UNIT I

GENERATION OF WASTES AND CONSQUENCES OF SOIL POLLUTION

1.3. Causes of soil pollution & Factors governing soil pollution interaction clay minerals

1.3.1 Soil pollution

Definition of Soil Pollution

Soil Contamination

Causes of Soil Pollution

1.3.2 Factors governing soil pollution interaction clay minerals

1.3.1 Soil pollution

Definition of Soil Pollution.

Soil pollution is defined as the presence of toxic chemicals (pollutants or contaminants) in the soil, in very high concentrations to pose a risk to human health and the ecosystem.

Soil Contamination

Soil contamination can occur because of human activities or because of natural processes. However, mostly it is due to human activities. It occurs due to many different activities such as overuse of pesticides the soil will lose its fertility and the presence of excess chemicals will increase the acidity or alkalinity of soil and hence degrading the quality of the soil.

Causes of Soil Pollution

Industrial Pollution

The discharge of industrial waste into soils can result in soil pollution. In India, as mining and manufacturing activities are increasing rapidly, soil degradation is also increasing. The extraction of minerals from the earth is responsible for affecting soil fertility. Whether it is iron ore or coal, the by-products are contaminated, and they are disposed of in a manner that is not considered safe. As a result, the industrial waste stays on the soil surface for a long duration and makes it unsuitable for further use.

Agricultural Activities

The use of insecticides and pesticides for a long period can cause soil pollution. Repetitive use can cause insects and pests to become resistant to it. Instead of killing pests and insects, it degrades the soil quality. They are full of chemicals that are not produced in nature and cannot be broken down by them. As a result, they seep into the ground after they mix with water and slowly reduce the fertility of the soil. Plants absorb many of these pesticides, and after decomposition cause soil pollution.

Waste Disposal

Disposal of plastics and other solid waste is a serious issue that causes soil pollution, disposal of electrical items such as batteries causes an adverse effect on the soil due to the presence of harmful chemicals. E.g.: lithium present in batteries can cause the leaching of

soil. Human waste such as urine, diapers, etc. is dumped directly in the land. It causes both soil and water pollution.

Acid Rain

It is caused when pollutants present in the air mix with the rain and fall back on the ground. The polluted water could dissolve away some of the essential nutrients found in soil and change the structure of the soil thus making it unsuitable for agriculture.

Heavy Metals

The presence of heavy metals (such as lead and mercury) in very high concentrations present in soils can cause them to become highly toxic for human beings.

Nuclear Waste

It can also lead to soil degradation.

Oil Spills

Oil leaks can happen during the storage or transport of chemicals, the chemicals present in the fuel deteriorates the quality of soil and make them unsuitable for further cultivation, chemicals can also enter into the groundwater through the soil, and hence it will make water undrinkable.

1.3.2 Factors governing soil pollution interaction clay minerals

Clay minerals play important roles in environment protection. Their environmental characteristics allow them to be a barrier for the distribution of inorganic contaminants, such as metals and metalloids like arsenic, iron, and lead, in clay-bearing rocks. These minerals have been used in the disposal and storage of hazardous chemicals as well as for remediation of polluted water. The use of clay minerals as the adsorbents for the adsorption of various hazardous substances (heavy metals, dyes, antibiotics, biocide compounds, and other organic chemicals) has been widely studied by a large number of researchers.

Clay mineral remediation is one of the hot methods for heavy metal pollution remediation in recent years. Concrete by adding different types of mineral materials, to adjust and change of heavy metals in the soil physical and chemical properties, make its REDOX, precipitation, adsorption, chelation, suppress, or a series of reactions such as

antagonism, reduce its biological effectiveness and mobility in soil environment, thus reducing the heavy metal toxicity of plants and animals. Because of the advantages of low investment, high efficiency and simple operation, this method has a good application prospect for the remediation of large area contaminated soil.