



# Hydrogeologists of central ground water board lack knowledge and skill to interpret hydrochemical characteristics by using Chadha's diagram and publish reports in time

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## DESCRIPTION

The Central Ground Water Board is the apex organisation for development and management of ground water resources of the country and is entrusted with the responsibilities of scientific studies-including surveys, investigation and exploration programmes for the assessment of the resources-and assisting the states in development, management, augmentation, conservation and protection of ground water from pollution. Central Ground Water Board assists drought-affected states in locating sites and designing tube wells. Further the organisation studies the feasibility of application of new technologies for planning development and management of ground water resources. The activities of the Board, which are regular in nature, are being pursued on a continuing basis.

Off late the organisation is not able to publish many of the hydrogeological reports in time due to the non-availability of the interpreted hydrochemical characteristics of ground water samples collected from various sources like dug, bore and tube wells. This is due to the lack of knowledge and skill among

Hydrogeologists to interpret hydrochemical characteristics by using Chadha's diagram.

## Performance problem

Hydrogeologists of Central Ground Water Board are not able to interpret hydrochemical characteristics of ground water samples and publish reports in time.

## Training need

Impart knowledge and skill to Hydrogeologists of Central Ground Water Board to interpret hydrochemical characteristics and publish reports in time.

## Target group

Training to be imparted to Hydrogeologists of Central Ground Water Board (120 Nos) to interpret hydrochemical characteristics by using Chadha's diagram and publish reports in time.

Training will be imparted in 6 Regional offices (20 no. in each group) at Hyderabad in South, Lucknow in North, Ahmedabad in West, Kolkata in East, Nagpur in Central and Guwahati in North East.

## Constraints

**Location:** Training Institute of Central Ground Water Board (Rajiv Gandhi National Ground Water Training & Research Institute) is situated at Raipur and the accessibility of the institute from different Regional offices is very much limited. Training will be carried out in 6 Regional offices of Central Ground Water Board (20 participants at each office) at Hyderabad in South, Lucknow in North, Ahmedabad in West, Kolkata in East, Nagpur in Central and Guwahati in North East(Alliger GM et al., 1989).

**Time:** During monsoon (July to September) to ensure maximum participation of the trainees.

**Duration of training:** 5 days

**Aim of training:** Central Ground Water Board will be able to publish reports in time.

## Benefits

- Hydrogeologists will be able to interpret hydrogeochemical data of water samples,
- Central Ground Water Board will be able to disseminate data timely through publication of technical reports and stakeholders will be able to utilize the Reports for effective ground water management, and

- The organizational efficiency and credibility will improve.

## Training Objectives (TOs)

### TO.1

- ✓ Trainees will be able to prepare base map of area and collect ground water samples in field and submitting the samples in chemical laboratory and the Chemists of Client organization will analyse water samples,

### TO.2

- ✓ Trainees will be able to interpret the analysed data by using Chadha's diagram and prepare reports, and

### TO.3

- ✓ At the end of the training session, the trainees will be able to reply to queries (open house), carry out individual exercises and independently interpret water quality data by using Chadha's diagram(Bramley P, 1986).

## Enabling Objectives (EO) of TO.1

- Trainees will be able to
- EO-1 Prepare base map of the study area for chemical sampling,
  - EO-2 Establish optimum numbers of wells for water sample collection,
  - EO-3 Use Global Positioning System (GPS), and
  - EO-4 To identify the source, collect water samples in field and other well inventory

details.

### **Enabling Objectives (EO) of TO.2**

Trainees will be able to

EO-1 Calculate water quality data, prepare Chadha's diagram and draw inferences by Chadha's diagram,

EO-2 Identify ground water problems of the area, and

EO-3 Propose management options and future strategies for effective ground water management with respect to pollution.

### **Relevance of objectives to training needs**

The training need of the project is to impart knowledge and skill to Hydrogeologists of Central Ground Water Board to interpret hydrochemical characteristics. The TO-1 can be achieved only by the EOs viz. preparation of base map, establishing optimum numbers of

wells for water sample collection, GPS and identifying the water source and collect water samples in field. Similarly enabling objectives TO-2 is accomplished by preparing water quality chemical maps, identifying ground water quality problems and propose the management to adopt future strategies regarding ground management with respect to ground water pollution. The relevance of the training need is to increase the efficiency of the organization and publish reports in time. The stakeholders will be able to access chemical quality data and reports of Central Ground Water Board in time (Chyung SY, 2008).

### **Entry Behaviour (EB) will be taken into account**

The significant EBs of the hydrogeologists are compiled (Table 1).

**Table 1.** Entry behaviour of the Hydrogeologists.

#	Item	Entry behaviour
1	Education	MSc, MTech in Geology/Applied Geology
2	Age group	25-35 years
3	Experience	1-3 years
4	Location	Working in different Regional offices of CGWB
5	No. of trainees	120 trainees (6 groups -20 No. in each group)
6	Available period for training	Monsoon (July-Aug.-Sept)
7	Nature of group	Homogeneous

### **Assumptions about trainees**

Basic knowledge of hydrochemical characteristics of water.

### **Assessing entry behaviour**

Profile of trainees received from client.

### **Design of training**

The training details like objectives,

content defined in relation to objectives, content, time and timing considered, appropriateness of training methods, media specified and appropriate, trainers

taken into account, performance aids and transfer of learning taken into account are compiled (Table 2).

**Table 2.** Design details of the training.

Day and Time	Objective	Content	Method	Media	Trainer	Performance Aid	Timing (min.)	Assessment
1 (10 00-10 30)	Registration of the trainees							
1 (10 30-11 15)	Inaugural Session							
1 (11 15-11 30)	Tea break							
1 (11 30-12 45)	TO-1 EO-1	Introduction: Basic concept on ground water, water sampling and terminology associated with toposheets and geological map	Lecture	Power-Point Presentation, white board writing	Superintending Hydrogeologist	None	75	Formative Assessment by MCQ
1 (12 45-14 00)	Lunch break							
1 (14 00-15 15)	TO-1 EO-1	Preparation of base map: identifying and selecting features from toposheets and geological map and superimposing selected features into the base map	Demonstration	Toposheet, geological map, tracing sheet, other stationery	Superintending Hydrogeologist	None	75	Formative Assessment
1 (15 15 – 15 30)	Tea break							
1 (15.30-16.45)	TO-1 EO-1	Preparation of base map identifying and selecting features of toposheet and geological map	Coaching	Toposheet, geological map, tracing sheet (stationeries)	Superintending Hydrogeologist assisted by two Senior Hydrogeologists	None	75	Formative Assessment
1 (16.45-	Interaction with trainees							

17.00)								
2 (10 00-11.15)	TO-1 EO-2	Guidelines on number of wells to be established for water sample collection and well inventory details	Lecture	Power-Point Presentation, white board writing	Superintending Hydrogeologist	None	75	Formative Assessment
2 (11 15-11 30)	Tea break							
2 (11 30-12 45)	TO-1 EO-2	Exercise for no of wells to be established for water sample collection and well inventory details	Coaching	Note book, exercise question and maps	Superintending Hydrogeologist assisted by two Senior Hydrogeologists	Well inventory forms	75	Formative Assessment
2 (12 45 – 14 00)	Lunch break							
2 (14.00-15.15)	TO-1 EO-3	Use of GPS and measuring tape in field	Coaching	GPS and measuring Tape	Superintending Hydrogeologist assisted by two Senior Hydrogeologists	GPS Manual	75	Formative Assessment
2 (15.15-15.30)	Tea break							
2 (15.30-16.45)	TO-1 EO-4	Field data collection (latitude, longitude, water sample, well inventory details)	Coaching	GPS, clean PVC water bottle, bucket and rope and measuring tape	Superintending Hydrogeologist assisted by two Senior Hydrogeologists	Manual on Field survey	75	External validation
2 (16.45-15.00)	Interaction with trainees							
3 (10.00-11. 15)	TO-2 EO-1	Introduction: Basic concept on water quality, milligram/litre (mg/l), milli equivalent/litre (epm), conversion from mg/l to epm	Lecture	Power-Point Presentation, white board writing	Superintending Hydrogeologist		75	Formative Assessment by MCQ
3 (11.15-11. 30)	Tea break							

3 (11.30-12.45)	TO-2	Chemical quality data processing and	Lecture	Power-Point Presentation, white board writing	Superintending Hydrogeologist		75	Formative Assessment by MCQ
	EO-1	chemical quality data analysis						
3 (12.45-14.00)	Lunch break							
3 (14.00-15.15)	TO-2	Introduction to Software and its functions	Coaching	Computers loaded with software	Superintending Hydrogeologist	Manual on Software	75	Formative Assessment
	EO-1	Preparation of Chadha's diagram			assisted by two Senior Hydrogeologists			
3 (15.15-15.30)	Tea break							
3 (15.30-16.45)	TO-2	Interpretation of Chadha's diagram and identification of water types/facies	Coaching	Computers loaded with software	Superintending Hydrogeologist	Manual on Software	75	Formative Assessment
	EO-1				assisted by two Senior Hydrogeologists			
3 (16.45-15.00)	Interaction with trainees							
4 (10.00-11.15)	TO-2	Introduction: Quality problems under different geological set ups.	Lecture	Power-Point Presentation, white board writing	Superintending Hydrogeologist		75	Formative Assessment
	EO-2							
4 (11.15-11.30)	Tea break							
4 (11.30-12.45)	TO-2	Different types pollution and contamination, case studies	Lecture	Power-Point Presentation, white board writing	Superintending Hydrogeologist		75	Formative Assessment
	EO-2							
4 (12.45-14.00)	Lunch break							
4 (14.00-15.15)	TO-2	Introduction: Strategies regarding ground water management with respect to ground water pollution perspectives	Lecture	Power-Point Presentation, white board writing	Superintending Hydrogeologist		75	Formative Assessment
	EO-3							
4 (15.15-15.30)	Tea break							
4 (15.30-16.45)	TO-2	Introduction: Strategies	Lecture	Power-Point Presentation,	Superintending Hydrogeologist		75	Formative Assessment
	EO-3							

		regarding ground water management with respect to ground water pollution perspectives		white board writing				
4 (16.45-15.00)	Interaction with trainees							
5 (10.00-11.15)	TO3	Open house discussion, use of software and preparation of maps	Coaching	White board, Flip charts, computer system	Superintending Hydrogeologist assisted by two Senior Hydrogeologists		75	Various components are used by trainees.
5 (11.15-11.30)	Tea break							
5 (11.30-12.45)	TO3	Open house discussion, use of software and preparation of maps	Coaching	White board, Flip charts, computer system	Superintending Hydrogeologist assisted by two Sr. Hydrogeologists		75	Various components are used by trainees.
5 (12.45-14.00)	Lunch break							
5 (14.00-15.15)	Evaluation of Programme by Slip test/MRQ							
5 (15.15-15.30)	Tea break							
5 (15.30-16.30)	Feedback/IRQ							
5 (16.30-17.00)	Valedictory function							

## Budget

The budget details of the training are compiled (Table 3).

**Table 3.** The budget details of the training.

Particular for one training	No of participants/session	No of days	Unit cost (Rs)	Total (Rs)
Training Kit	20 Participants	-----	500	10000
Refreshment	20 Participants	5	200	20000
Honorarium	-	-	-	
Stationery		Lump sum	4000	4000
Training Aid		Lump sum	2000	2000
Miscellaneous		Lump sum	2000	2000
Total amount for one Training				38000
Total for six Trainings Rs. 38000*6=Rs. 228000				

## Validation

Two methods of validation can be carried out-internal and external Validations. The internal validation as per the following feedback (Table 4) (Hayes M, 2003). The internal validation provides trainers with feedback about the training they provide, checks whether the trainees have achieved the specified objectives, enables the quality of training to be monitored, indicates where the effectiveness of training can be improved and can be effectively delivered and provides the

basis for certification. The external validation will be done by line or department management after 2 to 3 months. The external validation focuses on actual performance, can be related to identified training needs, establishes the basis for the transfer of learning, indicates the validity of the specified training objectives, can be used as evidence of competence, provides essential data for cost benefit analysis and proves the benefits being obtained from training(Kirkpatrick DL, 1994).

**Table 4.** Details of internal validation of the training.

Particular	Fully	Partially	Not at all
Relevancy of the contents			
Implementation at work place			
Are objectives achieved			

## Evaluation

Evaluation will be done by senior management, accountants, consultants, or by customers. The reasons for doing evaluation of training include it recognises the importance of satisfying the needs of the clients, provides justification for the investment of training, establishes the benefits of having a training function, encourages management to make further investment in training, enables training to be valued from different perspectives, includes cost benefit analysis, provides professional discipline for training management and encourages careful scrutiny of training proposals.

Alliger GM, Janak EA (1989). Kirkpatrick's levels of training criteria: Thirty years later. Personnel Psychology. 42(2): 331-342.

Bramley P (1986). Evaluation of Training : A Practical Guide. London: British Association for Commercial and Industrial Training, England.

Brinkerhoff R (2006). Telling Training's Story: Evaluation Made Simple, Credible, and Effective. Berrett-Koehler, USA.

## REFERENCES



Chyung SY (2008). Foundations of Instructional Performance Technology. HRD Press Inc, Amherst, MA, United States.

Hamblin AC (1974). Evaluation and Control of Training. Mc Graw Hill, London, UK. 208.

Hayes M (2003). Just Who's Talking ROI? Information Week. San Francisco, California, USA,18.

Kirkpatrick DL (1994). Evaluating Training Programmes. Berrett-Koehler. 1-373.



