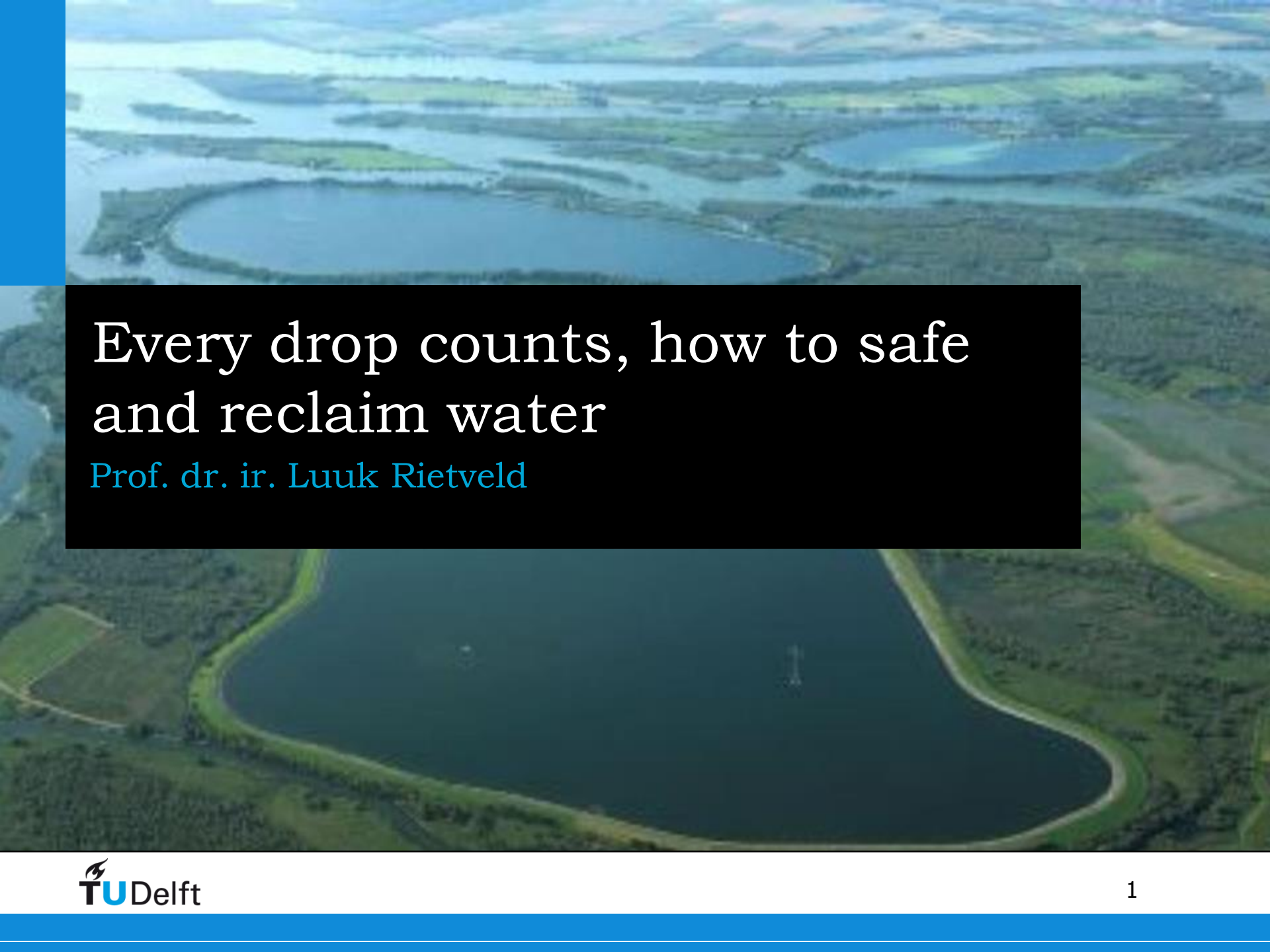




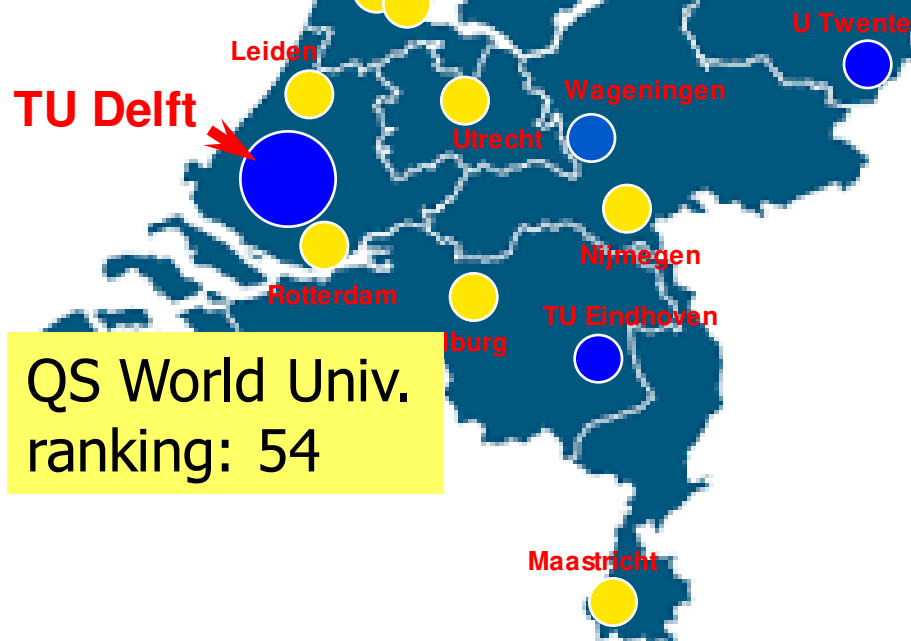
Every drop counts, how to safe and reclaim water

Prof. dr. ir. Luuk Rietveld

Universities in the Netherlands

QS World Univ. ranking
- Civil Engineering: 7 !

Shanghai Ranking -
Water Resources: 1 !



QS World Univ.
ranking: 54

University	Students (±)
Utrecht University	23.000
Universiteit van Amsterdam	22.000
University of Groningen	20.000
Erasmus University Rotterdam	16.000
Vrije Universiteit Amsterdam	16.000
University of Nijmegen	15.000
Leiden University	15.000
Delft University of Technology	22.500
Universiteit Maastricht	11.000
Tilburg University	10.000
Technische Universiteit Eindhoven	8.000
University of Twente	8.000
Wageningen University	8.000



University of Technology

Position TU Delft?

Urban Water Engineering & Environmental Technology

- **3 full professors:**

- Wastewater treatment & Environmental engineering: Prof. Jules van Lier
- Drinking water & Urban water cycle technology: Prof. Luuk Rietveld
- Environmental Technology: Prof. Merle de Kreuk

- **3 part-time professors (externally paid):**

- Water & Health: Prof. Gert-Jan Medema
- Sewerage & drainage: Prof. Francois Clemens
- Drinking water Engineering: Prof. Jan Peter vd Hoek



- **8 scientific staff members:**

- Advanced water treatment: Dr. Bas Heijman
- Industrial (waste)water treatment: Dr. Henri Spanjers
- Sewerage and asset management: Dr. Jeroen Langeveld
- Groundwater treatment/Arsenic: Dr. Doris van Halem
- Physico-chemical interactions: Dr. Boris van Breukelen
- Smart grids in urban areas: Dr. Lisa Scholten
- Resource recovery: Dr. Ralph Lindeboom
- Water quality in distribution networks: Dr. Gang Liu

9 post-docs
50-60 PhD students

- **6 support staff: lab., secr., fin. man.:** Armand, Mohammed, Mariska, Tamara,

Sabrina, Petra

WaterX MOOCs

CTB3365x: Introduction to Water Treatment

Learn about urban water services, focusing on basic drinking water and wastewater treatment technologies [MORE](#)

STARTS: 16 Sep 2013 • INSTRUCTORS: Jules van Lier • DelftX

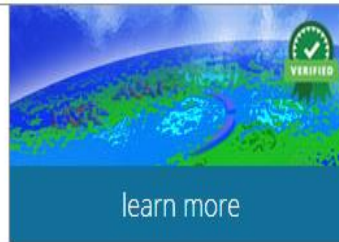


Students: 30000

NEW CTB3300WCx: Introduction to Water and Climate

The basic elements of and the relation between water and climate are highlighted and further discussed together with their mutual coherence.

STARTS: 26 Aug 2014 INSTRUCTORS: Nick van de Giesen DelftX



[learn more](#)

NEW CTB3365DWx: Introduction to Drinking Water Treatment

Learn about urban water services, focusing on conventional technologies for drinking water treatment.

STARTS: 28 Oct 2014 INSTRUCTORS: Luuk Rietveld DelftX



[learn more](#)

NEW CTB3365STx: Introduction to the Treatment of Urban Sewage

Learn about urban water services, focusing on basic sewage treatment technologies.

STARTS: January 2015 INSTRUCTORS: Jules van Lier DelftX

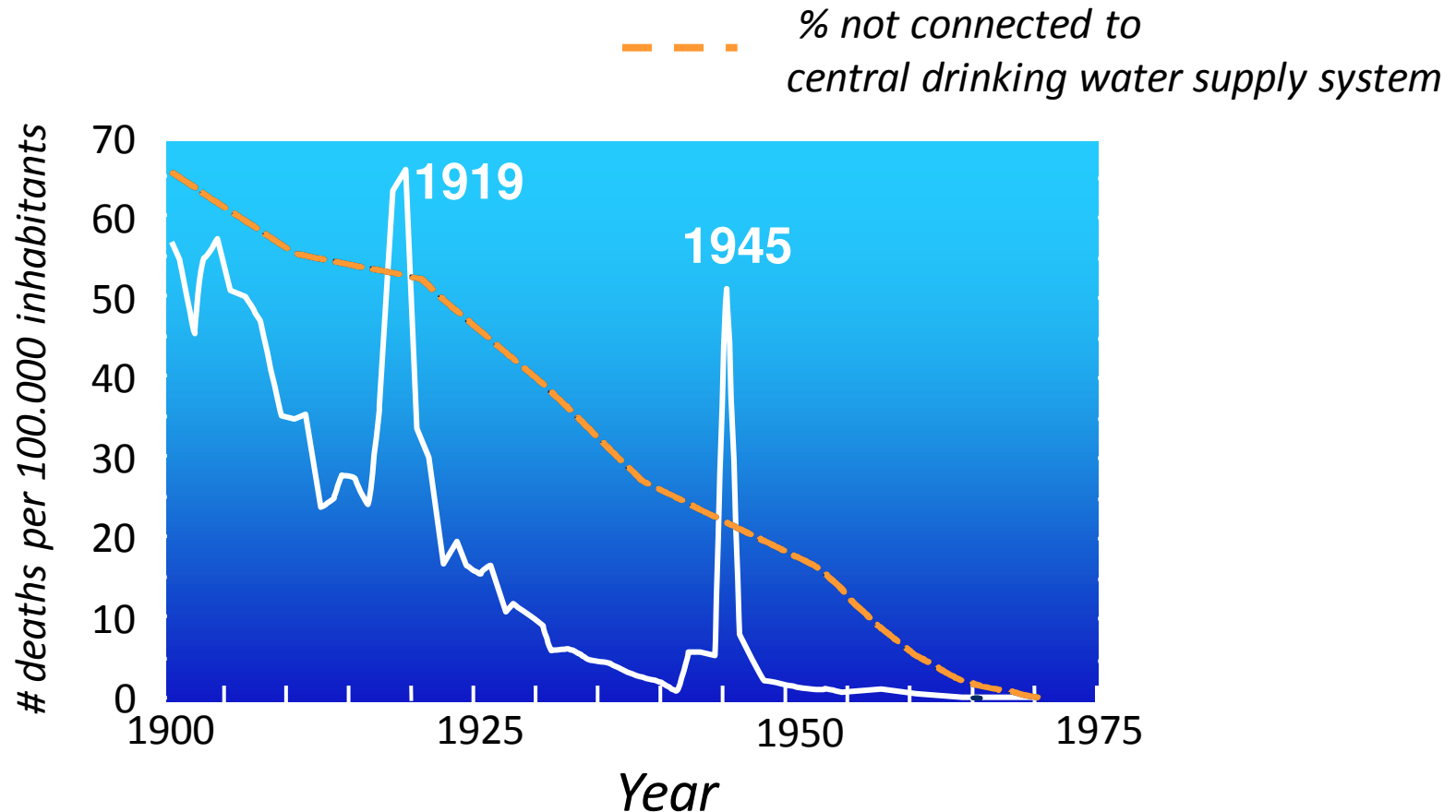


[learn more](#)

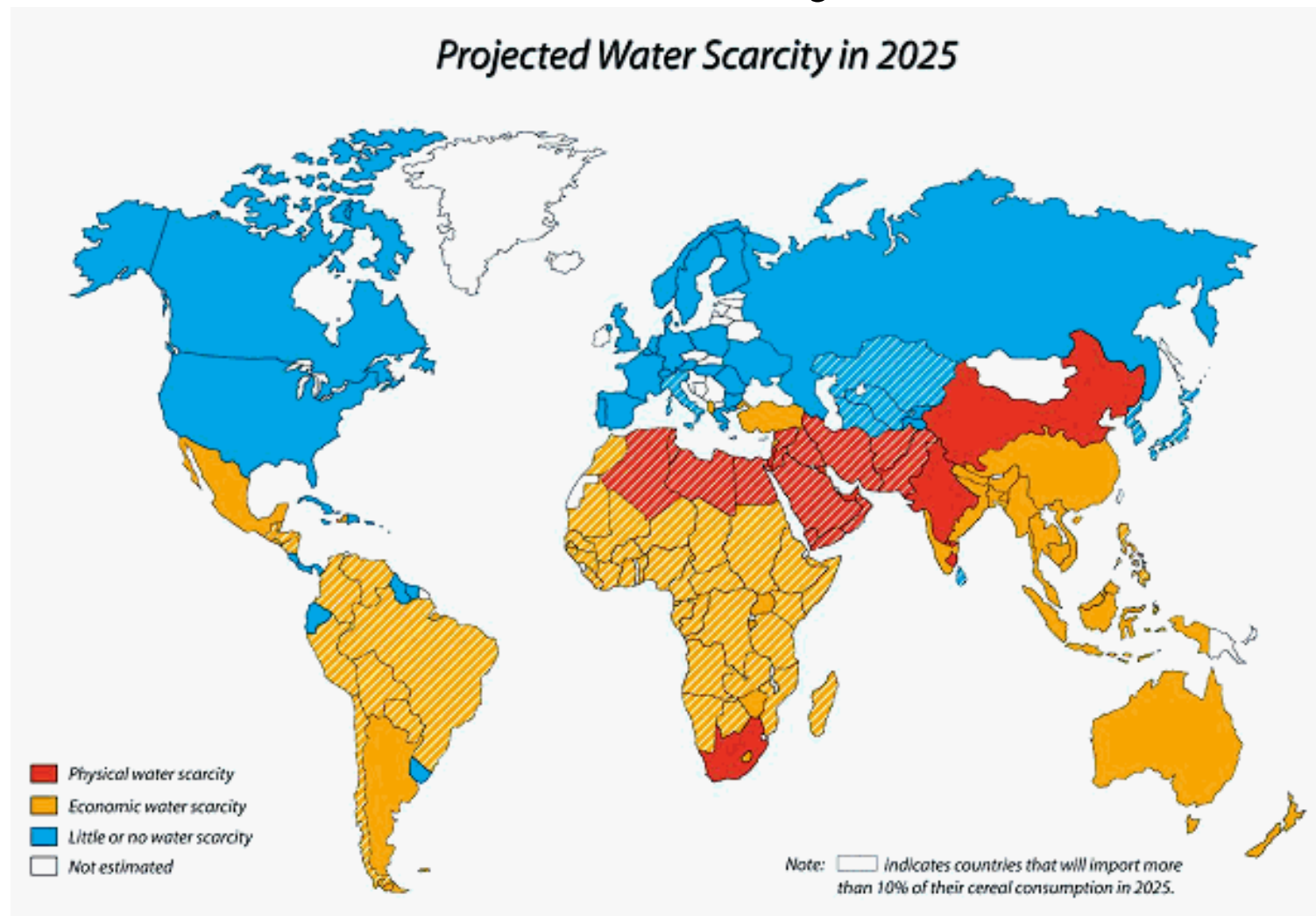
WaterX-series

Clean water for a healthy life...

example of typhoid fever in the Netherlands



Global Water Scarcity



Climate Change



Urbanization and demographic changes



Lesotho Highlands project

MOHALE TUNNEL CONTRACTOR CONTRACT LHDA NO. 2007 ACCIDENTS STATISTICAL RECORD		
MANDAYS WORKED WITHOUT DISABLING INJURY	86	MATSATSI A SEBELITSOENG NTLE HO KOTSI E MPE
LAST DAY OF DISABLING INJURY	25/03/02	LETSATSI LA HO QETELA LA KOTSI E MPE
PREVIOUS RECORD	51	REKOTO E FETILENG
TARGET MOTTO	90	SEPHEO LEPETJO
SAFETY STARTS WITH ME!!! POIBABALLO BO QALA KA "NA!!!		



Challenges for wastewater engineers

Carbon (soluble and solids)



EWFD / KRW

N: 10/15 $\rightarrow$ 2.2

P: 1/2 $\rightarrow$ 0.15

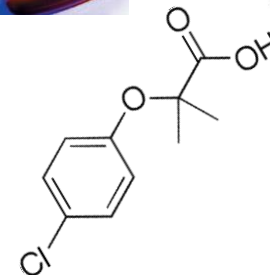


Increased nutrients' removal

Prevention of pollution
(ecosystem approach)

Pathogenic organisms ?

Micro-pollutants (incl. heavy metals)



The Urban Water Cycle



Domestic water use efficiency

Drinking
water

126.2

10.9

kitchen

5.2

Wash basin

45.7

bath/shower

22.8

Washing

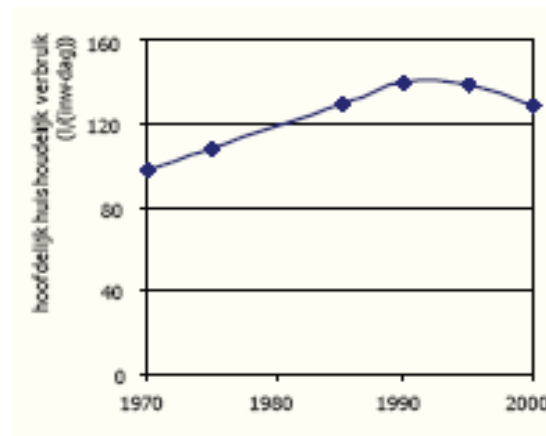
machine

6.8

garden, etc

34.8

toilet



€ 0.18/d!!!



Decentralized collection and treatment



Anaerobic wastewater treatment



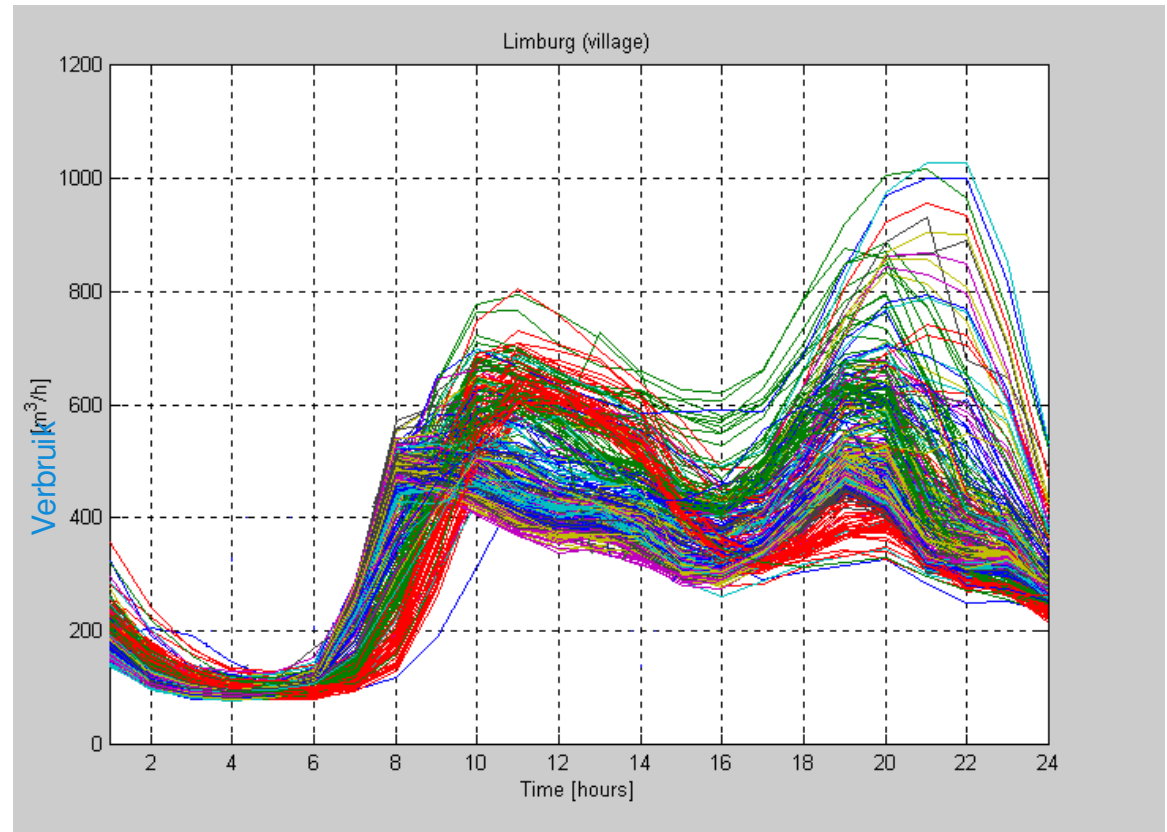
Decentralised recovered CH_4 cost-effectively into the grid?



Pipe burst VUMC



Control of Water Supply



Industrial Water Use efficiency





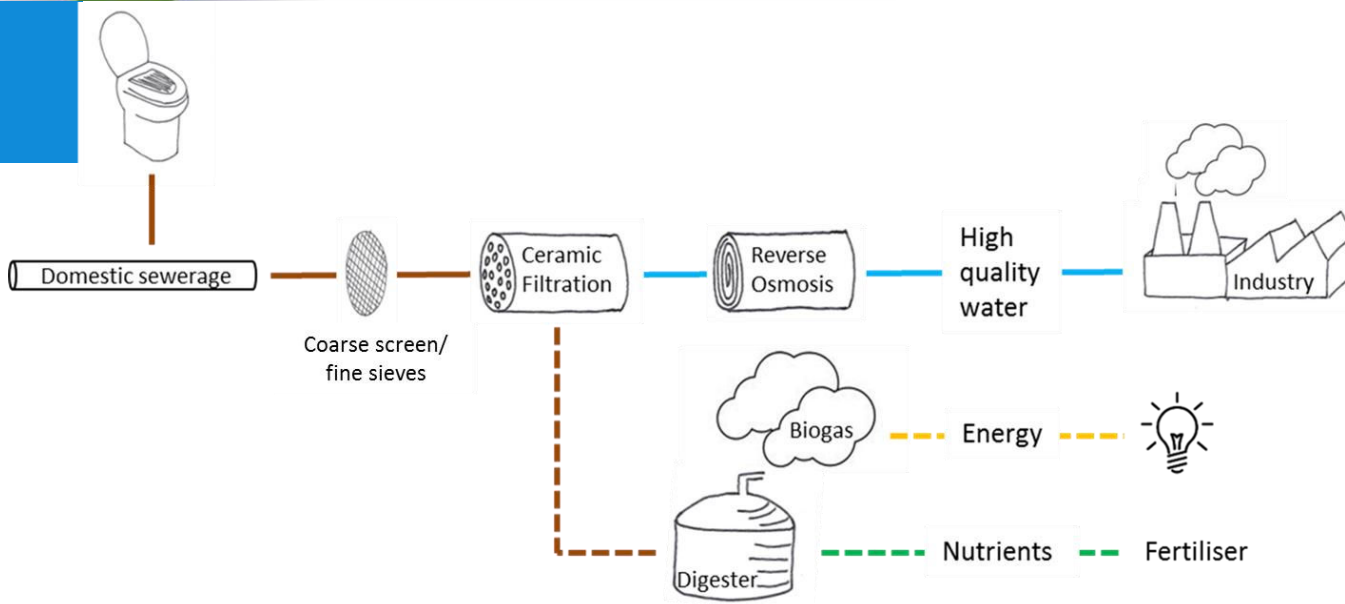
RINNEW

evides

TU Delft



Gemeente Rotterdam

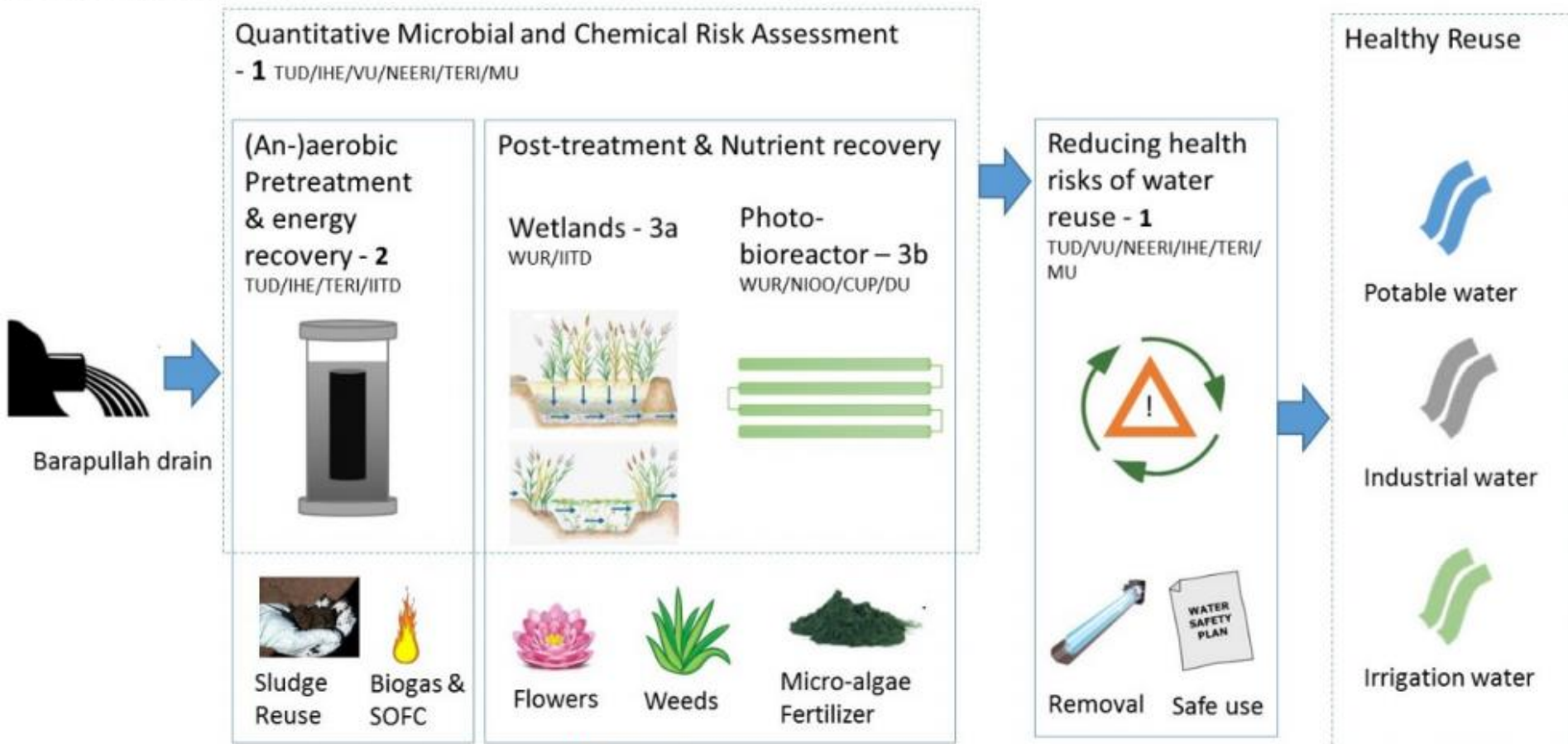


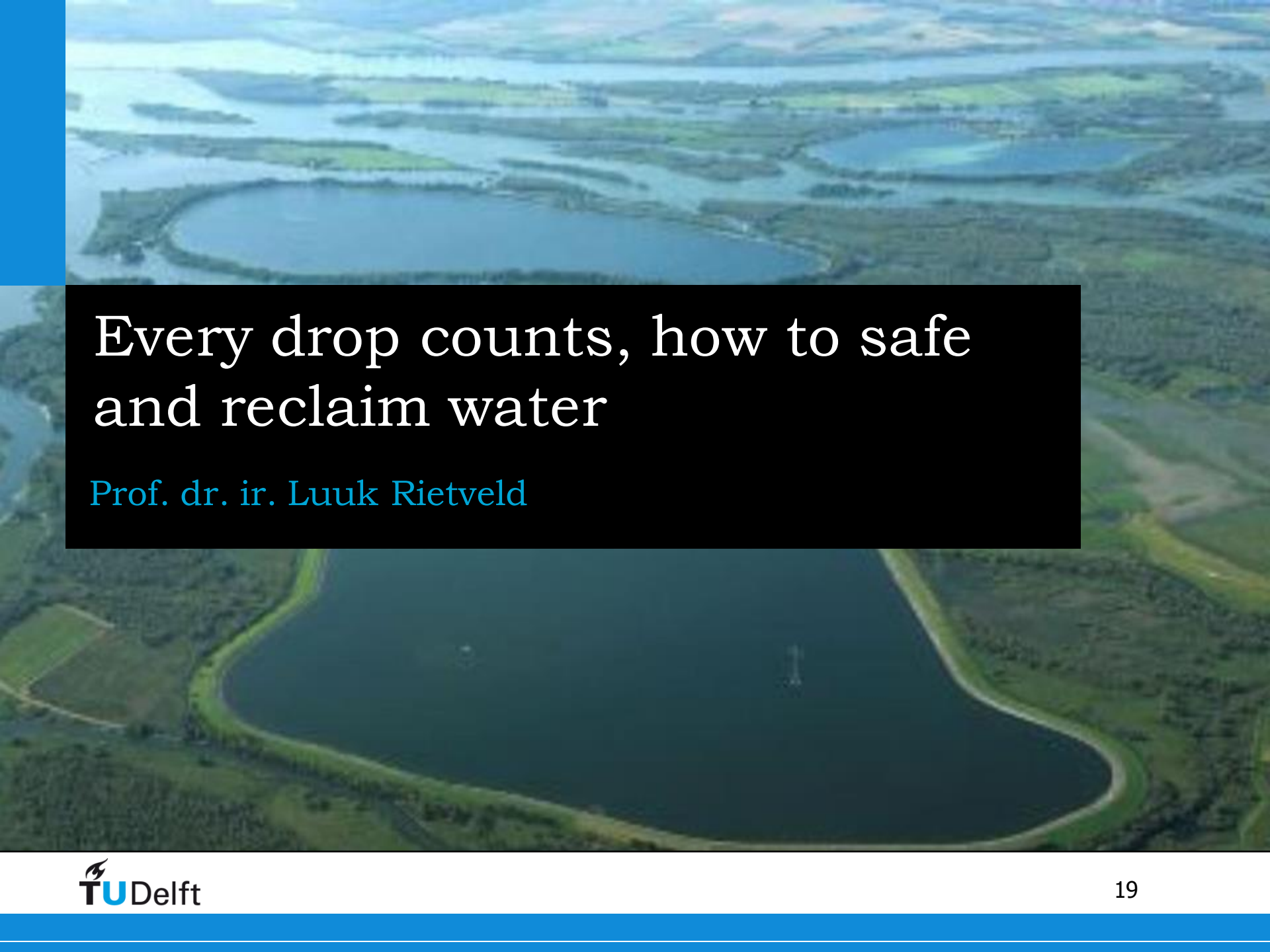
Concentrate the COD and nutrients in municipal wastewater using Ceramic NanoFiltration (CNF)



Urban Water Management: LOTUS^{HR}

Local Treatment Urban Sewage streams for Healthy Reuse





Every drop counts, how to safe and reclaim water

Prof. dr. ir. Luuk Rietveld