Waste Stabilization Ponds:

Waste stabilization ponds (WSPs) are sanitation technologies that consist of open basins that use natural processes to treat domestic wastewater, septage, and sludge, as well as animal or industrial wastes. They can be used in centralized or semi-centralized sewerage systems, they can also be used to treat fecal sludge from onsite dry sanitation systems, or as onsite water-based sanitation systems serving a single building or home. The most common types of WSPs are anaerobic ponds, facultative ponds, maturation or polishing ponds, aerated ponds, and high-rate algal ponds (HRAPs)

Some pathogen removal is accomplished in anaerobic, facultative, aerated ponds and HRAPs, even though their primary function is to remove and stabilize organic matter. The primary function of maturation and polishing ponds however, is to remove and inactivate pathogens.

WSP systems require large areas of open land, making them ideal in smaller towns and rural settings, though they are used successfully in many urban environments as well, often in combination with other sanitation technologies. One of the biggest advantages of WSPs is that they are easy and inexpensive to operate and maintain, and generally do not rely on mechanized equipment or expensive material.

Waste stabilization ponds (WSPs) are open basins enclosed by earthen embankments, and sometimes fully or partially lined with concrete or synthetic geofabrics. They employ natural processes to treat domestic wastewater, septage, and sludge, as well as animal or industrial wastes. They can be used in centralized or semi-centralized sewerage systems, serving cities or towns; they can also be used as onsite systems serving a single entity (e.g., highway rest area, community center, etc.)

Inputs and Outputs for Waste Stabilization Ponds:

WSPs can be used to treat a variety of water and waste streams, thus the inputs may include wastewater, septage, latrine pit contents, and/or sludge from other wastewater treatment processes.

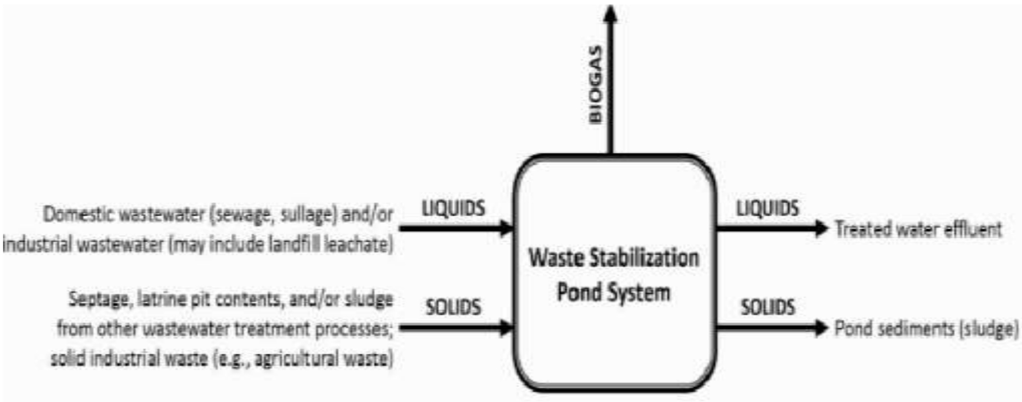
WSPs may receive untreated wastewater that has gone through preliminary treatment (e.g. screening and grit removal), or they may receive secondary effluent from some other treatment process, such as anaerobic reactors, activated sludge, or trickling filters.

The outputs from WSP systems include the treated effluent (liquid), sludge/sediments (solids), and biogas. The treated liquid effluent from WSPs is often continuously discharged; however, operators of some systems (especially in colder climates) may stop discharging for months at a time, allowing the ponds to fill up and discharging once the temperature gets warmer (this extra retention time makes up for the slower rate of treatment during colder months).

Sludge removed from WSPs is contaminated with pathogens and needs to be safely managed (to prevent exposure) or treated (to reduce the concentration of pathogens). Refer to the chapter on Sludge Management.

Factors Affecting Pathogens in Waste Stabilization Ponds:

Different factors affect different types of pathogens in different ways. The most important factor for the removal of viral and bacterial pathogens is sunlight exposure, although other factors such as temperature, dissolved oxygen and pH are also important. Sedimentation, hydraulic efficiency, sunlight exposure, and physical chemical factors (including temperature and pH) are all important factors for the removal of protozoan pathogens, though sedimentation is perhaps the most important.



Typical inputs and outputs from waste stabilization pond systems

Sedimentation

WSP systems have hydraulic retention times on the order of days, weeks, or even months, which allows large, dense particles to settle. Sedimentation is more effective in WSPs with less turbulence. Ponds should be designed to maintain quiescent conditions that approach laminar flow.

The size and density of pathogens and particles determines their settling velocities. Bacteria and viruses will not settle in WSPs unless they are attached to larger, denser particles. Only a small percentage of viruses attach to WSP particles, and they mostly attach to particles that are too small to settle.

Physical-Chemical and Microbiological Factors

The most important physical-chemical factors for pathogen inactivation are pH, temperature and dissolved oxygen in the presence of dissolved organic matter. Most bacterial pathogens are vulnerable to high pH.