THE WATERHARMONICA

THE STOWA PROJECT – DUTCH SITUATION

Presentation at the Waterharmonica Session

7th International Wetlands Conference

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thinking in all dimensions

Topics

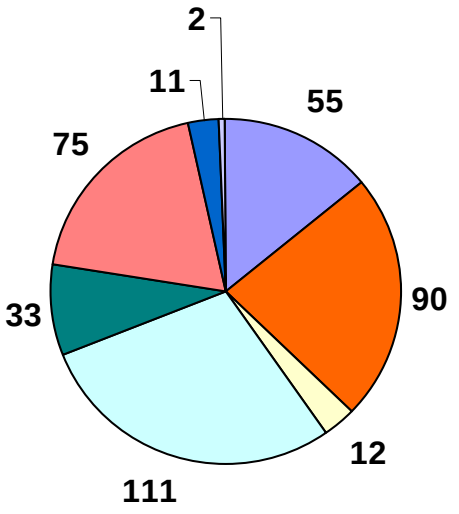
- Sewage treatment in The Netherlands
- WWTP-effluent characteristics
- Demands
- Basic designs
- Projects
- Performance
- Prospects
- Evaluation

SEWAGE TREATMENT IN THE NETHERLANDS (1)

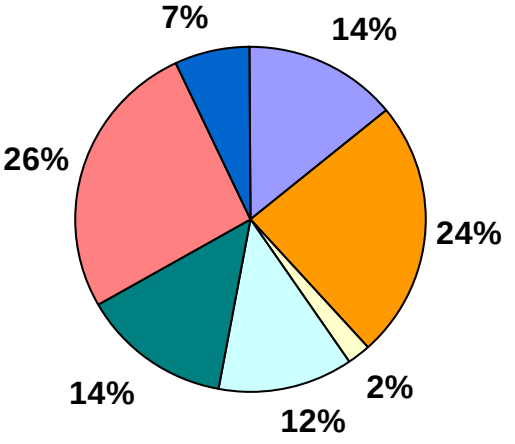
- STOWA study: status, opportunities and demonstration of Waterharmonica in The Netherlands and developing world
- Holland: 389 waste water treatment plants (WWTP)
- Design capacity: 26 million PE
- Treated in 2001:18 million PE
- 7 WWTP apply the Waterharmonica concept
- Stimulus with the implementation of the European Water Framework Directive by combined improvement of the chemical status and ecological status of receiving surface waters

SEWAGE TREATMENT IN THE NETHERLANDS (2)

Number of plants

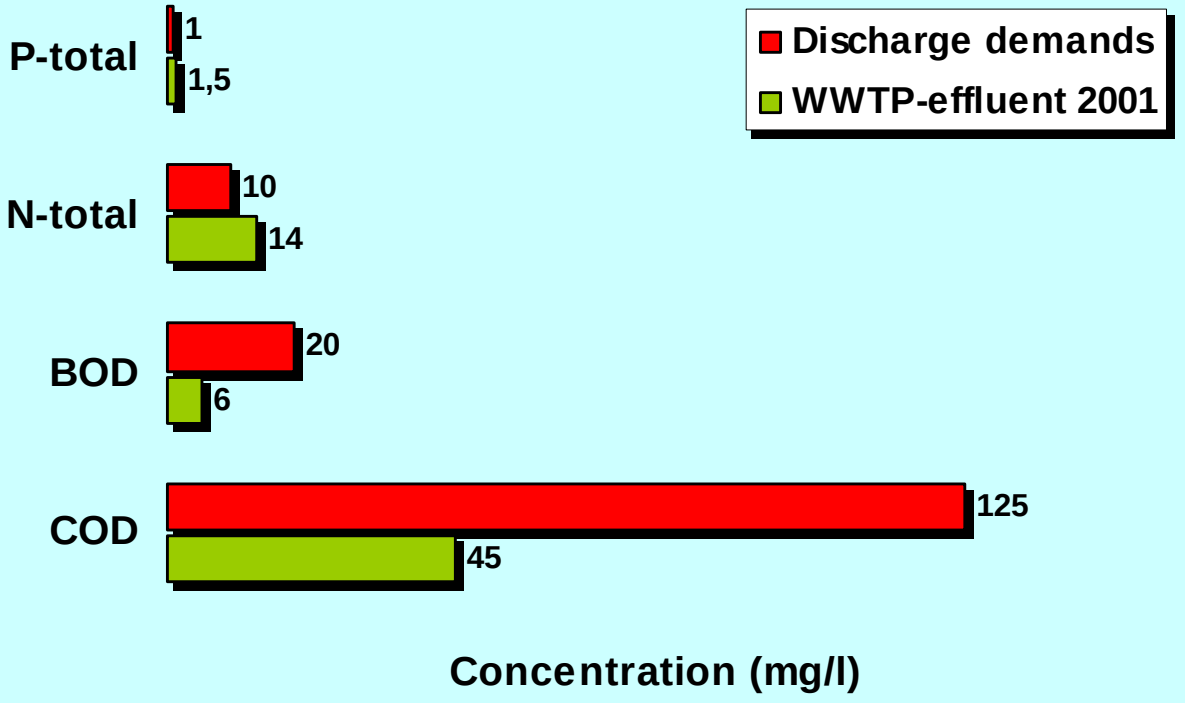


Effluent load



Brooks | Canals | Moors | Polder reservoirs
Small rivers | Large rivers | Salt waters | Other WWTP

Discharge demands and characteristics of WWTP-effluent in 2001



DEMANDS OF WATERHARMONICA SYSTEMS

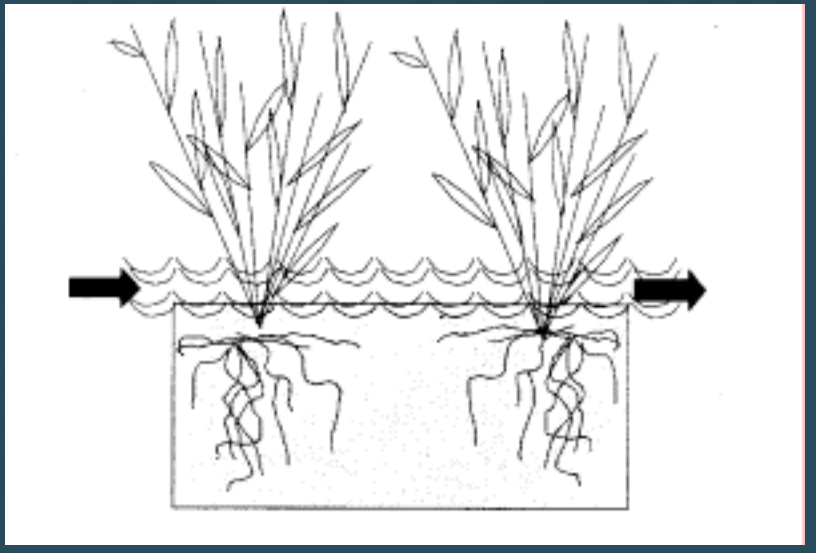
- Induction of natural oxygen regime (day-night rhythm)
- Reduction of BOD, COD and suspended solids
- Reduction of nutrients (N and P)
- Reduction of heavy metals
- Reduction of bacteria and human originated viruses
- Decrease of eco-toxicological risks
- Build-up of a natural ecosystem
- Improvement of organoleptic quality (scent and color)
- Sustainable use of space combined with other functions
- Reuse of water, substances and space

Four basic Waterharmonica designs

- Surface flow systems (SF)
- Vertical subsurface flow systems (VSSF)
- Horizontal subsurface flow systems (HSSF)
- Combined food chain ponds (CFCP)

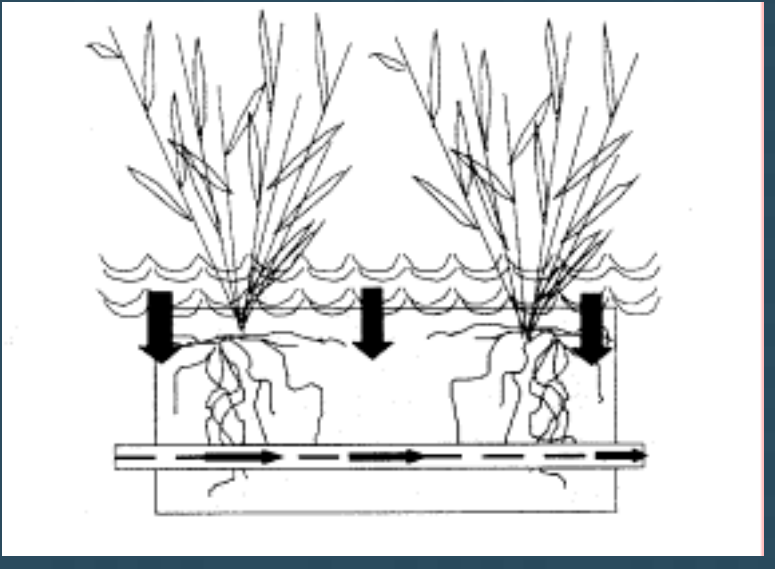
In practice one single system or a combination of two systems is applied

Surface flow systems (SF)



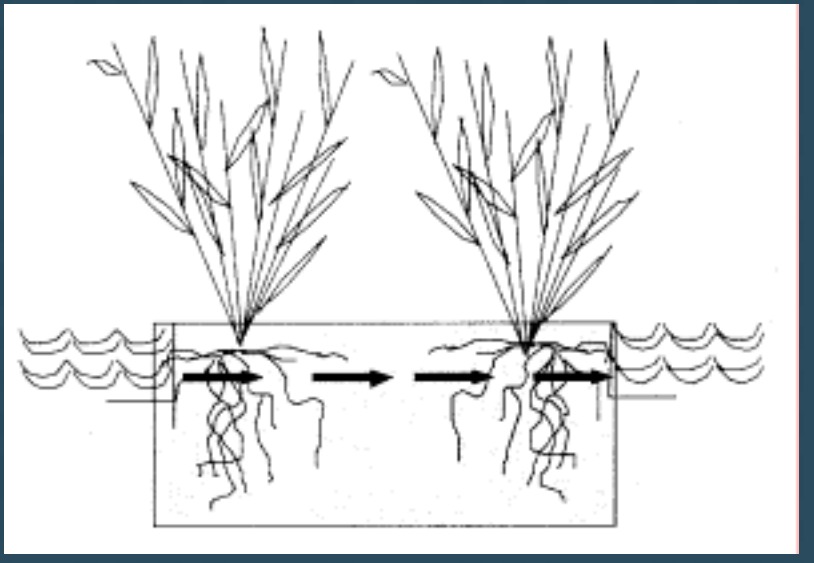
Reed-, rush- and cat's tail fields

Vertical subsurface flow systems (VSSF)



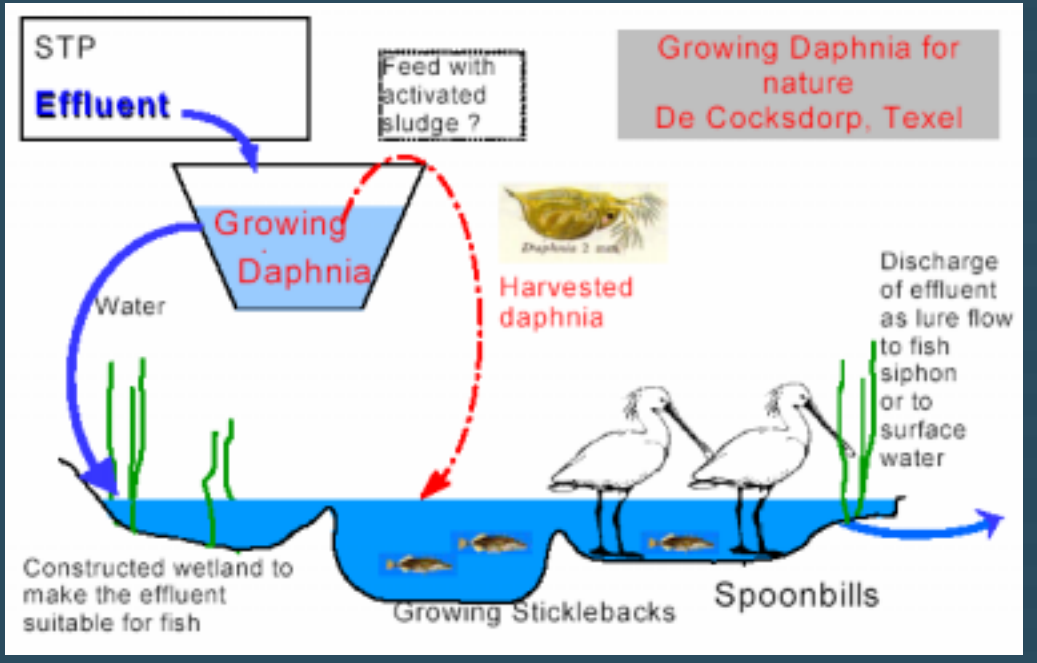
Infiltration fields

Horizontal subsurface flow systems (HSSF)



Root zone systems

Combined food chain ponds



"Kwekelbaarsjes" system at Texel

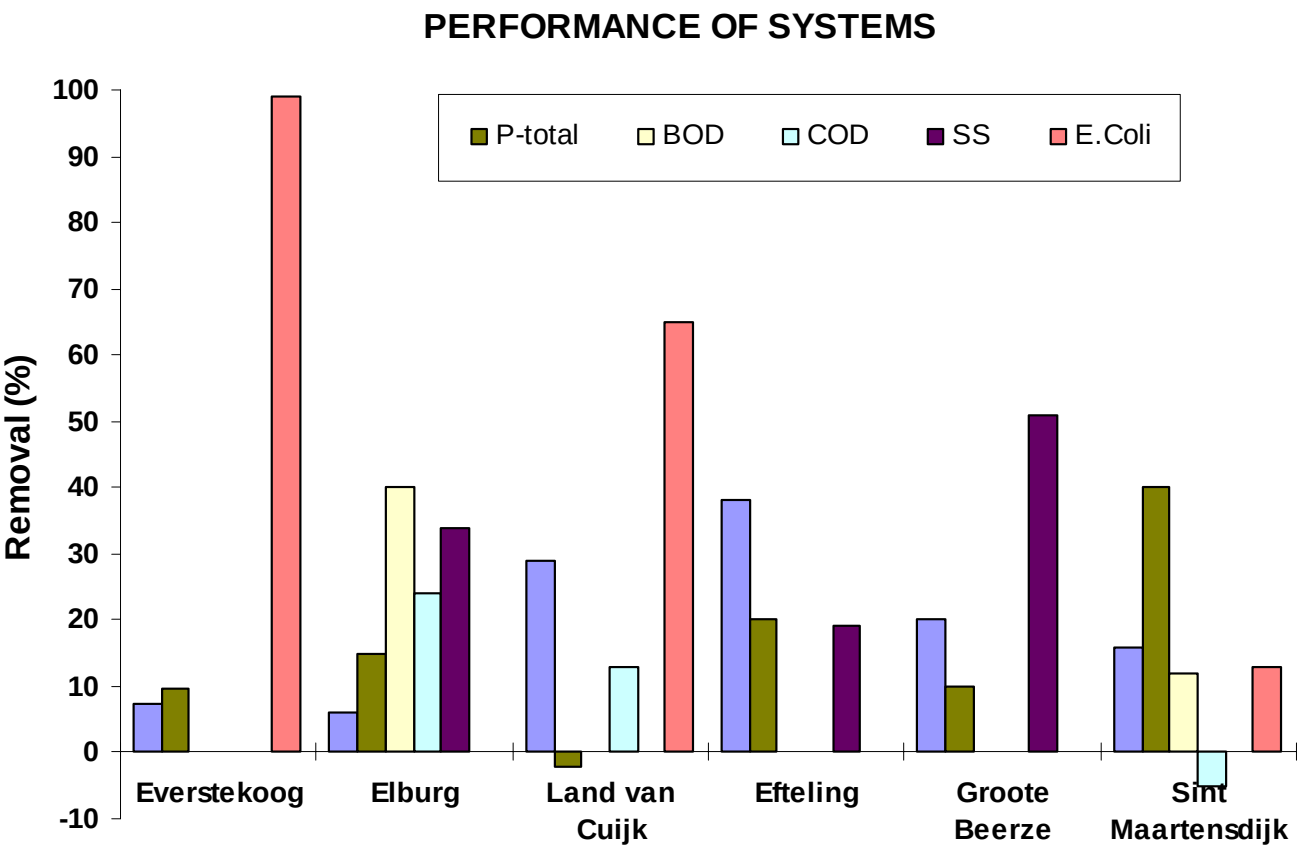
WATERHARMONICA PROJECTS (1)

1. Kwekelbaarsjes
   research project
2. WWTP Everstekoog
3. WWTP Elburg
4. WWTP Land van Cuijk
5. Klaterwater Efteling
6. Waterpark Groote Beerze
7. WWTP Sint Maartensdijk

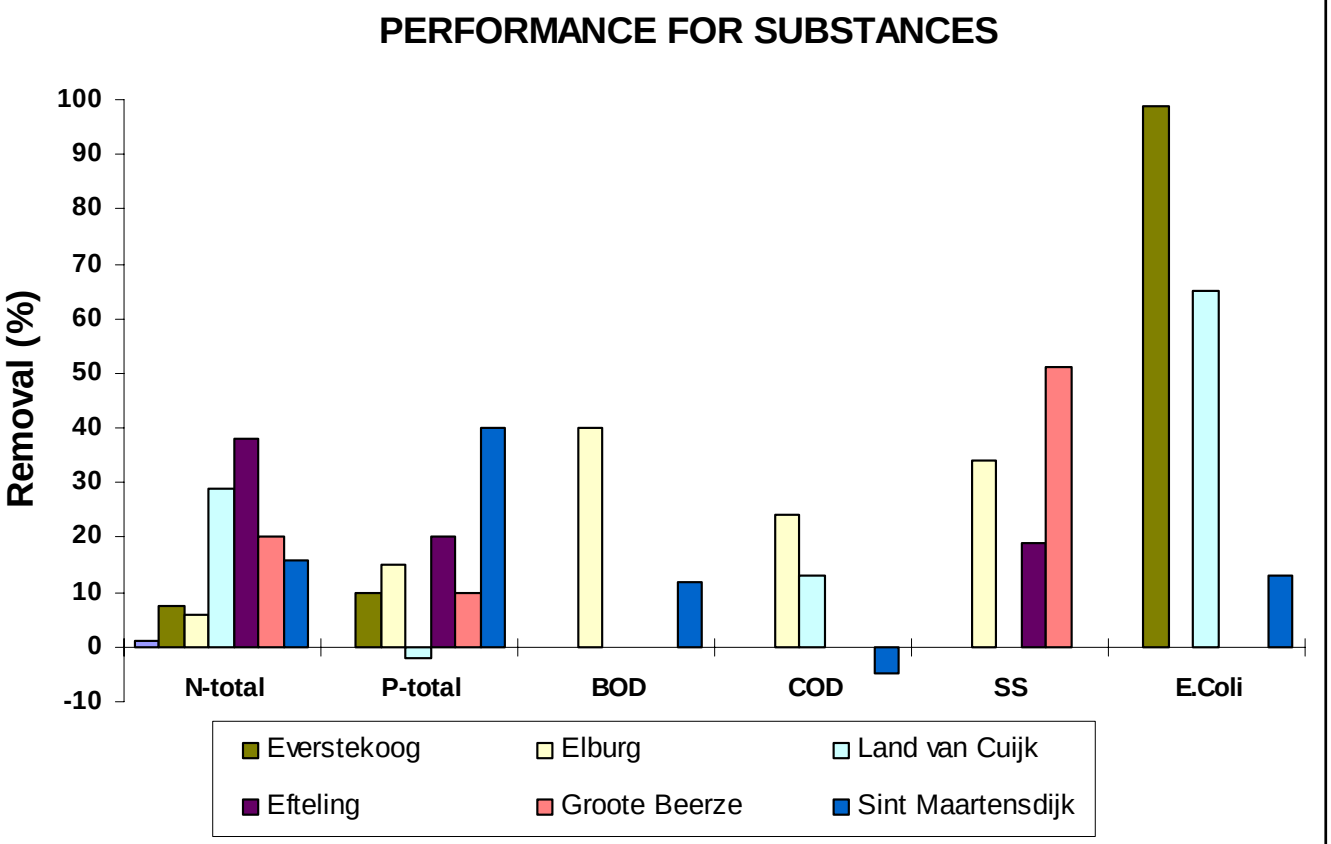
WATERHARMONICA PROJECTS (2)

	System	Res. time (days)	Hydr. load ($m^3/m^2.d$)	Area (ha)
Everstekoog	SF	2,2	0,24	1,3
Elburg	SF	6,0	0,13	15
Land van Cuijk	SF	6,0	0,17	3,85
Efteling	VSSF	2,3	0,14	0,825
Groote Beerze	SF	0,23	1,70	1,4
Sint Maartensdijk	HSSF/SF	2,0	0,24	1

PERFORMANCE (1)



PERFORMANCE (2)



PERFORMANCE (3)

Other achievements

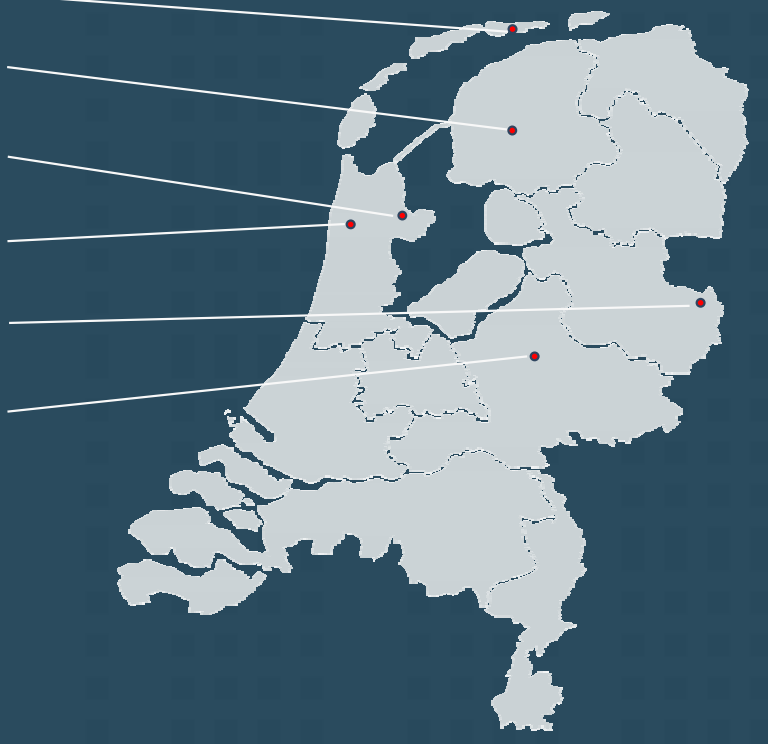
- induction of natural day-night oxygen rhythm
- good organoleptic quality of treated water
- reuse of water for agriculture, groundwater completion and recreation
- obtainment of water buffering capacity
- production of vegetable and animal biomass

and good possibilities for

- reinforcement of overall ecological qualities
- environmental and ecological education
- creation of water parks with high landscape values

PROSPECTS FOR NEW PROJECTS

1. WWTP Ameland
2. WWTP Grouw
3. WWTP Wervershoof
4. WWTP Geestmerambacht
5. WWTP Ootmarsum
6. WWTP Apeldoorn



EVALUATION

- first lessons are learned
- results do justify further implementation of the concept
- still a long way to go
- further research and development with emphasis on
  - monitoring of chemical and biological parameters
  - research on hydraulic, hydrological and ecological aspects
  - optimization of operation and maintenance
  - introduction of the concept as overall measure in compliance with the objectives of the WFD

IN CONCLUSION

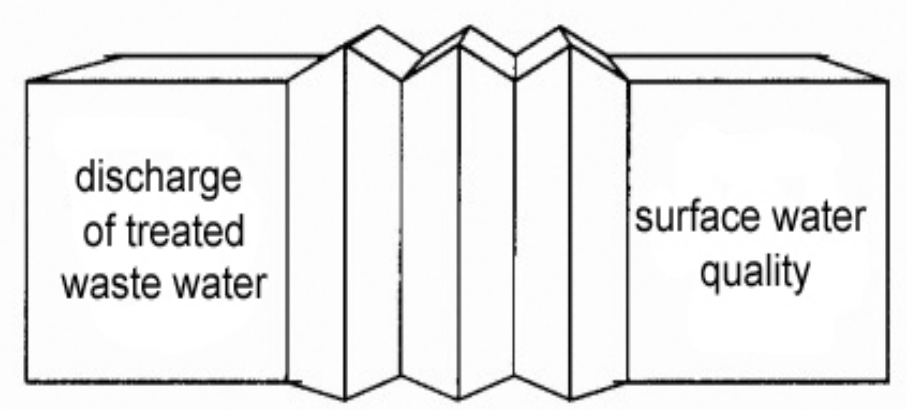
For dilution is not a solution for pollution

find inspiration for natural attenuation

with application of

ROYAL HASKONING

The Waterharmonica



Thank you for your attention

thinking in
all dimensions