



Solar Water Disinfection (SODIS)

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Depending on the initial situations and respective local circumstances, there is no guarantee that single measures described in the toolbox will make the local water and sanitation system more sustainable. The main aim of the SSWM Toolbox is to be a reference tool to provide ideas for improving the local water and sanitation situation in a sustainable manner. Results depend largely on the respective situation and the implementation and combination of the measures described. An in-depth analysis of respective advantages and disadvantages and the suitability of the measure is necessary in every single case. We do not assume any responsibility for and make no warranty with respect to the results that may be obtained from the use of the information provided.



Contents

1. Concept
2. How it can optimize SSWM
3. Treatment efficiency
4. Operation and maintenance
5. Applicability
6. Advantages and disadvantages
7. References

1. Concept

Background

- simple low-cost, household-level drinking water treatment technology
- uses solar radiation to improve microbiological quality of drinking water
- one of the recommended HWTS by World Health Organisation (WHO).



SODIS user's instruction

Source: Samuel Luzi (Fundacion SODIS), Regula Meierhofer, (EAWAG/SANDEC)

1. Concept

Working principal

- PET (Polyethylene terephthalat) bottles or bags (1 to 2 litres) filled with low turbidity water and exposed to sun light
- optical inactivation (UV-A radiation):
 - *only slightly attenuated by clouds*
 - *turbidity reduces amount of UV radiation that penetrates water (→ containers should not exceed depths of 10 cm)*
- thermal inactivation (infrared light):
 - *increased water temperatures reduces required exposure time*
- Exposure time:
 - *6 hours (bright to 50% cloudy sky) to 2 days (100% cloudy sky)*

1. Concept

The 4 SODIS steps (adapted from <http://www.sodis.ch/>)



Step 1: Wash the bottle well the first time you use it



Step 2: Fill up the bottle fully and close the lid well



Step 3: Expose the bottle to the sun from morning until evening for at least six hours



Step 4: The water is now ready for consumption

1. Concept

Examples



Indonesian SODIS users
Source: SODIS EAWAG

1. Concept

Examples



Prototype of SODIS bag for use in humanitarian missions

Source: <http://www.sodis.ch/>

2. How it can optimize SSWM

- simple and extremely low cost method to improve microbial quality of drinking water at household levels
- be used in both rural areas and urban settings

3. Treatment efficiency

Microbiological studies demonstrate effectiveness of SODIS against a range of germs

Bacteria

	Disease	Reduction with SODIS method (6h, 40°C)
Escherichia coli	Indicator for water quality & enteritis	99.999%
Vibrio cholera	Cholera	99.999%
Salmonella species	Typhus	99.999%
Shigella flexneri	Dysentery	99.999%
Campylobacter jejuni	Dysentery	99.999%
Yersinia enterocolitica	Diarrhoea	99.999%

Virus

	Disease	Reduction with SODIS method (6h, 40°C)
Rotavirus	Diarrhoea, dysentery	99.9 - 99.99%
Polio virus	Polio	99.9 - 99.99%
Hepatitis virus	Hepatitis	Reports from users

Parasites

	Disease	Reduction with SODIS method (6h, 40°C)
Giardia species	Giardiasis	Cysts rendered inactive
Cryptosporidium species	Cryptosporidiasis	Cysts rendered inactive after > 10h exposure
Amoeba species	Amibiasis	Not rendered inactive. Water temperature must be above 50 °C for at least 1h to render inactive!

Overview on most important research results

Source: SODIS EAWAG

4. *Operation and maintenance*

Check on water turbidity

Turbidity of raw water must be less than 30 NTU.

Water turbidity can easily be determined:

- place full bottle on a newspaper headline (letters should have size of about 1.5 cm) and look through bottle from top to bottom
- water turbidity is less than 30 NTU if letters are readable
- if not, water must be filtered first

Replacement of bottles

Old bottles and bottles that are no longer transparent (about 6 to 12 months of daily use)

5. Applicability

- no replacement to access to safe drinking water
- simple and extremely low cost method to improve the microbial quality of drinking water at household levels (small volumes)
- used in rural areas and urban slums; PET bottles generally more available in urban regions
- cannot treat chemically polluted water (e.g. arsenic, fluoride or industrial and agricultural organic contaminants)
- secondary treatment of water coming from an improved source (e.g. well water), which does not meet the microbial quality standards

6. *Advantages and disadvantages*

Advantages:

- improves microbiological quality of drinking water
- extremely low-cost
- easy to understand and simple to use
- relies on locally available resources, plastic bottles and sunlight

Disadvantages:

- does not treat chemical pollution
- is strongly climate and weather dependent
- treatment of small volumes
- requires PET bottles (or plastic bags)
- large efforts in terms of promotion and information to have an impact

7. References

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