

Mridul Buragohain

Groundwater Heavy Metal Contamination

A GIS-based Study in Dhemaji District of Assam, India



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Preface

I am pleased to present the book **GROUNDWATER HEAVY METAL CONTAMINATION: A GIS-BASED STUDY IN DHEMAJI DISTRICT OF ASSAM, INDIA**, a final report of minor research project.

I am thankful to the University Grants Commission (UGC), New Delhi and Regional Office (UGC-NERO), Guwahati for financial assistance in the form of minor research project vide no. F. 5- 511/2011-12 (MRP/NERO)/15292 dated 23rd March, 2012. I am also thankful to Mr. Monjit Borthakur, Research Fellow, OKD Institute of Social Change & Development, V.I.P Road, Upper Hengerabari, Guwahati for his kind help in using Arc View GIS software.

I hope that the book will be quite helpful to the academicians, Researcheres, etc. in acquiring the knowledge in the field of water quality monitoring researches. I sincerely hope that the book will be appreciated by our learned colleagues. I shall be glad to receive constructive suggestions and will be gratefully acknowledged.

North Lakhimpur, Assam, India
September, 2015

Dr. Mridul Buragohain

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Abbreviations

AAS	: Atomic Absorption Spectrometry
APHA	: American Public Health Association
BDL	: Below Detection Limit
BIS	: Bureau of Indian Standards
EPA	: Environment Protection Agency
GPMB	: Ganga-Padma-Meghna-Brahmaputra
HG-AAS	: Hydride Generation Atomic Absorption Spectrometry
ICMR	: Indian Council of Medical Research
ISI	: Indian Standard Institute
MHS	: Mercury Hydride System
NGO	: Non Governmental Organization
PHED	: Public Health Engineering Department
SOES	: School of Environmental Studies
UNICEF	: United Nation's International Children Emergency Fund
UV	: Ultra Violet
WHO	: World Health Organization

Chapter 1

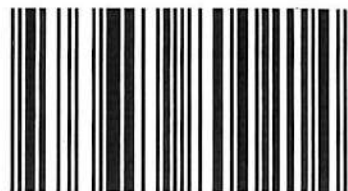
Introduction

The quality of water resources is a subject of ongoing concern. The health and happiness of the human race are closely tied up with the quality of the water used for consumption where the per capita consumption of water is an index of quality of life of the people as well as their economic and social condition. It is being estimated that, by the year 2025, more than half of the world population will be facing water-based vulnerability⁽¹⁾. Water is essential for sustaining life, and adequate, safe and accessible supply of water must be available to all. Human and plant body consists of 60% and 90% water respectively. Access to safe drinking water is essential to health, a basic human right and a component of effective policy for health protection. Due to various ecological factors either natural or anthropogenic, the groundwater is getting polluted because of deep percolation from intensively cultivated fields, disposal of hazardous wastes, liquid and solid wastes from industries, sewage disposal, and surface impoundments etc⁽²⁻⁸⁾. The use of various structurally complex synthetic compounds in the fields of industry and agriculture has added many potentially toxic chemical substances in the aquatic environment. Of these, the important ones are arsenic, barium, beryllium, cyanide, fluoride, lead, mercury, nickel, nitrate and nitrite, selenium, silver etc. amongst the inorganic constituents and pesticides, polynuclear aromatic hydrocarbons, phenols etc. amongst the organic constituents. There are other chemical constituents, which are nontoxic, but affect the aesthetic and organoleptic quality of water. These include aluminium, chloride, colour, copper, hydrogen sulphide, iron, manganese, dissolved oxygen, zinc, sulphate etc. The presence of arsenic in groundwater has been reported extensively in recent years from different parts of the world, including countries in North America and Latin America, (viz. USA, Canada, Mexico, Argentina, Bolivia, Brazil, Nicaragua), Australia, and Southeast Asia, viz. Bangladesh, China, Nepal, Vietnam, Cambodia and India⁽⁶⁻⁹⁾. However, the environmental problem of arsenic toxicity in groundwater of entire Bengal delta of Ganga-Padma-Meghna-Brahmaputra (GPMB) river

This book provides an overview of the current state of knowledge on the occurrences and distribution of heavy metals viz. iron, lead, arsenic, cadmium, aluminium, copper, nickel, manganese, zinc and chromium problems in water supplies in Dhemaji district of Assam, India. This book is an attempt to address the groundwater contamination of heavy metals in a regional context. A comprehensive analytical, statistical and spatial distribution of heavy metals in ground water in the study area has been presented in this book using SPSS® statistical package (Window Version 10.0) and curve fitting method in arc view GIS software. GIS database helps in decision-making process by identifying the most sensitive zones that need immediate attention. The concentration of studied heavy metals in the water sources of the area is beyond the permissible limits of WHO. The immediate involvement of the research community is needed to combat the slow-onset disaster. It is hoped that the book can be used as a reference while carrying out regional scale studies of ground water quality in near future.



Dr. Mridul Buragohain is Assistant Professor in Chemistry, Lakhimpur Girls' College, Assam, India. He has already published two books, sixteen research papers and completed two MRP's funded by UGC. Reviewer of Polish Journal of Env. Studies, POLAND and Sustainable Water Resources Management, Springer, USA. Life Member of IJRCE (EISSN 2248 – 9649).



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