EC-LINK 中欧生态城
Europe-China Eco-Cities Link
中欧低碳生态城市合作项目

Primary Tools

Water Management

Waste Water Options

What this tool does:

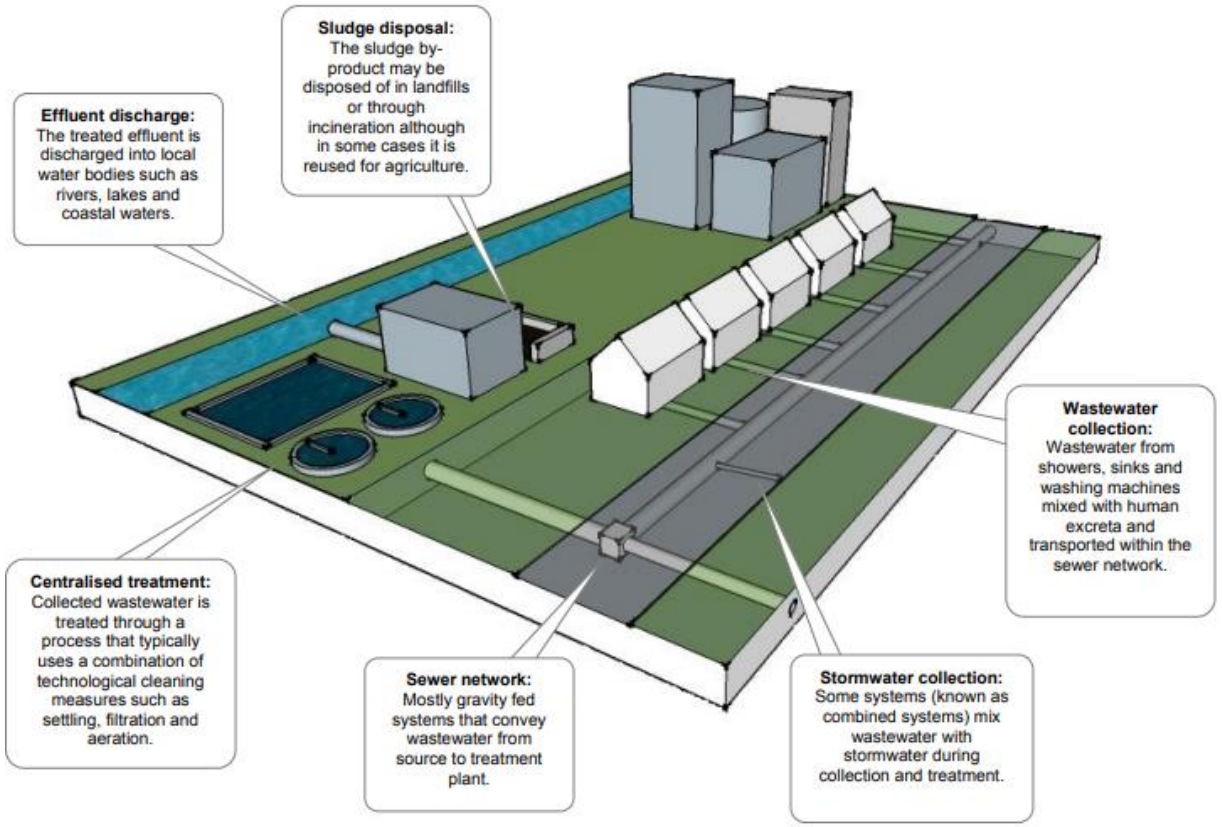
This tool supports decision makers to make right choices for waste water treatment in their cities. There exist conventional centralized systems, and non-coventional decentralized systems. The comparison of the systems indicates that non-conventional methods can increase the potential for water-use for non-potable purposes, can make available sludge nutrients for fertilizer and biogas, and generate energy from waste water.

How does it work:

The conventional approach to urban wastewater management is based on a centralised system that collects and treats a combined flow of most or all of the typical wastewater elements. This approach dates back to Roman times but was developed in its current format during the industrial revolution as cities were growing in size, population and density. The increasing volumes of untreated human waste severely affected the health of inhabitants resulting in outbreaks of diseases such as cholera. To overcome the problem, waterbased toilets, piped sewer networks and centralised treatment facilities were constructed; this proved to be an effective solution to prevent the spread of disease through human contact with wastewater in the city.

Integrated Waste Water Treatment

An alternative approach to wastewater management views wastewater not as a problem that needs to be disposed of but rather as a variety of resources that, when managed correctly, can be reused. Conventional wastewater management can be considered a linear process with inputs (combined wastewater flows) at one end and outputs (downstream discharges of treated effluent and disposal of sludge) at the other. An integrated approach that is based on the cyclical processes observed in nature in contrast encourages the separate collection, treatment and reuse of urine, faeces, greywater and stormwater. This approach is considered more sustainable as solutions can be applied that improve treatment performance at less cost and enable resources to be recycled more efficiently.



Conventional Waste Water Treatment[1]

Aspect of wastewater management	Conventional approach (wastewater management as a linear process)	Integrated approach (wastewater management as a cyclical process)
Collection	Faeces, urine, greywater and stormwater are combined and conveyed through an expensive sewer network to a centralised treatment facility.	Faeces, urine, greywater and stormwater are collected separately and managed close to the source.
Treatment	Centralised treatment of combined wastewater elements based on energyand chemical-intensive infrastructure and technology.	Separate wastewater elements are treated using innovative, decentralised technologies and natural systems.

Treated effluent	Treated effluent is discharged downstream to receiving water bodies such as rivers, lakes and estuaries.	Treated effluent is reused locally for nonpotable water supply purposes.
Nutrients	Nutrients are disposed of in the environment through discharged effluent and sludge.	Nutrients are recycled and reused locally through the recycling of urine and creation of biosolids from faecal sludge.
Sludge by-product	The sludge by-product is disposed of in landfill or through incineration.	Sludge is digested to create biogas and converted to biosolids for use as fertiliser and soil conditioner.
Energy consumption	Large amounts of energy are used for treatment and pumping	Energy consumption is minimised through the use of natural treatment processes.
Comparison of Conventional with Integrated Waste Water Treatment Options[2]		

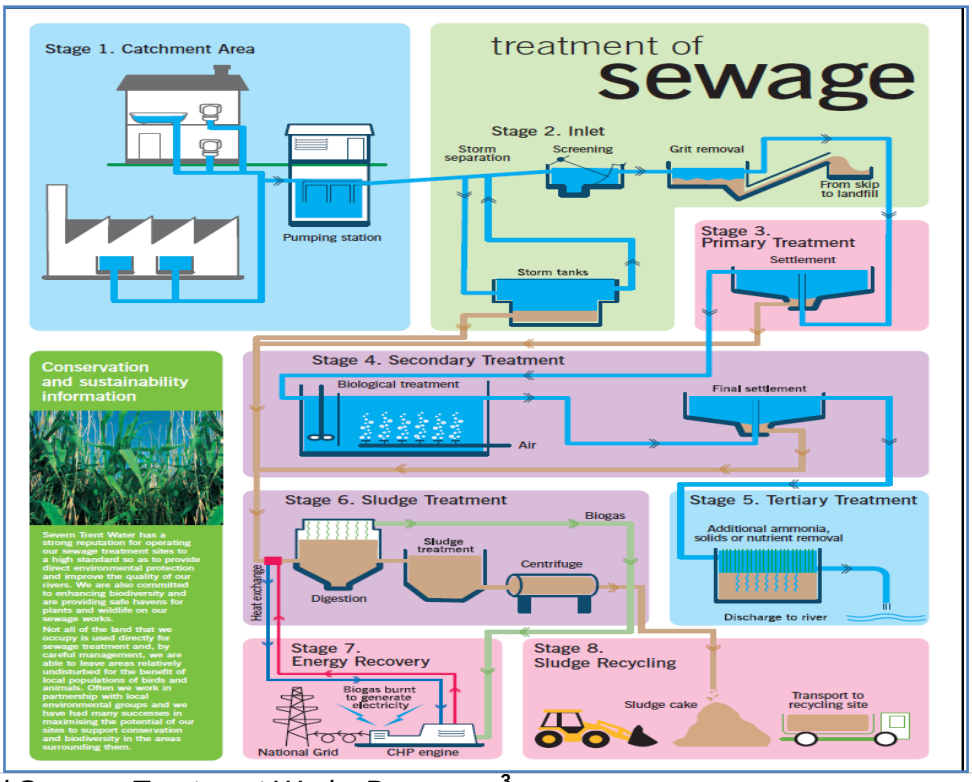
The impact of the use of non-conventional methods to waste water treatment is:

- Increased access to sanitation for all.
- Water savings.
- Flexibility to population growth and urbanization.
- Recycling of plant nutrients.
- Financial savings.
- Employment generation.
- Energy recovery.
- More cost-efficient treatment through decentralized methods.
- Urban biodiversity and amenity.

Example:

The sewage treatment process can be describes by the following stages:

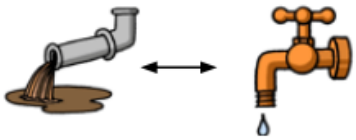
- Stage 1: Catchment area/ Sewerage System
- Stage 2: Inlet and Screening
- Stage 3: Primary Treatment
- Stage 4: Secondary Treatment
- Stage 5: Tertiary Treatment
- Stage 6: Sludge Treatment
- Stage 7: Energy Recovery
- Stage 8: Sludge Recycling



Simplified Sewage Treatment Works Processes[3]

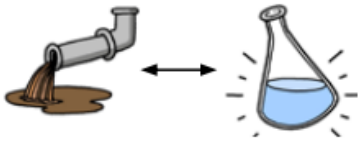
Wastewater and stormwater management

In many cities stormwater collection is linked to wastewater management through combined sewer systems. Heavy rainfall increases the volume of water needing to be treated and can result in overflows from the system. This causes untreated sewage to be released to the environment.



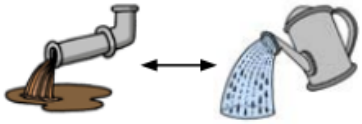
Wastewater and domestic water consumption

Household water use is directly related to the volume of wastewater to be treated. Rising consumption through the installation of high water use appliances increases the volume of wastewater to be treated while reducing the concentrations of human waste within it.



Wastewater and water quality

Treated effluent discharged from centralised wastewater treatment works typically contains high levels of nutrients causing an increase in algal blooms in receiving water bodies. Poorly treated discharges and overflows of untreated effluent can also cause severe pollution to ground and surface water resources. In many occasions this same water is re-abstracted downstream for potable uses.



Wastewater and non-potable water supply

Wastewater (treated and untreated) is a cheap source of non-potable water that may be used for supply purposes. Greywater and treated effluent can be reused for irrigation, industrial uses, toilet flushing and to recharge aquifers. Wastewater reuse is particularly valuable in cities that suffer from water scarcity and drought.

Examples of Waste Water in the Urban Water Cycle[4]

Credentials;

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Copy edited by Kosta Mathéy, July 2018

Sources:

[1] SWITCH. Training Kit – Integrated Urban Water Management in the City of the Future. Module 5-Waste Water - Exploring the Options.

http://www.switchtraining.eu/fileadmin/template/projects/switch_training/files/Modules/Module_reduced_size/Switch_Training_Kit_Module_5.pdf

[2] SWITCH. Training Kit – Integrated Urban Water Management in the City of the Future. Module 5-Waste Water - Exploring the Options.

http://www.switchtraining.eu/fileadmin/template/projects/switch_training/files/Modules/Module_reduced_size/Switch_Training_Kit_Module_5.pdf

[3] Source: Severn Trent Water Website - https://www.stwater.co.uk/content/conMediaFile/775

[4] Source: SWITCH. Training Kit – Integrated Urban Water Management in the City of the Future. Module 5-Waste Water - Exploring the Options.

http://www.switchtraining.eu/fileadmin/template/projects/switch_training/files/Modules/Module_reduced_size/Switch_Training_Kit_Module_5.pdf