Waste Water Management

For Prelims: Waste Water Management, SBM 2.0, Open Defecation-Free (ODF) status, AMRUT Mission, Water (Prevention and Control of Pollution) Act, 1974, The Environment (Protection) Act, 1986, Central Pollution Control Board, Eutrophication, Bioremediation, Phytoremediation.

For Mains: Challenges in Waste Water Management and Related Government Initiatives.

Why in News?

Almost half, or **43% of the world's rivers are contaminated with active pharmaceutical ingredients** in concentrations that can have disastrous effect on health.

- The pharmaceutical industry must prioritise waste water management **and process controls to limit antibiotic pollution** and **Antimicrobial Resistance (AMR).**
  - Widescale pharmaceutical pollution has been reported across the different states of India, particularly in pharmaceutical hubs like **Himachal Pradesh, Andhra Pradesh, and Telangana.**

What is Waste Water?

- **About:**
  - Wastewater is the **polluted form of water generated from rainwater runoff and human activities** and is also called sewage.
  - It is typically categorized by the manner in which it is generated—**specifically, as domestic sewage, industrial sewage, or storm sewage (stormwater).**
  - Normally, raw sewage dumped into a water body can clean itself through a natural process of **stream cleaning and self-purification.**
  - But the rise in population, as well as **large-scale urbanization, has led to an increase in sewage discharge** that far **exceeds the rate of natural purification.**
  - The excess nutrients thus generated cause eutrophication **in the water body and gradual deterioration of the water quality.**
    - **Eutrophication** is the process of a **water body becoming overly enriched** with minerals and nutrients which induces **excessive growth of algae or algal bloom,** thereby, leading to **oxygen depletion of the water body.**
- **Waste Water Treatment:**
  - Wastewater treatment, **also called** sewage treatment, is the **removal of impurities from wastewater, or sewage,** before it reaches aquifers or natural bodies of water such as rivers, lakes, estuaries, and oceans.
  - On-site **Sewage Treatment Plants (STPs)** treat and purify wastewater and render it suitable for reuse.
    - STPs remove contaminants from waste water primarily from household sewage.

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What is the Status of Waste Water Management in India?

- **About:**
  - According to a report published by **Central Pollution Control Board (CPCB)** in 2021, India's **current water treatment capacity is 27.3% and the sewage treatment capacity is 18.6%** (with another 5.2 % capacity being added).
    - Although India's waste and sewage treatment capacity is **higher than the global average of around 20%,** it is **far from adequate, and without swift measures** and not scaling up the sewage treatment capacity may have serious consequences.
  - As per government statistics, **62.5% of wastewater in urban India remained untreated or partially treated.**
  - According to a 2019 research report, **most of the sewage treatment plants** established under the **Ganga Action Plan** and **Yamuna Action Plan are not working,** and out of the **33000 million litres per day (MLD) of waste generated, only 7000 MLD is collected and treated.**
- **Regulation:**
  - **The Water (Prevention and Control of Pollution) Act, 1974, (Amended in 1988)**
    - This legislation was introduced to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.
  - **The Water (Prevention and Control of Pollution) Cess Act, 1977, (Amended in 2003)**
    - It aims to provide for the levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities.
  - **The Environment (Protection) Act, 1986**
    - It empowers the Central government to prescribe sewage and effluent discharge standards, investigate and ensure compliance, and conduct research.
    - This Act applies to all kinds of environmental pollution, including water, land, air, and noise.
- **Government Initiatives:**
  - The Indian government shifted its focus to **solid waste, sludge and greywater management** under the **Swachh Bharat Mission 2.0 (SBM 2.0).**

        - Following a sustained focus on achieving **Open Defecation-Free (ODF) status**, the **Ministry of Housing and Urban Affairs (MoHUA)** developed detailed criteria for cities to achieve **ODF+, ODF++ and Water+ statuses.**
    - Under **Atal Mission for Rejuvenation and Urban Transformation (AMRUT) Mission**, sewerage & septage management projects were launched by MoHUA.

What are the Challenges in the Waste Water Management?

- **Schedule 7** of the Indian constitution identifies **water as a State matter,** but it is **explicitly subjected to the provisions mentioned in the Union List.**
    - It enables the **Parliament to legislate on regulating and developing inter-state waters in the larger public interest** while the **State retains the autonomy to frame laws regarding the use of water within the State** on matters like water supply, irrigation, drainage and embankments, water storage, etc.
    - This disintegrated approach to wastewater and its fallouts can also be seen within the States. The governance of water resources is **further fragmented at local levels, rural and urban, as per the** 73rd and 74th constitutional amendment acts.
    - These constitutional mechanisms have resulted in power imbalances between the Centre and the States, creating **federal jurisdictional ambiguity.**
        - Particularly, in the case of wastewater management, **one State's inaction affects the interests of one or more other States and causes disputes.**
- While **centralised wastewater treatment** solutions require a well-developed network of interconnected sewers and drainage for the wastewater to be collected in a central location. This makes them **expensive, labour-intensive, and time-consuming.**

Way Forward

- Although a **decentralised approach is needed for better assessment and redressal of wastewater issues**, but for the efficient functioning of policies and overall development of water bodies, water governance needs to be recognized at all levels.
    - In this regard, **wastewater must be seen not only as an environmental pollution issue** but as a **water sector matter to be addressed coherently** by all central, state, and local governments.
- It is imperative to **complement centralised treatment plants with cheaper alternative solutions such as:**
    - **Decentralised wastewater treatment plants** can be set up in small townships, urban and rural clusters, gated colonies, factories, and industrial parks. **They can be installed directly on-site, thus treating the wastewater directly at its source.**
    - **Bioremediation** utilises microbes such as fungi and bacteria in order to **break down pollutants and hazardous effluents.**
    - **Phytoremediation** refers to the **use of plants and associated soil microbes to reduce the concentrations or toxic effects of contaminants** and has been proven quite effective at cleaning lakes and ponds throughout the country.

UPSC Civil Services Examination, Previous Year Questions (PYQ)

Q1. Biological Oxygen Demand (BOD) is a standard criterion for (2017)

(a) Measuring oxygen levels in blood
(b) Computing oxygen levels in forest ecosystems
(c) Pollution assay in aquatic ecosystems
(d) Assessing oxygen levels in high altitude regions

Ans: (c)

Exp:

- Biological Oxygen Demand (BOD) is the amount of Dissolved Oxygen needed by aerobic organisms

to decompose organic material in a given sample of water at a certain temperature over a particular time period.
- BOD is one of the most common measures of pollutive organic material in water. BOD indicates the amount of putrescible organic matter present in water. Therefore, a low BOD is an indicator of good quality water, while a high BOD indicates polluted water.
- Sewage and untreated water discharge results in the decreased amount of Dissolved Oxygen as much of the available dissolved oxygen is consumed by aerobic bacteria in the degradation process, robbing other aquatic organisms of the Oxygen they need to live.
- **Therefore, option C is the correct answer.**

Q2. In the context of solving pollution problems, what is/are the advantage/advantages of bioremediation technique? (2017)

1. It is a technique for cleaning up pollution by enhancing the same biodegradation process that occurs in nature.
2. Any contaminant with heavy metals such as cadmium and lead can be readily and completely treated by bioremediation using microorganisms.
3. Genetic engineering can be used to create microorganisms specifically designed for bioremediation.

Select the correct answer using the code given below:

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (c)

Exp:

- Bioremediation is a treatment process that uses naturally occurring microorganisms (yeast, fungi, or bacteria) to break down, or degrade, hazardous substances into less toxic or nontoxic substances.
- The microorganisms break down the organic contaminants into harmless products-mainly Carbon Dioxide and water. It is a cost effective, natural process applicable to many common organic wastes. Many bioremediation techniques can be conducted on-site. **Hence, statement 1 is correct.**
- All contaminants cannot be easily treated by bioremediation using microorganisms. For example, heavy metals such as Cadmium and Lead are not readily absorbed or captured by microorganisms. **Hence, statement 2 is not correct.**
- Genetic engineering can be used to create microorganisms designed for specific purposes for bioremediation. For example, Bacterium Deinococcus radiodurans (the most radioresistant organism known) has been modified to consume and digest Toluene and ionic Mercury from highly radioactive nuclear waste. **Hence, statement 3 is correct.**
- **Therefore, option C is the correct answer.**

Source: DTE