



Value Chain of On-Site Sanitation Systems

20X Flash Cards





The Urban Management Centre (UMC) is a not-for-profit organization, that works towards professionalizing urban management in India and worldwide. UMC provides technical assistance and support to city governments and facilitates change through peer-to-peer learning processes. It enhances the capacity of city governments by providing expertise and ready access to innovations on good governance implemented in India and abroad. UMC extensively works in the areas of urban water and sanitation, heritage management, planning, urban health, municipal finance, urban management, urban transportation and institutional restructuring. UMC is a legacy organization of International City/County Management Association (ICMA) and hence is also known as ICMA-South Asia since 1997. For more information, visit our website: www.umcasia.org



PAS, a seven-year action research project, has been initiated by CEPT University with funding from the Bill and Melinda Gates Foundation. PAS aims to develop better information on water and sanitation performance at the local level to be used to improve the financial viability, quality and reliability of services. It uses performance indicators and benchmarks on water and sanitation services in all the 400 plus cities in Gujarat and Maharashtra. Urban Management Centre (UMC) and the All India Institute of Local Self Government (AIILSG) are CEPT University's project partners in Gujarat and Maharashtra, respectively. More details are available on: www.pas.org.in.

Acknowledgements

The graphics and technology descriptions used in the flashcards are sourced from The Online Compendium of *Sanitation Systems* and Technologies developed by the Eawag (Swiss Federal Institute of Aquatic Science and Technology).

We would like to thank Chief Officers and staff from municipalities in Gujarat for sharing data on existing fecal sludge management practices in their cities . UMC is also happy to have received financial and technical support from CEPT University under the Performance Assessment System (PAS) program. Special thanks to Dr. Meera Mehta, Dr. Dinesh Mehta and PAS team at CEPT University for their advice and support for developing these flash cards and allied publications.

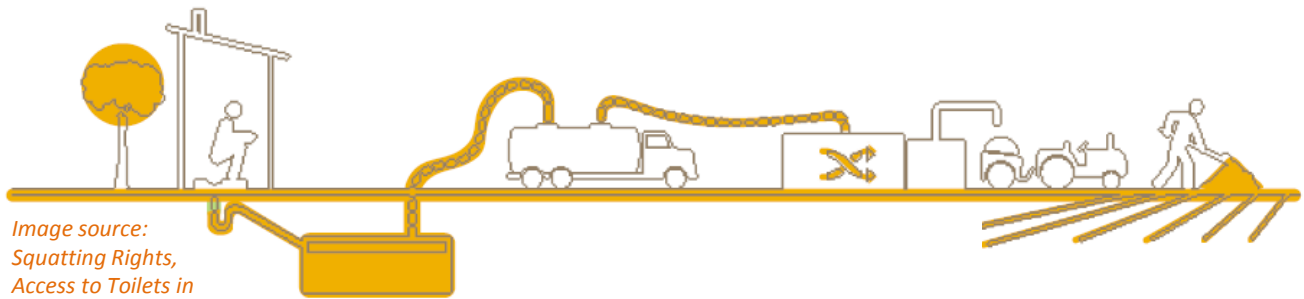
Lastly, we would like to appreciate the effort by the team working at UMC on PAS project for both on-site and off-site activities related to this study.

105 cities out of 167 cities in Gujarat do not have an underground drainage system and are dependent on on-site sanitation solutions. However most ULBs do not have any reliable data on the different types of waste-water collection, treatment and disposal systems prevalent in their cities. It is observed that officials of urban local bodies (ULB) as well as households are rarely aware of the difference between pit systems (for collection), septic tanks (for collection and primary treatment) and soakpits (for disposal) and their appropriate use and acceptability. The emptying and conveyance procedures in many cities are rudimentary and unsafe. Disposal and reuse of waste water is also often unregulated.

These flash cards illustrate the existing and available technology options and processes across the entire value chain of on-site sanitation in Gujarat (for pour-flush user interface). The flash cards will be used as visual aids in the field to identify and evaluate existing systems and processes. These cards can also be used as tools to foster discussion with ULB officers on septage management in cities.

Graphics and description for various technologies adapted from the Compendium of Sanitation Systems and Technologies

Eawag (2014): eCompendium – The Online Compendium of *Sanitation Systems* and Technologies.
Dübendorf: Swiss Federal Institute of Aquatic Science and Technologies (Eawag). Available at: www.eCompendium.sswm.info






*Image source:
Squatting Rights,
Access to Toilets in
India, Dasra*

The flashcards are organized according to the following steps in the value chain:

- C** Collection and storage/ treatment (local)
- Co** Conveyance mechanism
- T** (Semi) Centralized treatment
- D** Disposal or use

The set of 20 flash cards present collection, conveyance, treatment and disposal options for outputs from a pour flush user interface.

The cards are color-coded as follows based on the level of acceptability and conformation to safe sanitation practices.

-  Systems and processes that are prohibited by law
-  Systems and practices that are unsafe and need to be improved/ phased out
-  Acceptable and safe systems and practices



C

Collection systems

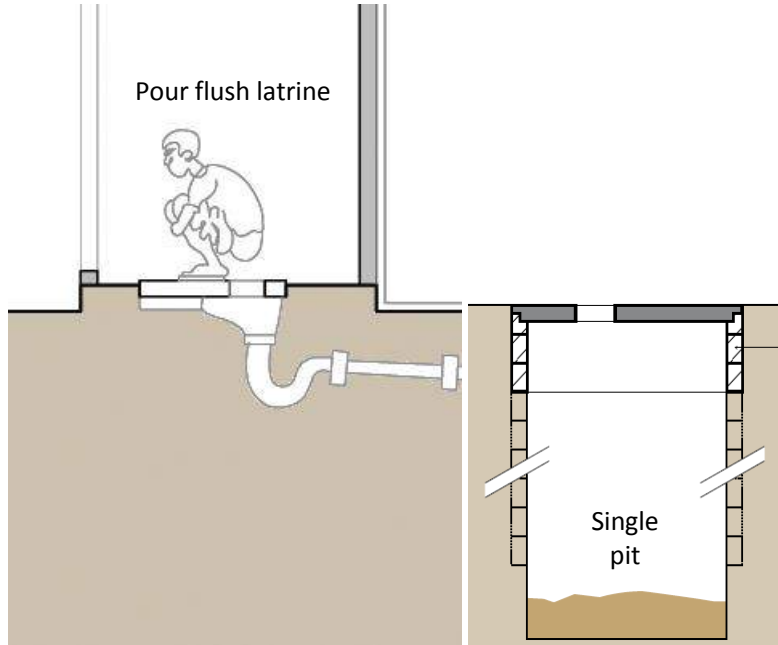
describe the ways of collecting, storing, and treating (to some extent) the black water generated by the pour flush latrine on site.

The level of treatment provided is usually passive. Over time, the solids that settle to the bottom are degraded anaerobically. However the treated by-products often require subsequent treatment before use and/or Disposal.

C 1

Pour flush latrine connected to single pit

સીંગલપિટ (ખાળકૂવા) સાથે જોડાયેલું પોર ફ્લશ લેટ્રીન



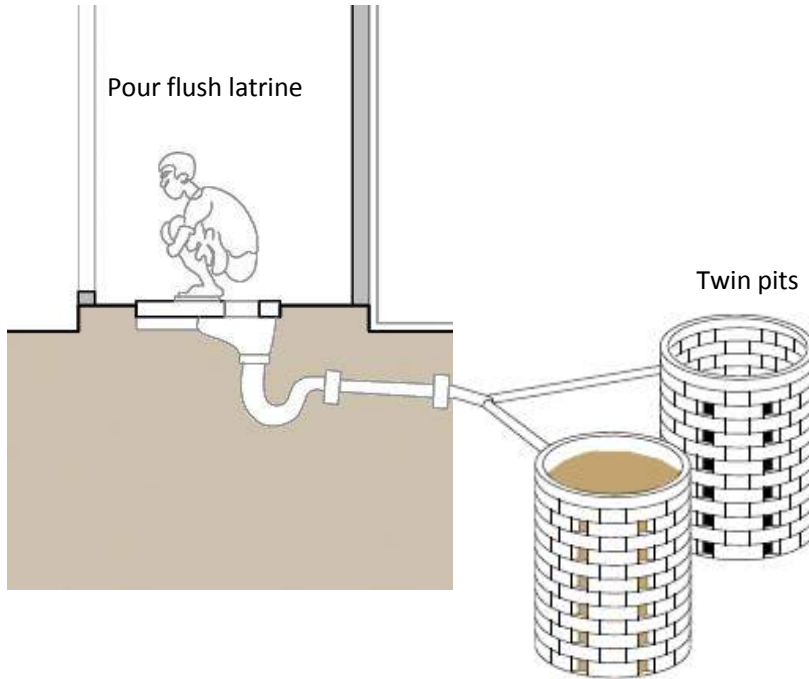
The collection system is widely prevalent and uses a single pit technology to collect and store excreta. Pits could be lined or left un-lined. The bottom of the pit is unlined to allow for the infiltration of liquids out of the pit into the soil. Depending on how deep they are, some pits may last 20 or more years without emptying.

Single pit technology is appropriate for rural and peri-urban areas. In dense areas they are difficult to empty and/or have insufficient space for infiltration, hence pose health and environmental risks.

C 2

Pour flush latrine connected to twin pits

ટૂવિનપિટ સાથે જોડાયેલું પોર ફ્લશ લેટ્રીન

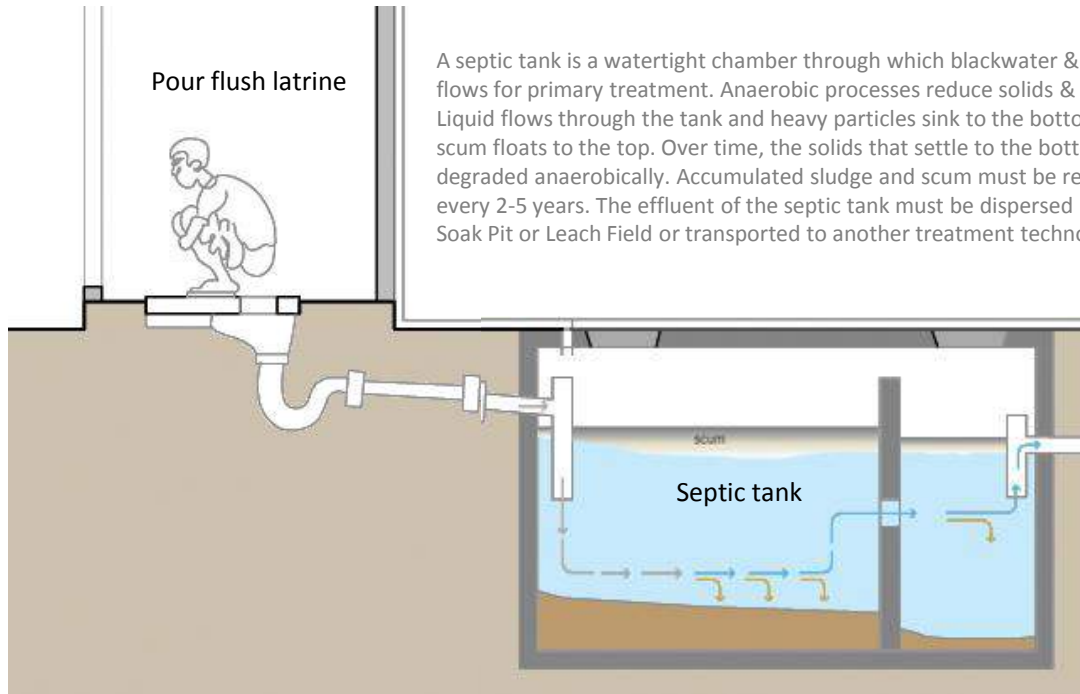


This technology consists of two alternating pits connected to a Pour Flush Toilet. The blackwater and greywater is collected in the pits and allowed to slowly infiltrate into the surrounding soil. Only one of the two pits is used at any time. The pits should be of a size to accommodate a volume of waste generated over one or two years. Then the second pit is used. This allows the contents of the full pit enough time to transform into Pit Humus (a partially sanitized soil-like material) that can be manually excavated.

C 3

Pour flush latrine connected to septic tank

સેપ્ટિક ટેંક સાથે જોડાયેલું પોર ફ્લશ લેટ્રીન

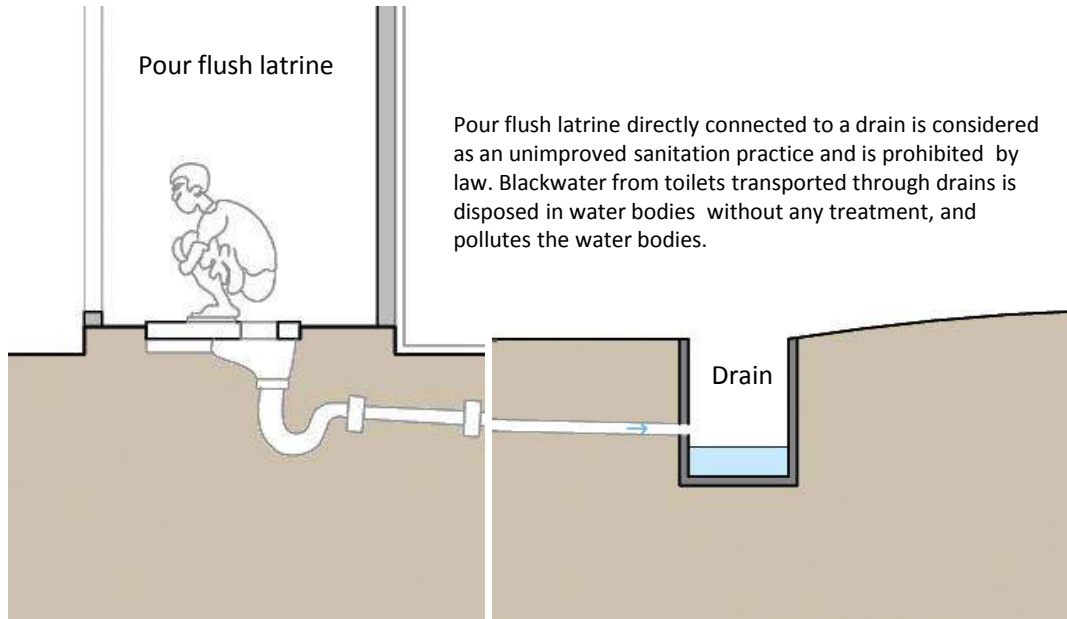


A septic tank is a watertight chamber through which blackwater & greywater flows for primary treatment. Anaerobic processes reduce solids & organics. Liquid flows through the tank and heavy particles sink to the bottom, while scum floats to the top. Over time, the solids that settle to the bottom are degraded anaerobically. Accumulated sludge and scum must be removed every 2-5 years. The effluent of the septic tank must be dispersed by using a Soak Pit or Leach Field or transported to another treatment technology.



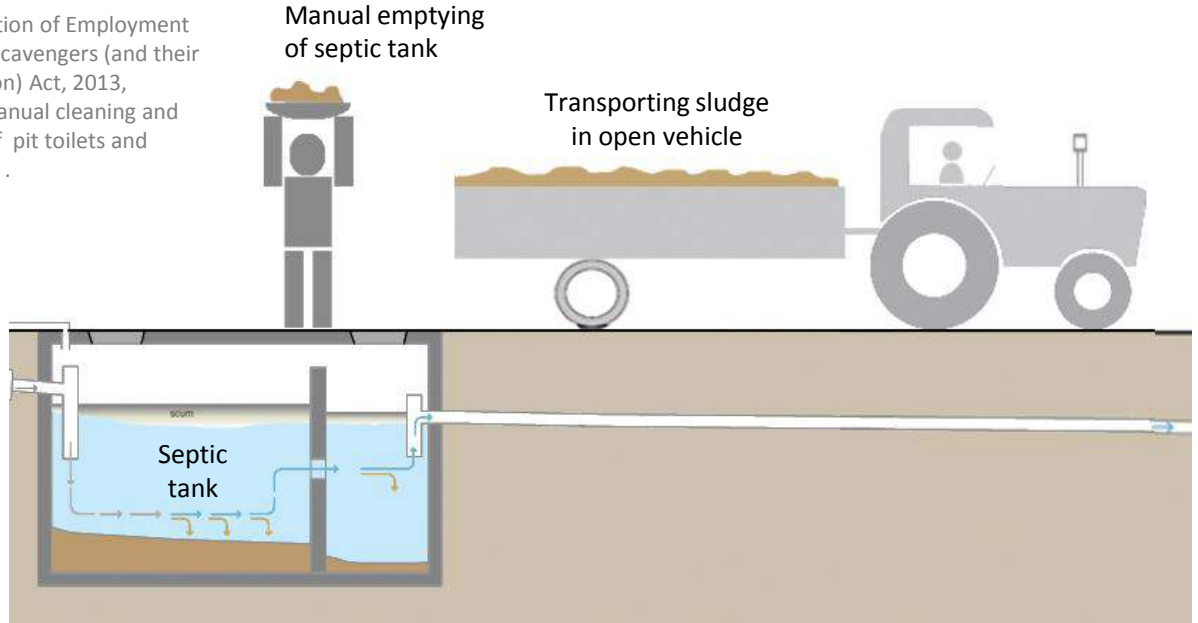
Co

Conveyance systems (Co) describe the technologies used to transport the products from the user interface or collection system to a (Semi-) centralized treatment facility.



સેપ્ટિક ટેંકમાંનું મેલું માથે ઉપાડી લઈ જવું

The Prohibition of Employment as Manual Scavengers (and their rehabilitation) Act, 2013, prohibits manual cleaning and emptying of pit toilets and septic tanks .

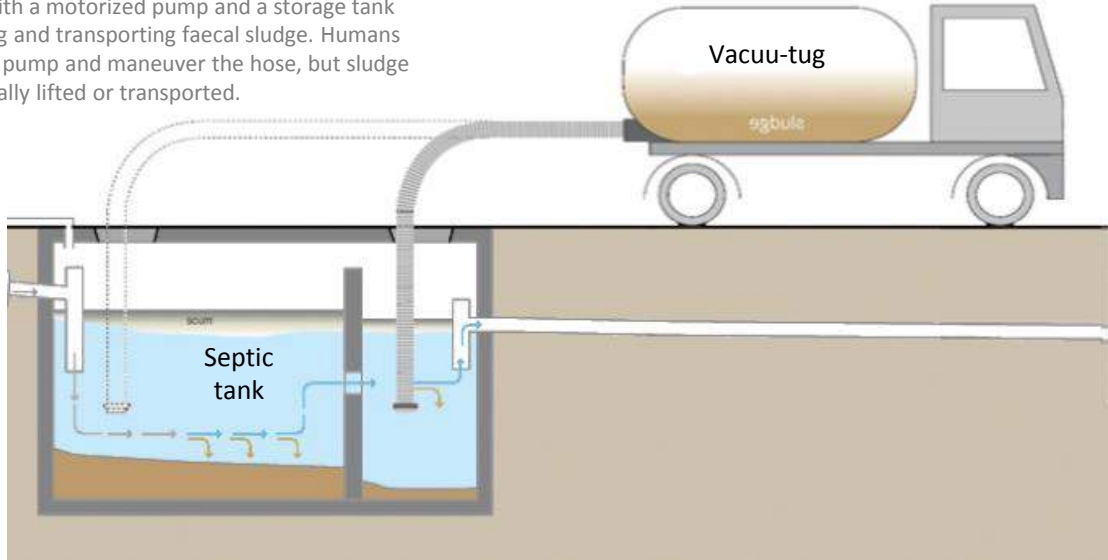


CO 3

Motorized emptying & transport of sludge

મળ વાળું ગંદુ પાણી મશીન દ્વારા ખાલી કરીને લઈ જવામાં આવે

Motorized emptying and transport refers to a vehicle equipped with a motorized pump and a storage tank for emptying and transporting faecal sludge. Humans operate the pump and maneuver the hose, but sludge is not manually lifted or transported.

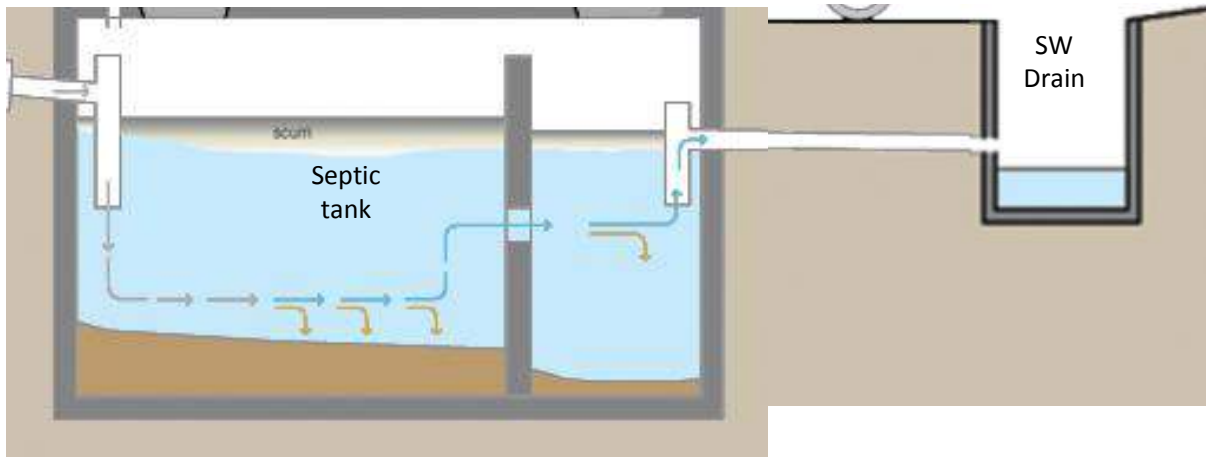


CO 4

Effluent discharged in SW drain

સેપ્ટિક ટેકના એફ્લ્યુએન્ટનો વરસાદી પાણીની ગટરમાં નિકાલ કરવો

Although recommended only as an interim measure, the effluent can be discharged into the stormwater drainage network for disposal. This should only be considered if the quality of the effluent is high and if there is no capacity for onsite infiltration or transportation offsite.

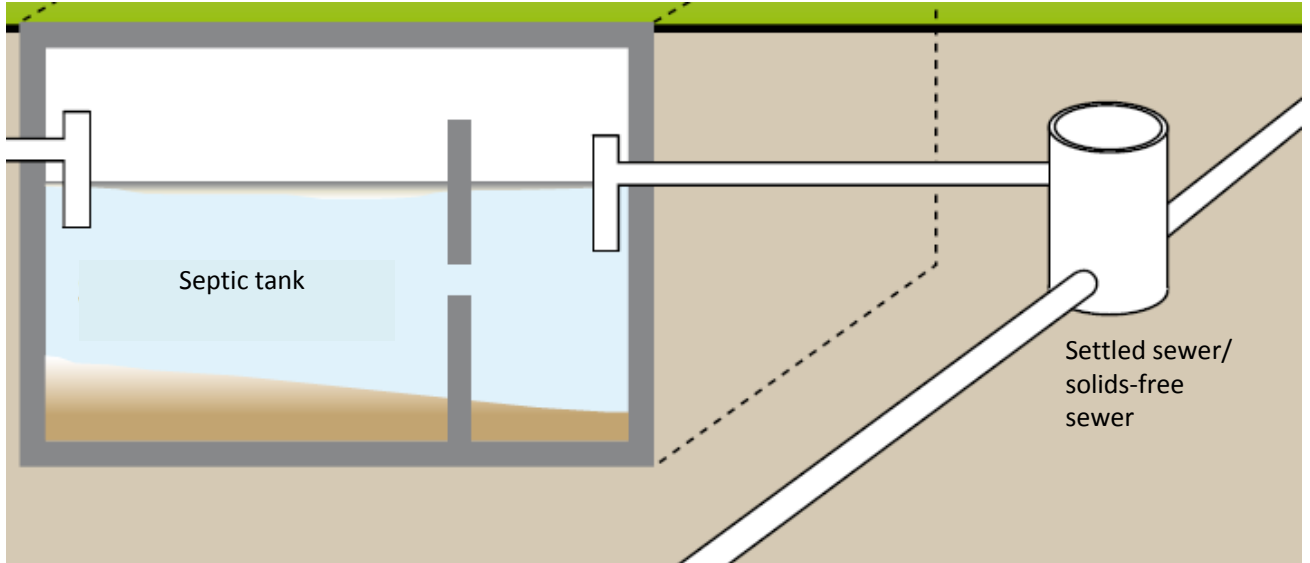


CO 5

Septic tank connected to settled sewer

સેપ્ટિક ટેકના એફ્લુએન્ટનું સેટલ્ડ સીવર દ્વારા વહન થાય છે

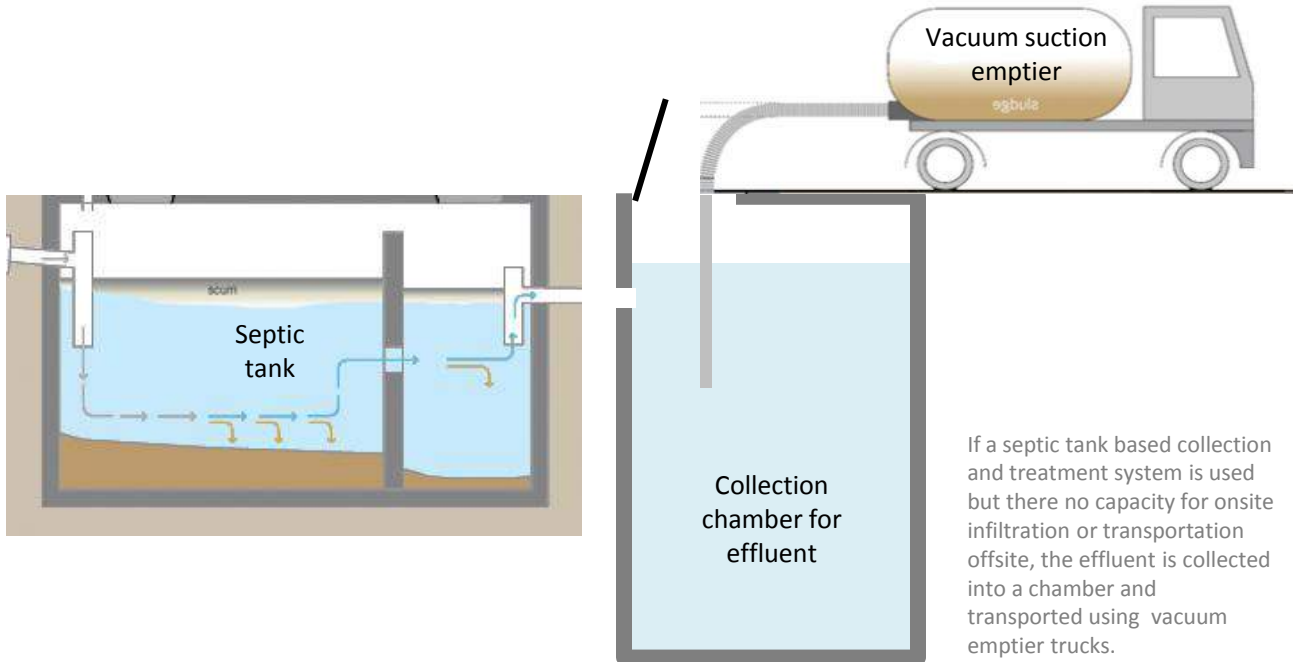
A settled /solids-free sewer is a network of small-diameter pipes that transports pre-treated and solids-free wastewater (such as septic tank effluent). It can be installed at a shallow depth and does not require a minimum wastewater flow or slope to function.



CO 6

Effluent discharged in chamber, emptied

સેપ્ટિક ટેકના એફ્લ્યુએન્ટનો ચેમ્બરમાં નિકાલ કરવો

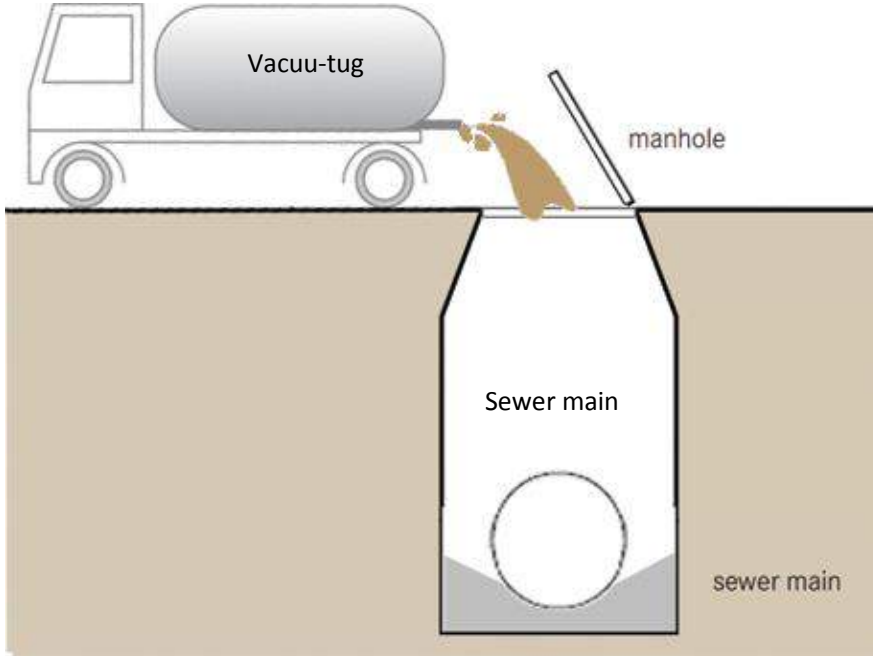


If a septic tank based collection and treatment system is used but there no capacity for onsite infiltration or transportation offsite, the effluent is collected into a chamber and transported using vacuum emptier trucks.

CO 7

Sludge and effluent emptied in main sewer line

સ્લજ, એફ્લ્યુએન્ટને મુખ્ય ભૂગર્ભ ગટર લાઈનમાં ખાલી કરવું



In cities that have an underground drainage system, sludge and effluent collected using vacuum emptiers is emptied into the sewer lines. The sludge and effluent is treated together with the sewage at STP.



T

(Semi-) Centralized Treatment

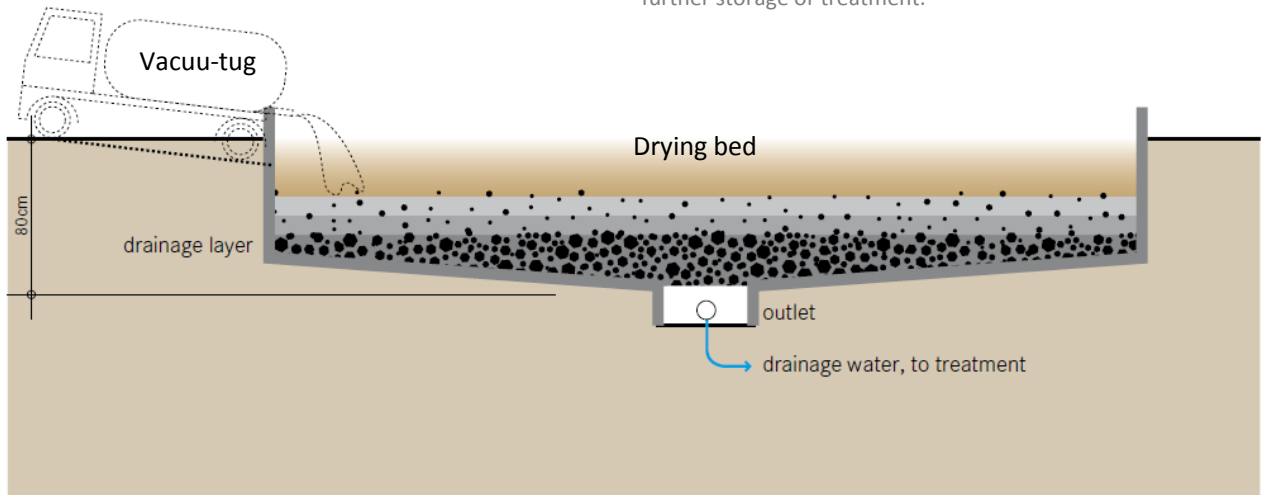
refers to treatment technologies appropriate for large user groups (neighbourhood to city level applications). The treatment technologies can be divided into 2 groups: primary treatment for blackwater, brownwater, greywater or effluent, and treatment for Sludge.

T 1

Sludge treated using drying beds

સ્લજને ડ્રાઈંગબેડ થકી ટ્રીટ કરવું

A sludge drying bed is a simple, permeable bed that, when loaded with sludge, collects percolated leachate and allows the sludge to dry by evaporation. Approximately 50% to 80% of the sludge volume drains off as liquid or evaporates. The dried sludge is stabilized and pathogenic content is decreased using further storage or treatment.

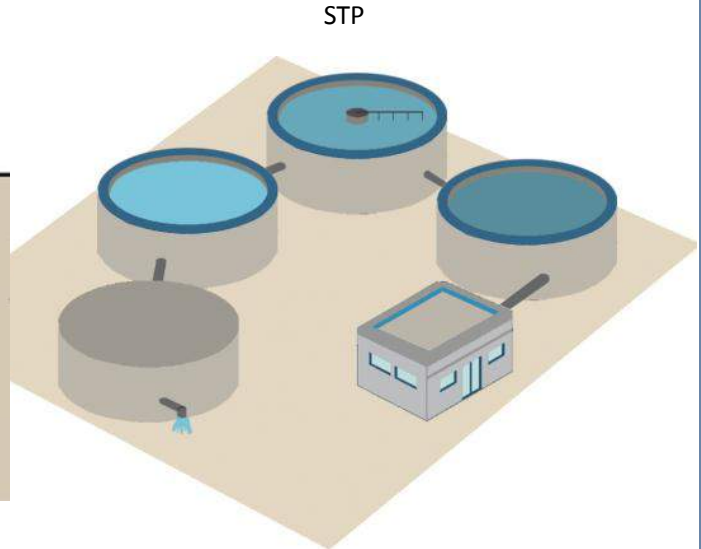
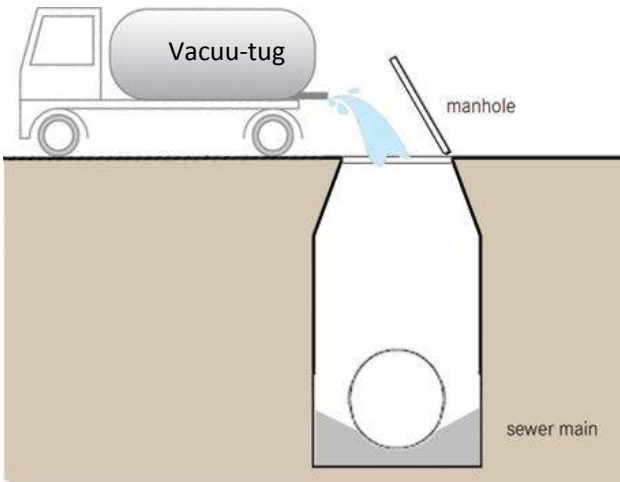


T 2

Sludge & effluent emptied in sewer, treated at STP

સ્લજ, એફ્લુયેન્ટને ગટરમાં ખાલી કરવું, STP માં ટ્રીટ કરવું

A sewage treatment plant can employ various technologies for the treatment of blackwater, brownwater, greywater or effluent to remove organics and pathogens. The effluent from STP can be safely disposed in water bodies.





D

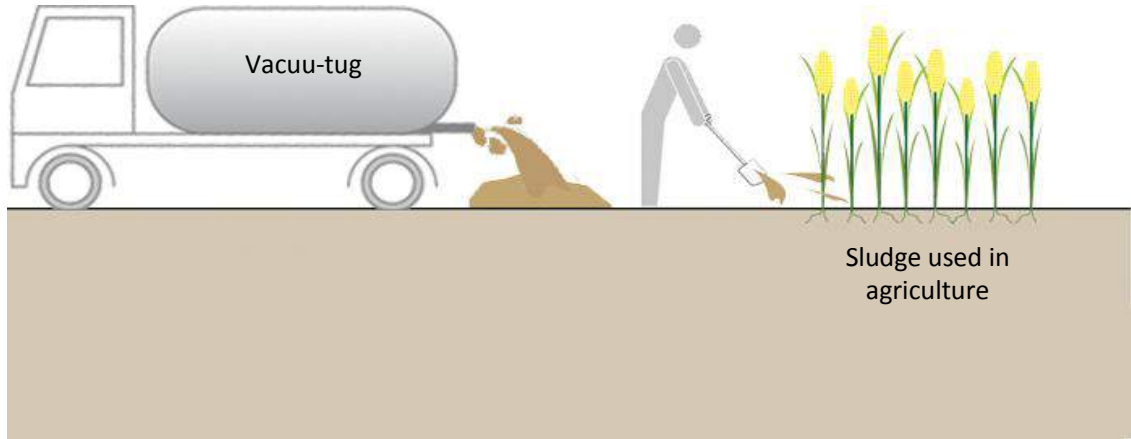
Reuse and/or Disposal

refers to the methods by which products are ultimately returned to the environment either as useful resources or reduced-risk materials.

D 1

Untreated sludge emptied used as manure in farms

સ્લજને ખેતરમાં ખાલી કરવું અને ખાતર તરીકે વાપરવું

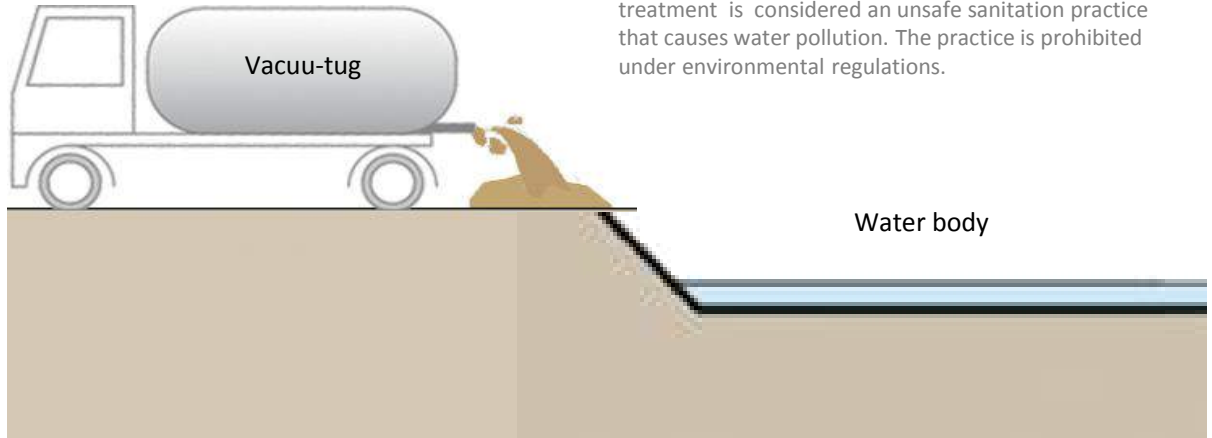


Faecal sludge from pit latrines and septic tanks generally does not contain any chemical inputs and is, therefore, not a high risk source of contamination. Sludge removed from septic tanks and pits is often used in agriculture after drying. However the practice should be regulated and the sludge should be appropriately tested for safety before use.

D 2

Sludge emptied in water bodies

સ્લજનો જળાશયમાં નિકાલ કરવો

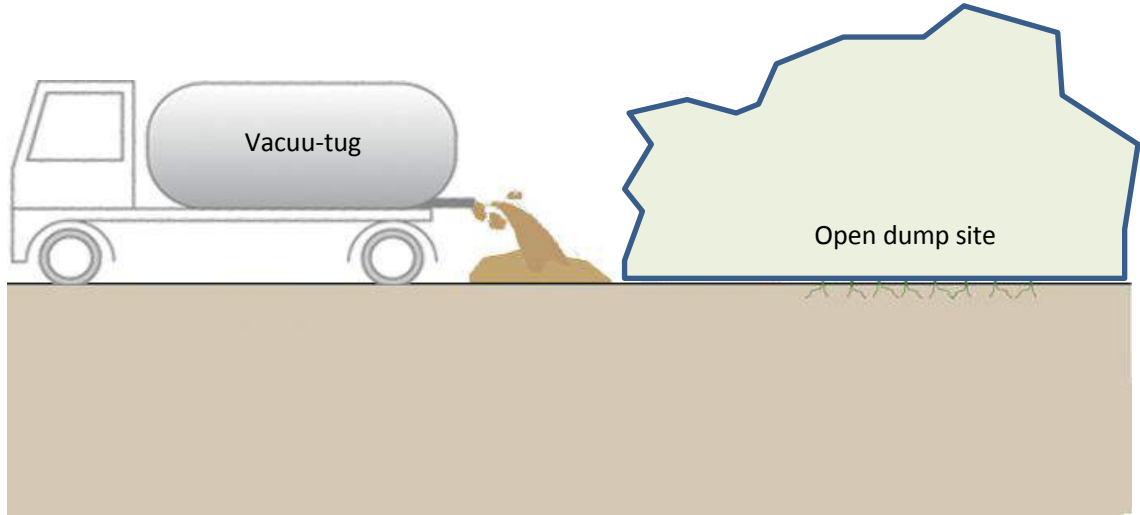


Emptying of fecal sludge into water bodies without any treatment is considered an unsafe sanitation practice that causes water pollution. The practice is prohibited under environmental regulations.

D 3

Sludge emptied at dump site

સ્લજને ડમ્પ સાઈટ પર ખાલી કરવું

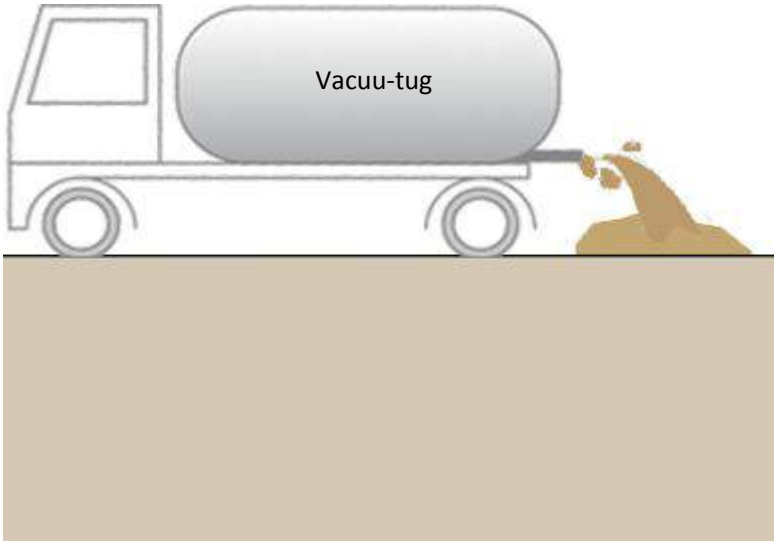


Emptying of faecal sludge onto open dump sites without any treatment is considered an unsafe sanitation practice that poses a risk of ground water contamination.

D 4

Sludge emptied at vacant plots

સ્લજને ખુલ્લી જગ્યામાં ખાલી કરવું



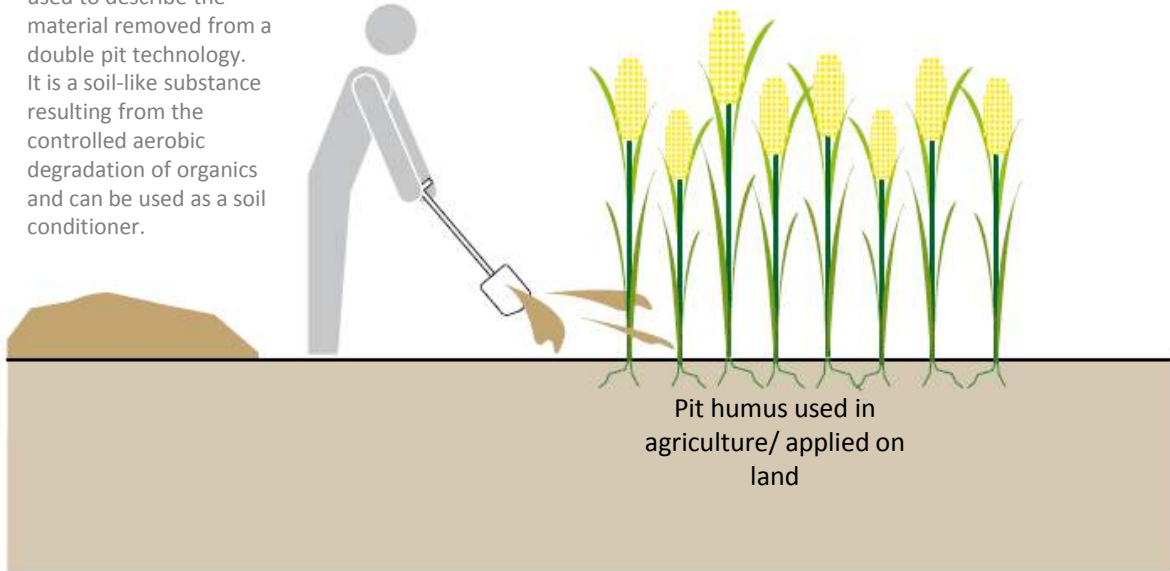
Emptying of faecal sludge onto vacant plots without any treatment is considered an unsafe sanitation practice that poses a risk of soil and ground water contamination.

D 5

Pit humus from twinpits used as manure

ટ્વીન પિટ્સ માંથી પિટ હુમસ ખાતર તરીકે વપરાય છે

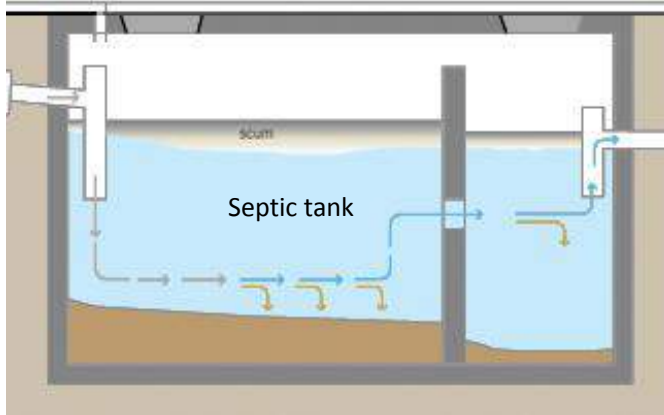
Pit humus is the term used to describe the material removed from a double pit technology. It is a soil-like substance resulting from the controlled aerobic degradation of organics and can be used as a soil conditioner.



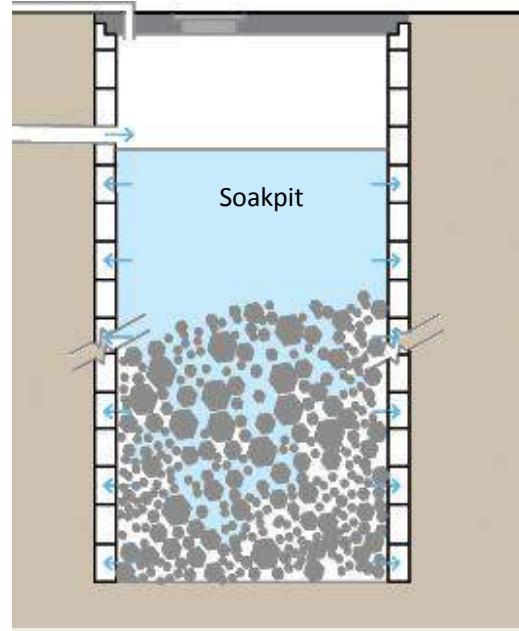
Effluent treated & disposed through soakpit

D 6

એફલ્યુએન્ટ શોષખાડા દ્વારા જમીનમાં શોષાય છે



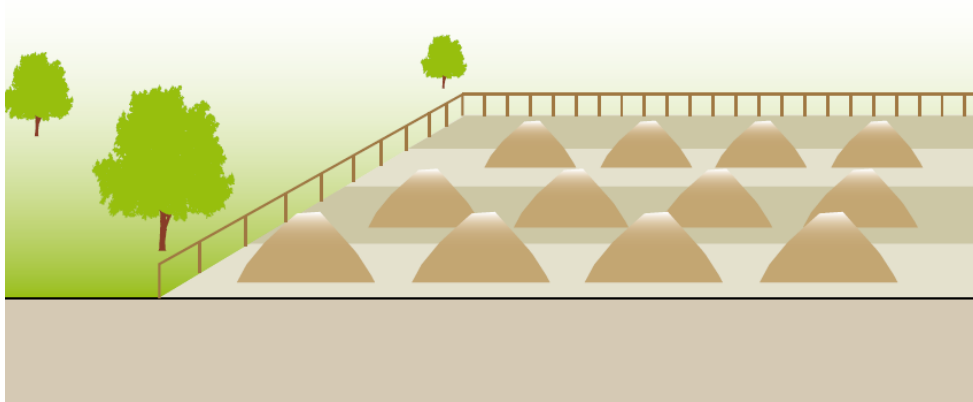
A soak pit, also known as a soakaway or leach pit, is a covered, porous-walled chamber that allows water to slowly soak into the ground. Pre-settled effluent from the septic tank is discharged to the underground chamber from which it infiltrates into the surrounding soil.



D7

Storage or surface disposal of treated sludge

પ્રોસેસ્ડ થયેલ સ્લજને જમીન ઉપર નાખવું

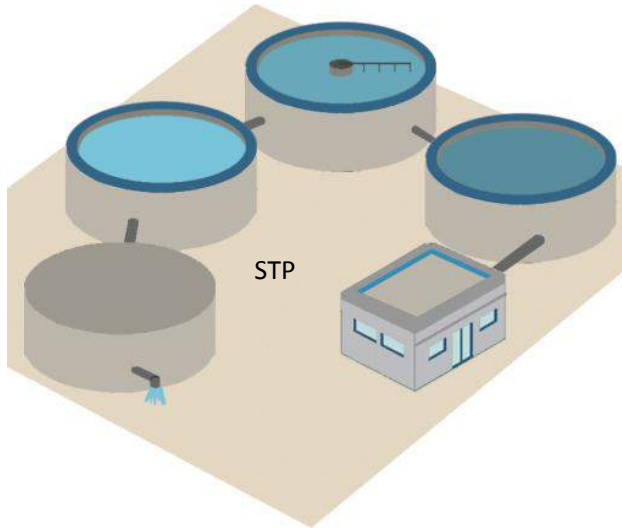


Surface disposal refers to the stockpiling of sludge that cannot be used elsewhere. Once the material has been taken to a surface disposal site, it is not used later. Storage refers to temporary stockpiling.

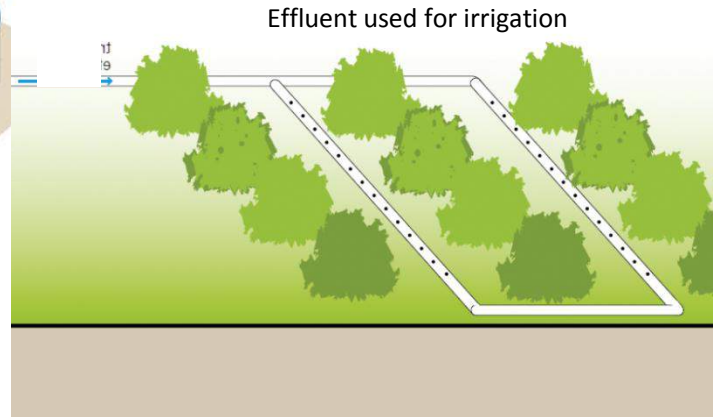
D8

Treated effluent used for irrigation

ગંદા પાણીને STP માંથી પ્રોસેસ કરી સિંચાઈમાં વાપરવું



To reduce dependence on freshwater, wastewater of varying quality can be used in agriculture. However, only water that has had secondary treatment (i.e., physical and biological treatment) should be used to limit the risk of crop contamination and health risks to workers.

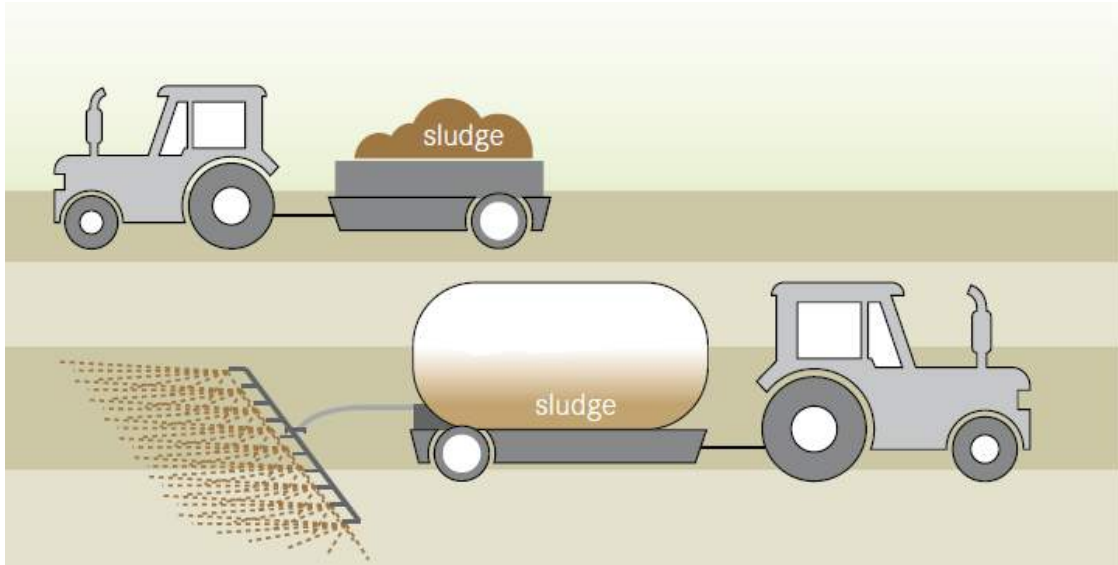


D 9

Treated sludge used in agriculture

પ્રોસેસ થયેલ સ્લજને ખાતર તરીકે વાપરવું

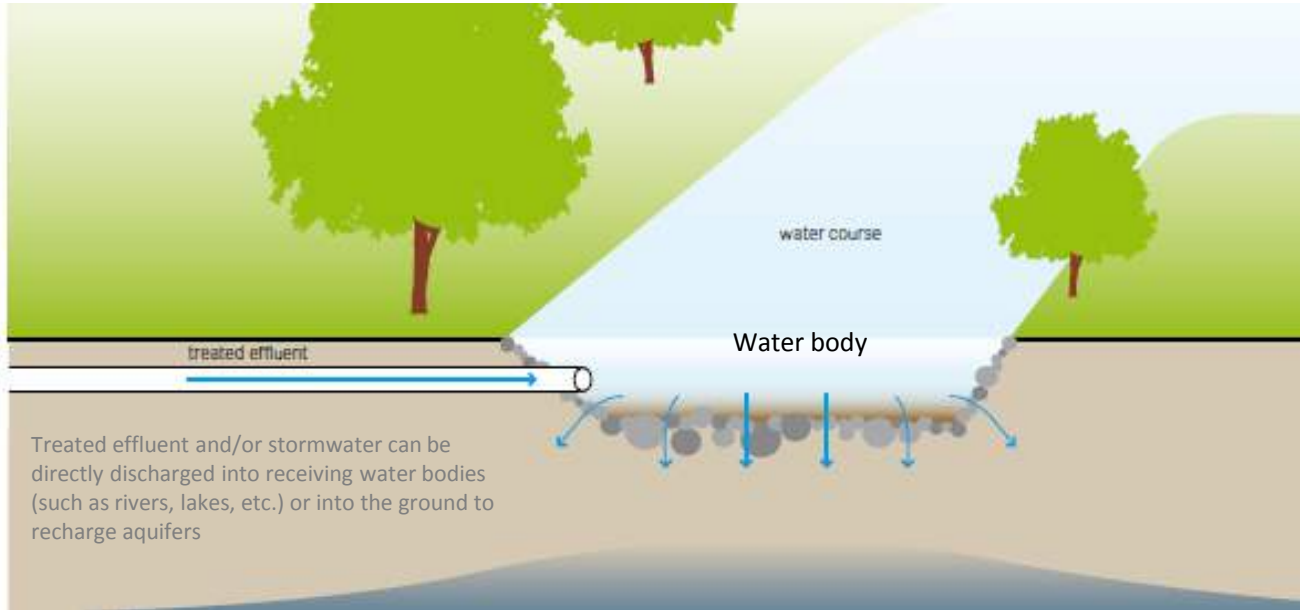
Depending on the treatment type and quality, digested or stabilized sludge can be applied to public or private lands for landscaping or agriculture.



D 10

Treated effluent disposed in water body

STP માંથી શુદ્ધ થયેલ ગંદા પાણીનો જળાશયમાં નિકાલ કરવો



**Value Chain of
On-Site Sanitation Systems**
20X Flash Cards



Urban Management Centre
c/o 3rd Floor, AUDA building, Usmanpura
Ahmedabad, Gujarat, India
Telefax: 91 79 27546403/ 5303
Email: info@umcasia.org
www.umcasia.org