

# Terra mater's silent struggle: the urgent need to save our soil

Soil, a foundational component of the Earth's ecosystem, is critical for food production, water filtration, and providing habitat for countless organisms (Sekercioglu 2010; Sahu et al. 2024). Despite its importance, soil faces a severe and escalating threat from pollution, driven primarily by human activities. "Terra mater", Latin for "Mother Earth," epitomizes our planet's nurturing and life-sustaining essence. Earth sustains its myriad inhabitants as a mother provides for her offspring (Johnson 1993). However, this nurturing relationship is under threat as the insidious war on soil pollution intensifies (Staros 2021). Far from being mere dirt, soil is essential for terrestrial life, yet it is compromised by industrial processes, modern agriculture, urban development, and improper waste disposal (Bardgett 2016). The pollution not only undermines the soil's ability to support life but also disrupts ecosystems and poses significant risks to biodiversity and human health (Kolawole & Iyola 2023).

Addressing this hidden crisis



**It is more valuable than oil. It is our Soil!! © Pooja Purohit.**



**Discarded cigarette filter: a hidden threat to soil health and ecosystems. © Akash Rana.**



Effective waste management practices at Shikhar Fall, Dehradun: preserving natural beauty and soil health. © Himanshu Sahu.



Domestic animals consuming waste and plastic, with improper waste management leading to road contamination: Morena, M.P. © Himanshu Sahu.

is imperative for maintaining the health and balance of

our planet's ecosystems. This article explores the causes,

consequences, and potential solutions to soil pollution, highlighting the urgent necessity for soil conservation.

### The hidden crisis of soil pollution

Soil pollution refers to the presence of toxic chemicals, contaminants, and pollutants in the soil that can harm plant, animal, and human health (Osman 2014).

Unlike more visible forms of environmental degradation, such as deforestation or air pollution, soil pollution often goes unnoticed until its effects are severe (Al-Taai 2021).

Given the foundational role soil plays in the health of our ecosystems, addressing its pollution is paramount for the conservation of our planet.

### Causes of soil pollution

Soil pollution driven by various human activities, significantly impacts environmental and public health. Industrial activities contribute heavily, as factories release heavy metals, chemicals, and waste into the environment, rendering soil toxic and unsuitable for agriculture (Mishra et al. 2019). Agricultural practices further exacerbate soil pollution; the extensive use of pesticides, herbicides, and

fertilizers introduces harmful substances, disrupting soil biota and contaminating water supplies. Urbanization and construction lead to soil erosion and contamination, with improper waste disposal degrading the soil further (Al-Taai 2021). Waste disposal practices, including landfills and illegal dumping, introduce pollutants into the soil, with leachate contaminating soil and groundwater.



**Plastic waste on topsoil: threatening plant growth and ecosystem health.**  
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The consequences of soil pollution are severe and multifaceted. Contaminated soil not only diminishes crop yield and quality but also leads to the bioaccumulation of toxic substances in the food chain, jeopardizing both food security and consumer health (Ali & Khan 2018). The health impacts are profound, including an increased risk of cancers, neurological disorders, and reproductive issues (Mishra et al. 2019). Additionally, ecosystem balance is disrupted, as pollutants kill beneficial microorganisms and insects, reducing soil fertility and biodiversity (Sahu et al. 2024). This also adversely affects wildlife, with contaminants moving up the food chain, leading to health problems and



**Land conservation through clean-up and plantation efforts by Bhomya Foundation: restoring ecosystem health and promoting biodiversity.**  
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decreased survival rates (Ali & Khan 2018). Economically, the degradation of soil necessitates expensive remediation efforts and reduces agricultural productivity, which negatively impacts farmers' livelihoods and the broader economy.

### **Conservation: the foremost priority**

Conserving soil is crucial for the survival and well-being

of all life forms (Pimentel et al. 2013). Soil forms the foundation of terrestrial ecosystems, supporting plant growth, herbivores, and their predators, ensuring robust ecosystems. It acts as a natural filter for water, trapping pollutants and maintaining the purity of water sources by recharging aquifers and rivers. As a significant carbon sink, soil captures carbon dioxide from

the atmosphere, mitigating climate change and controlling global carbon levels. Additionally, soil plays a vital role in nutrient cycling, breaking down organic matter and replenishing nutrients essential for plant growth. Many animals, from insects to larger mammals, depend directly on soil for habitat and as a food source (Coleman et al. 2024). Before addressing other conservation issues like water, plants, or animals, prioritizing soil protection and restoration is essential due to its foundational role in sustaining life and ecosystems.

### Mitigation and remediation

Effective mitigation and remediation of soil pollution requires strict regulations on industrial emissions, waste disposal, and agricultural chemicals. International agreements are crucial for addressing transboundary pollution. Sustainable agricultural practices, like organic farming, integrated pest management, and crop rotation, reduce reliance on harmful chemicals, while conservation tillage and covering cropping maintain soil health. Pollution cleanup methods such as bioremediation, phytoremediation, and soil washing detoxify polluted soils using natural processes. Raising public awareness and education on soil health's importance and pollution's impacts can drive community action and policy change, ensuring sustainable soil conservation and ecosystem health.

### Conclusion

The health of our soil is intrinsically linked to the health of our planet and ourselves. As the foundation of life, soil requires our immediate attention and care. Addressing soil pollution necessitates a concerted effort from governments, industries, and individuals worldwide. Governments must enforce

stricter regulations on industrial waste and agricultural practices, while industries should adopt sustainable methods to minimize contamination. Individuals can contribute by reducing the use of harmful chemicals in their gardens and supporting sustainable products. By understanding the gravity of the situation and taking these proactive measures, we can protect and restore this vital resource, ensuring a sustainable future for generations to come. Only through prioritizing soil conservation can we safeguard the broader ecosystems that depend on this fundamental element.

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