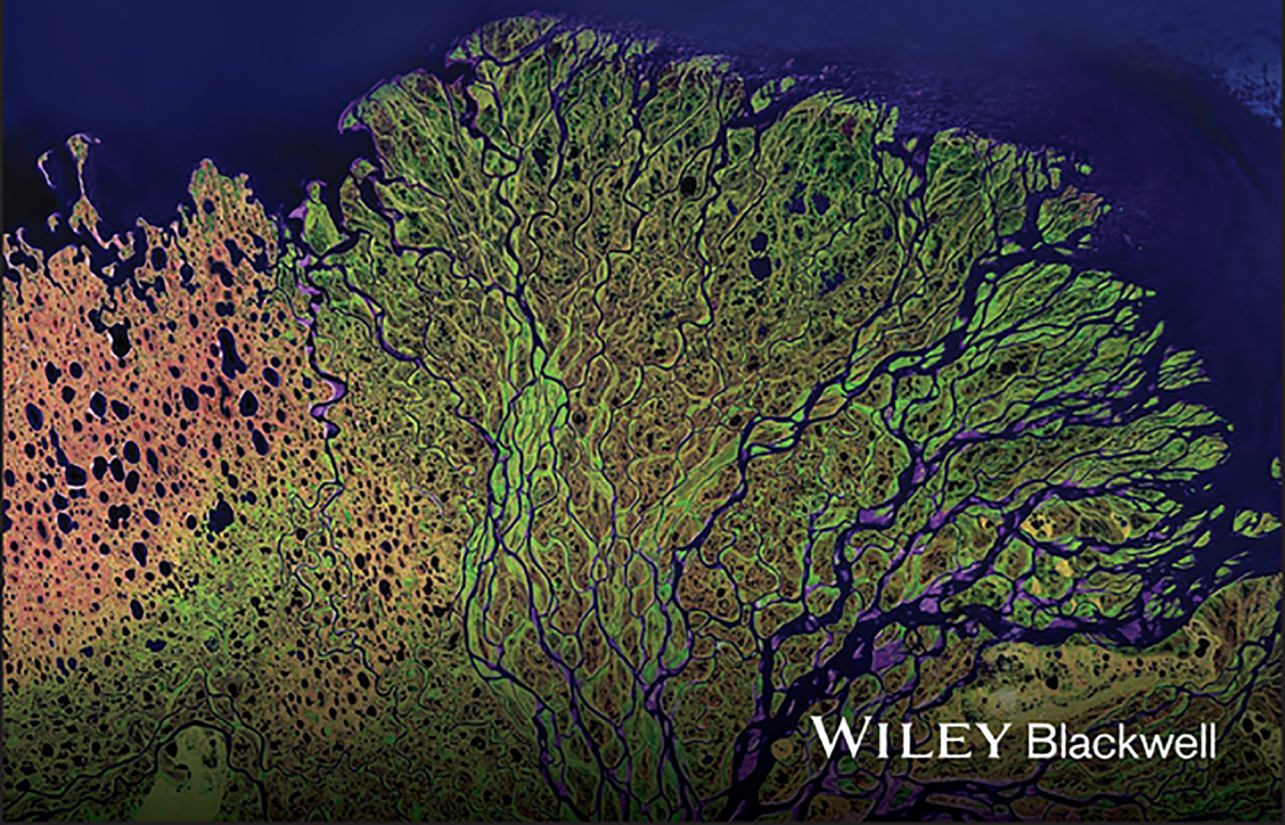


SECOND EDITION

HANDBOOK OF CATCHMENT MANAGEMENT

EDITED BY

ROBERT C. FERRIER | ALAN JENKINS



WILEY Blackwell

Handbook of Catchment Management

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Second edition

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Preface

It is with much pleasure that we introduce you to the new edition of the Handbook of Catchment Management, a decade after the first.

The hydrological cycle has always the most important earth system process on the planet but how has our relationship with water changed in the space of a decade? As population continues to grow, the human-induced pressures on catchments have never been so great, but this has also been accompanied by an explosion in information technology which has made our current world very different from that of 10 years ago.

At school, we learn of water as a virtuous cycle where evaporation from the ocean generates cloud, which deposits as pristine rain on the landscape which then returns through the multitude of streams rivers, lakes back to the sea (along with some recharging to groundwater). The physics of this process haven't changed (and will never change), and the water cycle continues to function, but our human impact on that process has never been greater.

Human-driven climate change has altered the timing, magnitude, and impact of rainfall through floods and droughts. We have continued to extract increasing amounts of fossil water from our groundwaters along with surface waters from lakes and rivers and concomitantly have contaminated most global environments. Biodiversity over the last decade has declined across the world, and the use of our land resources, through increased urbanisation and agricultural intensity, has placed further pressures on our most valuable resource.

This supports an overarching principle underlying the concept of catchment management in that land and water are intimately connected and that any land use decision is also a water decision. We must appreciate that managing land and water must be complementary and inclusive.

But our relationship and commitment to water have improved, and in many contexts, recovery of ecosystems is evident due to coordinated trans-national cooperation and inter-basin management. We have increasingly seen water as a critical resource, one that contains 'value' in all its forms – green, blue, grey, and brown. Embracing this concept is embedded in the UK Sustainable Development Goals, (SDGs) although targets for Water Sanitation and Health (WASH) are still aspirational in many countries. Research, development, and innovation are essential to support informed decision-making while community-based action is critical for addressing the root causes of poor sanitation. In many development

contexts, it is also important that we design systems of support that benefit from recent technological innovation and are suitably future-proofed and don't only address contemporary issues.

Over the last decade, there has been an increasing awareness of water quality issues, and although the excess use of nitrogen in agriculture continues to drive deterioration of resources, the more incipient emergence of other pollutants, such as organics, pesticides, pharmaceuticals, and antibiotics, is raising a warning flag, and the likely consequences of this are not truly understood but the development of Antimicrobial Resistance (AMR) is most definitely a cause for future concern.

We have seen developments in Artificial Intelligence (AI), Earth Observation (EO), and information technologies driving our modern world. Although there are areas of the globe where information on water resources, stores, and flows is poor, we are increasingly living in a world where information is not necessarily limiting, but where the focus has moved to how to interpret information, analyse, and use it in a real-time decision-making. This is an exciting development in monitoring and analysing our complex environmental systems and how they are influenced by change. Such technologies have generated a digital water value chain, where sensing, monitoring, evaluation, and analytics such as blockchain are generating a new 'ecosystem' of water users and stakeholders, including trans-boundary management efforts.

There has been no doubt that the biggest concern for catchment resources is that from climate-driven change. Altered temperature dynamics and weather patterns are driving changes in snow accumulation and melt, seasonal temperatures, the incidence of flood, and drought with massive consequences for our existence and such changes will drive social and financial inequality, migration, and global economics potentially over time scales in which we will be unable to respond and build resilience. The growth of a global children's movement and declaration by many countries of a climate crisis underline the significance and requirement for a sustainable green economy based on low carbon technologies, and water is at the heart of this. The rise in 'sponge cities' and 'water sensitive cities' and other urban infrastructure planning approaches are evidence of how the challenge is being met in our increasingly urbanised world but as mega-cities grow, the necessary water provision and sanitation infrastructure is still woefully lacking in many contexts.

In this volume, we have aimed to bring together different issues pertinent to our current thinking and to encourage our authors to consider the future challenges. We invited a suite of case studies from across the globe to highlight new contexts where water resource management is being developed as well as more mature approaches to catchment management which provide invaluable knowledge on progress and challenges in multi-stakeholder perspectives and the ongoing challenge of trans-boundary management.

As we go to press, the world is facing the significant challenge against a global pandemic. Planning for such an event has been considered by many countries for a considerable time, but the scale and rapid spread have pushed countries contingency planning to the maximum, and the cracks are showing. Nobody knows at this stage what the outcome of this will be in terms of a new world order, but already it has taught us some important lessons. With air and water quality improving, the incredible restorative properties of nature have been exposed and our relationship with biodiversity and natural systems put under the microscope. With a justifiable pressing focus on public health and ensuring economic

recovery, it is understandable that our line of sight has moved away from the environment, but it is important that we take cognisance of the impact on our resource consumption and the reduction in carbon emission that the enforced 'lock-down' has generated. This should provide a stimulus to designing a new future where natural processes are enhanced rather than controlled.

The pandemic has also highlighted the societal disparities we live with in terms of access to resources and opportunity with the old, poor, and marginal groups being more significantly impacted than others. The SDGs should provide the beacon for a new vision, rather than being a desired outcome, they should be the blueprint for the future. Having given the earth a break, it is perhaps our most pressing challenge to drive through a global green agenda, with water at its heart where access to resources and sustainable development are the drivers for a more equitable society. Achieving that vision needs consensus (much on a global scale), but governance of natural processes such as that for catchment management has given us a set of guiding principles and highlights the critical need for inclusive and equitable governance.

To deliver that vision, we must ensure that the respected knowledge generated by research underpins our options for future management, that all stakeholders are involved, an appreciation of the important role of natural processes is promoted, and that we consider cross-sectoral integration to deliver tangible benefits.

Aberdeen and Wallingford, July 2020

Bob Ferrier and Alan Jenkins

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