

REVIEW ARTICLE OPEN ACCESS

Environmental Health Understanding and Addressing the Link between Environment and Human Well-being

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Abstract

Environmental health is a critical field at the intersection of public health and ecological science, focusing on how environmental factors—such as air, water, soil, and climate—affect human health. This paper explores the components of environmental health, identifies key environmental hazards, and evaluates strategies for mitigation. Particular attention is given to climate change, pollution, waste management, and environmental justice. The study concludes with policy recommendations aimed at strengthening environmental health systems globally, especially in vulnerable and low-resource settings.

Introduction

Environmental health is a crucial and increasingly urgent field that focuses on the interactions between human populations and their surrounding physical, chemical [1], and biological environments. As the global population continues to grow, and industrialization, urbanization, and environmental degradation accelerate, the health consequences of environmental exposures are becoming more visible and widespread. Environmental health seeks to understand these consequences and mitigate the harmful effects of environmental factors on human well-being. It forms the foundation for creating healthier living conditions and promoting public health on both local and global scales [2]. The World Health Organization (WHO) estimates that nearly a quarter of the global disease burden and one in four deaths worldwide can be attributed to environmental risks, including air and water pollution, poor sanitation, chemical exposures, and climate change. These environmental hazards are not only linked to communicable diseases such as cholera and malaria but are increasingly associated with non-communicable conditions like respiratory illnesses, cardiovascular diseases, and certain types of cancer. Children, the elderly, pregnant women, and low-income communities are often disproportionately affected, making environmental health an important issue

of equity and social justice [3]. One of the most pressing environmental health challenges is air pollution. Both outdoor and indoor air quality have a profound impact on respiratory and cardiovascular health. In rapidly developing urban areas, vehicle emissions, industrial discharge, and the burning of fossil fuels contribute significantly to atmospheric pollution. Meanwhile, in low-income settings, the use of biomass fuels for cooking and heating poses a serious threat, particularly to women and children. In addition to air pollution, the contamination of water sources due to poor sanitation, industrial waste, and agricultural runoff leads to widespread disease outbreaks, especially in developing countries lacking adequate infrastructure. Climate change has emerged as a major environmental health threat, influencing a wide range of health outcomes through its effects on weather patterns, food systems, water security, and the spread of infectious diseases. Rising temperatures and extreme weather events such as floods, droughts, and hurricanes disrupt health systems, displace populations, and increase the risk of water- and vector-borne diseases. These impacts are especially pronounced in regions with limited adaptive capacity, thereby reinforcing existing health inequalities.

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Furthermore [3], the improper management of solid and hazardous waste, especially electronic and industrial waste, continues to pose significant challenges. Exposure to heavy metals, persistent organic pollutants, and radioactive materials can cause long-term damage to human organs and ecosystems. The growing volume of waste, paired with inadequate disposal methods, contributes to soil degradation, water contamination, and air toxicity. Addressing environmental health requires a multidisciplinary and multi-sectoral approach that includes public health professionals, environmental scientists, policymakers, urban planners, and local communities. Preventive strategies such as stricter environmental regulations, improved waste and sanitation systems [4], promotion of clean energy technologies, and increased public awareness are essential to mitigate these risks. Ultimately, ensuring a healthy environment is not only vital for protecting human health but also for achieving broader sustainable development goals and building resilient societies. This paper aims to explore the scope of environmental health, identify key environmental risks to human health, and evaluate global and local responses. By understanding the intricate link between the environment and human well-being, we can better design effective interventions that promote health equity and environmental sustainability [5].

Key Components of Environmental Health

Air Quality

Air pollution is one of the leading causes of mortality worldwide, associated with respiratory and cardiovascular diseases, stroke, and cancer. Fine particulate matter (PM2.5), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂) are common pollutants in urban settings. Indoor air pollution, particularly from solid fuel use in developing countries, also poses severe health risks [6].

Water and Sanitation

Access to clean water and adequate sanitation is essential for health. Waterborne diseases such as cholera, dysentery, and typhoid fever remain prevalent in many parts of the world due to unsafe water sources and poor hygiene infrastructure [7].

Waste Management

Improper management of solid and hazardous waste leads to environmental contamination, vector-borne diseases, and exposure to toxic substances [8]. Electronic waste (e-waste) is an emerging issue, containing heavy metals that can leach into soil and water systems [9].

Climate Change

Climate change affects health both directly (e.g., heatwaves, floods, wildfires) and indirectly (e.g., altered disease vectors, food insecurity). It exacerbates existing health disparities and undermines efforts to achieve sustainable development goals (SDGs) [10].

Chemical and Radiation Hazards

Exposure to industrial chemicals, pesticides, heavy metals (like lead and mercury), and radiation can lead to both acute poisoning and

chronic health issues, including neurodevelopmental disorders and cancers [Table 1].

Environmental Hazard	Source Examples	Primary Health Effects
Air Pollution	Vehicle emissions, industries	Asthma, lung cancer, cardiovascular disease
Water Contamination	Poor sanitation, industrial waste	Diarrhea, cholera, typhoid
Solid Waste Mismanagement	Landfills, e-waste, open dumping	Vector-borne diseases, toxic exposure
Climate Change	Global warming, deforestation	Heatstroke, malnutrition, disease outbreaks
Chemical Exposure	Pesticides, heavy metals	Cancer, birth defects, neurological disorders

Table 1: Major Environmental Health Hazards and Their Associated Health Effects

Environmental Health and Vulnerable Populations

Certain populations are more susceptible to environmental health risks, including children, the elderly, pregnant women, and low-income communities. For instance, children absorb pollutants at higher rates relative to their body weight and are more affected by air and water contamination. Environmental injustice also plays a role—communities near industrial sites or waste dumps often bear the brunt of environmental hazards due to socioeconomic inequalities.

Case Study: Air Pollution in Urban China

Over the past decades, China has experienced significant air quality challenges due to industrialization and vehicle emissions. In cities like Beijing, PM2.5 levels frequently exceeded safe limits, resulting in increased respiratory hospitalizations. In response, the Chinese government implemented the Air Pollution Prevention and Control Action

Plan (2013–2017), which led to measurable reductions in key pollutants. This case illustrates the importance of regulatory frameworks and cross-sector collaboration in environmental health.

Strategies for Improvement

Policy and Regulation

Governments must enforce environmental protection laws, such as emissions standards and waste disposal regulations. Environmental health should be integrated into urban planning, energy policy, and public health strategies.

Surveillance and Risk Assessment

Systematic monitoring of environmental exposures and health outcomes is crucial. Geographic Information Systems (GIS), environmental sensors, and community reporting can support early detection and response.

Public Education and Community Engagement

Educating the public on environmental risks and encouraging behavioral change is essential. Community participation ensures culturally appropriate interventions and empowers citizens to advocate for cleaner environments.

International Collaboration

Many environmental health issues transcend national borders, requiring global cooperation. Initiatives like the United Nations Environment Programme (UNEP) and the Sustainable Development Goals (SDGs) foster shared responsibility and innovation.

Discussion

Environmental health is an interdisciplinary field requiring coordination between public health, environmental science, engineering, and policy. While progress has been made, challenges persist, particularly in low- and middle-income countries where infrastructure and regulatory enforcement are limited. Climate change introduces new complexities, demanding urgent and adaptive strategies. Ensuring environmental justice is critical to reducing health disparities and promoting equity in health outcomes.

Conclusion

Protecting environmental health is foundational to public well-being. By identifying risks, implementing evidence-based interventions, and promoting sustainable practices, societies can reduce disease burdens and improve quality of life. Policymakers, researchers, and communities must collaborate to build resilient systems that safeguard both human and environmental health in a rapidly changing world.

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