

# **Water Pollution by Detergents**

# Why in News

Water **pollution caused by detergents** has become a big concern in the global context.

- The per capita (per person) detergent consumption in India is around 2.7 kilogram per year.
  - It is around 3.7 kg in the Philippines and Malaysia and 10 kg in the United States of America.

#### **Water Pollution**

- Water pollution occurs when harmful substances—often chemicals or microorganisms—contaminate a stream, river, lake, ocean, aquifer, or other body of water, degrading water quality and rendering it toxic to humans or the environment.
- Water is uniquely vulnerable to pollution. Known as a "universal solvent," water is able to dissolve more substances than any other liquid on earth.
- Some of the causes for water pollution are sewage water, industrial Wastes, agricultural sources, thermal and radiation pollution, marine pollution, invasive species, underground water pollution etc.

#### Note:

- Point Source: When pollutants are discharged from a specific location such as a drain pipe carrying industrial effluents discharged directly into a water body it represents point source pollution.
- Non-Point Source: It includes discharge of pollutants from diffuse sources or from a larger area such as runoff from agricultural fields, grazing lands, construction sites, abandoned mines and pits, etc.

# **Key Points**

#### Detergents:

- A detergent is a **surfactant or mixture of surfactants** that has cleaning properties in dilute solution with water. A detergent is similar to soap.
  - **Surfactant**, also called surface-active agent, substance such as a detergent that, when added to a liquid, reduces its surface tension, thereby increasing its spreading and wetting properties.
  - **Surface Tension** is the property of the surface of a liquid that **allows it to resist** an **external force**, due to the cohesive nature of its molecules.
- They tend to be more soluble in hard water than soap because the sulfonate of

detergent doesn't bind calcium and other ions in hard water as easily as the carboxylate in soap does.

### Detergents & Pollution:

#### Bioaccumulation of Nonylphenol:

- Nonylphenol, a hazardous chemical present in detergents, is known to enter water bodies and the food chains. It <u>bio-accumulates</u> and can pose serious environmental and health risks.
- It has been **detected in human breast milk, blood and urine,** and is associated with reproductive and developmental effects in rodents.

#### • Inhibition of Biodegradation:

- Many laundry detergents contain approximately 35 to 75% phosphate salts. **Phosphates can cause a variety of water pollution problems.**
- For example, phosphate tends to inhibit the biodegradation of organic substances. Non-biodegradable substances cannot be eliminated by public or private wastewater treatment.
  - **Biodegradation** is the process by which organic substances are broken down into smaller compounds by living microbial organisms.
- Some phosphate-based detergents can also cause eutrophication. Phosphateenrichment can cause the water body to become choked with algae and other plants.
  - Eutrophication: When a water body becomes overly enriched with minerals and nutrients which induce excessive growth of algae or algal bloom. It deprives the water of available oxygen, causing the death of other organisms.
  - In Belgium, phosphates have been restricted for use in household detergents since 2003.

## Oxygen-Reducing Substances:

 Detergents also contain oxygen-reducing substances (ie, a chemical compound that readily transfers oxygen atoms) that may cause severe damage to the fishes and other marine animals.

#### Destruction of Mucus:

- Detergents are capable of destroying the **external mucus layers that protect the fish from bacteria and parasites,** causing severe damage to the gills.
  - Mostly fish die when detergent concentrations are near 15 parts per million (ppm); however, detergent concentrations as low as 5 ppm will kill fish eggs.

# Makes Water Turbid:

- A few more harmful components of detergents which are anthropogenic components such as herbicides, pesticides and heavy metal concentrations (like zinc, cadmium and lead) can cause the water to grow dark. This blocks out light and disrupts the growth of plants.
- Turbidity also **clogs the respiratory system** of some species of fishes. Pathogens from these toxic water bodies cause diseases, some fatal, in human or animal hosts diseases.

#### Hazardous for Humans:

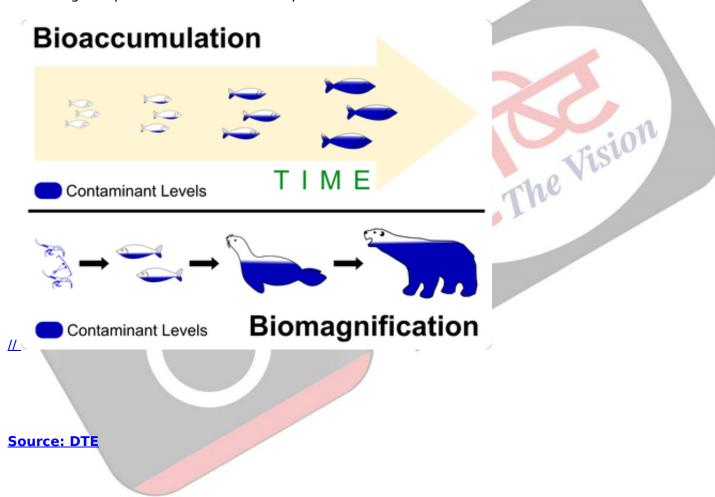
- The detergents contain suspected **carcinogens**, and ingredients that do not fully biodegrade.
  - A **carcinogen** is an agent with the capacity to cause cancer in humans.

#### Indian Initiative:

- **ECOMARK Scheme:** The Government has instituted this scheme on **labeling of Environment Friendly Products.**
- The scheme is operating on a national basis and provides accreditation and labeling for household and other consumer products which meet certain environmental criteria along with quality requirements of the Indian Standards for that product.
- The Ecomark Scheme covers various product categories like Soaps and Detergents, paints, food items etc.

# **Bioaccumulation vs Biomagnification**

- Bioaccumulation is when the concentration of chemicals increases within an organism or species. This can occur when toxic substances are ingested. These toxic substances are very difficult for organisms to excrete, therefore, accumulate in their tissues.
- Biomagnification is the process by which toxic chemicals build up within predators. This
  typically occurs across an entire food chain and affects all of the organisms but animals
  higher up in the chain are more impacted.



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