

Increasing the natural values of treated waste water



Efficient use and management of water for urban supply
Tenerife
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Increasing the natural values of treated wastewater

“ecological engineering”

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This presentation:


- the island of Texel
- *why is treated waste water not surface water??*
- constructed wetlands to make a “living water” from waste water
- some constructed wetlands around the world
- Texel:
 - the Eversteekooog constructed wetland
 - the “kwekelbaarsjes” in De Cocksdorp
- other examples and plans in The Netherlands

More sustainable, natural water system
Use of treated waste water for agriculture and nature

Texel



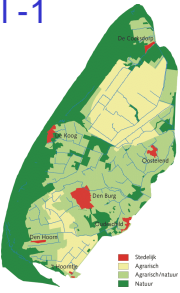
- Is a beautiful island
- A tourist resort
- A bird island
- Still a strong agricultural stronghold





Water on Texel - 1

- Scarce
- Island surrounded by saline water
- Summer 5 x tourists
- Only external supply fresh water is drinking water from mainland

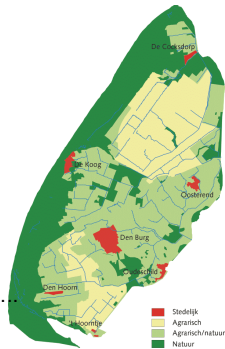


Water on Texel - 2

- **Former policy:**
 - focused on quantity of water
 - not so interested in different qualities
 - different types of water were freely mixed
- **Agriculture:**
 - lower water tables and fresh ground water
 - fresh water lens under island smaller since 70s
- **Nature:**
 - higher ground water table
 - fresh, brackish and saline ground water

The Water for Texel Master Plan

- All parties with interest in water
- Consensus.....
- Take "everything in consideration"....
- Combining interests.....



Effluent discharge to the sea



Effluent use on the island



Treated wastewater

- improvements: C, N, P
- regional STP's
- influence at effluent discharge:
 - sludge particles, flocs
 - loose bacteria
 - odor, foam
 - low O₂



⇒ "Dead water", not satisfied with quality

"Clear effluents"

It used to be the finest water we had:
it originates from drinking water and rain water

- Above that:
 - ⇒ regional STP's
 - ⇒ concentrating the finest water from a a region on one place
- but: it needs further treatment and care !!!

"Old fashioned system??!!"

Per inhabitant per year:

- 50 l faeces and 500 l urine
- + 15.000 l drinking water, mainly for "transport"
- + 15.000 l rain
- ➔ large and expensive sewers

NB: faeces and urine = 80 % N, 75 % P and 100 % of pathogens

But every **disadvantage** has his own **advantage**

Constructed wetland

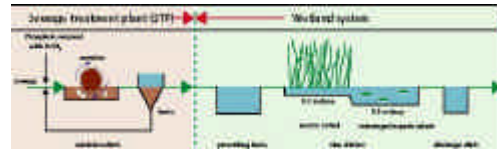
- a constructed, optimised water system
 - helophytes: reed, cattail
 - (submerged) water plants
 - plants on the banks
 - sediments
 - algae, Daphnia, etc
- works on solar energy



A constructed wetland to make a "living water" from treated waste water

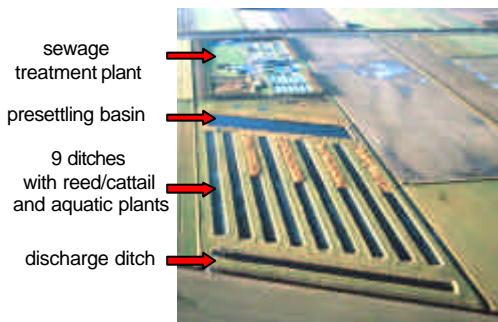


STP Eversteekooog and constructed wetland



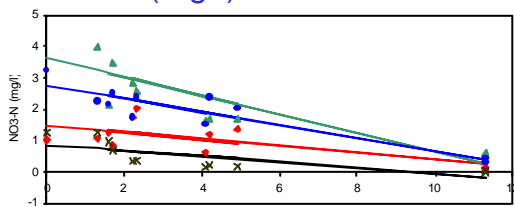
sewage treatment plant constructed wetland

Aerial view STP Eversteekooog



Eversteekooog

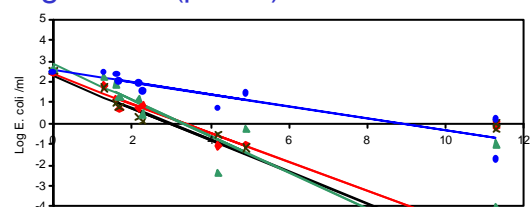
Nitrate (mg/l) vs retention time



Just some of the results

Spring Summer Autumn Winter

Log E.Coli (per ml) vs retention time



Hydraulic retention time (days)

Spring Summer Autumn Winter

After constructed wetland different water

- Natural oxygen regime
- No odor
- Less sludge particles lead to disinfection
- More but different suspended solids
- Living water:
 - algae, daphnia
 - all kind of "waterlife"
 - fish
 - birds



Texel

Resulted in a lot of knowledge and ideas!!

Learning the process by doing"

*well treated wastewater
can be a good source of life!*

⇒ can we grow biomass for nature on the
treated wastewater??

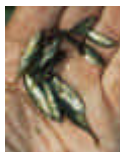
- Algae
- Daphnia
- Fish?
- Birds?



Fish in the Eversteekooog constructed wetland



- in first pond no fish
- fish in ditches:
 - but only after 3 days retention time
 - after 10 days a lot of fish
up to 15 Stickleback per m²



Sticklebacks



“Kwekelbaarsjes”

growing **Daphnia** on treated wastewater of the STP De Cocksdorp

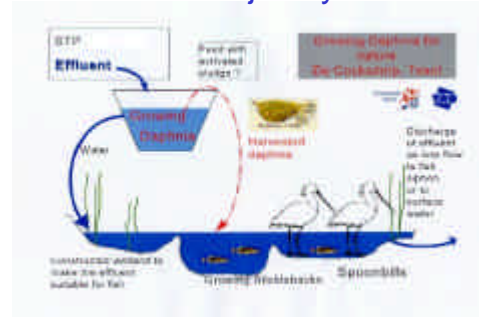


to grow **Sticklebacks**



as food for **Spoonbills**

“Kwekelbaarsjes system”



Research in 2001 - 2003

- 4 mesocosms 2 m³
- 4 ponds 25 m³
- modelling
- food studies
- harvest methods
- how fast can Daphnia swim?



Up to 70 m/h

Semi-technical research STP Eversteekooog



Experimental set-up



Harvesting Daphnia for research





Some observations:

- growing of Daphnia on treated waste water is feasible
- Daphnia feed on sludge particles
- see Internet for latest experimental results!!

⇒ www.rekel.nl/kwekelbaarsjes

Kwekelbaarsjes ?
"spoonbills and treated waste water"

- Feasible on Texel
 - growing Daphnia
 - bring Sticklebacks to the constructed wetland
 - it attracts Spoonbills
 - ecotoxicological aspects
 - effects, but no "fear"



• Also on other places attractive!!



De Cocksdorp



Panorama photo



Ditch along dike, as seen from the STP in the direction of De Cocksdorp

De Cocksdorp



kwekelbaarsjes constructed wetland
ca 4 ha

Planning:
• design 2003
• construction 2003 / 2004 ?

Pumping station and fishladder

Texel

not only the special constructed wetland:
kwekelbaarsjes

**renewed interest in The Netherlands for
constructed wetlands for upgrading effluents:**

- Land van Cuijk, Waterboard de Maaskant
- Hapert, Waterboard De Dommel
- Sint Maartensdijk, Waterboard Zeeland

STP Land van Cuijk, Waterboard de Maaskant

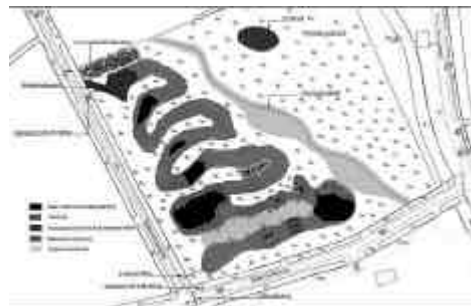


Water park Groote Beerze



STP Hapert De Dommel

Sint Maartensdijk



Texel

More Spin-offs

- **Waterboard Friesland:**
 - Plans for Wadden Sea island Ameland
 - STP Grou
- **Decision of our board:**
 - “all STP's on Texel will get a constructed wetland for after treatment
 - Everstekooog: more capacity and longer HRT
 - start a study for the 150.000 p.e. plants Wervershoof and Geestmerambacht on the mainland

Conclusions

A more natural constructed wetland:

- different, living water
- disinfection
- nutrient removal
- natural values

*After treatment of waste water
or
pre treatment of surface water?!*

A constructed wetland as a buffer



www.waterharmonica.nl



More information on
www.rekel.nl/water