

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 1452 mm. 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 Archaean to Recent origin underlie the State. The Archaean 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. The present level of ground water exploration in the State is on an average 18.31%. By March 2004, in total 389140 ground water structures have been grounded only for irrigation use. The details are given in the following Table.

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 ground water resources of the State, under the administrative control of the Department of Water Resources. GWS&I has two circles, ten field Divisions and five Water Quality Laboratories. The Divisions are facilitated with Data Processing Centres. State level Ground Water 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 district wise figures of ground water resource are presented in the annexure.

- **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 ground water 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 ground water 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.

- **Artificial Recharge to Ground Water & Rain Water Harvesting:**

For augmentation of ground water and raising of water table, 3 watershed 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, Government of India under Central Sector Scheme have been taken up and completed. The impact has been assessed to be very promising. Proposal for seven more artificial recharge projects has been submitted to the Ministry of Water Resources, Government of India for approval and funding. Besides, there is a proposal to take up 16 more artificial recharge schemes for implementation in various parts of the State including western districts under centrally funded scheme. Feasibility study has been taken up during 2008-09 in 20 different locations for the same.

- **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 Behaviour 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 behaviour 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.

• **Deposit Works:**

The Directorate undertakes drilling works, water quality analysis and artificial recharge of ground water and rain water harvesting works of other agencies on deposit of estimated amount. The works undertaken during 2008-09 is given in the table below.

Deposit Works taken up during 2008-09

Sl. No.	Organization Name	Amount Deposited(in Rupees)	Status
A. Water Quality Analysis			
1.	Project Director, ADRI, Phulnakhara, Cuttack	585.00	Completed
2.	Dy. Manager, Power Grid Corporation, Rengali	819.00	Completed
3.	M/s Anil Agrawal Foundation, Vedanta University Project, Puri	878.00	Completed
4.	M/s Durga Water, Dhenkanal	849.00	Completed
5.	M/s. Aquarium Industries, Laxmisagar, Bhubaneswar	790.00	Completed
6.	M/s. Metcast Metals Pvt. Ltd.	2106.00	Completed
B Feasibility study of Water Harvesting structure			
1.	Aditya Aluminium, Lapanga	199000.00	Completed
C Rain Water Harvesting			
1.	OCL India Ltd., Rajgangaur	632000.00	Ongoing
2.	Asst. General Manager, RBI, Bhubaneswar	1515150.00	Ongoing

Ground Water Legislation

Even though the average utilization of ground water 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. Exploitation of ground water resources 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 in efficient 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:

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.

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. 21.35 Crores out of which the ground water component is Rs. 11.23 Crores. The Project is scheduled to be implemented within a period of 6 years (i.e. 2006-07 to 2011-12). Mahanadi basin is the study area for the above activities.

Status

During FY 2008-09, Expenditure of Rs. 78.50 Lakhs 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, upgradation of IT infrastructures, awareness raising and management and monitoring support covered under Component-I. An outlay of Rs. 229.00 lakhs has been provided for the financial year 2009-10.



GW Table monitoring



Sample Collection

GROUND WATER RESOURCES OF ORISSA

Sl.No.	Block	Ground water 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-		
			DW with tenda	DW with pumpset	STW (RIDF)	FPTW	BW	STW	MDTW	DTW	Irrigation Use	Domestic Use	Industrial Use
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Angul	86673	27718	2454			247				11881	2509	77
2	Balasore	99888		5708	770	5010		256	1212		43018	4146	24
3	Bargarh	56073	6444	436			608				5105	2777	14
4	Bhadrak	51209	108		2368			1398	103		20294	2387	49
5	Bolangir	71349	20189	2671			71				9049	2727	18
6	Boudh	36977	13772	1191			6				5350	789	3
7	Cuttack	105367	10971	999	3327				246		14635	4790	21
8	Deogarh	21225	4195	56			121				1859	535	3
9	Dhenkanal	65195	13496	3590			89				8040	2207	14
10	Gajapati	27754	3319	2334			5	68			4033	962	6
11	Ganjam	113804	29976	4042	84	9	30	918			22548	5966	46
12	Jagatsinghpur	139699	421	2170	1480	1304		870	34		18378	1919	5
13	Jajpur	58997	7109	263	1778	1144	24	272	337		17267	3437	43
14	Jharsuguda	17267	6306	557			63				2733	915	22
15	Kalahandi	89520	24861	1646			94				9530	2826	40
16	Kandhamal	62396	10360	2050							5159	1373	10
17	Kendrapara	32344	626	45				852		4	8852	1348	4
18	Keonjhar	132291	22562	3889		657	57	109			13977	3360	24
19	Khurda	90183	16455	311	333		143	97		8	7728	4106	63
20	Koraput	82136	4118	658		5	46				2116	2052	129
21	Malkangiri	32880	2211	252							914	909	15
22	Mayurbhanj	152064	9075	11518	193	2225	6	108	343		27553	4583	88
23	Nawapara	36729	8599	1326			177				4702	1102	3
24	Nawarangpur	48103	7095	892			28				3145	2169	5
25	Nayagarh	51429	13548	707	396	14	106				6082	1803	9
26	Puri	88348	3300	1407	111	791	12		60		5946	3133	20
27	Rayagada	62882	3851	619	37	15	41	262			4699	1541	177
28	Sambalpur	66332	9084	1126			129				4432	1941	48
29	Subarnapur	29940	5282	512			22				2196	1127	4
30	Sundargarh	92074	13892	4899			136				9680	3980	48
	State Total	2101128	298943	58328	10877	11174	2261	5210	2335	12	300901	73419	1044

NB: GW=Ground Water, HM=Hectare Metre, DW=Dug Well, TW=Tube Well, STW=Shallow TW, FPTW=Filter Point TW, BW=Bore Well, MDTW= Medium Draft Tube Well, DTW=Deep Tube Well
Unit draft of GW structures (HM) : DW (tenda)=0.30, DW (pumpset)=1.00, STW (RIDF) =2.00, FPTW=3.00, BW=4.50, STW=10.00, MDTW=15.00
All GW structure / draft figures are as of 31st March 2004.

