

## Water Resources Engineering By Sk Garg

**This book explores many recent techniques including ANN, fuzzy logic, hydraulic models and IWRM utilized for integrated water resources management, a real challenge in India for obtaining high irrigation efficiency. The book deals with topics of current interest, such as climate change, floods, drought, and hydrological extremes. The impact of climate change on water**

**resources is drawing worldwide attention these days; for water resources, many countries are already stressed and climate change along with burgeoning population, rising standard of living, and increasing demand are adding to the stress. Further, river basins are becoming less resilient to climatic vagaries. Fundamental to addressing these issues is hydrological modelling which is covered in this book Further, integrated water resources**

**management is vital to ensure water and food security. Integral to the management is groundwater and solute transport. The book encompasses tools that will be useful to mitigate the adverse consequences of natural disasters.**

**Discusses the mechanical advantages of Jeeps, Land Rovers, and other rigs and describes optional equipment, driving techniques, and on-the-road repair procedures**

**Water Resources and Environmental History is a collection of historical articles that cover the existence and function of early water projects and origins of some of today's greatest water systems. Water and sedimentation topics extend back to the Greek and Roman Eras, the ancestral Puebloans who lived in southwestern Colorado 1,200 years ago, and the Incas who constructed Machu Picchu. The unique diversity of topics covered include: construction of**

**the Suez Canal, a photo essay of the Strawberry Valley Project, history of the Bureau of Reclamation's dam design, historical perspectives on existing hydrologic and hydraulic programs, hydraulic laboratories, and engineering libraries. Practicing engineers, students, historians, and anyone interested in the origins of some of today's greatest water systems will benefit from reading this book.**

**World Environmental and Water**

**Resources Congress 2013  
Hydrology and Water Resources  
Engineering  
Copulas and their Applications in Water  
Resources Engineering  
Select Proceedings of AMIWRE 2021  
Selected Water Resources Abstracts  
Showcasing the Future**

*Contains ten state-of-the-art review articles on selected topics in hydraulics/fluid mechanics and water resources engineering.*

*This book is divided into four parts. The first part,*

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*Preliminaries, begins by introducing the basic theme of the book. It provides an overview of the current status of water resources utilization, the likely scenario of future demands, and advantages and disadvantages of systems techniques. An understanding of how the hydrological data are measured and processed is important before undertaking any analysis. The discussion is extended to emerging techniques, such as Remote Sensing, GIS, Artificial Neural Networks, and Expert Systems. The statistical tools for data analysis including commonly used probability distributions, parameter estimation, regression and correlation, frequency analysis, and*

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*time-series analysis are discussed in a separate chapter. Part 2 Decision Making, is a bouquet of techniques organized in 4 chapters. After discussing optimization and simulation, the techniques of economic analysis are covered. Recently, environmental and social aspects, and rehabilitation and resettlement of project-affected people have come to occupy a central stage in water resources management and any good book is incomplete unless these topics are adequately covered. The concept of rational decision making along with risk, reliability, and uncertainty aspects form subject matter of a chapter. With these analytical tools, the practitioner is*



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*well equipped to take a rational decision for water resources utilization. Part 3 deals with Water Resources Planning and Development. This part discusses the concepts of planning, the planning process, integrated planning, public involvement, and reservoir sizing. The last part focuses on Systems Operation and Management. After a resource is developed, it is essential to manage it in the best possible way. Many dams around the world are losing some storage capacity every year due to sedimentation and therefore, the assessment and management of reservoir sedimentation is described in details. No analysis of water resources systems is complete*

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*without consideration of water quality. A river basin is the natural unit in which water occurs. The final chapter discusses various issues related to holistic management of a river basin.*

*This book presents select proceedings of the national conference on Advanced Modelling and Innovations in Water Resources Engineering (AMIWRE 2021) and examines numerous advancements in the field of water resources engineering and management towards sustainable development of environment. The topics covered includes river basin planning and development, reservoir planning and management, integrated water management, reservoir*

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*sedimentation, soil erosion and sedimentation, agricultural technologies for climate change mitigation, uncertainty analysis in hydrology, water distribution networks, floods and droughts management, water quality modelling, environmental modelling, environmental impact assessment, urban water management, open channel hydraulics, hydraulic structures, groundwater hydraulics, groundwater flow and contaminant transport modelling, computational fluid dynamics, ocean engineering, HEC-RAC, SWAT, MIKE, MODFLOW models applications, numerical analysis in water resources engineering, climate change impacts on*

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*hydrology, optimization techniques in water resources, soft computing techniques and applications in water resources and remote sensing / geospatial techniques in water resources. This book will be beneficial for water sectors development mainly agricultural production, reservoir operations, improvement of water quality, flood and drought controls, designing hydraulic structures and geospatial analysis. This book will be a valuable reference for faculties, research scholars, students, design engineers, industrialists, R & D personnel and practitioners working in water resources engineering and its related fields.*

*Water Resources Management and Reservoir*

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*Operation*

*Geospatial Technologies for Land and Water*

*Resources Management*

*Proceedings of the International Conference on Water and Environment (WE-2003), December 15-18, 2003,*

*Bhopal, India*

*Modern Water Resources Engineering*

*A Textbook Of Water Power Engineering*

*Natural and Anthropogenic Disasters*

This book is open access under a CC BY-NC 4.0 license. This revised, updated textbook presents a systems approach to the planning, management, and operation of water resources

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infrastructure in the environment. Previously published in 2005 by UNESCO and Deltares (Delft Hydraulics at the time), this new edition, written again with contributions from Jery R. Stedinger, Jozef P. M. Dijkman, and Monique T. Villars, is aimed equally at students and professionals. It introduces readers to the concept of viewing issues involving water resources as a system of multiple interacting components and scales. It offers guidelines for initiating and carrying out water resource system planning and management projects. It introduces alternative optimization, simulation, and

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statistical methods useful for project identification, design, siting, operation and evaluation and for studying post-planning issues. The authors cover both basin-wide and urban water issues and present ways of identifying and evaluating alternatives for addressing multiple-purpose and multi-objective water quantity and quality management challenges. Reinforced with cases studies, exercises, and media supplements throughout, the text is ideal for upper-level undergraduate and graduate courses in water resource planning and management as well as for practicing planners and engineers in the

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field.

The material of this book will derive its scientific under-pinning from basics of mathematics, physics, chemistry, geology, meteorology, engineering, soil science, and related disciplines and will provide sufficient breadth and depth of understanding in each sub-section of hydrology. It will start with basic concepts: Water, its properties, its movement, modelling and quality The distribution of water in space and time Water resource sustainability Chapters on 'global change' and 'water and ethics' aim respectively to emphasize the



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central role of hydrological cycle and its quantitative understanding and monitoring for human well being and to familiarize the readers with complex issues of equity and justice in large scale water resource development process. Modern Hydrology for Sustainable Development is intended not only as a textbook for students in earth and environmental science and civil engineering degree courses, but also as a reference for professionals in fields as diverse as environmental planning, civil engineering, municipal and industrial water supply, irrigation and catchment management.

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This book comprises select papers presented at the International Conference on Trends and Recent Advances in Civil Engineering (TRACE 2018). The book covers inter-disciplinary research and applications in integrated water resource management, river ecology, irrigation system, water pollution and treatment, hydraulic structure and hydro-informatics. The topics on water resource management include technological intervention and solution for climate change impacts on water resources, water security, clean water to all, sustainable water reuse, flood risk assessment, interlinking of rivers and hydro

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policy. The contents of this book will be useful to researchers and professionals working in the field of water resource management and related policy making.

Engineering Hydrology

Hydrology and Water Resources of India

Water Resources System Operation

Modern Hydrology and Sustainable Water Development

Advances in Water Resources Engineering and Management

Irrigation and Water Resources Engineering New Age

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International

The Book Irrigation And Water Resources Engineering Deals With The Fundamental And General Aspects Of Irrigation And Water Resources Engineering And Includes Recent Developments In Hydraulic Engineering Related To Irrigation And Water Resources Engineering. Significant Inclusions In The Book Are A Chapter On Management (Including Operation, Maintenance, And Evaluation) Of Canal Irrigation In India, Detailed Environmental Aspects For Water Resource Projects, A Note On Interlinking Of Rivers In India, And Design Problems Of Hydraulic Structures Such As Guide Bunds,

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Settling Basins Etc. The First Chapter Of The Book Introduces Irrigation And Deals With The Need, Development And Environmental Aspects Of Irrigation In India. The Second Chapter On Hydrology Deals With Different Aspects Of Surface Water Resource. Soil-Water Relationships Have Been Dealt With In Chapter 3. Aspects Related To Ground Water Resource Have Been Discussed In Chapter 4. Canal Irrigation And Its Management Aspects Form The Subject Matter Of Chapters 5 And 6. Behaviour Of Alluvial Channels And Design Of Stable Channels Have Been Included In Chapters 7 And 8, Respectively. Concepts Of Surface

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And Subsurface Flows, As Applicable To Hydraulic Structures, Have Been Introduced In Chapter 9. Different Types Of Canal Structures Have Been Discussed In Chapters 10, 11, And 13. Chapter 12 Has Been Devoted To Rivers And River Training Methods. After Introducing Planning Aspects Of Water Resource Projects In Chapter 14, Embankment Dams, Gravity Dams And Spillways Have Been Dealt With, Respectively, In Chapters 15, 16 And 17. The Students Would Find Solved Examples (Including Design Problems) In The Text, And Unsolved Exercises And The List Of References Given At The End Of Each Chapter Useful.

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Including Dams Engineering, Hydrology and Fluid Power Engineering. For the student of B.E./B.Tech. Civil Engg., Institution of Engineers (India) U.P.S.C. Exam & Practising Engineers.

Water Resource Systems Planning and Management  
Advances in Water Resources Management for  
Sustainable Use

Select Proceedings of TRACE 2018  
Proceedings

The Decision Tree Framework  
Water-Resources Engineering

Proceedings of the World Environmental and Water

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Resources Congress 2013: Showcasing the Future, held in Cincinnati, Ohio, May 19-23, 2013. Sponsored by the Environmental and Water Resources Institute of ASCE. This collection contains 326 papers covering a broad range of current research and practice in the field of environmental and water resources engineering with a focus on emerging and cutting-edge technologies. Papers from the following symposia are included: 10th Urban Watershed Management Symposium; 11th Symposium on Groundwater Hydrology, Quality, and Management; 15th Annual Symposium on Water Distribution Systems Analysis; Symposium on Cloud Computing in Water and Environmental Engineering; 1st



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Annual Symposium on Uncertainty Analysis Approaches in Hydrologic Modeling; Symposium on Desalination and Water Reuse; Symposium on Hydraulic Fracturing; Hydro-Climate Symposium on Modeling Climate Change; Ohio River Basin and Large Rivers Issues and Research Symposium; and the Daniel P. Loucks Water Resources Symposium. Additional topics include integrated water resources management; education and research; hydraulics and waterways; environmental planning and management; water, wastewater and stormwater management; and history and heritage. This proceedings will be of interest to a wide range of engineers in academic research, government agencies,

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and private sector design and construction. Engineers have attempted to solve water resources engineering problems with the help of empirical, regression-based and numerical models. Empirical models are not universal, nor are regression-based models. The numerical models are, on the other hand, physics-based but require substantial data measurement and parameter estimation. Hence, there is a need to employ models that are robust, user-friendly, and practical and that do not have the shortcomings of the existing methods. Artificial intelligence methods meet this need. Soft Computing in Water Resources Engineering introduces the basics of artificial neural networks (ANN),

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fuzzy logic (FL) and genetic algorithms (GA). It gives details on the feed forward back propagation algorithm and also introduces neuro-fuzzy modelling to readers. Artificial intelligence method applications covered in the book include predicting and forecasting floods, predicting suspended sediment, predicting event-based flow hydrographs and sedimentographs, locating seepage path in an earth-fill dam body, and the predicting dispersion coefficient in natural channels. The author also provides an analysis comparing the artificial intelligence models and contemporary non-artificial intelligence methods (empirical, numerical, regression, etc.). The ANN, FL, and GA are fairly new methods in

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water resources engineering. The first publications appeared in the early 1990s and quite a few studies followed in the early 2000s. Although these methods are currently widely known in journal publications, they are still very new for many scientific readers and they are totally new for students, especially undergraduates. Numerical methods were first taught at the graduate level but are now taught at the undergraduate level. There are already a few graduate courses developed on AI methods in engineering and included in the graduate curriculum of some universities. It is expected that these courses, too, will soon be taught at the undergraduate levels.

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This book presents the innovative ideas and technical expertise for the sustainable solution in the field of water resources. It covers various topics on sustainable water resources management under climate change where researchers and professionals have shared their experience, innovative ideas, issues, recent trends and future directions in field of water resources engineering, science and technology. This book culminates the importance of achieving the ways towards water security and espouse targets and measures that will allow the end-user to meet this challenge in conjunction. It is a compendium of research articles pertaining to the mitigation of water crisis, surface and groundwater

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management, watershed management and modelling, case studies related to wetland vulnerability, water pollution, water quality, extreme climate hazards and others issues and its sustainable diminution through ingenious ideas and technologies that will incur valuable information to the stakeholders in the society. Given its scope, this book will be useful for the researchers and professionals.

Water Management and Water Governance

Water Resources and Environmental History

Water Resources and Development

June 23-July 1, 2004, Salt Lake City, Utah

Confronting Climate Uncertainty in Water Resources

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## Planning and Project Design

### Climate Change Impacts on Water Resources

### Confronting Climate Uncertainty in Water

### Resources Planning and Project Design

describes an approach to facing two fundamental and unavoidable issues brought about by climate change uncertainty in water resources planning and project design. The first is a risk assessment problem. The second relates to risk management. This book provides background on the risks relevant in water systems planning, the different approaches to

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scenario definition in water system planning, and an introduction to the decision-scaling methodology upon which the decision tree is based. The decision tree is described as a scientifically defensible, repeatable, direct and clear method for demonstrating the robustness of a project to climate change. While applicable to all water resources projects, it allocates effort to projects in a way that is consistent with their potential sensitivity to climate risk. The process was designed to be hierarchical, with different stages or phases of analysis triggered based on



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the findings of the previous phase. An application example is provided followed by a descriptions of some of the tools available for decision making under uncertainty and methods available for climate risk management. The tool was designed for the World Bank but can be applicable in other scenarios where similar challenges arise.

The major challenges of the 21st century faced by human beings are how to achieve water security, food security, energy security and environmental security. Owing to enhanced

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natural/anthropogenic disasters worldwide, these challenges become much more complicated and daunting especially for developing countries. Therefore, it is important to highlight the risk of different disasters as well as the modern tools and techniques for minimizing disaster incidence and losses. Disaster management being highly multidisciplinary in nature, a comprehensive book dealing with different aspects of disaster management, and encompassing important disasters faced by humankind is presently not

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available. This book is an attempt to fulfill this gap. It provides clear, comprehensive, and up-to-date information about different facets of disaster management along with salient case studies. The book highlights the current status of disaster management focusing on developing nations, discusses vital issues such as climate change and sustainable development, modern approaches and tools/techniques, and the challenges of and future R&D needs for sustainable disaster management. Complex environmental and hydrological

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processes are characterized by more than one correlated random variable. These events are multivariate and their treatment requires multivariate frequency analysis. Traditional analysis methods are, however, too restrictive and do not apply in many cases. Recent years have therefore witnessed numerous applications of copulas to multivariate hydrologic frequency analyses. This book describes the basic concepts of copulas, and outlines current trends and developments in copula methodology and applications. It includes an accessible

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discussion of the methods alongside simple step-by-step sample calculations. Detailed case studies with real-world data are included, and are organized based on applications, such as flood frequency analysis and water quality analysis. Illustrating how to apply the copula method to multivariate frequency analysis, engineering design, and risk and uncertainty analysis, this book is ideal for researchers, professionals and graduate students in hydrology and water resources engineering.

Soft Computing in Water Resources Engineering

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Statistical Methods in Water Resources

Water Supply Engineering

Research Perspectives in Hydraulics and Water Resources Engineering

Flow Transition Design in Hydraulic Structures

Elements of Water Resources Engineering

*This book provides insights and a capacity to understand the climate change phenomenon, its impact on water resources, and possible remedial measures. The impact of climate change on water resources is a global issue and cause for concern. Water resources in many countries are extremely stressed, and*

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*climate change along with burgeoning populations, the rise in living standards, and increasing demand on resources are factors which serve to exacerbate this stress. The chapters provide information on tools that will be useful to mitigate the adverse consequences of natural disasters. Fundamental to addressing these issues is hydrological modelling which is discussed in this book and ways to combat climate change as an important aspect of water resource management.*

*Environmental engineers continue to rely on the leading resource in the field on the*

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*principles and practice of water resources engineering. The second edition now provides them with the most up-to-date information along with a remarkable range and depth of coverage. Two new chapters have been added that explore water resources sustainability and water resources management for sustainability. New and updated graphics have also been integrated throughout the chapters to reinforce important concepts. Additional end-of-chapter questions have been added as well to build understanding. Environmental engineers will refer to this text throughout their careers.*



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*India is endowed with varied topographical features, such as high mountains, extensive plateaus, and wide plains traversed by mighty rivers. Divided into four sections this book provides a comprehensive overview of water resources of India. A detailed treatment of all major river basins is provided. This is followed by a discussion on major uses of water in India. Finally, the closing chapters discuss views on water management policy for India.*

*Advanced Modelling and Innovations in Water Resources Engineering  
Workshop, Remote Sensing and GIS Applications*

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*in Water Resources Engineering, 29–31 August 2001, Lucknow*

*Hydrological Modeling*

*Hydraulics, Water Resources and Coastal Engineering*

*Workshop Technology (Manufacturing Process)*

*Comprehensive Workshop Technology (Manufacturing Processes)*

*Transitions are provided in hydraulic structures for economy and efficiency. This book covers all types of flow transitions: sub-critical to sub-critical, sub-critical to super critical, super-critical to sub-critical with hydraulic jump, and super-*

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*critical to super-critical transitions. It begins with an introduction followed by characteristics of flow in different types of transitions and procedures for hydraulic design of transitions in different structures. Different types of appurtenances used to control flow separation and ensure uniform flow at exit of transition and diffusers are included. Examples of hydraulic design of a few typical hydraulic structures are given as well. The Book Conforms To The Modern Concept Of Treating The Diversified Problems Of Water Resources Engineering Through A Multi-Disciplinary And Integrated Approach And*

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*Incorporating It In The Educational Curriculum For Effective And Comprehensive Teaching. It Specifically Deals With The Principal Segments Of Water Resources Engineering Which Include Hydrology, Ground Water, Water Management For Irrigation And Power, Flood Control, Engineering Economy In Water Resources Projects For Flood Control, Project Planning In Water Resources, Concrete And Earth Dams. Because Of The Multi-Disciplinary Nature Of Water Resources Engineering Problems, It Is Seldom Possible To Do Full Justice To The Subjects Unless The Teaching Imparts Background Knowledge Of The Allied*

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*Disciplines, Viz., Probability And Statistics, Engineering Economics And Systems Engineering. The Book Represents An Attempt To Fulfill This Primal Need. The Book Would Primarily Benefit Students Doing Graduation In Civil Engineering And Those Appearing In Section-B Examination Of The Institution Of Engineers (India). Besides, Some Of The Topics Covered In The Book Would Also Be Of Much Use By Post-Graduate Students In Water Resources Engineering.*

*This textbook includes exposure to plant & shop layout, industrial safety, engineering materials and their heat treatment, bench work and fitting,*

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*smithy and forging, sheet metal work, wood and wood working, foundry, welding, mechanical working and machine shop practices. A greater stress has been laid on pictorial representation of various hand tools, operators and machine tools rather than giving exhaustive write up on various topics. The matter has been presented in a structured manner and in an easy to understand language, which can be mastered easily by students of various disciplines. Attention has also been paid to the fact that the text as well as the diagrams can be easily reproduced by the students in theory examinations. The book will be*

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*useful for the students of engineering, supervisors, tool room personnel and operators working in manufacturing and other industries.*

*Irrigation and Water Power Engineering*

*Irrigation Engineering And Hydraulic Structures*

*An Introduction to Methods, Models, and Applications*

*Irrigation Engineering and Hydraulic Structures*

*Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms*

*Water Resources Systems Planning and Management*

*Irrigation Engineering and Hydraulic*

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*Structures comprehensively deals with all aspects of Irrigation in India, soil moisture and different types of irrigation systems including but not limited to Sprinkler, Tubewell, Canal and Micro-Irrigation. The book also focuses on Engineering Hydrology, Dams, Water Power Engineering as well as Irrigation Water Management. Special care has been taken to highlight the principles, practices and design procedures that have been widely recommended as well as suggest improvements in the application of*



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*existing methods and adoption of latest techniques used in other parts of the world.*

*The Handbook of Environmental Engineering series is an incredible collection of methodologies that study the effects of pollution and waste in their three basic forms: gas, solid, and liquid. This exciting new addition to the series, Volume 15: Modern Water Resources Engineering , has been designed to serve as a water resources engineering reference book as well as a supplemental textbook.*

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*We hope and expect it will prove of equal high value to advanced undergraduate and graduate students, to designers of water resources systems, and to scientists and researchers. A critical volume in the Handbook of Environmental Engineering series, chapters employ methods of practical design and calculation illustrated by numerical examples, include pertinent cost data whenever possible, and explore in great detail the fundamental principles of the field. Volume 15: Modern Water Resources Engineering, provides*

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*information on some of the most innovative and ground-breaking advances in the field today from a panel of esteemed experts. This book focusses on hydrological modeling, water management, and water governance. It covers the applications of remote sensing and GIS tools and techniques for land use and land cover classifications, estimation of precipitation, evaluation of morphological changes, and monitoring of soil moisture variability. Moreover, remote sensing and GIS techniques have been applied for crop*

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*mapping to assess cropping patterns, computation of reference crop evapotranspiration, and crop coefficient. Hydrological modeling studies have been carried out to address various issues in the water sector. MODFLOW model was successfully applied for groundwater modeling and groundwater recharge estimation. Runoff modeling has been carried out to simulate the snowmelt runoff together with the rainfall and sub-surface flow contributions for snow-fed basins. A study has been included, which*

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*predicts the impact of the land use and land cover on stream flow. Various problems in the water sector have been addressed employing hydrological models such as SWAT, ArcSWAT, and VIC. An experimental study has been presented wherein the laboratory performance of rainfall simulator has been evaluated. Hydrological modeling studies involving modifications in the curve number methodology for simulation of floods and sediment load have also been presented. This book is useful for academicians,*

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*water practitioners, scientists, water managers, environmentalists, and administrators, NGOs, researchers, and students who are involved in water management with the focus on hydrological modeling, water management, and water governance.*

*Irrigation and Water Resources Engineering  
Vulnerability, Preparedness and Mitigation*

*Water Resources Engineering*

*Geographic Information Systems in Water  
Resources Engineering*

**State-of-the-art GIS spatial data management and**

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**analysis tools are revolutionizing the field of water resource engineering. Familiarity with these technologies is now a prerequisite for success in engineers' and planners' efforts to create a reliable infrastructure. GIS in Water Resource Engineering presents a review of the concepts and application Water Resources and Development explores water management strategies through scientific, social and political perspectives, and uses case studies to exemplify four key development challenges: economic growth, poverty reduction, competition and conflict over water, and adaptation to climate change Data on water quality and other environmental issues are being collected at an ever-increasing rate. In the**

**past, however, the techniques used by scientists to interpret this data have not progressed as quickly. This is a book of modern statistical methods for analysis of practical problems in water quality and water resources. The last fifteen years have seen major advances in the fields of exploratory data analysis (EDA) and robust statistical methods. The 'real-life' characteristics of environmental data tend to drive analysis towards the use of these methods. These advances are presented in a practical and relevant format. Alternate methods are compared, highlighting the strengths and weaknesses of each as applied to environmental data. Techniques for trend analysis and dealing with water below the detection**



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**limit are topics covered, which are of great interest to consultants in water-quality and hydrology, scientists in state, provincial and federal water resources, and geological survey agencies. The practising water resources scientist will find the worked examples using actual field data from case studies of environmental problems, of real value. Exercises at the end of each chapter enable the mechanics of the methodological process to be fully understood, with data sets included on diskette for easy use. The result is a book that is both up-to-date and immediately relevant to ongoing work in the environmental and water sciences.**