


Chapter 1


Advancements in Environmental Monitoring Technologies and Their Impact on Global Human Health

Vishal Jain

 <https://orcid.org/0000-0003-1126-7424>

Sharda University, India

Archan Mitra

 <https://orcid.org/0000-0002-1419-3558>

NITTE University, India

ABSTRACT

Advancements in environmental monitoring technologies have revolutionized the ability to assess and respond to environmental changes that directly impact global human health. From traditional methods limited by manual data collection to modern, high-resolution systems using IoT, satellite imaging, and AI, these technologies enable real-time data acquisition and predictive analytics. Air and water quality monitoring, enhanced by these advancements, play critical roles in identifying pollution hotspots, mitigating health risks, and guiding policy interventions. However, the application of these technologies varies between developed and developing countries due to economic and logistical constraints. Developed nations benefit from comprehensive monitoring networks, whereas mobile monitoring solutions in low-resource areas effectively reduce waterborne disease prevalence. The deployment and scalability of these technologies highlight the importance of adapting solutions to regional needs.

DOI: 10.4018/979-8-3693-8532-6.ch001

1. INTRODUCTION

Context and Importance

Environmental health directly influences human health, which necessitates a nuanced understanding of environmental changes and their immediate impacts on public welfare (Landrigan et al., 2018). The World Health Organization (WHO) emphasizes that 23% of all global deaths are linked to the environment, underscoring the critical interdependence of environmental health and human well-being (Prüss-Ustün et al., 2016). This profound connection makes the case for ongoing environmental monitoring, which provides essential data to identify, evaluate, and respond to environmental hazards that could potentially affect millions of lives.

The need for accurate and continuous environmental monitoring systems stems from the requirement to manage and mitigate risks associated with environmental pollution and other changes. For instance, air quality monitoring plays a pivotal role in assessing the impact of air pollution on respiratory conditions, which can inform healthcare professionals and policymakers about necessary interventions (Cohen et al., 2017). Similarly, water quality monitoring helps in preventing waterborne diseases by ensuring that contaminants are kept at safe levels (Rojas-Valencia, 2011). Thus, advanced monitoring technologies not only help in immediate health crisis management but also in long-term health planning and policy-making.

Historical Overview

Traditional environmental monitoring methods primarily involved manual data collection and periodic assessments, which often led to delays in data processing and analysis. For example, traditional air quality monitoring relied on fixed-site monitoring stations that provided valuable information but were limited by their static location and the infrequency of data collection (Baldauf et al., 2019). These methods were not capable of providing real-time data or large-scale environmental assessments, making it difficult to respond quickly to environmental health emergencies.

Similarly, water quality monitoring historically required labor-intensive sample collection and lab-based analysis, which could take days or even weeks to yield results (Tiwari & Mishra, 2017). This delay in data availability impeded timely responses to pollution events, leading to prolonged exposure to harmful conditions for the affected populations. Furthermore, these traditional methods often involved significant costs and logistical challenges, particularly in remote or underdeveloped areas, further complicating widespread implementation.

Objective

The primary objective of this paper is to explore recent advancements in environmental monitoring technologies and evaluate their impact on global human health. This involves a comprehensive review of modern technologies such as satellite remote sensing, Internet of Things (IoT) devices, and artificial intelligence (AI) models that have revolutionized the field of environmental monitoring. By integrating

12 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/advancements-in-environmental-monitoring-technologies-and-their-impact-on-global-human-health/376397

Related Content

Applying Knowledge Management in Public Health Intervention: A Street Food Safety Perspective

Iffat Tasnim Haque and Youji Kohda (2021). *Research Anthology on Public Health Services, Policies, and Education* (pp. 695-713).

www.irma-international.org/chapter/applying-knowledge-management-in-public-health-intervention/282001

On Health Expenditure and Income Inequality

Orhan Torul (2020). *Multidimensional Perspectives and Global Analysis of Universal Health Coverage* (pp. 117-151).

www.irma-international.org/chapter/on-health-expenditure-and-income-inequality/247162

Measles

Katrine Faysal Ibrahim, Jimmy Joseph Dagher, Rasha Mustafa Harband Hussein Khalil Hmadi (2026). *Distribution and Treatment of Infectious Diseases: Challenges for Developed and Developing Nations* (pp. 81-94).

www.irma-international.org/chapter/measles/385852

Awareness and Information Sources of Hypertensive Diseases Among Aged Civil Servants in Southwest, Nigeria

Ojinga Gideon Omiunu (2018). *International Journal of Public Health Management and Ethics* (pp. 38-54).

www.irma-international.org/article/awareness-and-information-sources-of-hypertensive-diseases-among-aged-civil-servants-in-southwest-nigeria/196595

No One Left Behind?: Migrant and Refugee Health in the COVID-19 Crisis in Greece

Athanassios Vozikis, Theodoros Fouskas and Symeon Sidiropoulos (2021). *Research Anthology on Public Health Services, Policies, and Education* (pp. 789-808).

www.irma-international.org/chapter/no-one-left-behind/282007