Lessons learned on Groundwater Flooding in TOPSOIL

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midt Central Denmark Region

GEUS

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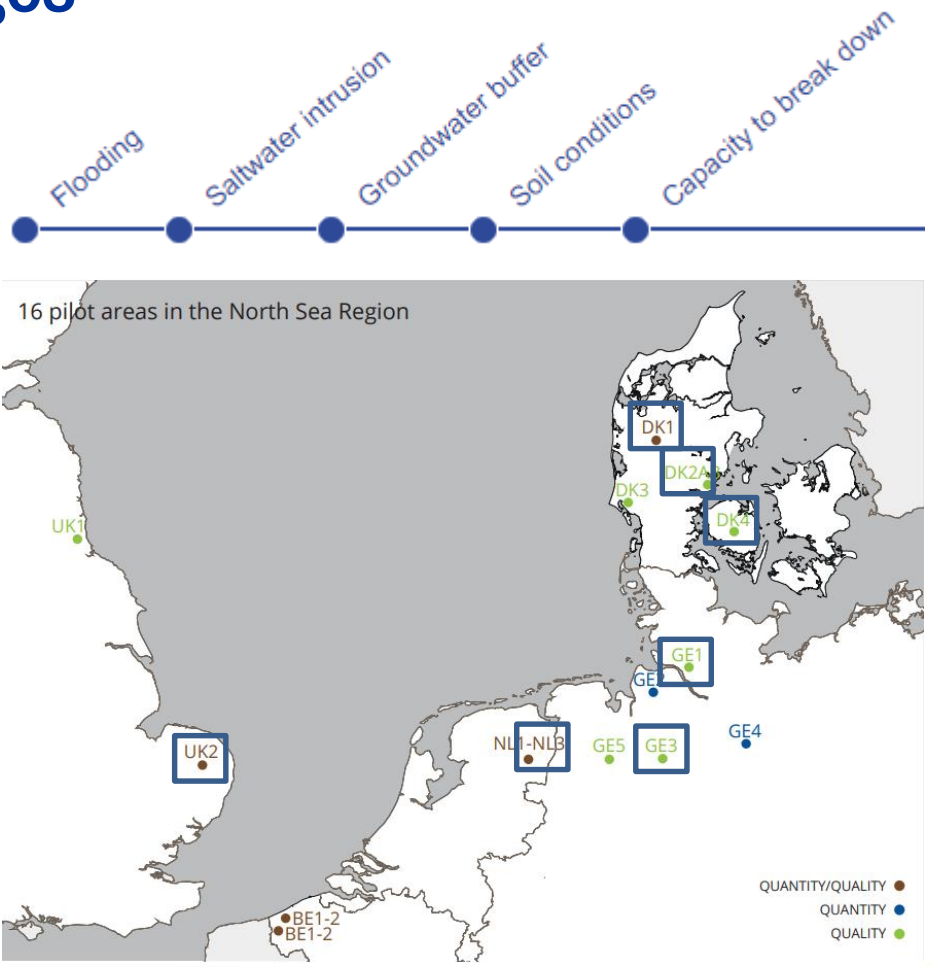
TOPSOIL pilots and challenges

- Groundwater flooding 1 of 5 challenges
- Groundwater flooding is investigated in 7 of the 16 pilots: DK-1, DK-2, DK-4, GE-1, GE-3, NL-3, UK-2 (more or less intensively)

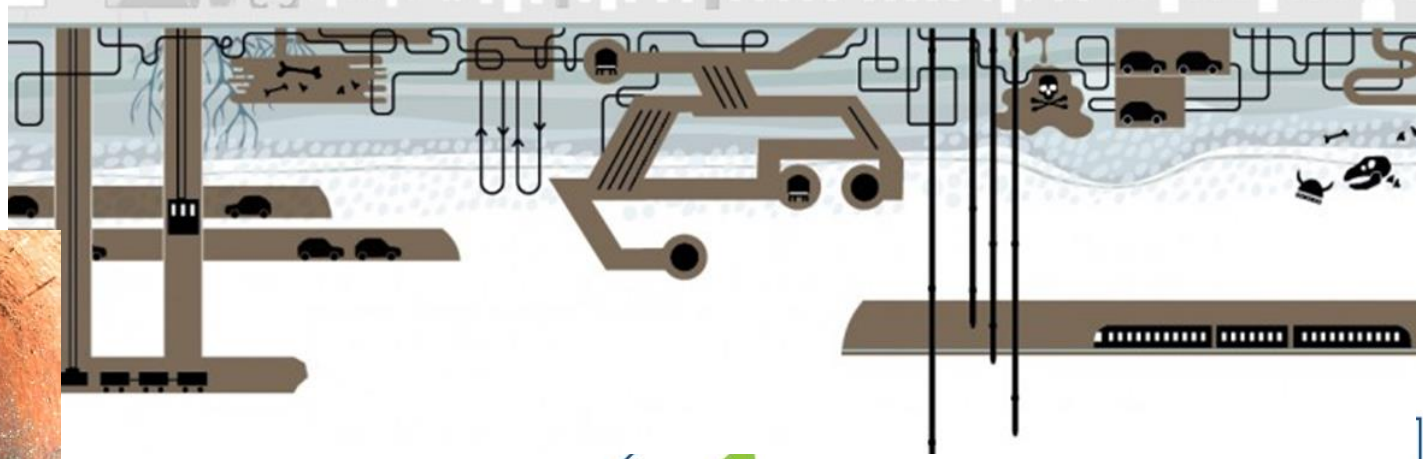


The challenges of groundwater flooding

The direct consequences - experienced in TOPSOIL

The urban environment

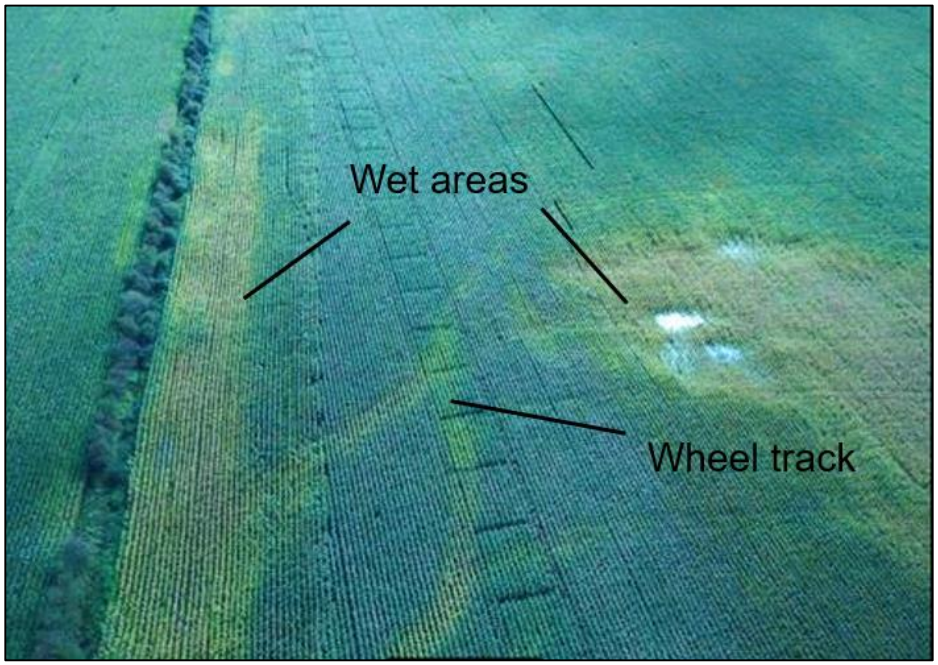
- Old sewers act as drainage (unintentional large water volumes at waste water plant)
- New sewers → no drainage effect → rising groundwater levels
- Rise in groundwater level due to changes in abstraction patterns (drinking water)
- Mobilization of contamination plumes
- City densification with urban development in low lying areas
  - Water in basements etc.



The direct consequences - experienced in TOPSOIL

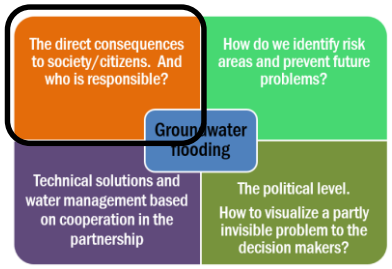
The open land

- Groundwater flooding of fields/crops
- Many derived effects on agriculture (limited root zone, lower soil temp. etc.)



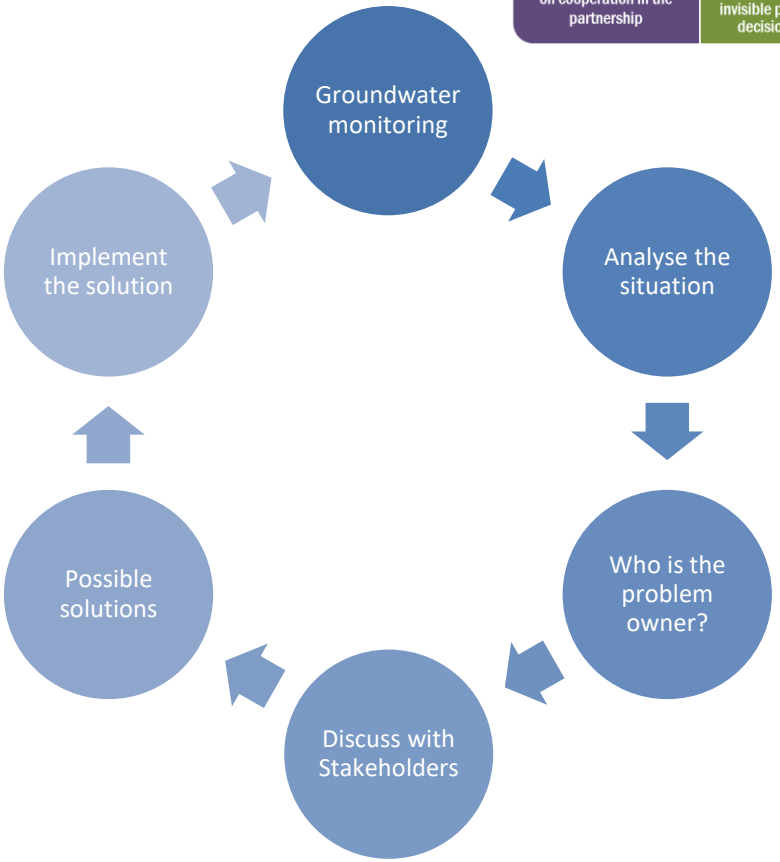
Reference: SEGES, R. K. Laursen

Shared experiences on urban groundwater monitoring and legislation



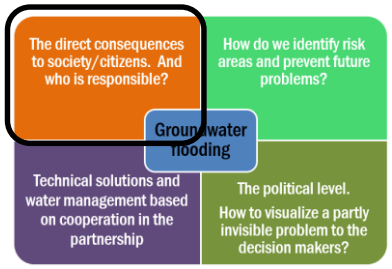
Lessons learned

- Urban groundwater monitoring network important
  - Predict and prevent problems
  - Identify problem owner
- The management of surface water is also of influence on the groundwater level in urban areas
- It is effective to regulate groundwater by a third drainage pipe in the sewer systems
- The importance of proper stakeholder involvement (clear communication plan)



Reference: Helbig A., Gemeente Groningen

Legislation – barrier or opportunity?



The cross border partnership is valuable in the process for adapting national legislation on groundwater flooding/rising groundwater

Example:

Clear Dutch legislation on shallow groundwater acts partly as an driver/input to push for changes in regulation in Denmark

Dutch regulations on this topic since 2008

Figure to right: Danish scientific newspaper article describing challenges in the present Danish legislation

Lovgivning bremser effektiv indsats mod stigende grundvand

PLUS.

En metode udviklet af forskere fra Aarhus Universitet er i Sunds ved Herning blevet brugt til at kortlægge undergrunden omkring byen langt mere detaljeret, end man hidtil har kunnet. Det er gjort i et samarbejde med Geus, Herning Kommune og Region Midtjylland som en del af EU-projektet Topsoil. (Illustration: Geus)

Reference: Ingeniøren, August 2019

Reference: Helbig, A., Gemeente Groningen

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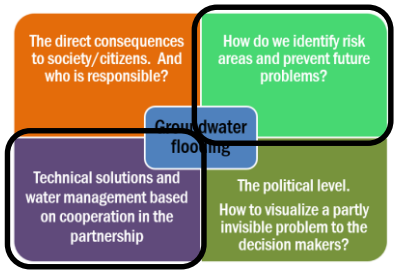
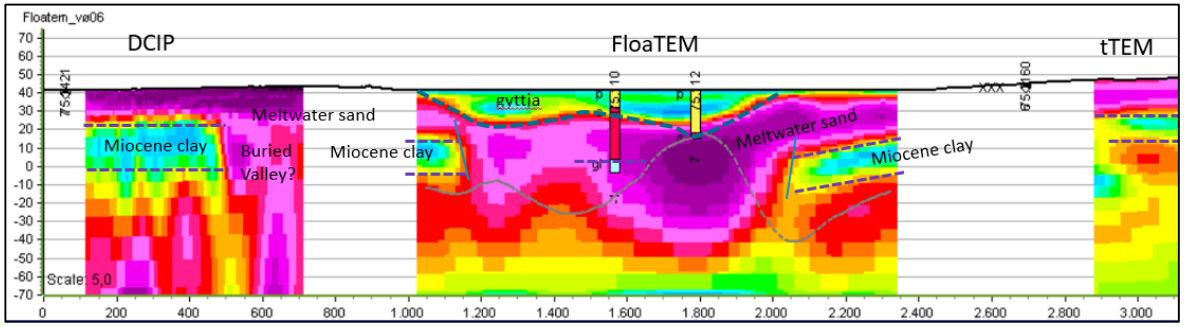
Added benefit in TOPSOIL pilots – new technical solutions



- Thorough subsurface mapping and modelling approach
- New geophysical investigation methods → Tow-TEM and FloaTEM
- Detailed geological and hydrological models → technical models as scientific basis for estimating effective preventive measures
- Pilot DK1 – Sunds (results presented in earlier session)



Reference GEUS, 2019

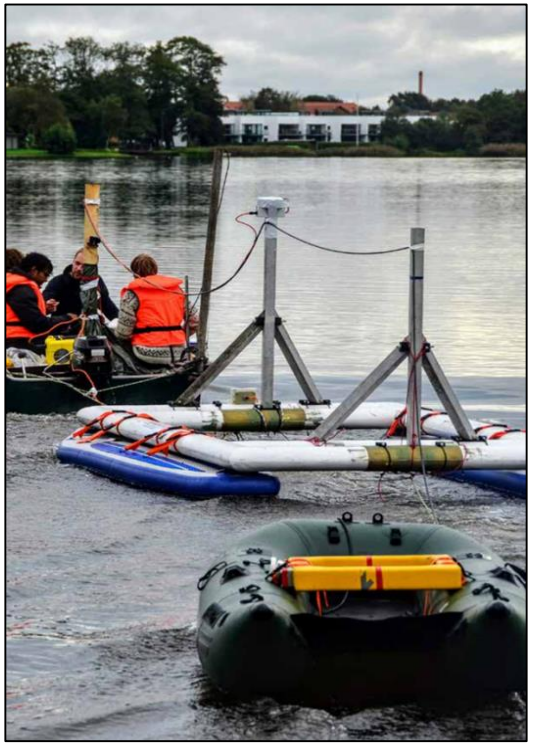


Photo from: Hydro Geophysics Group, Geoscience, Aarhus University

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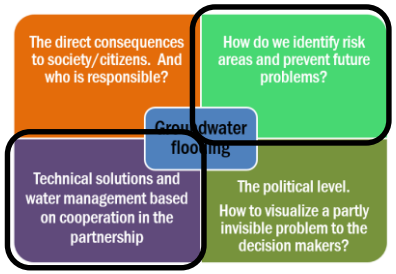
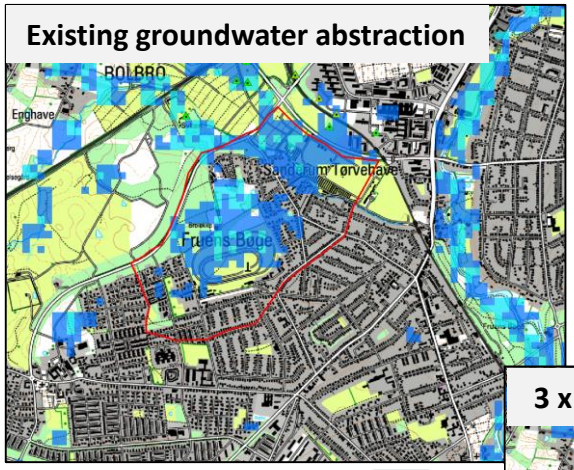
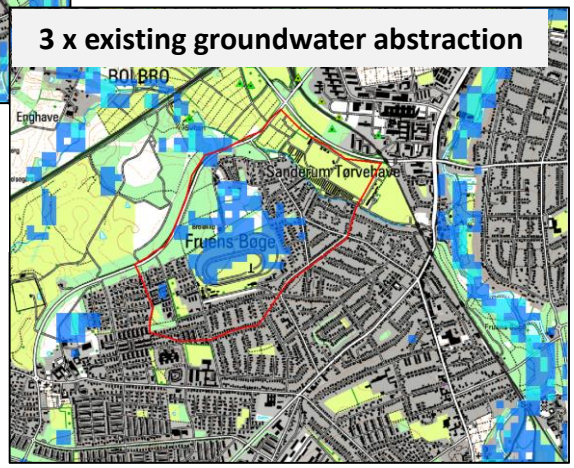
Modelling of rising groundwater levels and preventive measures



- Example from Odense (pilot DK4)
- Challenge
  - Climate induced increase in precipitation and extreme rain
  - Reduced groundwater abstraction in urban areas

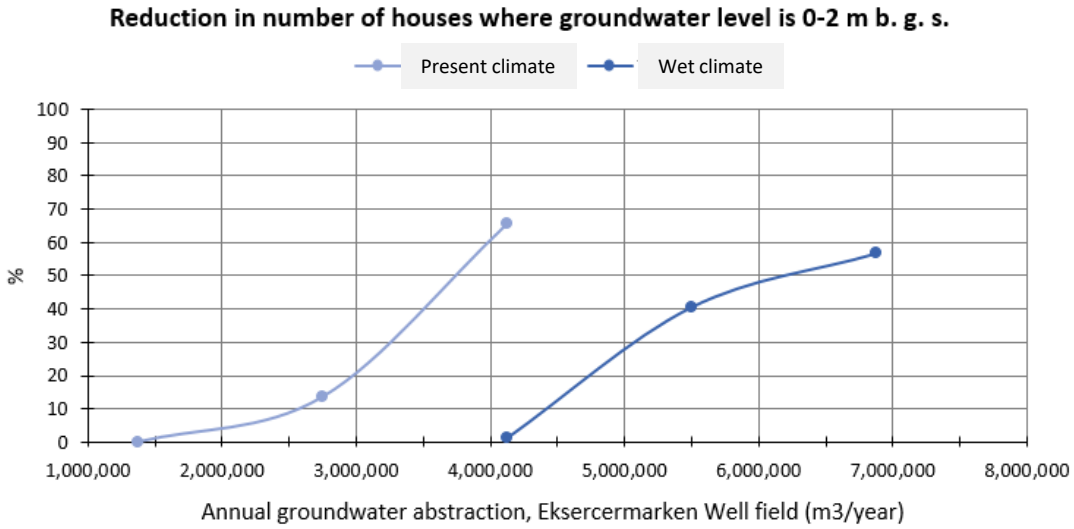




Groundwater level m b. .g. s. < 0 | >0 - 1 | >1 - 2 | >2

Reference: GEUS (Ane LaBianca)

Tested measure: Increase in groundwater abstraction



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TOPSOIL as a platform for communicating groundwater flooding to the political level

- TOPSOIL cases adds value on how to face/prevent groundwater flooding
- TOPSOIL acts as channel of communication to politicians in the North Sea region on groundwater-surface water projects
- Lessons learned gives perspectives on future focus in groundwater – surface water management

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