

Guidelines for Water Reuse International and Regional Experiences

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Why Guidelines ?

- Reuse of water as resource in water scarce regions is increasingly gaining importance
 - Agricultural reuse of water can be related to health risks (farmers, consumers)
 - Constituents of reclaimed water effect plant growth, crop yield, environment, soil conditions, irrigation infrastructure
- ⇒ Guidelines needed to reduce negative impacts and to boost reuse of valuable resource

Guidelines for water reuse in agriculture...

...focus on	<ul style="list-style-type: none">• health and environmental protection
...define	<ul style="list-style-type: none">• extent of required wwt• required water quality through limit values (bacteriological / physico-chemical)• irrigation method• control of areas and/or crops

Standards for safe reuse...

...need to be....

- a) realistic in relation to local conditions (epidemiological, socio-cultural, technical, environmental factors)
- b) affordable
- c) Enforceable

- ⇒ If guidelines are set to strict and are therefore not affordable/enforceable, in worst case two options remain:
- no water reuse
 - (illegal) reuse without applying guidelines

Parameters typically regulated in guidelines

- (1) Microbiological parameters
 - (2) Physico-chemical parameters
 - (3) Other parameters: crop restriction, irrigation practices, human exposure control
- ⇒ to protect human and environmental health
 - ⇒ to sustain long-term soil productivity
 - ⇒ to maintain functioning of irrigation schemes

(1) Microbiological parameters

- Indicators for microbiological contamination
 - ⇒ limit values for
 - total coliforms
 - fecal coliforms
- Indicators for parasite contamination
 - ⇒ limit values for
 - helminth / nematodes eggs

(2) Physico-chemical parameters

- Limit values for
 - salinity
 - heavy metals
 - nutrients (N, P, K)
 - suspended solids
 - pH
 - and others

(3) Other parameters

- Specific requirements for wastewater treatment
- Crop restriction, e.g.:
 - no vegetables that can be eaten raw
 - no edible plant parts, etc.
- Restriction of irrigation practices, e.g.:
 - no spray/sprinkler irrigation
- Human exposure control and awareness
 - farm workers
 - their families
 - crop handlers
 - consumers of crops
 - people living close to irrigated areas

Different approaches – International experience

- Set strict limit values for microorganisms and chemicals
(USA, California, Spain, etc.)
 - ⇒ costly
- Crop restrictions + irrigation practices
(many developing countries)
 - ⇒ difficult to monitor / control
- Combination of use restrictions + easy-to-measure limit values for chem. and biol. sum parameters
(Mexico, Tunisia, WHO a.o.)
 - ⇒ comprehensive and pragmatic approach
targeting minimum safety and conducive
to promoting water reuse

WHO Guidelines

(1989, revised version expected end of 2005)

- focus on protection of human and public health
 - 3 categories (A, B, C) defined by
 - reuse restriction
 - limit values for fecal coliforms, intestinal nematodes
 - type of wwt
 - set the benchmark for the development of water reuse guidelines
 - offer framework guidance to decision makers
- ⇒ goals should be modified according to local needs to be in line with the capabilities of the country in question

Mexican Guidelines (1996)

- designed to be achievable with the technology and resources available at present / near future
- 2 categories (restricted and unrestricted reuse) defined by
 - reuse restriction: restricted category excludes salad crops and vegetable eaten raw
 - limit values for fecal coliforms, helminth eggs
 - limit values for heavy metals, cyanides
- realistically policed by reducing the amount of monitoring required
- sufficient to protect “at-risk” groups

Mediterranean Recommendations

(proposed by Bahri and Brissaud, 2002)

- proposed for all Mediterranean countries
- minimum requirements to constitute the basis of water reuse regulations in every country in the region
- higher protection standards possibly for developed countries
- 4 categories of reuse (I-IV) defined by
 - reuse restriction
 - limit values for fecal coliforms, intestinal nematodes, suspended solids
 - type of wastewater treatment

Guiding Questions

When wastewater reuse guidelines are formulated, the specific local conditions have to be considered:

- What are the **specific needs** (for example typical crop types, irrigation systems, etc.)?
- What is the typical **wastewater composition**, what treatment is available?
- What are the **challenges** in enforcing water reuse guidelines?