



## Module 1: Introduction to Governance & Sanitation

### Lesson 6: Sustainable Sanitation

#### 6.0 Lesson Overview

»Notre urine vaut de l'or«

(“Our urine is worth gold”,  
Title of a film on ecosanitation in Burkina Faso)

**Conventional wastewater systems have limitations!**

#### Centralized water-borne systems

Conventional sanitation systems, based on water-borne sewerage, are the accepted manner for removal of human waste from cities. However, in recent years they have proven to be unable to make a significant impact on the backlog of nearly half of the world’s population.

These conventional centralised systems require a huge financial investment, and have relatively high maintenance and operation costs. They have very obviously improved the hygienic situation of inhabitants of urban areas (being served by well functioning sewer systems). However, due mainly to a lack of adequate human and financial resources, these systems cannot be correctly operated in many countries in North and South.

The resulting sanitation systems are not sustainable: As water is used to transport the wastes, they have a high water consumption, making them unsuitable in the long term for regions with water scarcity.

#### Shortcomings of "conventional" on-site systems

Conventional on-site sanitation systems have been used for centuries to provide excreta disposal at the household level. There are two basic types, dry systems (pit toilets) and water based systems (flush toilets).

Given the limited financial means of most developing countries, the pit toilet has remained the main solution.

Resource recovery is not included as part of their function. Indeed, the health impact of underground waste disposal, particularly its impact on groundwater, was rarely considered. The increasing density of populations meanwhile often has led to situations where the required minimum distance between drinking water well and pit toilets can not be respected.

**Both systems do not facilitate the reuse of macro and micro nutrients present in excreta and wastewater!**

#### Keywords:

Conventional Sanitation Systems  
Water-Borne Systems  
"Conventional" Pit Toilets  
Sustainable Sanitation  
Ecological Sanitation  
CLUES = Community-led Urban Environmental Sanitation  
Stakeholders & Decision Making  
HCES = Household-Centred Environmental Sanitation  
Project Cycle  
Closing the Loop Through Source Separation  
Ecosan Education and Training

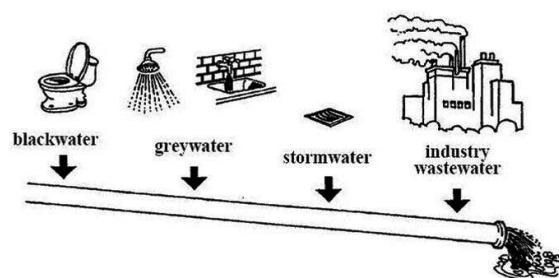
#### 6.1 Limitations of Conventional Sanitation Systems

##### Centralized water-borne systems

Conventional sanitation systems, based on water-borne sewerage, are the accepted manner for removal of human waste from cities. However, in recent years they have proven to be unable to make a significant impact on the backlog of nearly half of the world’s population.

Water born sewer systems, used since the 19th century in industrialized nations, and coupled with wastewater treatment plants have very obviously improved the hygienic situation of inhabitants of urban areas (being served by well functioning sewer systems). These conventional centralised systems require a huge financial investment, and have relatively high maintenance and operation costs.

However, due mainly to a lack of adequate human and financial resources, these systems cannot be correctly operated in many countries in North and South



The resulting sanitation systems are not sustainable: **As water is used to transport the wastes, they have a high water consumption, making them unsuitable in the long term for regions with water scarcity.**

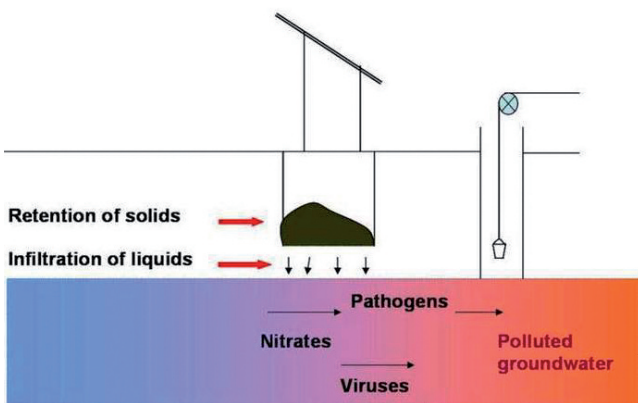
The fact that our current sanitary systems are, for the most part, directly connected to the water cycle requires that both the sanitation and water crises be considered, before we can begin trying to de-couple them.

### Shortcomings of "conventional" pit toilets

Conventional on-site sanitation systems have been used for centuries to provide excreta disposal at the household level. There are two basic types, **dry systems** (pit toilets) and **water based systems** (flush toilets).

Given the limited financial means of most developing countries, the pit toilet has remained the main solution. On-site poor flush toilets are today popular and widely used in South-Asia, especially in India.

Resource recovery is not included as part of their function. Indeed, the health impact of underground waste disposal, particularly its impact on groundwater, was rarely considered. The increasing density of populations meanwhile often has led to situations where the required minimum distance between drinking water well and pit toilets can not be respected.

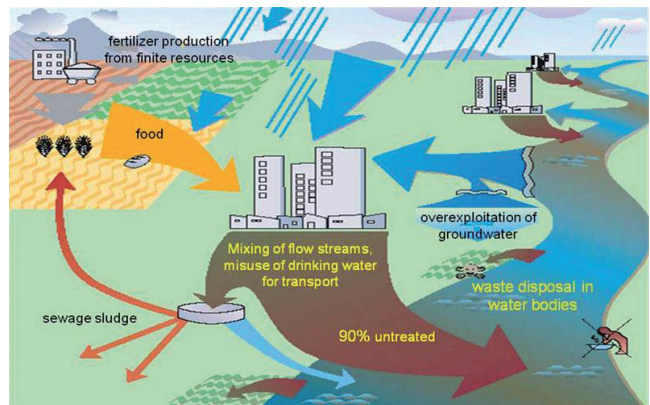


### Lack of attention to macro-nutrient cycling

While the above are serious disadvantages of both water-borne and dry conventional sanitation systems, a far more fundamental problem is that **they do not facilitate the reuse of macro and micro nutrients** present in excreta and wastewater.

The valuable nutrients and trace elements contained in human excrement are very rarely re-channelled back into agriculture in conventional systems.

Even when sewage sludge is used in agriculture, only a very small fraction of the nutrients contained in the excrement are reintroduced into the living soil layer. Most are either destroyed in the treatment process (e.g. by nitrogen elimination) or enter the water cycle, where they pollute the environment, causing the eutrophication of lakes and rivers.



[Source: GTZ]

## 6.2 Principles of the Sustainable Sanitation Approach

When improving an existing and/or designing a new sanitation system, sustainability criteria related to the following aspects should be considered:

1. **Health and hygiene:** includes the risk of exposure to pathogens and hazardous substances. It also covers aspects such as hygiene, nutrition and improvement of livelihood achieved by the application of a certain sanitation system, as well as downstream effects.
2. **Environment and natural resources:** involves the required energy, water and other natural resources for construction, operation and maintenance of the system, as well as the potential emissions to the environment resulting from its use. It also includes the degree of recycling and reuse practiced and the effects of these e.g. through the production of renewable energies (such as biogas).
3. **Technology and operation:** incorporates the functionality and the ease with which the entire system including the collection, transport, treatment and reuse and/or final disposal can be constructed, operated and monitored by the local community and/or the technical teams of the local utilities.
4. **Financial and economic issues:** relate to the capacity of households and communities to pay for sanitation, including the construction, operation, maintenance and necessary reinvestments in the system. Besides also direct benefits e.g. from recycled products (soil conditioner, fertiliser, energy and reclaimed water) and external costs and benefits have to be taken into account.
5. **Socio-cultural and institutional aspects:** the criteria in this category refer to the socio-cultural acceptance and appropriateness of the system, convenience, system perceptions, gender issues and impacts on human dignity, the contribution to food security, compliance with the legal framework and stable and efficient institutional settings.

The concept of sustainability is more of a direction rather than a stage to reach. Nevertheless, it is crucial, that sanita-

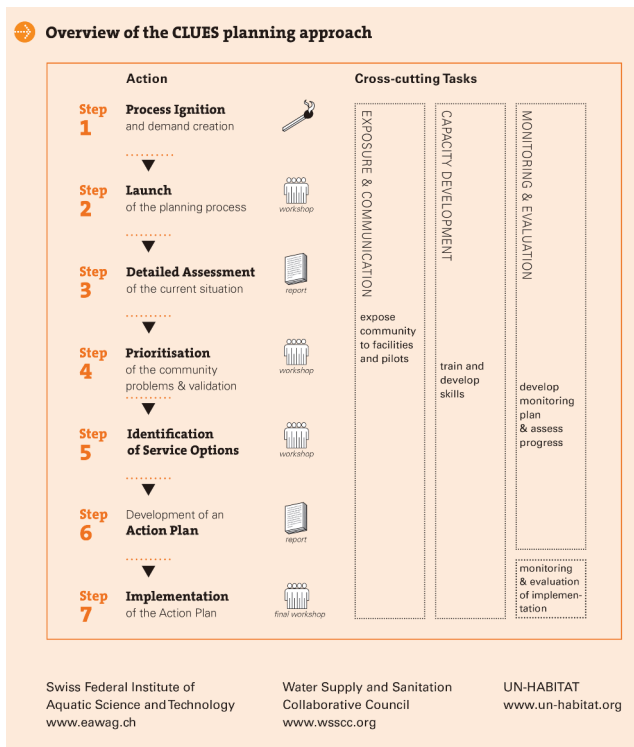


tion systems are evaluated carefully with regard to all dimensions of sustainability. Since there is no one-for-all sanitation solution which fulfils the sustainability criteria in different circumstances to the same extent, this system evaluation will depend on the local framework and has to take into consideration existing environmental, technical, socio-cultural and economic conditions.

(adapted from SuSanA: What is Sustainable Sanitation)  
 [Refer to the «Resources» box to get further informations.]

### Community-Led Urban environmental sanitation: CLUES

was mentioned in Lesson 4.6 as an approach for the planning and implementation of environmental sanitation infrastructure and services especially for disenfranchised urban and peri-urban communities. The overview of the planning approach is shown below:



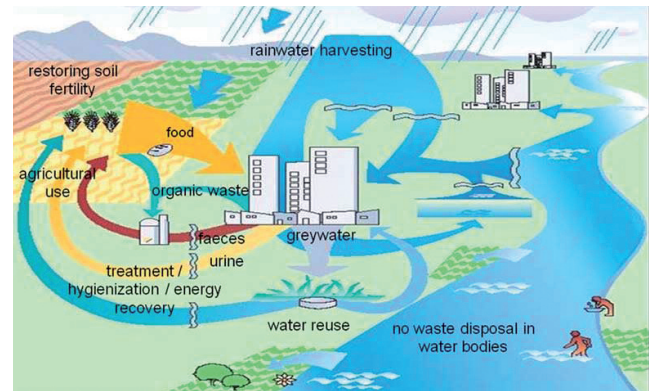
Source: Community-Led Urban environmental sanitation planning: CLUES; Complete guidelines for decision-makers with 30 tools.  
 [Refer to the «Resources» box to get more informations.]

### 6.3 Ecological Sanitation

Ecological sanitation is a sub section of sustainable sanitation that stresses on reuse. Ecological sanitation (ecosan) recognises human excreta and household wastewater as resources that can be recovered, treated where necessary and safely reused. Ecosan systems enable the recovery of nutrients contained in excreta and wastewater, and their reuse in agriculture. In this way, they contribute to improved soil fertility and food security, whilst minimising the consumption and pollution of water resources. They also have the potential to produce renewable energy from biogas systems.

Ecosan does not equate to a specific technology but is rather a way of thinking. It includes diverse technologies such as urine-diversion dehydration (UDD) toilets, composting, rainwater harvesting, constructed wetlands, vacuum sewers, biogas reactors and many more.

Ideally, ecological sanitation systems enable the complete recovery of all nutrients from faeces, urine and greywater to the benefit of agriculture, and the minimisation of water pollution, while at the same time ensuring that water is used economically and is reused to the greatest possible extent, particularly for irrigation purposes.



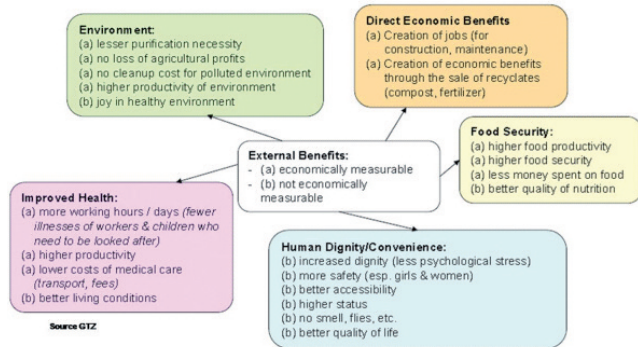
### Dr. Justamoment



I am keen to learn whether there are examples of EcoSan projects in the participants countries.

## 6.4 Cost & Benefits

### Benefits of EcoSan

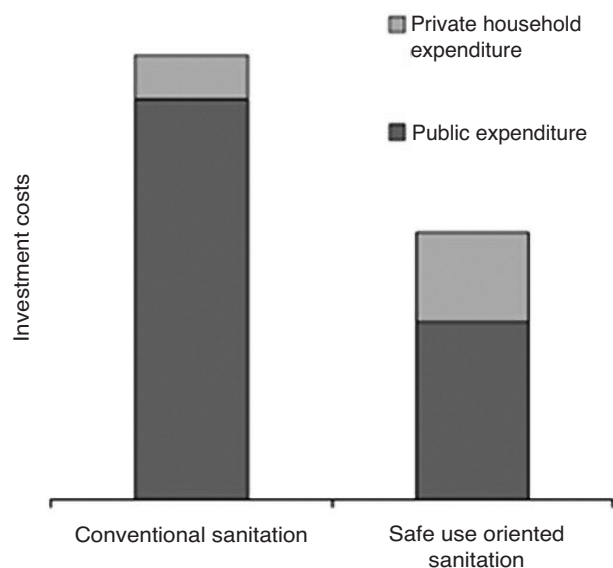


[Source: GTZ. Ecological Systems: Benefits]

Conventional sewers, treatment plants and sludge disposal arrangements are very costly. Ecosan systems costs are bound to lower the total costs of urban sanitation. This is mainly due to the decentralised, modular nature of source separating systems, which do not require large sanitary infrastructure, such as centralised treatment works, sewerage, or pump stations. In comparison to traditional decentralised sanitation such as pit latrines.

It is difficult to give exact cost figures for Ecosan because of the local conditions on which they rely. Generally figures show that the annual cost of Ecosan options are lower than most conventional options.

However, although the overall costs are less, those to be covered by the private household may very well increase and can be higher as a result of having to replace or transform domestic sanitary facilities (for example by installing a urine diversion toilet..)



[Source: GTZ. E The cost structures of conventional and safe use oriented sanitation systems]

### Other issues to be aware of when planning ecosan projects:

- Any ecosan project relies on an “enabling environment” before any it begins, to ensure that governmental support and the legislative framework will result in the development of appropriate standards that will allow the installation of ecosan systems (including the agricultural use of ecosan products). This is not always provided.
- A participatory approach for the implementation of an ecosan project requires a good deal of facilitation. This facilitator needs to be appropriately trained.
- As ecosan is still a relatively unknown concept in many countries, awareness raising must first be done. This requires appropriate funding.
- The requirements for planning reuse-based ecosan projects are higher than for conventional sanitation, as the concept is not yet widely known. Project planning is thus more demanding.
- In Uganda, Ecosan has been more successful at the household and school level rather than at the community level.

(adapted from <http://www.sswm.info>, Sustainable Sanitation and Water Management)

[Refer to the «Resources» box to get more informations.]

## 6.5 Stakeholders & Decision Making

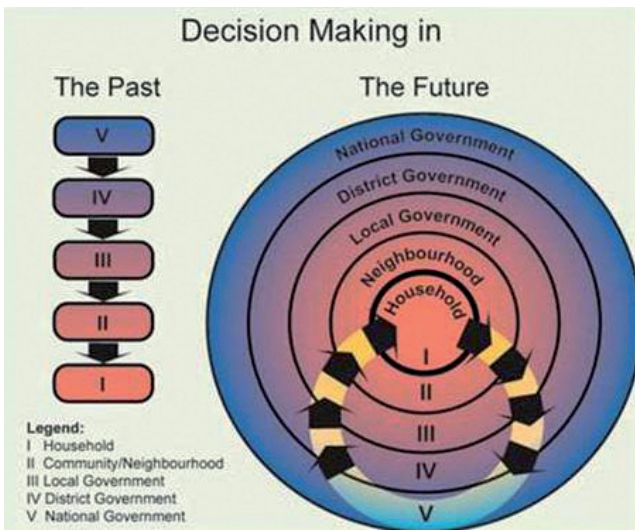
Sanitation decisions are community decisions

- People have different sanitation needs, decisions about sanitation should be made by the people who will be most affected by those decisions.
- Community participation can make the difference between success and failure when a government or outside agency plans a sanitation program.

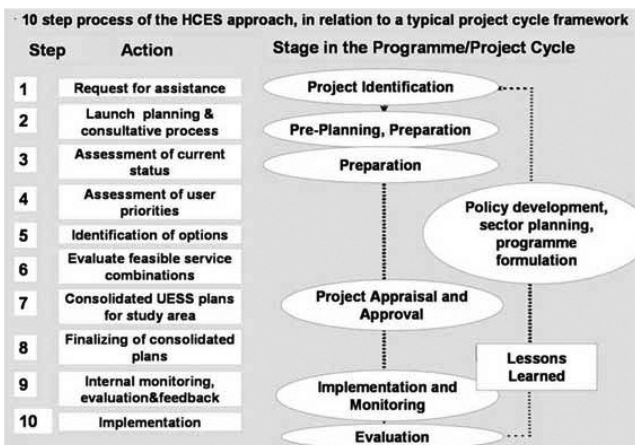
Household-Centred Environmental Sanitation (HCES) approach

To implement Sustainable Sanitation projects based on the **Bellagio Principles**, it is recommended to adopt a Household-Centred Environmental Sanitation (HCES) approach. This approach attempts to avoid the problems resulting from either “top-down” or “bottom-up” planning approaches, by employing both within an integrated framework, providing direct response to the needs and demands of the user.

- **Stakeholders** are members of a “zone”, and act as members of that zone (“zones” range from households to the nation).
- **Zones** may be defined by political boundaries (for example, city wards and towns) or reflect common interests (for example, watersheds or river basins).
- **Decisions:** consultation with all stakeholders affected by the decision, in accordance with the methods selected by the zone in question.



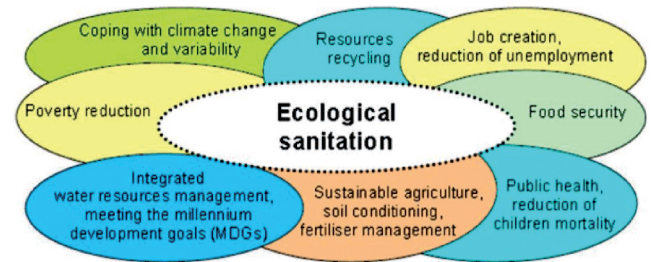
[This approach presents the radical re-think of current planning practices, proposed by the HCES.]



A typical project cycle [Source: "Household-Centred Environmental Sanitation, Implementing the Bellagio Principles in Urban Environmental Sanitation, Provisional Guideline for Decision-Makers". Eawag, June 2005]

## 6.6 Ecosan & Education

Changing the conventional sanitation mindset and creating a favorable environment for the implementation of ecological sanitation will not be an easy task. It will require time and will not happen overnight. In order to increase the success rate of ecological sanitation projects and to generate a more positive perception amongst its future users, education and training in all of its aspects must reach a wide range of society members.



[Source: GTZ. Ecological sanitation is an inter-disciplinary field and is related to many aspects of modern societies in both developed and developing world]

There is a growing need and pressure to provide sound educational tools in order to encourage capacity building and to support the world-wide implementation of ecological sanitation. There is also a need for a broad analysis of existing curricula and education systems in both formal education at all levels and continuing education in water and environment related disciplines, with a view to introducing the holistic concept of ecological sanitation.

**In the developed world** the role of EcoSan education and training is to contribute to broader application of its concept, especially in areas where the advantages are directly obvious (e.g. individual homes or groups of houses in areas where there is no sewer network, in small communities, vacation areas and in other similar contexts).

**In developing countries and countries in transition,** EcoSan education and training is even more important and urgent, especially in the context of achieving the Millennium development Goals.



## Further studies / Secondary readings

You may find the following videos, readings, and links helpful to give you better understanding about this lesson's topic. Although it is relevant material, the study is not obligatory to complete the e-Learning lesson successfully.

- ***Sustainable Sanitation Alliance (SuSanA)***

The Sustainable Sanitation Alliance (SuSanA) is an open international network of members who share a common vision on sustainable sanitation. SuSanA works as a coordination platform, working platform, sounding board, contributor to the policy dialogue on sustainable sanitation and as a "catalyst". At the present time, the secretariat function is carried out by GIZ (German International Cooperation). Participation is open to those who want to join and be active in the promotion of sustainable sanitation systems. The SuSanA invites international, regional and local organisations to join the network, contribute ideas, and to become active partners in the thematic working groups.

[Link: <http://www.susana.org>]

- ***CLUES - Community-Led Urban Environmental Sanitation Planning***

Complete Guidelines for Decision-Makers with 30 Tools. The guidelines including the description of the tools have 100 pages, well arranged with many graphs and illustrations.

The Community-Led Urban Environmental Sanitation (CLUES) approach presents comprehensive guidelines for the planning and implementation of environmental sanitation infrastructure and services in disenfranchised urban and peri-urban communities. The planning approach builds on a framework which balances the needs of people with those of the environment to support human dignity and a healthy life. It emphasises the participation of all stakeholders from an early stage in the planning process.

[Link: <http://www.wsscc.org/resources/resource-publications/community-led-urban-environmental-sanitation-planning-clues>]

The accompanying toolbox is very helpful for practitioners: it starts with very practical tips and guidance for "Ignition and demand creation", gives agendas for workshops with stakeholders up to monitoring checklists → see the Toolbox Overview. The toolbox can be downloaded from the EAWAG/SANDEC website (The whole toolbox has 167 MB!):

[Link: [http://www.eawag.ch/forschung/sandec/gruppen/SESP/projects\\_sesp/clues/index\\_EN](http://www.eawag.ch/forschung/sandec/gruppen/SESP/projects_sesp/clues/index_EN)]

- ***Compendium of Sanitation Systems and Technologies***

Abundant information exists about sanitation technologies but it is scattered throughout dozens of books, reports, proceedings and journals; this Compendium aims to pull the main information together in one volume. Another aim of the Compendium is to promote a systems approach; sanitation devices and technologies should always be considered as parts of an entire system. A very useful resource for sanitation systems and technologies! (PDF, 158pp, 4.2 mb)

[Link: [http://www.eawag.ch/forschung/sandec/publikationen/sep/dl/compendium\\_high.pdf](http://www.eawag.ch/forschung/sandec/publikationen/sep/dl/compendium_high.pdf)]