

# Open Channel Hydraulics Solutions

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**Open Channel Flow** Francis Martin Henderson  
1966 Basic concepts of fluid flow;the energy  
principle in open channel flow;the momentum  
principle in open channel flow;flow resistance;flow

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resistance, nonuniform flow computations;channel  
controls;channel transitions;unsteady flow;flood  
routing;sediment transport;similitud and models.  
Computational Hydraulics C. A. Brebbia 2013-10-22  
Computational Hydraulics provides an introduction

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to computational techniques for hydraulic and fluid flow engineers. It combines classical hydraulics with new methods such as finite elements and boundary elements, which are both presented in a matrix formulation. The most interesting feature of the book is the integrated treatment given to the theoretical and computing aspects of numerical methods. The format presents a series of complete computer programs, for linear and non-linear pipe network analysis, depth flow computations, and finite and boundary elements for Laplace equations. The programs, which are written in standard FORTRAN, are self-contained and easy to implement in any computer. The book is the product of several years' experience in teaching and research at undergraduate and post-graduate level and can be used to offer a self-contained course on Computational Hydraulics for final year or M.Sc. Engineering students. The authors hope that this

book will make practicing hydraulic engineers more aware of modern computer techniques and be useful in teaching them to the next generation. The Hydraulics of Open Channel Flow Hubert Chanson 1999-09-29 The Hydraulics of Open Channel Flow is a major new textbook for senior undergraduates and postgraduate students. Dr Chanson first introduces the basic principles of open channel flow hydraulics, namely the continuity, Bernoulli and momentum principles. Applications include short transitions (e.g. intake), hydraulic jumps and flow resistance. The key topics of sediment transport, hydraulic modelling and the design of hydraulic structures are then developed in turn. This innovative textbook contains numerous examples, including practical applications, and is fully illustrated with line drawings and photographs in colour and black and white.

Exercises - located at the end of each chapter and as  
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revision sections at the end of each part - form an integral part of the text. The book concludes with major assignments, which assimilate all the knowledge into a fully coherent whole. Solutions to exercises, together with the shareware software Hydroculv, are available from the Web at: Key Features: Ideal for Use by Students and Lecturers in Civil and Environmental Engineering Numerous Exercises and Examples, Including a Supporting Website, to Aid the Reader's Understanding Comprehensive Coverage of the Basic Principles and the Key Application Areas of the Hydraulics of Open Channel Flow the Reader is Taken Step by Step from the Basic Principles to the More Advanced Design Calculations

**Open-Channel Flow** M Hanif Chaudhry 2007-12-04 Open Channel Flow, 2nd edition is written for senior-level undergraduate and graduate courses on steady and unsteady open-channel flow. The book is

comprised of two parts: Part I covers steady flow and Part II describes unsteady flow. The second edition features considerable emphasis on the presentation of modern methods for computer analyses; full coverage of unsteady flow; inclusion of typical computer programs; new problem sets and a complete solution manual for instructors.

**Open Channel Hydraulics, Third Edition** Terry W. Sturm 2021-07-28 A definitive guide to open channel hydraulics—fully updated for the latest tools and methods This thoroughly revised resource offers focused coverage of some of the most common problems encountered by practicing hydraulic engineers and includes the latest research and computing advances. Based on a course taught by the author for nearly 40 years, Open Channel Hydraulics, Third Edition features clear explanations of floodplain mapping, flood routing, bridge hydraulics, culvert design, stormwater

system design, stream restoration, and much more. Throughout, special emphasis is placed on the application of basic fluid mechanics principles to the formulation of open channel flow problems. Coverage includes: Basic principles Specific energy Momentum Uniform flow Gradually varied flow Hydraulic structures Governing unsteady flow equations and numerical solutions Simplified methods of flow routing Flow in alluvial channels Three-dimensional CFD modeling for open channel flows

Open Channel Hydraulics A. Osman Akan

2011-02-24 Open Channel Hydraulics is written for undergraduate and graduate civil engineering students, and practicing engineers. Written in clear and simple language, it introduces and explains all the main topics required for courses on open channel flows, using numerous worked examples to illustrate the key points. With coverage of both

introduction to flows, practical guidance to the design of open channels, and more advanced topics such as bridge hydraulics and the problem of scour, Professor Akan's book offers an unparalleled user-friendly study of this important subject ·Clear and simple style suited for undergraduates and graduates alike ·Many solved problems and worked examples ·Practical and accessible guide to key aspects of open channel flow

Stream Restoration Hydraulics Robert Newbury

2011 A collection of successful project designs illustrating the application of simple open channel hydraulic solutions that restore fish habitats and natural characteristics to channelized and altered streams and rivers. Selected aspects of fluvial geomorphology, stream habitats and open channel hydraulics provide the background for designing pools, riffles, meanders, channel alignments and fish passage works.

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**Open Channel Flow** Roland Jeppson 2010-11-09 A comprehensive treatment of open channel flow, *Open Channel Flow: Numerical Methods and Computer Applications* starts with basic principles and gradually advances to complete problems involving systems of channels with branches, controls, and outflows/ inflows that require the simultaneous solutions of systems of nonlinear algebraic equations coupled with differential equations. The book includes a CD that contains a program that solves all types of simple open channel flow problems, the source programs described in the text, the executable elements of these programs, the TK-Solver and MathCad programs, and the equivalent MATLAB® scripts and functions. The book provides applied numerical methods in an appendix and also incorporates them as an integral component of the methodology in setting up and solving the governing equations. Packed with

examples, the book includes problems at the end of each chapter that give readers experience in applying the principles and often expand upon the methodologies use in the text. The author uses Fortran as the software to supply the computer instruction but covers math software packages such as MathCad, TK-Solver, MATLAB, and spreadsheets so that readers can use the instruments with which they are the most familiar. He emphasizes the basic principles of conservation of mass, energy, and momentum, helping readers achieve true mastery of this important subject, rather than just learn routine techniques. With the enhanced understanding of the fundamental principles of fluid mechanics provided by this book, readers can then apply these principles to the solution of complex real-world problems. The book supplies the knowledge tools necessary to analyze and design economical and properly performing

conveyance systems. Thus not only is the book useful for graduate students, but it also provides professional engineers the expertise and knowledge to design well performing and economical channel systems.

*Open Channel Hydraulics* Terry W. Sturm 2010  
[Test Problems with Analytic Solutions for Steady Open Channel Flow](#) I. MacDonald 1994

**Modeling and Control of Hydrosystems** Xavier Litrico 2009-09-17 Open-channel hydraulics are described by hyperbolic equations, derived from laws of conservation of mass and momentum, called Saint-Venant equations. In conjunction with hydraulic structure equations these are used to represent the dynamic behavior of water flowing in rivers, irrigation canals, and sewers. Building on a detailed analysis of open-channel flow modeling, this monograph constructs control design methodologies based on a frequency domain

approach. In practice, many open-channel systems are controlled with classical input–output controllers that are usually poorly tuned. The approach of this book, fashioning pragmatic engineering solutions for the control of open channels is given rigorous mathematical justification. Once the control objectives are clarified, a generic control design method is proposed, first for a canal pool, and then for a whole canal. The methods developed in the book have been validated on several canals of various dimensions up to a large scale irrigation canal.

**Open Channel Hydraulics, River Hydraulic Structures and Fluvial Geomorphology** Artur Radecki-Pawlik 2017-09-07 This book presents practical hydraulic and river engineering research along with fluvial geomorphological concepts, and links the theoretical and practical knowledge of people working every day with rivers, streams,

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and hydraulic structures to fluvial geomorphology. Besides providing a guide for professionals, this book also provides material for students to acquire the knowledge and skills to rehabilitate rivers, streams, and waterways.

**Hydraulics of Open Channel Flow** Hubert Chanson  
2004-05-25 Since the publication of its first edition in 1999, 'The Hydraulics of Open Channel Flow' has been praised by professionals, academics, students and researchers alike as the most practical modern textbook on open channel flow available. This new edition includes substantial new material on hydraulic modelling, in particular addressing unsteady open channel flows. There are also many new exercises and projects, including a major new revision assignment. This innovative textbook contains numerous examples and practical applications, and is fully illustrated with photographs. Dr Chanson introduces the basic

principles of open channel flow and takes readers through the key topics of sediment transport, hydraulic modelling and the design of hydraulic structures. ·Comprehensive coverage of the basic principles of key application areas of the hydraulics of open channel flow ·New exercises and examples added to aid understanding ·Ideal for use by students and lecturers in civil and environmental engineering

Hydraulic Research in the United States and Canada  
United States. National Bureau of Standards 1978

**Open-channel Hydraulics** Richard H. French  
1994-01 This book was originally designed as a state-of-the-art reference book for the practising professional, but the addition of homework problems for the primary chapters and a solutions manual has made it also very suitable as a textbook for courses in open-channel hydraulics in civil engineering. The homework problems were drawn

from the author's many years of experience teaching in civil engineering and consultancy work.

*Numerical Modeling in Open Channel Hydraulics*

Romuald Szymkiewicz 2010-03-10 Open channel hydraulics has always been a very interesting domain of scientific and engineering activity because of the great importance of water for human living. The free surface flow, which takes place in the oceans, seas and rivers, can be still regarded as one of the most complex physical processes in the environment. The first source of difficulties is the proper recognition of physical flow processes and their mathematical description. The second one is related to the solution of the derived equations. The equations arising in hydrodynamics are rather complicated and, except some much idealized cases, their solution requires application of the numerical methods. For this reason the great progress in open

channel flow modeling that took place during last 40 years paralleled the progress in computer technique, informatics and numerical methods. It is well known that even typical hydraulic engineering problems need applications of computer codes. Thus, we witness a rapid development of ready-made packages, which are widely disseminated and offered for engineers. However, it seems necessary for their users to be familiar with some fundamentals of numerical methods and computational techniques applied for solving the problems of interest. This is helpful for many reasons. The ready-made packages can be effectively and safely applied on condition that the users know their possibilities and limitations. For instance, such knowledge is indispensable to distinguish in the obtained solutions the effects coming from the considered physical processes and those caused by numerical artifacts.

**Proceedings of the Advanced Seminar on One-dimensional, Open-Channel Flow and Transport Modeling** 1989

**Civil Engineering Problems and Solutions** Donald G. Newnan 2004-05 Written by 6 professors, each with a Ph.D. in Civil Engineering; A detailed description of the examination and suggestions on how to prepare for it; 195 exam, essay, and multiple-choice problems with a total of 510 individual questions; A complete 24-problem sample exam; A detailed step-by-step solution for every problem in the book; This book may be used as a separate, stand-alone volume or in conjunction with Civil Engineering License Review, 14th Edition (0-79318-546-7). Its chapter topics match those of the License Review book. All of the problems have been reproduced for each chapter, followed by detailed step-by-step solutions. Similarly, the 24-problem sample exam (12 essay and 12 multiple-

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choice problems) is given, followed by step-by-step solutions to the exam. Engineers looking for a CE/PE review with problems and solutions will buy both books. Those who want only an elaborate set of exam problems, a sample exam, and detailed solutions to every problem will purchase this book. 100% problems and solutions.

**Flow in Open Channels** K. Subramanya 2009  
**Open Channel Flow** MADAN MOHAN DAS 2008-07-11 Primarily intended as a textbook for the undergraduate and postgraduate students of civil engineering, this book provides a comprehensive knowledge in open channel flow. The book starts with the concept of open channel flow, types of forces acting on the flow, types of channel flow, velocity distribution and coefficients, and basic continuity in 1D and 3D. Then it moves on to steady gradually varied flow, its differential equation, hydraulics of alluvial channel, design of

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channel and hydraulic jump. Finally, the text concludes with Saint-Venant equations and its solutions by few numerical methods in flood routing and dam-break situations. KEY

FEATURES : Includes computer programs for steady gradually varied flow Provides various numerical methods of solving the equations Explains dam-break problem in detail Contains numerous solved examples

Open Channel Hydraulics Terry W. Sturm 2010  
Open Channel Hydraulics is intended for advanced undergraduates and first-year graduate students in the general fields of water resources and environmental engineering. It offers a focused presentation of some of the most common problems encountered by practicing engineers with the inclusion of recent research advances and personal computer applications. In addition, emphasis is placed on the application of basic principles of fluid

mechanics to the formulation of open channel flow problems so that the assumption and limitation of existing numerical models are made clear.

Concise Hydraulics

*NBS Special Publication* 1918

**Elementary Hydraulics** James F. Cruise 2007

Elementary Hydraulics is written for the undergraduate level and contains material to appeal to a diversified class of students. The book, divided into three parts, blends fluid mechanics, hydraulic science, and hydraulics engineering. The first part of the text draws upon fluid mechanics and summarizes the concepts deemed essential to the teaching of hydraulics. The second part builds on the first section while discussing the science of hydraulics. The third section looks at the engineering practice of hydraulics and illustrates practical applications of the material covered in the text. In addition to these applications, the text

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contains a number of numerical problems and a reading aid at the end of each chapter to enhance student learning.

**Applied and Computational Fluid Mechanics** Scott Post 2010-01-30 Designed for the fluid mechanics course for mechanical, civil, and aerospace engineering students, or as a reference for professional engineers, this up to date text uses computer algorithms and applications to solve modern problems related to fluid flow, aerodynamics, and thermodynamics. Algorithms and codes for numerical solutions of fluid problems, which can be implemented in programming environments such as MATLAB, are used throughout the book. The author also uses non-language specific algorithms to force the students to think through the logic of the solution technique as they translate the algorithm into the software they are using. The text also includes an introduction to

Computational Fluid Dynamics, a well-established method in the design of fluid machinery and heat transfer applications. A DVD accompanies every new printed copy of the book and contains the source code, MATLAB files, third-party simulations, color figures, and more.

**Open Channel Flow** Roland Jeppson 2010-11-09 A comprehensive treatment of open channel flow, *Open Channel Flow: Numerical Methods and Computer Applications* starts with basic principles and gradually advances to complete problems involving systems of channels with branches, controls, and outflows/ inflows that require the simultaneous solutions of systems of nonlinear algebraic equations coupl

Gradually-varied Flow Profiles in Open Channels  
Chyan-Deng Jan 2014-01-08 Gradually-varied flow (GVF) is a steady non-uniform flow in an open channel with gradual changes in its water surface

elevation. The evaluation of GVF profiles under a specific flow discharge is very important in hydraulic engineering. This book proposes a novel approach to analytically solve the GVF profiles by using the direct integration and Gaussian hypergeometric function. Both normal-depth- and critical-depth-based dimensionless GVF profiles are presented. The novel approach has laid the foundation to compute at one sweep the GVF profiles in a series of sustaining and adverse channels, which may have horizontal slopes sandwiched in between them.

Hydraulic Research in the United States 1970

United States. National Bureau of Standards 1971

*Fluid Mechanics for Civil and Environmental*

*Engineers* Ahlam I. Shalaby 2018-02-21 An ideal textbook for civil and environmental, mechanical, and chemical engineers taking the required

Introduction to Fluid Mechanics course, Fluid

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*Mechanics for Civil and Environmental Engineers* offers clear guidance and builds a firm real-world foundation using practical examples and problem sets. Each chapter begins with a statement of objectives, and includes practical examples to relate the theory to real-world engineering design challenges. The author places special emphasis on topics that are included in the Fundamentals of Engineering exam, and make the book more accessible by highlighting keywords and important concepts, including Mathcad algorithms, and providing chapter summaries of important concepts and equations.

**River Flow 2006, Two Volume Set** Rui M.L.

Ferreira 2006-09-14 Rivers are complex entities. In addition to being valuable wildlife habitats, they support human activities by providing water for human usage, renewable energy and convenient transportation. Rivers may also pose threats to

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riverine communities, in the form of floods and other natural or man-induced hazards. Contemporary societies recognize their responsibility in ensuring the sustainable use of rivers and in preserving river's intrinsic ecological and landscape values. This obligation is often in conflict with riverine economical exploitation and with risk management concerns. As a discipline, Fluvial Hydraulics makes a significant contribution to the development of strategies for sustainable river use by providing new modelling tools and engineering techniques based on advances in phenomenological understanding and in computational modelling. River Flow 2006 comprises the Proceedings of the third edition of the International Conference on Fluvial Hydraulics, organized under the auspices of the Fluvial Hydraulics Section of the International Association of Hydraulic Engineering and Research (IAHR).

The book covers issues such as river hydrodynamics, morphodynamics and sediment transport. Other contributions describe interdisciplinary approaches and experiences, particularly regarding interfacial activities involving environmental sciences and information technologies. River Flow 2006 contains the most recent theoretical accomplishments, numerical developments, experimental investigations and field studies in Fluvial Hydraulics. It is an excellent resource for researchers, civil and environmental engineers, and practitioners in river-related disciplines.

### **Environmental Hydraulics for Open Channel Flows**

Hubert Chanson 2004-10-14 Environmental Hydraulics is a new text for students and professionals studying advanced topics in river and estuarine systems. The book contains the full range of subjects on open channel flows, including mixing

and dispersion, Saint-Venant equations method of characteristics and interactions between flowing water and its surroundings (air entrainment, sediment transport). Following the approach of Hubert Chanson's highly successful undergraduate textbook *Hydraulics of Open Channel Flow*, the reader is guided step-by-step from the basic principles to more advanced practical applications. Each section of the book contains many revision exercises, problems and assignments to help the reader test their learning in practical situations.

- Complete text on river and estuarine systems in a single volume
- Step-by-step guide to practical applications
- Many worked examples and exercises

**Nalluri And Featherstone's Civil Engineering Hydraulics** Martin Marriott 2016-05-02 This is an update of a classic textbook covering a core subject taught on most civil engineering courses. The sixth edition contains substantial worked example sections

with an online solutions manual.

**Non-Hydrostatic Free Surface Flows** Oscar Castro-Orgaz 2017-03-27 This book provides essential information on the higher mathematical level of approximation over the gradually varied flow theory, also referred to as the Boussinesq-type theory. In this context, it presents higher order flow equations, together with their applications in a broad range of pertinent engineering and environmental problems, including open channel, groundwater, and granular material flows.

**Open-Channel Flow** Subhash C. Jain 2000-10-24 A clear, up-to-date presentation of the principles of flow in open channels A fundamental knowledge of flow in open channels is essential for the planning and design of systems to manage water resources. *Open-Channel Flow* conveys this knowledge through the use of practical problems that can be solved either analytically or by simple numerical

methods that do not require the use of computer software. This completely up-to-date text includes several features not found in any other book on the subject. It derives one-dimensional equations of motion using both a simplified approach and a rigorous approach, and it explains the distinction between the momentum and mechanical energy equations. The author places great emphasis on identifying the types and locations of the control sections that are essential in analyzing flow profiles, and he includes a section on recently recognized nonunique flow profiles. Offering numerous worked examples that are helpful in understanding the basic principles and their practical applications, this book:

- \* Presents the latest computational methods for profiling spatially varied and unsteady flow
- \* Includes end-of-section exercises that measure and build understanding
- \* Fully explains governing equations in algebraic and differential

form \* Brings sluice-gate analysis completely up to date \* Covers artificial channel controls such as weirs, spillways, and gates, and special topics such as transitions in supercritical flow and flow through culverts Written in metric units throughout, this excellent learning tool for senior- and graduate-level students in civil and environmental engineering programs is also a useful reference for practicing civil and environmental engineers.

*Unsteady Flow in Open Channels* Jurjen A. Battjes  
2017-02-16 Practitioners in water engineering rely on a thorough understanding of shallow water flows in order to safeguard our habitat, while at the same time sustaining the water environment. This book proposes a unified theoretical framework for the different types of shallow flow, providing a coherent approach to interpret the behaviour of such flows, and highlighting the similarities and differences. Every major topic in the book is

accompanied by worked examples illustrating the theoretical concepts. Practical examples, showcasing inspiring research and engineering applications from the past and present, provide insight into how the theory developed. The book is also supplemented by a range of online resources, available at [www.cambridge.org/battjes](http://www.cambridge.org/battjes), including problem sets and computer codes. A solutions manual is available for instructors. This book is intended for students and professionals working in environmental water systems, in areas such as coasts, rivers, harbours, drainage, and irrigation canals.

Experimental and Computational Solutions of Hydraulic Problems Paweł Rowiński 2013-01-04

What is the progress in hydraulic research? What are the new methods used in modeling of transport of momentum, matter and heat in both open and conduit channels? What new experimental

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methods, instruments, measurement techniques, and data analysis routines are used in top class laboratory and field hydro-environment studies? How to link novel findings in fundamental hydraulics with the investigations of environmental issues? The consecutive 32nd International School of Hydraulics that took place in Łochów, Poland brought together eminent modelers, theoreticians and experimentalists as well as beginners in the field of hydraulics to consider these and other questions about the recent advances in hydraulic research all over the world. This volume reports key findings of the scientists that took part in the meeting. Both state of the art papers as well as detailed reports from various recent investigations are included in the book

**Selected Water Resources Abstracts** 1990

Shallow Water Hydraulics Oscar Castro-Orgaz

2019-11-08 This book presents the theory and

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computation of open channel flows, using detailed analytical, numerical and experimental results. The fundamental equations of open channel flows are derived by means of a rigorous vertical integration of the RANS equations for turbulent flow. In turn, the hydrostatic pressure hypothesis, which forms the core of many shallow water hydraulic models, is scrutinized by analyzing its underlying assumptions. The book's main focus is on one-dimensional models, including detailed treatments of unsteady and steady flows. The use of modern shock capturing finite difference and finite volume methods is described in detail, and the quality of solutions is carefully assessed on the basis of analytical and experimental results. The book's unique features include: • Rigorous derivation of the hydrostatic-based shallow water hydraulic models • Detailed treatment of steady open channel flows, including the computation of transcritical

flow profiles • General analysis of gate maneuvers as the solution of a Riemann problem • Presents modern shock capturing finite volume methods for the computation of unsteady free surface flows • Introduces readers to movable bed and sediment transport in shallow water models • Includes numerical solutions of shallow water hydraulic models for non-hydrostatic steady and unsteady free surface flows This book is suitable for both undergraduate and graduate level students, given that the theory and numerical methods are progressively introduced starting with the basics. As supporting material, a collection of source codes written in Visual Basic and inserted as macros in Microsoft Excel® is available. The theory is implemented step-by-step in the codes, and the resulting programs are used throughout the book to produce the respective solutions.

2021-05-21 Open Channel Hydraulics, Second Edition provides extensive coverage of open channel design, with comprehensive discussions on fundamental equations and their application to open channel hydraulics. The book includes practical formulas to compute flow rates or discharge, depths and other relevant quantities in open channel hydraulics. In addition, it also explains how mutual interaction of interconnected channels can affect the channel design. With coverage of the theoretical background, practical guidance to the design of open channels and other hydraulic structures, advanced topics, the latest research in the field, and real-world applications, this new edition offers an unparalleled user-friendly study reference.

Introduces and explains all the main topics on open channel flows using numerous worked examples to illustrate key points Features extensive coverage of bridge hydraulics and scour - important topics civil

engineers need to know as aging bridges are a major concern Includes Malcherek's momentum approach where applicable

### **Dam-break Problems, Solutions and Case Studies D.**

De Wrachien 2009-01 The aim of the book is to give an up-to-date review on dam-break problems, along with the main theoretical background and the practical aspects involved in dam failures, design of flood defense structures, prevention measures and the environmental social, economic and forensic aspects related to the topic. Moreover, an exhaustive range of laboratory tests and modeling techniques is explored to deal effectively with shock waves and other disasters caused by dam failures. Disaster management refers to programs and strategies designed to prevent, mitigate, prepare for, respond to and recover from the effects of these phenomena. To manage and minimize these risks, it is necessary to identify hazards and vulnerability by

means of a deep knowledge of the causes which drive to dam failures, and to understand the flow propagation process. Knowledge and advanced scientific tools play a role of paramount importance of coping with flooding and other dam-break problems along with capacity building in the context of political and administrative frameworks.

All these aspects are featured in the book, which is a comprehensive treaty that covers the most theoretical and advanced aspects of structural and hydraulic engineering, together with the hazard assessment and mitigation measures and the social economic and forensic aspects related to subject.