangrajguma Sand Bed Khata No-100, Plot No-188,190,192,376,372/1, 5.00Ha 18°31'11.12"N 82°13'26.31"E	50% sand area i.e. 25000	1.0	25000	15000
09	**Khoirput**	Sikhpali sand Bed Khata No-150, Plot No-1582/1, 1734/1, 2.354Ha 18°27'29.91"N 82°08'19.55"E	60% sand area i.e. 14124	1.0	14124	8474
10	**Khoirput**	Kamlapadar Sand Bed Khata No-23, Plot No-70, 5.00Ha 18°35'49.18"N 82°16'25.33"E	40% sand area i.e. 20000	0.4	8000	4800
11	**Kalimela**	Tamanpali Sand Bed Khata No-224, Plot No-25,4.50Ha 18°03'43.77"N 81°36'36.57"E	50% sand area i.e. 22500	0.5	11250	6750
12	**Kalimela**	Tamanpali Sand Bed Khata No-224, Plot No-74, 4.20Ha 18°03'26.58"N 81°36'07.46"E	50% sand area i.e. 21000	0.5	10500	6300

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

As in nature the replenishment of sand is a natural process within the river bed, But the estimated potential may vary in each successive year.

(a) District wise details of river or stream and other sand source; ***Annexure-I***

In Malkangiri District River beds and streams are the only source of Sand, hence the details of the main river and streams are given in the following table as per the data provided by irrigation department:

Drainage system with description of main river (Table No. 11.A.01)

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

(b) District wise availability of sand or gravel or aggregate resources; ***Annexure-II***

In this case only ***Sand*** *has been considered*

Salient Features of Important Rivers and Streams: (Table No. 11.B.01)

S. No	Name of the River or Stream	Total Length in the District (in Km)	Place of origin	Altitude at Origin	Portion of the River or Stream Recommended for Mineral Concession	Length of area recommended for mineral concession (in Km)	Average width of area recommended for mineral concession (in meters)	Area recommended for mineral concession (in Sq. meter)	Mineable mineral potential (in m^3) (60% of total mineral potential)
01	Saberi/Kolab River	380.00	Sinkaram Hill (Western Slopes of Eastern Ghats)	1370.00	***Details of area proposed sources are given in below Table No. 11.A.03 & existing source details are given in the reserve table above.***				**240817**
02	Sileru / Machkund	112.00	Eastern Ghats in northeastern Andhra Pradesh	600.00 - 900.00					
03	Potteru	111.25	Balimela Power House	418.00					
04	Satiguda Nallah	17.000	Down-stream of Satiguda Dam	192.63					
05	Korukonda Nallah	26.400	Dhumsilgurha	200.00					
06	Tamasa Nallah	21.200	Chhatisgarh	Not available					

(c) District wise details of existing mining leases of sand and aggregates;

Annexure-III

In this case only ***Sand*** *has been considered.* ***(Table No. 11.C.01)***

Sl.No.	Name of the Mineral	Name of the Lease	Adress & Contact No. of lesee	Mining lease Grant Order No. & date	Area of Mining lease (in Hc)	Period of Mining lease (Initial)		Date of commencement of mining operaion	Status (Working Non Working/Temp. working for despatch etc.)	Obtained Environvental clearence (Y/N) if Y letter No. with date of grant of E.C	Location of the mining lease (Latitude & Longitute)
						From	To				
1	2	3	4	5	6	7	8	11	12	14	15
Name of the Tahasil:- Malkangiri											
1	Kodelmetla Sand Bed	Sri. Kameswar Batulu	At:- Kursuwada malkangiri	11.09.2015	5.020	2015-16	2019-20	01.04.2015	Working	254/10.04.2015	18°12'38.3"N to 18°13'11.6" 81°50'33.6"E to 81°50'41.9"E
2	Chidupalli Sand bed	Sri. Haribara Dhali	At:- Pitakata Malkangiri	14.07.2015	1.825	2015-16	2019-20	01.04.2015	Working	244/10.04.2018	18°14'06.9"N to 18°14'01.0" 81°52'55.9"E to 81°52'49.0"E
3	Chidupalli Sand bed	Sri. Haribara Dhali	At:- Pitakata Malkangiri	14.07.2015	4.930	2015-16	2019-20	01.04.2016	Working	249/10.04.2018	18°14'50.1"N to 18°1432.9" 81°52'26.5"E to 81°5221.0"E

Name of the Tahasil:- Kudumulugumma											
4	Maheswar pur & kondelguda Sand bed	Sri. Ramesh Ch. Patnaik	At:- K.Gumma, Malkangiri	07.06.2019	5.796	2019-20	2019-20	07.06.2019	Working	3114/12.06.2017	18'17"13.2" to 18'17"55.2"N and 81'06".20.0" to 81'06"48.1"E
Name of the Tahasil:- Mathili											
5	Dhungiaput Sand bed	Sri. Manoranjan Sahoo	At:-Mathili Malkangiri	1273/03.10.2016	4.430	2016-17	2020-21	2017-18	Working		18'35'01'3" to 18'35"15'1"N 82'14"58'9" to 82'15"05'8"
6	Chaulamendi Sand Bed	Sri Chhabi Das	At:- Malkangiri	06.04.2015	8.100	2015-16	2019-20				18°30'13.3" N to 18°30'25.1"N 82°9'38.2"E to 82°9'48.8" E
Name of the Tahasil:- Motu											
7	Motu Sand Bed	A.D. Debadanam	At:- Motu, Malkangiri Mob No. 9439171713	160/25.04.2016	5.000	2015-16	2019-20	09.05.2017	Working	153/06.04.2017	17"49'31.5" to N17"49"48.0" E81"23"20.7" to E81"23"26.5"

Name of the Tahasil:-Khairput											
8	Podhghat Sand Bed	Sri Kalandi Patra	At- Mandiguda, Malkangiri	1974/26.12.2017	5.100	2017-18	2021-22				18°28'49.2" N 82°10'49.0"E
9	Govindpalli Sand Bed	Sri Prafulla Chandra Rath	At- Govindpalli, Malkangiri	254/20.02.2018	5.477	2018-19	2022-23				18°34'14.30"N 82°16'43.71"E
Name of the Tahasil:-Chitrokonda											
10	Orkel Sand Bed	Sri Digavalli Venkata Rao	At- Kumutigada Malkangiri	10.04.2015	5.000	2015-16	2019-20				18°13'4.20"N 82°03'1.5"E
Name of the Tahasil:-Kalimela											
11	Venkatapallam Sand Bed	Sri Rudra Kumar Patra	At- kalimela, Malkangiri		5.23	2018-19	2022-23				18°07'22.12"N 81°42'55.14"E
12	Maharanpalli Sand Bed	Sri Rudra Kumar Patra	At- kalimela, Malkangiri		5.140	2018-19	2022-23				17°57'13.13"N 81°34'43.04"E

13	Girkanpalli Sand Bed	Sri Krishna Rangu	At- kalimela, Malkangiri	06.12.2018	5.86	2018-19	2022-23				18°03'11.36"N 81°39'17.19"E
14	Teliguda Sand Bed	Sri Rudra Kumar Patra	At- kalimela, Malkangiri		5.000	2018-19	2022-23				

***NB**: in the above table omitted Columns are,*
*Column **9&10** Period of Mining lease (1st/2nd...renewal)-**NA***
*Column **13** Captive/ NonCaptive- **All NonCaptive***
*Column **16** Method of Mining (Opencast/Underground)- **All Open cast***

Mineral Potential (Table No. 11.A.02)

Boulder (MT)	Bajari (MT)	Sand (m^3)	Total Mineable Mineral Potential (m^3)
NA	NA	525384	240817
Annual Deposition			
	NA	525384	240817

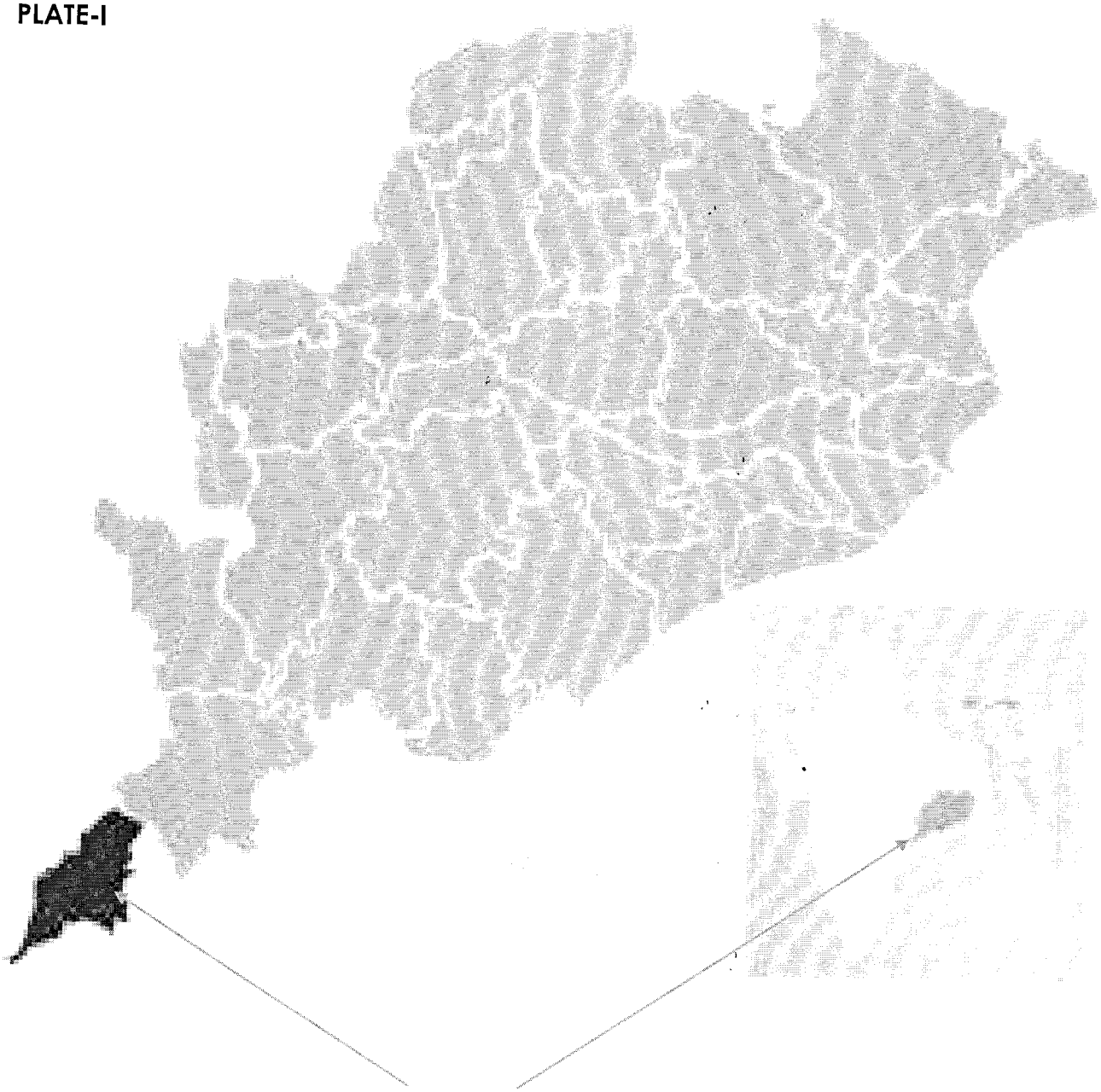
(Table No. 11.A.03)

Main river streams in Malkangiri district are Saberi/Kolab River, Sileru / Machkund, Potteru etc, rest all streams are tributaries of these rivers. Details of the proposed sources are as Follows,.

S. No.	River or Stream	Portion of the river or stream recommended for mineral concession	Length of area recommended for mineral concession (in kilometer)	Average width of area recommended for mineral concession (in meters)	Area recommended for mineral concession (in square meter	Mineable mineral potential (in m^3) (60% of total mineral potential
1	Ogel River	Chitapari Sand Bed Khata No-57, Plot No-394,370,	0.4	30	1.367Ha	2050
2	Gotiguda River	Ghatikaguda Sand Bed, Khata No-158, Plot No-1162,	0.5	50	2.500Ha	7500
3	Saria River	Mecca Sand Bed Khata No-167, Plot No-2457/1, 2458, 2702/1,	1.0	50	5.00Ha	15000

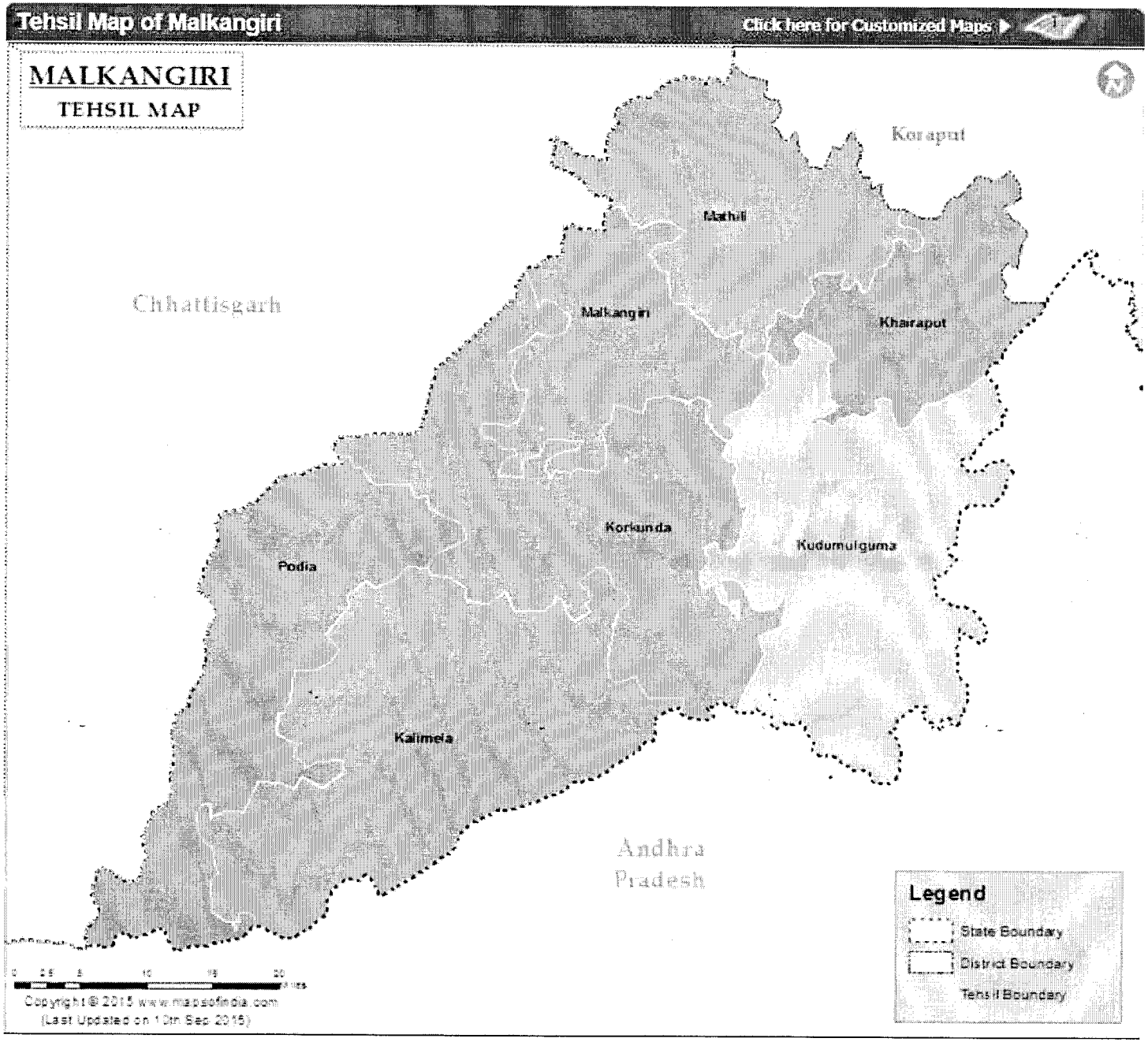
4	Pangam River	Pangam Sand Bed Khata No-163, Plot No-152,	0.5	100	5.00Ha	9000
5	Pangam River	Podaguda Sand Bed Khata No-47, Plot No-195,	0.5	100	5.00Ha	9000
6	Sikhar Nadi	Maliguda Sand Bed Khata No-44, Plot No-254, 356	1.0	50	5.00Ha	9000
7	Dardur Nadi	Khairpali Sand Bed, Khata No-131, Plot No-1169,418,	0.7	50	3.760Ha	5640
8	Gariagad River	Gangrajguma Sand Bed Khata No-100, Plot No-188,190,192,376,372/1,	0.5	100	5.00Ha	15000
09	Bagaguda River	Sikhpali sand Bed Khata No-150, Plot No-1582/1, 1734/1,	0.5	50	2.354Ha	8474
10	Saptadhara River	Kamlapadar Sand Bed Khata No-23, Plot No-70	1.2	40	5.00Ha	4800
11	Potteru River	Tamanpali Sand Bed Khata No-224, Plot No-25,	0:9	50	4.92Ha	3106.4

PLATE-I



MALKANGIRI

PLATE-II



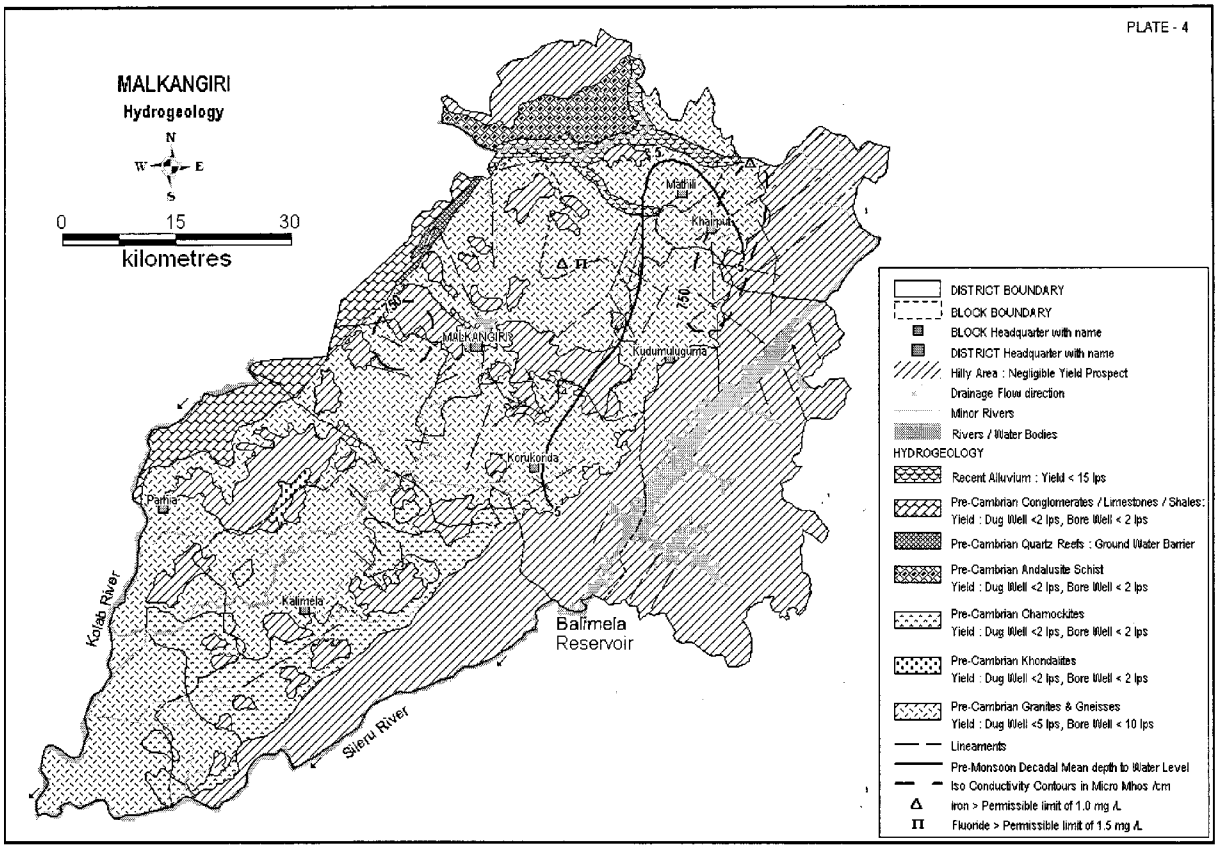
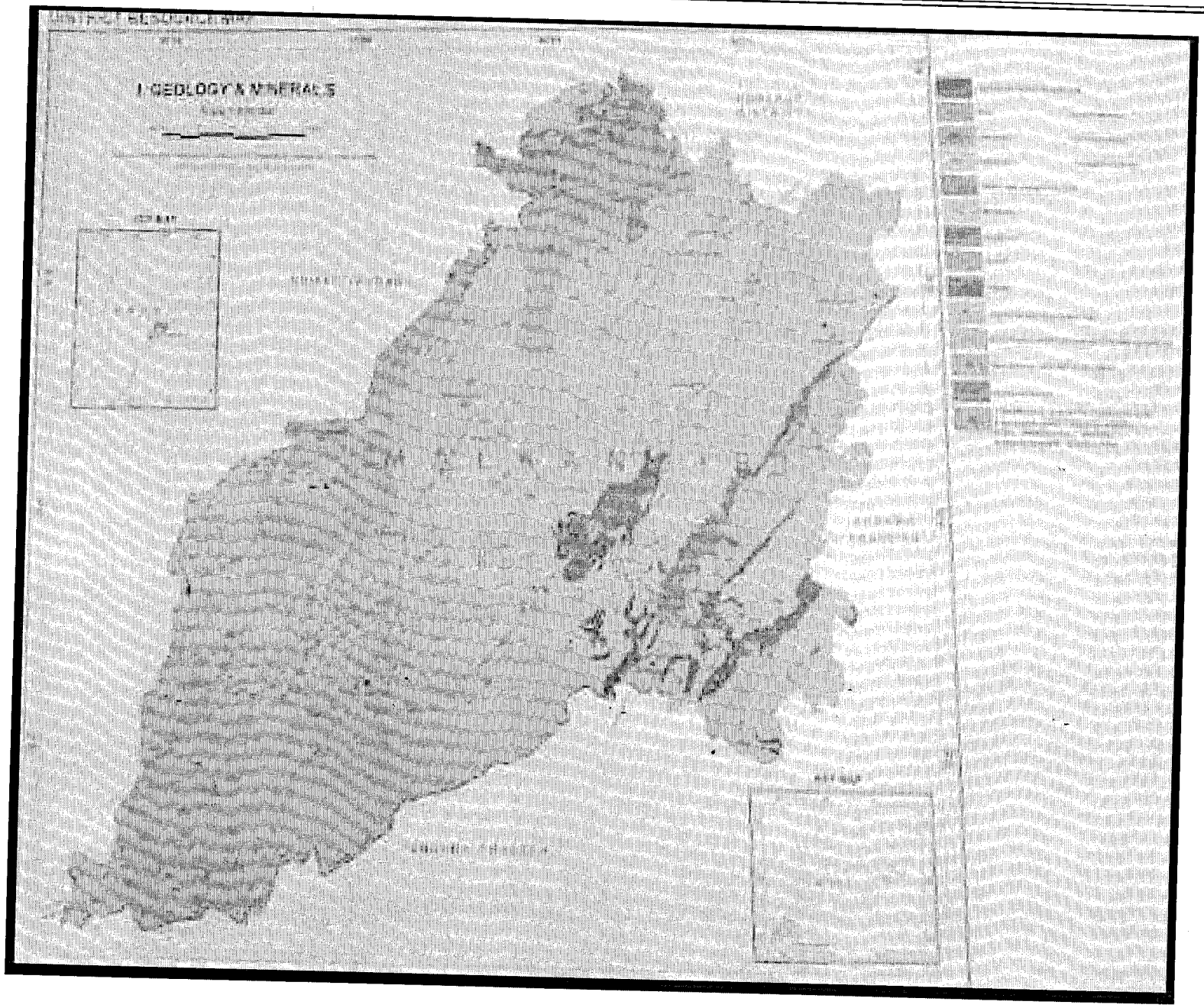


PLATE - 4
MALKANGIRI
Hydrogeology
N
W
E
S
0
15
30
kilometres
Mathili
Khairput
MALKANGIRI
Kudumulugumma
Konukonda
Partia
Kalimela
Kolab River
Sileru River
Balimela
Reservoir
DISTRICT BOUNDARY
BLOCK BOUNDARY
BLOCK Headquarter with name
DISTRICT Headquarter with name
Hilly Area : Negligible Yield Prospect
Drainage Flow direction
Minor Rivers
Rivers / Water Bodies
HYDROGEOLOGY
Recent Alluvium : Yield < 15 lps
Pre-Cambrian Conglomerates / Limestones / Shales: Yield : Dug Well <2 lps, Bore Well < 2 lps
Pre-Cambrian Quartz Reefs : Ground Water Barrier
Pre-Cambrian Andalusite Schist Yield : Dug Well <2 lps, Bore Well < 2 lps
Pre-Cambrian Charnockites Yield : Dug Well <2 lps, Bore Well < 2 lps
Pre-Cambrian Khondalites Yield : Dug Well <2 lps, Bore Well < 2 lps
Pre-Cambrian Granites & Gneisses Yield : Dug Well <5 lps, Bore Well < 10 lps
Lineaments
Pre-Monsoon Decadal Mean depth to Water Level
Iso Conductivity Contours in Micro Mhos /cm
Iron > Permissible limit of 1.0 mg /L
Fluoride > Permissible limit of 1.5 mg /L

PLATE-IV



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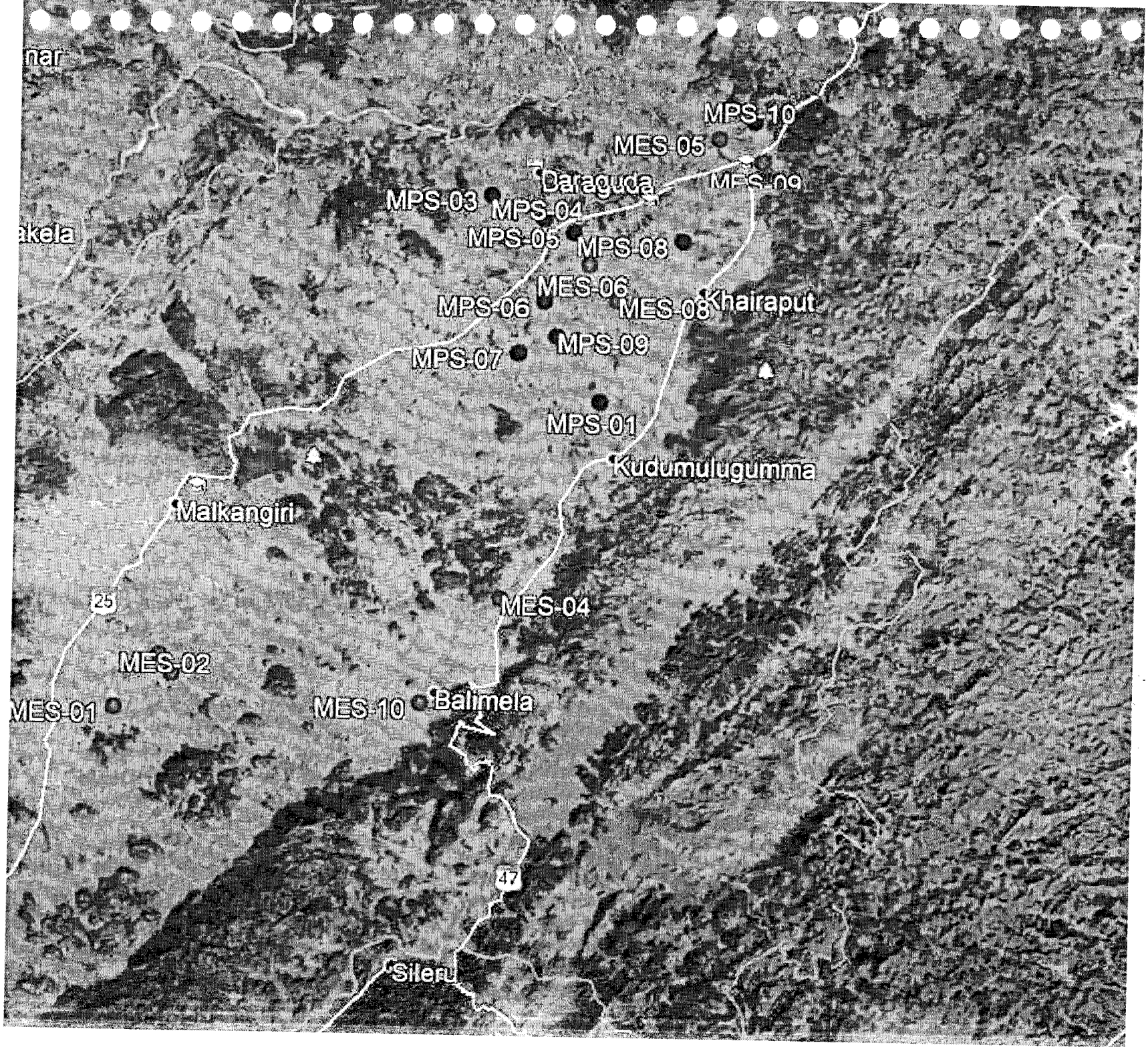
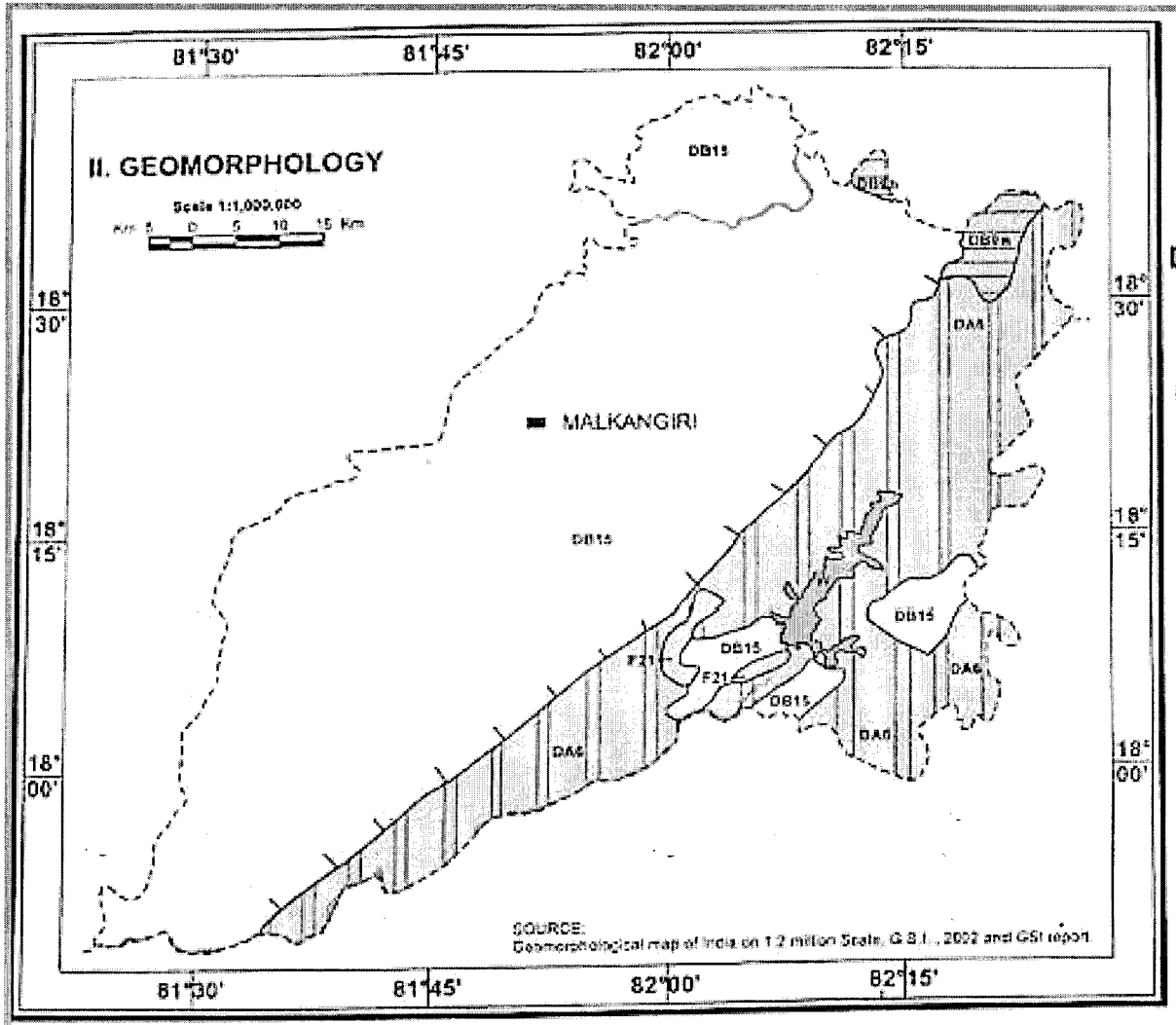


	Chitrupalli
MES-04	Maheswa kondelgu
MES-05	Dhungiap
MES-06	Chaulame
MES-07	Motu San
MES-08	Podhghat
MES-09	Govindpa
MES-10	Orkel San
MES-11	Venkatap
MES-12	Maharajp
MES-13	Girkanpall
MES-14	Teliguda S



GEOMORPHOLOGY

I. UNITS OF DENUDATIONAL ORIGIN

DENUDATION STRONGLY CONTROLLED BY STRUCTUR

DA6 Ridges / Hills with or without valleys

DENUDATION WITH MINIMAL CONTROL OF STRUCTUR

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

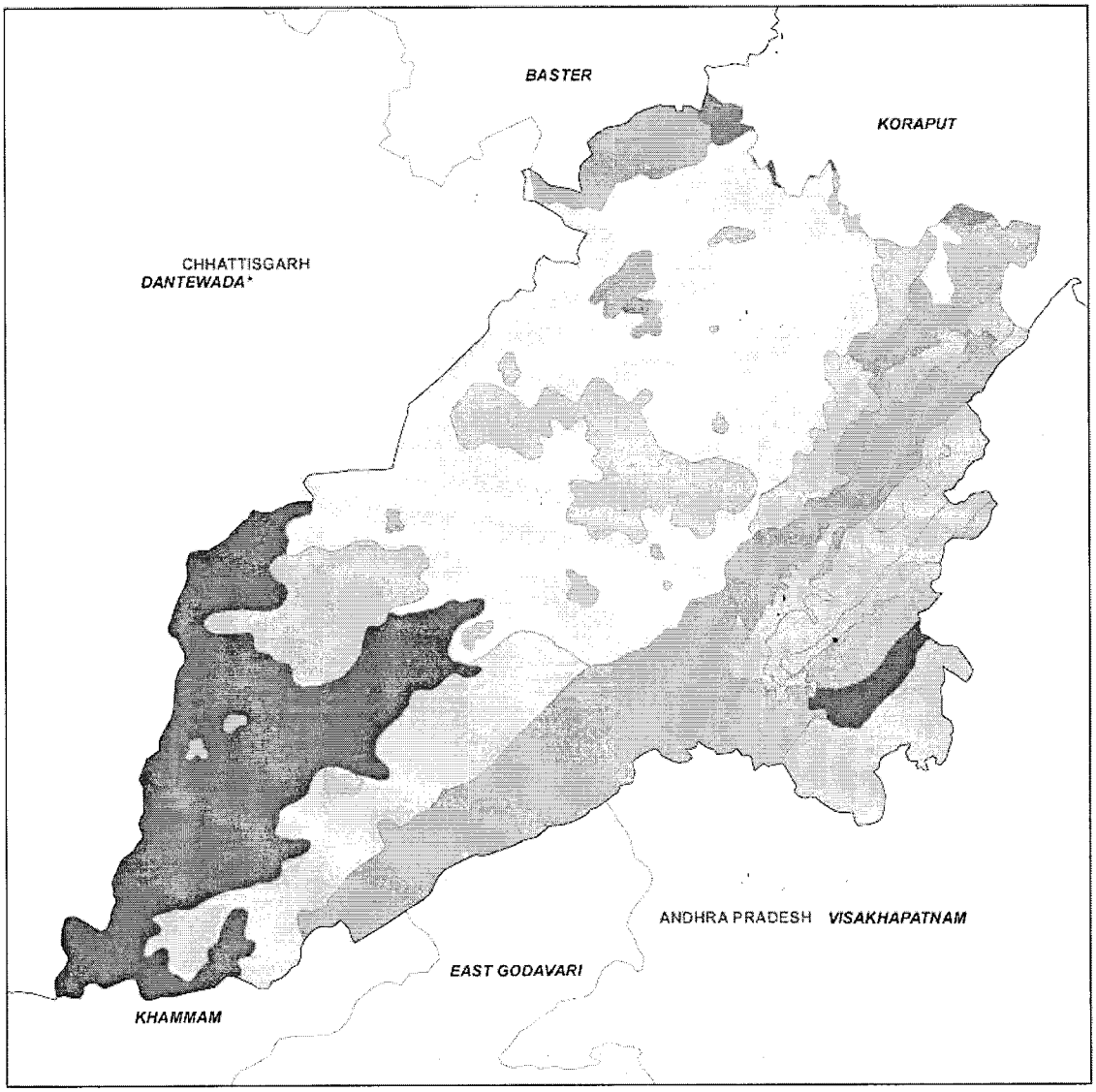
Escarpment

FORMS OF FLUVIAL AND LACUSTRINE ORIGIN

W Waterbody

River

DISTRICT ATLAS - MALKANGIRI

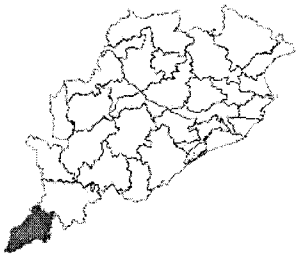


Legend

State Boundary

District Boundary

ORISSA



SOIL MAP

2

0 3.5 7 14 21 28 35 km

Source : SOI

Maps Composed by NIC

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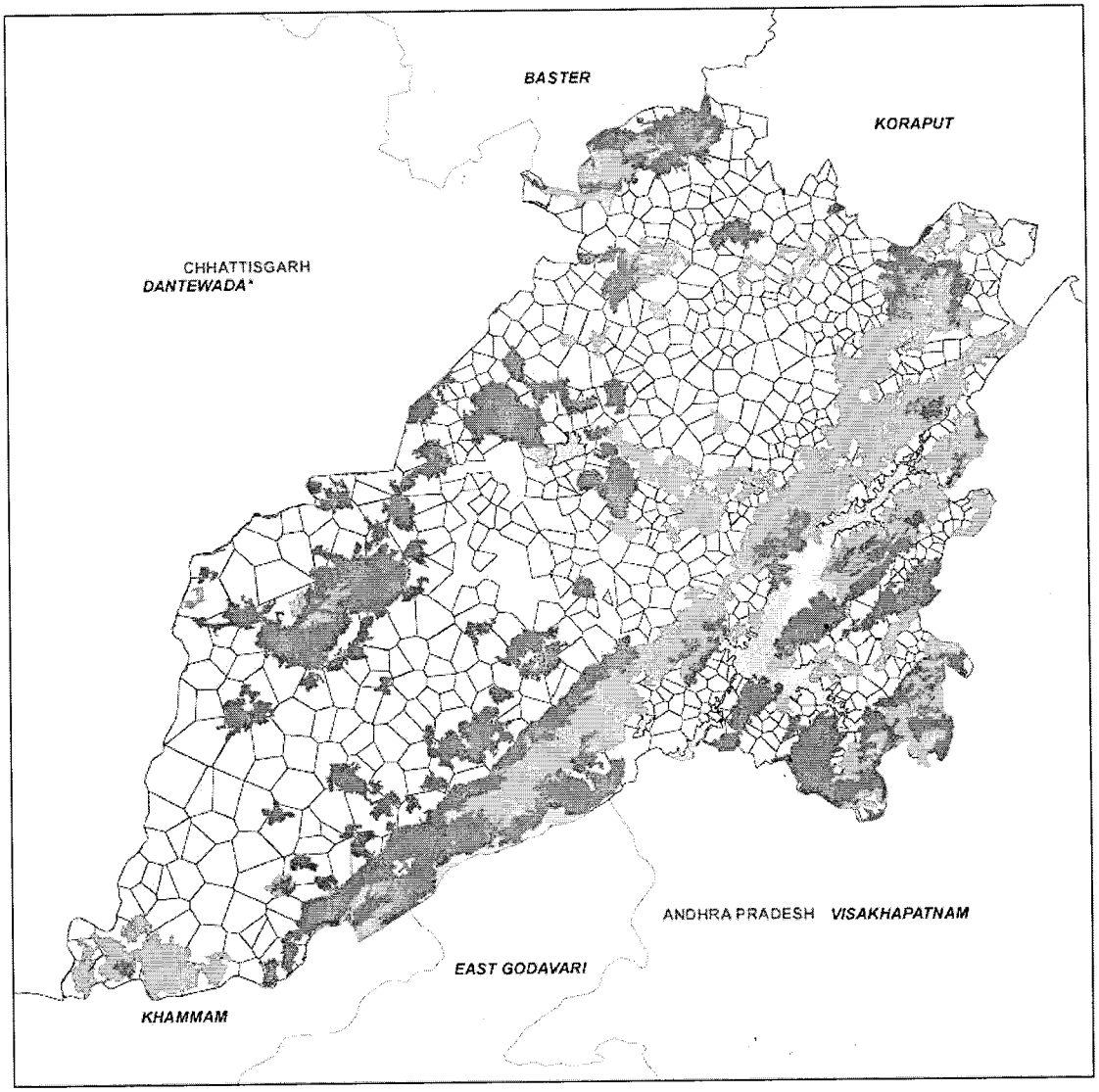
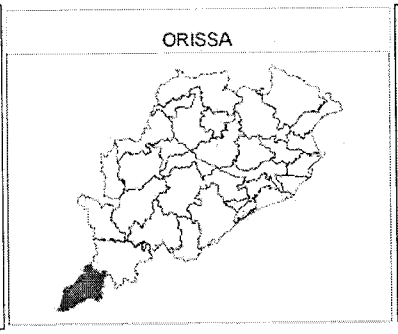
DISTRICT ATLAS - MALKANGIRI



Legend

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



FOREST MAP

2

0 3.5 7 14 21 28 35 km

Source : SOI

Maps Composed by NIC

DRAFT COPY