

**Report
Workshop on**

GROUND WATER MODELLING FOR AQUIFER MANAGEMENT IN SOFT ROCK AREAS

1st September 2016 at IIT, Kharagpur

INTRODUCTION

Central Ground Water Board (CGWB), Ministry of Water Resources, River Development and Ganga Rejuvenation, Govt. of India has taken up National Aquifer Mapping Programme (NAQUIM) during the XII Five Year Plan with the aim to carry out detailed mapping of aquifers in the country and to formulate aquifer management plans to ensure long-term sustainability of aquifer systems. Ground water modelling is one of the important components of this programme. To facilitate wider consultation leading to formulation of scientifically accurate and policy relevant

management plans involving ground water modelling, CGWB had organised a workshop at IIT, Bangalore during 22nd April 2016. In this series, CGWB organised another one day workshop at IIT, Kharagpur on the central theme of ground water modelling. While workshop at Bangalore



Dignitaries on the dais during the inaugural sessions (from L Dr. D Saha, Member, CGWB; Shri K B Biswas, Chairman, CGWB; Dr. S K Bhattacharyya, Officiating Director, IIT, Kharagpur; Dr. A Sarkar, Prof., IIT, Kharagpur; Dr. J Bhattacharya, Prof., IIT, Kharagpur

focussed on modelling in hard rock areas, the workshop at Kharagpur was organised with special reference to the issues and challenges in soft rock areas. The workshop was planned to provide a platform for a multidisciplinary dialogue on various aspects of ground water modelling and allied topics. Various aspects like data requirements, data adequacy, alternative approaches, protocols, SOPs, skill requirements etc were deliberated upon.

PARTICIPATION

The workshop was inaugurated by Dr. S K Bhattacharyya, Acting Director, IIT, Kharagpur in the gracious presence of Shri K B Biswas, Chairman, CGWB; Dr. D Saha, Member, CGWB; Dr. Anindya Sarkar, Professor and Head, Department of Geology and Geophysics, IIT, Kharagpur; and Dr. J. Bhattacharya, Professor and Head, School of Environmental Studies, IIT, Kharagpur



Dr. S K Bhattacharyya, Officiating Director, IIT, Kharagpur along with Shri K B Biswas, Chairman, CGWB lighting the ceremonial lamp during inauguration

Nearly 80 participants including professionals and researchers from IIT, Kharagpur; IIT, Guwahati; IIT, Bhubaneswar; ISM, Dhanbad; NIT, Jaipur, MNNIT, Allahabad; NIT, Durgapur; NIH, Patna; ICAR, Patna; IISWBM, Kolkata; Agriculture University, Kalyani; CMPDIL, Ranchi; Centre for Ground Water Studies (NGO); Professionals from Govt. of West Bengal and various regions of Central Ground Water Board.



Participants during the technical session

TECHNICAL SESSIONS (Presentations, brainstorming and plenary)

The workshop was divided into three sessions. Summary of the proceedings are given below.

Presentation Title (included presentations by invited experts followed by brainstorming)	Name of the expert
Technical Session-I	
National Aquifer Management Programme in India (Keynote)	Dr. D Saha , Member (CGWB)
Groundwater Modelling – an Eye Opener for Groundwater Management	B. Chakraborty , Head, NIH Centre, Patna
Pumping Induced Impacts on the Groundwater Flow of Central West Bengal: Analysis of Arsenic Contamination of Deep Aquifer via Numerical Modelling	Dr. P K Sikdar , Prof. IISWBM, Kolkata
Solute Transport Modelling for Groundwater Management	Dr. S Kartha , Associate Professor, IIT, Guwahati
Technical Session-II	
Model Assisted Aquifer Management Plan of a multi-layered Alluvial Aquifer	S N Dwivedi , CGWB, Faridabad
Regional groundwater flow model of the alluvial aquifers of Western Bengal Basin	Dr. A Mukherjee , IIT, Kharagpur
Ground water modelling in an urban environment- an example from NCT, Delhi	Rajesh Chandra , CGWB, New Delhi
Regional coarse grid numerical groundwater modeling in NW India - a case study. (Use of groundwater model as a hydrogeological tool)	Dr. Shashank Shekhar , Associate Prof. University of Delhi
Plenary	
Dr. D Saha , Member, CGWB	
Dr. S Sarkar , Professor and Dean, Agriculture, University, Kalyani, West Bengal	
Dr. M K Jha , Professor, IIT, Kharagpur	
Dr. S P Sinha Ray , Member (retd), CGWB	

MAJOR RECOMMENDATIONS

During the plenary session, the distinguished panellists summarised the key issues that emerged during the preceding sessions and after assimilating the views expressed by the experts during the session, the following recommendations were made

- Ground water modelling is an important tool to understand the dynamics of the aquifer system in its entirety and should therefore be made an integral part of any aquifer management plan.
- Ground Water modelling should be carried out following the established modelling protocols
- As groundwater modelling is an important tool to study, characterise and understand the ground water system with the capability of higher end use towards making predictive assessment, it is essential that this exercise be done with utmost scientific integrity so as to avoid its misuse. The success of the modelling study rests on the following four pillars (i) Data availability (ii) Quality of available data (iii) Knowledge of the System and (iv) Knowledge of Modelling
- Vadose zone characteristics which play an important role in the migration of contaminants particularly those of anthropogenic origin should therefore be accorded due weightage in transport modelling of groundwater.
- Modelling reports should also present an assessment of the acceptable level of uncertainties in the modelled output arising out of uncertainty in the input parameters
- The impact of the landuse and land cover changes on the recharge fluxes as well as the impacts arising out of the climate change should also be considered in groundwater modelling
- Quantification of the evapotranspiration for assessing groundwater demand for agriculture and moisture status of soils should also be studied.
- Modelling scenarios should also account for the impact of the crop diversification strategy and the associated changes in water demand
- CGWB should strive to develop a comprehensive knowledge bank on groundwater modelling in association with the professionals and experts from academia and industry. Strengthening of CGWB and capacity building of its professionals on groundwater modelling would be the key to success of the aquifer mapping and management of India's ground water

- A trade-off between the desired level of calibration and validation in consonance with the objective of the modelling should be pre-defined to make the best use of the modelling tool within a given timeframe for some specific studies
- Dr S.P. Sinha Ray (Retd Member) CGWB, highlighted the role that an improved understanding of the ground water system played in development of groundwater resources that became the key driver towards success of the green revolution in India. He suggested the Gen X ground water professionals to capitalise upon the computational capability of the modelling tools and charter the path for a sustainable ground water development to steer the 2nd phase of green revolution.



Experts on the dais during the plenary session (from L: Dr. M K Jha, Professor, Department of Agricultural Engineering, IIT, Kharagpur; Dr. S P Sinha Ray, Member (Retd), CGWB; Dr. Dipankar Saha, Member, CGWB; Dr. S Sarkar, Professor and Dean, Vidhan Chandra Krishi Vishwavidyalay, Kalyani, West Bengal.)