

Applied Ecology

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The Impact of Climate Change on the Accumulation of Hydrogen Sulfide (H₂S) in the Black Sea and Its Application in Nuclear Energy Production

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2025

Abstract

Over the millennia, climate change has had a destructive impact on the environment, posing a threat to both human life and the biodiversity of species. Climate change has a detrimental impact on terrestrial and marine ecosystems, including the biogeochemical processes occurring in the Black Sea. The increase in the average annual temperature of air masses in Earth's atmosphere has strengthened the horizontal stratification of water temperature and affected vertical mixing, making it impossible for oxygen to be evenly distributed in deeper waters. The diverse species of microorganisms in the anaerobic environment of the Black Sea have contributed to the accumulation of hydrogen sulfide (H_2S), a result of the decomposition of organic substances. Numerous scientific studies confirm that hydrogen sulfide (H_2S) is responsible for the loss of biodiversity in the Black Sea and, consequently, for the ecological and socio-economic patterns of the region. Modern research has shown that the accumulation of hydrogen sulfide (H_2S) in the Black Sea water leads to the formation of hypoxic zones, where the metabolic processes essential for the majority of living organisms do not occur, which is critically important for survival. Hydrogen sulfide (H_2S), as a byproduct of both natural and anthropogenic processes, is known as a potential resource for energy production, chemical product synthesis, and addressing environmental problems. This paper describes the role of climate change in the process of hydrogen sulfide (H_2S) accumulation in the Black Sea and its potential applications in nuclear energy. It also emphasizes the necessity of managing the changes occurring in the Black Sea ecosystem as a result of climate change and optimizing the potential benefits of these changes, which requires an integrated approach that will unite marine sciences, environmental policy, and technological innovations.