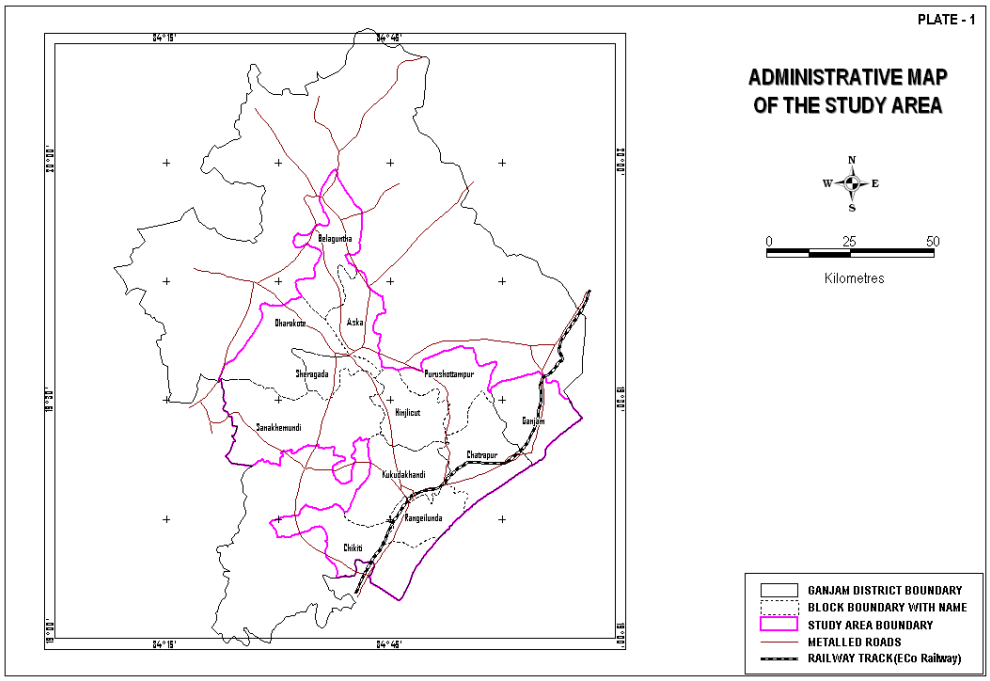
GROUND WATER INFORMATION BOOKLET

GANJAM DISTRICT, ORISSA



Ministry of Water Resources
Central Ground Water Board,SER
Bhubaneswar
March, 2013

DISTRICT AT A GLANCE

Sr. No.	Items	Statistics
1	**GENERAL INFORMATION**	
	(i) Geographical Area (Sq. km)	8706
	(ii) Number of Blocks	22
	(iii) Number of Panchayat	475
	(iv) Number of Villages	3212
	(v) Population as on 2011 Census	3,520,151
	(vi) Average annual rainfall (mm)	1295
2	**GEOMORPHOLOGY**	
	1.Major Physiographic Units	(i)Undulating plains dotted with residual hills (ii)Scattered hill with high relief
	2.Major Drainages	Rushikulya & Bahuda
3	**LAND USE (Hect)**	
	a) Forest Area	57000.0
	b) Net Area Sown	292000.0
4	**MAJOR SOIL TYPE**	Alfisol, Ultisols, Entisols
5	**AREA UNDER PRINCIPAL CROPS**	1. Autumn – 126166 Ha 2. Winter – 1449577 Ha 3. Summer – 53586 Ha
6	**IRRIGATION BY DIFFERENT SOURCES (Area and nos of structures)**	
	1. Canals	(i) Major & Medium Irrigation Project – 130.8 Ha(Kharif) & 13.68(Rabi). (ii) Minor Irrigation Project (Flow) – 103.93 Ha(Kharif); 6.80(Rabi) (iii) Lift Irrigation Project – 25.09 (Kharif); 14.71(Rabi)
	2. Net Irrigated Area	294.36 Ha (Kharif) 70.45 Ha(Rabi)
7	**NUMBER OF GROUN WATER MONITORING WELLS OF CGWB (as on 31.3.2011)**	
	1. No of BoreWells	39

	2. Nos of Piezometers	Nil
8	**PREDOMINANT GEOLOGICAL FORMATIONS**	(i) Eastern Ghat Supergroup of Rocks (Precambrian Crystalline Rocks) (ii) Quternaries
9	**HYDROGEOLOGY** • Major Water Bearing Formations • Pre-Monsoon Depth to Water Level during 2011 • Post-Monsoon Depth to Water Level during 2011 • Long Term water level trend in 10 yrs (2001-2011) in m/yr	Weathered & Fractured Crystalline Rocks 1.05 mbgl to 12.99 mbgl 1.14 mbgl to 11.62 mbgl 53.8% of wells show rise from 0-2m, 7.7% wells show rise from 2-4 m (Pre-monsoon). 58.8% of wells show rise in 0-2 m, 11.8% of wells show rise from 2-4 m (Post monsoon).
10	**GROUND WATER EXPLORATION BY CGWB (As on 31.3.2011)** No of wells drilled (EW,OW,Pz,SH,Total) Depth Range (m) Discharge (lps) Transmissivity(m ²/day)	E/W - 15 (Departmental) O/W – 4 (do) E/W-18 (Outsourcing) Total – 34. 90 – 200m Negligible to 25 0.5 to 116
11	**GROUND WATER QUALITY** Presence of Chemical constituents more than permissible limit (e.g. EC ,F,AS, Fe) Type of water	EC and F value higher in limited patches. Normal(pH 7.12 to 8.19 mg/ltr)
12	**DYNAMIC GROUND WATER RESOURCES (2009 in Ham)** 1. Annual replenishable Ground Water Resources	**114541.00**

	2. Net Annual Ground Water Draft 3. Projected demand for domestic and industrial uses up to 25 years 4. Stage of Ground Water Development	6969 9203 29.17%
13	**AWARENESS AND TRAINING ACTIVITY** Mass Awareness Programmes organized Data Place No of Participiants	One
	Water Management and Training Programmes Organised Data Place No of Participiants	Nil
14	**EFFORTS OF ARTIFICIAL RECHARGE & RAIN WATER HARVESTING** Projects compiled by CGWB (No & Amont spent) Projects under technical guidance of CGWB (numbers)	 Nil Nil
15	**GROUND WATER CONTROL AND REGULATION** No of OE Blocks No of Critical Blocks No of Blocks Notified	 Nil Nil Nil
16	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	Groundwater pollution & depletion in parts of blocks

1.0 INTRODUCTION

Ganjam district is broadly divided into two divisions, the coastal plains area in the east and hill and table lands in the west. The eastern ghats run along the western side of the district. The plains lies between the eastern ghats and the Bay of Bengal. Since the hills are close to the sea, the rivers flowing from hills are not very long and are subject to sudden floods. The plains are narrow because of the absence of big rivers. The coastal plains in the east contain more fertile and irrigated lands. Towards the centre and south it is hilly with beautiful well watered valley. The south eastern portion is fertile. The extreme north east is occupied by a portion of the famous Chilika lake.Spreading over an area of 8206.0 Sq.km, it is surrounded by Kandhamal in the North-West, Nayagarh in the North, Khurda in the North-East, Gajapati district in the West and Bay of Bengal in the South-East. On its Southern periphery the district borders the state of Andhra Pradesh.

1.1 Land Holding Patthern

Ganjam has total geographical area of 8206.00 sq.km., having forest area of 3149.9 sq.km and total cultivable area of 434000 ha. The permanent pasture and grazing land comprises 20,000 ha. area out of the total area. The barren and un-cultivable waste land comprises 37,000 ha. area and total fallow land 28,000 ha.

1.2 Agriculture

Agriculture is the backbone of the economy and around 80% people of Ganjam district depend on Agriculture and Allied Activities. Gross cropped area of Ganjam is estimated at 6.4 lakh ha.The total irrigated area so far surveyed is 293192 ha. for Kharif and 58730 ha. for Rabi crops. Therefore nearly 50% of the gross cropped area has got the possibility of getting irrigation facilities. As against this potential only 2.83 lakh ha. get actual irrigation facility to grow various crops. Therefore only 41.54% crops get irrigation facility. Different crops are sown under rainfed condition in nearly 58% of the cultivated areas. Except Jagannath Prasad block all the blocks of Ganjam have more than 35% of the cultivable land having irrigation facility from various sources. A variety of crops like paddy, groundnut, sugarcane, maize, oil seeds, millets, green gram, black gram, horse gram etc. are grown in the district.

1.3 Forest

The district is rich in mountains and forests, some valuable wood like Sal, Teak, Gambhari are found in plenty in the forests. Forest products like Bamboo, Medicinal plants of various types, Jhuna, Mahul, Lakha, Sal leaves influence its economy. The total coverage of the present forest area is 3149.9 sq.km. in Ganjam out of which the area of reserved forests is 1485.69 sq.km. demarcated forest is 143.54 sq.km., un-classified forest is 0.86 sq.km. and un-demarcated protected forest area is 1167.36 sq.km.

2.0 RAINFALL & CLIMATE

The district is characterized by an equitable temperature all through the year, particularly in the coastal regions. The average annual rain fall of the district is 129.60cms. The rainfall generally increases from the coast towards the interior hilly
tracks of the district. The relative humidity is high throughout the year specifically in coastal areas. Winds are fairly strong particularly in coastal regions in summer and monsoon months

3.0 GEOMORPHOLOGY & SOIL TYPE

PHYSIOGRAPHY, & LANDFORM

The area belongs to the Eastern Ghat hill ranges and mostly presents a highly undulating topography with scattered isolated hillocks and mounds with an average altitude between 40 to 140 m amsl, intermontane valleys, gently undulating narrow plains covered by Quaternary sediments deposited by Rushikulya river. Transported laterites, near the delta of Rushikulya, form low uplands. The coastal dunes occupy considerable area.

GEOMORPHIC FEATURES

The major geomorphic units occurring in the area are Structural hills, denudational hills, residual hills, inselbergs, linear ridges, pediments, intermontane valleys, buried pediments, flood plains, coastal plains, sand dunes, mud flats etc The area maintains a general slope towards the coast. A brief description of the major hydrogeomorphic units (After Panda et.al., 2000; Panda et.al., 2003) are given below:

Denudational Hills: These are group of massive hill ranges interspersed with intermontane valleys. Compositionally, these hills are either Granite Gneisses/ Khondalites or Charnockites and are traversed by fractures and lineaments. Generally, they act as high run off zones. Deeper aquifers in this unit are controlled by fractures/ lineaments.

Structural Hills: These are groups of curvilinear, folded hill ranges. Compositionally these hills consist of Khondalites/ Charnockite suite of rocks and are structurally controlled by complex folding, joints/ fractures. Deeper aquifers are controlled by joints/ fractures.

Residual Hills: These units are characterized by massive hill ranges of moderate dimensions and surrounded by gently undulating plains all around. Compositionally these hills are either Granite Gneisses/ Khondalites or Charnockite suite of rock. Ground water potential is poor.

Inselberg: These are isolated hills of limited aerial extent, surrounded by plain land all around. Ground water potential is poor.

Intermontane Valley: These are almost flat valleys, surrounded by hill all around. Owing to their topographic disposition these units are highly favourable locii for ground water occurrence.

Gorge: This a isolated feature of very limited aerial extent and present near the Barada-Munishipentha village.

Valley Fill: These units are interspersed within hill ranges and are of very limited aerial extent. Since these are mostly made up of unconsolidated sediments, their ground water potential is usually good to excellent.

Weathered Buried Pediments: These units are characterised by presence of relatively thicker alluvial, colluvial or weathered materials. Depending upon the thickness and depth of the buried materials they can be broadly classified as Shallow(Depth 0-5m), Moderate(Depth 5-20m) and Deep(Depth more than 20m). These units are either developed on granite gneisses or khondalite/ charnockite suite of rocks. Depending on the thickness and depth of the unconsolidated material, the ground water potential is moderate to good.

Pediment: These are massive to well foliated, highly folded and faulted, broad, gently sloping rock floor covered with a thin veneer of weathered material. Ground water occurrence is poor to good, depending on the presence of fracture/ lineaments.

Flood Plains: These are narrow stretches of alluvium occurring along river course. Ground water potential is usually very good, depending on the presence and amount of the porous and permeable sediment.

The slope of all categories of hills vary from 15% to 35%, whereas that of pediments vary from 3 to 15%. All the weathered units (Buried pediments and pediplains), flood plains show slope of less than 3%. The slope of coastal plain is around 1%.

SOIL

Three major type of soils are present in the study area and they can be briefly described as:

1. ***Alfisols:*** These are red loamy soils and red sandy soils and occupies the major part of the area.
2. ***Ultisols:*** These are lateritic soils and are common in the hill slope in the north and north-eastern part of the study area, bordering alluvial deposits and also occur in patches in uplands, especially as capping over country rocks, particularly khondalites.
3. ***Entisols:*** These are coastal sandy soils, which occur in the south and south-eastern part of the study area, as narrow elongated patches. Beside these, coastal alluvial soils are also a dominant soil type in the area which is prevalent along the Rushikulya flood plain and delta area.

4.0 GROUNDWATER SCENARIO

4.1 GENARALIZED GEOLOGY

Major part of the area is underlain by the hard crystalline rocks of Archaean age. Sediments of recent to sub-recent age occur along the narrow coastal tract and as discontinuous patches along the Rushikulya river. Laterite also occurs in the area as capping over the older formations i.e. Khondalites. The generalized stratigraphic sequence of the study area is given below:

Recent to Sub-Recent	Alluvium	Sand, Silt, Clay in varying proportions.
	Laterite and Lateritic gravels	
~~ UNCONFORMITY ~~~~~~~~~~~~~~~~~~~~~~		
Archaean	Eastern Ghat Granitic Suite	Pegmatite and Quartz veins, Porphyritic and non porphyritic Granites, Granite Gneisses, Garnetiferous Granite Gneiss,
	Charnockite Suite	Hypersthene Granite Gneiss, Basic Pyroxene Granulites,
	Khondalite Suite	Quartz-garnet-sillimanite schists and gneisses, Quartzites, Calc-Silicate rocks

The crystallines of Eastern Ghat Group comprises of granite, granite gneisses, Khondalites, Charnockites, Pegmatite and quartz veins. A brief description of the litho units are described below:

Granite and Granite Gneisses: Granite and granite gneisses and their variants constitute the most predominant rock type in the study area. They belong to both porphyritic and non-porphyritic varieties. Their intrusive nature is evident by contact effects, quartzo-feldspathic veins, tongues and apophyses along the foliation planes of older formations. These rocks are usually grey to light grey in colour and are fine to medium grained in texture.

Khondalites: Khondalites are a metasedimentary origin rocks which is compositionally quartz-feldspar-garnet-sillimanite±graphite bearing schist/ gneiss(Walker, 1902), quartzite and calc silicate gneiss and granulites which represents the metamorphosed argillaceous, areanaceous and calcareous sediments respectively. These rocks are usually greyish brown to reddish brown in colour, foliated and displays gneissic banding. Most of these Khondalite outcrops are highly weathered, kaolinised and often topped by a lateritic capping. Variants like Leptynites are less common. Occurrence of quartzites and calc silicates are sporadic and very limited. These are usually fine grained and light grey in colour. These are the chief source of rare earth mineral, which occurs in the coastal tracts near Gopalpur on sea, as beach placers, in economic proportions and are being mined by Indian Rare Earths Limited.

Charnockites: Charnockite suite of rocks include the hypersthene bearing rocks of granodioritic and granitic composition (intermediate and acidic types). They are fine to medium grained, massive, hard and recognized by greyish black colour and greasy lustre with presence of smoky grey quartz and sometimes garnetiferous.

Pegmatites and Quartz veins: The country rocks are traversed by numerous pegmatites and quartz veins. Pegamites are coarse grained comprising mainly of quartz, feldspar and muscovites. The quartz veins generally intrude into the older formations along foliation planes, especially along the shear zones.

Laterites and Lateritic Gravels: Laterites are reddish, porous, concretionary materials occurring as capping over the older formations. Compositionally they vary widely and with that the colour too varies from reddish to yellowish and light grey with increasing alumina content. The thickness of the laterite capping varies from 8 to 20m.

Alluvium: Alluvium of Recent to Sub-Recent occurs as thin (10 to 42m) discontinuous patches along the drainage channel of Rushikulya and its major tributaries. A narrow strip of alluvium also occurs along the coastal part. The alluvium comprises of fine to coarse grained sands, gravels and brownish to grey sticky clay(probably of marine origin). The thickness of this formation is maximum in the near vicinity of the river channels and gradually reduces away from it.

STRUCTURE

The area is a part of the Eastern Ghats. The rocks of the area have undergone polyphasic deformational episodes on a regional scale. This is evident from structural features like foliations, joints, folds, faults etc. Gneissosity and foliations are well developed in khondalites and granitic rocks. Crude foliations are also common in Charnockites. Two major ductile deformational episodes (Narayanswamy, 1975) could be recognized in this area. The Earlier folds (both normal and isoclinal) are with ENE-WSW and NE-SW axial trends. The later phase produced cross folds about N-S and NNW-SSE axial trends. The dominant NE-SW foliation is observed is the result of regional NE-SW folding. Structural analysis done by Prabhakar Rao et.al., 1982, from Landsat imageries revealed at least five major tectonic events represented by NE-SW, ENE-WSW, N-S, NW-SE and NNE-SSW tectonic trends in chronological order. The major NE-SW, NW-SE, N-S and E-W lineaments are closely related to the fold movement.

HYDROGEOLOGY

Water bearing formations

The contrasting water bearing properties of different geological formations usually play an important role in the occurrence and movement of groundwater. The crystalline rocks occupy major part of the total geographical area. The narrow discontinuous patches of recent to sub-recent alluvium along the major river courses and on coastal plain occupy about 300sq. km. area in the district. Hydrogeologically the weathered and fractured zones of the crystallines and the porous alluvial and coastal deposits form the main repository of ground water in the area. Depending on the water yielding properties of various formations, the district can be broadly grouped into three distinct hydrogeological units.

1. Consolidated formations
2. Semiconsolidated formations
3. Unconsolidated formations

Consolidated formations

These include granites and granite gneisses, khondalites and charnockites of Eastern Ghat Group. These rocks are devoid of primary porosity and are usually very hard and compact in nature. The secondary porosity in the consolidated formations developed as result of weathering and fracturing due to major and minor tectonic movement form the conduits for movement of groundwater as also act as reservoir of groundwater. This fractured and jointed rocks when interconnected form potential aquifers, which sustain limited to moderate yield. Groundwater occurs under water table conditions in the weathered residuum while it occurs under semi-confined to confined conditions in the fractured and jointed rocks.

Occurrence movement and distribution of ground water in each unit

Granites and Granite gneisses

The most prevalent rock types occurring in the district are granite and granite gneisses. These rocks reduce to loose kaolinised granular material on weathering. The thickness of weathered mantle ranges from 5 m to 15 m and sometimes up to 25 m. The weathered, fractured and fissured granites, granite gneisses occurring on topographic low form potential aquifers. Groundwater can be developed through dug, dug cum bore wells in other locales. Porphyritic granite gneisses have comparatively thicker weathered mantle than the garnetiferous granite gneisses. The yield of the wells depends upon the thickness of the water-saturated zone as also number of intersecting fractures tapped. The depth of open wells generally ranges from 5.8-18.0 m below ground level. The depth to water levels during pre-monsoon season varies from 1.75 m to 13.5 m and during post-monsoon season from ground level to 1.1-14.0 m below ground level. The specific capacity index of open wells in this formation varies from around 0.9-4.0 lpm/m^2. The yield of the existing open wells generally varies from 20-30 m^3 / day. Discharge of borewells varies from 0.50 to 15.78 lps for drawdown of 5.63 to 35.05 m.

Khondalites

These are metasediments, well foliated, jointed and intensely weathered; khondalites have undergone high degree of weathering down to a depth of more than 20 m. Although the interlacing joints and sheared surfaces form potential receptacles of ground water, preponderance clayey material reduces the permeability of the formation. The weathered and fractured rocks form the aquifers and can be developed through dug well, dug cum bore well and bore well in the low lying areas. The depth of the open wells

ranges from 6.7 m to 13.8 m below ground level. The depth to water level during premonsoon period ranges from 1.7 m to 10.6 mbgl. and during postmonsoon period from 1.94 m to 6.7 mbgl. The pumping test analysis in the open wells indicate that specific capacity index of the formation varies from 1.73 to 12.83 lpm/ m^2. The yield of irrigation dugwells ranges from 15-25 m^3 / Day.

Charnockites

The charnockite suite of rocks in the area are usually very hard and compact, generally occupying high hills. Weathering is not pronounced. These are generally devoid of significant groundwater storage due to scarcely developed joints and fractures. The thickness of weathered mantle ranges from 5 to 10 m only. The average depth of open wells varies from 6.5 to 12.5 mbgl. The depth to water level in open wells varies from 4.28 m to 11.4 mbgl in premonsoon period and from 2.97 m to 6.0 mbgl in postmonsoon period. The specific capacity index of the formation is in the order of 2 lpm / m^2 yield of irrigation dug well is around 10 –20 m^3 / day .

Semi consolidated formations

Laterites constitute the semi consolidated formation. These are highly porous in nature and are formed as capping over the older crystalline formations in the upland areas. Laterites form very good near surface aquifers to be tapped through dug wells and dug cum bore wells. The laterite profile extends down to a depth of 8 to 20 m. The depth of open wells ranges from 6.0 to 12.1 m. The depth to water level varies from 4.46 to 7.8 mbgl in the premonsoon period and from 2.97 to 4.5 m bgl in the postmonsoon period. Because of restricted areal extent the aquifers have limited development potentials.

Unconsolidated formations

Alluvium of sub recent to recent age constitutes the unconsolidated formations.

The recent deposits in the flood plains of the Rushikulya river form the most potential aquifers in the district due to high degree of porosity and permeability. The long, narrow strip of coastal alluvium also play an important role as a very good shallow aquifer, which can be tapped through open wells only. Otherwise salinity hazards are inevitable. The alluvium comprises of an admixture of gravel, sand and clay derived from eroded and weathered country rocks. Ground water occurs under confined to semi- confined condition and is developed through shallow tube wells & dug wells. A number of open wells and shallow tube wells have already been constructed in the alluvium. Due to interference of collector wells tapping alluvium, located in Bada Madhapur, Barang area near Chatrapur, open wells and shallow tube wells go dry in peak summer time in an area of about 1.5 km radius. The thickness of flood plain deposits varies from 10 to 42 m in the Rushikulya basin.

The depth open wells range from 4.2-9.8 mbgl. The depth to water level varies from 1.98 m to 7.22 mbgl in pre-monsoon period and from 1.6 to 4.2 mbgl in post monsoon period. Specific capacity index of the formation varies from 5 to 50 lpm / m^2. Yield of irrigation dugwell ranges from 30-40 m^3 / day.

Shallow tubewells tapping about 6 to 12 m of saturated granular zones record a discharge of 5 to 26 lps for a drawdown of 3 to 6 m.

Depth to Water Level : The occurrence and movement of ground water and seasonal water table fluctuation were studied through hydrograph network stations monetarily data collected in pre and post monsoon period of 2011. Based on monitoring data depth to water level zone maps for pre-monsoon and post-monsoon periods have been prepared. The depth to water level during pre-monsoon (April-11) ranges from 4.5 to 11.9m below ground level and from 1.3 to 6.97m below ground level during post-monsoon period (Nov,11).

Seasonal Fluctuation : The study of the water table fluctuation data shows that in the major part, fluctuation of the water table is in the range of (1.5 to 2.3m and 2.5 to 4m).

GROUND WATER EXPLORATION:

Till March, 2011, total 139 wells have been drilled by the Departmental Exploration Programme. 13 wells are drilled through Accelerated Exploration Drilling Programme (AEDP).

GROUND WATER RESOURCES :

Blockwise ground water resource estimation has been based on norms recommended by Ground Water Estimation Committee (G.E.C 1997) and presented in below. The total ground water resource of the district is assessed to be 114541.00 hectare meter (HM). The annual draft for irrigation use by all structures is 4468 hectare meter and the gross annual draft for all uses is 6969 hectare meter. Thus a net balance of ground water resource of 16906 HM is available for future irrigation development in the district. The present stage of ground water development has been estimated to be 24.65%. Kashinagar block shows the highest development of (37.12%) than the other blocks in the district.

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	4	5	6	7	8	9	10
1	Aska	4461.00	1895.00	427.51	2323.00	537.00	2029.00	52.07
2	Belaguntha	4124.00	1176.00	297.75	1474.00	368.00	2579.00	35.74
3	Bhanjanagar	9120.00	1452.00	332.06	1784.00	455.00	7213.00	19.56
4	Buguda	5565.00	928.00	297.80	1226.00	391.00	4246.00	22.03
5	Chhatrapur	5794.00	1206.00	388.41	1595.00	392.00	4196.00	27.53
6	Chikiti	4619.00	1455.00	185.87	1641.00	261.00	2903.00	35.53
7	Dharakote	4611.00	883.00	269.33	1152.00	359.00	3369.00	24.98
8	Digapahandi	7569.00	1159.00	335.29	1494.00	469.00	5941.00	19.74
9	Ganjam	2865.00	1375.00	204.94	1580.00	208.00	1282.00	55.15
10	Hinjilicut	4031.00	1683.00	277.22	1960.00	386.00	1961.00	48.62
11	Jaganathprasad	8051.00	1040.00	285.00	1325.00	374.00	6637.00	16.46
12	Kabisuryanagar	3379.00	784.00	315.91	1100.00	405.00	2190.00	32.55
13	Khalikote	4292.00	1191.00	330.00	1521.00	528.00	2573.00	35.44
14	Kodala	3857.00	720.00	323.44	1043.00	445.00	2692.00	27.04
15	Kukudakhandi	6400.00	769.00	323.53	1093.00	417.00	5213.00	17.08
16	Patrapur	4345.00	882.00	309.06	1191.00	403.00	3060.00	27.41
17	Polasara	4568.00	922.00	343.22	1265.00	487.00	3159.00	27.69
18	Purusottampur	5283.00	2059.00	401.56	2461.00	525.00	2699.00	46.58
19	Rangeilunda	3975.00	1010.00	334.17	1345.00	411.00	2554.00	33.84
20	Sanakhemundi	5753.00	1190.00	361.69	1551.00	503.00	4061.00	26.96
21	Shergada	3676.00	1179.00	299.23	1478.00	426.00	2071.00	40.21
22	Sorada	8203.00	1479.00	325.92	1806.00	453.00	6271.00	22.02
	District Total	**114541.00**	**26437.00**	**6969.00**	**33408.00**	**9203.00**	**78899.00**	**29.17**

GROUND WATER QUALITY :

Ground water quality depends upon the lithological and chemical composition of the aquifer, climate condition, quantum of recharge made and its movement, micro organisms activity and presence of contaminants in the environment etc. The water samples collected from the national hydrograph stations during ground water monitoring work hydrogeological surveys are analyzed in the chemical laboratory of CGWB for assessing ground water quality.

As per the standards of the ISI mostly ground water of Gajapati district is suitable for drinking purpose except for a few places in granitic & Khondalitic terrain where NO_3 and Fe connection exceed the permissible limits which may be attributed due to local pollution.

The suitability of ground water for irrigation use depends on the degree of tis mineralization and the effects of the dissolved constituents on plants and the soil. High Sodium concentration reflects reducing permeability of the soil as for as the suitability for irrigation purpose is concerned. The sodium absorption ration (SAR) is important for studying the suitability of ground water for irrigation purpose. From chemical analysis data, it is observed that ground water can be used for irrigation with moderate teaching and moderate salt tolerant crops. It is also suitable for forest product industries, broiler feed and livestock use. The ground water from deeper aquifers, of few exploratory wells mainly restricted in the southern part of the district also reveals that the water is suitable for drinking and irrigation use.

STATUS OF GROUND WATER DEVELOPMENT :

Ground water development in the district is mainly through dug wells, Dug-cum-bore wells, bore wells & shallow tube wells. Ground water is mainly used for domestic and irrigation purpose and in a few small industrial purpose.

Dug wells are most common ground water abstraction structure in the district. Specially in shallow water table area with a thick cover of weathered mantle. The dug wells of 9 to 12m depth, diameter 4.5 to 6m in such suitable pumps. The yield may be upto 2 lps. Such dug wells may irrigate upto 4 ha area of land. Approximately a total of 19323 additional dug wells for irrigation use are feasible in the district.

Bore wells, -Bore wells are suitable structure, even in the areas of deeper water level and hard rocks are encountered at diameter of 150mm. (Depending upon the discharge and draw down of the bore wells suitable 2 HP submerisible pumps may lift yield upto 10 lps in some cases).

5.0 Ground Water Management Strategy

Ground water development: The existing irrigation facilities of t he district are inadequate to meet the requirement of agricultural production. There is large scope for groundwater development by sinking open wells, dug cum bore wells, bore wells and tube wells as hydrogeologically feasible areas.Table below :

Artificial Recharge & Rainwater Harvesting: Although Ganjam district does not represents drastic fall of depth to water level then also there are scope for implementating artificial recharge structure and rainwater harvesting structures here. The district shows rugged terrain where there is high surface run off in comparison to the rate of infiltration. The ground water resource can be augmented through adoption of artificial recharge techniques like construction of sub surface dykes, percolation tank, gully plugging etc.

6.0 Ground Water related issues & Problems

Ground Water Problems : There is no significant ground water problems. There are water quality problems in very few locales of the district.

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7.0 Awareness & Training Activity

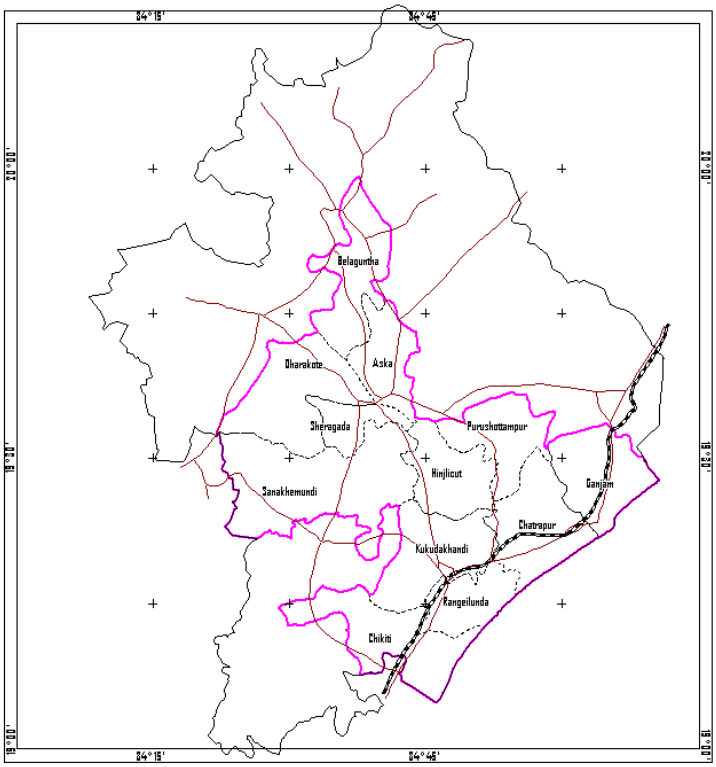
There was no Mass Awareness & Training Activity in the district of Raygada.

8.0 Areas Notified by CGWA

The stage of Groundwater development is well within Safe Category and there is no overexploitation and major threat of Groundwater pollution and depletion. Hence no area has been notified by CGWA.

9.0 Recommendations

PLATE - 1



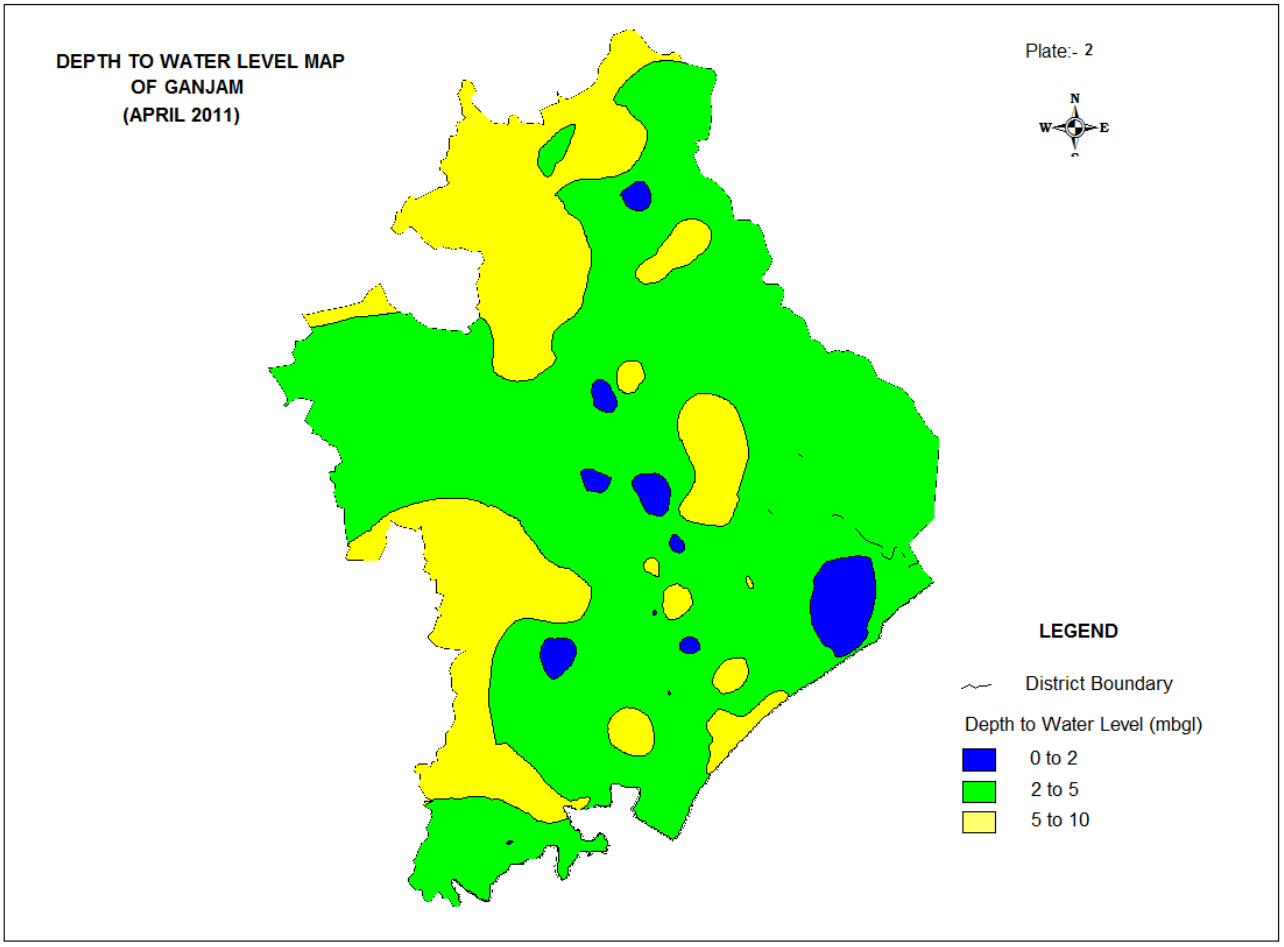
ADMINISTRATIVE MAP OF THE STUDY AREA

N
W E
S

0 25 50

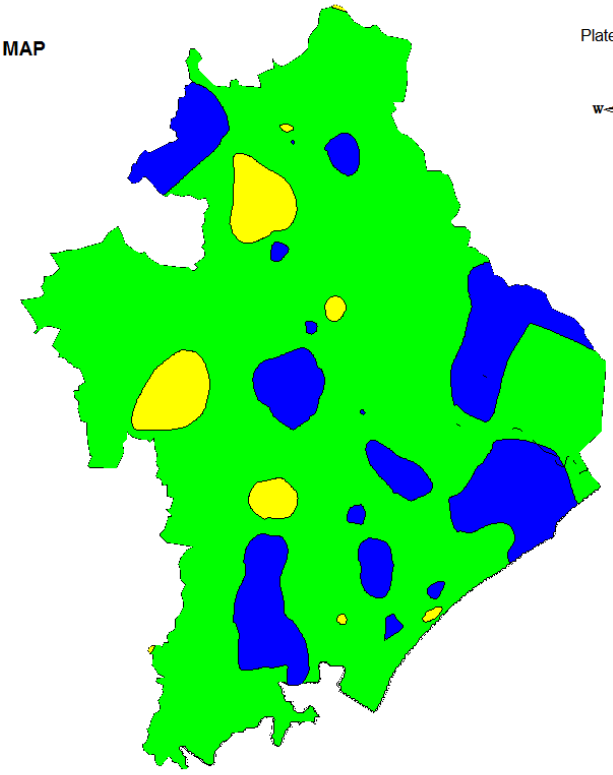
Kilometres

GANJAM DISTRICT BOUNDARY
BLOCK BOUNDARY WITH NAME
STUDY AREA BOUNDARY
METALLED ROADS
RAILWAY TRACK(ECo Railway)


DEPTH TO WATER LEVEL MAP
OF GANJAM
(APRIL 2011)
Plate:- 2
N
W
E
LEGEND
District Boundary
Depth to Water Level (mbgl)
0 to 2
2 to 5
5 to 10

DEPTH TO WATER LEVEL MAP
OF GANJAM
(NOVEMBER 2011)

Plate:- 3



LEGEND

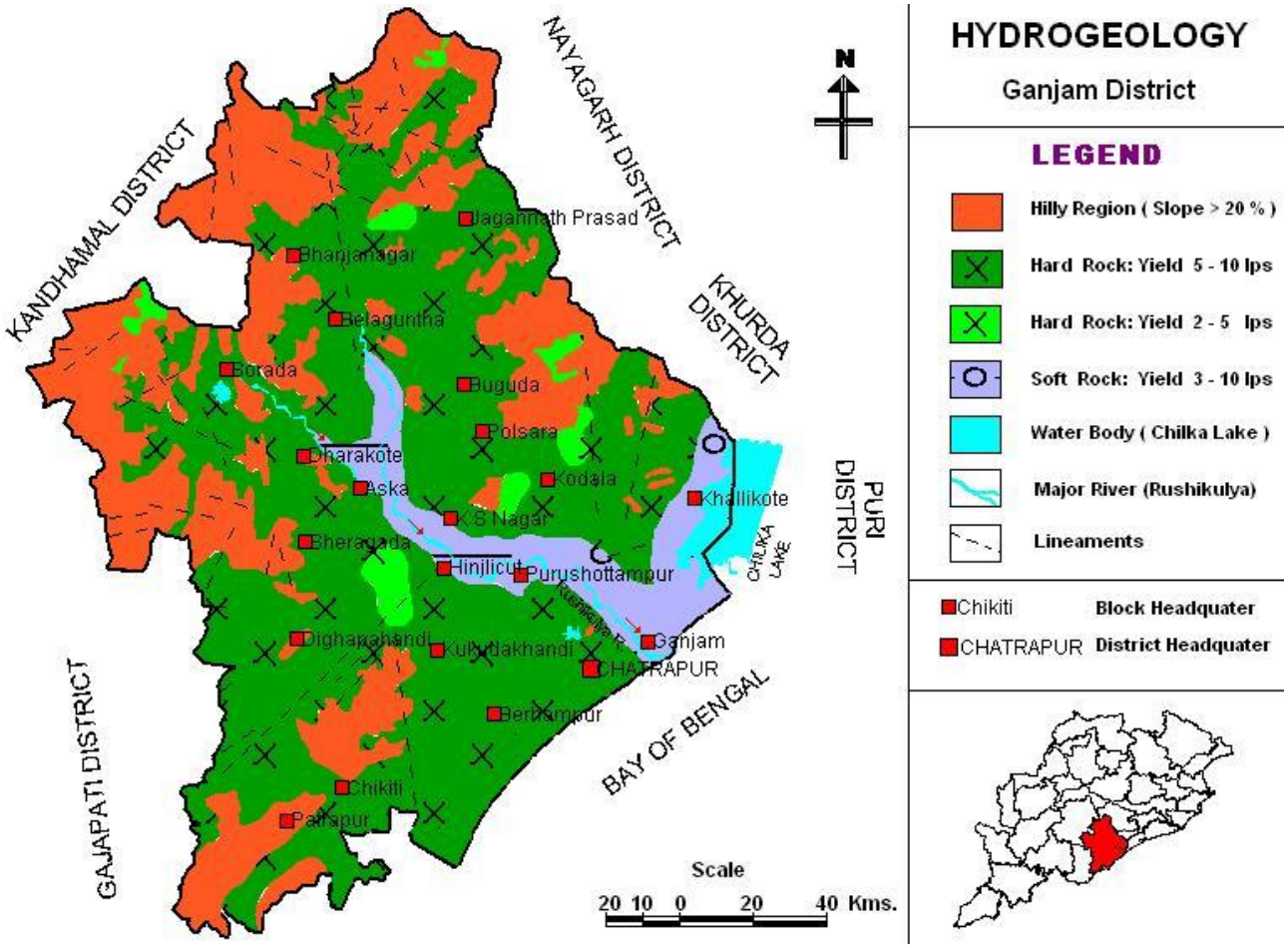
District Boundary

Depth to Water Level (mbgl)

0 to 2

2 to 5

5 to 10


HYDROGEOLOGY
Ganjam District
LEGEND
Hilly Region (Slope > 20 %)
Hard Rock: Yield 5 - 10 lps
Hard Rock: Yield 2 - 5 lps
Soft Rock: Yield 3 - 10 lps
Water Body (Chilka Lake)
Major River (Rushikulya)
Lineaments
Chikiti Block Headquater
CHATRAPUR District Headquater
N
KANDHAMAL DISTRICT
NAYAGARH DISTRICT
KHURDA DISTRICT
PURI DISTRICT
GAJAPATI DISTRICT
BAY OF BENGAL
Jagannath Prasad
Bhanjanagar
Belaguntha
Borada
Buguda
Polsara
Dharakote
Aska
Kodala
Khallikote
K.S Nagar
Bhergada
Hinjilicut
Purushottampur
Digharahandi
Kukudakhandi
Ganjam
CHATRAPUR
Berhampur
Chikiti
Palasapur
CHILKA LAKE
Scale
20 10 0 20 40 Kms.