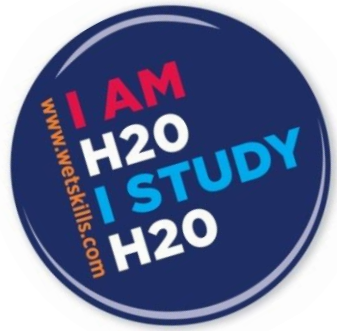


# Wetskills Water Challenges

*The concept explained*



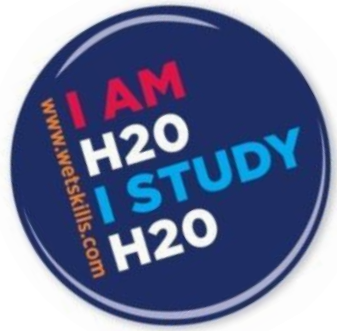
Leeuwarden, 26 March 2015  
Erwin Vonk (KWR / Wetskills-USA)



# Agenda

- Wetskills introduction (Erwin Vonk)
- Wetskills-USA (Erwin Vonk)
- Case owner experience: Paul Buijs (Berson UV)
- Case owner experience: Keimpe Sinnema (Waterschap Groot Salland)
- Question round & closing





# What is Wetskills?

A two-week think tank in a specific country...

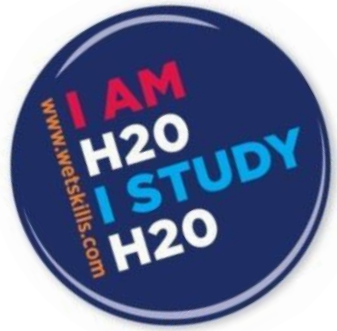
to promote international cooperation  
& knowledge sharing...

between international water  
students and young professionals

Resulting in out-of-the-box concepts  
for study cases provided by business partners...

...being presented during a high-level event in the  
host country.



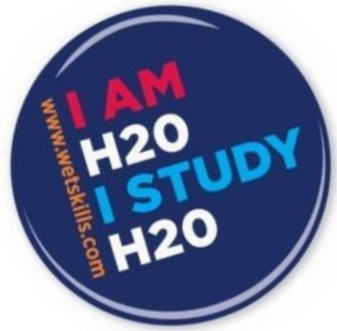


# NWP/water sector

## Goals:

- Involve universities in water sector
- Promote business opportunities (follow-up after events)
- Holland branding



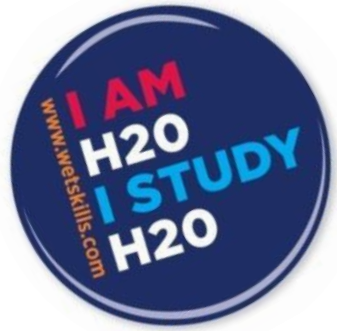


# Participants

## Goals:

- Experience international cooperation
- Develop presentation skills
- Grow international network
- Apply knowledge in multi-disciplinary context
- Follow-up:
  - Wetskills Alumni Network
  - National Water Traineeship & YEP
  - Contact with water sector / companies



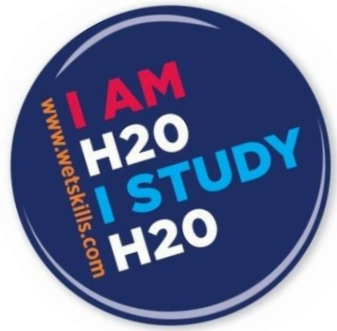


# Companies/organisations

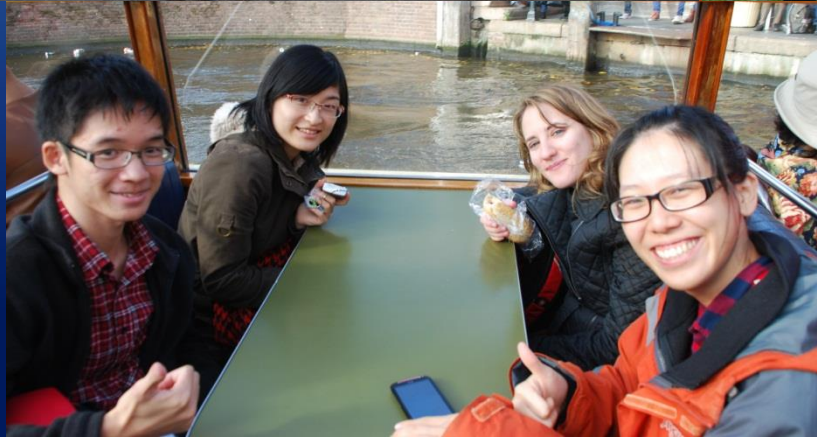
- Receive great concept for your case
- Have your case/business represented
- Harvest business opportunities
- Get in touch with potential employees
- Get in touch with potential employees in international
- Get in touch with potential employees

An original way to promote your business abroad





# Program - teambuilding



- Visit water-related and cultural sites
- Teambuilding (mixed teams)





# Program – brain hurricane

Teams meet experts



Initial idea-building



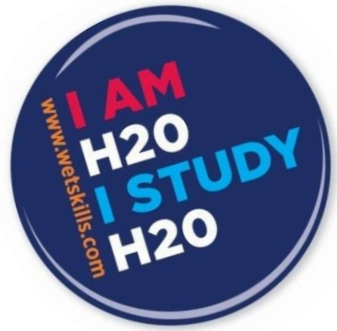
Brainstorming



Kickstart for teamwork







# Program - teamwork

Presentation skills



Intercultural cooperation



THINK  
OUTSIDE  
THE BOX



Various educational backgrounds

Technical challenge



# Resulting ideas



## Catch me, if you can

An echydrological solution to restore the watercycle in Dhofar

Zaher Al-Salmari, Deena Al-Zadjali, Kris Hopstaken and Marjolein Stuurman

### Green monsoons

Water scarcity is a well-known problem in Oman. The Dhofar region (Figure 1) is famous for its monsoon season and green mountain hills. With a population of 197,000 Salalah is the second biggest city in Oman. The main focus of this project will be on water catchment and reuse.

Figure 1. Dhofar region

### Restore the balance

The Dhofar region is being threatened by severe water problems:

- Overexploitation of the Salalah plain aquifer
- Deforestation in the Al-Qara mountains
- Seawater intrusion

To restore the balance, the recharge of the Salalah plain aquifer has to be increased and the watercycle in the area has to be restored.

### Rainwater harvesting

- The use of rooftops to collect rainwater will deliver water a year in 1
- Rainwater pipes connected to the pipelines of the rainwater's injection to the city

### Storage dams

- Increase number of (small) dams

## DESTWATER: Drops from the Desert

### Turning produced water into irrigation water

R.S.S. Al-Farsi, M.N.K. Al-Rawahi, P. Franken, E.F. van der Vee

Deserts in Oman are the driest places in the country. However, a large amount of water is produced daily in this areas as by-product in the production of oil. The Destwater project by Petwa changes this large amount of produced water into distilled water, which can be used for greenhouse irrigation.

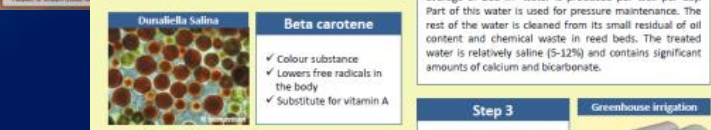


### Step 1

The algae used for beta carotene production are the saltwater algae *Dunaliella Salina*. Under ordinary conditions the algae have a green colour, but under stress conditions they turn orange, because of beta carotene they produce to protect themselves. Stress conditions rise with increasing salinity, temperature and the intensity of light and oxygen in the water. At the end of the basin the beta carotene is collected from the algae at a rate of 2.45 mg/m<sup>3</sup>/day<sup>1</sup>. After collection the algae can be re-used.

**Dunaliella Salina**      **Beta carotene**

- ✓ Colour substance
- ✓ Lowers free radicals in the body
- ✓ Substitute for vitamin A



### Origin of Destwater

The used water is a by-product of oil production. An average of 200 m<sup>3</sup> water is produced per well per day. Part of this water is used for pressure maintenance. The rest of the water is cleaned from its small residual oil content and chemical waste in reed beds. The treated water is relatively saline (5-12‰) and contains significant amounts of calcium and bicarbonate.

### Step 3

Destwater can be used for hydroponic greenhouse irrigation systems. Certain types of crops, such as cucumbers, lettuce and decoration plants can be used. There are many other future options for usage, but this will need further research.

### Why choose Destwater?

- ✓ Good start in the direction of sustainable use of water
- ✓ Create jobs in a new area of agriculture
- ✓ Environmental friendly process with low carbon dioxide footprint
- ✓ Possibility for salt beta carotene production
- ✓ Future options for Destwater usage, like tree and grass growth for paper production and as base for fertilizers and cleaning material in factories

## Nereda<sup>®</sup> today

### sustainable tomorrow

Bemmel/Wierse, Doel/Dugman, Panzone Kempe, Gudo Obergang, Bontas (The)

Nereda for biological wastewater treatment: Proven at TU Delft, developed by DHV, demo plant in Gansbaai, South Africa, first full scale plant launched on 8 May 2012 in Epe, the Netherlands. While this technology is a clear improvement over conventional treatment, securing investment remains a challenge.

## Break the ice

In contrast to conventional facts wastewater air up to 30% less in 75% less land. However the 1 of lack of fresh in new technology water industry globally.

## Sewage treatment; A walk in the park

Introducing the problem

4,550 people    20 °C    330 mm/year    COD = 455 kg/day    TKN = 54,6 kg/day

Current WWTP

The village Barrydale is part of the Swellendam municipality. It is a semi-arid area characterized by low levels of agricultural and industrial development. The municipal waste water treatment plant (WWTP) is currently processing 4.5 times more than capacity. Due to the poor performance of the plant, the effluent does not meet the water quality standards neither for irrigation uses or disposal to water courses. Hence there is an urgent need for upgrading the treatment plant. This provides a unique opportunity to come up with a sustainable and integrated vision on how to turn waste water into a valuable resource.

## HOW to improve the WWTP ?

Method

We replace the oxidation plant with a multifunctional wetland, which purifies wastewater through a filter bed that removes both solids and soluble organic matter. The process is done by microorganisms operating in aerobic and facultative environments. The effluent can be reused for irrigation.

## Water quality

Our system meets irrigation and discharge water quality standards!

The capital investment and operating costs have long term benefits. The estimated capital cost for the wetland is R400/m<sup>2</sup>, dependent mainly on the cost of sand and the macrophyte plants.

Parameter (mg/l)	General limits		Water quality	
	Disposal	Irrigation	Current system	Constructed wetland
COD	75	400	200 - 1200	30 - 120
Nitrogen	6 - 15	15 - 30	40 - 60	28
Suspended Solids	25	150	ND	20

## Benefits

- Adequate water quality for irrigation proposes
- Saves a lot of energy
- Retains key nutrients for agriculture
- No odour
- Stimulates local economy
- Reuse of effluent → drought-proof water supply for agriculture

Constructed wetlands can recycle wastewater and turn it into irrigation water, while simultaneously enhancing the local ecological and economic value. It is a low cost and energy efficient solution, which can be designed as both a productive and recreational area. We believe this is the best way to upgrade the WWTP of Barrydale.





Final day: attending business delegation



Final presentations (Wetskills-Israel)



Elevator pitching of results



'Young and old' with award

# 'Royal' Wetskills-Oman





'Presidential' Wetskills-Israel





China 2010



Morocco 2010



The Netherlands 2011



Indonesia 2011



South Africa 2012



Egypt 2012



Oman 2012



Mozambique 2013



The Netherlands 2013



Romania 2013

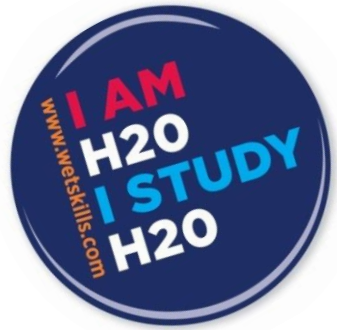


# Wetskills Water Challenges

*USA 2015*

*Program and opportunities*





# USA 2015

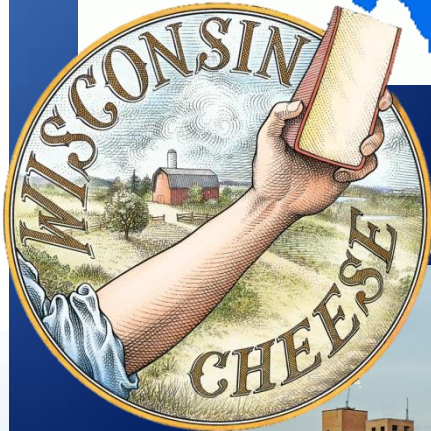
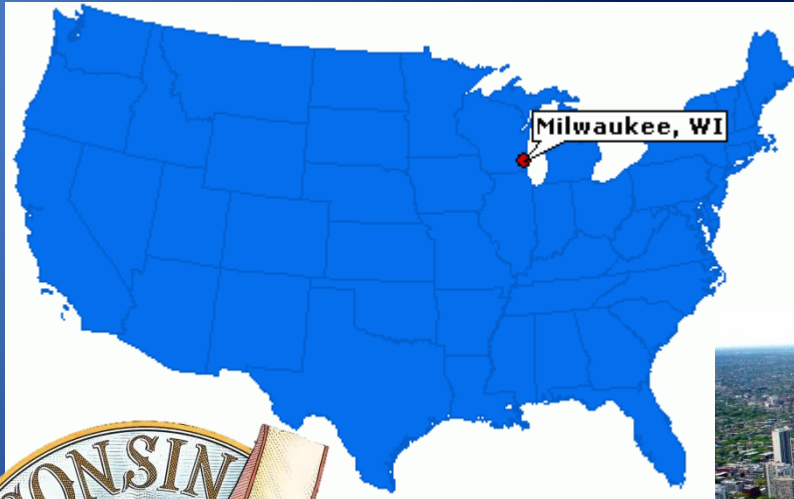
- Invited by Consulate and Embassy
- Milwaukee Water Summit (23-24 June)
- University of Wisconsin as host
- 9 NLD, 9 USA and 7 CAN students/PhDs
- 5 study cases



Kingdom of the Netherlands



Institute for Water Business





# Milwaukee - US Water hub

- Major US water technology research hub
- Over 150 water tech companies<sup>1</sup>
- Research institutes/academic programs

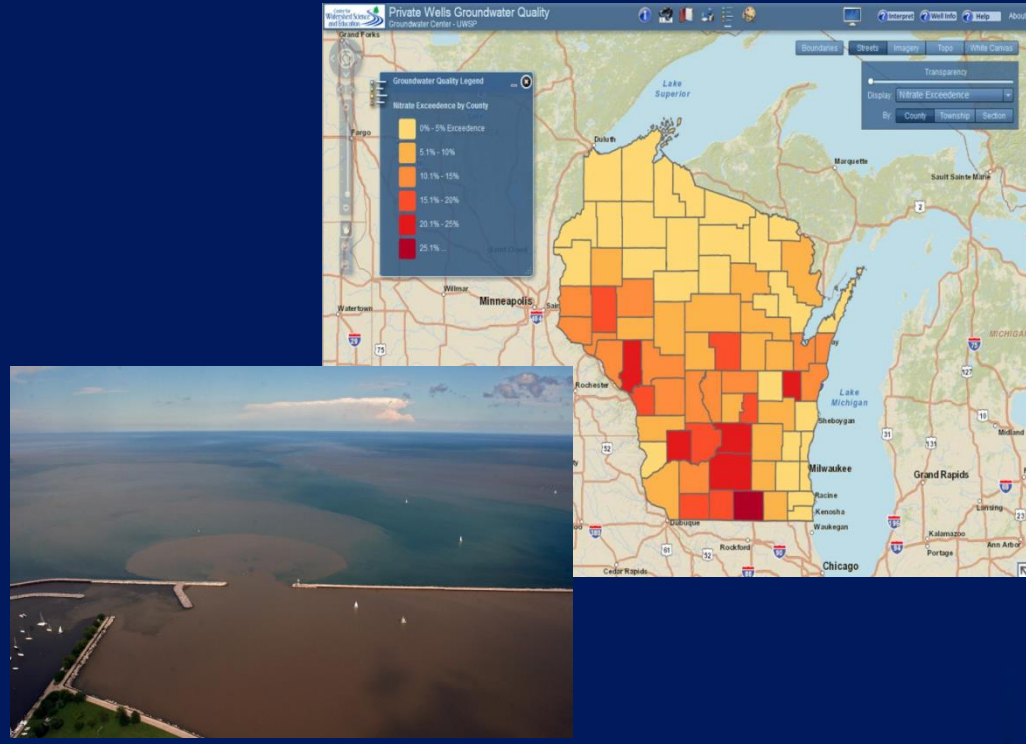


<sup>1</sup> Wateronline, 2015



# Water issues in Wisconsin (1)

- Surface- and groundwater quality issues
- Toxic algae bloom in lake Michigan
- 2010: new water quality standards (Clean Water Act)
- 2012: start Wisconsin Phosphorus Program





# Water issues in Wisconsin (2)

- Stormwater management in urban areas
- 2008: June Midwest Floods
- 2010: Minnesota and Wisconsin flash flooding
- 2012: June Midwest Flash Flooding
- 2013: Milwaukee urban flash flooding
- 2014: Door County September Floodings

Minnesota, Wisconsin residents cope with deadly flooding

By the CNN Wire Staff  
Updated 0000 GMT (0700 HKT) June 23, 2012

More from CNN

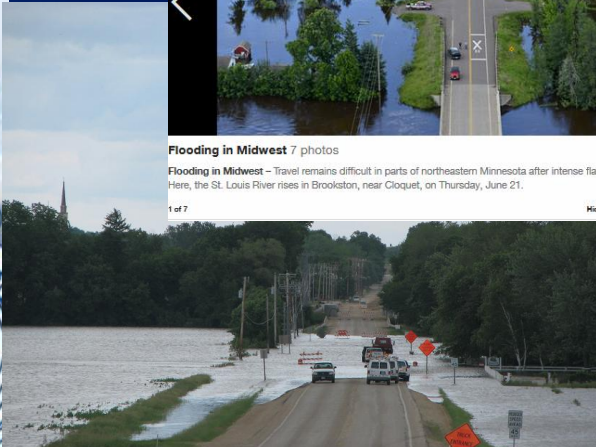
- CNN Student News
- 10 places to see before they change forever
- The Airbus A320
- Why the n-word doesn't go away
- Got roses this Valentine's Day? They probably came from Kenya
- Unknown group threatens troops online

Flooding in Midwest 7 photos

Flooding in Midwest - Travel remains difficult in parts of northeastern Minnesota after intense flash flooding. Here, the St. Louis River rises in Brookston, near Cloquet, on Thursday, June 21.

1 of 7

Hide Caption





# Water issues in Wisconsin (3)

- 2012: start Wisconsin Phosphorus Program
- Nutrient recovery from dairy (and beer) industry
- Resource recovery from STPs
- Investments in water disinfection technology (2006 DBP-II regulations)



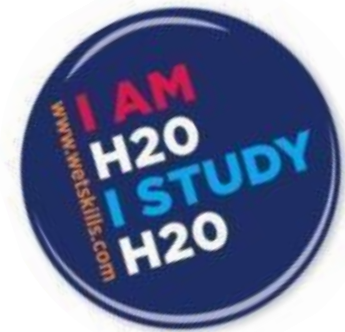




# We are looking for case sponsors!

- Expose yourself through Water Summit
- Attend Workshop Resource Recovery





# For more information

[www.wetskills.com](http://www.wetskills.com)

[erwin.vonk@wetskills.com](mailto:erwin.vonk@wetskills.com)



Wetskills' partners: Netherlands Water Partnership and KNW, H<sub>2</sub>Oost, World Water Academy, Vitens, Waterschap Groot-Salland, Rotterdam University of Applied Sciences, KWR Watercycle Research Institute and other partners in the Dutch water sector, including Dutch Water education institutes