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Impact of Industrial Waste on Environment

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Abstract

Industrial sectors like the food, paper, pulp, and agro-industries are growing as a result of the growing population's demands. The hazardous waste produced by these sectors is mostly organic in nature and is therefore being processed or disposed of in the environment. Increased contamination from these wastes causes more mortality as well as morphological and physical alterations in the creatures and animals that come into contact. Despite being dangerous, the generated waste can be effectively used for the extraction and manufacturing of value-added goods because it mostly comprises macromolecules and bioactive chemicals. The impact of these waste streams on aquatic and terrestrial ecosystems is reviewed in this article. (Poonam Sharma and Vivek Kumar.2020)

Key words: Industrial waste, pollution, heavy metal, environmental effects

Introduction

To meet the demands of society, more resources are required as the population rises, mostly food and agricultural products on a local and global scale (Vivek Kumar Gaur et al., 2020). Paper waste is another important resource that is frequently overlooked. This focuses on three industries that are expanding quickly: food, paper & pulp, and agriculture. Approximately five billion metric tons of biomass are produced annually worldwide by agriculture alone (Bharathiraja et al., 2017). The pulp and paper with its massive discharge of toxic wastewater, industry is also one of the most polluting sectors (Chakraborty et al., 2019). Appropriate rules must be created to regulate waste release and encourage its safe use in order to lessen the negative consequences of waste.

Industrial pollution frequently finds its way into city sewers, streams, and other natural water bodies. The different industrial waste from the industries is shown in Figure.1.

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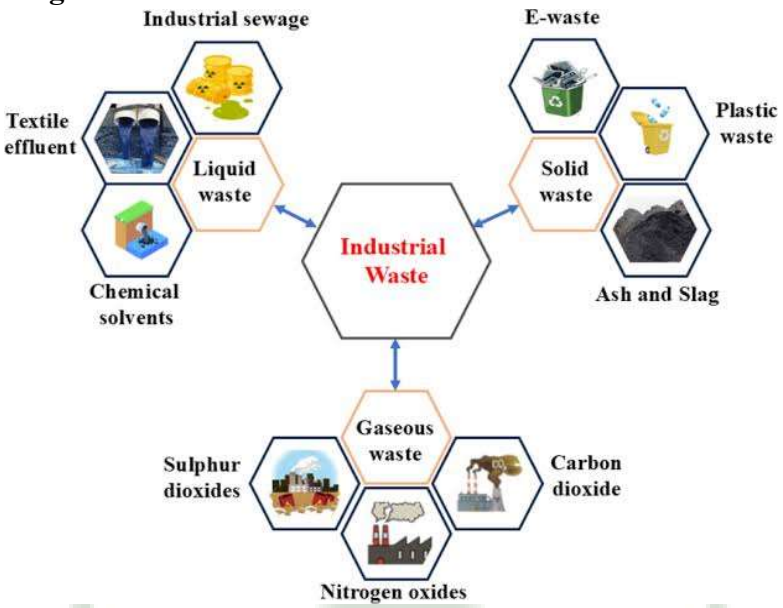
Figure.1: Different industrial waste from the industries



(Source: Shubham et al., 2024)

Environmental Impact

Many industries and power plants are located next to rivers or lakes in order to obtain significant volumes of water for cooling devices or factory operations. Power plants utilize the most water in the United States. A lot of water is also required by industries such as food processing facilities, aluminum plants, steel factories, chemical plants, pulp and paper mills, and oil refineries. Eutrophication, which damages or kills life in water bodies, can be brought on by wastewater containing nutrients like phosphates and nitrates.

When hot water used for cooling is discharged into rivers or lakes, thermal pollution occurs. This causes the water's temperature to rise and oxygen levels to drop, which can kill fish, disrupt food chains, kill off species, and make room for species that prefer heat (thermophilic).

Solid and hazardous waste

Solid waste, usually referred to as municipal solid waste, mostly consists of non-hazardous materials such as trash, garbage, garden waste, and construction debris. Because it requires more careful handling and has specific criteria, hazardous trash is different. Waste is deemed hazardous under U.S. law if it is toxic, combustible, reactive, or corrosive. Additionally, certain hazardous waste kinds are subject to particular regulations (Almorox, 2023). The waste application to land and effects of wastes on soil physico-chemical properties is listed in Table.1.

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Table.1: Waste application to land and effects of wastes on soil physico-chemical properties

Soil properties	Waste type	Outcome	Reference
Soil moisture/water movement and retention	Fly ash	Increase bulk density, increase porosity, increase hydraulic conductivity	Moreira et al. 2016.
Soil pH	Bauxite, cement, and lime kiln, fly ash, sugar beet lime and wood ash, dairy waste, steel slag and paper pulp	Liming agent to reduce acidity	Qing et al. 2015.
Redox potential	Black coal fly ash, tannery waste	Changes in redox effecting solubility and mobility of contaminants	Miretzky and Cirelli 2010
Organic matter	Fly ash, tannery sludge, dairy effluents	Mostly increased organic matter, decreased in some cases	Roy and Joy 2011.
Soil salinity and sodicity	Tannery waste, dairy wastes, pulp and paper mill effluent, fly ash	Increase soil salinity and/or sodicity	Liu et al. 2011.

Source: Shamali and Carson, 2023

CONCLUSION

To put it briefly, industrial waste is a significant issue, but it may also be a useful instrument for environmental cleanup if used wisely and properly. Finding innovative, safe, and sustainable solutions to repurpose garbage while minimizing harm is crucial. The text does clarify, though, that not all industrial waste is worthless. Certain waste materials, such as furnace slag, fly ash, and red mud, contain beneficial substances. In fact, by eliminating dangerous contaminants like colors, salts, and even medication waste, these can be utilized again to purify contaminated water. Adsorption is a method that effectively reduces pollutants. To put it briefly, industrial waste is a significant issue, but it may also be a useful instrument for environmental cleanup if used wisely and properly. Finding innovative, safe, and sustainable solutions to repurpose garbage while minimizing harm is crucial.

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