

Chapter 2

Impacts of Hazardous Waste on Soil Health: Sources of Hazardous Wastes

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ABSTRACT

Soil, a natural medium for plant growth, provides the anchorage to the plants and supplies various nutrients required for the plant growth. It is an important ecosystem that not only provides the shelter to various organisms but also participates directly or indirectly in various biogeochemical cycles. However, in recent years, the earth's soil has been stripped away, rendered sterile, and contaminated with toxic chemicals due to various anthropogenic activities. This increasing wide spread pollution has caused vast areas of land to become non-arable and hazardous for both wildlife and human populations. Unlike many other organic pollutants, which are degraded in the soils, some of the hazardous compounds like heavy metals, pesticides, polycyclic aromatic compounds, and phthalates are of special concern as most of these are conserved. The presence of such compounds in soil ecosystem causes severe toxicity and imbalances in the soil ecosystem as a whole. The chapter focuses on various sources of soil pollutants and the effects of hazardous compounds on soil health.

INTRODUCTION

Soil is an essential component for all living beings and is designated as basic living factor because it provides the essential nutrients for growth of plants. Intensifying global industrialization in both public and private sectors along with population explosion and green revolution has resulted in varying degrees of environmental pollution (Watanabe & Hirayama, 2001; Singh et al., 2018). The progress of urbanization as well as industrialization led to the development of new technologies and products, whose manufacturing involves utilization of various raw materials as well as synthetic compounds, resulting

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in release of huge quantities of hazardous wastes (Przybylinska & Wyszowski, 2016). Vehicular emissions and open dumping of solid waste have also consequenced in deterioration of soil quality as well as decrease in vegetation abundance (Ali et. al., 2014). Migration of various contaminants into non-polluted areas as dust or leachates through soil and spreading of pollutants through sewage sludge are the factors contributing towards contamination of soil ecosystem (Tangahu et al., 2011). The ultimate threat lies in the accumulation of toxic/hazardous compounds, released from various sources, in the food chains via crops grown on the contaminated lands because most of these synthetic compounds are either non-biodegradable or the slow degradable. Environmental contaminants adversely poses the negative influences on the soil properties which further result in toxic effects to the native flora and fauna along with other forms of life (Ziolkowska & Wyszowski, 2010; Wyszowska & Sivitskaya, 2012). Unlike many other organic pollutants which are anthropogenic and often degraded in the soils, potent carcinogens like heavy metals and pesticides are of special concern because are conserved (Wade *et al.*, 1993). Moreover, these contaminants cannot be destroyed biologically (Knasmuller *et al.*, 1998). Global concern over the magnitude of soil pollution calls for immediate remedial actions (Garbisu, 2001). The present study pertains to report the sources of soil contaminants and their impacts on soil health.

SOURCES

There are numbers of factors responsible for release of hazardous chemicals to air, water and soil. The present part of the chapter deals with various sources of hazardous chemicals leading to soil pollution.

Dumping of Solid Waste

The major source of the soil pollution is the waste generated from the households which is dumped in the outskirts of the city or town. Municipal solid waste (MSW) is an inevitable byproduct of human activities and is presently, causing the menace of environmental pollution in most of the developing countries. This waste is generated from domestic and commercial activities, human settlements, the small-scale industries along with wastes from additional sources like hospitals and clinics, especially due to non-availability of specific techniques to handle these wastes (Pattnaik & Reddy, 2009). As MSW is a mixture of both organic and inorganic wastes, its dumping not only alters the physico-chemical characteristics of soil but also results in inducing toxicity including damage to the gene pool of exposed population.

Impacts of open dumping of municipal solid waste on soil and vegetation diversity were studied by Ali et al. (2014). Surface soil samples (n=12) from the depth of 9 inches were collected from the waste disposal site, Islamabad, Pakistan. Wide variability existed in all samples for various parameters with respect to the control soil samples. Various elements ($\mu\text{g/g}$) were observed as Ca (14196.32), Mg (24704.85), Na (282.09), K (19229.5), Pb (133.23), Ni (101.92) and Zn (63249) and the values were found to be higher than those of the control soil. The study revealed the accumulation of heavy metals in soil through the dumping of solid waste. The authors stated that MSW services were recognized as the third priority in municipal commitments in their state after water supply and sanitation. The main environmental problem associated with the open disposal sites was the potential health risks posed to the soil ecosystem. Some earlier studies revealed the elevated levels of average trace elements in soil samples directly due to deposition of municipal waste (McCalla et al., 1977). Direct toxicity of the

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