Japan Develops Seawater-Dissolving Plastic

Prelims: Sustainable development| Science and technology | Current events of national and international importance

Why in news?

Recently, Japanese scientists from the RIKEN Center for Emergent Matter Science and University of Tokyo have developed a new type of plastic that dissolves in seawater within hours.

- The new type of plastic is as strong as petroleum-based plastics but breaks down into its original components when exposed to salt.
- **Material composition** – It is made from **biopolymers** like PLA (Polylactic Acid), PHA (Polyhydroxyalkanoates).
- It can be derived from **renewable sources** (corn starch, sugarcane) or modified petrochemicals.
- **Degradation mechanism** – The material is chemically designed to **respond to sodium ions and salinity** in seawater.
- Salt causes the **polymer structure to loosen and break down**.
- **Hydrolysis reaction –** Water molecules in saltwater **penetrate the polymer** and break the chemical bonds (**hydrolysis**), turning the plastic into smaller, harmless molecules.
- **Biological processing** – These smaller molecules are then **digested by marine bacteria**, preventing microplastic formation and allowing full assimilation into the ecosystem.
- **Durability** – Despite its biodegradability, it maintains **functional strength and usability**.
- **Potential applications** – It can be used like conventional plastic when properly coated.
- It is currently being explored for use in **packaging**, with growing interest from the industry.

Significance

- It leaves no residual trace after dissolving.
- No microplastics are formed, preventing harm to aquatic life and food chains.
- The material is non-toxic, non-flammable, and does not emit carbon dioxide.

The UN Environment Programme predicts plastic pollution will triple by 2040, adding 23–37 million metric tons of waste annually to oceans.

Reference

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