

Ground Water Survey & Investigation (GWS&I)

Introduction

In this millennium, the thrust on ground water is increasing exponentially to support the exploding population for the domestic, irrigation and industrial needs. A comprehensive understanding of the ground water regime, its recharge and discharge characteristic is very important to evolve strategy for its optimal utilization. Hence precise assessment of quantity and quality of ground water resource is a pre-requisite for planning its development. Orissa has a geographical area of 1, 55,700 km² with a vast track of coastal plains. It receives on an average annual precipitation of about 1452mm. The prevailing topography, climate and soil condition exert lot of influence on the infiltration-run off characteristics of the hydrological cycle. The diverse rock types, ranging in age from Achaean to Recent origin underlie the State. The Achaean occupies about 80% of the total geographical area of the State. The state has an estimated ground water potential of 21.011 BCM, out of which 60% i.e.12.607 BCM can be safely utilized. As per latest ground water assessment made in 2004, level of ground water exploration in the State is on an average 18.31% and total 389140 ground water structures have been grounded only for irrigation use. The details are given in the following Table.

Table-7.1

Type	State Total	
	Nos.	% of Total
Dug well	357271	91.82
Bore well	2261	0.58
Shallow tube well	16087	4.13
Filter point tube well	11174	2.87
Deep tube well	12	0.003
Medium depth tube well	2335	0.60
Total	389140	100.00

Organization

The GWS&I headed by a Director is functioning as a nodal agency for monitoring of groundwater resources of the State, under the administrative control of the Department of Water Resources. GWS&I have two circles, ten field Divisions and five Water Quality Laboratories. The Divisions are facilitated with Data Processing Centers. State level Groundwater Data Processing Centre (SGWDPC) and Data Storage Centre (SDSC) have been set up at Bhubaneswar to handle the entire hydrological data of the State for dissemination to the Hydrological Data Users Group (HDUG). It also provides technical supports for sustainable ground water explorations to the user agencies and individuals. Some of the major activities of GWS&I have been highlighted below.

Activities

Assessment of Ground Water Resources:

For all 314 blocks of the state, the ground water resource assessment has been done as per Ground Water Estimation Committee Norms of Govt. of India. The annual draft as on March 2004 for irrigation use is 3.00 lakh ha. mtr, for domestic use is 0.74 lakh ha. mtr, & for industrial use is 0.10 lakh ha. mtr. The district wise figures of ground water resource presented in the following table-7.4. During 2009-10, steps have been taken for re-estimation of groundwater resources assessment in all 314 blocks under the guidance of CGWB, Govt. of India.

Ground Water Table Monitoring:

The ground water table monitoring is being carried out regularly at 1035 locations (integrated with CGWB) four times in a year i.e. pre-monsoon, mid-monsoon, post-monsoon and post-winter period for quantitative study of groundwater potential.

Ground Water Quality Monitoring:

Water sample collection and its chemical analysis are being undertaken once in a year during pre-monsoon period at 1035 locations. The same is repeated at 237 stations earmarked as trend stations to conduct water quality study three times more in a year i.e. during mid-monsoon, post-monsoon and post-winter period.

Remote Sensing Study:

Remote sensing studies are being carried out for higher success in ground water survey work by interpretation of satellite imagery with proper ground truthing in different blocks as well as specified watersheds under various R&D programme.

Preparation of Hydro-geological Block Reports:

The hydrological data collected from various parts of the state are analyzed at State Ground Water Data Processing Centre. Incorporating these data and latest ground water norms, Hydro-geological Reports of different Districts, Blocks and specified watersheds are prepared. These reports serve as the reference manuals for micro-level groundwater resources planning.

Feasibility of Bore Well:

This organization has technical know-how for identification of feasible sites for installation of bore wells. The Agriculture Department under KSK programme has assigned the job for identification of feasible sites for installation of bore wells. Vertical Electrical Sounding tests are being conducted and the results are communicated to Agriculture Department. The Directorate undertakes deposit works of various agencies for such feasibility studies.

Geographical Information System (GIS):

Under Hydrology Project Phase-I, digitization of GIS data sets such as land use, geomorphology, drainage, administrative boundary, geology (litho units, local macroscopic structure), settlements, transportation networks, soil, contour and hydrological boundary for the entire state have been completed. These are utilized for determining the zoning of ground water table and ground water quality linking the GIS layers with Hydrological Information System (HIS).

Research & Development:

Ministry of Water Resources had assigned a project titled "Ground Water Behavior in Connate Water Area and Hard Rock Terrains of Orissa with respect to different Schedules of Pumping and Varied draw down Conditions". The study aims at finding the ground water behavior of connate water areas of Bhadrak, Balasore, Cuttack, Kendrapada & Ganjam districts and 50 wells installed by CGWB at different locations for drinking water supply. The research work is in progress. Besides, aquifer modification through hydro-fracturing in Bargarh district, chemical treatment in failed tube wells in parts of Ganjam, Jajpur and Balasore district and Estimation of return flow in Chaukinalla area of Hirakud command are in progress.

Artificial Recharge to Ground Water & Rainwater Harvesting:

For augmentation of ground water and rising of water table, 3 watersheds based experimental projects i.e. "Study of Artificial Recharge to Ground Water" and 2 projects on "Roof Top Rainwater Harvesting" funded by the Central Ground Water Board (CGWB), Ministry of Water Resources, and Government of India under Central Sector Scheme have been taken up and completed. The impact has been assessed to be very promising. Besides physibility study of 14 artificial recharge schemes including 4 roof top rains with harvesting has been completed. Detailed project report (DPR) has been prepared and submitted for CG WB approval and funding. The details are given below.

Table-7.2

Sl. No.	Name of the Scheme	Block	District
1.	Ground Water Management & Regulation in Ganda Watershed	Korei	Jajpur
2.	Ground Water Management & Regulation in Himitira Watershed	Koshore Nagar	Angul
3.	Ground Water Management & Regulation in Nigarkata Watershed	Banrpal	
4.	Ground Water Management & Regulation in Panduripathar Watershed	Jharsuguda	Jharsuguda
5.	Ground Water Management & Regulation in Bheden Watershed	Jharsuguda	Jharsuguda
6.	Ground Water Management & Regulation in Upalairai Watershed	Gosani	Gajapati
7.	Ground Water Management & Regulation in Burudi Watershed	Ganjam	Ganjam
8.	Ground Water Management & Regulation in Kasianalla Watershed	Joda	Keonjhar
9.	Ground Water Management & Regulation in Haranalla Watershed	Bologada	Khurda
10.	Ground Water Management & Regulation in Kermali Watershed	Saintala	Bolangir
11.	Rooftop Rainwater Harvesting in the premises of the office Building of DRDA (District Collectorate campus), Khurda	Khurda	Khurda
12.	Rooftop Rainwater Harvesting in the premises of the office Building of Hydrologist, GWS&I Division, Sambalpur	Sambalpur	Sambalpur
13.	Rooftop Rainwater Harvesting in the premises of the office Building of Govt. Women's Polytechnic Hostel Building, Berhampur	Berhampur	Ganjam
14.	Rooftop Rainwater Harvesting in the premises of the office Building of Sr. Geologist, GWS&I Division, Baripada	Baripada	Baripada

Ä Deposit Works:

The Directorate undertakes drilling works, water quality analysis VES tests and artificial recharge of ground water and rain water harvesting works of other agencies on deposit of estimated amount. The works undertaken during 2009-10 is given in the table below.

Table-7.3

Deposit Works taken up during 2009-10

Sl. No.	Organization Name	Amount Deposit in Rs.	Status
A.	Water Quality Analysis		
1.	U.E. Charitable Trust, Bhubaneswar	965.00	Completed
2.	Bhambra Construction, Nayapally	1258.00	Completed
3.	M/s S.P.B.M. Foundation, Nayapally, Bhubaneswar	527.00	Completed
4.	M/s Innovation Trust, Khurda	1199.00	Completed
5.	M/s Trimurty Trust, Bhubaneswar	527.00	Completed
6.	Akhya Das, Kesinga, Kalahandi	1199.00	Completed
7.	B.Venketswar Rao, Rayagada	819.00	Completed
B.	Vertical Electrical Sounding Test (VES)		
1.	BSNL Office, Balasore, Rayagada, Berhampur, Jagatsinghpur	-	Completed
2.	Horticultural Department office at Bolangir, Kharihar, Nuapada	-	Completed
3.	Department of Post Bidanasahi, Cuttack	-	Completed
4.	B.P.C.L., Bhubaneswar	-	Completed
5.	Open Air Jail, Bhubaneswar	-	Completed
6.	Fishery Firm, Angul	-	Completed

Ground Water Legislation

Even though the average utilization of groundwater resources in the state is only 18.31 %, in some of the blocks its utilization is quite high (>50%). In order to prevent such regional imbalances in ground water development which can lead to aquifer degradations, extraction up to 60% is considered safe. An exploitation of ground water resource in a judicious and regulated manner is extremely essential. A suitable legislation to regulate the development of ground water resources in the state is under consideration of the Government.

Hydrology Project

The Hydrology Project (Phase-II) is under implementation in the State with effect from 5th April 2006. To promote effective use of data in water resources planning and management with better productivity, efficacy and cost effectiveness is the primary objective of this project. This would ultimately result inefficient management of the water resources in all sectors involved. Under Phase-II operation, creation / development of hydrological design aids and developing decision support system in Mahanadi River basin and its sub-basins.

The project consists of the following main components and sub-components:

I. Institutional strengthening

- I.A. Consolidation of HP-I activities in the state
- I.B. Awareness raising, dissemination and knowledge sharing.
- I.C. Implementation support II.

II. Vertical Extension.

- II.A. Development of Hydrological Design Aids
- II.B. Development of Decision Support System (DSS)
- II.C. Implementation of Purpose Driven Studies (PDS)

The total financial outlay of the project is Rs.27.51Crores out of which the ground water component is Rs.14.23Crores. The Project is scheduled to be implemented within a period of 6years (i.e. 2006-07 to 2011-12). Mahanadi basin is the study area for the above activities.

Status

During FY 2009-10, Expenditure of Rs.93.75lakhs was made for attending to the activities under Component-I i.e. consolidation of HP-I, implementation support etc. with emphasis on Hydrological Design Aid, Planning Decision Support System and Purpose Driven Studies under Component-II (i.e. Vertical Extension), capacity building, up gradation of IT infrastructures, awareness raising and management and monitoring support covered under Component-I. An outlay of Rs.200.00lakhs has been provided for the financial year 2010-11.



VES test in progress



Recuperation test in progress

Table-7.4
Ground Water Resources of Orissa

SI No.	Block	Grounwater resource assessed 1999(HM)	Nos. of existing GW structures for irrigation use as of 31-03-2004								Annual GW Draft (HM) as of 31-03-2004				Stage of GW Development (Old Names) (%)
			DW with tenda	DW with pump set	STW (RIDF)	FPTW	BW	STW	MDT W	DTW	Irrigation Use	Domestic Use	Industrial Use	Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Anugul	86673	27718	2454			247				11881	2509	770	15160	17.49
2	Balasore	99888		5708	770	5010		256	1212		43018	4146	240	47404	47.46
3	Bargarh	56073	6444	436			608				5105	2777	147	8029	14.32
4	Bhadrak	51209	108		2368			1398	103		20294	2387	491	23172	45.25
5	Bolangir	71349	20189	2671			71				9049	2727	186	11962	16.77
6	Boudh	36977	13772	1191			6				5350	789	31	6170	16.69
7	Cuttack	105367	10971	999	3327				246		14635	4790	216	19641	18.64
8	Deogarh	21225	4195	56			121				1859	535	31	2425	11.43
9	Dhenkanal	65195	13496	3590			89				8040	2207	147	10394	15.94
10	Gajapati	27754	3319	2334			5	68			4033	962	67	5062	18.24
11	Ganjam	113804	29976	4042	84	9	30	918			22548	5966	467	28981	25.47
12	Jagatsinghpur	139699	421	2170	1480	1304		870	34		18378	1919	52	20349	14.57
13	Jajpur	58997	7109	263	1778	1144	24	272	337		17267	3437	437	21141	35.83
14	Jharsuguda	17267	6306	557			63				2733	915	228	3876	22.45
15	Kalahandi	89520	24861	1646			94				9530	2826	404	12760	14.25
16	Kandhamal	62396	10360	2050							5159	1373	105	6637	10.64
17	Kendrapara	32344	626	45				852		4	8852	1348	47	10247	31.68
18	Keonjhar	132291	22562	3889		657	57	109			13977	3360	240	17577	13.29
19	Khurda	90183	16455	311	333		143	97		8	7728	4106	630	12464	13.82
20	Koraput	82136	4118	658		5	46				2116	2052	1297	5465	6.65
21	Malkangiri	32880	2211	252							914	909	156	1979	6.02
22	Mayurbhanj	152064	9075	11518	193	2225	6	108	343		27553	4583	883	33019	21.71
23	Nawapara	36729	8599	1326			177				4702	1102	33	5837	15.89

24	Nawarangpur	48103	7095	892			28				3145	2169	57	5371	11.17
25	Nayagarih	51429	13548	707	396	14	106				6082	1803	95	7980	15.52
26	Puri	88348	3300	1407	111	791	12		60		5946	3133	208	9287	10.51
27	Rayagada	62882	3851	619	37	15	41	262			4699	1541	1770	8010	12.74
28	Sambalpur	66332	9084	1126			129				4432	1941	484	6857	10.34
29	Subarnapur	29940	5282	512			22				2196	1127	40	3363	11.23
30	Sundargarh	92074	13892	4899			136				9680	3980	488	14148	15.37
	State Total	2101128	298943	58328	10877	11174	2261	5210	2335	12	300901	73419	10447	384767	18.31
NB:	GW=Ground Water, HM=Hectare Meter, DW=Dug Well, TW=Tube Well, STW=Shallow TW,FPTW=Filter Point TW,														
	BW=Bore Well, MDTW=Medium Deep TW, DTW=Deep TW														
	Unit draft of GW structures (HM):DW (tenda)=0.30,DW(pump set)=1.00, STW (RIDF)=2.00, FPTW=3.00,														
	BW=4.50, STW=10.00, MDTW=15.00, DTW=25.00														
	All GW structure/draft figures are as of 31 st March 2004.														