

## “Water Quality Modelling for Rivers and Streams”, book review

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**Abstract:** This review is written for the book “Water Quality Modelling for Rivers and Streams”, of Marcello Benedini and George Tsakiris. This title is included in the series of Water Science and Technology Library published by Springer and is copyrighted in 2013.

**Key words:** Mathematical modelling, rivers and streams, water contamination, Water Framework Directive, water quality

### 1. INTRODUCTION OF THE AUTHORS

The book Water Quality Modelling for Rivers and Streams was written by Marcello Benedini and George Tsakiris. Marcello Benedini is an active engineer in Italian and international scientific organizations dedicated to water resources management topics. He has carried out research on the advanced methods for the integrated use of water resources management and environmental protection, in collaboration with several scientific institutions worldwide. He is currently the editor-in-chief of the scientific journal “European Water” published by EW Publications. George Tsakiris is currently the president of the European Water Resources Association (EWRA) and editor-in-chief of the journal “Water Resources Management” published by Springer. He has published many research papers in international scientific journals and conferences and has convened many collaborative research projects in the area of water resources management as project coordinator.

### 2. SUMMARY

As one may expect, the major part of this book is taken up with the explanation of the computational methods that deal with the complex problem of water quality modelling in rivers and streams. Chapters one through four consist of introductory material related to the state of the art, the fundamental hydrodynamic processes and the basics of pollution transport. Chapters five through eight describe the most frequent pollutants in a river system and explain biochemical pollution. Chapters nine through fifteen are dedicated to numerical and analytical methods, which are useful for the simulation of pollution transport in rivers and streams. Chapter sixteen is devoted to thermal pollution and heat exchange. Chapters seventeen and eighteen are concerned with optimization models and the processes of model calibration and verification. Chapters nineteen and twenty deal with data acquisition and retrieval as well as with model reliability and measurement uncertainty. Chapter twenty one covers perspectives and future trends.

The book is comprehensive and well written by experts in the field of water resources management aiming to assist postgraduate students and professionals in the fields of catchment management and water quality.

### 3. BODY OF THE REVIEW

This title provides a comprehensive and detailed primer to water quality modelling. It provides the knowledge needed for a deeper understanding of water quality models and the development of new ones, which will fulfill future quality requirements in water resources management. The future quality requirements in water resources of the European countries are directly associated with the main objective of the Water Framework Directive which is the achievement of “good status” of all the water bodies in the European member states. Dispersion, advection, sinks of contaminants or concentrated sources lead to the formulation of the fundamental differential equation of contaminant transport. Its integration, according to appropriate initial and boundary conditions and with the knowledge of the velocity field, allows for contaminant behaviour to be assessed in the entire water body. Integration in the numerical field is useful for taking into account particular aspects of water body and pollutants. To ensure their reliability, the models require accurate calibration and validation, based on proper data, taken from direct measurements. In addition, sensitivity and uncertainty analysis are also of utmost importance. All the above items are discussed in detail in the 21 chapters of the book which treat key water modelling issues, including: Water Quality in the Context of Water Resources Management, Basic Notions, Mathematical Interpretation of Pollution Transport, Fundamental Expressions, Dispersion in Rivers and Streams, The Biochemical Pollution, The Most Frequent Pollutants in River, Temperature Dependence, Application of the General Differential Equations, The Steady-State Case, Interpretation in Finite Terms, Progress in Numerical Modelling: The Finite Difference Method, The Finite Element Method, The Finite Volume Method, Multidimensional Approach, Thermal Pollution, Optimisation Models, Model Calibration and Verification, Water Quality Measurements and Uncertainty, Model Reliability and Final Thoughts and Future Trends.

In these chapters the authors did not intend to replace any of the comprehensive books on numerical open channel hydraulics and water quality. Their aim is to provide the reader with the description of modelling fundamental issues of water quality problems in rivers and streams. Additionally, their intention was to assist potential managers in devising the new generation of models, especially with the models which are required for the effective implementation of the Water Framework Directive in European countries and other countries worldwide.

### 4. CONCLUSION

The book “Water Quality Modelling for Rivers and Streams” (Benedini and Tsakiris, 2013) is particularly useful for water planners and managers, watershed users, postgraduate students and professionals in the fields of environmental planning, water quality, civil engineering and catchment management. It is well written and structured. The reader will find this book as a good basis for understanding water quality modelling and very beneficial in his professional life.

### REFERENCES

- Benedini M. and Tsakiris G. (2013). Water Quality Modelling for Rivers and Streams. Water Science and Technology Library, Vol. 70, Springer. p.288