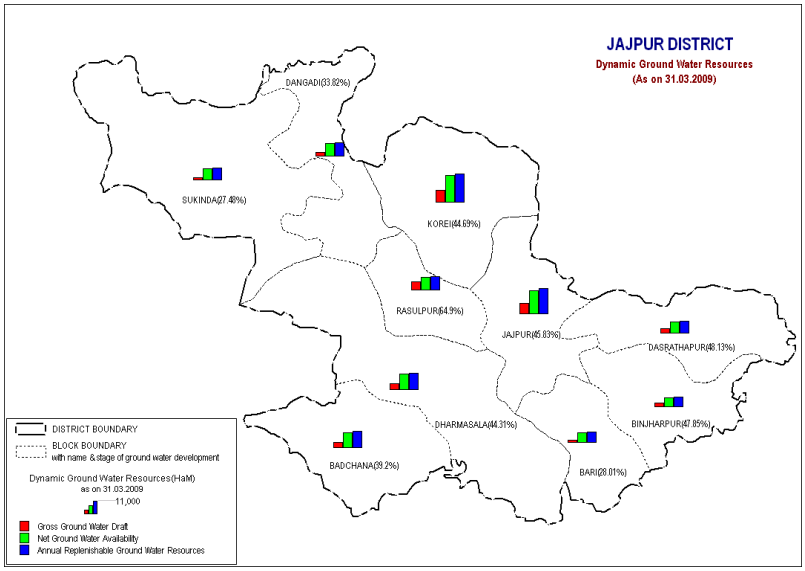
Govt. of India
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET

OF
JAJPUR DISTRICT



South Eastern Region
Bhubaneswar
May , 2013

1.0 INTRODUCTION :

1.1 Administrative details

The district lies between north latitudes 20^0 34' 57''& 21^0 08' 52'' and east longitudes 85^0 41' 21''& 86^0 37' 26'' and covers an area of 2899 sq. km. (Map -1).It falls in 73 G,H and L Degree sheets of Survey of India. It is bounded in the north by Keonjhar and Bhadrak districts, in the west by Dhenkanal and Cuttack districts, south by Kendrapada and Cuttack districts and in the east by Kendrapada district. The district is well connected by roads and railway lines. The N.H. 5 connecting Chennai and Kolkota, Paradeep Express highway connecting Daitari and Paradeep passes through the district. The East Coast railway line connecting Kolkota and Chennai also passes through the district. All the block Headquarters are connected to district head quarters by good motorable road .

The district is constituted by one administrative sub-division viz. Jajpur. which is further subdivided in to 10 CD blocks. It has 280 gram-panchayats with 1575 inhabited and 203 uninhabited villages and 2 urban areas, viz; Jajpur (Municipal corporation), Jajpur (N.A.C). The district head quarters is located at Jajpur town.

The total population of the district is 16,24,341 (as per 2001census) out of which urban population is only 69,851. The scheduled caste and scheduled tribe community accounts for 22.99 % and 7.76 % respectively of the total population of the district.

1.2 Drainage

The district is mainly drained by river Brahmani, Birupa, Khharsuan and Baitarani along with their tributaries. These rivers are having south-easterly flow direction. Due to falling of topography and drainage channel, the runoff water during heavy down pour of rainfall, often splashes out and inundates the surrounding flood plains. The meandering of rivers gives rise to formation of ox-bow lakes along their course.

1.3 Studies carried out by CGWB

The district has been covered by systematic groundwater survey programme during the F.S.P. 1980-81,1981-82 and 1985-86 by Central Ground Water Board. Subsequently reappraisal hydrogeological survey was carried out in different parts in the district during 1991-92,95-96. During the period of 1958-59 by the erstwhile Ground water wing of G.S.I. and subsequently by C.G.W.B. 24 exploratory boreholes were drilled. Besides, 7 numbers of deposit wells , 2 numbers of slim holes and 3 numbers of piezometers were also drilled in the district.

2.0 Rainfall & Climate

The district is characterized by humid sub- tropical monsoon climate having three distinct seasons in a year, viz. winter, summer and rainy seasons. Winter commences from late November and continues till end of February. Winter is followed by the summer season, which extends upto mid June. During the period between April and May, 3 to 4 cyclonic rains generally occur in the district. The rainy season sets in

the district with the advent of the southwest monsoon, generally from the middle of June and continues till end of September.

Lowest and the highest temperatures- The maximum temperature rises upto 46^0C in the summer and falls to a minimum of 14 ^{0}C in winter. The December and January are the coldest and May is the hottest month.

The relative humidity is high, on an average, varies from 40 to 90% during the year and during monsoon it is much more where as in winter it is less.. The mean monthly potential evapo-transpiration varies from 57 mm during January to 320 mm during May.

Rainfall in the district is caused by the south-west monsoon. The average rainfall of the district is 1771.8 mm. Maximum rainfall generally occurs in the month of August. Average nos. of rainy days in a year is 72.The western, south-western, eastern southern tract s receive a fairly high rainfall (>1500 mm.) which gradually decreases to 1300mm towards north-east. The district has experienced an unprecedented mild to severe drought situation during 1996.

3.0 Geomorphology & Soil Types :

3.1 Physiography :

Physiographically, the district can be divided into five distinct units viz (1). Structural hills, (2) Residual and denudational hills, (3) Very deep buried pediments, (4) Shallow to moderate buried pediments and (5) Alluvial plain.

3.1.1. Structural hills: Structural hills are found in the north-west corner of the district. This tract is situated at a highest elevation in the district. The southern part of the hill range is called Mahagiri ranges and the northern ranges are called Daitari ranges. Both the ranges are made up of quartzites.

3.1.2. Residual and denudational hills: These are small hills made up of khondalites, quartzitic rocks and granite gneiss. The altitude of the hillocks range up to 300 m above msl.

3.1.3. Very deep buried pediments: The Sukinda valley area is underlain by ultramafics rock bodies, which are believed to be thrusted into quartzitic country rocks. The structural weak plain as developed and mineralogical properties of ultramafic intrusives has highly accentuated a very deep weathering. These highly deep buried pediments are hosting the rich friable chromite ores whose reserve is proved down to the depth of 250 m.

3.1.4. Shallow to moderate buried pediments : This unit mostly occurs in the west and in a small patch around the small hilly tract near Balichandrapur in the south. The area exhibits shallow to moderate deep buried pediments developed due to weathering of the country rocks. The area is highly undulating and rugged and the altitude varies from 48 to 140 m. above msl.

3.1.5. Alluvial plain: The eastern, north-eastern and southern part of the district is covered by thick alluvium deposits formed by the river system of Brahmani and the Baitarani. The slope of the tract is towards south-east and the altitude of the plain

varies from 4 to 25 m. above msl. The small dotted hills within the alluvial plain represents monadnocks. The meandering rivers form ox-bow lakes at places. Bogs and swamps are developed in low lying area.

3.2. Soil types:

Generally four types of soils, viz. Alfisols, Utisols, Vertisols and Entisols occur in the district. As per agro-climatic classification, the district falls under North Eastern Coastal plain.

3.2.1. Alfisols : These soils include deltaic old alluvia soils and red sandy soils. These deltaic soils are found in river valley and the sandy soils are seen in the areas underlain by crystalline rocks. The red sandy soils are light textured usually devoid of lime concretions.

3.2.2. Ultisols: These include lateritic soils which are found in the western upland areas and these are poor in nitrogen, phosphorous, potassium and organic matters.

3.23.Vertisols: These are medium black soils occurring in the northern part of the district. These are rich in iron, calcium, magnesium, potash and lime but poor in organic matters, nitrogen and phosphorous. These soils are fertile.

3.2.4.Entisols : These soils include younger alluvial soils occurring in the central - eastern and south eastern blocks of the district These are deficient in nitrogen, phosphorous and humus but not in potash. These soils are fertile.

4.0 Ground Water Scenario

4.1 Hydrogeology :

4.1.1. Water bearing formations- The water bearing formation of the area can be divided into 4 groups viz; (a) Crystalline and meta sedimentary formation (b) Alluvium (c) Laterite capping highly weathered limonitised-cherty ultramafics (d) Laterite capping the crystalline and meta sedimentary sedimentary formation.

4.1.2 Occurrence of ground water:

4.1.2.1. Crystalline and meta sedimentary formation : Ground water in the hard granitic rocks or meta sedimentary khondalites and schistose quartzites formations occurs under unconfined conditions within the weathered residuum whereas in the bed rocks (fractured) aquifer it occurs in semi confined to confined conditions. The top weathered saprolite horizon is tapped by dug wells while the fractured basement rocks are tapped by bore wells.

4.1.2.2. Alluvial formation: In the unconsolidated alluvial formation ground water occurs under unconfined conditions in shallow aquifers and semi-confined to confined conditions in deeper aquifers.

4.1.2.3. Laterites capping weathered ultramafics: Laterite occurs in two types of settings. In one type of setting which is found in Sukinda valley the laterites are

underlain by highly weathered ultramafics composed of limonites, cherts and weathered ultramafics. In these formation ground water occurs under unconfined conditions in shallow aquifers and semi-confined to confined condition in deeper aquifers.

4.1.2.4. Laterites capping crystalline and metasedimentary: In this type of setting the laterites cap the schistose quartzites. The laterites have high degree of effective porosity and form potential aquifer which are commonly tapped by dug wells. In these formation ground water occurs under unconfined conditions in shallow aquifers. The specific capacity of the dug well in laterites varies from 0.0016 m^3 /min/metre to 0.2214 m^3 /min/metre of draw down and the transmissivity varies from 3.2m^2 /day to 506m^2 /day .

4.1.3.Aquifer parameter: Water bearing properties of different formations vary widely. A brief account of the water bearing properties of different lithounits are enumerated below.

4.1.3.1.Crystalline and meta sedimentary formation: The yield potential of weathered and fractured aquifer in these formation are limited as compared to alluvium. The yield of dug wells in khondalites varies from 5 m^3 /day to 25 m^3 /day while in schistose quartzites, it varies from 6 m^3 /day to 30 m^3 /day and in granite, it ranges from 6 to 15 m^3 /day. The specific capacity of dug well in these three hard formations vary from 0.0034 to 0.0054 m^3 /min/metre, 0.004 to 0.008 m^3 /min/metre and 0.0037 to 0.007 m^3 /min/metre of draw down respectively. The yield of bore wells in these formations is up to 5 lps.

4.1.3.2. Alluvial formation : The yield of shallow and filter point tubewells in the alluvium varies 5 to 15 lps within a depth range of 25 to 60 metre below ground level. The transmissivity of shallow and deep aquifer varies from 234 m^2 /day to 3112 m^2 /day and 393 m^2 /day to 4650 m^2 /day. The yield of medium deep well in older alluvium varies from 20 to 40 lps where as in younger alluvium the yield of medium to deep tube well may go beyond 40 lps and the transmissivity varies from 393 to 4600 m^2/day.

4.1.3.3. Laterites capping weathered ultramafics:
The yield of dug wells in such formations varies from 118 to 373 m^3 /day. The specific capacity of the dug well varies from 0.82 m^3 /min/metre to 0.260 m^3 /min/metre draw down. The transmissivity of shallow aquifer constituted by laterites-limonites and chert varies from 40 m^2 /day to 234 m^2 /day . The yield of the bore wells/ tube well tapping the deeper aquifers varies from 1.5 to 12 lps. and the transmissivity of deep aquifer varies from 74 m^2 /day to 91 m^2 /day . From the exploration data of two exploratory wells drilled in these tract by C.G.W.B. ,it is revealed that zone of saturation extent down to a depth of 66 m below which the highly limonitised and ultramafic rocks do not hold water.

4.1.3.4. Laterites capping crystalline and metasedimentary: The specific capacity of the dug wells in laterites varies from 0.0016 m^3 /min/metre to 0.2214 m^3 /min/metre of draw down and the transmissivity varies from 3.2 m^2 /day to 506 m^2 /day.

4.1.4.Depth to water level:

4.1.4.1.Pre & post monsoon 2011 : The depth to water level map for pre and post monsoon periods 2011 are prepared based on the ground water monitoring data of 23 Nos of National Hydrograph Stations of C.G.W.B. monitored during the month of April and November 2011 and are presented in Map 2 and 3 respectively **.** The pre and post monsoon depth to water levels in the district range from 0.98 m to 9.85 m below ground level and 0.33 to 5.36 m below ground level respectively.

4.1.4.2.Seasonal Fluctuation: The seasonal fluctuation of water levels with respect to pre and post monsoon periods (2011) varies from –2.75m (Fall) at Saruabill to 5.83 m (Rise) at Hatibari.

4.1.2.3. Long term water level trend in last 10 years: Long-term trend analysis (2001-2011) of phreatic water levels indicate that the water level in three-fourth of the dug wells show rising trend varying from 0.002 to 1.743 m/year, while the rest of the dug wells have declining trend ranging from 0.426 to 1.54 m/year.

4.2. Ground Water Resources:

As per the ground water resources assessed during 2009, the total annual replenishable ground water resources in the district is 56933ham. The block wise ground water resources are given in Table-1. 15 % of the total ground water resources i.e. 8850 ham is reserved for domestic and industrial uses. The annual ground water draft for irrigation in the district is only 22441 ham leaving the balance ground water resource available for irrigation is 31538 ham. Over all the present level of ground water development is only 43.09 percent in the district with the maximum of 64.9% in Rasulpur block and minimum of 27.48 % in Sukinda block. Hence the whole district as well as all the blocks come under the safe category from ground water development point of view.

Table:1 Ground water Resource Potential of Jajpur District As on 31.03.2009

Figures in hectare metre

Sl. No.	Assessment unit/block	Net Annual Ground Water Availability	Existing gross ground water draft for irrigation	Existing gross ground water draft for domestic and industrial water supply	Existing gross ground water draft for all uses	Allocation for domestic and industrial requirement supply up to next 25 years	Net ground water availability fo future irrigation development	Stage of ground water developme nt (%)
1	Badchana	5837	2135	153.61	2288	165	3537	39.20
2	Bari	3838	866	209.00	1075	389	2583	28.01
3	Binjharpur	3513	1618	62.79	1681	67	1828	47.85
4	Danagadi	5009	1447	247.00	1694	349	3213	33.82
5	Dasarathpur	4297	1981	87.84	2068	112	2205	48.13
6	Dharmasala	6087	2640	56.82	2697	79	3368	44.31
7	Jajpur	8809	3947	89.77	4037	91	4771	45.83

8	Korei	10194	4102	454.00	4556	658	5434	44.69
	Rasulpur	4997	2849	394.00	3243	577	1571	64.90
	Sukinda	4352	856	340.00	1196	468	3028	27.48
	District Total	56933	22441	2095.00	24535	2955	31538	43.09

4.2.1. Details of over exploited, critical and semi critical areas: Stage of ground water development shows that all blocks fall under safe category.

4.3 Ground water Quality:

The chemical quality of groundwater both from shallow and deeper aquifers has been studied based on the analysis of water samples from hydrographs stations(April 2004) and exploratory wells of C.G.W.B. The quality of ground water for shallow and deeper aquifers are described below.

4.3.1.Shallow Aquifers: The ground water is alkaline in nature with pH value ranging from 7.34 at Kabirpur to 8.30 at Madhupurgarh. The electrical conductance values show a wide range from 73 to 1660 μS / cm at 25 ^{0}C but in most cases it is between 200-500 μS / cm at 25 ^{0}C. Higher values of electrical conductance are noted at Chinguripal (1197), Panikuili (1243) Chhatia(1433) , Rampei (1596)and Haridaspur(1660). Concentration of chloride is within the desirable limit i.e. 250 mg/l in all cases except at Haridaspur where slightly higher concentration(273 mg/l) is noted .Nitrate concentration is generally within the desirable limit in all cases except 3 places at Chinguripali (111 mg/l), Rampei (168 mg/l) and Haridaspur where concentration are found more than the desirable limit. Although the fluoride concentration varies from 0.15 to 5.20 mg/l), it is by and large less than 1.0 mg/l (permissible limit 1.5 mg/l). Concentration of iron is below the permissible limit in all cases except at Saruabili (7.4 mg/l), Haridaspur (1.48) and Binjharpur (3.37)(permissible limit 1.0 mg/l).Total Hardness in nearly seventy percent cases is within 250 mg/l (desirable limit 300 mg/l) and in rest thirty percent cases it varies from 320 to 470 mg/l (permissible limit 600 mg/l). However in other areas concentration of other chemical constituents like Calcium, Sulphate and Phosphate are well within the desirable limit in more than ninety percent cases and rest is well within the permissible limit. It is observed that, in general chemical quality of ground water from shallow aquifers is good and fit for both domestic and irrigation purposes except in isolated patches mentioned above, where the parameters are beyond the permissible limits. However in other areas all the constituents are well within the permissible limit.

4.3.2.Deeper Aquifers: The pH value ranges from 6.95 at Dubakona to 8.45 at Saruabil with the majority of the value ranging between 7.5 and 8.0 which indicate ground water from deeper aquifers is generally alkaline in nature. The electrical conductance values ranges from 211 to 1700 μS / cm at 25 ^{0}C. The electrical conductance values are generally less than 700 μS / cm at 25^{0}C in non-saline area while it is above 800 μS / cm at 25 ^{0}C in saline hazard area where the values generally are around 1000 μS / cm at 25 ^{0}C. The concentration of total dissolved solids ranges from 144 to 764 mg/l. The chloride content in the area varies from 13 to 255 mg / l.

Nitrate concentration in deeper aquifers is non detectable to 1.6 mg/l and the maximum fluoride content is 0.58 mg/l, which indicate that concentration of both the pollutants in deeper aquifers are well within the permissible limit (100 mg/l for nitrate and 1.5 mg/l for fluoride). The concentration of iron varies from 0.25 to 1.13 mg/l against the permissible limit of 1.0 mg/l. Total hardness varies from 50 to 285 mg/l against the desirable limit of 300 mg/l. The concentration of other chemical constituents like Calcium, Sulphate and Phosphate are within the desirable limits.

4.3.3. Suitability of Ground Water for Drinking Purpose

The concentration of major chemical constituents and also the pollutants like fluoride and nitrate content in fresh ground water of shallow and deeper aquifers are well within permissible limit of drinking water specification (Indian Standard 1991). Hence the fresh ground water may be used as safe drinking water source.

4.3.4. Suitability of Ground Water for Agricultural Purpose

Ground water from both shallow and deeper aquifers in general is suitable for irrigation purpose. Ground water from shallow and deeper aquifers belongs to C_1S_1 and C_2S_1 and C_3S_1 classes of USSL Classification, which indicates that the ground water, in general is fit for most type of crops except in local pockets where, C_3 S_1 types of water occurs in deeper aquifer, belongs to low alkaline and medium to high salinity class. In these pockets salt tolerant crops should be grown. Based on the hydrogeological condition of the district, the feasibility of various ground water structure with their yield potential, existing depth, discharge range water lifting devices etc are described below and given in table-3.

Table-3: DEPTH RANGE, PROBABLE THICKESS OF AQUIFER AND YIELD OF DIFFERENT GROUNDWATER STRUCTURES IN THE DISTRICT

Hydro-geological setting	Type of structures	Depth range (m)	Probable thickness of aquifer	Probable Yield (lps)	Water lifting device
Crystalline and alluvial area	Dug wells	9-15	4.5-6	3-5	Submersible pump 2-5HP
Crystalline area	Bore well	60-120		<5	Submersible pump 2-5HP
Alluvial area	Filter point and Shallow tube wells.	25-60	10-20	5-15	Submersible/turbine pump 5HP
Alluvial area	Medium deep tube wells.	60-100	20-30	20to>40	Submersible /turbine pump 10HP
Alluvial area	Deep tube wells	100-150	25-30	>40	Submersible/turbine pump 15 HP

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4.4.1. Feasibility of Ground Water Structures in Non Saline Area :

4.4.1.1. Dug wells : The depth of the dug wells in crystalline and alluvium areas (with or without lateritic capping) should be in the range of 9 to 15 m. below ground level. The diameter of the wells may be 4 .5 to 6 m. The expected yield of these wells may be upto 5 lps.

4.4.1.2. Filter Point Tube Wells : These tube wells are very successful on the recent flood plain deposits occurring along the banks of river and stream and also on the bank of moribund channels of rivers or streams and within the dried up stream course. The depth of these structures may be 25 to 60m and dia 10cm x 5cm or all through 5cm. Submersible pumps of 2 H.P capacity may be fitted. The yield of these wells is generally within 5 to 15 lps. The pumps of 2 to 5 H.P capacity may be installed in these tube wells.

4.4.1.3. Shallow Tube Wells : The depth of the shallow tube wells may be restricted to 50 mbgl and the diameter to 15cm. The thickness of available aquifer zones vary from 5 to 10m within this depth. These structure are mainly feasible in the central part of the area underlain by older alluvium and east- central part occupied by recent alluvium. The expected yield is generally within 15 lps and submersible pumps of 2 to 5 H.P may be installed.

4.4.1.4Medium Deep Tube Wells: The medium deep tube wells upto a depth of 150m are feasible in the non saline tract. The depth of the wells may vary from 90 to 150m and within this depth range the thickness of aquifer zones vary from 25 to 60m. The yields of these tube wells varies from 20 to 40 lps. Submersible pumps of 7.5 to 20 H.P may be installed.

4.4.2. Feasibility of Structures in Saline Tract :

In and around Singhpur area fresh water bearing aquifer is generally found within the top 20 m depth and then beyond 90 m. In such place dug wells with the depth range of 10 to 15 m. and dia of 4.5 to 6.0 m is feasible to tap the upper fresh water zone. The yields of these dug wells may vary in the range of 5 to 10 lps To tap the deeper fresh water zone medium to deep tube well with the depth more than 100 m. is feasible.

In area like Binjharpur and its surrounding where top fresh aquifer aquifers extend up to 48 m. depth, shallow tube wells with the depth range of 30 to 50 m. and dia of 0.15 to 0.20 m. are feasible. The yields of these tube wells may be up to 40 lps. Submersible pumps of 7.5 to 25 H.P may be installed.

In Kcruna- Mangalpur- kumardihi tract fresh water bearing aquifer generally occur below 90m depth and extends down to a depth of more than 200m. below ground levels. Hence in this tract medium to deep tube wells with depth of 90 to 150 are feasible. The yield of these tube wells are expected to be around 40 lps. The diameter of these wells may be 20cm. Submersible/turbine pumps of 7.5 to 20 H.P may be installed.

5.0. Ground Water Management Strategy

5.1Ground Water Development:

The ground water development is being done through dug wells, bore wells and tube wells. Tube wells include filter point and shallow, medium deep tube wells. The use of ground water is for both domestic and as well as irrigation purposes. Stage of ground water development shows that further scope exist for its development in all blocks of the district.

5.2 Area suitable for ground water development:

Area suitable for ground water development type of abstraction structure feasible, their depth range, yield prospect and type of lifting devices etc are shown in Map –6. In the district additional 345 nos. of medium deep tube wells, 76 nos. of shallow tube wells, 4487 nos of filter point tube wells and 14152 dug wells can be constructed for further development of ground water.

5.3.Drilling and Well design : Tube wells can be constructed by deploying rotary rig . First pilot hole is constructed .Then on the basis of granular zones assembly are lowered in well . In saline tract cement sealing is provided to prevent from mixing of fresh water aquifer .Then well is developed with Air compressor/pump to get sand free water. Bore wells should be constructed by deploying DTH rigs.

5.4.Water conservation and artificial recharge:

The scope for artificial recharge exits in hard rock terrain in western part of the district . In this part water levels during post monsoon rest between 2 to 4 m. bgl and on an average below 3m. and during pre- monsoon on an average the water level rests below 6m. depth. Physiographically the area shows low hills with intermontane valley or pediplains dotted with low hills. The artificial recharge structure like infiltration tank, contour bunding, gully plugging are feasible in the area. In some areas, in addition to above structures, subsurface dykes may also be constructed. All these structure will be help in augmenting ground water resources in those areas which experience water scarcity during summer.

6.0 Ground Water Related Issues & Problems :

The ground water related issues generally include the water logged area, polluted area and water table depleted area and these are discussed in the following paragraph.

6.1 Water logged area:

Water logging problem is found in some parts of the district as a result of trapped rain and flood water which can not be drained due to low topographic gradient. The possibility of canal seepages from the irrigation canals of two existing two major irrigation project in the area can not be ruled out.

6.2 Ground water quality problems:

There is no large scale pollution in the district except in chromite mining belt of Sukinda valley area where seepage water from mine quarry, surface water and water from tube wells having high concentration of toxic hexavalent chromium ranging from 0.05 to 1.22 ppm are noted.

6.3. Water Table Depleted area:

The long term trend analysis data of water level from the network stations of district indicate that there is no significant water table depleted area in the district except few localized patches as 75% of hydrograph net work stations have shown rise in water level. However, the heavy pumping of ground water in the chromite mining belt of Sukinda valley for continuation of mining process is creating an imminent problem of lowering of water table in and around the valley.

6.4 Salinity Problem:

The district posses a narrow tract in south-east ie in part of Dasrathpur and Binjharpur blocks ,where the saline aqufer are seen. In Karuna- Mangalpur-Kumardihi tract of Dasarathapur block, saline/ brackish water bearing aquifer extending from 95 m. to further down are found. At Singhpur, saline aquifers are found 20 to 90 m. bgl. And in Binjharpur the water is brackish below 48 m. below ground level. Besides the above mentioned tracks, in rest of the district in general fresh ground water is encountered.

6.5. Drilling Problem: No problem.

6.6. Risk to Natural disaster: Jajpur, being a coastal district is always prone to drought, Flood and cyclone .

Flood : Flood is a very common disaster in the eastern part of the district which occurs almost every year .

7.0.Awareness & Training Activity:

7.1 Mass Awareness programme (MAP) & Water Management Training Programme, (WMTP) by CGWB : Not organized till March 2008.

7.2: Participation in Exhibition, Mela, Fair etc: No participation

7.3: Participation & Lectures delivered in public forum/ radio/TV//Institution of Public Repute/ Grassroots associations / NGO/ Academic Institutions etc: Nil

8.0 Area notified by CGWA/SGWA: Nil

9.0 Recommendations:

Large scale planning should be adopted for formulation of ground water development strategies, which may be preceded by intensive hydrogeological, geophysical and remote sensing studies.

An intensive net work of ground water monitoring stations should be established in the command areas of major irrigation projects to monitor the change in ground water regime consequent to application of surface water and to asses the extent of area under water logging.

Conjuctive use studies should be taken up in the water logged areas of the canal command areas to minimize the menace of water logging and salinity hazards.

Mass awareness training programme should be organized among the common people to educate them about the different aspects of ground water such as for

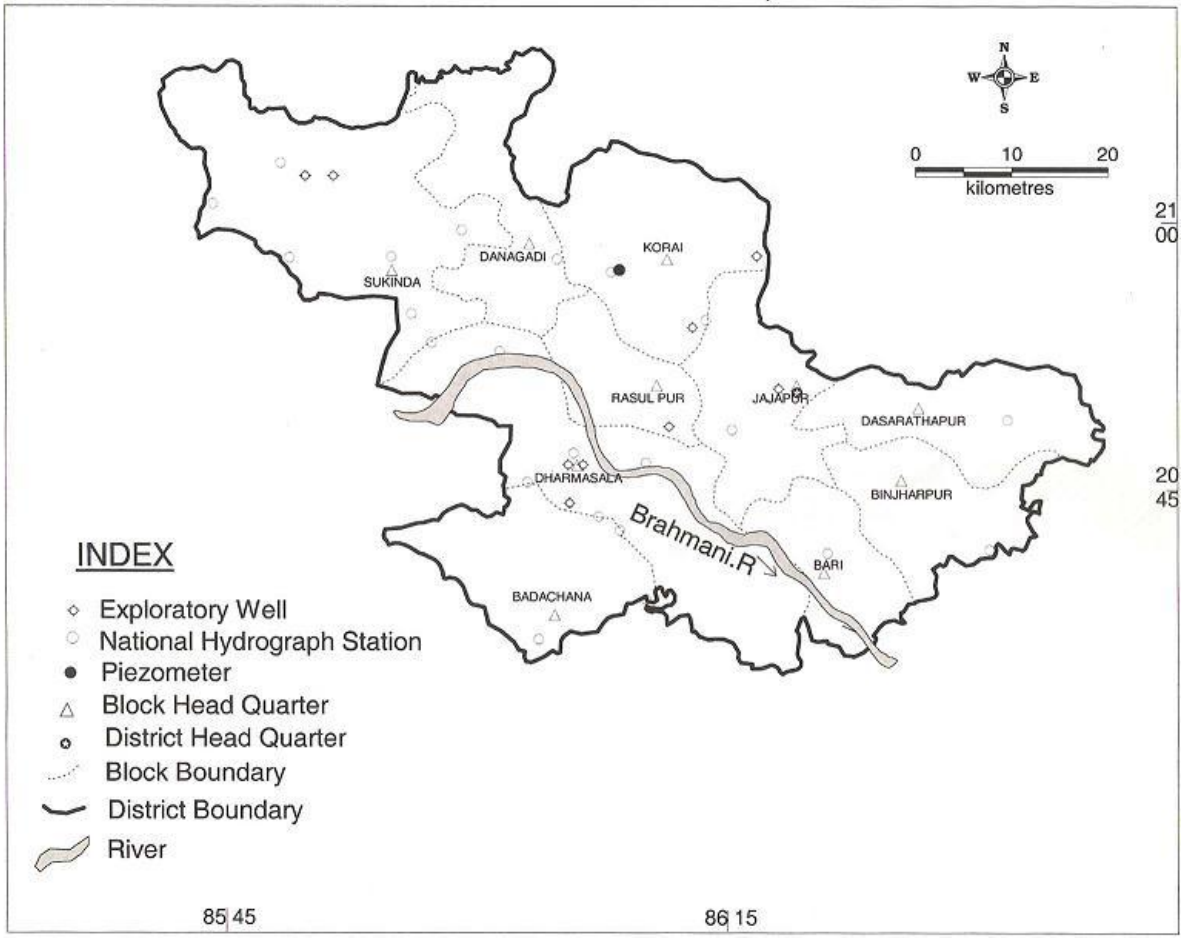
adopting suitable cropping pattern, for optimal utilization of available ground water and surface water resources. Financial institution and bankers should extend necessary co-operation to farmers. State Electricity Board and Rural electrification Corporation (REC) should also take steps for energization of wells to ensure an interrupted power supply.

Artificial recharge structures like check dams, percolation tanks, contour bunding etc should be constructed in the hard rocks areas lying to the western parts of the district.

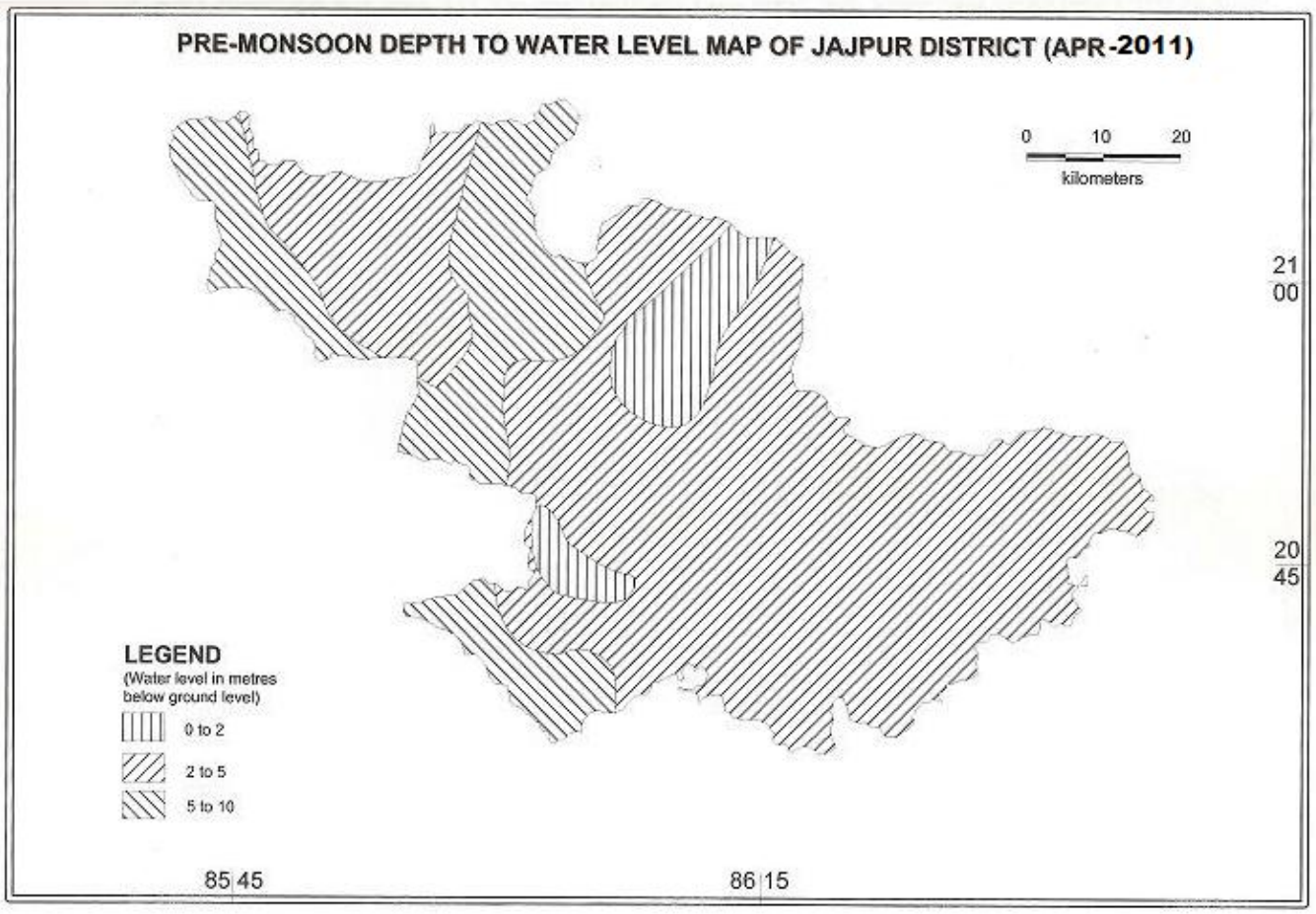
The State Pollution Control Board should monitor regularly the discharged water in chromite mining areas, so that the untreated water is not pumped out to the nearby fields and streams, which may pollute the surface and ground water resources.

INDEX MAP OF JAJPUR DISTRICT, ORISSA

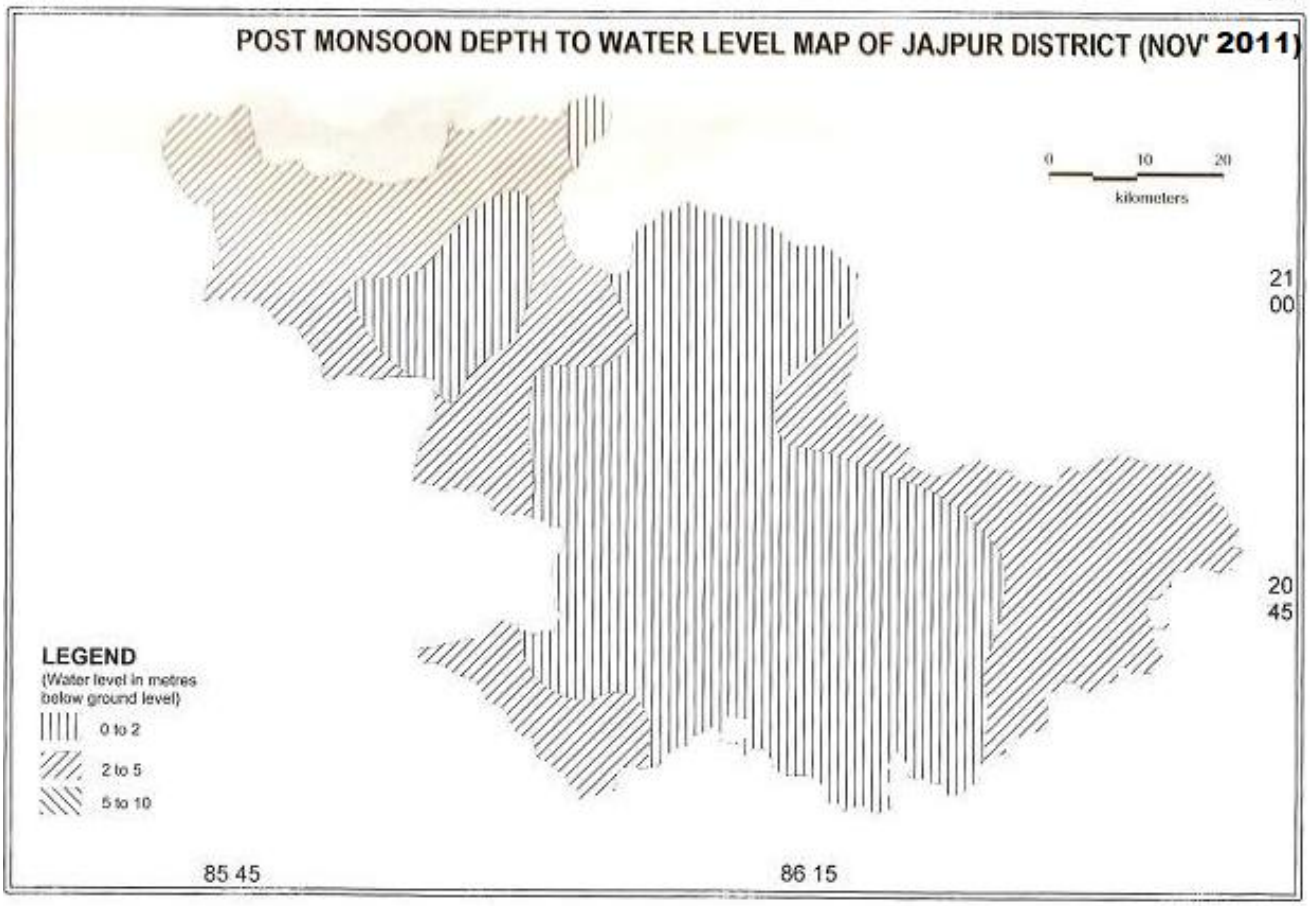
Map :- 1



Map-2


PRE-MONSOON DEPTH TO WATER LEVEL MAP OF JAJPUR DISTRICT (APR-2011)
0 10 20
kilometers
21 00
20 45
LEGEND
(Water level in metres below ground level)
0 to 2
2 to 5
5 to 10
85 45
86 15

Map - 3


POST MONSOON DEPTH TO WATER LEVEL MAP OF JAJPUR DISTRICT (NOV' 2011)
0
10
20
kilometers
21
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45
LEGEND
(Water level in metres below ground level)
0 to 2
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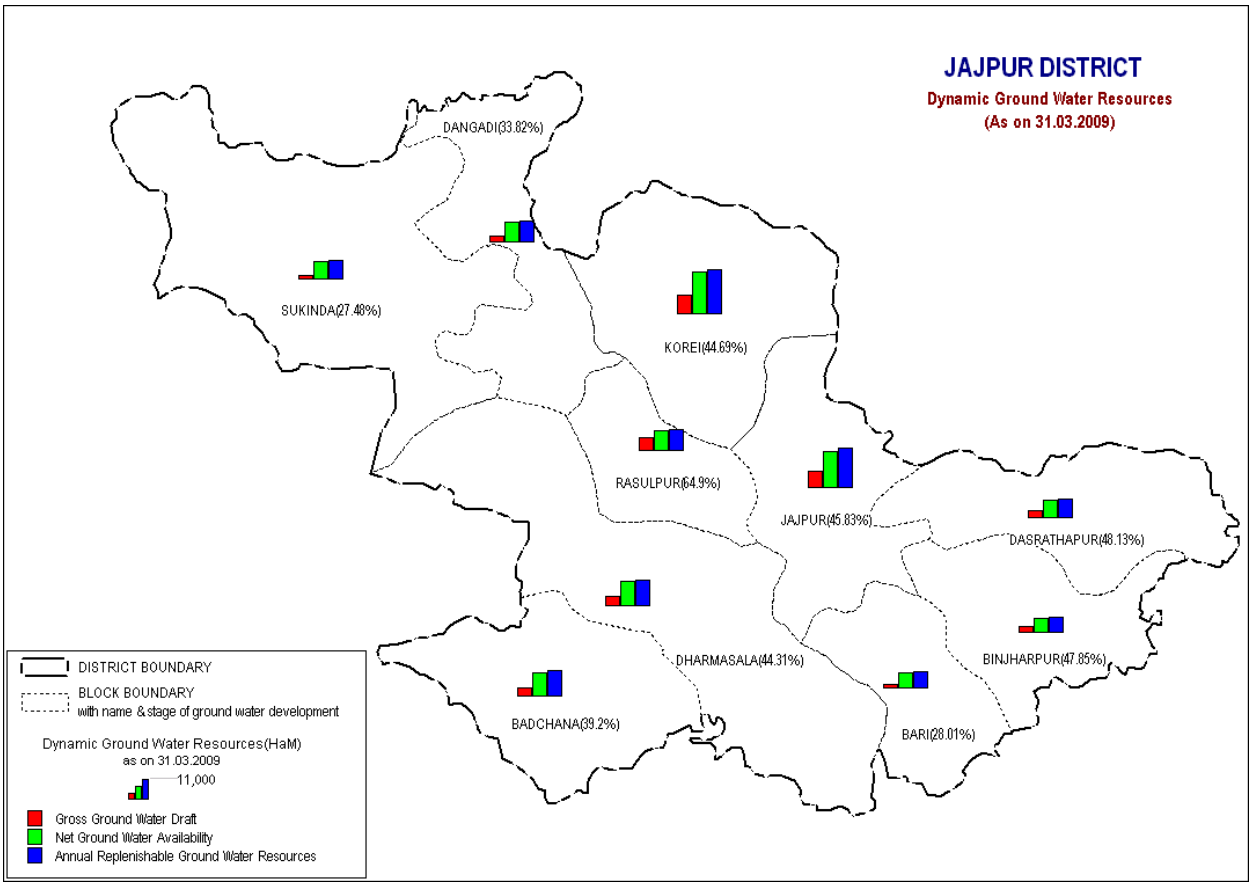
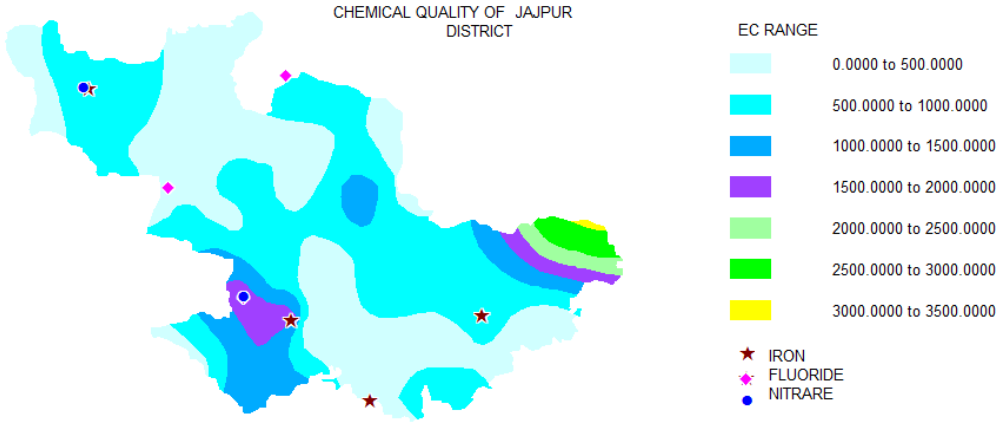
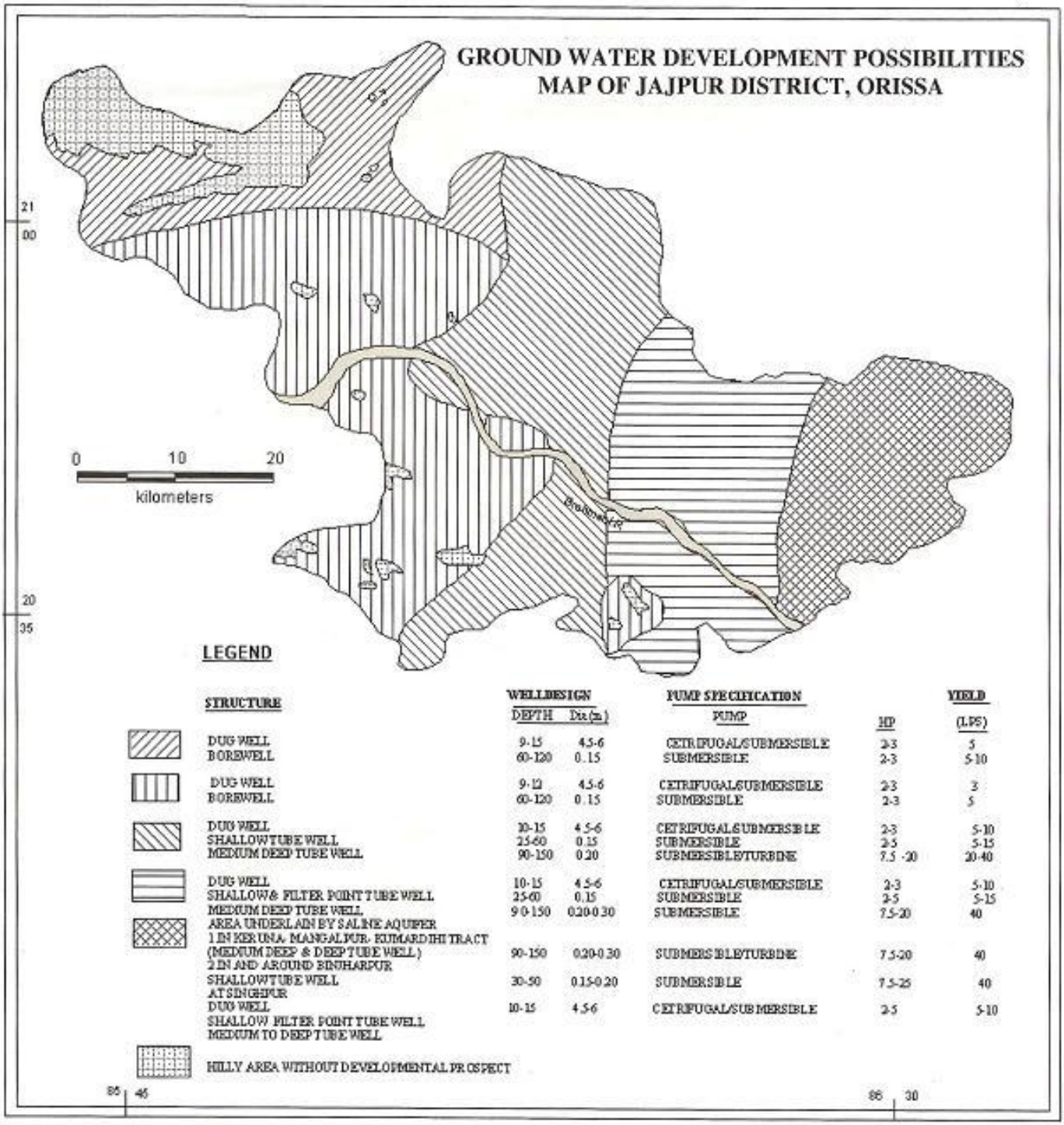
85 45
86 15


JAJPUR DISTRICT
Dynamic Ground Water Resources
(As on 31.03.2009)
DANGADI(33.82%)
SUKINDA(27.48%)
KOREI(44.69%)
RASULPUR(64.9%)
JAJPUR(45.83%)
DASRATHAPUR(48.13%)
DHARMASALA(44.31%)
BINJHARPUR(47.85%)
BADCHANA(39.2%)
BARI(28.01%)
DISTRICT BOUNDARY
BLOCK BOUNDARY
with name & stage of ground water development
Dynamic Ground Water Resources(HaM)
as on 31.03.2009
11,000
Gross Ground Water Draft
Net Ground Water Availability
Annual Replenishable Ground Water Resources


CHEMICAL QUALITY OF JAJPUR DISTRICT
EC RANGE
0.0000 to 500.0000
500.0000 to 1000.0000
1000.0000 to 1500.0000
1500.0000 to 2000.0000
2000.0000 to 2500.0000
2500.0000 to 3000.0000
3000.0000 to 3500.0000
IRON
FLUORIDE
NITRARE

Map -6


GROUND WATER DEVELOPMENT POSSIBILITIES
MAP OF JAJPUR DISTRICT, ORISSA
21 00
20 35
0 10 20
kilometers
Brahmani R.
LEGEND
STRUCTURE
WELL DESIGN
DEPTH Dia (m)
PUMP SPECIFICATION
PUMP
HP
YIELD
(LPS)
DUG WELL 9-15 4.5-6 CETRIFUGAL/SUBMERSIBLE 2-3 5
BOREWELL 60-120 0.15 SUBMERSIBLE 2-3 5-10
DUG WELL 9-12 4.5-6 CETRIFUGAL/SUBMERSIBLE 2-3 3
BOREWELL 60-120 0.15 SUBMERSIBLE 2-3 5
DUG WELL 10-15 4.5-6 CETRIFUGAL/SUBMERSIBLE 2-3 5-10
SHALLOW TUBE WELL 25-60 0.15 SUBMERSIBLE 2-5 5-15
MEDIUM DEEP TUBE WELL 90-150 0.20 SUBMERSIBLE/TURBINE 7.5 -20 20-40
DUG WELL 10-15 4.5-6 CETRIFUGAL/SUBMERSIBLE 2-3 5-10
SHALLOW& FILTER POINT TUBE WELL 25-60 0.15 SUBMERSIBLE 2-5 5-15
MEDIUM DEEP TUBE WELL 90-150 0.20-0.30 SUBMERSIBLE 7.5-20 40
AREA UNDERLAIN BY SALINE AQUIFER
1 IN KERUNIA- MANGALPUR- KUMARDIHI TRACT
(MEDIUM DEEP & DEEP TUBE WELL) 90-150 0.20-0.30 SUBMERSIBLE/TURBINE 7.5-20 40
2 IN AND AROUND BINJHARPUR
SHALLOW TUBE WELL 30-50 0.15-0.20 SUBMERSIBLE 7.5-25 40
AT SINGHPUR
DUG WELL 10-15 4.5-6 CETRIFUGAL/SUBMERSIBLE 2-5 5-10
SHALLOW FILTER POINT TUBE WELL
MEDIUM TO DEEP TUBE WELL
HILLY AREA WITHOUT DEVELOPMENTAL PROSPECT
85 45
86 30