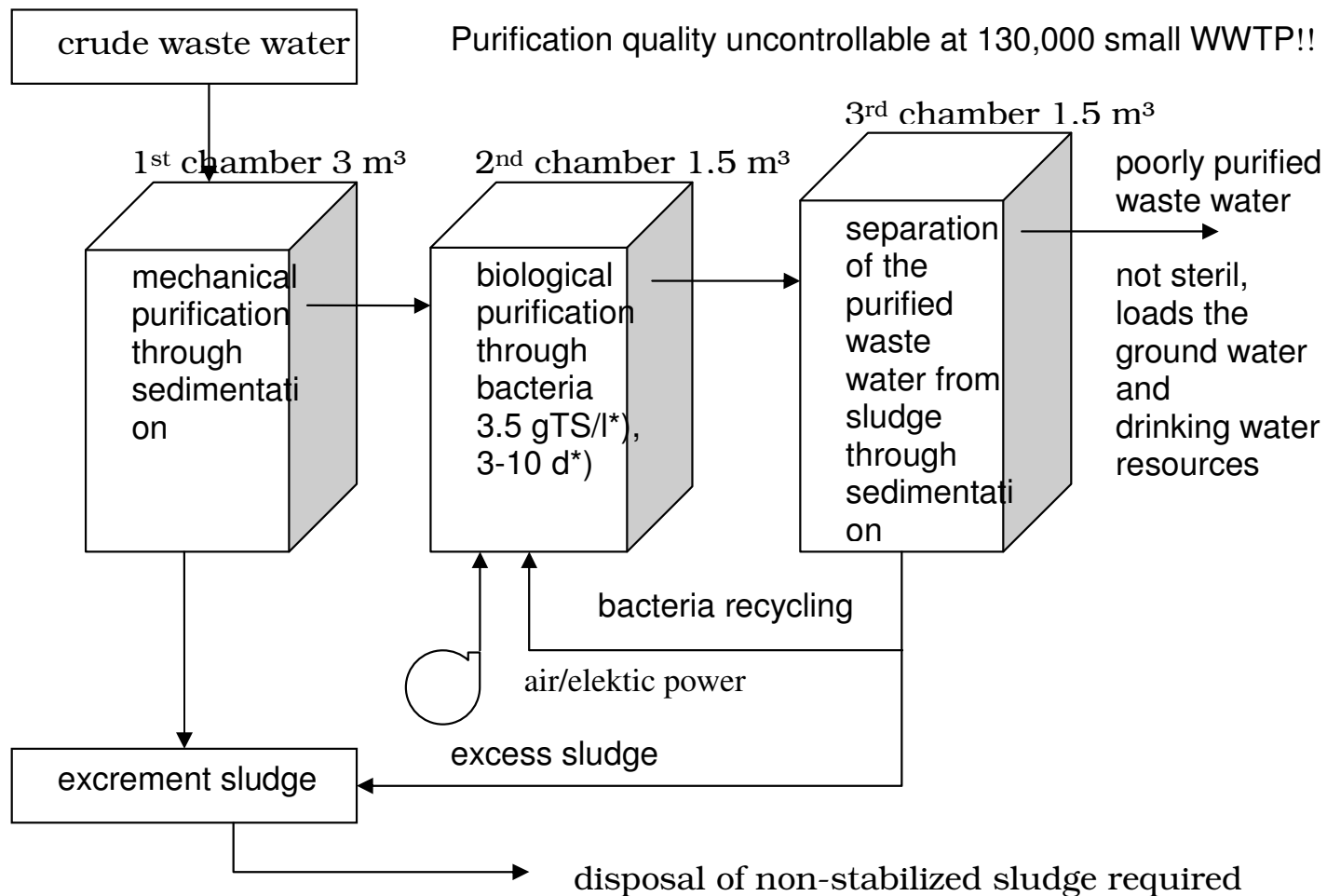


**Economic and sustainable
disposal of waste water,
sludge and organic waste
materials as well as
recovery of water and
reuse for several purposes
including drinking,
in extreme locations**



*) small dry substance and small age of sludge require large volumes
 no re-use of the purified waste water possible
 drainage pit required
 high re-investment cost and retrofit for future requirements

Principle of the conventional methods

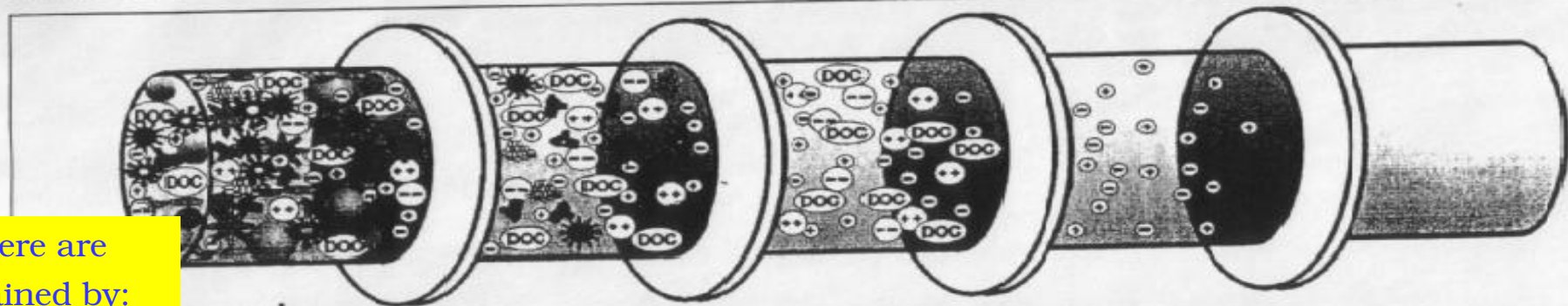
Delimitation of the Membranes

Abgrenzung Membranen

Removal of substances contained in water through membrane filtration of different separation sizes

Bild 1:

Entfernung von Wasserinhaltsstoffen durch Membranfiltration unterschiedlicher Trenngrößen



there are retained by:

Zurückgehalten werden durch:

folgende Wasserinhaltsstoffe

Mikrofiltration
> 0,2 µm

Ultrafiltration
0,1 - 0,01 µm

Nanofiltration
0,01 - 0,001 µm

Umkehrosmose
< 0,001 µm

Zooplankton
Algen
Trübungen
Bakterien
Suspendierte Partikel

Makromoleküle
Viren
Kolloide

organische Verbindungen
zweiwertige Ionen

einwertige Ionen

monovalent ions

bivalent ions

colloids, viruses

bacteria

the following substances contained in water

erforderliche Druckdifferenz:

0,2 - 5 bar

1 - 10 bar

5 - 10 bar

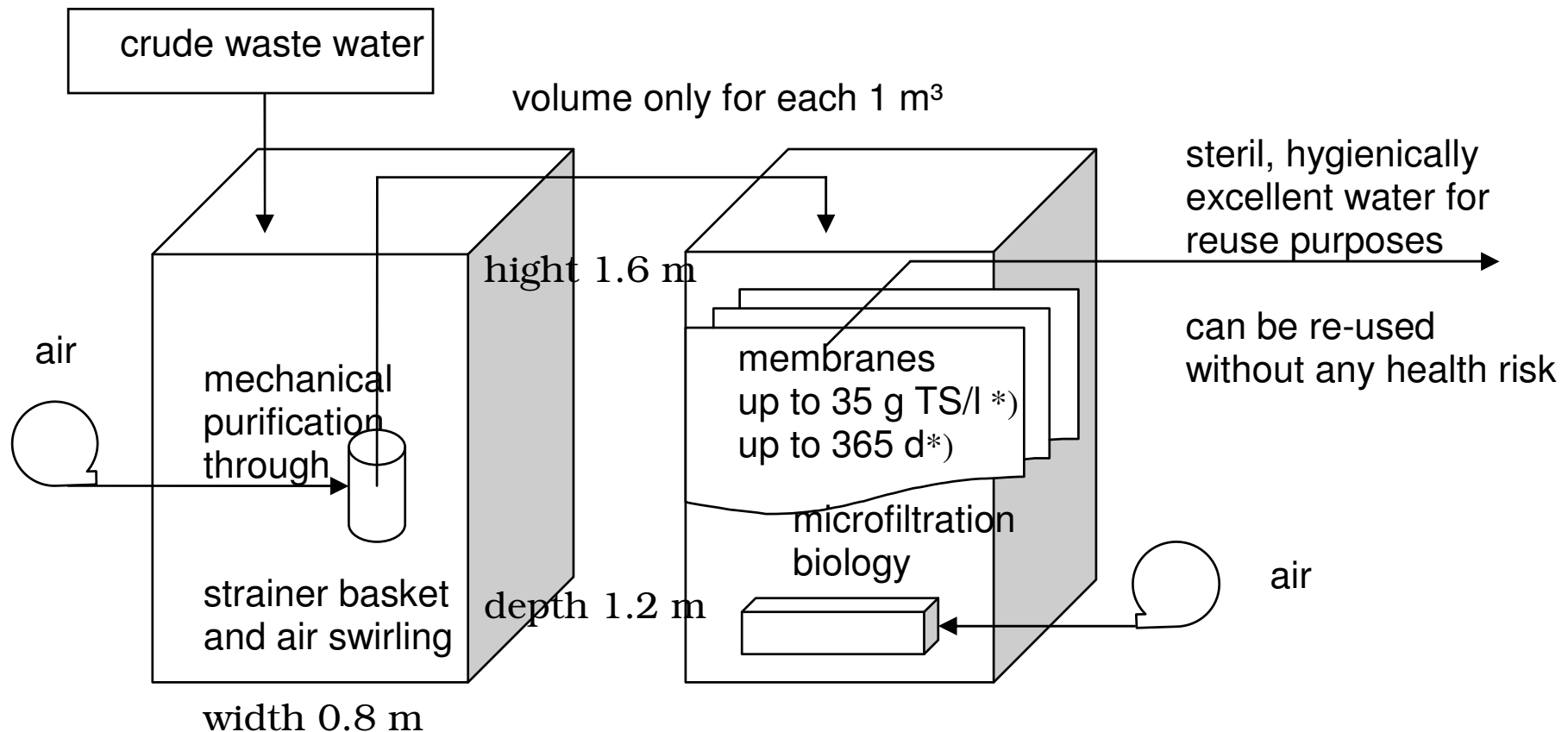
10 - 150 bar

microfiltration

ultrafiltration

nanofiltration

reverse osmosis



*) high biomass concentration and high age of sludge provide for highest possible purification power

membranes retain pathogens, bacteria resistant to antibiotics and germs

occurring sludge at an amount of approx 4 kg of each inhabitant is mineralized

inodorous method and no disposal of excrement sludge

full operation guaranteed for 50 years

capital and operating costs in the long run are very low

Principle of the membrane microfiltration biology



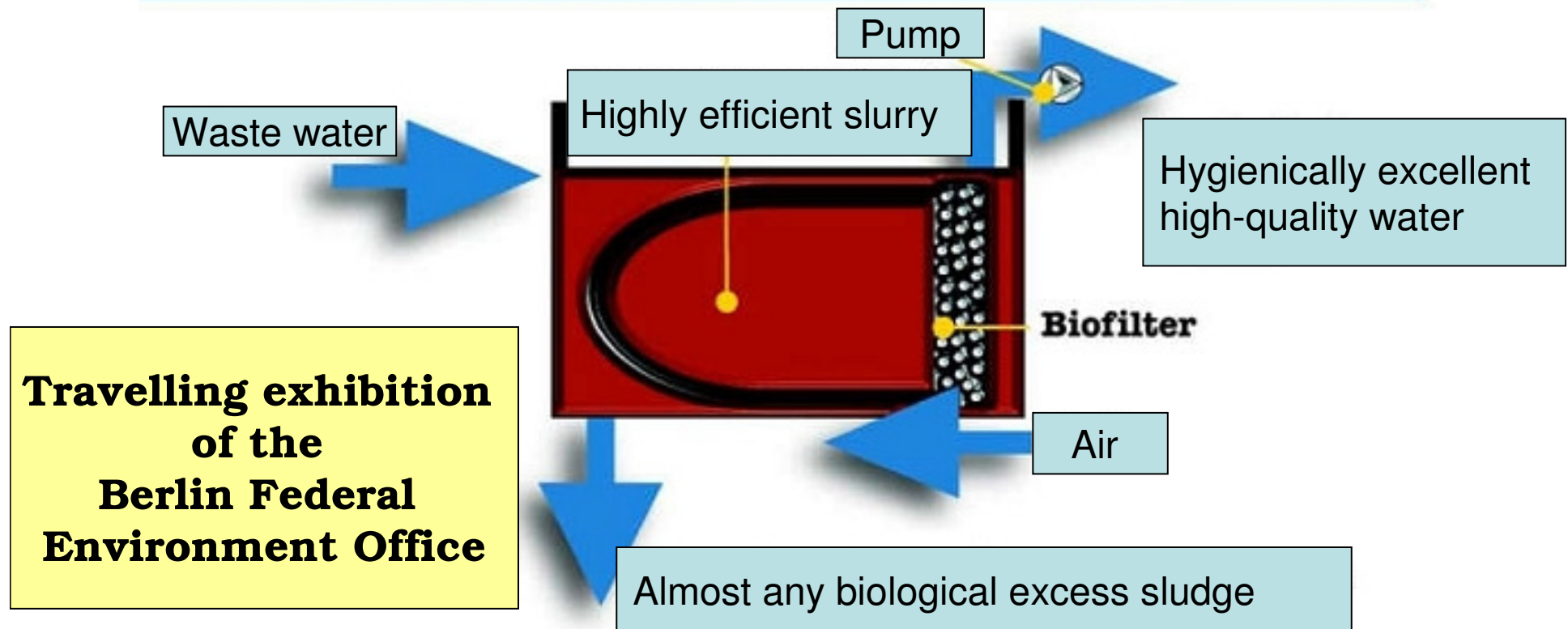
Reuseable steril water from waste water

Microbiological parameters

- Enclosure 1 (to § 5 sections 2 and 3)
- Part I:
General demands on water for human use

Parameter	Limit (number/100 ml)
• Escherichia coli (E. coli)	0
• Enterococcus	0
• Coliform bacteria	0

Highly effective bio-membrane technology



Result of a 2-years test:

Almost complete removal of bacteria and viruses

Almost complete removal of organic substances (COD about 15 mg/l)

High purification stability also in the case of high fluctuations of pollution

Biological self-regulation and self-optimization

Possible use of the purified water as process water,

for watering and for ground water enrichment (for drinking water production)

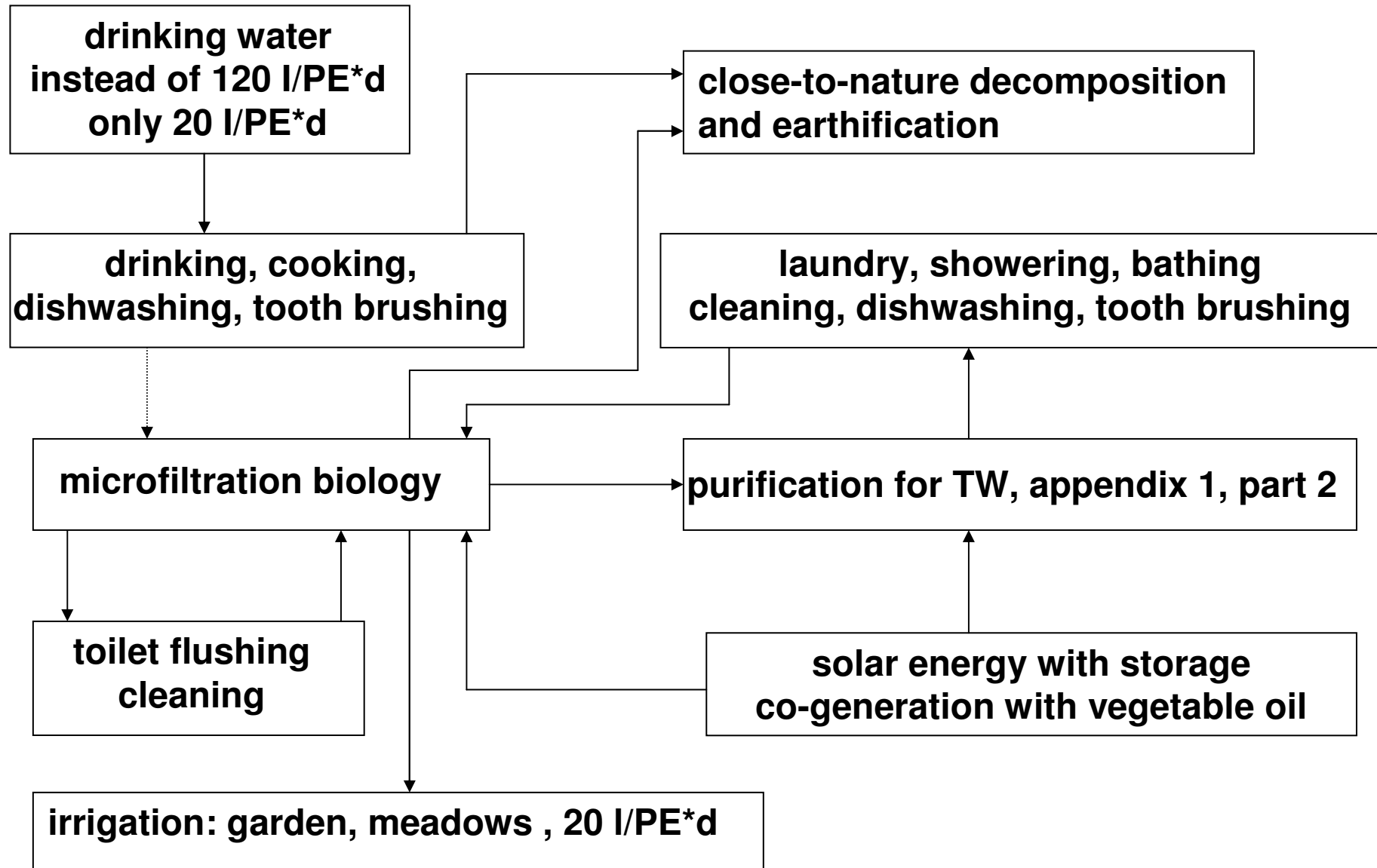
Steril water from decentralized waste water sewage systems as a preliminary stage for the

- enrichment of ground water for the drinking water production**
- toilet flushing**
- garden and park watering**
- direct production of drinking water**

From waste water to drinking water

- **at least two barriers**
- **low energy cost**
- **low maintenance cost**
- **low producing cost**
- **easy to operate**
- **suitable for incorporation in existing systems**
- **sustainable problem solution**

Disposal of waste water, sludge and organic waste materials as well as recovery of industrial water and drinking water in extreme locations

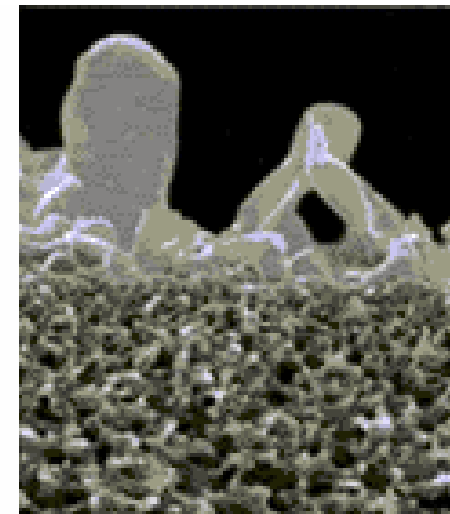
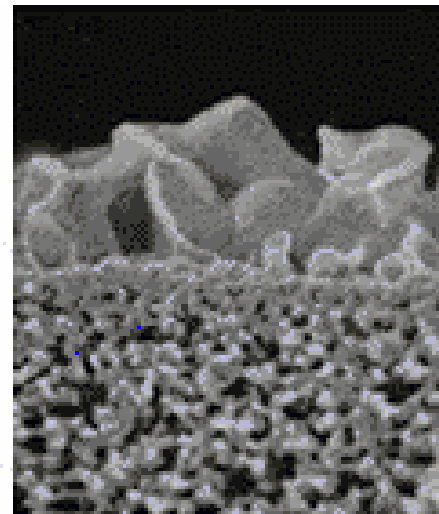
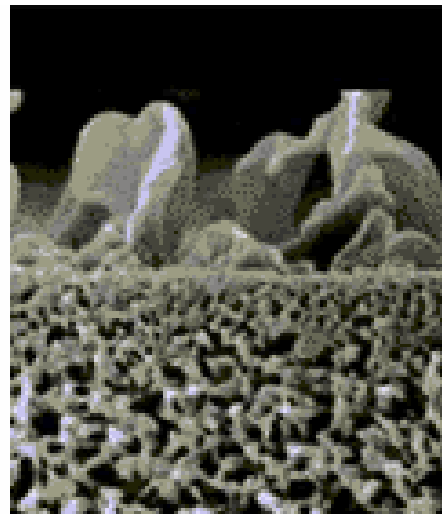
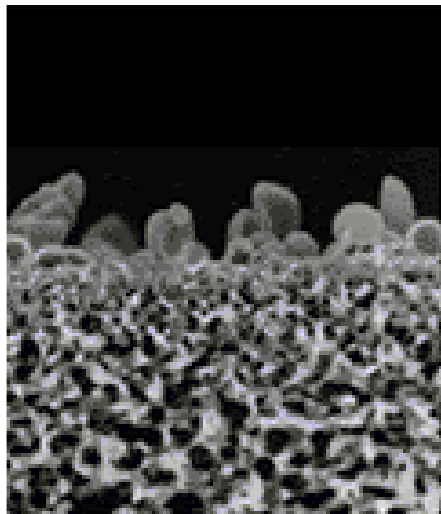


Microbiological parameter

- **Part II:**
Demands on water for human use intended for being bottled or filled in other containers for the purpose of sale

Parameter	Limit
• Escherichia coli (E. coli)	0/250 ml
• Enterococcus	0/250 ml
• Coliform bacteria	0/250 ml
• Pseudomonas aeruginosa	0/250 ml
• Colony number at 22 °C	100/ml
• Colony number at 36 °C	20/ml

Microscopical pictures of

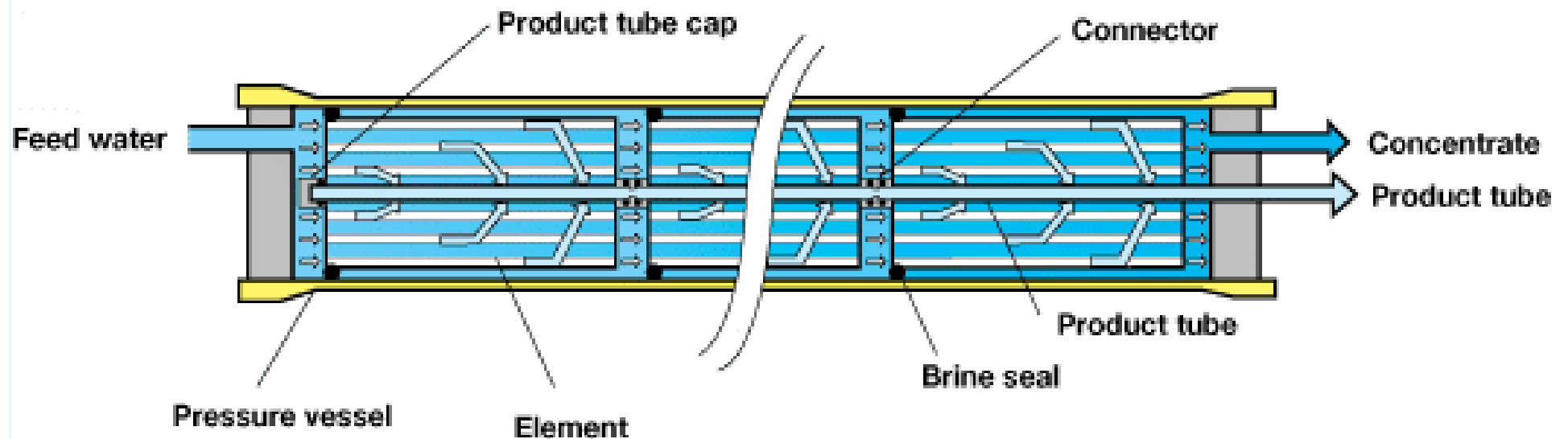


600nm

low pressure membranes

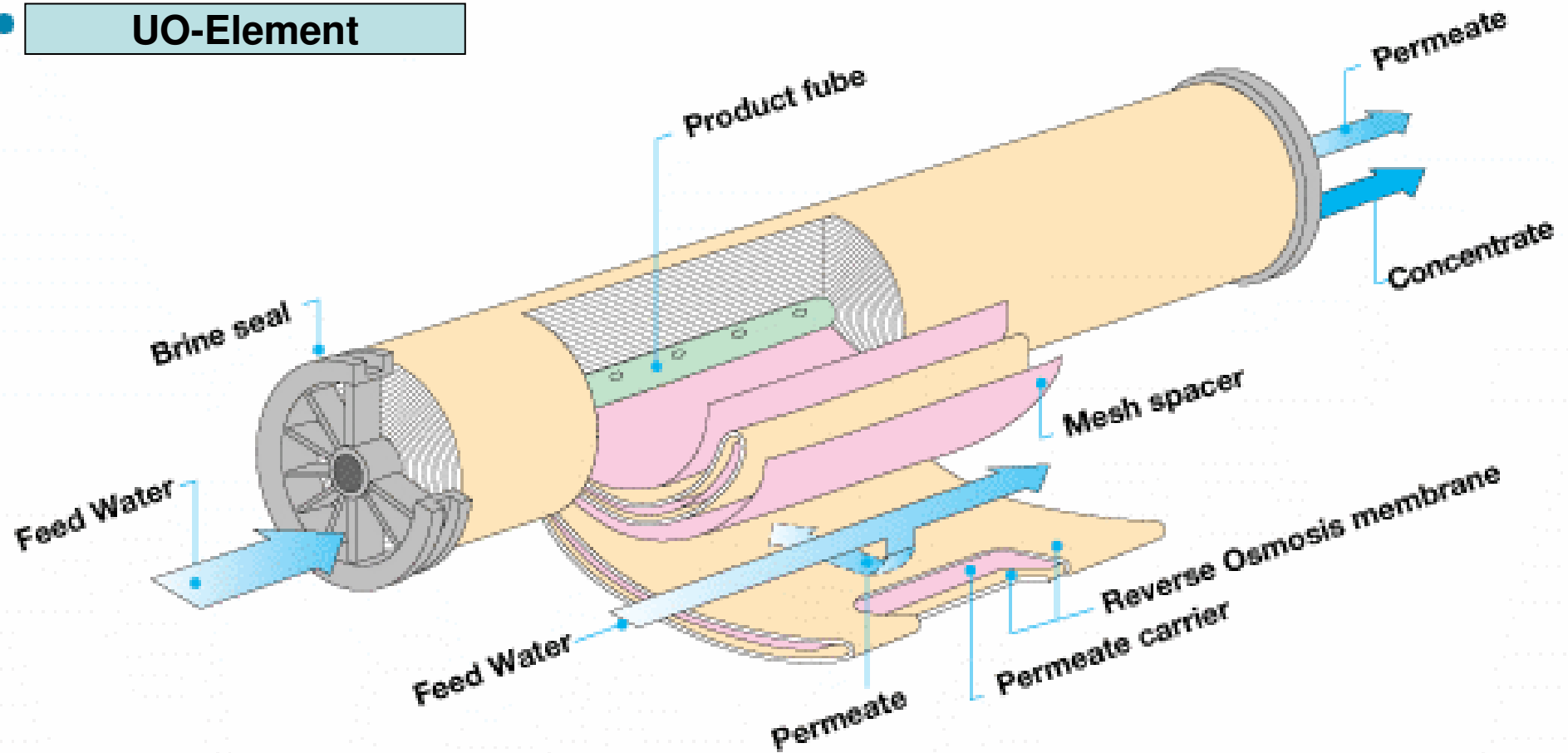
Reverse osmosis

Structure of reverse osmosis module



Reverse osmosis unit

- UO-Element



A photograph of a log cabin built on a grassy hillside. The cabin is constructed from light-colored logs and has a gabled roof with exposed log rafters. A red pipe runs along the side of the cabin. The background shows a forest of bare trees under a clear blue sky. Two text overlays are present: 'Toiletten / Duschen' and 'toilets/showers' in the upper middle, and 'Abwasserrecyclinganlage' and 'waste water recycling system' in the lower middle.

Toiletten / Duschen
toilets/showers

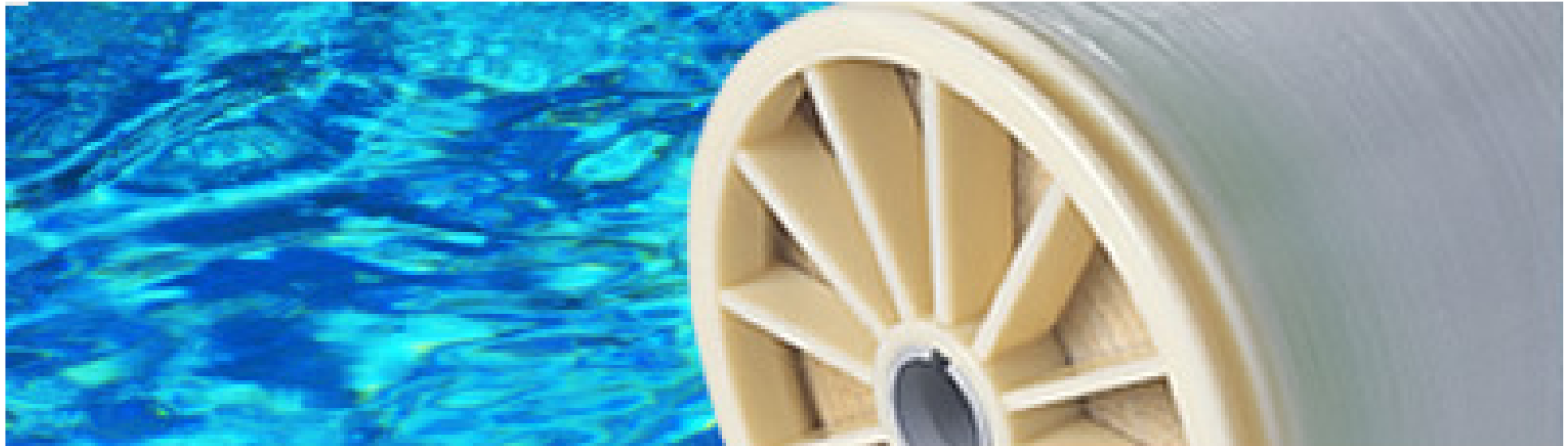
Abwasserrecyclinganlage
waste water recycling system





Solar energy
with storage

Thank you for your attention



**Reliable technology for the production of
drinking water from waste water**