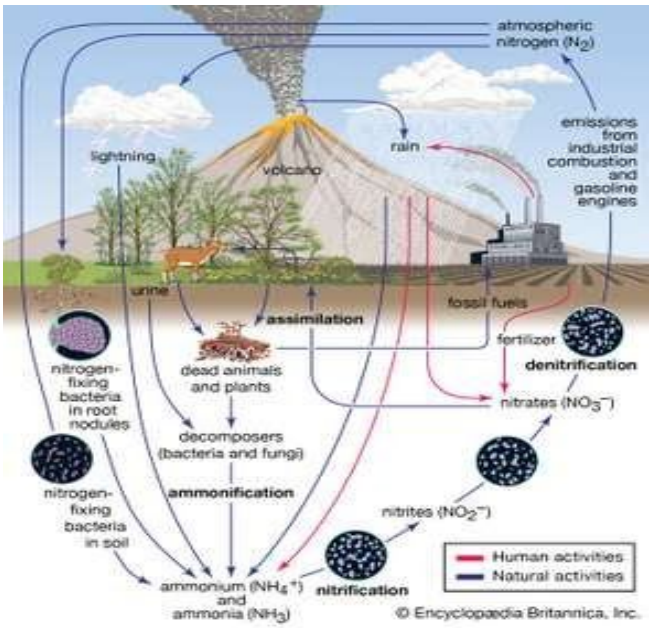
Acid rain



Acid rain, also called acid precipitation or acid deposition, precipitation possessing a pH of about 5.2 or below primarily produced from the emission of sulfur dioxide (SO2) and nitrogen oxides (NOx; the combination of NO and NO2) from human activities, mostly the combustion of fossil fuels. In acid-sensitive landscapes, acid deposition can reduce the pH of surface waters and lower biodiversity. It weakens trees and increases their susceptibility to damage from other stressors, such as drought, extreme cold, and pests. In acid-sensitive areas, acid rain also depletes soil of important plant nutrients and buffers, such as calcium and magnesium, and can release aluminum, bound to soil particles and rock, in its toxic dissolved form. Acid rain contributes to the corrosion of surfaces exposed to air pollution and is responsible for the deterioration of limestone and marble buildings and monuments.

Chemistry Of Acid Deposition

Acid rain is a popular expression for the more scientific term acid deposition, which refers to the many ways in which acidity can move from the atmosphere to Earth's surface. Acid deposition includes acidic rain as well as other forms of acidic wet deposition—such as snow, sleet, hail, and fog (or cloud water). Acid deposition also includes the dry deposition of acidic particles and gases, which can affect landscapes during dry periods. Thus, acid deposition is capable of affecting landscapes and the living things that reside within them even when precipitation is not occurring.

Acidity is a measure of the concentration of hydrogen ions (H+) in a solution. The pH scale measures whether a solution is acidic or basic. Substances are considered acidic below a pH of 7, and each unit of pH below 7 is 10 times more acidic, or has 10 times more H+, than the unit above it. For example, rainwater with a pH of 5.0 has a concentration of 10 microequivalents of H+ per litre, whereas rainwater with a pH of 4.0 has a concentration of 100 microequivalents of H+ per litre.Normal rainwater is weakly acidic because of the absorption of carbon dioxide (CO2) from the atmosphere—a process that produces carbonic acid—and from organic acids

generated from biological activity. In addition, volcanic activity can produce sulfuric acid (H_2SO_4), nitric acid (HNO_3), and hydrochloric acid (HCl) depending on the emissions associated with specific volcanoes. Other natural sources of acidification include the production of nitrogen oxides from the conversion of atmospheric molecular nitrogen (N_2) by lightning and the conversion of organic nitrogen by wildfires. However, the geographic extent of any given natural source of acidification is small, and in most cases it lowers the pH of precipitation to no more than about 5.2.

$SO_2 + H_2O \rightarrow H_2SO_4 \longleftrightarrow H^+ + HSO_4 \longleftrightarrow 2H^+ + SO_4^{2-}$

$NO_2 + H_2O \rightarrow HNO_3 \longleftrightarrow H^+ + NO_3$