Environmental sensing and monitoring technologies: Global markets

The global market for environmental sensing and monitoring technologies was valued at $29.7 billion in 2023 and is expected to grow at a compound annual growth rate (CAGR) of 5.7% to reach $41.4 billion by the end of 2029.

Table 1. Global market for environmental sensing and monitoring technologies, by type, through 2029 ($ millions)

Type	2023	2024	2029	CAGR % (2024–2029)
Particulate	10,496.4	11,160.6	15,247.1	6.4
Chemical	7,453.1	7,808.4	9,937.4	4.9
Biological	5,925.2	6,394.3	9,341.3	7.9
Moisture	2,033.3	2,093.3	2,427.0	3.0
Temperature	1,766.8	1,835.4	2,231.8	4.0
Noise	1,289.6	1,315.4	1,427.7	1.7
Others*	715.7	734.9	789.0	1.4
Total	29,680.1	31,342.3	41,401.3	5.7

*Other segments include barometric pressure sensors, rainfall sensors, and wind speed and direction sensors.

The growing awareness of environmental issues, such as climate change, air and water pollution, and natural resource depletion, has led to increased government initiatives and corporate responsibility programs to address these challenges. These projects have created a need for reliable and accurate environmental monitoring tools.

Environmental sensors are made in thousands of forms with varying output formats. But the main sensor types are particulate sensors, chemical sensors, biological sensors, temperature sensors, moisture sensors, and noise sensors (Table 1). The particulate sensor segment has the largest market share, with 35.4% in 2023. In contrast, noise sensors were the smallest segment due to many countries categorizing noise as a nuisance rather than a pollution source.

Technological advances have made environmental monitoring solutions more efficient, cost-effective, and versatile. For example,

- **IoT integration:** Internet of Things-enabled sensors can collect data in real time and transmit it to centralized platforms for analysis. This streamlined data process facilitates the creation of large-scale environmental monitoring networks.
- **Miniaturization:** Sensor miniaturization has enabled the development of wearable sensors for health monitoring, as well as allowed integration into drones and satellites for remote sensing applications.
- **Improved data analytics:** Applying sophisticated algorithms, such as machine learning, to sensor data allows for anomaly identification, future trend prediction, and optimized monitoring strategies.

China, the U.S., the U.K., and Germany are the major countries that applied for and published environmental sensing and monitoring technologies patents in 2023–2024. About 75% of the patents granted during this period use intelligent systems based on IoT and machine learning and are equipped with remote systems and satellite monitoring.

Technologies for air pollution sensing and monitoring have witnessed the widest range of developments. According to the World Health Organization, roughly one in nine deaths worldwide can be attributed to air pollution—amounting to 7 million premature deaths each year. As a result, air pollution has moved from being seen as an environmental concern to a health concern in many countries.

Five companies—Robert Bosch GmbH, Veralto Corp. (formerly part of Danaher Corp.), Honeywell International Inc., Merck KGaA, and PerkinElmer Inc.—hold a major share in the global market for environmental sensor and monitoring technologies, each with distinct strengths and strategies to secure their market share. However, technology companies such as IBM, Microsoft, and Amazon have recognized the potential of environmental sensors and are now entering the market by offering comprehensive IoT platforms and solutions.

About the author

BCC Publishing Staff provides comprehensive analyses of global market sizing, forecasting, and industry intelligence, covering markets where advances in science and technology are improving the quality, standard, and sustainability of businesses, economies, and lives. Contact the staff at Helia.Jalili@bccresearch.com.

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