Source : www.thehindu.com Date : 2023-12-26

A DIVE INTO SANITATION SOLUTIONS: PROCESSING, MANAGING AND TREATING USED WATER

Relevant for: Environment | Topic: Environmental Pollution - Air, Water, Soil & E-waste

December 25, 2023 11:20 pm | Updated 11:20 pm IST

Apart from the water we drink and consume through our food, we use water for cooking, cleaning ourselves and our homes, and washing clothes and utensils. Where does the used waterfrom our homes go?

Common answers to this question are into the ground, into the open space around the house, into pipes underground or into open drains or canals, among other water bodies. Some of these responses are not entirely wrong, but the key concern is where this used water should go.

It should go into sanitation systems designed to contain, convey, treat, and either dispose of or reuse the used water (given its value as a resource, the term ‘used water’ is preferred over ‘wastewater’) – ensuring good public health and reducing environmental pollution. While rudimentary sanitation was introduced by ancient civilisations around 4000 BC, the modern sanitation system was built in London around the 1800s.

The type depends on where you live. In rural areas or spacious urban residences, used water goes into twin pits or septic tanks, also known as on-site sanitation systems (OSS), connected below ground to toilets.

While twin pits and septic tanks are widely used, other OSS types include bio-digester toilets, bio-tanks, and urine diversion dry toilets. These systems serve as collection and storage structures that passively treat the used water and dispose of the liquid into the surrounding soil. The residue that collects within the pits and septic tanks is called faecal sludge, or septage, and is composed primarily of solids from human excreta.

Twin pits are two pits separated by at least one metre. The pits, used alternatively, have porous walls that allow the liquid part of used water to soak into the ground while solids collect and degrade at the bottom of the pit.

When one pit reaches capacity, it is covered and left unused for two years until its contents are dry, pathogen-free, and safe for reuse. In this period, the second pit operates, and the cycle repeats.

Twin pits are a complete system by itself, as the full sanitation cycle from containment to treatment and disposal happens within the pit and its immediate surroundings. However, they

may not be suitable for all locations, such as rocky soil where water percolates slowly. In such conditions, septic tanks along with pits or other forms of soakaways are used.

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. The clear liquid is disposed of in the surrounding soil through pits that are like twin pits or in a longer, shallower trench.

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).

Conversely, 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. (Machine-holes is a better term than ‘manholes’, which is inappropriate since the law prohibits manual cleaning exercises.)

This used water, called sewage, is transported by sewers to sewage treatment plants (STPs).

FSTPs can be either mechanical or gravity-based. Mechanised systems rely on equipment such as screw presses or centrifuges for dewatering; gravity-based systems use sand drying beds and sunlight.

The treated solids can be reused in agriculture when composted with organic municipal solid waste. Treated water is often reused in landscaping within the FSTP facilities. This process of containing, conveying and treating faecal sludge is also called faecal sludge management (FSM). In many small and medium towns or villages, OSS-FSM is the predominant form of the sanitation system.

STPs use a series of physical, biological, and chemical processes to remove pollutants and contaminants from used water. Like FSTPs, the treatment of used water has a primary stage that separates solids from the liquid part, followed by purification (where solids settle and are digested by microorganisms), and disinfection.

To facilitate the reuse of used water, advanced systems use additional treatment such as membrane filtration. STP technology can be of several types, either mechanised and non-mechanised, and is often chosen based on techno-managerial and the financial capacities of a city’s government.

FSTPs are generally smaller than STPs and can be colocated with municipal solid waste management sites. They can also be decentralised and located closer to the sources of faecal sludge. In contrast, STPs are much larger, centralised installations designed to serve entire communities or large urban areas. They require substantial infrastructure and are typically located near water bodies so they can discharge treated water.

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.

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.

K.V. Santhosh Ragavan is a Senior Lead – Practice, at the Indian Institute of Human Settlements (IIHS), Bengaluru, and currently leads the Tamil Nadu Urban Sanitation Support Programme (TNUSSP). Mahima Vijendra is a Senior Consultant at IIHS and works on TNUSSP focusing on policy, governance and institutions.