Quadrant II – Notes

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ACID RAIN

Acid rain is one of the most dangerous and widespread forms of pollution. Sometimes called "the unseen plague" acid rain can go undetected in an area for years. Technically acid rain has a large amount of acid in it than is normal. Generally, the baseline for identifying acid rain is a **pH** (**p**otential of **H**ydrogen) of 5.6. Acid rain was first detected in 1927 in England. It is one of the secondary pollutants caused by the primary pollutants e.g., sulphur dioxide and oxides of nitrogen.

Acid rain' is generally referred to as the atmospheric deposition of acidic or acid forming compounds in either:

- wet state (rain, snow, sleet, fog and dew) or
- dry state (acidifying particles and gases).

Therefore sometimes 'acid rain' is referred to as acid deposition.

Causes of Acid Rain

There are two main causes: *Natural* causes and *Anthropogenic* causes.

A. Natural Causes:

1. *Volcanic Acidity:* Volcanic eruptions often produce significant emissions of sulphur dioxide and hydrogen sulphide, eventually producing sulphuric acid. Acid production in volcanoes is often very great, leading directly to strong acidic rain in the region.
2. *Wild fires:* Wild or bush fires burn significant portions of the world's vegetated areas and release a lot of pollutants in the atmosphere.

3. *Bacterial action in the soil:* 10% of the sulphur dioxide released in the atmosphere is by the rotting of vegetables crops, decaying of plants and animals by the sulphur oxidizing bacteria.

B. Anthropogenic Causes:

1. *Industrial and Automobiles:* The burning of fuels in industries and vehicles give out a lot of oxides of sulphur and nitrogen in the atmosphere causing acid rains.
2. *Burning of fuels for Domestic use:* The burning of petroleum products and other fuels for cooking, heating etc. produce gases which form acid rains.

How is Acid Rain Formed:-

- Sulphur dioxide and oxides of nitrogen are released in the atmosphere by various processes.
- These oxides react with water vapour in the atmosphere to form sulphuric and nitric acids.
- When it rains these acids come down and the rain becomes acidic and is called 'Acid Rain'.

Harmful Effects of Acid Rain:-

- Natural water becomes acidic and unfit for human and animal use.
- Human beings are prone to respiratory diseases such as bronchitis and asthma which can cause pre-mature deaths.
- Direct contact with acid rain causes skin problems.
- In animals too similar problems are observed.
- Acid rains can affect aquatic life. The water not only turns the water acidic, the run off from the soil can contaminate fish with highly toxic chemical compounds and cause fish to die.
- Some fish and animals such as frogs cannot reproduce in an acidic medium.
- Leaches calcium out of the soil, which has caused a decline in snail- eating songbirds, as snails have grown scarce.
  - The calcium deficient songbirds have begun producing eggs with thin porous shells that either break or dry out within few days after they are laid.
  - Most of the chicks that are hatched suffer from bone malformations, a sure sign of calcium deficiency.
- Soil nitrogen levels have increased. This can over stimulate growth of other unwanted plants and intensify depletion of soil nutrients which in turn reduce tree growth and vigour.

- It damages tree foliage directly, but the most serious effect is weakening trees, so they become more susceptible to other types of damage, e.g., evergreen forests, conifers such as red spruce at high elevations, which are bathed almost continuously in every acidic fog.

- If the level of acidity in water in very high then, it can contaminate fish with highly toxic methyl mercury compounds and cause fish to die.

- Statues and monuments like the Taj Mahal having calcium carbonate is affected by acid rain forming calcium sulphate (the pollutants come from industries in the vicinity, mainly from the oil refinery at Mathura).

- It damages metals, car finishes and buildings.

Measures to Reduce Formation of Acid Rain:

It is highly recommended that we control the pollutants causing acid rain.

1. Make an extra effort to walk or use a bicycle whenever possible instead of taking a bus or personal vehicle.
2. Turn off lights, computer and other electrical appliances when you're not using them.
3. It should be ensured that the smokestacks and the exhaust pipes are cleaned.
4. There should be proper maintenance of vehicles.
5. Devices such as a catalytic converter should be fitted into car exhaust pipes to minimize the effect of sulphur dioxide.
6. Coal must be burnt more efficiently- if coal is cleaned before it is burnt, the dangerous pollutants (e.g., sulphur) that cause acid rain can be cleaned away.