

## Sustainable Water & Wastewater Treatment Technologies

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Improvement of freshwater supply and sanitation are two of the world's most pressing challenges as it has been also formulated in the United Nations Millennium Development Goals which demands to halve by 2015 the number of people without access to safe drinking water and sanitation. However, such improvements must be done in an economical, environmental and societal sustainable way. This demands the incorporation of sustainability considerations, in water and wastewater treatment that constitute the principal technologies for improving freshwater supply and sanitation.

Technological improvements and development of innovative processes, methods, or devices in water and wastewater treatment and their application form a wide area of multidisciplinary research and development (R&D) to improve freshwater supply and sanitation. The technologies use physical, chemical and biological processes to produce water of a desired quality that depends on its end use, e.g. as drinking water, irrigation water, or water for specific industrial purposes. Improving economic, environmental and societal sustainability needs R&D to improve process design, operation, performance, automation and management of water and wastewater systems considering aims, and local conditions. A key parameter when selection a specific technology is the scale, ranging from (public, private and municipally owned) large-scale water and wastewater industries to small-scale community- or even single-household-scale systems.

This book series is spanning the wide continuum between research, development and practice covering all areas and facets in water and wastewater treatment including also water reuse which achieves increasingly attention. Individual volumes cover subjects essential for the further development of the water and wastewater sectors focusing particularly on economic, environmental and societal sustainable technological solutions. This comprises either finding new approaches to conventional technologies e.g. those of seawater desalination or developing innovative ones. It involves R&D of technologies and their applications that stronger focus on water savings, water recovery, water reuse and recycling. It includes waste water reduction (e.g. by advanced treatment) and reuse. It promotes resource efficiency and better reuse of the resources contained in used water, i.e. metals, salts, nutrients, energy and the water itself. Such sustainable approaches extend the life cycle of water and benefit not also the environment but also lead to a cost reduction.

The book series provides a source of solid information for an industry that employs hundreds or thousands of professionals in each of the countries worldwide working in the different fields of freshwater production, wastewater treatment and water reuse. In contrast to many other industries, which suffer from the global economic downturn observed in many countries, water

and wastewater industries form a fast growing sector and provide significant investment opportunities and markets. This applies especially to those using sustainable water and wastewater technologies, which are increasingly finding favor. Key market drivers are demographic and economic growth in particular in urban and periurban areas together with increasing water scarcity, increasing water needs for food production, increasing awareness to treat or to improve treatment of wastewater along with increasingly stringent and influential regulations regarding nutrient limits on wastewater discharges or the elimination the option of easily treated wastewater discharges, and the establishment of international targets.

However, the book series is not only a platform for industrial scale approaches but also for smaller-scale applications. These are of the same importance as large-scale applications but need quite different technological approaches. In particular, low-tech, cost-effective, but sustainable water treatment and wastewater systems such as ponds or artificial wetlands or wastewater gardens are required.

This book series aims to become a state-of-the-art resource for a broad group of readers including not only professionals from the water and wastewater industry but also manufacturers and consultants as well as a diversity of stakeholders and professionals from governmental and non-governmental organizations, international funding agencies, universities, public health and other relevant institutions, and the broader public. It is designed to increase awareness and understanding of sustainable water and wastewater solutions including the promotion of water and wastewater reuse.

By consolidating international findings, the objective of this book series is to focus on practical solutions in the implementation of sustainable water and wastewater treatment and water reuse. Not moving forward with these efforts could have serious social, environmental and economic impacts on global scale.

## **Fields covered in the field of Water and Wastewater (but not limited to)**

- |  |                                       |  |  |
|--|---------------------------------------|--|--|
| • Active oxidizing species               | • Biotechnology                       | • Decentralized water supply/sanitation  | • Filtration                             |
| • Adsorption chemistry/mechanism/models  | • Boron removal                       | • Desalination technology                | • Financing freshwater supply            |
| • Adsorption membrane filtration         | • Brine disposal management           | • Detoxification                         | • Flocculation /floculants               |
| • Adsorption methods                     | • Catalytic filters                   | • Disinfection                           | • Foreword osmosis                       |
| • Advanced oxidation processes           | • Centralized water supply/sanitation | • Drinking water for the poor            | • Freshwater demand                      |
| • Aerobic/anaerobic wastewater treatment | • Chlorination                        | • Drinking water regulations             | • Freshwater security and independence   |
| • Agricultural wastewater treatment      | • Chromatographic methods             | • Economic constraints                   | • Freshwater solutions for small islands |
| • Algae-based wastewater treatment       | • Coagulation /Coagulants             | • Electrochemical treatment/technologies | • Freshwater supply infrastructure       |
| • Alternative water resources            | • Community-based approaches          | • Electrodialysis reversal               | • Freshwater supply scenarios            |
| • Anti-scalants                          | • Composite adsorbents                | • Emergency solutions                    | • Gender and freshwater                  |
| • Artificial wetlands                    | • Constructed wetlands                | • Energy demand                          | • Geogenic adsorbents                    |
| • Asset management                       | • Contaminant immobilization          | • Energy recovery                        | • Heavy metal removal                    |
| • Autonomous desalination systems        | • Contaminant-specific removal        | • Environmental technology               | • Heterogeneous photocatalysis           |
| • Biodegradation                         | • Control systems                     | • Feasibility analysis                   | • Household filters                      |
|  | • Cost analysis                       | • Fenton and photo-Fenton processes      | • Household-scale treatment technologies |
|  | • Cost-effective systems              |  | • Humidification-                        |
|  | • Crystallization                     |  |  |

- dehumidification
- Hybrid (decentralized and centralized) infrastructure
- Hybrid adsorbents
- Hybrid desalination processes
- Industrial effluents
- Industrial-scale units
- In-situ groundwater treatment
- Ion exchange membranes
- Ion exchange technologies
- Large-scale operations
- Lime-softening
- Low-cost technologies
- Magnetic treatment
- Mechanical vapor compression
- Membrane bioreactor
- Membrane contractors
- Membrane development
- Membrane distillation
- Membrane fouling
- Membrane permeability
- Membrane scaling
- Membrane technologies
- Microalgae (water treatment)
- Microbiology
- Microfiltration
- Modeling systems
- Mud-pot filtering system
- Multi-effect distillation
- Multi-effect solar stills
- Multi-flash distillation
- Multiple-effect distillation
- Multi-stage electrodialysis
- Multi-stage flash distillation
- Nanofiltration
- Nanosized adsorbents
- Natural adsorbents
- Nutrient removal /recovery from wastewater
- On-site treatment systems
- Operation and maintenance
- Oxidation methods
- Ozonation
- Passive solar thermal distillation methods
- Performance
- Phytoremediation
- Point-of-entry devices
- Point-of-use devices
- Post-treatment
- Precipitation methods
- Pre-treatment
- Process design/operation/optimization/automation
- Pump and treat method
- Quality (drinking water)
- Rainwater harvesters
- Regeneration of adsorbents
- Recycling
- Regulations (drinking water quality; effluents)
- Resins (ion exchange)
- Reverse osmosis
- Rural area applications
- Sanitation technologies
- Save water for poverty reduction
- Scaling
- Seawater desalination
- Septage and biosolids management
- Sever/drainage networks
- Slow sand filters
- Sludge treatment /disposal
- Small-scale operations
- Social acceptance of technologies
- Solar disinfection
- Solar still
- Sorption methods/materials
- Stormwater management
- Sterilization
- Strategies and policies
- Sustainable sanitation
- Sustainable treatment chemicals
- Technical sustainability
- Technology selection according water type
- Thermal desalination
- Thermal vapor compression
- Thermodynamic modeling
- Ultrafiltration
- Urban drainage
- Urban water management
- Vapor compression distillation
- Waste products
- Wastewater ponds
- Wastewater reuse
- Wastewater treatment
- Water disinfection
- Water for agriculture
- Water quality /monitoring
- Water reuse
- Water recycling
- Water sources
- Water supply technologies
- Water works