

Question 1

Planning a sustainable sanitation service chain must include many design considerations that go beyond technology. Please mention at least one context where a **dry toilet** is a good user interface (toilet) choice and in which context a **pour-flush toilet** is an appropriate sanitation technology.

Dry

Arid, water-stressed area, no rocky soil, no high groundwater

Wet

Water availability, culturally accepted (water-based cleansing), sewer in vicinity

Question 2

The image shows a typical low-income settlement in Raipur, India. The road you see is unpaved. Population density in such a neighbourhood is high. Many people in this particular area have a private water tap. Overall, average water consumption is about 80 litres per capita per day. The main sewer line is about 1 km away from the area. List the pros and cons of two possible sanitation solutions for this neighbourhood both for implementation as long-term operation and maintenance:

- (a) simplified sewers that connect to the pour-flush toilets or
- (b) motorized emptying and transport of the faecal sludge.

- a) pro: space-saving, good for high densities, water available; con: complex to implement, more costly, needs regular maintenance & servicing*
- b) Less costly, job creation, resource recovery possible; special collection vehicles necessary, not every toilet/ST is easily accessible*



Question 3 & 4 (2p)

What are the important elements of a successful & sustainable operation of a water system in a low-income context?

- *Water source(s)*
- *Willingness to pay of beneficiaries*
- *Availability of treatment options, e.g. chlorine*
- *Energy requirements*

Please list at least 5 considerations you must take into account when designing a WASH project in an emergency context?

- *Density and space availability*
- *Water availability*
- *Cultural habits (wet/dry)*
- *Short-term vs long-term crisis*
- *Institutional factors – NGOs/service providers*

Question 5 & 6 (2p)

What influences solid waste generation rates – describe 2.

Wealth quintiles – poor vs rich

Existence of source separation scheme?

Please provide two problems that may arise with pour-flush toilets in low-income settings

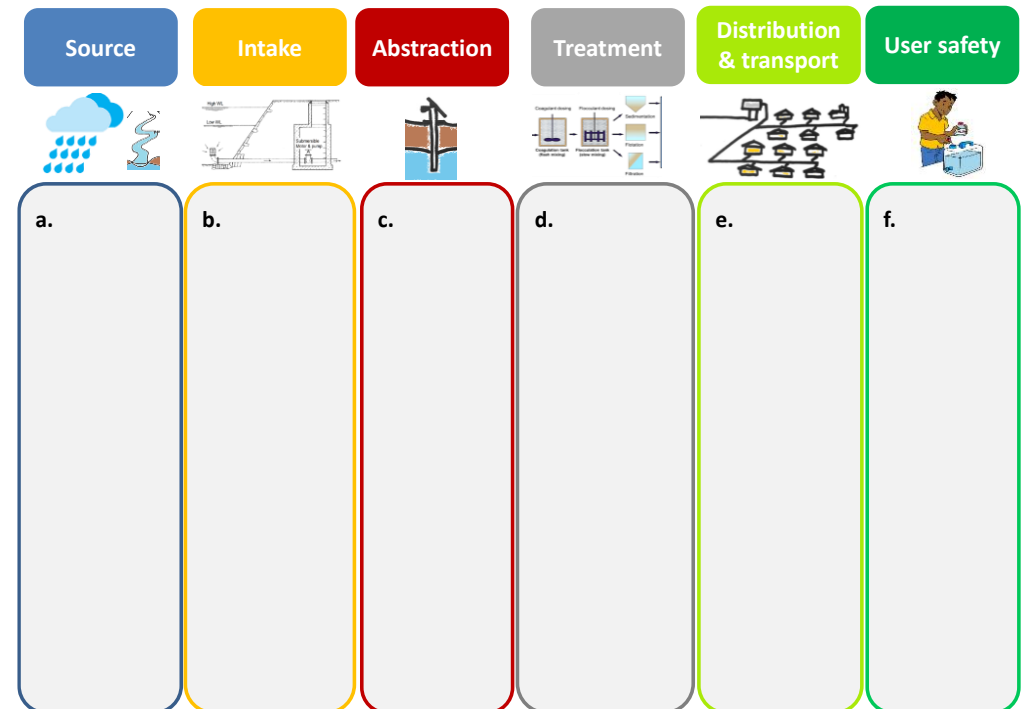
- *Requires a constant source of water (can be recycled water and/or collected rainwater)*
- *Requires materials and skills for production that are not available everywhere*
- *Coarse dry cleansing materials may clog the water seal*

Question 7

A small village in a hilly region of Nepal has about 5000 inhabitants. There is a monsoon period with heavy rainfalls for three months of the year and has several spring sources in the hills above the village. Other smaller communities and livestock are located close to the spring sources. Most of the residents live in small houses scattered in the hills where they practice small-scale farming and livestock rearing. There is also a primary and secondary school in the village.

Propose a drinking water configuration that covers the entire water service chain from source to user safety.

Answer: several configurations possible for rural hilly setting. E.g., spring water diagram combined with rainwater as complementary source, possibility of community taps or private connections, potential microbial contamination from communities nearby spring sources (and evtl. increased turbidity from heavy rainfalls) considered, detailed & logical choices for each step.



Question 8

An existing faecal treatment plant for a small town sells dried faecal sludge from the drying beds. The main customers are farmers who directly apply the dried faecal sludge on the fields as soil amendment. A consultant is concerned that this current situation might lead to the spread of diseases, as the dried FS is not considered as pathogen-free. The consultant suggests to use pyrolysis to carbonize the dried sludge to biochar. The consultant's idea is to sell the biochar as pathogen-free solid fuel at the local market.

- a) From a technological point of view, do you agree with the consultant's suggestion? Justify your answer.
- b) Based on the consultant's detailed technical design of the carbonization step, the plant operator decides to implement the solution. Justify if this a good idea, based on the engineering design approach.

Yes, dried FS still needs to be hygienised;

No, no market studies initially conducted to assess if commercially viable.

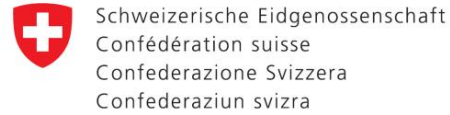
Wobulenzi Case Study

Please send it by Monday 22 December to:

luethi@eawag.ch

WASH careers

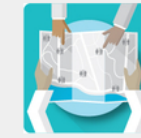
- Sandec project officer
- PhD at EPFL/ETHZ
- Internships @ Sandec



Swiss Agency for Development and Cooperation SDC



Our seven strategic research themes are:



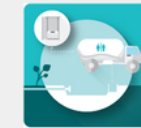
Strategic Environmental Sanitation Planning

Our aim is to develop sanitation strategies and concepts that are socially, culturally and technically appropriate in urban and peri-urban settings.



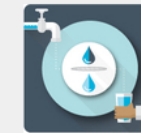
Solid Waste Management

We focus on innovative solutions for the appropriate treatment of the organic fraction of municipal solid waste.



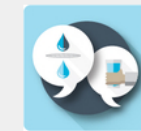
Management of Excreta, Wastewater and Sludge

We address three main challenges in faecal sludge management: optimisation of treatment technologies, innovation in resource recovery, and methods for sustainable system level implementation.



Water Supply and Treatment

We develop sustainable and cost-efficient approaches for measuring and improving drinking water quality.



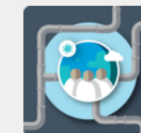
Water Safety Management

We develop and evaluate appropriate solutions that strengthen access to and enhance the consumption of safe drinking water in vulnerable households in low income countries.



Organizations & Climate

The Organizations & Climate Group researches the dynamic capabilities water and sanitation organizations need to adapt their strategies and manage new interventions in response to climate change impacts.



Public Health, Infrastructure and Climate

We conduct operational research into the challenges of improving water supply and sanitation infrastructure in low-resource and crisis-affected settings. Our goal is to support the delivery of safe, climate-resilient services that prevent infectious diseases and contribute to better public health outcomes.

NGO sector



Multi & bilateral sector

