Lesson 7: Critical Issues Related to Sanitation

7.0 Lesson Overview

»Lack of investment in sanitation reveals a blind spot in development policy: a failure to recognize sanitation's integral role in reducing poverty«

(WaterAid, Tackling the Silent Killer)

Keywords:

IWRM = Integrated Water resources Management
Catchment solidarity
River basin agency
Re-use of treated wastewater
Sludge management
Land application
Composting
Stomwater management
Flooding

Sanitation and IWRM (Integrated Water Resources Management)

Managing sanitation services is usually the responsibility of local authorities. It may seem contradictory to an IWRM approach, which is rather operated at a catchment level, and involves different water using sectors. This is especially true for the waste water treatment and pollution prevention of water resources.

Indeed local authorities are more concerned by taking their waste water away from their cities than by their treatment, and so it may endanger downstream users and aquatic resources. Therefore it is relevant to implement water resource management entities (river basin agencies) which have the task to look after enforcing IWRM principles based on institutional and governance arrangements, e.g. the discharge of untreated wastewater may be forbidden and reprimanded.

A still better approach is to enable a participatory approach and encourage institutional and financial mechanisms in order to involve all the stakeholders at a catchment level and to set up an effective IWRM by creating a «catchment solidarity» among different user groups spread all over the river basin (both up and down stream).

7.1 Linkage Between Sanitation and IWRM

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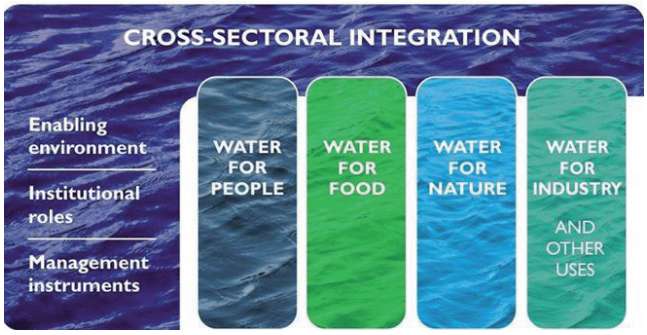
IWRM helps to protect the environment, foster economic growth and sustainable agricultural development, promote democratic participation in governance, and improve human health. Worldwide, water policy and management are beginning to reflect the fundamentally interconnected nature of hydrological resources, and IWRM is emerging as an accepted alternative to the sector-by-sector, top-down management style that has dominated in the past.

The basis of IWRM is that the many different uses of finite water resources are interdependent. High irrigation demands and polluted drainage flows from agriculture mean less freshwater for drinking or industrial use; contaminated municipal and industrial wastewater pollutes rivers and threatens ecosystems; if water has to be left in a river to protect fish-

What is IWRM?

Integrated Water Resources Management (IWRM) is a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment.

eries and ecosystems, less can be diverted to grow crops. There are plenty more examples of the basic theme that unregulated use of scarce water resources is wasteful and inherently unsustainable.



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

Dr. Justamoment and Ms. Gorightahead

Why is the upstream – downstream compensation within the catchment so important?

Because the upstream population can cause a lot of water pollution or water diversion that leaves only problems for the downstream users!

7.2 Re-Use of Treated Wastewater

Re-Use of treated wastewater (REUSE) is a **complex issue with institutional, technical and financial challenges**. It has to be developed based on feasibility studies.

It is inevitably linked with the IWRM approach. REUSE is emerging as an important issue because it relates to both concerns: pollution prevention and minimization of treatment costs (although it must be stated that reuse has additional costs related to transfer and monitoring. It could command additional and at times expensive treatment).

In addition, REUSE may be an alternative option to conventional and even the non-conventional water resources (such as desalination). This is particularly true for arid and semi arid areas.

Reuse of wastewater poses a number of trade-offs which have to be carefully managed. Especially important are health aspects.

The EMWater Guide

A practical guide for decision makers: Improving wastewater treatment and reuse practices in the Mediterranean countries. The EMWater Guide seeks to support decision-making in environment protection, wastewater management and planning of relevant projects. The guide consists of two parts: Part I, "Wastewater Treatment", introduces small-scale, centralised and decentralised treatment systems suitable for rural and suburban areas. Part II, "Water Reuse", focuses on the use of reclaimed water for irrigation in agriculture and for landscaping. The EMWater Guide also provides lists of references and other sources of information that may support the successful development, implementation and operation of wastewater projects.

Water reuse for urban agriculture:

Climate change, drought, population growth - they could all threaten future food supplies. But global agriculture, with its dependence on fuel and fertilisers is also highly vulnerable to an oil shortage, as Cuba found out 20 years ago. By means of organic urban agriculture Cuba reportedly has been able to provide four million tonnes of vegetables a year making the country 90% self-sufficient in fruit and vegetables.

7.3 Sound Practices for Sludge Management

Sludge can contain large levels of pathogens and chemical contaminants that are hazardous to human health and the environment. However, it contains significant nutrients, food value and biomass which – if handled correctly – may be beneficial and profitable as fertiliser for example.

UNEP recommends the sound practices, listed below, for reducing and handling sewage sludge:

- Preventing large volumes of sludge through **separation of sewage and stormwater systems**.
- **Minimise reliance** on **centralised sewage systems** by installation of onsite treatment, and separation of household washwater for reuse.
- Land application requires **regular monitoring of the sludge** to show that the metal content is very low.
- **Treatment** such as drying, liming, and composting, or co-composting with yard waste followed by land application. Again, levels of metal contaminants need to be monitored.
- **Drying and disposal on landfills**. It is important that it is dried to avoid generation of large quantities of leachate.

More Resources on Faecal Sludge Management

Management of faecal sludge is often neglected but essential for the functioning of sanitation systems and the well-being of urban dwellers. Issue 13 of Sustainable Sanitation Practice (SSP) Journal on "Faecal sludge management" (see in the Resources box) presents studies from different regions that mainly show the non-existence of faecal sludge management in most regions. Additionally, the last paper describes of a new technological solution (the LaDePa machine) for producing hygienically safe organic fertiliser from sludge from VIPs. The LaDePa machine was developed in eThekwini municipality (Durban), South Africa. The issue 13 of SSP includes 4 contributions: the analysis of faecal sludge management in 3 cities in Bangladesh, the analysis of faecal sludge management in 2 cities in Cameroon, the description of the development of an optimized sludge management system in Ouagadougou, Burkina Faso, and the description the LaDePa machine

Low-Cost Options for Treating Faecal Sludges in Developing Countries: Read more in an article which analyses and discusses the options further.

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

7.4 Stormwater Management

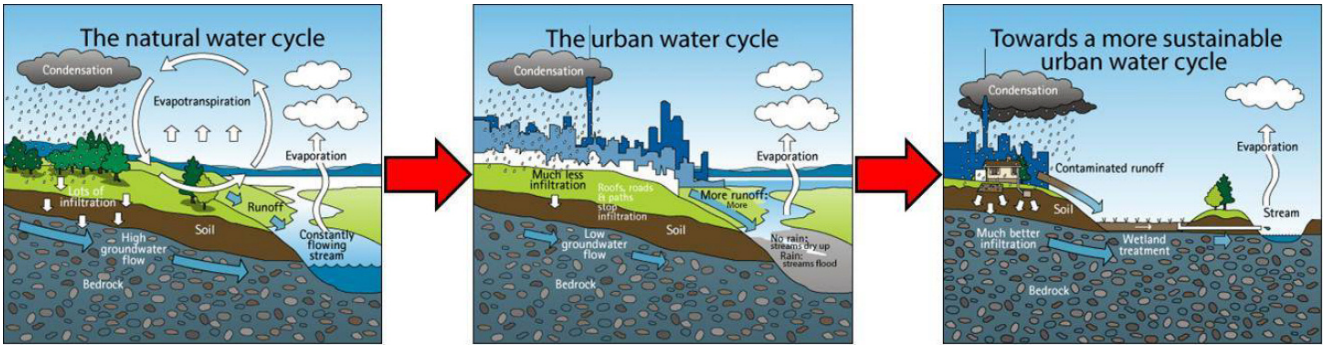
Stormwater management means to manage surface runoff. It can be applied in rural areas (e.g. to harvest precipitation water), but is essential in urban areas where run-off cannot infiltrate because the surfaces are impermeable.

The traditional model of **stormwater management** is based on a misconception. It aims at draining of urban **runoff** as quick as possible with the help of channels and pipes, which increases peak flows and costs of stormwater management. This type of solution only transfers flood problems from one section of the basin to another section. Urban runoff contains a large amount of solids and a higher concentration of metals and other toxic components.

A more **sustainable** approach is **Integrated Urban Water Management (IUWM)**, which refers to the practice of managing freshwater, wastewater, and stormwater as links within the resource management structure, using an urban area as the unit of management (UNEP 2009). **IUWM** includes the following activities:

- Improve water supply and consumption efficiency
- Ensure adequate water quality for drinking water as well as wastewater treatment through the use of Environmentally Sound Technologies (ESTs) and preventive management practices
- Utilise alternative water sources, including rainwater and reclaimed and treated water
- Engage communities to reflect their needs and knowledge for water management
- Establish and implement policies and strategies to facilitate the above activities
- Support capacity development of personnel and institutions that are engaged in IUWM
- Improve economic efficiency of services to sustain operations and investments for water, wastewater, and stormwater management

New technologies for stormwater development in the sense of IUWM have been developed since the 1970s and include detention and retention ponds, permeable surfaces, infiltration trenches, **surface** and **surbsurface groundwater recharge**, and other sources control measures!

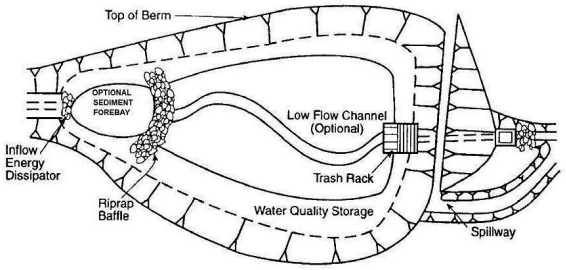


From left to right: a natural water cycle allows infiltration, groundwater flow and evapotranspiration. When urban areas seal surfaces and avoid groundwater recharge or infiltration, floods occur. Modern techniques use natural processes (e.g. infiltration ponds or wetlands) to manage runoff water. Source: AUCKLAND CITY COUNCIL (2010)

Detention Ponds

(as an example for dealing with stormwater in an intelligent way)

Detention ponds are excavated reservoirs or constructed in natural depressions, which are dry during low flow periods. They provide temporary storage of stormwater runoff attenuation for both stormwater quality and quantity management. To ensure the pollution removal role, ponds must be designed to allow stormwater to sit long enough to settle out the solids.



Extended Detention Basin Components. Source: NJDEP (2004)

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.

- ***Looking up the pipe and down the drain***

  Positioning sanitation within Integrated Water Resources Management. This Briefing Note discusses the linkages between sanitation options and water resources and the ways in which concerns for both can be effectively integrated and managed. (PDF, 22pp, 0.3 mb)
  [Link: http://www.susana.org/lang-en/library/library?view=ccbktypeitem&type=2&id=538]

- ***What is IWRM?***

  GWP (Global Water Partnership) was founded in 1996 to foster integrated water resources management (IWRM) which is defined as the coordinated development and management of water, land, and related resources in order to maximise economic and social welfare without compromising the sustainability of vital environmental systems. A wealth of interesting information can be found on their website regarding IWRM (Integrated Water Resources Management).
  Link: [http://www.gwp.org/The-Challenge/What-is-IWRM/]

- ***Topic: Safe Use of Wastewater in Agriculture***

  On this website, you will find guidelines for the safe use of wastewater, excreta and greywater.
  Link: [http://www.ais.unwater.org/ais/course/view.php?id=6]

- ***EMWater Guide,***

  A practical guide for decision-makers; Improving wastewater treatment and reuse practices in the Mediterranean countries
  Given the fact of water shortage in many Mediterranean countries. on the one hand. and increasing pollution of existing water resources, on the other, the EMWater project aims to improve water management through highlighting innovative solutions in wastewater treatment and promoting reuse of reclaimed water. (PDF,126 pp, 2.6 mb)
  [Link: http://www.ppks.net/__downloads/werbeagentur-referenzen/flyer-broschueren/emwater-guide.pdf]

- ***Low-cost Options for Treating Faecal Sludges (FS) in Developing Countries (7 pages)***

  analyses and discusses the performances of low cost technology for treating faecal sludges (FS) in developing countries. (SANDEC, 2004) (PDF, 7pp, 175 kb)
  [Link: http://www.susana.org/lang-en/library?view=ccbktypeitem&type=2&id=404]

- ***The journal "Sustainable Sanitation Practice", issue 1 of Oct. 2012,***

  presents studies from different regions that mainly show the non-existence of faecal sludge management in most regions. Additionally, the last paper describes of a new technological solution (the LaDePa machine) for producing hygienically safe organic fertiliser from sludge from VIPs. (PDF, 36pp, 175 kb)
  [Link: http://www.ecosan.at/ssp/issue-12-faecal-sludge-management/SSP-13_Oct2012.pdf]

- ***Stormwater Management***

  Stormwater management means to manage surface runoff. It can be applied in rural areas (e.g. to harvest precipitation water), but is essential in urban areas where run-off cannot infiltrate because the surfaces are impermeable. Traditional stormwater management was mainly to drain high peak flows away. Unfortunately, this only dislocates high water loads.
  [Link: http://www.sswm.info/category/implemdetention entation-tools/wastewater-collection/hardware/surface-runoff/stormwater-management]