



# WHEN WATERS TURN GREEN A GROWING THREAT FROM ALGAE BLOOMS

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Water bodies across the world are experiencing a silent but fast-spreading crisis. Lakes, rivers and coastal zones that once supported thriving ecosystems are increasingly turning murky shades of green, blue-green or even red. This transformation is driven by the rise of harmful algal blooms, a phenomenon that has intensified in recent years due to pollution, warming temperatures and changing rainfall patterns. Although algae are natural components of aquatic ecosystems, excessive blooms disrupt ecological balance, threaten human health and destabilize water-dependent economies. The growing scale, frequency and toxicity of these events have made them one of the most urgent environmental challenges of our time.

At the heart of the problem lies nutrient pollution, particularly the influx of nitrogen and phosphorus into water bodies. These nutrients, commonly found in agricultural runoff, untreated sewage, detergents and industrial waste, act as fertilizers for algae. When they enter lakes and rivers in large quantities, they trigger explosive

growth of algae populations. Many countries, including India, face this issue because of rapid urbanisation, intensive farming, insufficient wastewater treatment and the dumping of solid and liquid waste into water sources. In places where monsoon rains flush large amounts of nutrients from fields and cities into waterways, the problem becomes worse and blooms peak soon after heavy rainfall.

Climate change is amplifying the threat dramatically. Rising temperatures create warm, stagnant conditions that favour the growth of harmful algae, especially cyanobacteria, also known as blue-green algae. These microorganisms thrive in still, nutrient-rich waters and often produce toxins that can harm fish, livestock, wildlife and even humans. Heatwaves, increasingly common in South Asia, worsen the situation by increasing water temperature for extended periods. Unpredictable rainfall patterns also play a role. When rains fail, water levels decrease and pollutants become more concentrated. When extreme rainfall occurs, large quantities of

nutrients are washed into rivers and lakes in a short span of time. This weather volatility supports algae proliferation in ways that did not exist decades ago. The ecological consequences of algal blooms are severe. Thick mats of algae block sunlight from reaching underwater plants, disrupting photosynthesis and killing vegetation that fish and other organisms depend on. When algae die, they decompose and consume dissolved oxygen, creating dead zones where aquatic life cannot survive. Fish kills, sometimes involving thousands of fish washing up on shores, are increasingly reported worldwide. In coastal ecosystems, algal blooms can devastate coral reefs, smother seagrass beds and alter food chains. These disruptions ripple through entire ecosystems, reducing biodiversity and weakening the resilience of natural habitats.

Human communities also face significant risks. Certain species of algae release toxins known as cyanotoxins that are extremely harmful even in small quantities. These toxins can contaminate drinking water supplies, making water unsafe for consumption without advanced treatment. In India, several lakes that serve as drinking water sources for cities have experienced toxic blooms, forcing authorities to close water intakes or issue health advisories. Exposure to contaminated water can cause skin irritation, allergic reactions, respiratory issues and gastrointestinal illness. Pets and livestock are particularly vulnerable because they may drink directly from affected water bodies. Coastal algal blooms, such as red tides, can contaminate seafood and lead to paralytic or neurotoxic shellfish poisoning if consumed. Beyond health risks, algae blooms carry significant economic impacts. Fisherfolk and aquaculture operators suffer losses when fish die or when water conditions become unsuitable for breeding. Tourism declines when lakes and beaches become foul-smelling, discoloured or unsafe for recreation. Waterfront businesses, restaurants and hotels feel the impact almost immediately. Municipalities spend large amounts on water treatment, mechanical removal of algae or restoration measures.

These costs further strain developing regions with already limited water infrastructure. Algal blooms can be controlled by reducing nutrient pollution at its source through better sewage treatment, lower industrial discharge, bans on phosphate detergents, and sustainable farming practices. Measures such as precision fertilisation, buffer strips, and green urban infrastructure like wetlands can significantly cut nutrient runoff into water bodies.

Monitoring and early warning systems also play a vital role. Satellites, drones and advanced sensors are increasingly being used to detect bloom formation and measure water quality in real time. When authorities receive early alerts, they can implement temporary restrictions, aerate water bodies to improve oxygen levels or issue public warnings if necessary. In some places, introducing certain species of plants or filter-feeding animals helps control excess nutrients naturally, although these measures must be carefully managed to avoid unintended ecological effects.

Public awareness is a powerful tool in tackling algal blooms. When communities understand their causes and impacts, they are more likely to support pollution controls, join cleanup efforts, and change harmful behaviours. Simple household actions, along with education through schools and local programs, can significantly reduce nutrient pollution and help protect freshwater resources.

As algae blooms continue to rise in frequency and intensity, they signal a deeper environmental imbalance driven by pollution, climate stress and unsustainable practices. These green waters are not just seasonal inconveniences but warnings of long-term ecological decline. Protecting lakes, rivers and coastal ecosystems requires collective action from governments, industries, scientists and citizens. If we act decisively, it is possible to restore the natural clarity and vitality of our waters. If not, we risk allowing a preventable crisis to grow into an irreversible transformation of our planet's most precious resource.