Biomaterials

Prelims: *Current events of national and international importance | Science & Technology*

Why in News?

With the shift to cleaner processes to manufacture consumer products, biomaterials are the new frontier.

- **Biomaterials –** Biomaterials are materials derived ***wholly or partly from biological sources*** or engineered.
  - It uses biological processes, designed to replace or interact with conventional materials.
- **Examples of Biomaterials –**
  - Bioplastics made from plant sugars or starch
  - Bio-based fibres used in textiles
  - Biodegradable sutures and tissue scaffolds used in healthcare
- **Types of biomaterials –**
  - **Drop-in biomaterials** – Chemically identical to petroleum-based materials and usable in existing manufacturing systems (e.g., bio-PET).
  - **Drop-out biomaterials** – Chemically different and require new processing or end-of-life systems (e.g., PLA).
  - **Novel biomaterials** – Offer new properties such as self-healing materials, bioactive implants, and advanced composites.
- **India's Need for Biomaterials–**
  - To reduce dependence on fossil-based imports
  - Waste reduction and support environmental sustainability
  - Generate industrial growth and new income streams for farmers
  - Enable the Indian industry to stay competitive in low-carbon global markets.
- **Current Status in India –**
  - India's biomaterials sector is emerging rapidly, with the bioplastics

market valued at around $500 million in 2024.
    - Major investments in domestic innovation are seen, though some technology dependence remains.
- **Global Developments –**
    - The EU has introduced a binding Packaging and Packaging Waste Regulation recognising the benefits of ***compostable packaging***.
    - The UAE is developing the world's largest PLA facility.
    - The U.S. leads in biomaterials through advanced technologies and federal procurement via the USDA BioPreferred programme.

Reference

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