Overview of ongoing research projects: *collaboration projects of Waternet*

Symposium Waterharmonica

Joost Kappelhof, april 24, 2009

Outline

- My view on waterharmonica
- Overview projects
- Ideas for application at Waternet

My impression of the waterharmonica by talking around with collegues

- Two groups of people:

followers and **opponents** of the Waterharmonica

What do we know?

- A lot! As we've seen in the former presentations
- Water quality:
  - N-removal varies from 0 upto 0,8 ppm
  - P-removal small, upto 0,1 ppm
  - Reduction suspended solids reasonable (appr.50%) and as SS trap during hydraulic peaks
  - Disinfection 1 to 3 logreduction in the system
  - Toxicity reduces, but not quantified yet
- Biodiversity increases
- Image waterboard improves

Main questions

- How to design to reach a desired effect?
- Effects of peaks: hydraulic and quality
- How and where takes disinfection place?
- SS out, what transition takes place and is SS-out better than SS-in?
- Toxicity effects: where occurs what improvement?
- Hygienic quality: can we produce water quality that meets bathing criteria?
- The value of biodiversity achieved by waterharmonica
- Value for recreation and the image for waterboards

Reserach set up
Waternet related projects

- Finalizing PhD student activities Ruud Kampf
- Stowa project
- PhD student Bram Mulling
- IP-KRW project "moeraszuiver afvalwater"

Finalizing PhD work Ruud Kampf

- Analyzing data collected from different sites:
  - Everstekoog
  - Aqualan Grou
  - Empuriabrava
  - Horstermeer
- N, P, SS removal: seasonal variations
- Briefly: hygienic quality, biodiversity
- To do:
  - Some additional analysis
  - Writing dissertation

Finalizing PhD work Ruud Kampf

- Network is powerfull
  - Same experiments at different places
  - Working in 'open space' leads to discussions

Stowa project

- Stowa funds 230.000 euro, 2009-2010
- Project manager: *Rob vd Boomen* (Witteveen en Bos)
- Focus on: design criteria constructed wetlands
  - Based on existing data
  - Knowledge gap: behaviour in cases of peaks
    - Hydraulic peaks
    - Disfunctioning WWTP (SS, N, P)
- Monitoring program focussed on peaks

- PhD student UvA: connected to Stowa project

PhD student Bram Mulling (UvA)

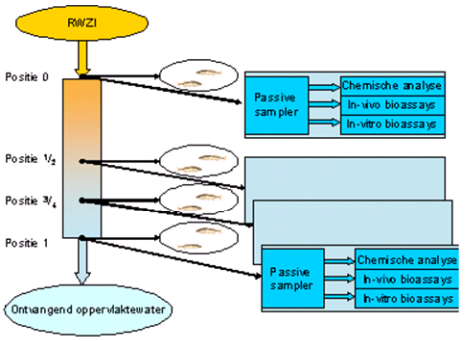
- Waternet funds PhD student
- The fate of particles in constructed wetlands (with help of the Spanish experiences)
- Transition in suspended solids in Daphnia ponds, in reed beds and fish spawning area
- Behaviour of pathogens and role of predation of pathogens on hygienic quality
- Knowledge also applicable for natural banks and other projects

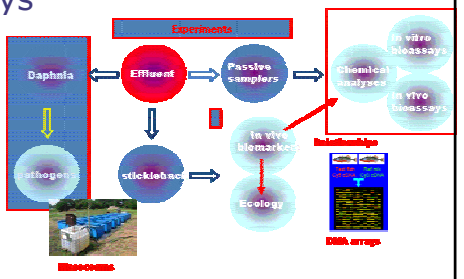
IP-KRW project "moeraszuiver afvalwater": Imares

- Project initiated and managed by Imares (*Edwin Foekema*)
- Upgrading Treated Wastewater in Constructed Wetlands
- Project cost: 1.267.480 Euro, subsidised 1.073.980 Euro.
- Partners: ImaresWUR, Deltares, Waterboard Fryslan, de Dommel, Aa en Maas, Waternet
- Aim: risk and effects of emerging substances in treated waste water including a constructed wetland system and predation of pathogens by daphnia:
  - Monitoring strategy aquatic toxicology
  - In what compartiment are emerging substances (organics and pathogens) removed?

Monitoring appraoch "moeraszuiver afvalwater"

- Aim: relation between chemical analysis and, in vitro and in vivo bioassays





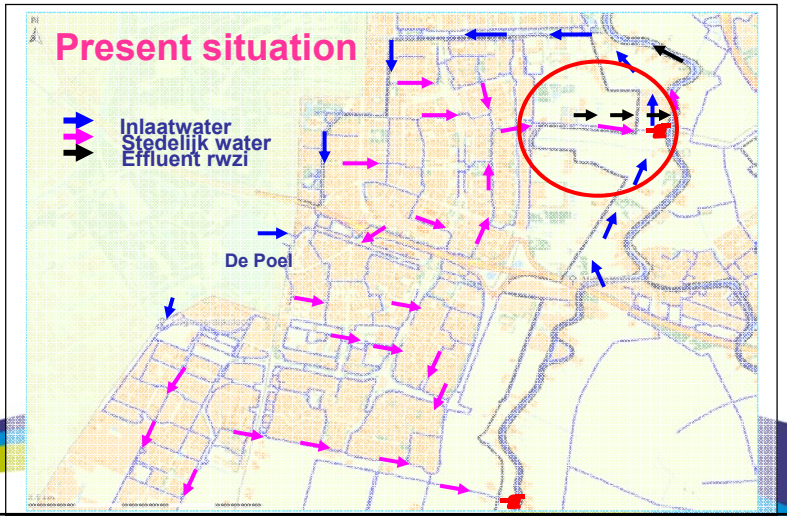
Ideas for application by Waternet *Horstermeer*

Rwzi Horstermeer met een moerassysteem van ca. 20 ha bij de rwzi

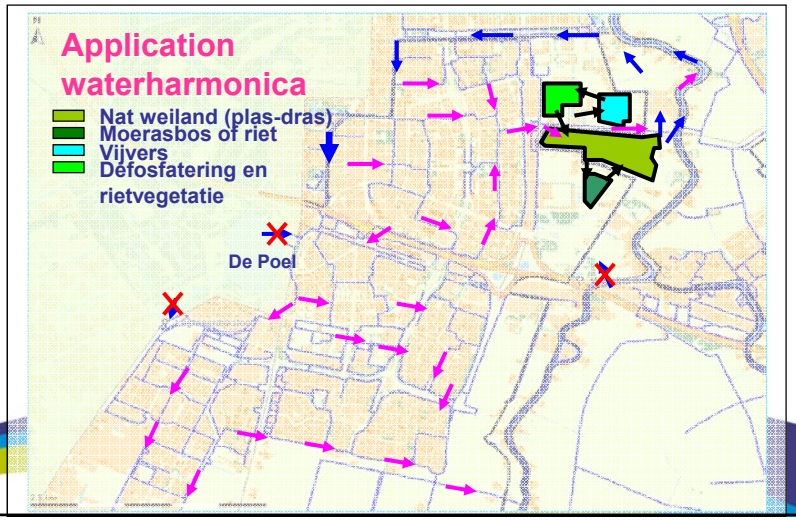
- Water ca. 34 ha, 100 % effluent
- Belasting 15 cm/dag, ca. 1 m2/i.e.
- Hydraulische verblijftijd ca. 3.5 dagen

Gevolgd door een ecologiserend filter als waterbuffer, etc.

Ideas for application by Waternet
WWTP effluent in city of Amstelveen via waterharmonica



Ideas about applications for Waternet
WWTP effluent in city of Amstelveen via waterharmonica



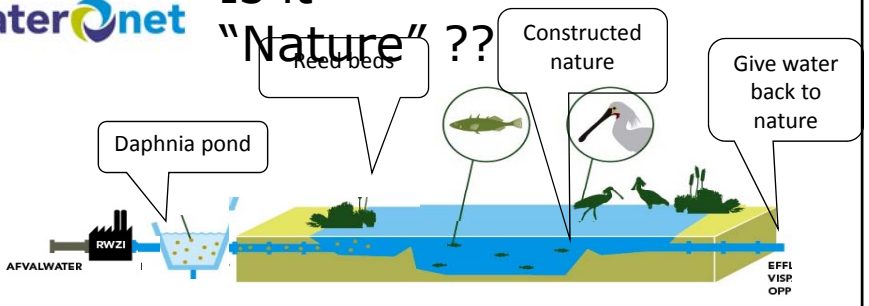
Conclusions

- Research projects focussed on
  - Design criteria
  - Value of waterharmonica in terms of water quality
    - Particle characterization
    - Hygiene
    - toxicity
- also attention for
  - Value of biodiversity in the water
  - Value from image point of view (experience of the watercycle and recreation)
- KRW boost leads to:
  - Even better network
  - better knowledge about the value of Waterharmonica

Discussion: the Spanish situation compared to us

- Do our activities on water quality (particles, hygienic oparameters, toxicity) cover your biggest concerns?
- How do the Spanish deal with:
  - Value of biodiversity in the water?
  - Value from image point of view (experience of the watercycle and recreation)?

Is it "Nature" ??



Or a process??

Daphnia reactor Biological filtration

Algae reactor for nutrient storage

Free flow wetland as phototrophic biofilm reactor

Fish spawning area to meet EU biodiversity criteria