

# **Biological Wastewater Treatment Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented By Type (Aerobic, Anaerobic), By End-User Industry (Municipal, Industrial), By Technology (Suspended Growth Systems, Attached Growth Systems, Integrated Systems), By Application (Effluent Treatment Plants, Sewage Treatment Plants, Common & Combined Effluent Treatment Plants), By Region & Competition, 2020-2030F**

<https://marketpublishers.com/r/BA56866ACCAAEN.html>

Date: June 2025

Pages: 185

Price: US\$ 4,500.00 (Single User License)

ID: BA56866ACCAAEN

## **Abstracts**

### **Market Overview**

The Global Biological Wastewater Treatment Market, valued at USD 10.01 billion in 2024, is projected to reach USD 14.34 billion by 2030, growing at a CAGR of 6.01%. Market growth is being driven by rapid urbanization, expanding industrial activities, and the global push toward sustainable water management. Biological treatment methods, which utilize microorganisms to degrade organic pollutants, are increasingly favored due to their environmental friendliness, cost-efficiency, and effectiveness in treating both municipal and industrial wastewater. Rising awareness about water pollution and stricter regulations governing effluent discharge are accelerating adoption across regions. Urban growth, especially in emerging economies, is straining existing wastewater systems, creating demand for advanced biological solutions. Meanwhile, industries like food & beverage, pharmaceuticals, chemicals, and textiles are adopting these technologies to meet environmental standards and minimize ecological impact. The combined effect of regulatory pressure, industrial demand, and the global need for clean water positions biological wastewater treatment as a critical solution for

sustainable wastewater management.

## **Key Market Drivers**

### **Stringent Environmental Regulations on Effluent Discharge**

Global environmental policies are increasingly enforcing stricter regulations on the discharge of untreated or inadequately treated wastewater. Countries such as the United States, Canada, Germany, and Japan have implemented stringent standards, where failure to comply can lead to heavy penalties or operational halts. Biological wastewater treatment systems are becoming the preferred solution due to their proven ability to effectively remove biodegradable organic materials and nutrients like nitrogen and phosphorus. These capabilities help industries and municipalities meet regulatory benchmarks efficiently. Regulatory frameworks such as the European Union's Urban Waste Water Treatment Directive require biological treatment for communities exceeding 2,000 population equivalents, prompting broader global adoption. Industrial sectors, including pulp & paper, food & beverage, and textiles, are under increasing pressure to adopt or upgrade biological treatment systems to comply with such mandates and ensure sustainable operations.

## **Key Market Challenges**

### **High Capital and Operational Costs of Advanced Biological Systems**

Despite their environmental advantages, advanced biological wastewater treatment systems pose significant financial challenges. High initial capital outlays are required for building infrastructure such as aeration tanks and sludge handling units, especially for technologies like Membrane Bioreactors (MBR) and Moving Bed Biofilm Reactors (MBBR). This financial burden is particularly daunting for low-income regions and small-scale operators. Moreover, the ongoing operational expenses—including energy-intensive aeration processes, skilled labor, monitoring systems, and regular maintenance—add to the total cost of ownership. The need for periodic replacement of components like membranes or biofilm media further increases lifecycle costs. These economic constraints hinder widespread adoption, especially where municipal budgets are tight or cost-efficiency takes precedence, often resulting in the continued use of less effective or more environmentally harmful alternatives.

## **Key Market Trends**

## Integration of AI, IoT, and Automation for Smart Process Management

The adoption of digital technologies such as AI, IoT, and automation is transforming biological wastewater treatment into a more intelligent and efficient process. These innovations allow real-time monitoring and autonomous control of critical operations, including aeration, nutrient balance, and sludge management. Smart systems can quickly respond to changes in influent conditions, detect microbial imbalances, and automatically adjust parameters to ensure continuous compliance and optimal performance. AI-driven analytics enable predictive maintenance and help minimize system downtimes. IoT-enabled sensors installed across treatment units provide precise data on parameters like dissolved oxygen, pH, BOD, and ammonia levels. These advancements are being embraced globally, particularly in areas with labor shortages or complex treatment needs. Municipal utilities in Europe and industrial zones in China and India are leading adopters of AI-augmented treatment plants, which enhance reliability, reduce manual intervention, and support long-term sustainability.

### Key Market Players

Veolia Water Technologies

SUEZ Water Technologies & Solutions

Ecolab Inc.

Xylem Inc.

Pentair plc

AECOM

Aquatech International LLC

Evoqua Water Technologies

Organica Water

Kurita Water Industries Ltd.

## Report Scope:

In this report, the Global Biological Wastewater Treatment Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

### Biological Wastewater Treatment Market, By Type:

Aerobic

Anaerobic

### Biological Wastewater Treatment Market, By End-User Industry:

Municipal

Industrial

### Biological Wastewater Treatment Market, By Technology:

Suspended Growth Systems

Attached Growth Systems

Integrated Systems

### Biological Wastewater Treatment Market, By Application:

Effluent Treatment Plants

Sewage Treatment Plants

Common & Combined Effluent Treatment Plants

### Biological Wastewater Treatment Market, By Region:

North America

United States

Canada

Mexico

Europe

Germany

France

United Kingdom

Italy

Spain

South America

Brazil

Argentina

Colombia

Asia-Pacific

China

India

Japan

South Korea

Australia

Middle East & Africa

Saudi Arabia

UAE

South Africa

## **Competitive Landscape**

Company Profiles: Detailed analysis of the major companies present in the Global Biological Wastewater Treatment Market.

## **Available Customizations:**

Global Biological Wastewater Treatment Market report with the given market data, TechSci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

## **Company Information**

Detailed analysis and profiling of additional market players (up to five).

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