Wastewater treatment:

One of the most common forms of pollution control in the world is wastewater treatment. Developing countries have a vast system of collection sewers, pumping stations, and treatment plants. Sewage is waste matter such as feces or dirty water from homes and factories which flows away through sewers.

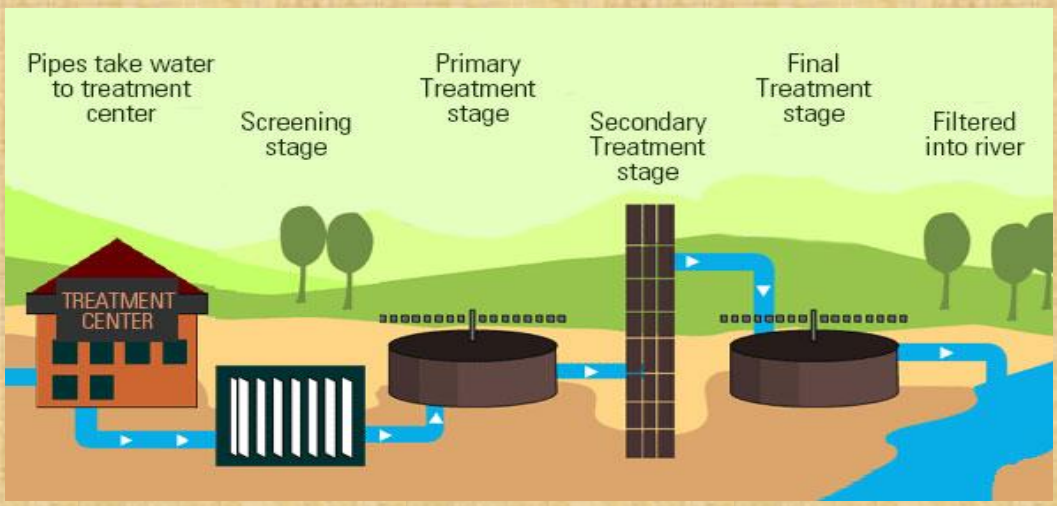
Wastewater is not just sewage. All the water used in the home that goes down the drains or into the sewage collection system is wastewater. This includes water from baths, showers, sinks, dishwashers, washing machines, and toilets. Domestic wastewater is wastewater that comes primarily from individuals and does not generally include industrial or agricultural wastewater.

Small businesses and industries often contribute large amounts of wastewater to sewage collection systems. Others operate their own wastewater treatment systems. In combined municipal sewage systems, water from storm drains is also added to the municipal wastewater stream.

Wastewater is about 99 percent water by weight and is generally referred to as influent as it enters the wastewater treatment facility.

Sewers collect the wastewater from homes, businesses, and many industries, and deliver it to plants for treatment. Treatment plants are designed to clean wastewater for discharge into streams or other receiving waters, or for reuse. Years ago, when sewage was dumped into waterways, a natural process of purification began. First, the sheer volume of clean water in the stream diluted wastes. Bacteria and other small organisms in the water consumed the sewage and other organic matter, turning it into new bacterial cells; carbon dioxide, and other products.

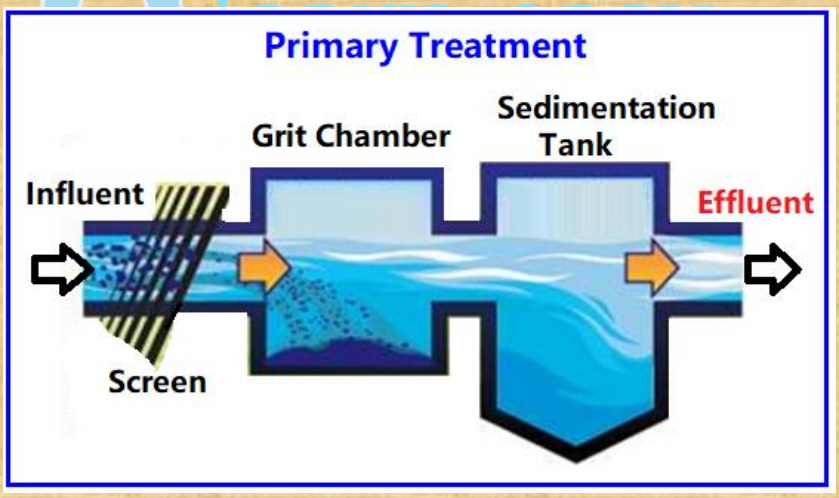
Today's higher populations and greater volume of domestic and industrial wastewater require that communities give nature a helping hand. The basic function of wastewater treatment is to speed up the natural processes by which water is purified.



There are two basic stages in the treatment of wastes, primary and secondary. In the primary stage, solids are allowed to settle and be removed from wastewater. The secondary stage uses biological processes to further purify wastewater. Sometimes, these stages are combined into one operation.

Primary Treatment:

- As sewage enters a plant for treatment, it flows through a bar screen, which removes large floating objects such as rags and sticks that might clog pipes or damage equipment.
- After the sewage has been screened, it passes into a grit chamber, where cinders, sand, and small stones settle to the bottom. A grit chamber is particularly important in communities with combined sewer systems where sand or gravel may wash into sewers along with storm water.



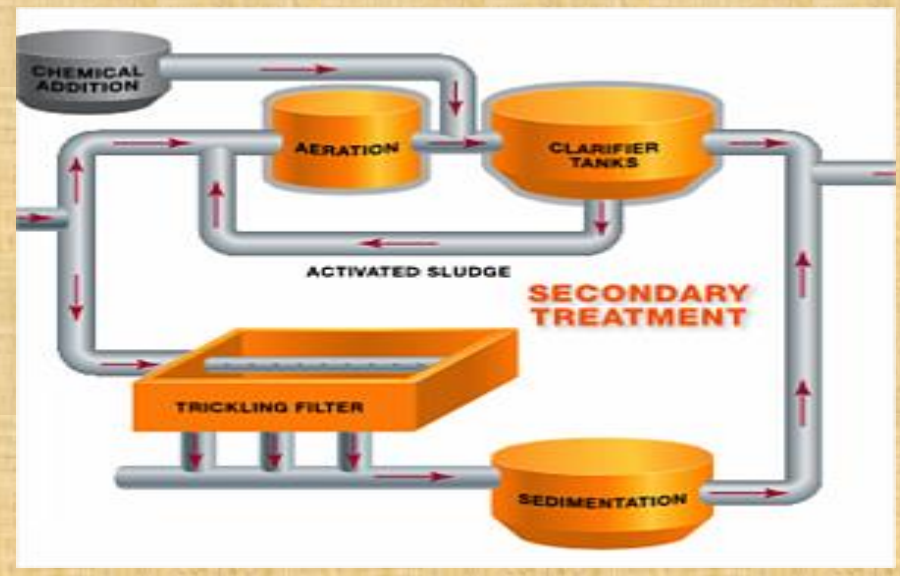
- After screening is completed and grit has been removed, sewage still contains organic and inorganic matter along with other suspended solids. These solids are minute particles that can be removed from sewage in a

sedimentation tank. When the speed of the flow through one of these tanks is reduced, the suspended solids will gradually sink to the bottom, where they form a mass of solids called raw primary bio-solids formerly sludge).

- Bio-solids are usually removed from tanks by pumping, after which it may be further treated for use as a fertilizer, or disposed of in a landfill or incinerated. Over the years, primary treatment alone has been unable to meet demands for higher water quality. To meet them, cities and industries normally treat to a secondary treatment level, and in some cases, also use advanced treatment to remove nutrients and other contaminants.

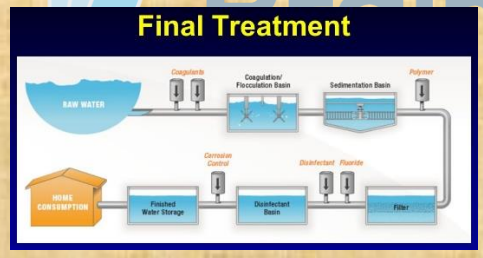
Secondary Treatment:

- The secondary stage of treatment removes about 85 percent of the organic matter in sewage by making use of the bacteria in it.
- The principal secondary treatment techniques used in secondary treatment are the trickling filter and the activated sludge process.
- After effluent leaves the sedimentation tank in the primary stage it flows or is pumped to a facility using one or the other of these processes.
- A trickling filter is simply a bed of stones from three to six feet deep through which sewage passes. Bacteria gather and multiply on these stones until they can consume most of the organic matter. The cleaner water trickles out through pipes for further treatment. From a trickling filter, the partially treated sewage flows to another sedimentation tank to remove excess bacteria.



- The trend today is towards the use of the activated sludge process instead of trickling filters. The activated sludge process speeds up the work of the bacteria by bringing air and sludge heavily laden with bacteria into close contact with sewage.
- After the sewage leaves the settling tank in the primary stage, it is pumped into an aeration tank, where it is mixed with air and sludge loaded with bacteria and allowed to remain for several hours.
- During this time, the bacteria break down the organic matter into harmless by-products. The sludge now activated with additional billions of bacteria and other tiny organisms can be used again by returning it to the aeration tank for mixing with air and new sewage.
- From the aeration tank, the partially treated sewage flows to another sedimentation tank for removal of excess bacteria.

- To complete secondary treatment, effluent from the sedimentation tank is usually disinfected with chlorine before being discharged into receiving waters.
- Chlorine is fed into the water to kill pathogenic bacteria, and to reduce odor. Done properly, chlorination will kill more than 99 percent of the harmful bacteria in an effluent.
- Many countries now require the removal of excess chlorine before discharge to surface waters by a process called de-chlorination.
- Alternatives to chlorine disinfection, such as ultraviolet light or ozone, are also being used in situations where chlorine in treated sewage effluents may be harmful to fish and other aquatic life.



At wastewater treatment plants, this flow is treated before it is allowed to be returned to the environment, lakes, or streams. There are no holidays for wastewater treatment, and most plants operate 24 hours per day every day of the week. Wastewater treatment plants operate at a critical point of the water cycle, helping nature defend water from excessive pollution.