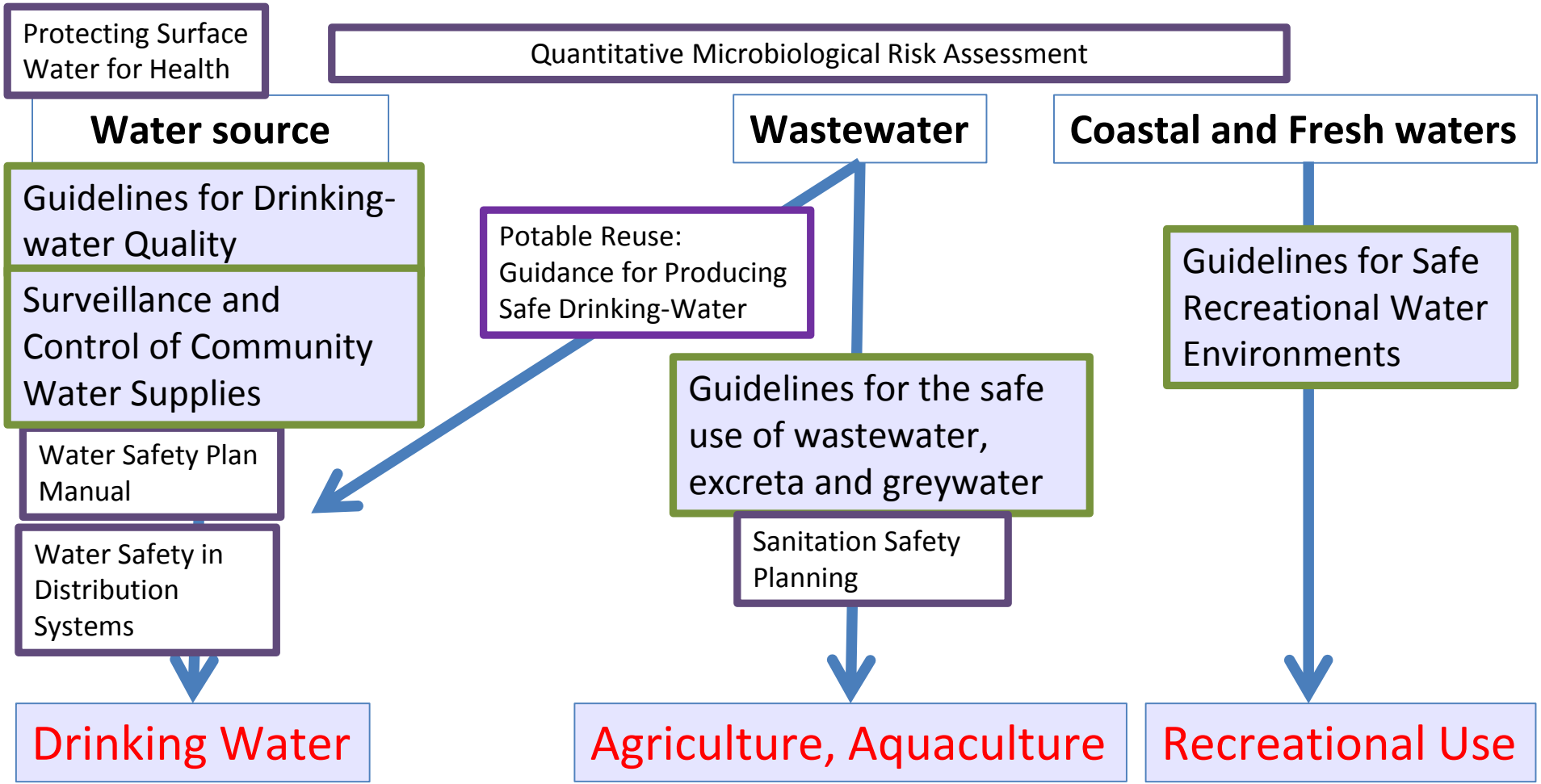
Food and Agriculture Organization of the United Nations

World Health Organization

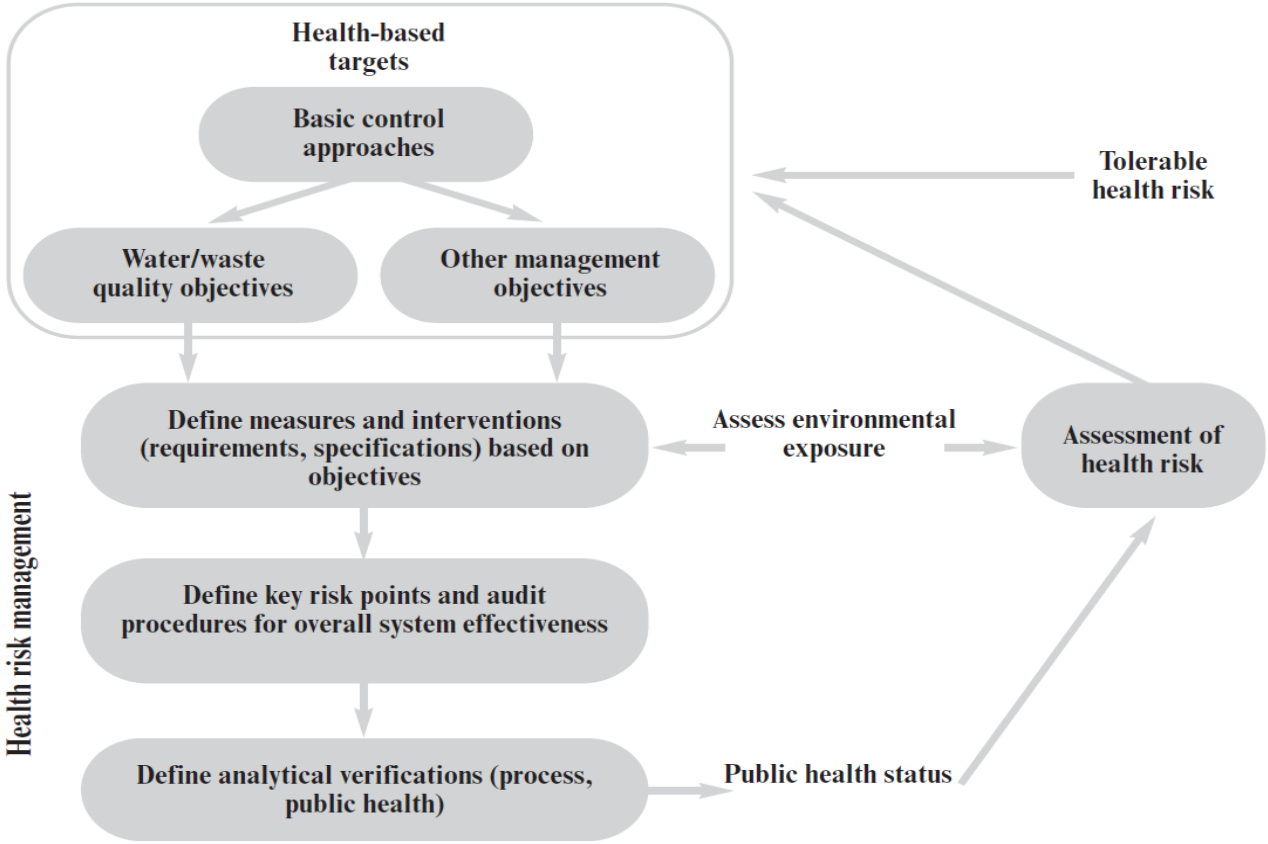
Overview of Existing FAO and WHO resources on Water Quality and Safety

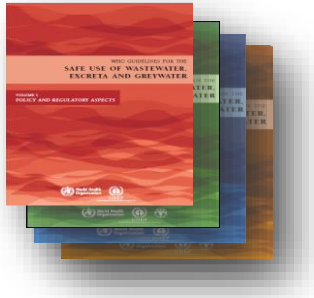
WHO Guidelines

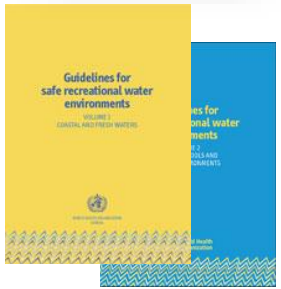


The Stockholm Framework

The basis of all WHO Water Quality Guidelines



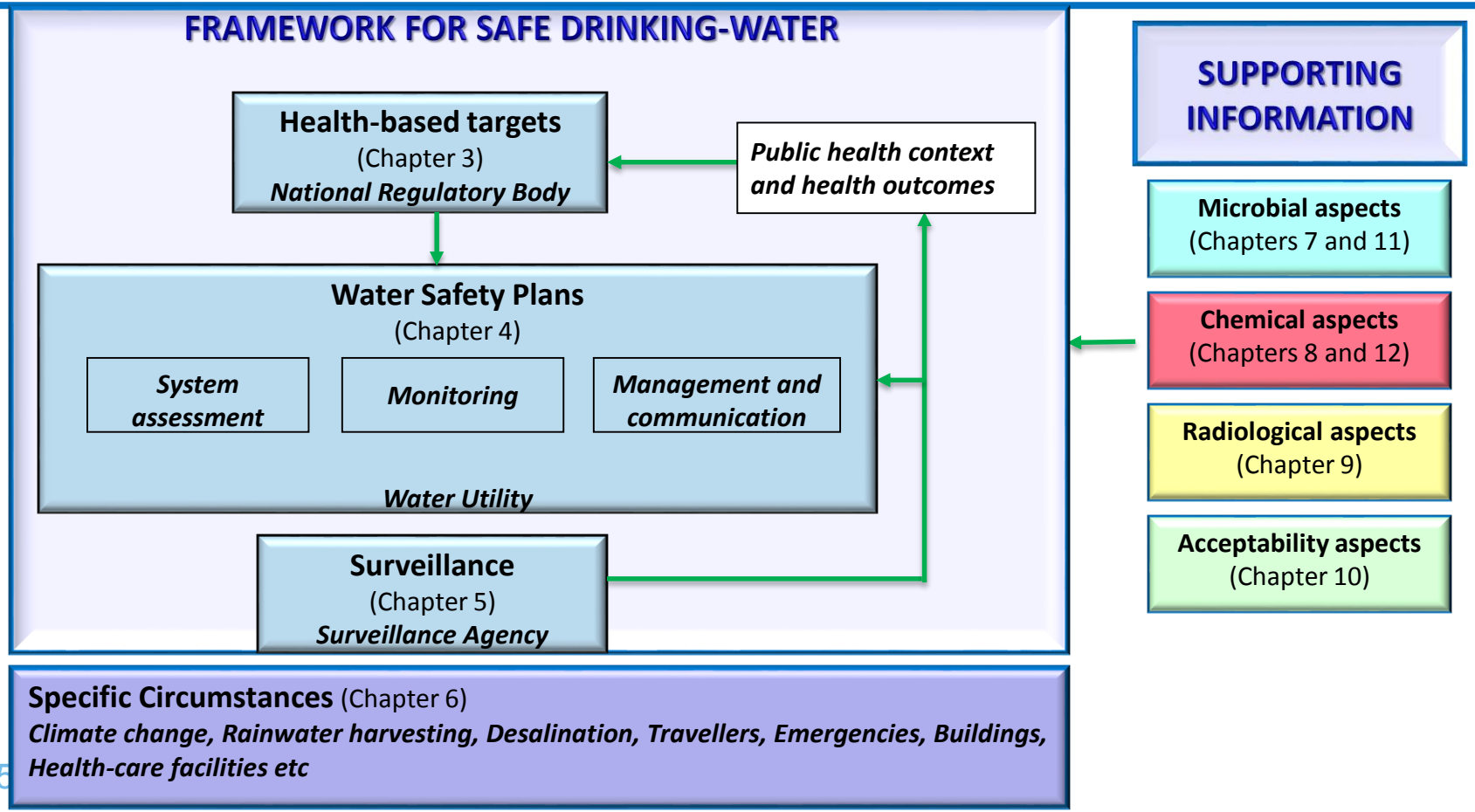




Drinking-Water Quality Guidelines (GDWQ) 1958-2016

Aim	• **Protection of human health**
Target Audience	• **Primarily regulators but wide use by water suppliers and practitioners**
Approach ***Evidence-based***	• **Best available evidence - science and practice** • **Advisory in nature allowing local adaptation considering overall health protection strategies** o ***Social, cultural, economic & environmental context*** • **Preventative incorporating multiple barriers** • **Incremental improvement**

Content of Guidelines



Health-Based Targets

Type of target	Nature of target	Typical applications	Notes
Health Outcome	• Defined tolerable burden of disease • No adverse effect/ negligible risk	Used to inform derivation of other targets	Guidelines define a tolerable burden of disease of 10^{-6} DALY per person per year
Water Quality	Guideline Values	Chemical hazards	Based on individual chemical risk assessment
Performance	Specified removal of hazards	Microbial and chemical hazards	Set at national level based on risk assessment and health outcome targets
Specified technology	Defined technologies (treatment processes)	Control of microbial and chemical hazards	

Water Treatment Technologies

Table 7.8 Reductions of bacteria, viruses and protozoa achieved by household water treatment technologies

Treatment process	Enteric pathogen group	Baseline removal (LRV)	Maximum removal (LRV)	Notes
Chemical disinfection				
Free chlorine disinfection	Bacteria	3	6	Turbidity and chlorine-demanding solutes inhibit this process; free chlorine × time product predicts efficacy; not effective against *Cryptosporidium* oocysts
	Viruses	3	6	
	Protozoa, non-*Crypto-sporidium*	3	5	
	Crypto-sporidium	0	1	
Membrane, porous ceramic or composite filtration				
Porous ceramic and carbon block filtration	Bacteria	2	6	Varies with pore size, flow rate, filter medium and inclusion of augmentation with silver or other chemical agents
	Viruses	1	4	
	Protozoa	4	6	
Membrane filtration (microfiltration, ultrafiltration, nanofiltration, reverse osmosis)	Bacteria	2 MF; 3 UF, NF or RO	4 MF; 6 UF, NF or RO	Varies with membrane pore size, integrity of filter medium and filter seals, and resistance to chemical and biological ("grow-through") degradation
	Viruses	0 MF; 3 UF, NF or RO	4 MF; 6 UF, NF or RO	
	Protozoa	2 MF; 3 UF, NF or RO	6 MF; 6 UF, NF or RO	

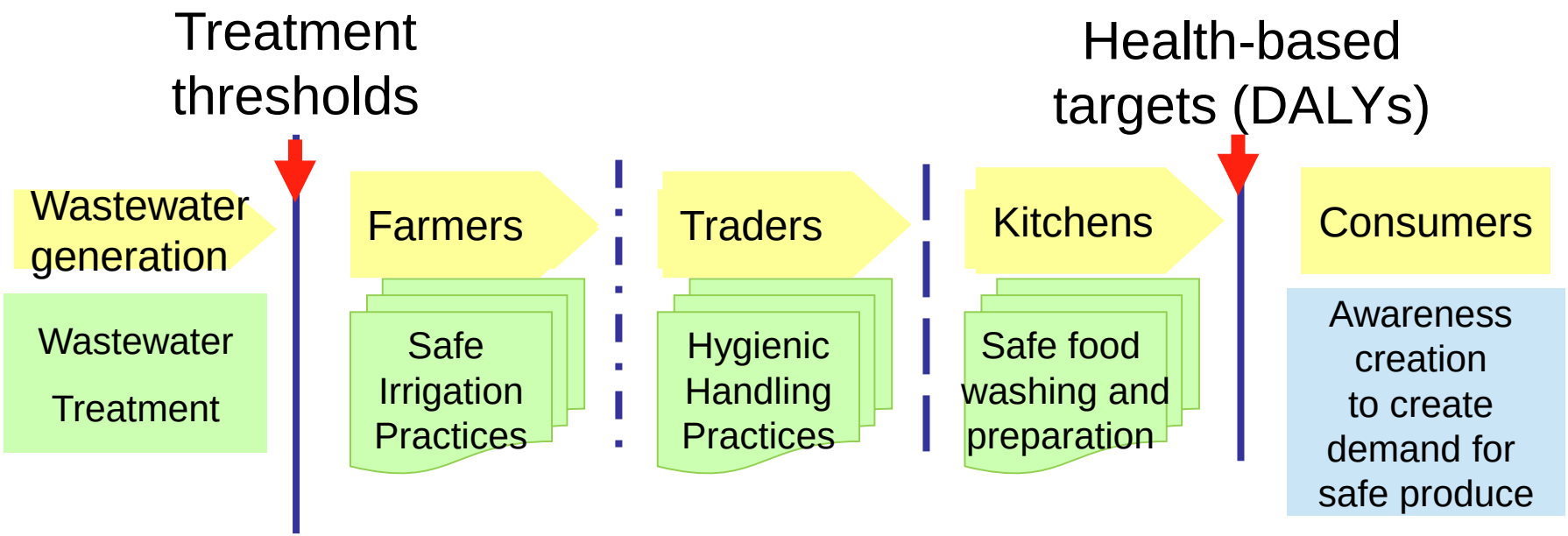
Combination of treatments to reach performance targets

WHO Guidelines for Safe Use of Wastewater, Excreta and Greywater (3rd Edition)

Objective: To Maximize the ***protection of human health*** and the ***beneficial use*** of human waste.

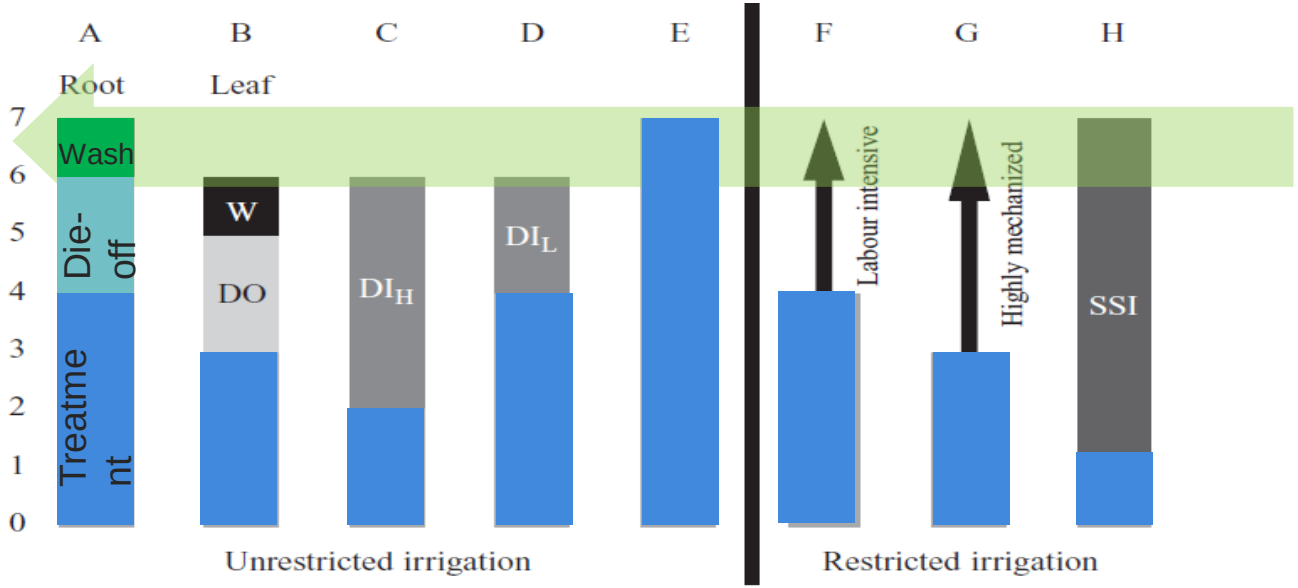
Workers, community, and consumers

Health-based targets



- *WHO guidelines adopt 10^{-6} DALYs – equivalant to 1 excess case of cancer per 100,000 people.*
- *Countries may choose to start lower at 10^{-4} or 10^{-5} DALYs*

How can we reach that target?



Aiming for total of 6-7 log reductions by adding up multiple barriers

Different levels of treatment depending on use and post treatment barriers

T: Treatment

DO: Die-off

W: washing of produce

DI: drip irrigation (H: high crops, L=low crops)

SSI: subsurface irrigation

Wastewater treatment processes

Table 5.2 Log unit reduction or inactivation of excreted pathogens achieved by selected wastewater treatment processes

Treatment process	Log unit pathogen removals[a]			
	Viruses	Bacteria	Protozoan (oo)cysts	Helminth eggs
Low-rate biological processes				
Waste stabilization ponds	1–4	1–6	1–4	1–3[b]
Wastewater storage and treatment reservoirs	1–4	1–6	1–4	1–3[b]
Constructed wetlands	1–2	0.5–3	0.5–2	1–3[b]
High-rate processes				
Primary treatment				
Primary sedimentation	0–1	0–1	0–1	0–<1[b]
Chemically enhanced primary treatment	1–2	1–2	1–2	1–3[b]
Anaerobic upflow sludge blanket reactors	0–1	0.5–1.5	0–1	0.5–1[b]

Key Concepts

- System assessment
- Hazard identification
- Risk assessment
- Multiple barriers for risk management
- Monitoring (operational and verification)
- Incremental improvement

Other documents on water quality for agriculture

- Water for animals, for irrigation, safe use of water in urban and peri-urban horticulture
- Focus on quality as it relates to agriculture production rather than from the safety of the resulting food for human consumption

Conclusions

- Clean water- not a concept that exists in these documents
- Guidance values are not mandatory, give flexibility for local situations, and allow for progressive improvements
- Risk assessment and management of water safety have been addressed extensively.
- The primary audience for this work has been the water management community. It does not explicitly address the food safety management community.
- How can we bridge between the guidance on water to the needs for the food safety management community?

Way forward

- No single value for clean water, context specific
- Need guidance on defining clean water
- Build on examples on irrigation water (Guidelines for Safe Use of Wastewater, Excreta and Greywater)
- What other key examples needed?
- Use of examples to develop guidance to bridge between the water guidance and food safety needs