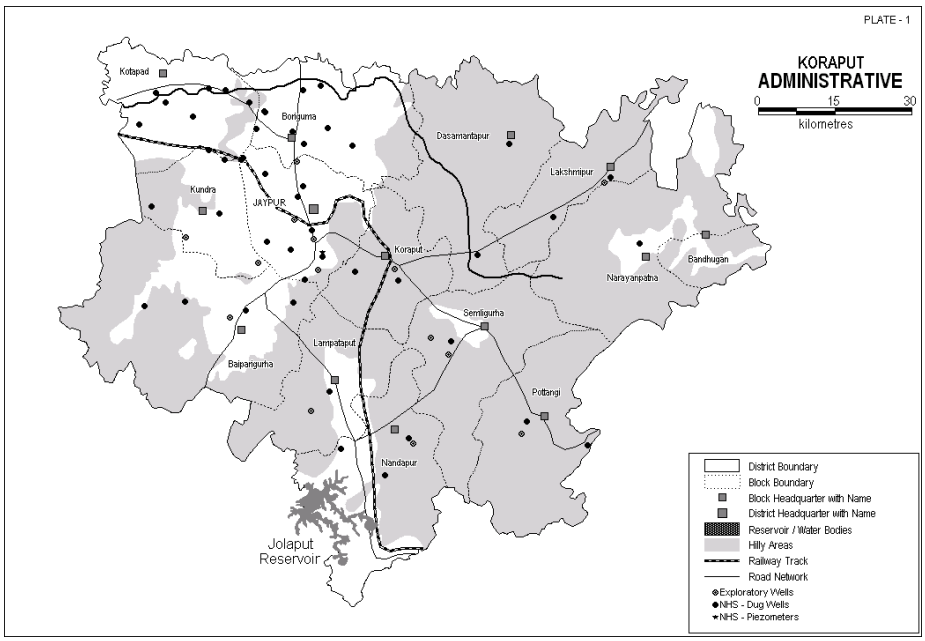
Govt. of India

MINISTRY OF WATER RESOURCES

CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET

KORAPUT DISTRICT, ORISSA



South Eastern Region

Bhubaneswar

March, 2013

KORAPUT DISTRICT AT A GLANCE

Sl No	ITEMS	Statistics
1.	**GENERAL INFORMATION**	
	i. Geographical Area (Sq. Km.)	8807
	ii. Administrative Divisions as on 31.03.2007	
	Number of Tehsil / Block	7 Tehsils,14 Blocks
	Number of Panchayat / Villages	226 Panchayats 2028 Villages
	iii Population (As on 2011 Census)	1,376,934
	iv Average Annual Rainfall (mm)	1521.8
2.	**GEOMORPHOLOGY**	
	Major physiographic units	Mostly highly rugged mountain with narrow intermontane valleys, gently undulating with isolated hillocks and mounds in the west
	Major Drainages	Indravati, Kolab, Sileru, Vegabati, Subarnamukhi & their tributaries
3.	**LAND USE (Sq. Km.)**	
	a) Forest Area	2321.59
	b) Net Sown Area	2408.97
	c) Cultivable Area	3010
4.	**MAJOR SOIL TYPES**	Alfisols, Ultisols
5.	**AREA UNDER PRINCIPAL CROPS**	Cereals etc : 2,17,000 Ha Pulses etc. : 25,630 Ha Oil seeds : 12,610 Ha
6.	**IRRIGATION BY DIFFERENT SOURCES**	
	(Areas and Number of Structures)	
	Dug wells	4,264 Ha
	Tube wells / Bore wells	
	Tanks / ponds	5,404 Ha
	Canals	47,687Ha
	Other sources	
	Net irrigated area	57,355 Ha
	Gross irrigated area	57,355 Ha
7.	**NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB(As on 31-3-2011)**	
	No of Dug wells	49
	No of Piezometers	2
10.	**PREDOMINANT GEOLOGICAL FORMATIONS**	Granites, Granite Gneiss & its variants
11.	**HYDROGEOLOGY**	
	Major Water bearing formation	Granites, Granite Gneiss
	Pre-monsoon Depth to water level during 2011	3 – 7 mbgl
	Post-monsoon Depth to water level during 2011	1.5 – 4.6 mbgl
	Long term water level trend in 10 yrs (2001-2011) in m/yr	No perceptible change
12.	**GROUND WATER EXPLORATION BY CGWB (As on 31-03-2011)**	
	No of wells drilled(EW, OW, PZ, SH, Total)	EW-17,OW-7,PZ-2,SH-0**>26**
	Depth Range(m)	25 – 200.80
	Discharge(litres per second)	0.10 – 6.90
	Storativity(S)	-

Sl No	ITEMS	Statistics
	Transmissivity(m^2/day)	-
13.	**GROUND WATER QUALITY**	
	Presence of Chemical constituents more than permissible limit(e.g. EC, F, As, Fe)	Not reported
	Type of Water	Mostly Calcium Bicarbonate, C_2S_1 Irrigation Class
14.	**DYNAMIC GROUND WATER RESOURCES(2009) – in mcm**	
	Net Ground Water Resources Availability	69.117
	Net Annual Ground Water Draft	6.530
	Projected Demand for Domestic and Industrial Uses up to 2025	3.388
	Stage of Ground Water Development	9.45 %
15.	**AWARENESS AND TRAINING ACTIVITY**	
	Mass Awareness Programmes organized	1
	Date	21st December, 2005
	Place	Koraput Town
	No of Participants	150
	Water Management Training Programmes organized	1
	Date	22nd December, 2005
	Place	Koraput Town
	No of Participants	150
16.	**EFFORTS OF ARTIFICIAL RECHARGE & RAIN WATER HARVESTING**	
	Projects completed by CGWB(No & Amount spent)	Nil
	Projects under technical guidance of CGWB(Numbers)	Nil
17.	**GROUND WATER CONTROL AND REGULATION**	
	Number of OE Blocks	Nil
	No of Critical Blocks	Nil
	No of Blocks notified	Nil
18.	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	None.

1.0 Introduction

Koraput district located in the southern part of the state has a total geographical area of 8807 sq. km. It lies It lies between Latitudes of 18° 15' 00" to 19° 12' 30" North and Longitude of 82° 08' 04" to Longitude 83° 24' 46" East, falling in survey of India degree sheets (1:2,50,000) nos. 65 I, J, M and N. It is bounded on the north by Nowarangpur, Kalahandi and Rayagada districts of Orissa, Andhra Pradesh in the south and east and Chattishgarh in the West. The district is divided into 2 subdivisions of Koraput and Jeypore. There are 14 community development blocks –

Physiographically, except the north western and west-west central part, almost the entire district is occupied by dense forest, highly rugged mountain, interspersed with narrow intermontane valleys. The average attitude of the hilly terrain ranges from 900 to 1400 m amsl. North Western and West-west central parts are characterized by gently undulating plain dotted with isolated hillocks. The Kolab and Indravati river and their tributaries constitute the main drainage system of the district. The main slope of the district is towards west and north-west.

The drainage pattern in the district is controlled by Indravati, Sabari (Kolab), Sileru, Vegavati, Subarnamukhi, Jaryhavati and their tributaries. The river Indravati and Kolab drains the major parts of Koraput district. Most of the tributaries of Kolab river and Indravati river are perennial in nature.

Koraput district shows wide variation in land use pattern. The land utilization pattern indicates that out of total geographical area, the forest area constitute 52279 ha. The net sown area is 240897 ha.

The district was geologically studied by Geological Survey of India and prepared the geological map of the district. The initial hydrogeological survey on regional scale was carried out by Central Ground Water Board during nineteen eighties. Subsequently the entire district was covered by Central Ground Water Board under reappraisal hydrogeological surveys during nineteen nineties. Under ground water exploration programme a considerable number of exploratory bore holes were drilled by Central Ground Water Board to asses the ground water potentials of rock formations at deeper depths. The ground water regime condition is being monitored by quite a large number of permanent hydrograph stations four times a year. Apart from these a number of water supply investigation were also carried out by Central Ground Water Board for different central and state Govt. agencies.

Groundwater Regime condition is being periodically monitored both quantitatively & qualitatively through 49 permanent hydrograph stations (NHS) and 2 piezometers. The depth to water level in dug wells ranges from 3.5 to 12.20 mbgl during pre-monsoon and from 0.35 to 6.8 mbgl during post monsoon period.

2.0 Rainfall & Climate

The district enjoys tropical climate characterized by hot summer, cold winters & rainy seasons. The winter season generally commences from late November & continues up to the end of February. The temperature in winter drops below 1°C at places like Pottangi otherwise it is in the range of 10°C to 13.5°C in the valley plains. The summer season commences from March & continues till middle of June. The summer is quiet pleasant here with the mean daily maximum temperature around 40°C while the mean daily minimum temperature is around 14°C.

It is observed that about 80% of the total annual rainfall takes place due to South West monsoon between the middle of June & mid-October. The north east monsoon gives erratic & insufficient rainfall. The average annual rainfall varies between 1320-1520mm. The district is drought prone because of the erratic and uneven pattern of rainfall.

3.0 Geomorphology & Soil Types

The entire Koraput district has a unique physiographic set up. Except the north western and west - west central part, the rest of the district is occupied by densely forest with highly rugged mountains, interspersed with intermontane valleys. The elevation of the hilly terrain ranges from 900 to 1400 mm above mean sea level with the highest peak of 1620 m amsl.

The major geomorphic units of the district are classified as - Flood plain, Mesa/butte, Denudational hills, Pediment, Deeply weathered pediplain, Inselberg, Structural hills, Severely dissected plateau, Intermontane valley, Structural valley, Residual hill and Bazada.

Flood Plain - These are the narrow stretch of alluvium occurring along the major rivers and include buried channels & migrated river courses. Depending upon the thickness of the alluvium the flood plain can be suitable for shallow aquifer.

Mesa/Butte - These are the flat topped hill with escarpment or both the sides. Perched water bodies of limited extent may occur depending on the width of the plateau.

Denudational Hill - These are represented by a group of massive hill ranges intersected with narrow intermontane valleys. Weathered zones in intermontane valleys are favourable for forming shallow aquifers while deeper aquifers are controlled by faults & fractures.

Pediments - These are gently undulating bed rocks with little or no weathering. Both the shallow and deeper aquifers are controlled by lithology & structures.

Deeply weathered pediplain -The pediplain generally present gently undulating topography with the thickness of weathered zone ranging between 5 to 20 m with the average thickness around 12 to 15 m. These are favourable locales for ground water occurrences. Deeper aquifers are controlled by lithology & structures.

Inselberg - These are isolated hills of limited Areal extent surrounded by plain all around.

Structural hills -These are linear to curvilinear hills at large Areal extent showing definite structural control. However moderate amount of infiltration takes place through fractures.

Severely dissected plateau - It is characterized by a number of sharp crested hills embraced by deep irregular valley. Weathered residuum in the valley forms shallow aquifers while the deeper aquifers are controlled by structurally weak planes in the valley.

Intermontane Valley - These are flat valleys surrounded by hills all around. These are highly favourable locales for groundwater occurrence due to good recharge from surrounding hills.

Structural Valley - These are narrow valley within the structural hills formed along the structurally weak planes and are highly favourable for groundwater occurrence & is sometimes marked with spring.

Residual hills - These are massive hills of moderate areal extent surrounded by plain and are not favourable for groundwater occurrence.

Bazada - It is characterized by gently sloping plain at the foot hill region & are highly favourable for shallow aquifers depending on the thickness of deposits.

The drainage pattern in the district is controlled by Indravati, Sabari (Kolab), Sileru, Vegavati, Subarnamukhi, Jaryhavati and their tributaries. The river Indravati and Kolab drains the major parts of Koraput district. Most of the tributaries of Kolab river and Indravati river are perennial in nature. East west flowing Indravati and North-South flowing Sabari river pass through the northern and western border of Koraput district. South East-North West flowing Kolab river traverses through the central part of the district. The rivers in general exhibit dendritic drainage pattern and are effluent in nature.

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

Alfisols - The alfisols includes Red loamy soil and red Sandy Soil and are generally light textured with a PH ranging from 6.5 to 7.3. The soils are in general having average to good fertility.

Ultisols - The Ultisols occurs as narrow and elongated patch in the Central part of the district. These soils are slightly acidic in nature with a PH ranging from 4.5 to 6.0.

4.0 Ground Water Scenario

4.1 Geology

Major parts of the Koraput district is underlain by hard rocks of Pre-Cambrian age. The consolidated rocks of upper to middle Proterozoic age occupy a small portion of north-western part of the district. The Recent to sub Recent alluvium occurs as thin and discontinuous patches in limited scale along the prominent drainage channel. The Laterite occurs as their capping over the country rocks in isolated pockets. The generalized stratigraphic sequence in the district is given below

Recent to Sub Recent		Alluvium, Laterite
Upper to middle Proterozoic	Chhattisgarh Group	Purple shale, limestone, Basal quartzite.
Proterozoic to Archaean	Bengal group	Quartzite, Quartz and biotite gneiss
	Eastern Ghat group	Biotite bearing garnetiferous granite. Gneiss with mega-crystal of white Feldspar.
		Acid, intermediate, basic Charnockite.
Archaean		Garnet-sillimanite Schist, green khondalite Quartzite& calc-granulite.

Granite Gneisses -These rock types of Eastern Ghat Group generally occurs in the undulating plains and sometimes forms hills and hillocks. These rocks are mostly represented by biotite gneiss, porphyritic granitic gneiss etc. They are porphyritic and non porphyritic in nature and are usually grey to light grey in colour.

Khondalites - This suite of rocks comprises mainly of quartz - garnet sillimanite gneiss and schist, garnetiferous sillimanite gneiss and schist, garnetiferous sillimanite quartzite and calc-granulite, which occurrs in an interbedded sequence. Khondalite are found associated with charnockite and porphyroblastic granitoid gneiss. The rocks are grayish brown to reddish brown in colour and are well foliated. The occurrence of quartzite and calc granulites are very limited and sporadic.

Charnockite -This suite of rocks comprises of pyroxene granulite (basic), hypersthene granite and granodiorite (acid and intermediate). These are generally found to occur in south and central part of the district. The acid and intermediate variety of charnockite is more prominent and form longer bodies than the basic variety. The charnockite are fine to coarse grained, greenish grey colour having greasy lustre.

Quartzite - These includes quartzite, garnet andalusite gneiss of Bengal Group. These are metasediments occupying limited area in western part of the district.

Shale, limestone and Quartzite - These belong to Chattisgarh Group of middle to upper Proterozoic age. These rocks occur uncomformably over granite gneisses. These are slightly metamorphosed and

consist of white non feldspathic quartzites, impure limestone and purple shales. These rocks are generally exposed in the north-eastern part of the district. These rocks are best exposed around Gupteswar - Ramgiri area in Boipariguda blocks.

Laterite and Alluvium -These are reddish, porous, concretionary material occurs as capping over the country rocks. Considerable thickness of Laterite mainly of detrital origin have also been formed or shaly formation around Kotpad area. Laterite generally occur due to intensive weathering under extreme oxidizing conditions in tropical to sub-tropical climate characterized by strongly contrasted wet and dry seasons.

The alluvium of recent origin comprising of sand, silt and clay of limited extension and thickness occurs in pockets along major drainage channels. They are generally fire to coarse grain in nature.

The major part of Koraput district is underlain by the rocks of the eastern ghat group which has undergone multiple deformation as reveled by the presence of structural features like fold, faults, joints, foliation etc: There are at least five major tectonic events represented by NE-SW, ENE-WSW, N-S, NW-SE and NNE-SSW tectonic patterns in chronological order. Granite gneisses exhibit gneissosity in NNE-SSW direction. Khondalite are highly fractured and sheared. Charnockite are usually massive and compact in nature.

The rocks of Chhattisgarh group are gently folded with low dips of both the limbs (4°-11°). The fold axis trends in N 35° E - S 35 °E.

4.2 Hydrogeology

Features like geological set up, rainfall distribution and the degree of primary and secondary porosity controls the hydrogeological framework of a place. As the district is underlain by diverse rock type as already discussed, it results in contrasting water bearing properties of these different geological formation. The major part of the Koraput district is underlain by hard, crystalline rocks and a small portion in the north-western part of Koraput district is occupied by rocks of Chattisgarh group.

Depending on the nature of formations and their water bearing capacities etc, the rock formations of the district may be divided broadly into two major hydrogeological units viz - Consolidated formations, Semi-consolidated formation, Unconsolidated formations

Consolidated formations

These include all the hard rocks of Eastern Ghat Group such as granite gneiss, khondalite, charnokite and Quartzite, gneiss, limestone and shale of Chhatisgarh Group.These rocks are devoid of primary porosity. The secondary porosity in these rocks developed as a result of weathering and fracturing due to major & minor tectonic movements along with climatological actions. The secondary porosity forms the conditions for movement of ground water and also act as reservoir of ground water. Groundwater occurs under water table conditions in weathered residuum while it occurs under semi confined to confined conditions in the fractured & jointed rocks. The hydrogeological characteristics of different rocks formations falling under consolidate unit are described below

Granite Gneisses -These are the most prominent rock types among all other rocks fall.ing under consolidated unit. The thickness of weathered residuum ranges from negligible to 34 m. The depth at the open wells ranges from 2.25 to 12.45 m bgl. The depth to water level in the dug wells during premonsoon period varies from 1.53 to 12.29 m bgl while during post monsoon period from 0.33 to 7.6 m bgl. The yield of the wells depends on the thickness of the water-saturated, zone as also the number of intersecting fracture tapped. The average yield of existing dug wells is around 1 lps and the wells can be pumped for 3-4 hrs during post monsoon and for 2-3 hrs during pre monsoon in a day. Out of the total wells drilled around 45% of the well has recorded yield 3 to 6.9 lps and only 20% wells yielded less than 1 lps and rest of the 35% of the wells recorded yield between 1 to 3 lps. The yield of the wells

located in granitic terrain in Jeypore, and Boriguma block is considerably more than those in Khondalitic terrain. Maximum potential fractures in this formation occurs in the depth range of 45-125 mbgl. Transmissivity value of the aquifer ranges from 0.5 to 10.68 m^2/ day.

Khondalites - Khondalite suites of rocks are generally highly metamorphosed intensely folded with fractures that are 25-30 m deep. The joints extend beyond 65 m depth bgl. Groundwater occurs under unconfined to semi-confined conditions. The thickness cif this residuum ranges from 27 to 47 m bgl. The depth to water level in pheratic aquifer during pre and post monsoon period varies from 0.65 to 15.35 mbgl and 0.42 to 13.75 mbgl respectively. The discharge of the bore well varies from 1 to 3 lps. Maximum potential fractures in this formation occur in the depth range of 35-96 m bgl. Transmissivity value of the aquifer ranges from 0.5 to 2-3 m^2/ day.

Charnokite -Due to hard, compact and massive nature of this formation, the thickness of weathered residuum is limited. The weathering is not very pronounced being upto only 7-10 m in depth. The spacing of joints is wide apart. The depth to water level in pheratic aquifer is of limited areal extent during pre and post monsoon period varies from 2.05 to 14.9 m bgl and from 2.31 to 11.30 m bgl respectively. Discharge of bore wells tapping fractured zone ranges from 1 to 5 lps. Maximum potential fractures in this formation occurs in the depth range of 30-136mbgl. Transmissivity value of the aquifer ranges from 1.8-3.0 *m2f* day.

Quartzite/gneiss - The phreatic aquifer in this formation is of limited areal extent. The thickness of weathered residium varies from 10 to 12 m bgl. The depth to water level in phreatic aquifer during pre and post monsoon period varies from 3.52 to 10.7 mbgl & from 1.24 to 7.08 mbgl respectively. Yield of the dug well is less than 1 lps.

Limestone -This formation is generally found in the western fringe of the district and is of limited areal extent. Groundwater occurs in weathered residuum in unconfined to confined conditions. The depth to water level in phreatic aquifers ranges from 8.03 to 10.15 mbgl during premonsoon period and from 5.59 to 7.66 mbgl during post monsoon period.

Semiconsolidated formation

Laterite -These are highly porous in nature and are formed as capping over the older formations. At quite a few places hydrological testing has revealed that the lateritic aquifer has the potentiality of yielding groundwater from 1-12 lps. The lateritic profile extends down to a depth of 10-20m. The depth of dug well varies from 3.14 to 13.4 mbgl. The depth to water level in pheratic aquifer varies from 1.93 to 13.22 mbgl during pre monsoon period while water level varies from 1.9 to 11.44 mbgl during post monsoon period.

Unconsolidated formations

Alluvium of Recent to Sub - Recent age constitutes the unconsolidated formation comprising of gravel, sand and clay. The alluvial deposits of recent origin occurs as their discontinuous patches along the prominent drainage channels and 'particularly in the flood plains of Indravati and Kolab river. Due to high degree of porosity and permeability, the alluvial strips constitute the moderately potential aquifers. Ground water occurs under semi confined to confined conditions. The potential aquifers present in this zone can be tapped through filter point shallow tubewells and dugwells. The maximum thickness of the alluvium is in the order of 20-23 m. The depth to water level varies from 1.3 to 7.64 mbgl during pre-monsoon period and from 0.40 to 5.89 mbgl during post monsoon period. Yield of dug well varies from 8-15 lps.

4.3 Ground Water Monitoring

Groundwater Regime condition is being periodically monitored both quantitatively & qualitatively

through 49 permanent hydrograph station (NHS). The depth to water level data are being collected four times in a year in the month of January April, August & November. Water samples from NHSS are collected during April and are analysed for chemical parameters.

Depth to water level - A total of 49 no. key wells were monitored during premonsoon and post monsoon period. A perusal of these data indicates that during post monsoon period (Nov) the depth to Water level in major parts of the district ranges between 1.5-4.6 below ground level. The shallow water levels i.e. 0-1.5 m depth range during the same period has been observed in the minor isolated pockets in the district. Depth to water levels more than 5 m are generally found in minor pockets. During premonsoon period (April) the depth to water level in major parts of the district range between 3 to 7 m below ground level.

Water Level Trend - The trend of water level on long term basis (10 years, 2001 to 2011) have been studied for pre-monsoon and post monsoon period based on the data of permanent hydrograph station (NHS). The water level trend analysis indicated that there is both minor rise and fall of water levels in both the periods. The water level trends during post monsoon period indicate that out of 49 stations 29 stations show rise and rest 15 stations show fall in water levels. The maximum rise of water level is to tune of 0.577m. The maximum fall of water level is 0.44m with the maximum values resting below 10 cm. The water level trends during pre-monsoon period indicate that fall has been noted in 15 stations. The maximum fall of water level is 0.761m. The remaining stations show rise of water level with the maximum rise around 0.577m. Considering the minor magnitude of rise and fall of water level over a period of 10 years both the rise and fall values are ignored and it is opined that no perceptible change has been occurred in ground water levels in any where in the district.

4.4 Ground water Scenario

CGWB has drilled 17 exploratory wells and 7 observation wells in the district. The depth of borewell ranges from 25 to 200.35 mbgl. The boreholes tapped fractured granite, granite gneiss, charnokite, khondalite, basic intrusives, migmatites etc. The depth of overburden varies from 18.40m at Pottangi to 49.20m at Sunabeda. The discharge of boreholes ranges from 0.25lps in Norite at Pottangi to 6.9lps in biotite gneiss and basic intrusive at Pampuni. The drawdown varies from 9.75m at Laxmipur to 40m at Sunabeda. In general 2 to 4 saturated fracture have been encountered. Most of the fractures occurs within 100m depth. Though is no definitive pattern in terms of yield and lithological association, granite and its variants are marginally higher yielding than their intermediate and basic counterparts and yield in the granitic terrain is marginally higher than in the khondalitic terrain.

4.5 Ground Water Quality

Based on the chemical analysis of 49 no of water samples collected from NHS stations, the quality of ground water in Koraput district has been assessed. The collected water samples were analysed in the chemical laboratory of south eastern Region as per the standard methods available in literatures. The Ph and electrical conductance (EC at 25.C) of the water sample were determined by the concerned instrument after calibration. The fluoride, iron and nitrate content of the water samples were determined spectrometrically.

The detail chemical analysis data indicate that ground water is slightly acidic to alkaline in nature and is potable. It is to be mentioned here that the chemical analysis data of water samples collected in different years during hydrogeological survey indicate that the higher concentration of nitrate beyond permissible limit (100 mg/l) and also higher cone. of iron are found in isolated pockets of the district. Apart from this a total of 31 nos of samples were collected for Arsenic analysis from NHS station in the district and all the samples were found to contain total arsenic below the
permissible limit Le <0.0001 mg/l.

The suitability for irrigational use of ground water from phreatic zone has been studied based on U.S.S.L. classification of irrigation water by plotting data of Sodium Adsorption Ratio and Sp.

Conductance values. The data indicate that majority of water samples fall either in C_1S_1 or C_2S_1 class of water i.e., low and medium salinity classes. Very few water samples fall in C_3S_1 class i.e., high salinity class. Only in rare cases the samples fall in C_4S_1 class i.e., very high salinity class. All the water samples fall in low sodium hazard group (S_1). This indicate that ground water is fit for most type of crops and in isolated local pockets salt tolerant crops should be grown.

4.6 Status of Ground Water Development (Blockwise)

Hard crystalline rocks occupy major parts of the district, where development of ground water is feasible through dug wells. In the hilly and rugged terrain development of ground water is feasible in the intermontane valleys through dug wells or shallow tube wells. In the flood plains of the river Indravati in Kotapad block alluvial deposits occur as discontinuous patches where shallow tube wells are feasible. Annually replenishable ground water resource of the district is assessed to be 69117 HM and the gross annual draft for domestic, industrial, and irrigation uses is 6530 HM. The average stage of ground water development in the district is 9.45 %.

Table : Blockwise Ground Water Resource of Koraput District (As per March, 2009)

Sl No	Block	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground Water Draft for domestic & Industrial Supply	Existing Gross Ground Water Draft for all uses	Provision for domestic & industrial requirement supply for next 25 years	Net Ground Water Availability for future irrigation development	Stage of Ground Water Development
		(ham)	(ham)	(ham)	(ham)	(ham)	(ham)	(%)
1	2	3	4	5	6	7	8	9
1	Baipariguda	11101.00	244.00	243.00	487.00	322.00	10535.00	4.39
2	Bandhugaon	1396.00	123.00	119.00	242.00	164.00	1109.00	17.34
3	Boriguma	7600.00	455.00	387.45	842.00	431.00	6714.00	11.08
4	Dasmantapur	4377.00	205.00	176.18	381.00	224.00	3949.00	8.70
5	Jeypore	6122.00	211.00	517.32	728.00	337.00	5574.00	11.89
6	Koraput	6511.00	284.00	265.00	549.00	216.00	6011.00	8.43
7	Kotpad	9450.00	398.00	250.26	648.00	259.00	8793.00	6.86
8	Kundra	6331.00	280.00	149.94	429.00	193.00	5859.00	6.78
9	Lamtaput	2849.00	221.00	148.00	369.00	183.00	2445.00	12.95
10	Laxmipur	1628.00	175.00	197.00	372.00	188.00	1265.00	22.85
11	Nandapur	4585.00	212.00	211.19	424.00	286.00	4087.00	9.25
12	Narayanapatna	1627.00	94.00	154.00	248.00	190.00	1343.00	15.24
13	Potangi	2124.00	107.00	155.00	262.00	205.00	1812.00	12.34
14	Similiguda	3416.00	161.00	387.77	549.00	190.00	3065.00	16.07
	District Total	**69117.00**	**3170.00**	**3362.00**	**6530.00**	**3388.00**	**62561.00**	**9.45**

5.0 Ground Water Management Strategy

5.1 Ground Water Development :

As discussed in proceeding chapters, there is an ample scope for large scale grond water

development by ground water structure e.g. dug well, dug cum bore well, bore well and filter point tube well at Hydrogeologically favourable location. Ground water is mainly used for domestic and irrigation purpose and in limited scale for industrial purpose.

Dug well - These are most common ground water absraction structure in koraput district and are feasible in topographic lows in hilly terrain and intermontane valleys. These should tap the maximum thickness of water saturated zone. The standard dugwell may be 10-15 m deep and of 4.5 to 6 m diameter, 1-2 H.P centrifugal pumps may be suitable for dug wells, in areas with deep water table,1 H.P centrifugal pumps may be used. A total of 57159 additional dugwells are feasible in the district.

Dug cum bore well - These are essentially dug wells with a bore drilled through the bottom down to the depth of 25-30 m from ground water level tapping the saturated shallow fracture below the regolith and in the top portion of the hard basement. The wells should be fitted with 2 HP centrifugal pumps.

Filter point / Shallow tube well - About 34.5 sq. km area in parts of Kotpad, Boriguma and Khundra blocks along the Indravati and Kolab river, underlain by flood plain deposists. A cumulative thickness of 4 to 8m of saturated granular zones may be tapped. The tube well should be of 25m deep and of 10-20 cm dia. 5-10 HP centrifugal pumps may be used.

Bore well - These are feasible in fractured and jointed consolidated formations in the district. Exploratory drilling data indicates good scope for ground water development through bore well in Koraput district. The bore wells should 100-120m deep and 15m dia. 2-3 H.P submersible pumps may be suitable for ground water development depending upon the availability of productive water bearing fracture zones.

Since the surface water resource are inadequate and the district often comes under the grip of drought, development of ground water resource may help in expanding irrigated agriculture in the district. The block wise existing ground water structure for irrigation is given in table-10.1

The ground water committee recommended dug wells for ground water development in the district. The feasible numbers of ground water structure i.e., dug well were estimated as 68577 on 2001. The feasible number of ground water structure for 2004 is found to be 57159 for the entire district but the block wise figure is not yet finalized.

The stage of ground water development during 2004 is 6.65% and for the year 2009 it is 9.45% and it is observed that the difference is 2.8%.

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

5.2 Water Conservation & Artificial recharge

Koraput district is mostly traversed by Archaean and Precambrian consolidated formations. The western, northern and south western parts of the district show deeper water condition during post monsoon period due to rapid recessation of ground water level. This is mainly due to prevailing topographic conditions and water table gradient, which facilitates flow of ground water through nalas and rivers and streams as base flows. To arrest the rapid decline of water table in these areas special studies may be taken up to pin point the areas where water scarcity problems are more pronounced during post monsoon and pre-monsoon period. In these pockets suitable sites are required to be pin pointed to adopt artificial recharge techniques and rain water harvesting methods based on site specific

conditions. This artificial recharge will also help in increase in storage and also in improving the quality of water etc. The most feasible artificial recharge and rain water harvesting structures are percolation tanks, nala/contour bunding, small check dams/weirs, renovation of old tanks to percolation tanks, water spreading, gully plugging, gabion structures etc.

6.0 Ground water related issues & problems

The ground water problems include water logging, ground water pollution and depletion of ground water level etc. As such there is no ground water related problems in the district, except for frequent droughts and lower yield prospect. The details are described below

Water logging - As such, there is no water logging condition in Koraput district. An area is considered water logged if the depth to ground water level remains within 0-2m depth range throughout the year. A perusal of the post monsoon depth to water level map indicates that only limited areas are characterized by shallow water table i.e., within 2 m below ground level. However in post monsoon period substantial areas are characterized by 2-4 m depth water level values. Water logging is present in some parts of canal command area.

Ground Water Table Depletion - The stage of ground water development in the different blocks varies from 3.88 to 18.41 percent with 6.65% as the total stage of ground water development. The analysis of water level trend for 10 years period (1996 to 2005) for both pre monsoon and post monsoon period indicate that there is no noticeable change in water levels. This also indicates that no depletion in water table has taken place in the district.

Ground Water Pollution - It has already been discussed in the ground water quality aspect that water from both shallow and deeper zone falls within permissible limit of drinking water standard. Besides these the study of irrigation class of water also indicates that majority of the samples fall in C_1S_1 and C_2S_1 classes. All these facts indicate that there is no incidence of major pollution in the district so far. Only in isolated pockets a little higher concentration of different pollutants may occur in specific time.

7.0 Awareness & Training Activity

As of March 2007, 1 mass awareness and 1 water management programme have been organized in the Koraput district so far.

7.1 Mass Awareness programme(MAP) & Water Management Training Programme(WMTP) by CGWB. : 1 + 1=2

7.2 Participation in Exhibition, Mela, Fair etc. : NIL

7.3 Presentation & Lectures delivered in public forum / Radio / T.V. / Institution of repute / Grassroots associations / NGO / Academic Institutions etc : NIL

8.0 Areas Notified by CGWA / SGWA

Since the stage of ground water development in the entire district is only 9.45 % with no significant decline in either pre-monsoon or in the post-monsoon, no notification was called for.

9.0 Recommendations

1. The existing hydrogeological set up and availability of huge ground water resource indicate that there is scope for development of ground water on large scale.

2. This large-scale development requires block as well as gram panchayat wise detail hydrogeological map on large scale. For this purpose intensive hydrogeological survey and exploratory drilling aided by remote sensing studies and geophysical investigation may be taken up jointly by the State and Central Govt. agencies. This will help in precise delineation of areas suitable for different ground water development structures and will also facilitate for designing different types of ground water extraction structure and defining specification of pumps etc.

3. Suitable steps for renovation of old and defective well may be taken by deepening to pierce the entire thickness of the saturated zones. Steps are to be taken up for speedy energisation of the wells already constructed to ensures optimal utilization of good potentials.

4. Suitable measures may be taken up by the state Govt. for conjunctive use of surface and ground water in canal irrigated areas. This will serve the dual purpose of preventing water logging situation and supplementing the irrigation water supply particularly in the command areas, which faces shortage of irrigation water.

5. Ground water resources may be augmented through adoption of artificial recharge techniques like construction of sub surface dykes, percolation tank etc.,

6. People participation is essential not only for ground water development but also for protecting this valuable natural resource from being polluted and also to avoid over development etc through human interference.

7. Financial institution & bankers should extend necessary co-operation to farmers for grating loan etc for construction & energisation of dug wells.

8. Adoption of best suited cropping pattern will also facilitate to improve the economic situation of this agriculture department district.

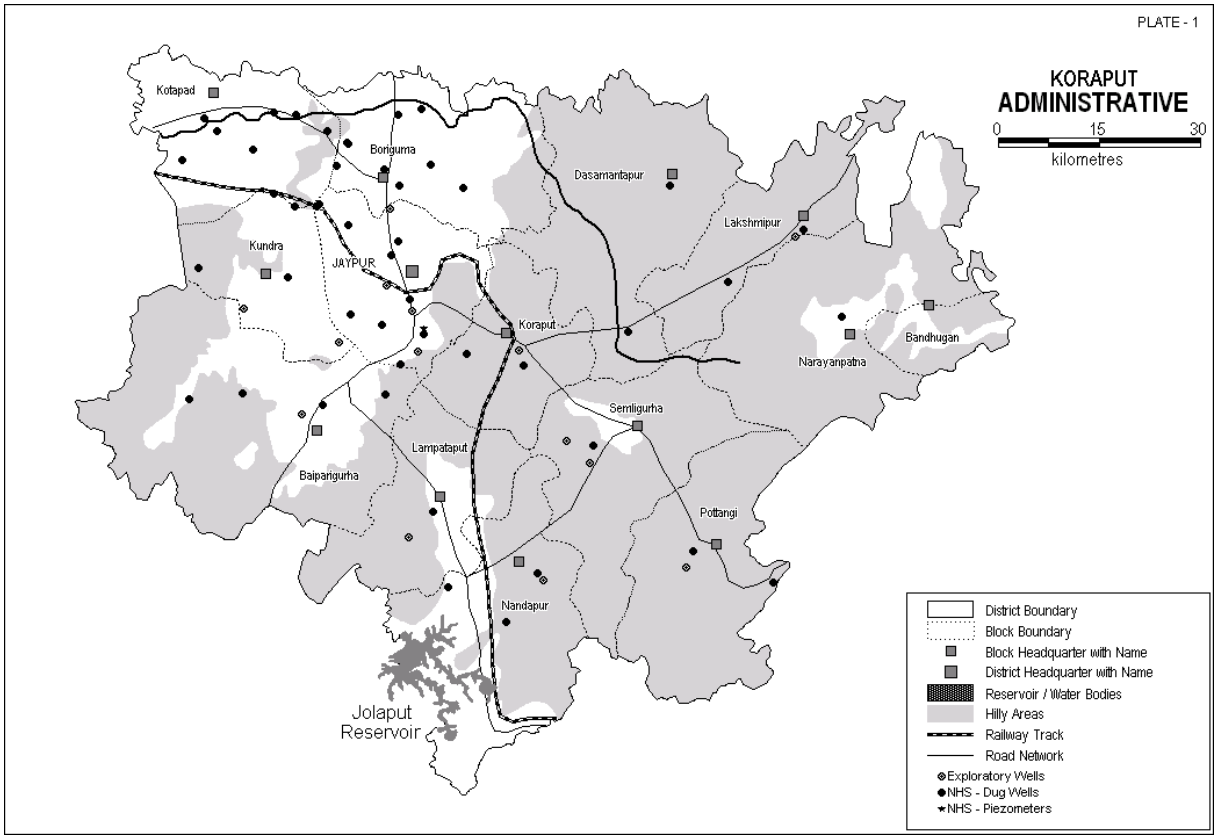


PLATE - 1
KORAPUT
ADMINISTRATIVE
0
15
30
kilometres
Kotapad
Borigumma
Dasamantapur
Lakshmipur
Kundra
JAYPUR
Koraput
Bandhugan
Narayanpatna
Semiliguda
Lamptaput
Baipariguda
Pottangi
Nandapur
Jolaput
Reservoir
District Boundary
Block Boundary
Block Headquarter with Name
District Headquarter with Name
Reservoir / Water Bodies
Hilly Areas
Railway Track
Road Network
Exploratory Wells
NHS - Dug Wells
NHS - Piezometers

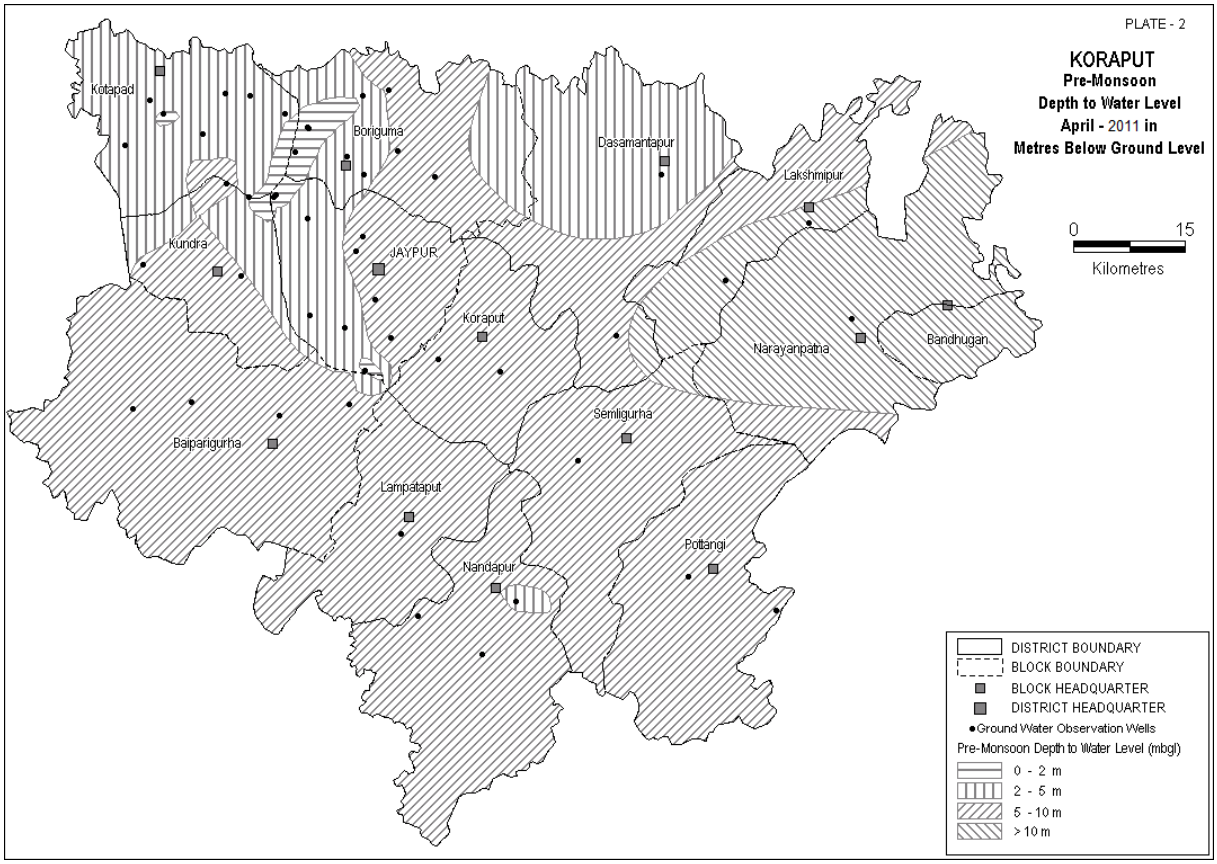


PLATE - 2
KORAPUT
Pre-Monsoon
Depth to Water Level
April - 2011 in
Metres Below Ground Level
0
15
Kilometres
Kotapad
Boriguma
Dasamantapur
Lakshmipur
Kundra
JAYPUR
Koraput
Narayanpatna
Bandhugan
Semiliguriha
Baipariguriha
Lampataput
Pottangi
Nandapur
DISTRICT BOUNDARY
BLOCK BOUNDARY
BLOCK HEADQUARTER
DISTRICT HEADQUARTER
Ground Water Observation Wells
Pre-Monsoon Depth to Water Level (mbgl)
0 - 2 m
2 - 5 m
5 - 10 m
> 10 m

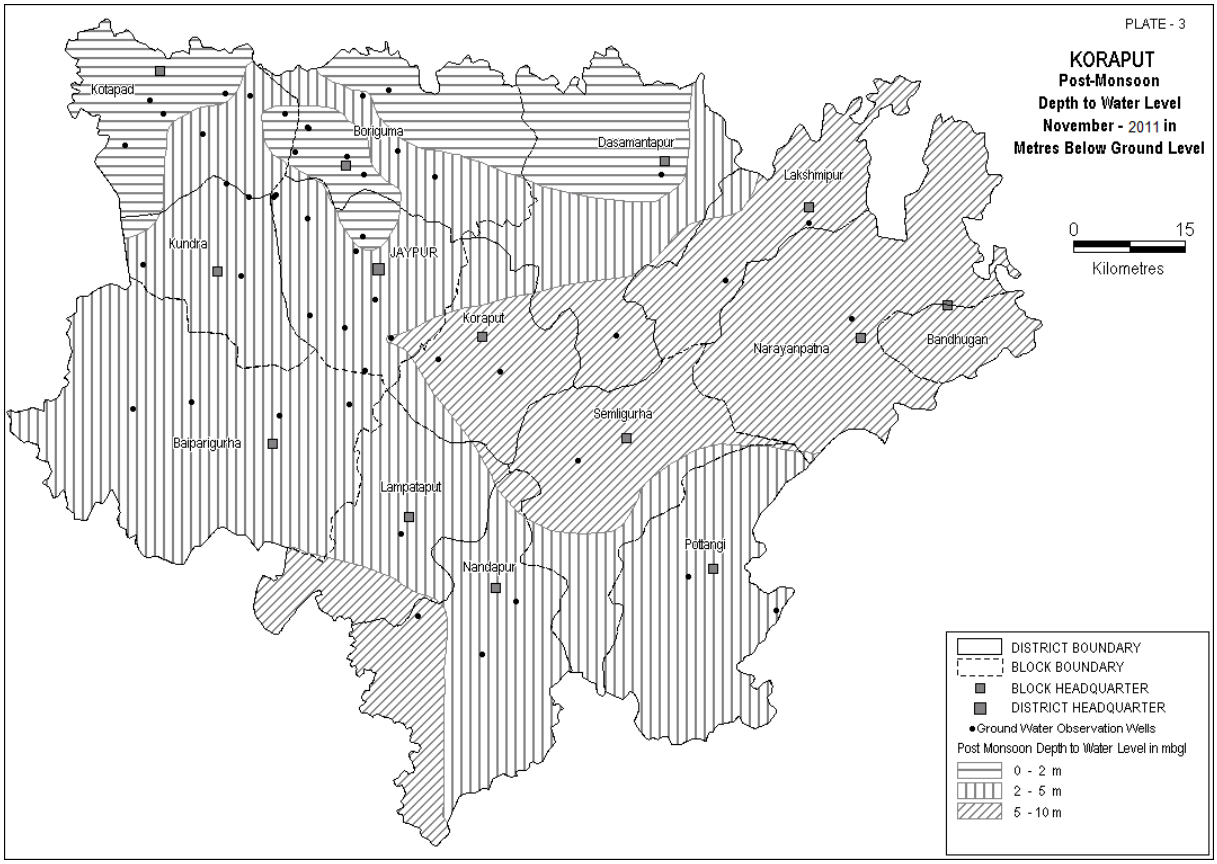


PLATE - 3
KORAPUT
Post-Monsoon
Depth to Water Level
November - 2011 in
Metres Below Ground Level
0
15
Kilometres
Kotapad
Borigumma
Dasamantapur
Lakshmipur
Kundra
JAYPUR
Koraput
Narayanpatna
Bandhugan
Semiliguda
Baipariguda
Lamptaput
Pottangi
Nandapur
DISTRICT BOUNDARY
BLOCK BOUNDARY
BLOCK HEADQUARTER
DISTRICT HEADQUARTER
Ground Water Observation Wells
Post Monsoon Depth to Water Level in mbgl
0 - 2 m
2 - 5 m
5 - 10 m

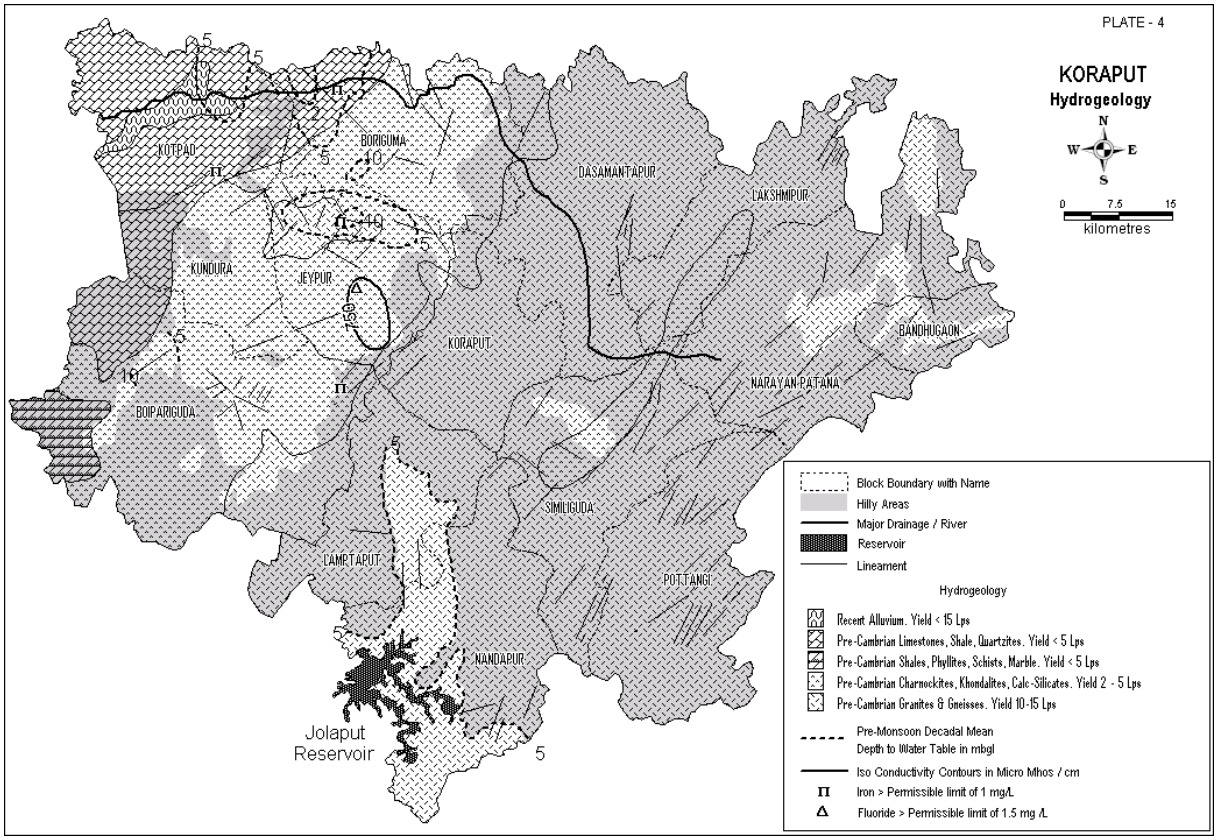


PLATE - 4
KORAPUT
Hydrogeology
N
W
E
S
0
7.5
15
kilometres
KOTPAD
BORIGUMA
DASAMANTAPUR
LAKSHMIPUR
KUNDURA
JEYPUR
KORAPUT
BANDHUGAON
NARAYAN PATANA
BOIPARIGUDA
SIMILIGUDA
LAMPTAPUT
POTTANGI
NANDAPUR
Jolaput
Reservoir
Block Boundary with Name
Hilly Areas
Major Drainage / River
Reservoir
Lineament
Hydrogeology
Recent Alluvium. Yield < 15 Lps
Pre-Cambrian Limestones, Shale, Quartzites. Yield < 5 Lps
Pre-Cambrian Shales, Phyllites, Schists, Marble. Yield < 5 Lps
Pre-Cambrian Charnockites, Khondalites, Calc-Silicates. Yield 2 - 5 Lps
Pre-Cambrian Granites & Gneisses. Yield 10-15 Lps
Pre-Monsoon Decadal Mean
Depth to Water Table in mbgl
Iso Conductivity Contours in Micro Mhos / cm
Iron > Permissible limit of 1 mg/L
Fluoride > Permissible limit of 1.5 mg /L

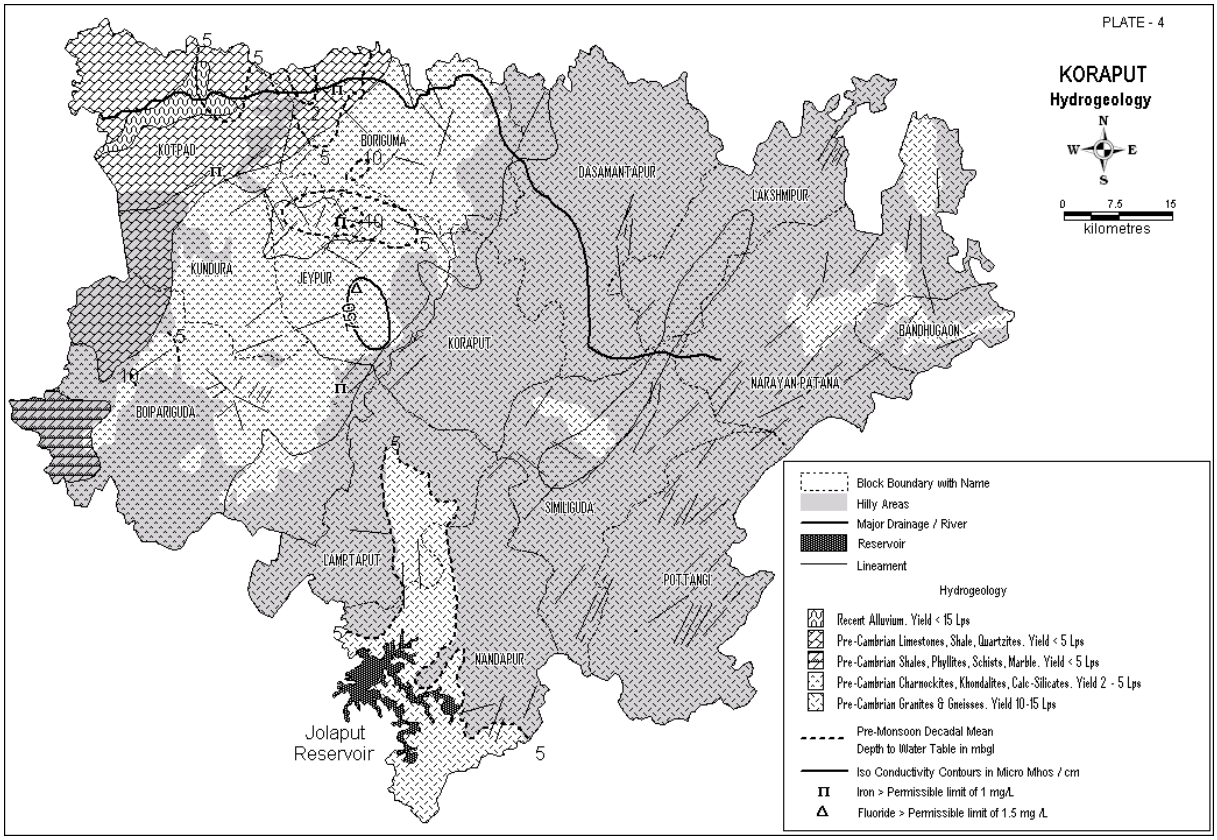
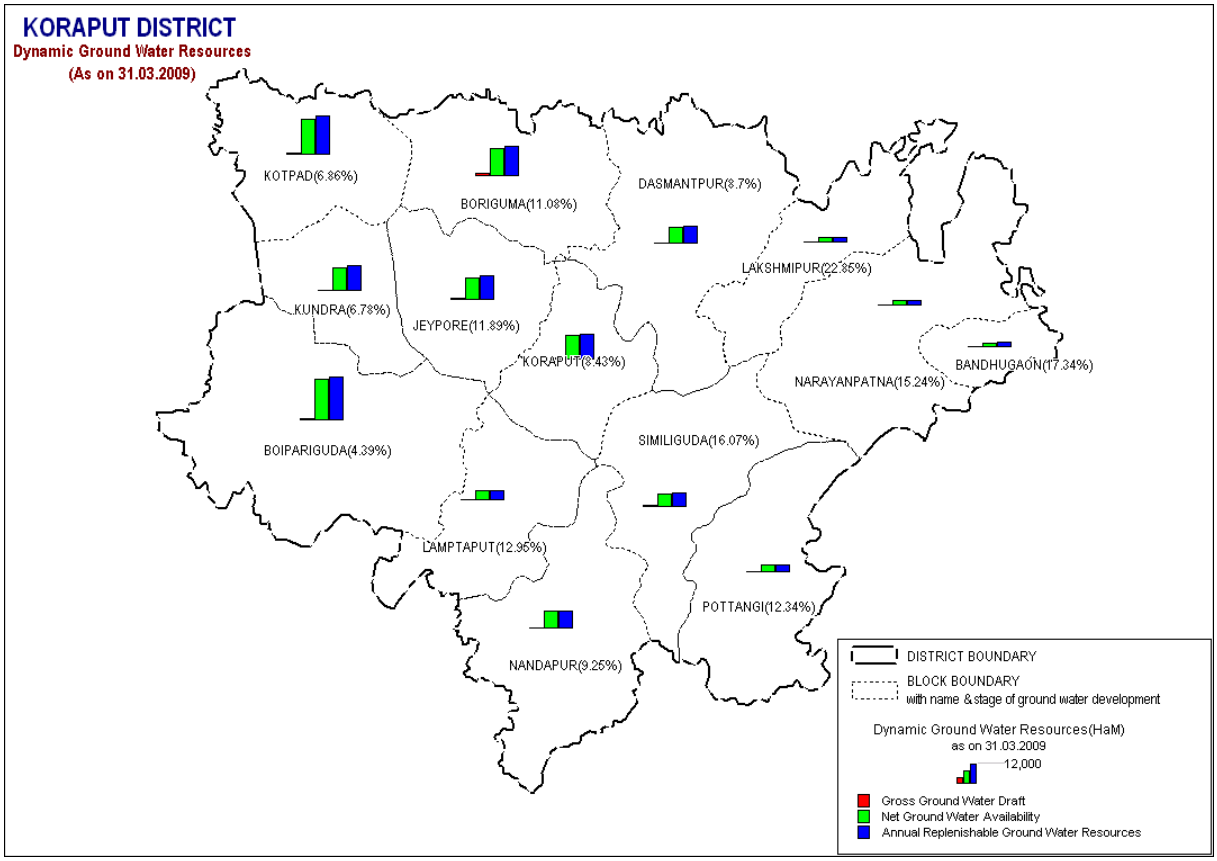
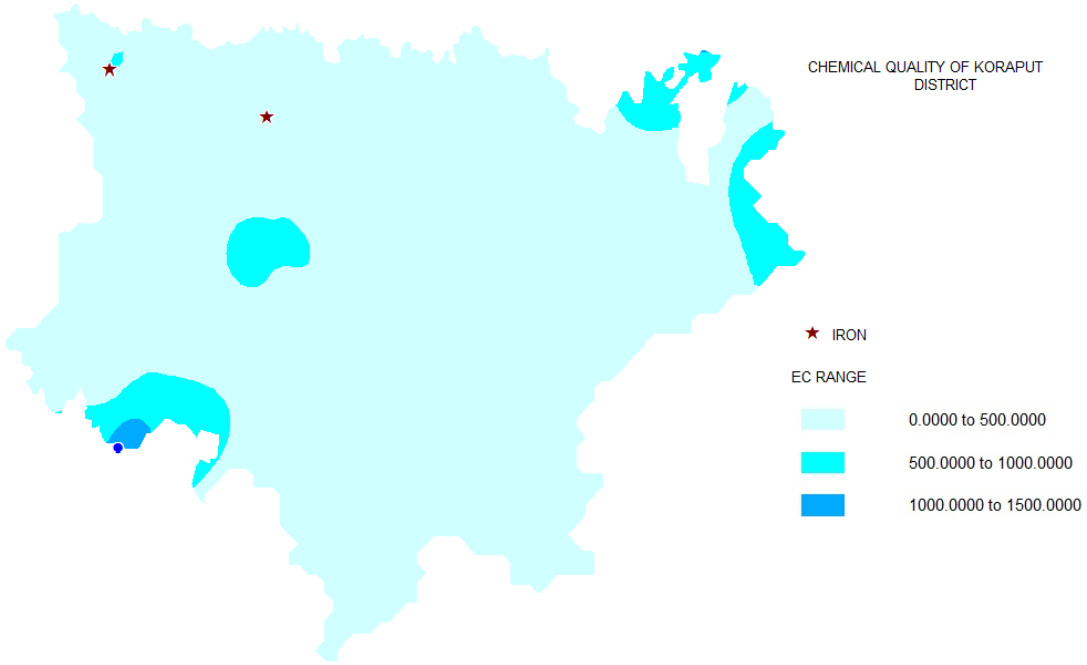


PLATE - 4
KORAPUT
Hydrogeology
N
W
E
S
0
7.5
15
kilometres
KOTPAD
BORIGUMA
DASAMANTAPUR
LAKSHMIPUR
KUNDURA
JEYPUR
KORAPUT
BANDHUGAON
NARAYAN PATANA
BOIPARIGUDA
SIMILIGUDA
LAMPTAPUT
POTTANGI
NANDAPUR
Jolaput
Reservoir
Block Boundary with Name
Hilly Areas
Major Drainage / River
Reservoir
Lineament
Hydrogeology
Recent Alluvium. Yield < 15 Lps
Pre-Cambrian Limestones, Shale, Quartzites. Yield < 5 Lps
Pre-Cambrian Shales, Phyllites, Schists, Marble. Yield < 5 Lps
Pre-Cambrian Charnockites, Khondalites, Calc-Silicates. Yield 2 - 5 Lps
Pre-Cambrian Granites & Gneisses. Yield 10-15 Lps
Pre-Monsoon Decadal Mean
Depth to Water Table in mbgl
Iso Conductivity Contours in Micro Mhos / cm
Iron > Permissible limit of 1 mg/L
Fluoride > Permissible limit of 1.5 mg /L


KORAPUT DISTRICT
Dynamic Ground Water Resources
(As on 31.03.2009)
KOTPAD(6.86%)
BORIGUMA(11.08%)
DASMANTPUR(8.7%)
LAKSHMIPUR(22.85%)
KUNDRA(6.78%)
JEYPORE(11.89%)
KORAPUT(8.43%)
BANDHUGAON(17.34%)
NARAYANPATNA(15.24%)
BOIPARIGUDA(4.39%)
SIMILIGUDA(16.07%)
LAMPTAPUT(12.95%)
POTTANGI(12.34%)
NANDAPUR(9.25%)
DISTRICT BOUNDARY
BLOCK BOUNDARY
with name & stage of ground water development
Dynamic Ground Water Resources(HaM)
as on 31.03.2009
12,000
Gross Ground Water Draft
Net Ground Water Availability
Annual Replenishable Ground Water Resources


CHEMICAL QUALITY OF KORAPUT DISTRICT
IRON
EC RANGE
0.0000 to 500.0000
500.0000 to 1000.0000
1000.0000 to 1500.0000