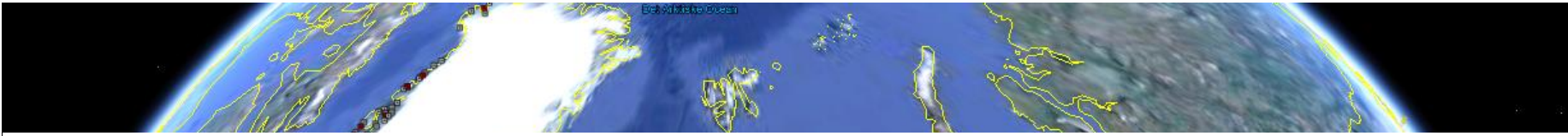


Danish Water Forum

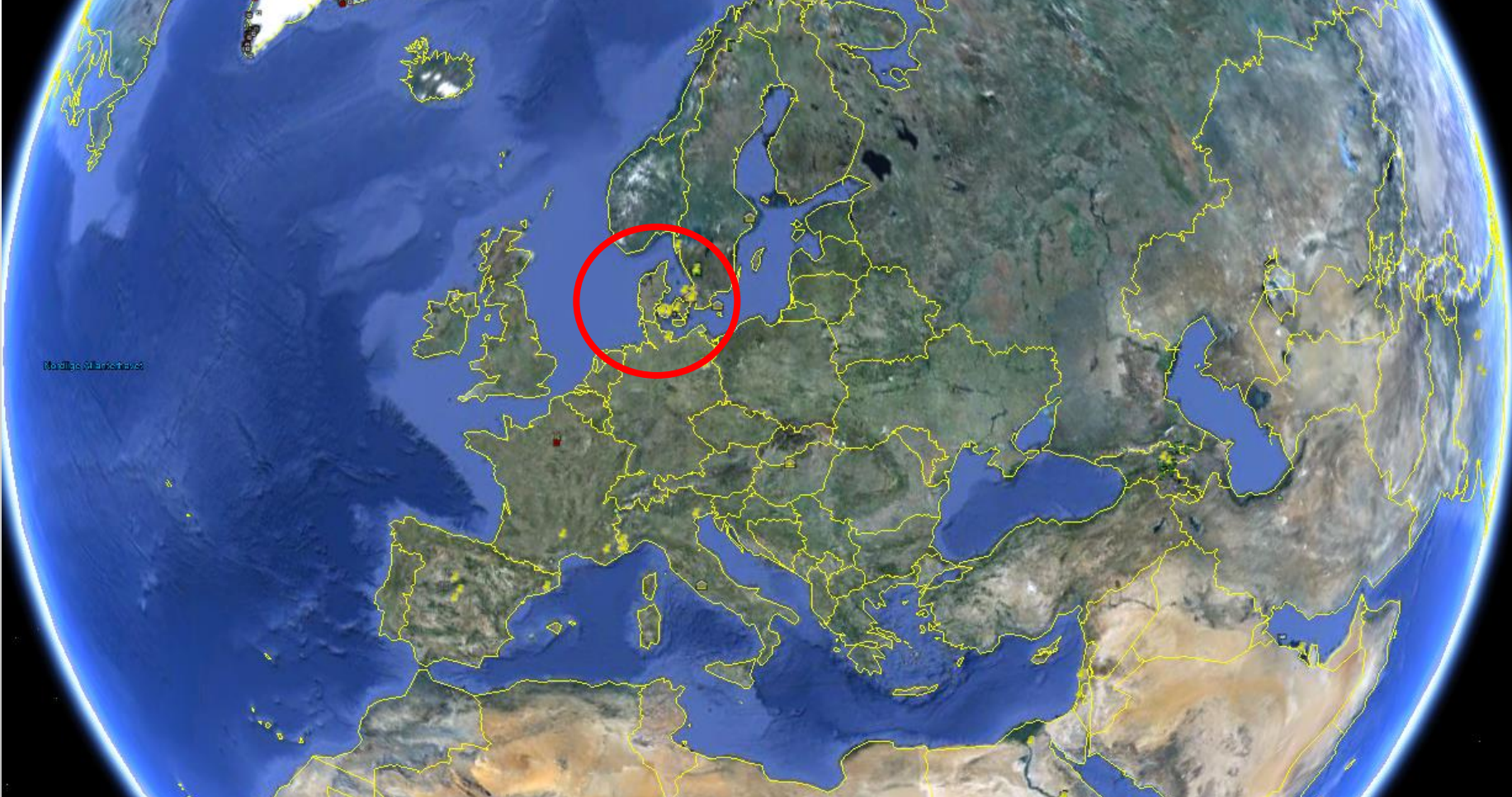
**Water New Zealand
20-22 September 2017**

By Jesper Goodley Dannisøe

www.danishwaterforum.dk
dwf@danishwaterforum.dk



Danes do not take access to water for granted!



Danish Water Knowledge

- Introduction to Danish Water Forum
- Tour of the water in Denmark



Danish Water Forum

- Established in 2003
- Water knowledge network of Danish stakeholders
- >50 members: Universities, Producers of equipment, Consultants, Water Companies, Authorities, NGO's etc.
- Support to the Danish water research society
- Support to the Danish Ministry of Foreign Affairs
- Promotion of Danish knowledge through export
- Promotion of knowledge sharing in Denmark



Vision and mission

Vision:

DWF supports Denmark to world-leading in the water sector.

Mission:

*DWF supports the water sector by **embracing** universities, authorities, producers and utilities and supports research, development, innovation and commercialisation of Danish water solutions globally*

*DWF **supports UN** in implementing the **Sustainable Development Goals***

Water in Denmark

Danish water supply based on groundwater for more than 120 years

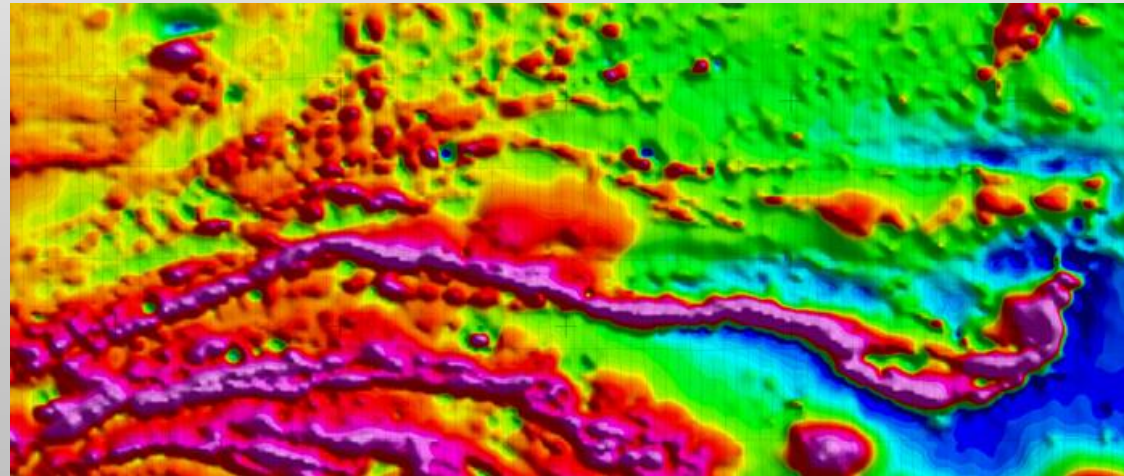


Chemical pollution !!!!!



Whole of Denmark mapped for ground water

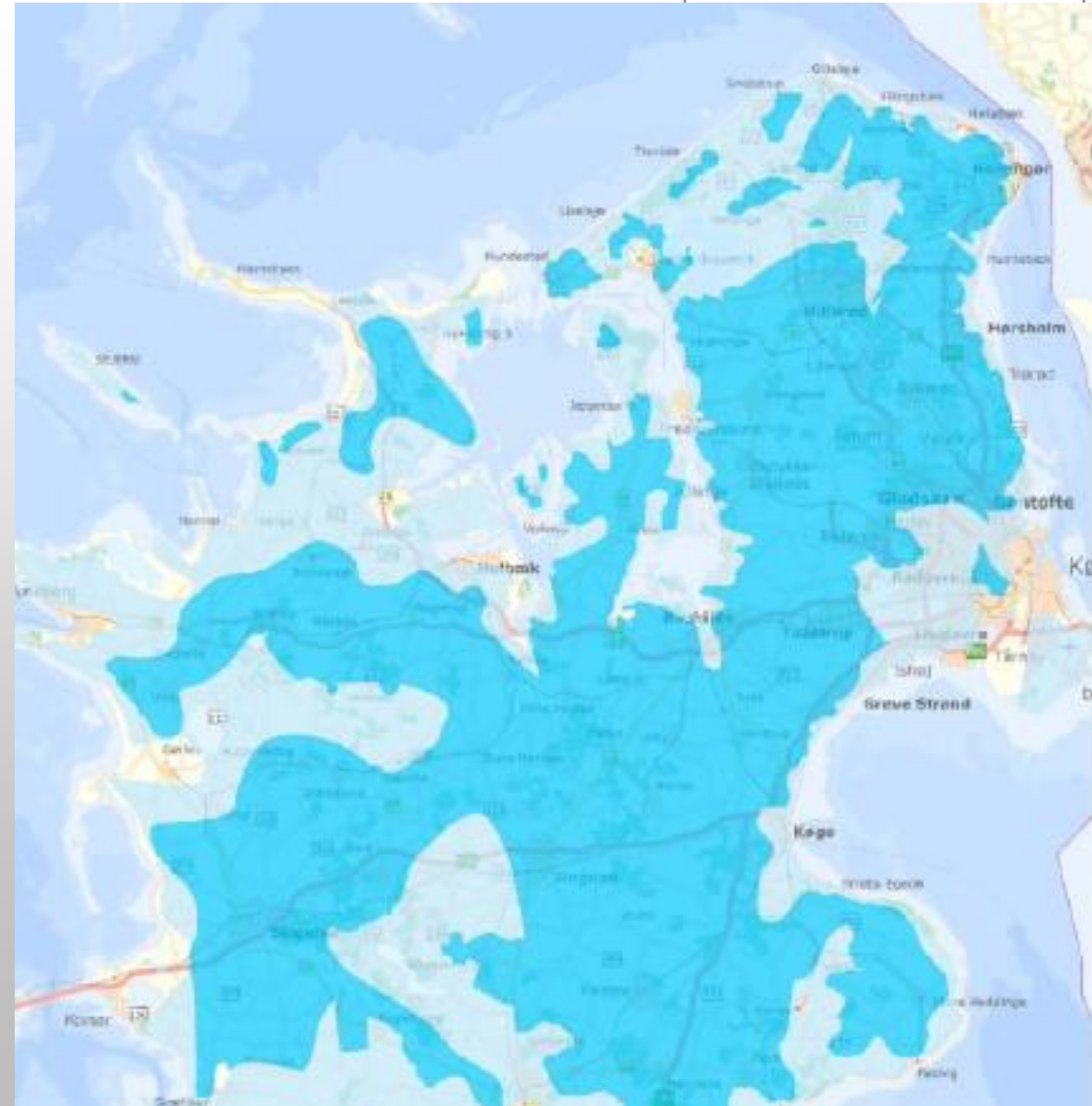
- Use of traditional and advanced systems
- Systems capable of mapping changes between sand, clay, silt, gravel, and tills that define the location and potential vulnerability of aquifers down to 500 m
- 1/3 of DK mapped with the SkyTem method (Magnetometer and Gamma Ray)



Groundwater protection

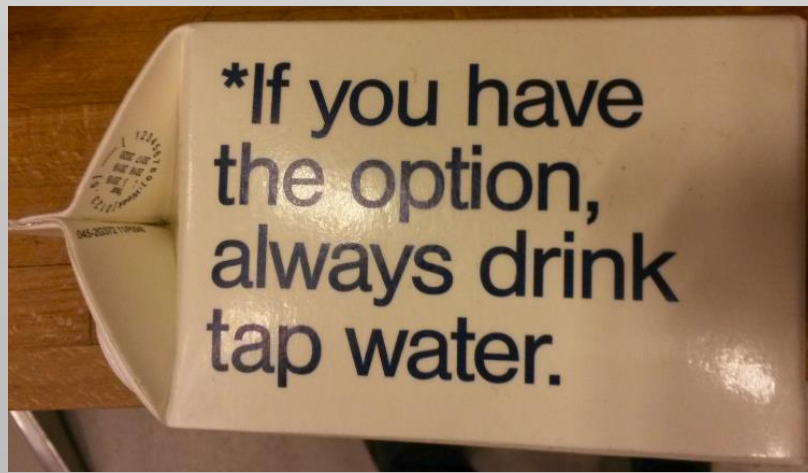
Based on mapping, sensitive groundwater areas have been mapped.

- Constraints to construction of new, potentially polluting industries and other activities, threatening the groundwater



The water distribution network

- Build in concrete, steel and plastic according to "fashion of the time of establishing it"
- Valves built to have same life-expectancy as the pipes (50-70 years)
- Pressure controlled constantly
- Leakage detection systems in all larger sections of the system
- 24/7 supply to 100% of the population



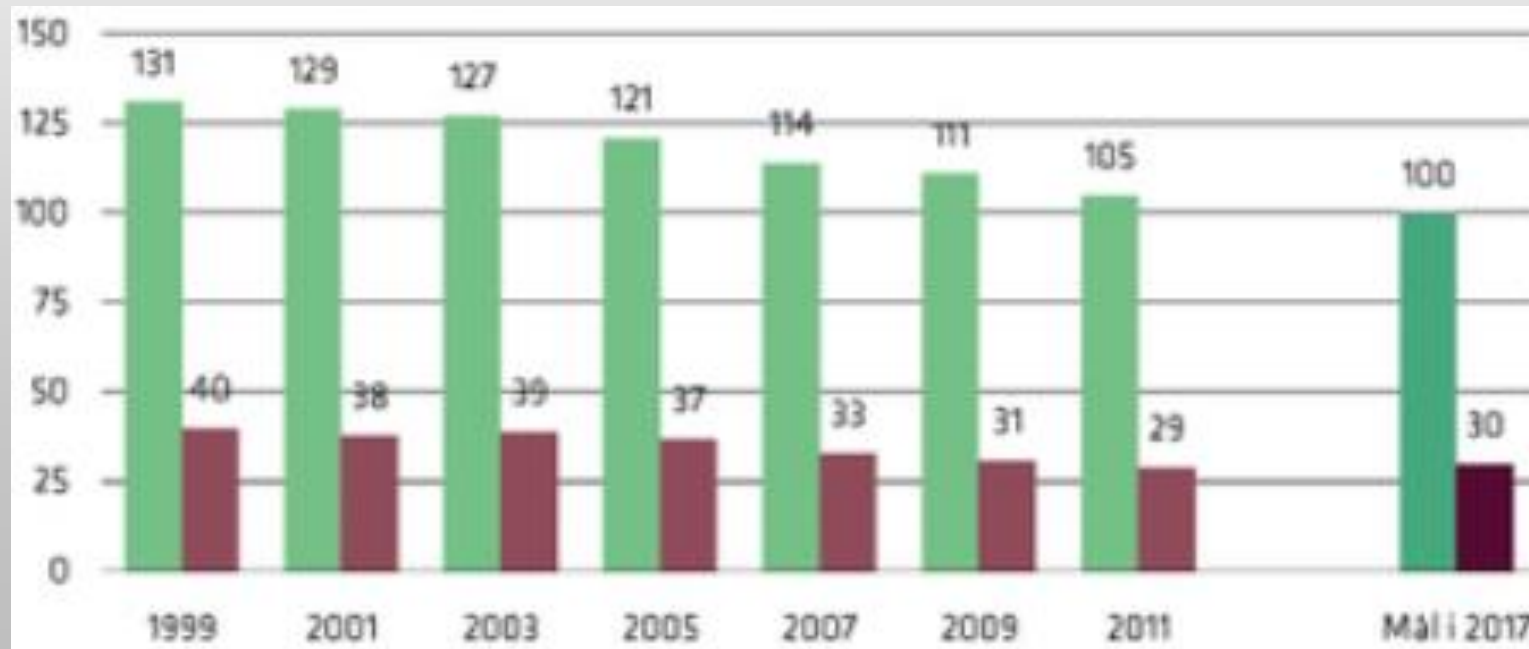
DK: 100-110 l/person/day

(NZ: 160 l/person/day)

Water consumption

High prize for water: 8-15 NZD/m³ (NZ: 3-4 NZD/m³)

Full cost/recovery price (drinking water and sewage water combined)



Liters/person/day
Green bar: persons
Brown bar: Industrial use

UN: Denmark is under water stress!!

No way! We just do not waste water!





Non-revenue water

5-10 % NRW, Why?

- People report leakages
- Supply companies have leakage teams and modern tracking equipment
- Plans for pipe rehabilitation is a tradition!
- Because water has a value !!!
- District Metering Areas (DMA): Standard!!
- NRW above 10% => Penalty!!



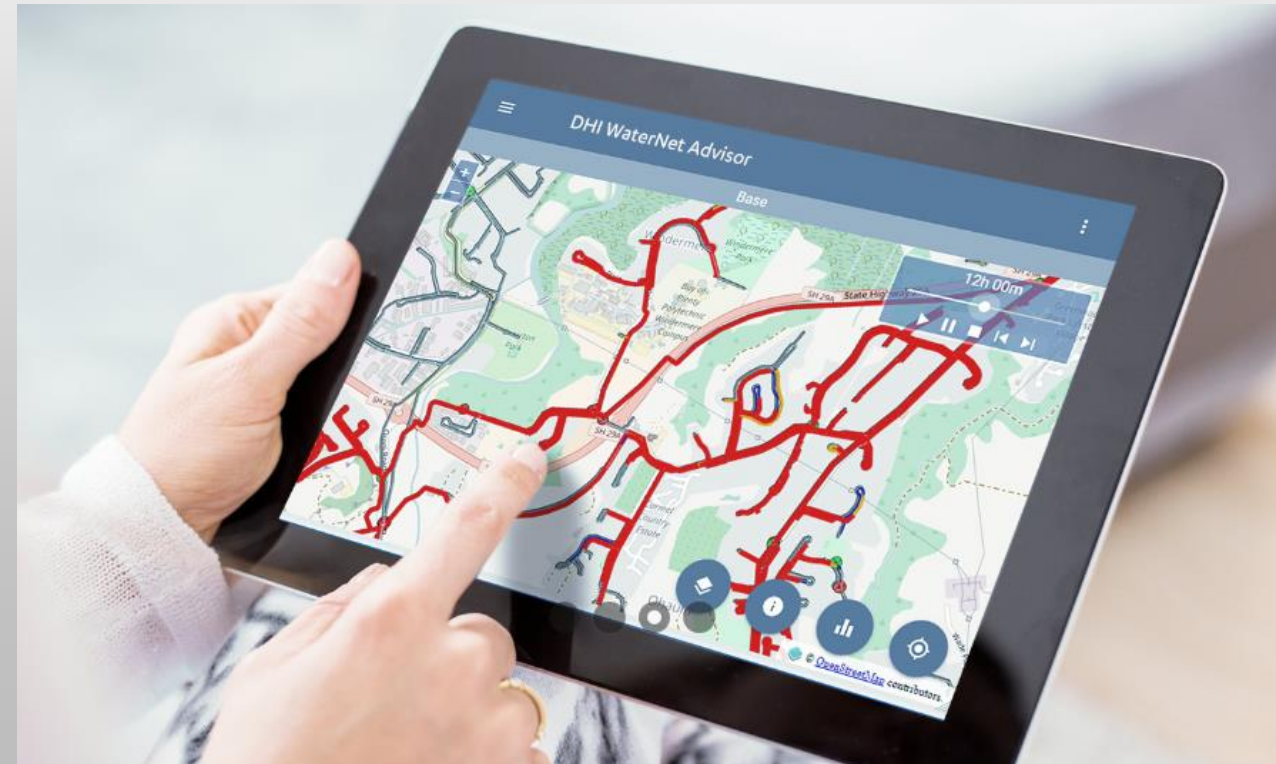


”Listening to the sound of ”money” leaking out from the pipe system!”

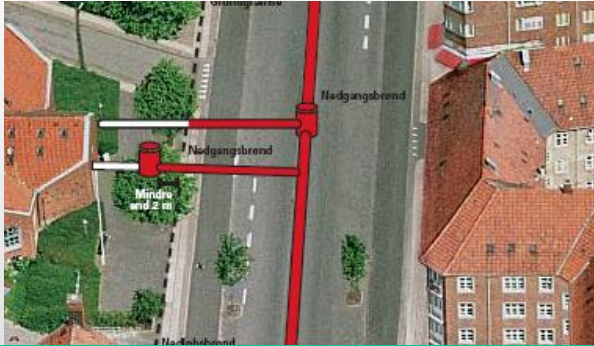


Dynamic models for the whole supply system

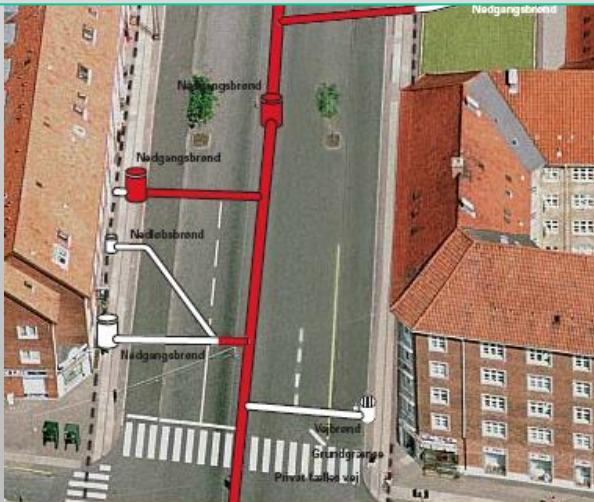
- Where is the water when??
- How to manage the supply?
- Scenario-modeling to predict when there is water scarcity in the supply system



Waste water systems = both combined and separate sewer systems



Main sewers of Copenhagen built 1857 – 1865, and still OK!



...and waste water treatment



Approx 90% treated in public treatment systems and 10 % in single household systems

National water plans from 1987: All systems upgraded
=> Increase in process and construction knowledge
=> Energy optimisation

Discharge permits

All wastewater treatment plants have tailor-made discharge permits:

- Based on type of recipient
- Distance to protected aquatic habitats
- Use of models to predict dispersion

Sensor technologies

Sensors are essential for on-line monitoring, control and optimisation of quality, flow, pressure and processes!

- H₂S sensors for the water phase => assessing the corrosion conditions
- Oxygen sensors for optimising treatment processes
- N₂O sensors for dynamic reduction of release from the Climate Gas
- Bacteria sensors online and built into pumps



Energy-neutral wastewater treatment plants

Several Danish WWTP energy neutral or net energy-exporting due to:

- Optimisation of processes (e.g.aeration)
- Better monitoring and control
- Energy-efficient pumps, valves and airblowers
- High sludge-utilisation for gas production
- Highly educated and skilled staff



Advertisement:

21 September 2017: Thought leadership!

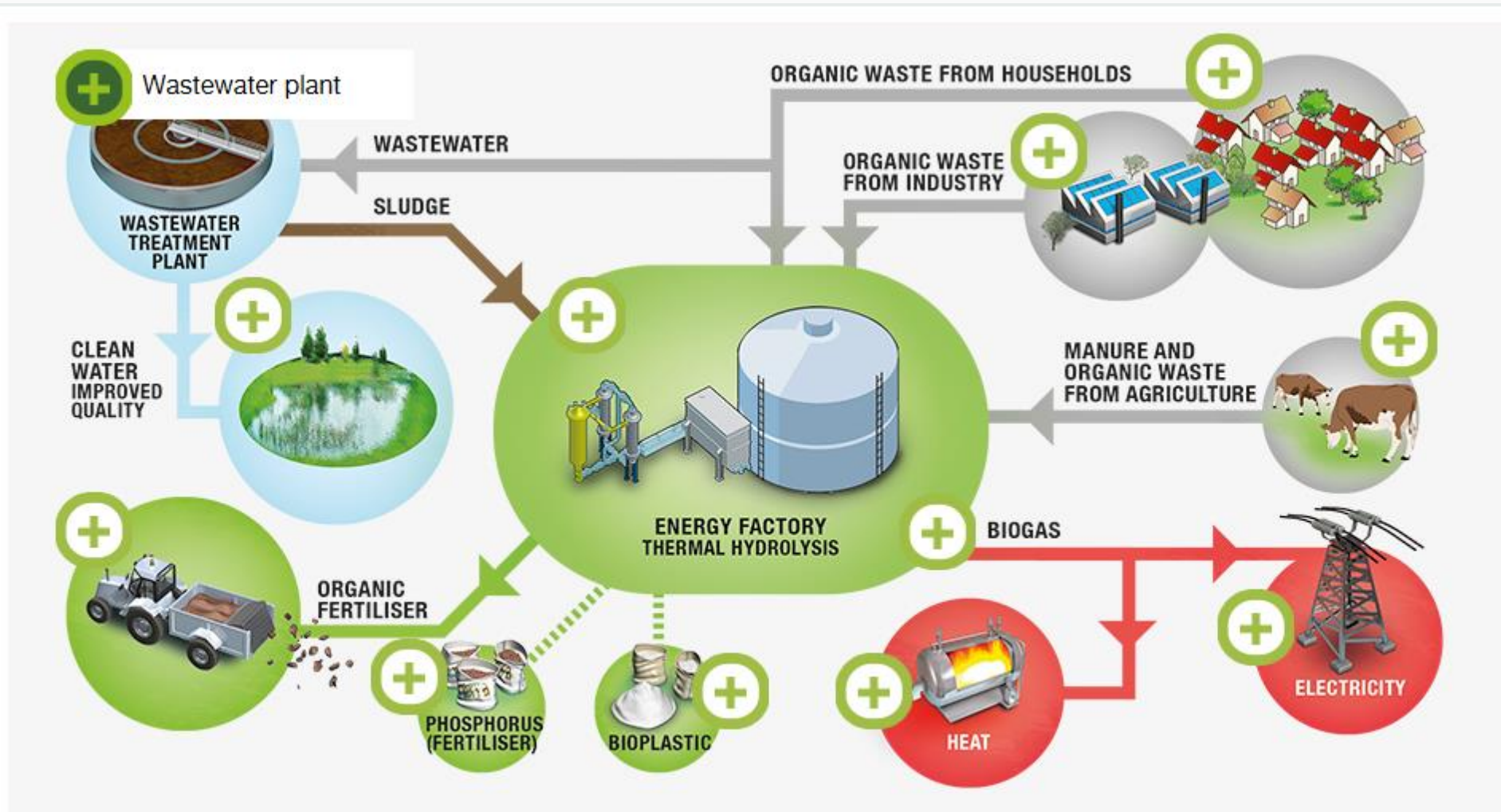
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Turning the Water
Industry into Energy
Neutrality

Mads Warming

*Global Segment Director,
Water and Wastewater,
Danfoss*

Biorefinery



Billund BioRefinery - Resource Recovery for the Future

Heavy rains in Denmark !!

Copenhagen, 30 August 2014!!



Climate-proofing Danish urban areas

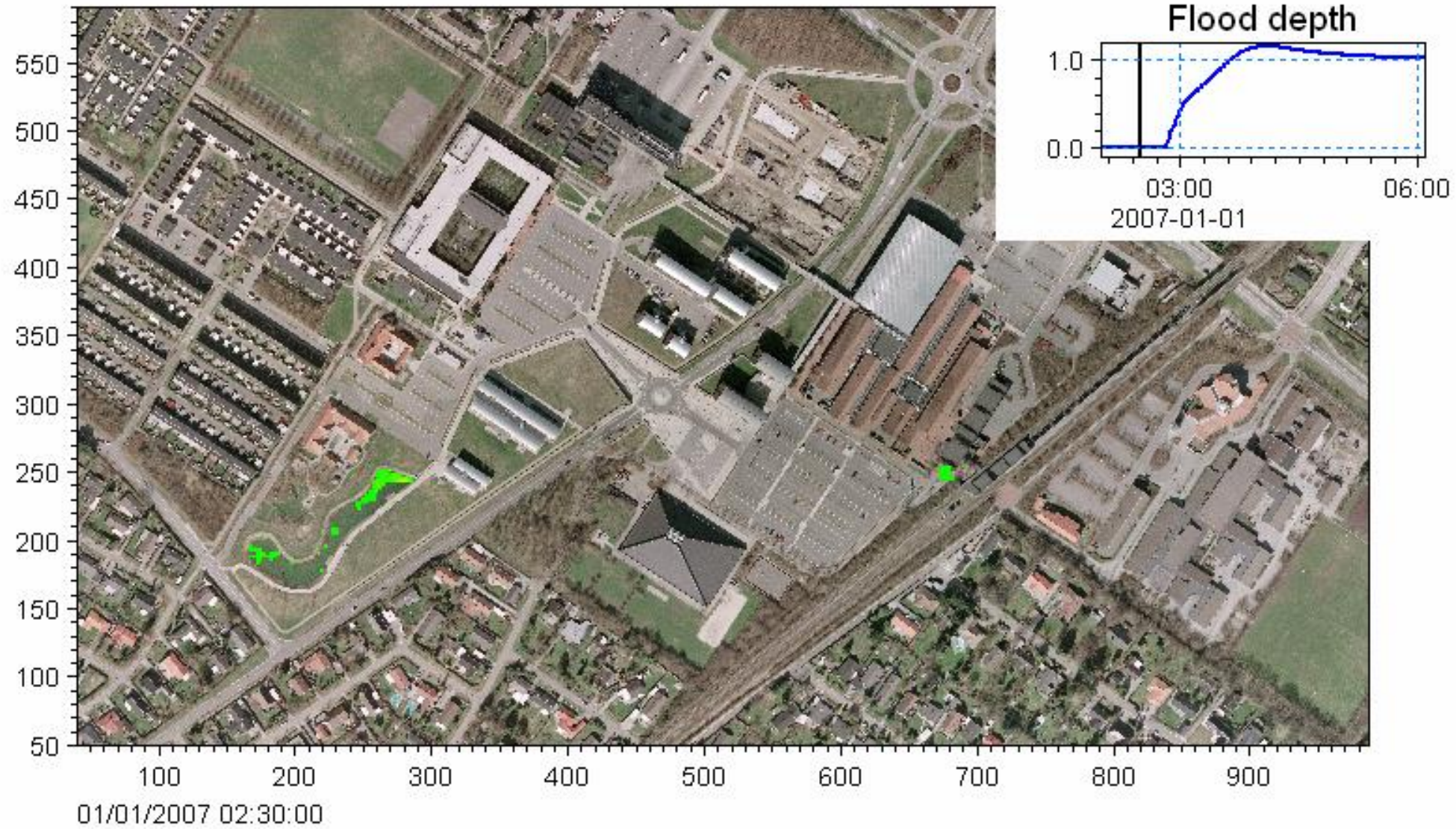
The climate-proofing of urban areas include:

- Separation of sewage and storm water
- Utilising stormwater as a resource for gardening, reducing pressure on the water resources
- Creating ponds and wetlands in parks (green infrastructure)
- Increasing groundwater recharge
- Integrating features in the city landscape





Modeling of flooding in cities

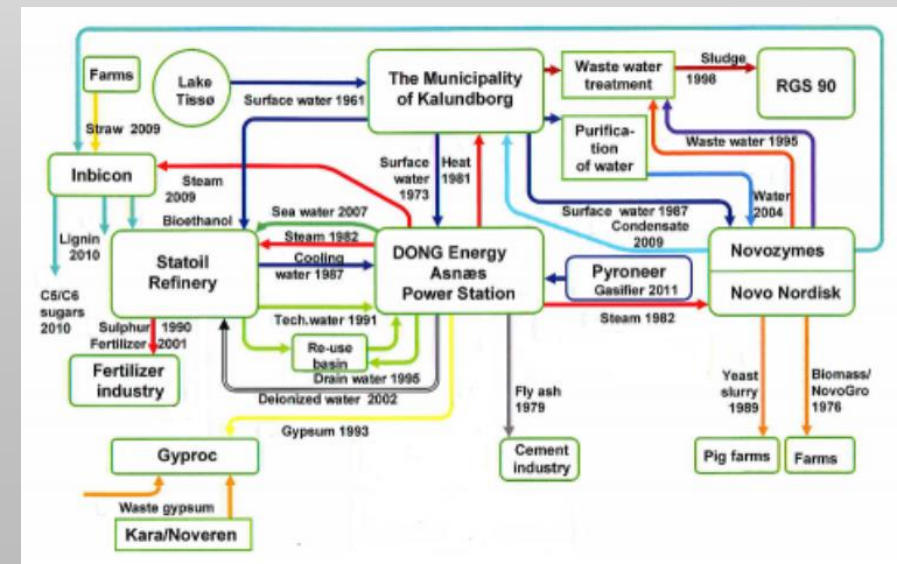


Symbiosis: 9 industries, sharing resources

9 major Danish industries joining forces to:

- Save water through using each others wastestreams in non-potable contexts (3 million m³/year)
- Energy symbioser by utilising e.g. surplus gas from one company in the production in another company (reduction of 300,000 t CO²/year)
- Exchanging solid and liquid wastestreams to be utilised as raw material in other products

30 years of experience!!



Summing up!

Denmark and water is driven by:

- Innovation and efficiency
- The water sector is in a constant move towards new technologies
- "Push n' Pull" incentives
- The utility sector is very attractive for young water scientists



Acknowledgement

Thanks to the Royal Danish Consulate for arranging my participation

Thanks to Water New Zealand for inviting Denmark!





**Thank you for
your attention!**

**Join us in Copenhagen at:
IWA World Water Congress and
Exhibition 2020**



www.danishwaterforum.dk