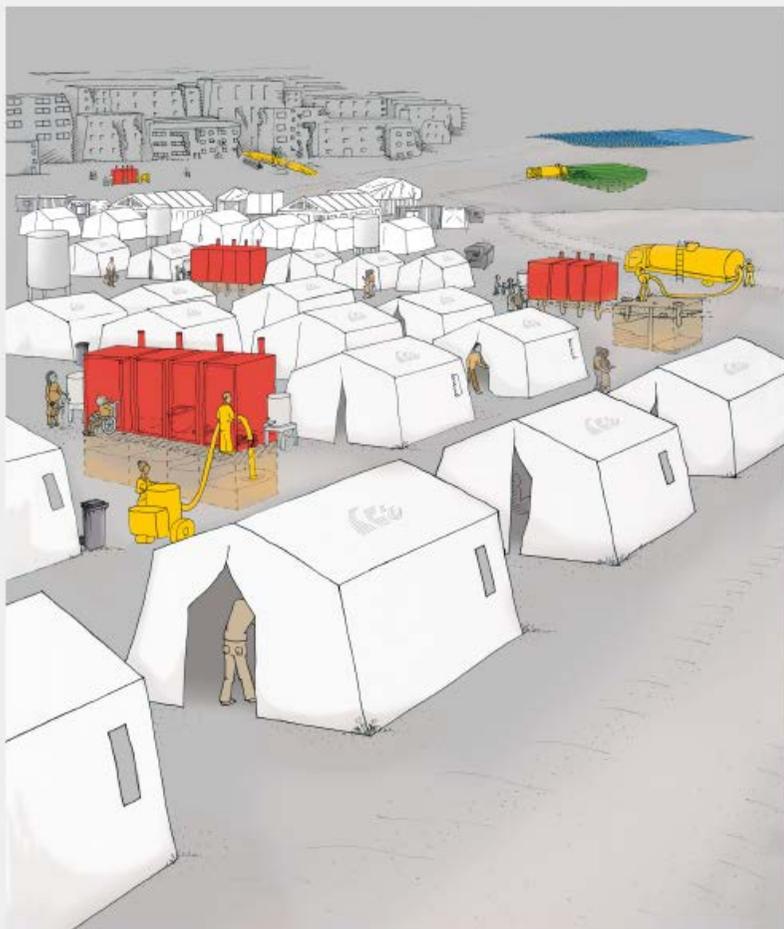


# Compendium of Sanitation Technologies in Emergencies

1<sup>st</sup> Edition



## Compendium of Sanitation Technologies in Emergencies – How to best use this tool

This overview document is intended to serve as quick introduction into the structure, logic and application of the Compendium of Sanitation Technologies in Emergencies.

The first part of the publication is an introduction presenting the structure of the book, how to use it, a general overview of all technologies and three overviews of technology appropriateness for different contexts.

The second part of the publication contains the technology factsheet themselves, a comprehensive compilation of relevant sanitation options for different emergency settings. The technologies are categorised and ordered according to the five functional groups which form the sanitation chain, from the toilet to end-use or final disposal. The functional groups are:

- U** User Interface
- S** Collection and Storage
- C** Conveyance
- T** Treatment
- D** Use/Disposal

The publication provides 61 “Technology Information Sheets”, i.e. 2-page summaries for each technology.

The third part of the publication covers cross cutting topics. This section should assist in choosing an appropriate sanitation technology for a given context, which depends upon a variety of factors other than technology aspects. Only if these factors, challenging conditions and different phases of an emergency are considered, a feasible and appropriate sanitation solution will successfully be chosen and implemented.

## Structure of the Compendium

The structure of the Compendium of Sanitation Technologies in Emergencies follows the logic of the five functional groups and subsequently treats crucial cross-cutting issues.



### User Interface

This section describes the technologies with which the user interacts, i.e. the type of toilet, pedestal, pan, or urinal. There are dry and water-based technologies.



### Collection and Storage/Treatment

This section describes on-site technologies that collect and store urine, excreta, greywater and blackwater generated at the user interface. Some of these technologies provide a preliminary and often a passive treatment.



### Conveyance

This section describes technologies, which can be used to convey products to (semi-) centralised treatment or use and/or disposal technologies. The conveyance technologies are either sewer-based, container-based, motorised or human-powered.



### (Semi-) Centralised Treatment

This section describes wastewater and faecal sludge treatment technologies generally appropriate for large user groups on a (semi-) centralized level



### Use and/or Disposal

This section presents the different technologies and methods, which can be used for products after storage, transport and treatment to ultimately return them to the environment, either as useful resources or reduced-risk materials.



### Cross-Cutting Issues

This section concisely introduces the most relevant cross-cutting issues for WASH projects and programmes from Assessment of the Initial Situation, Solid Waste Management to Inclusive and Equitable Design and much more.



## Sanitation System

A sanitation system is a multi-step process in which sanitation products such as human urine and faeces are managed from the point of generation to the point of reuse or disposal. It is a context-specific combination of technologies and services for the management of these sanitation products, i.e. for their collection, containment, transport, treatment, transformation, use or disposal. A sanitation system also includes the management and operation and maintenance required to ensure that the system functions safely and sustainably.

## Sanitation Technology

Sanitation technologies are defined as the specific infrastructure, methods, or services designed to collect, contain, transform and treat products, or to transport products to another functional group.

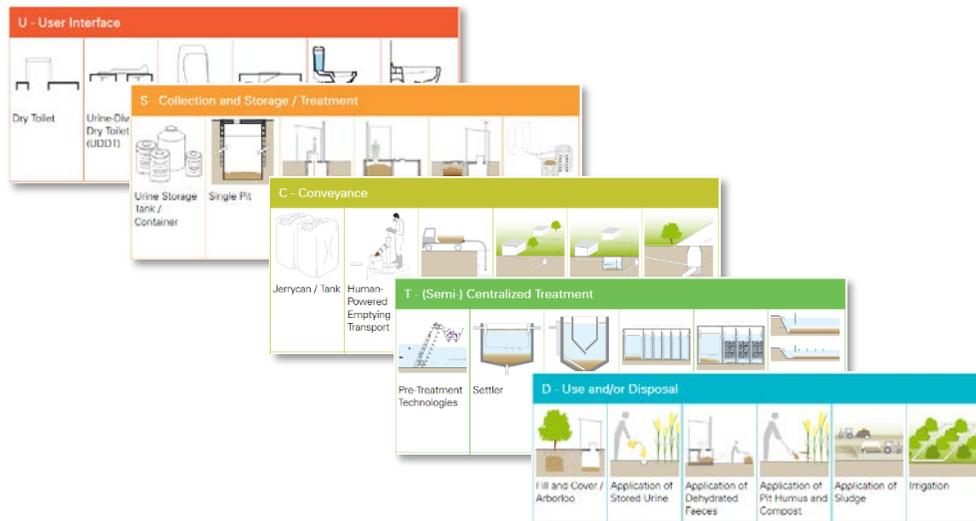
The technologies are categorised and ordered according to the functional group to which they belong and which are forming the sanitation chain from production of sanitation products to end-use or disposal.

Each of the 61 technologies included in this compendium is described on a 2-page technology information sheet in the technology compilation section. Sanitation technologies that have been sufficiently proven and tested are included, with a few notable exceptions of emerging technologies, which are clearly marked as such. The compendium is primarily concerned with systems and technologies directly related to managing human excreta.

## Sanitation Product

Sanitation products can be materials that are generated directly by humans (e.g. urine, faeces and greywater from bathing, cooking and cleaning), that are required for the technologies to function (e.g. flushwater to flush excreta through sewers) or are generated as a function of storage or treatment (e.g. sludge).

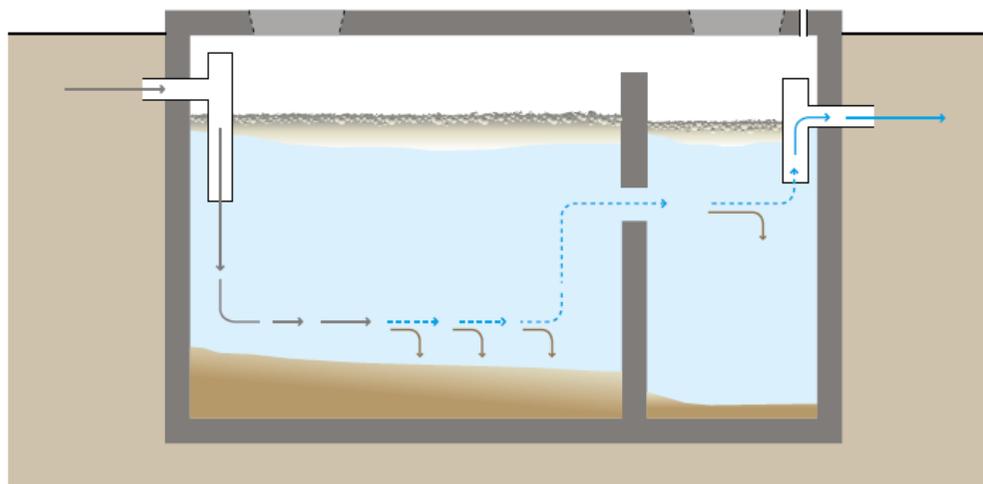
For the design of a robust sanitation system, it is necessary to identify all of the products that are flowing into (inputs) and out of (outputs) each of the sanitation technologies of the system.



Primary (Input) Products	Secondary (Output) Products
Urine	Stored Urine
Faeces	Dried Faeces
Excreta	Compost
Dry Cleansing Materials	Pit Humus
Anal Cleansing Water	Sludge
Flushwater	Effluent
Blackwater	Biogas
Greywater	Biomass
Organics	Pre-Treatment Products
Stormwater	
Menstrual Hygiene Products	

## Name of the Technology

<b>Phase of Emergency</b> ① * Acute Response ** Stabilisation ** Recovery	<b>Application Level / Scale</b> ② ** Household ** Neighbourhood City	<b>Management Level</b> ③ ** Household ** Shared ** Public	<b>Objectives / Key Features</b> ④ Excreta containment, Solid/liquid separation
<b>Space Required</b> ⑤ ** Medium	<b>Technical Complexity</b> ⑥ * Low	<b>Inputs</b> ⑦ ● Blackwater, ● Greywater	<b>Outputs</b> ⑦ ● Effluent, ● Sludge



Technology Description	⑫ Health and Safety
⑧ Design Considerations	⑬ Costs
⑨ Materials	⑭ Social Considerations
⑩ Applicability	⑮ Strengths and Weaknesses
⑪ Operation and Maintenance	⑯ References and Further Readings

## Technology Factsheets & Key Decision Criteria

Selecting the most appropriate set of sanitation technologies for a specific context is a challenging task and requires considerable experience. The key decision criteria aim to give the compendium user general guidance in the technology selection process and in the overall design of a sanitation system. The decision criteria are featured in each of the technology information sheets.

The top row of each factsheet characterises each technology according to

- (1) its suitability regarding the phase of emergency,
- (2) its application level,
- (3) by whom it can be managed,
- (4) what the objectives and key features of the technology are,
- (5) how much space it requires,
- (6) how much technical complexity it entails, and
- (7) what the input products and
- (8) the output products produced by this functional group are.

This is followed by a graphic illustration of the technology itself labelling particular technical features. Finally, the technology and its features is described regarding

- (8) its design considerations,
- (9) its materials,
- (10) its applicability,
- (11) considerations in terms of operation and maintenance,
- (12) and health and safety,
- (13) cost estimations,
- (14) considerations to foster social acceptance,
- (15) general strengths and weaknesses of the technology, as well as references and further reading.

## Technology Overview Templates

A sanitation system can be visualised as a matrix of functional groups (columns) and products (rows) that are linked together where potential combinations exist. Such a graphical presentation gives an overview of the technology components of a system and of all the products that it manages.

In order to allow for a first approximation and a quick assessment of which technologies are suitable for a specific context, the Compendium of Sanitation Technologies in Emergencies provides overviews of technology for different contexts.

### General Technology Overview (including Cross-Cutting Issues)

This template (page 22) gives a general technology overview according to the Compendium of Sanitation Technologies in Emergencies' logic, i.e. shows the flow and characteristic change of input/output products that travel through different functional groups, which contain technologies. Additionally, it contains a list of cross-cutting issues split into the three sub-categories "Initial Situation", "Conceptual Aspects" and "Design & Social Consideration" and lists composing factors for each that need to be considered.

### Sanitation Technologies in Different Emergency Phases

This overview (page 23) indicates which technologies are suitable for the acute response phase (first days and weeks) and which technologies are more suited for longer term stabilisation and recovery interventions. There may be additional technologies applicable in acute scenarios depending on already existing infrastructure that can be rehabilitated fast.

### Sanitation Technologies for Challenging Ground Conditions

This overview (page 24) indicates which technologies are suitable for areas with challenging ground conditions (e.g. rocky soils, areas with high groundwater table, soils with low infiltration capacity, flood prone areas) where underground digging may be difficult. It should be noted that these are just indications and not absolute requirements (e.g. underground treatment facilities in rocky undergrounds may still be realised with heavy blasting).

### Water-Based and Dry Sanitation Technologies

This overview (page 25) indicates which technologies are suitable for sanitation systems with flush-water as an input product and which are suitable for dry sanitation systems. There are some technologies that can be used both for flush-based and dry sanitation systems (e.g. sludge treatment technologies like Unplanted Drying Beds are indicated to be suitable for both systems, as also wet systems will produce faecal sludge).