# Water Science and Technology Library

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Comments or suggestions for future volumes are welcomed.

Vijay P. Singh, Department of Biological and Agricultural Engineering & Zachry Department of Civil Engineering, Texas A and M University, USA
Email: vsingh@tamu.edu

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Agnieszka Stec

# Sustainable Water Management in Buildings

## Case Studies From Europe

Springer

Agnieszka Stec
The Faculty of Civil and Environmental
Engineering and Architecture, Department
of Infrastructure and Water Management
Rzeszow University of Technology
Rzeszów, Poland

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# Preface

Water is a key resource of nature and it is indispensable for human health and life. Water resources determine the proper functioning of sectors such as agriculture, industry, tourism, transport, and energy. Many regions in the world, including Europe, are affected by the problem of limited water availability. Freshwater resources are particularly important as their quality and quantity are constantly decreasing. Climate changes, urbanization, and population growth are expected to increase water shortages in the future causing many serious adverse environmental changes threatening current and future generations. Therefore, it is important that the management of this resource is sustainable, which requires an integrated approach taking into account the environmental, economic, and social dimensions. The European Union Water Framework Directive rightly reminds us that "*water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such*."

Considering the above, the monograph presents some possibilities of saving fresh water by using alternative sources of water in residential buildings. The attention was drawn to rainwater and gray water, which are increasingly used around the world and are a valuable source of water, especially for non-potable uses. The main purpose of the book was to show that unconventional water systems not only reduce the consumption of tap water, but can also be financially profitable. Therefore, some analyses of Life Cycle Cost rainwater harvesting systems and graywater recycling systems located in selected European cities were carried out. These locations were characterized by different climatic conditions, different water consumption by residents, and different water purchase prices. This allowed determining the impact of these parameters on the profitability of using the tested systems.

Alternative sources of water in residential buildings, in spite of the development and implementation of appropriate ecological strategies, are used quite rarely in many European countries. This can be influenced by many factors, including the financial aspect, hygiene, and legal considerations. To find out the reason for this, a survey was conducted in selected European countries and its results are presented in this monograph. Such research is very important since the acceptance of society can be decisive in implementing unconventional solutions in construction.

The research outcomes presented in the monograph are not only scientific but also practical ones and can be a guide for potential investors in the decision-making process already at the investment planning stage. This book, therefore, can contribute to the growing interest in alternative water systems in housing, and thus to promote sustainable construction.

Rzeszów, Poland Agnieszka Stec

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# Abbreviations

| | |
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| $BOD_5$ | Biochemical oxygen demand |
| EEA | European Environment Agency |
| EU | European Union |
| EUR | Euro |
| EurEau | European Federation of National Associations of Water Services |
| GWHS | Graywater recycling system |
| IRR | Internal Rate of Return |
| LCC | Life Cycle Cost |
| MBR | Membrane bioreactor |
| NPV | Net Present Value |
| PB | Payback Period |
| RBC | Rotating biological reactor |
| RWHS | Rainwater harvesting system |
| SBR | Sequencing batch reactor |
| WFD | Water Framework Directive |
| WHO | World Health Organization |
| WWAP | World Water Assessment Programme |
| YAS | Yield-after-spillage algorithm |
| YBS | Yield-before-spillage algorithm |