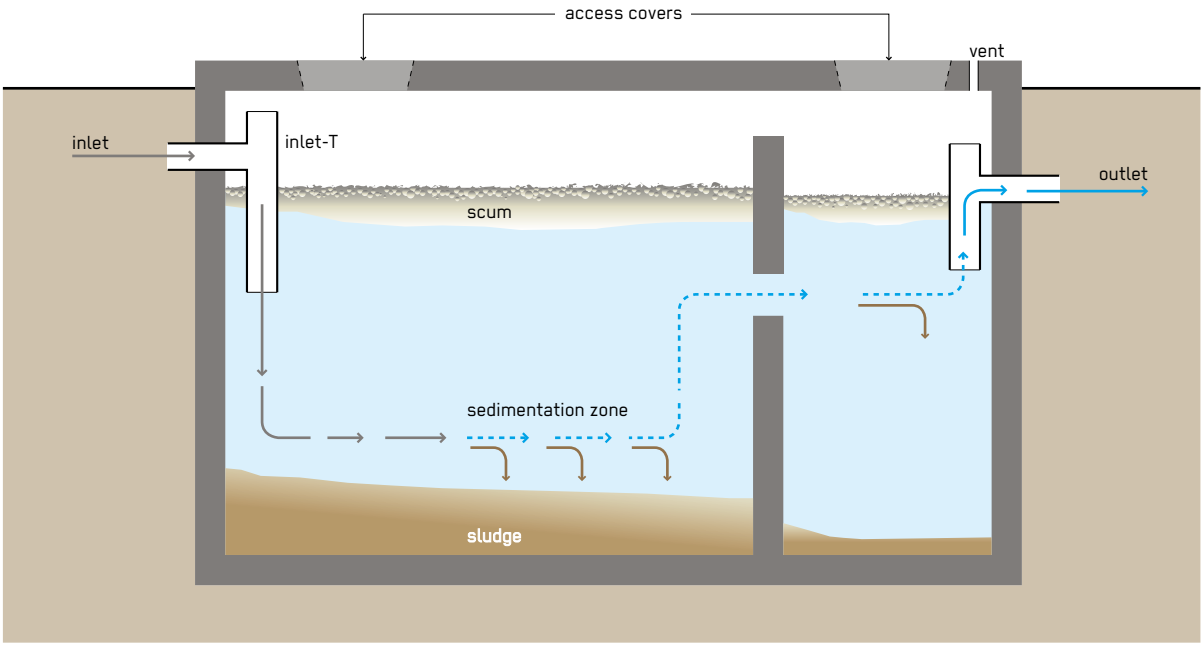
Septic Tank

Phase of Emergency	Application Level / Scale	Management Level	Objectives / Key Features
* Acute Response ** Stabilisation ** Recovery	** Household ** Neighbourhood City	** Household ** Shared ** Public	Excreta containment, Solid / liquid separation
Space Required	**Technical Complexity**	**Inputs**	**Outputs**
** Medium	* Low	● Blackwater, ● Greywater	● Effluent, ● Sludge



A Septic Tank is a watertight chamber made of concrete, fibreglass, PVC or plastic, through which blackwater and greywater flows for primary treatment, before further treatment or infiltration. Settling and anaerobic processes reduce solids and organics. The liquid effluent is commonly disposed of in a Leach Field (D.9) or Soak Pit (D.10) which provides further treatment.

Wastewater enters the first chamber of the tank, allowing solids to settle and scum (mostly oil and grease) to float to the top. Over time, solids that settle are degraded anaerobically. Generally, the removal of 50 % of solids, 30–40 % of the biochemical oxygen demand and a 10-fold reduction of E. Coli can be expected in a well-designed and maintained Septic Tank, although efficiencies vary greatly depending on operation and maintenance and climatic conditions.

Design Considerations: A Septic Tank should have at least two chambers. The first chamber needs to be at least 50 % of the total length. Most of the solids settle out in the first chamber. The baffle, or the separation between the chambers, prevents scum and solids from escaping with the effluent, as well as reduces short circuiting through the tanks. A T-shaped outlet pipe further reduces scum and solids that are discharged. Accessibility to all chambers (through access ports) is necessary for maintenance. Septic Tanks should be vented for controlled release of odorous and potentially harmful gases. The design of a septic tank depends on the expected number of users, the water used per capita, average annual temperature, desludging frequency and wastewater characteristics. The minimum recommended retention time for small tanks is 24 hours, decreasing to 12 hours in very large tanks. The volume must be large enough to avoid turbulent flow. An "aqua privy" is a variation of the Septic Tank where the storage and settling tank is located directly below the toilet so that

the excreta fall into it. The aqua privy can be smaller than a Septic Tank because no flushing water is required to transport excreta to the tank.

Materials: A Septic Tank can be made of local bricks, cement blocks or stone and thus can be constructed on site using local materials. Prefabricated tanks are available in fibreglass, PVC or plastic.

Applicability: This technology is appropriate at the household level as well as for institutions such as hospitals and schools. A Septic Tank is appropriate where the volume of wastewater produced is too large for disposal in pit latrines, and when there is sufficient water for flushing solids from the toilet to the tank. This depends on the distance between toilet and tank. If Septic Tanks are used in densely populated areas, on-site soil infiltration should not be used, because the ground may become saturated and contaminated, posing a serious health risk. Instead, Septic Tanks should be connected to a conveyance technology, through which the effluent is transported to a subsequent treatment or disposal site. Even though Septic Tanks are watertight, it is not recommended to construct them in areas with high groundwater tables or where there is frequent flooding. As the Septic Tank must be regularly desludged, a vacuum truck should be able to access the location **(C.2)**. They can be implemented in every type of climate, although the efficiency will be lower in colder climates (as anaerobic digestion occurs more efficiently at higher temperatures).

Operation and Maintenance: Desludging is required for Septic Tanks and frequency will depend on the volume of the tank relative to the input of solids, the amount of indigestible solids, and the ambient temperature, as well as usage, system characteristics and the requirements of the relevant authority. Well-functioning systems will require emptying every two to five years. Scum and sludge levels need to be monitored to ensure that the tank is functioning well. Emptying is best done by using a Motorised Emptying and Transport technology **(C.2)**, but Manual Emptying and Transport **(C.1)** can also be an option. The effluent and faecal sludge require further treatment prior to disposal. The most common cause of failure of Septic Tanks is the failure of the disposal system. Tanks connected to under-designed disposal systems will require emptying more frequently.

Health and Safety: Under normal operating conditions, users do not come in contact with the influent or effluent. Effluent, scum and sludge must be handled with care as they contain high levels of pathogens. During sludge and scum removal, workers should be equipped with personal protective equipment. Users should be careful when opening the tank because noxious and flammable gases may be released. If effluent is to infiltrate the ground, it is important to evaluate the contamination risk to groundwater, as well as the infiltration capacity of the soil.

Costs: This is a low to medium cost option, both in terms of capital and operational costs. However, additional costs for subsequent regular desludging, transport, treatment and disposal need to be taken into consideration.

Social Considerations: The Septic Tank is a very common and well-accepted technology among people who use flush toilets. Because of the delicate ecology in the system, awareness raising on eliminating the use of harsh chemicals for the users is necessary.

Strengths and Weaknesses:

⊕ Simple and robust technology
⊕ No electrical energy is required
⊕ Low operating costs and long service life
⊕ Built underground

⊖ Low reduction in pathogens, solids and organics
⊖ Regular desludging must be ensured
⊖ Effluent and sludge require further treatment and/or appropriate discharge

→ **References and further reading material for this technology can be found on page 191**