Module 12

Water Saving

Summary

Water is a limited resource of enormous importance for nature and all living creatures on earth. Climate change and population growth add to the burden on water resources. It is vitally important to conserve water and establish water efficient measures and decrease water scarcity. In this module, water saving methods and techniques for households are discussed in detail and examples of water saving methods are given. Also, the personal responsibility of each human to protect water resources is generally addressed.

Objectives

The pupils can explain which human activities are responsible for the most extensive water usages. They can describe sources of possible water loss within a water supply network and the households. Furthermore, they are able to make suggestions on how to save water in daily life.

Key words and terms

Water conservation, water efficiency, rainwater harvesting

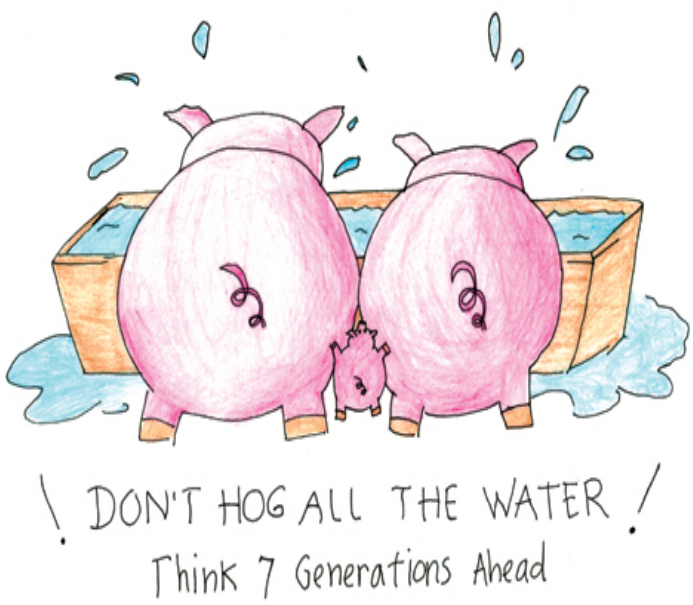
Preparation/materials

Materials	Preparation
Bucket	
Measuring bowl	
Electronic clock or stop-watch	
Precipitation beaker	

Water saving

Introduction

Water is fundamentally important, not only for human beings, but for all other living creatures on earth and the entire environment. Water plays a substantial role in numerous processes on the planet, and is essential for living and non-living elements. We are responsible to preserve quality water for future generations.



Source: http://www.harvesth2o.com/

1. Water conservation

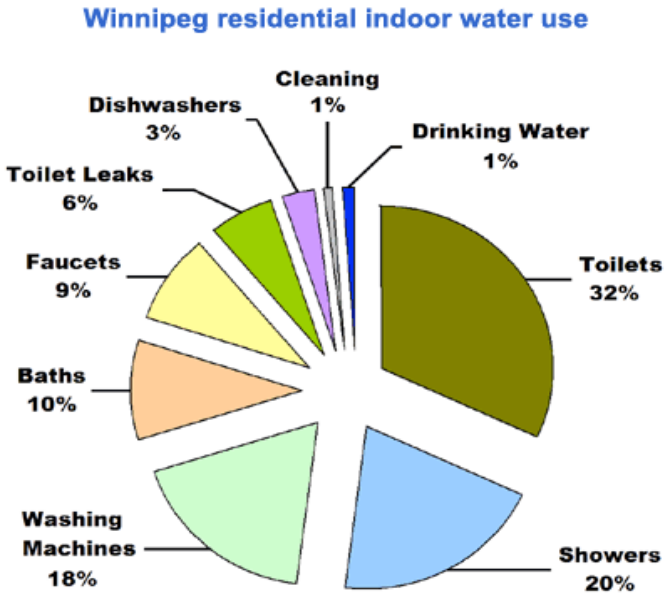
Water is a limited resource. Climate change reduces the availability of water in our geographical area as average annual temperatures increase and average annual precipitation decreases. Population growth also adds to the planet's the increasing burden on water resources.

We all need to take responsibility in monitoring our water consumption and apply water efficient solutions in our households, schools, offices, and factories. It is extremely important to introduce water efficient irrigation systems into our yards and farms. More than 70% of the consumed water serves the needs of agriculture, especially concerning irrigation water (see also module 11).

In our households, the biggest potential for preventing saving water is through the efficient use of water in toilets and bathrooms. Residents of households need to consider options for reusing the water used for toilet flushing, e.g. reusing the flushed water for the irrigation of the garden and lawn. Also, the consideration of not using drinking water for flushing the toilet, which is common, should be an appropriate action.

Leaks are another very large burden to our supply system, and also burden the financial status of our households.

Only one leaking tap may contribute to thousands of litres of water loss per year. Saving water means saving energy and other resources. By doing this, we protect natural resources and help animals and plants that also need water to sustain their lives



Graphic 1: Residential indoor water use on the example of Winnipeg, Canada
Source: www.winnipeg.ca

2. Water efficiency

Water conservation is the process of applying measures for the efficient use of water. This includes actions, change in behaviour, devices, technologies and improved designs to reduce the loss of water (by wasting or leakages), and to increase water reuse. More efficient water use leads to a reduced demand for water. The key for efficiency is reducing the wasting of water, not restricting the use. Examples of water efficient steps include, fixing leaking taps, taking showers rather than baths, installing displacement devices inside toilet cisterns, using dishwashers and washing machines with full loads.

Water efficiency is of growing importance. If present levels of consumption continue, two-thirds of the global population will live in areas of water stress by 2025 according to the Second UN World Water Development Report (2006). Now, 2,6 billion people do not have safe drinking water. Changes in climate, population growth and lifestyles influence the situation.

The graphic above (Graphic 1) gives an example from Canada showing how 35% of the water used within the household is used in the bathroom, and another 32% in the toilet. That means that an average of about 10 000 up to 20 000 litres of drinking water is used per person per year for flushing excreta into the sewerage. About 23% of the water used inside our home is used for laundry. About 10% of the water used inside our home is used in the kitchen. A running kitchen tap can use around 9 litres of water per minute.

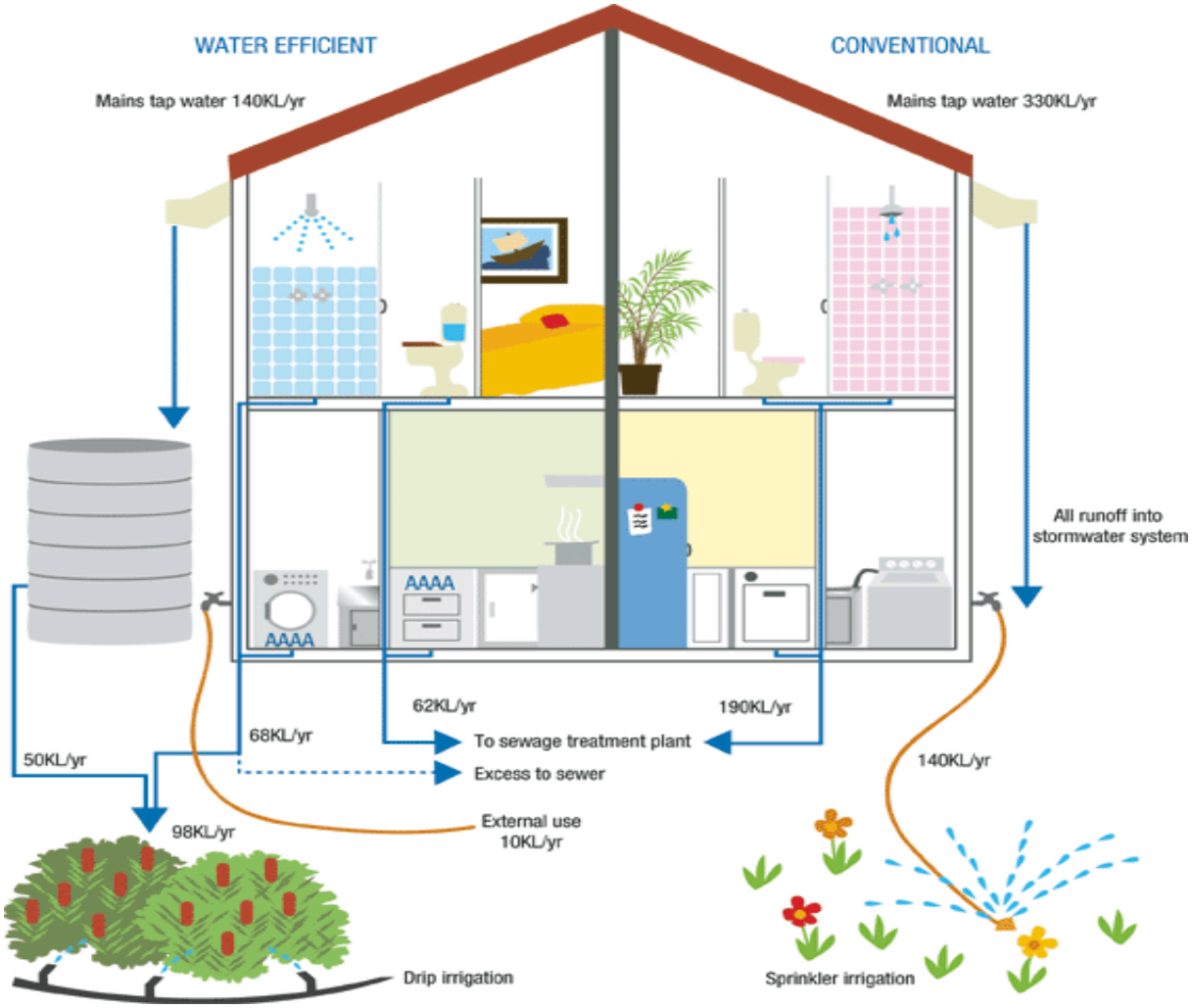
2.1. Simple methods to reduce water waste

We all can be more efficient at home by applying simple methods to reduce water waste, by:

- turning off the tap while brushing teeth or shaving - a running tap can waste over six litres per minute.
- putting a plastic bottle or other displacement device into the toilet cistern to reduce the flush.
- fixing dripping taps. A dripping tap can waste more than 2 000 litres of water per month, which is 24 000 litres per year.
- use the dishwasher and washing machine only when they are full.
- having a short shower instead of a bath. Every minute cut from the shower reduces up to 20l of water.
- washing fruits and vegetables in a bowl rather than under a running tap.

- using leftover water e.g. from washing vegetables. Not all used water needs to be thrown away immediately as it may still be useable for e.g. watering the plants.
  Used water does not necessarily mean that it is not useful anymore.
- using a bucket and sponge when washing the car rather than a running hosepipe.
- reusing grey water to flush the toilet or use a water-less or low flush- toilet
  (see also below chapter 2.2. and module 8).
- using water saving devices like aerators, etc. to reduce the water amount used in the kitchen sink.
  Tap aerators break up the solid flow of water, effectively adding air to the water flow. This results in less water passing out of the tap each second.
- checking for toilet leaks. A barely visible leak into your toilet bowl can waste more than 4 000 litres of water per year. Visible constant leaks (creating a hissing sound) can waste 95 000 litres per year.

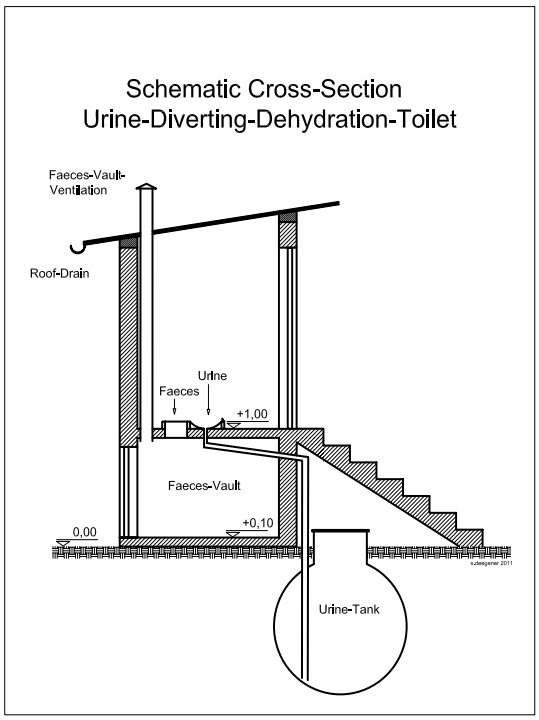
There are many other simple methods of saving water. Pupils should be encouraged to give other examples of activities that are already practised in their households or offer other innovative suggestions.



Graphic 2: Water efficient house
Source: www.thinkwater.act.gov.au

2.2. Example of a waterless toilet (*Urine Diverting Dry* or *Ecosan* Toilet)

Urine diverting dry toilets (UDDT, also called *Ecosan* toilets) are very useful in water scarce regions or in regions where no sewage or water supply system exists. A special urine-diverting toilet seat or squatting slab is used for a proper diversion of the urine from the faeces. With an *Ecosan* toilet urine and faecal matter are stored and treated separately. See graphic 3. No water is needed for flushing because faeces are stored in a dry condition and covered with ashes or saw dust, making sure that bad odours and flies are kept away. After a certain storage and/or composting period, the products are used as a fertiliser in the fields. See also module 8.



Graphic 3: Cross-section of a urine diverting dry (dehydration) toilet (UDDT).
Source and design Stefan Deegener, TUUH

Interior of an Ecosan toilet, toilet (UDDT), constructed inside of a house in Bulgaria. Photo Earth Forever

3. Rainwater harvesting

Rainwater harvesting means collecting, storing and reusing precipitation water. Rainwater is a reliable source of water for livestock, irrigation, as well as other typical uses of water. Rainwater collected from the roofs of buildings can make an important contribution to household needs. In some places, rainwater may be the only available or economical water source. After an appropriate treatment, rainwater can be used as drinking water. Rainwater harvesting systems can be simple to construct from inexpensive local materials and are potentially successful in most habitable locations.
The potential amount of collected water depends on the size and type of the collection surface (for example square metre of roofing), annual volume of precipitation and the rate of water lost, e.g. by the evaporation on the roof.

Rainwater harvesting solutions
Source: www.indiamart.com/hitechdrillingengineers rainwater-harvesting-solutions.html

Rain water barrels
Source: www.rain-barrel.net

The following example gives an example how to calculate the amount of water which can be harvested from a roof or plot.

1. Area of plot = 100 m^2
2. Height of the annual rainfall = 0.6 m (600 mm)
3. Volume of rainfall over the plot = area of plot (m^2) x height of rainfall (mm) = 100 m^2x 600 mm=60,000l
4. Assuming that only 60 per cent of the total rainfall is effectively harvested: volume of rainfall over plot x 0.6: 60,000 litres x 0.6 = volume of annual water harvested = 36,000 litres

4. Exercises and Questions

- Mathematical task: Which amount of water can be collected annually from the roof of the school that could be used for rainwater harvesting? How much money will that save for one year?
- Interview the oldest persons you know and write a short story of how people used to collect and use rainwater before. Examples for questions to be asked:

  Name of the interviewed person and how it happens that you know him/her.

  How old is he/she (year of birth)?

  Was he/she living in a rural or urban area?

  Does his/her household have access to tapped water?

  How was his/her family supplied with water?

  How much water was used in their household for the use of the family (what kind) and/or for animals and/or for the garden?

  Which needs were prioritised?

  Were they collecting rainwater in their households?

  How was the rainwater collected? How often and to which amounts?

  What was rainwater used for?

  What was the treatment they used to keep rainwater clean or to purify it?

  Are they collecting and using rainwater now? Why?

  Which amounts of water do they collect now and what are they using it for?

  What is his/her advice for young people concerning protection and usage of water?

- Make some observations at home:
  - How much water is used for flushing the toilet and for irrigation?
  - How much water is wasted approximately if the tap is open while brushing the teeth?
  - Which kind of everyday activities consume the largest amounts of water?
  - What can people do to reduce the usage?
- Measure weekly or monthly the amount of precipitation with a precipitation meter.
- Measure how much water will run from the tap while brushing teeth or while shaving.
- How much water runs out of the tap for 1 minute? (Save the water used for this experiment in order to use it for another use as well.)
- Project: Draw a plan for rainwater and wastewater harvesting for the school building:
  - Find out the required measures and calculate what could be the amount collected.
  - Propose which needs could be met with rainwater harvesting and what would be the savings for the school budget.
  - Give a proposal what could be done instead with the saved financial resources.

WSP related activities:

- Gather information from the water supplier in order to assess the quantity of water:
  - How much water (cubic meter) is yearly/monthly supplied into the network?
  - How much water is yearly/monthly used and paid by the consumer?
  - How much drinking water is non-accountable – is lost by leakages within the network?
- Interview a consumer on his/her daily or yearly water need from the water supply and/or from a well.
- Make an inventory/estimation of how many taps, or flush-toilets within the households are leaking (by interviews, observations).
- Make an estimation of the amount of yearly precipitation within the area of the village.
- Relate the level of precipitation/evaporation to the water usage in the village.
- Find out if the water supplier or local experts have information about the balance between the groundwater use and the amount of renewed groundwater.

5. Text sources and further reading

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