25 Jun 2022: PIB Summary for UPSC

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1. Swachh Bharat Mission - Urban 2.0

Syllabus: GS-2, Governance; Government policies and interventions for development in various sectors.

Prelims: Swachh Bharat Mission - Urban 2.0

Mains: Significance of Swachh Bharat Mission

Context:

Swachh Bharat Mission - Urban 2.0 launches Revised Swachh Certification Protocols to sustain Open Defecation Free Status across Urban India.

Details:

- The protocols have been launched for ODF, ODF+, ODF++, and Water+ certifications.
- The revamped revised protocol is aligned with SBM-2.0 objectives and is designed to ensure:
    - No untreated used water or faecal sludge is discharged into the environment and all used water (including sewerage and septage, grey water and black water) is safely contained, transported, and treated, along with maximum reuse of treated used water, in all cities with less than 1 lakh population.
    - To sustain open defecation free status in all statutory towns.
- It contains provisions to encourage cities to have a robust infrastructure with reliable Operation &Maintenance (O&M) mechanisms to achieve the goal of clean urban India.
- Key interventions against each certification are:
    - ODF - Robust monitoring mechanism ensured by increasing the survey sample size and location types.
    - ODF+ - Focus on functionality of CT/PT and innovative O&M business model for their sustainability in long run.
    - ODF++ - Emphasis on mechanized cleaning of septic tanks and sewers. Safe collection & treatment of used water as well as safe management of faecal sludge.
    - Water+ - The focus is on the collection, transportation, treatment, and reuse of both used water and faecal sludge to prevent environmental pollution.
        - For towns having a population of more than 20,000, a minimum of 25% of households are to be connected to the sewerage network.
        - Striving to achieve sustainability.
        - No untreated used water is let out in the environment.

Know more about the Swachh Bharat Mission in the linked article.

2. New development in solid-state lithium metal batteries

Syllabus: GS-3, Science and Technology - Developments and their applications and effects in everyday life

Prelims: Lithium-Ion Batteries

Mains: Challenges with the conventional lithium-ion batteries and key solutions

Context:

DST-IISc energy storage platform moves towards enabling fast-charging solid-state batteries.

What's new?

- Researchers from the Indian Institute of Science (IISc) have reported on an innovative interfacial engineering approach to enable fast charge-discharge rates in solid-state lithium metal batteries.
- They have found that nanoscopic refractory metal layers like Tungsten could improve the performance of these batteries which are crucial for purposes like electrical mobility.

Read more on lithium-ion batteries in the link.

Challenges with the conventional lithium-ion batteries:

- Conventional Li-ion batteries employ a graphite anode, a liquid electrolyte, and a transition metal cathode.
- However, the liquid electrolytes are flammable and degrade at high temperatures leading to poor battery life and in extreme cases lead to battery fires.
- Replacing the liquid electrolyte in a conventional Li-ion battery with a ceramic solid electrolyte and simultaneously replacing the graphite anode with a metallic lithium anode could enable safer Li-ion batteries that also last longer on a single charge.
- However, a long-standing challenge with solid-state batteries is the growth of lithium dendrites that short circuits the cells and this is accentuated during fast charging.

How the researchers overcame this:

- Based on extensive fundamental electrochemical measurements performed over several hundreds of solid-state half cells and subsequent nano-characterization, the researchers realized that dendrite growth was a manifestation of a deeper fundamental process: diffusive growth of lithium voids that are forming during discharge.
- The researchers identified that the growth of lithium voids during discharge leads to dendrite growth during charge.

- The researchers noted that tungsten is an ideal candidate to impede lithium vacancy motion due to its low solubility for lithium and therefore delay void growth. They collaborated with researchers from Carnegie Mellon University to corroborate their work through computational methods.
- The team now intends to build on this advance to develop full solid-state cells that could enable charging in less than an hour, and offer up to 1000 or more cycles while withstanding high temperatures of 45 ºC or higher outcompeting conventional Li-ion cells at a cost that is at par or lower than the cost of conventional Li-ion cells.