# Sanitation Systems

**For Prelims:** Sanitation Systems, **On-site Sanitation Systems**, Twin Pits and Septic Tanks, Urban Sewer Systems, **Faecal Sludge Treatment Plants (FSTPs).**

**For Mains:** Sanitation Systems, Government policies and interventions for development in various sectors and issues arising out of their design and implementation.

**Source: TH**

## Why in News?

Used water that goes into ground, open space, into open drains or canals should be channelized into proper Sanitation Systems for public health and environmental preservation.

- While rudimentary sanitation was introduced by **ancient civilisations around 4000 BC,** the modern sanitation system **was built in London around the 1800s.**

## What are the Types of Sanitation Systems?

- **On-site Sanitation Systems (OSS):**
  - Twin pits, septic tanks, bio-digester toilets, bio-tanks, and urine diversion dry toilets serve as prevalent **OSS** in rural or spacious urban settings. These systems passively treat used water, containing fecal sludge or septage, catering to varying spatial constraints.
  - **Twin Pits and Septic Tanks:**
    - Twin Pits Functionality: It consists of **two pits utilized alternately,** twin pits facilitate **liquid soaking into the ground** while solids settle and degrade.
      - One pit remains inactive for two years, **ensuring pathogen-free contents** for reuse, but unsuitable for rocky soils.
    - **Septic Tanks Operation:** Septic tanks are watertight; as used water flows through the tank, **solids settle at the bottom, while scum** – mostly oil and grease – floats to the top.
      - While settled solids in septic tanks degrade over time, the accumulated faecal sludge and scum must be removed at regular intervals.
      - This is done using trucks equipped with vacuum pumps that suck the faecal sludge out and transport it to treatment facilities called **Faecal Sludge Treatment Plants (FSTPs).**
- **Urban Sewer Systems:**
  - In densely populated urban areas that lack space within properties, an underground network of pipes – a.k.a. sewers – collects and conveys the used water to treatment facilities.
  - This network of interconnected pipes transports used water from toilets, bathrooms, kitchens to treatment facilities by gravity or with the help of pumps. Sewers have machine-holes for maintenance and to remove blockages.
  - This used water, called sewage, is transported by sewers to **Sewage Treatment Plants**

**(STPs).**

## What are the Functions of Treatment Facilities?

- **Faecal Sludge Treatment Plants (FSTPs):**
  - **Varieties of FSTPs:** FSTPs operate in **either mechanical** (utilizing equipment like screw presses) or **gravity-based systems** (employing sand drying beds). These facilities manage faecal sludge, aiming for effective containment, conveyance, and treatment, often referred to as **faecal sludge management (FSM).**
    - In smaller towns or **villages, OSS-FSM prevails.**
  - **Reuse and Disposal:** Treated solids from FSTPs, when composted with organic municipal waste, **become reusable in agriculture.**
    - The treated water is commonly **repurposed for landscaping within FSTP premises**, highlighting a sustainable approach.
- **Sewage Treatment Plants (STPs):**
  - **Comprehensive Water Treatment:** STPs employ **physical, biological, and chemical processes** to eliminate pollutants from used water.
    - Similar to FSTPs, the primary **stage separates solids, followed by purification where microorganisms digest** solids, and eventual disinfection.
  - **Advanced Techniques and Varied Types:** Advanced STPs employ methods like **membrane filtration to enhance water reuse.**
    - These facilities come in **mechanised and non-mechanised types,** selected based on technical and financial capacities of city administrations.

## Note

- FSTPs are smaller and can coexist with **Solid Waste Management** sites or be decentralised, located closer to sludge sources. In contrast, STPs are larger, centralised facilities serving whole communities or urban areas, usually situated near water bodies to discharge treated water.

## What is the Need for Such a Complex Sanitation System?

- As water **moves through its various domestic and non-domestic uses**, it accumulates natural as well as human-introduced impurities – including organic matter, nutrients from detergents, pathogens such as bacteria, viruses, and parasites, and heavy metals from solvents and pesticides. It also includes solids like soil, debris, minerals, and salts.
- To ensure that used water doesn't pollute or cause public health issues as a result of these impurities when reintroduced into natural environments, **it's essential to contain, remove, and treat used water before it is disposed of or reused.**
- Odour and aesthetics have **long been the main drivers of sanitation,** but it wasn't until their connections with public and environmental health became clear that people realised that using an "out of sight" approach was inadequate.

## Conclusion

- There have been significant improvements in public health since sanitation systems were invented, but universal access to safely managed sanitation services remains a challenge.
- Overcoming issues like poorly designed and built systems and unsafe operation and maintenance practices are crucial to effectively manage used water and protect our increasingly precious water bodies and groundwater aquifers.