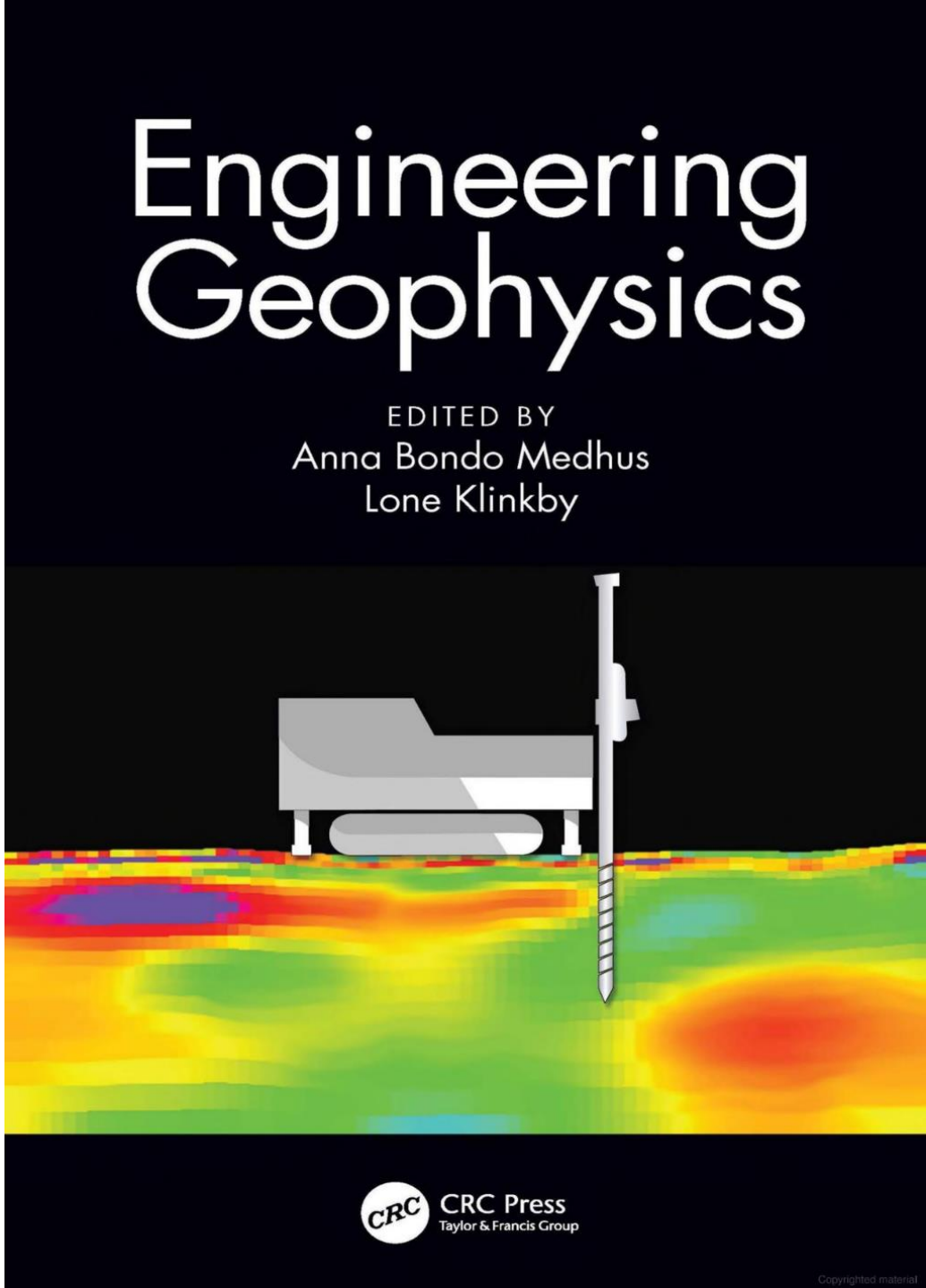
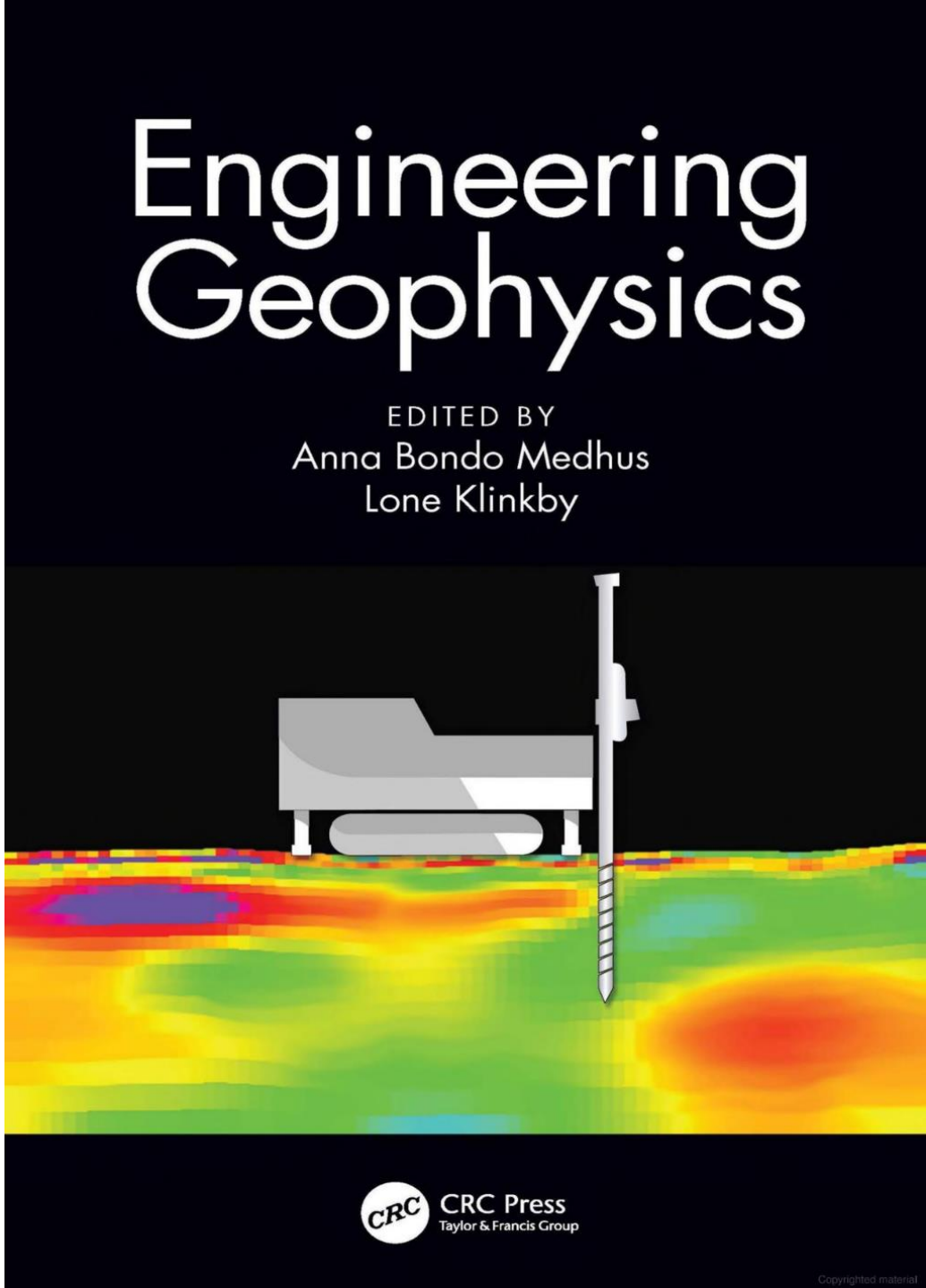
Hvordan udvider vi geosamarbejdet for ingeniørprojekter på land?



- Hvad leder din Geotekniker efter?
- Hvorfor skulle ingeniører dog bruge geofysik?
- Taler vi samme sprog og størrelsesordner?



Introduktion – Alt det med stort og småt

Bogen indhold bl.a.

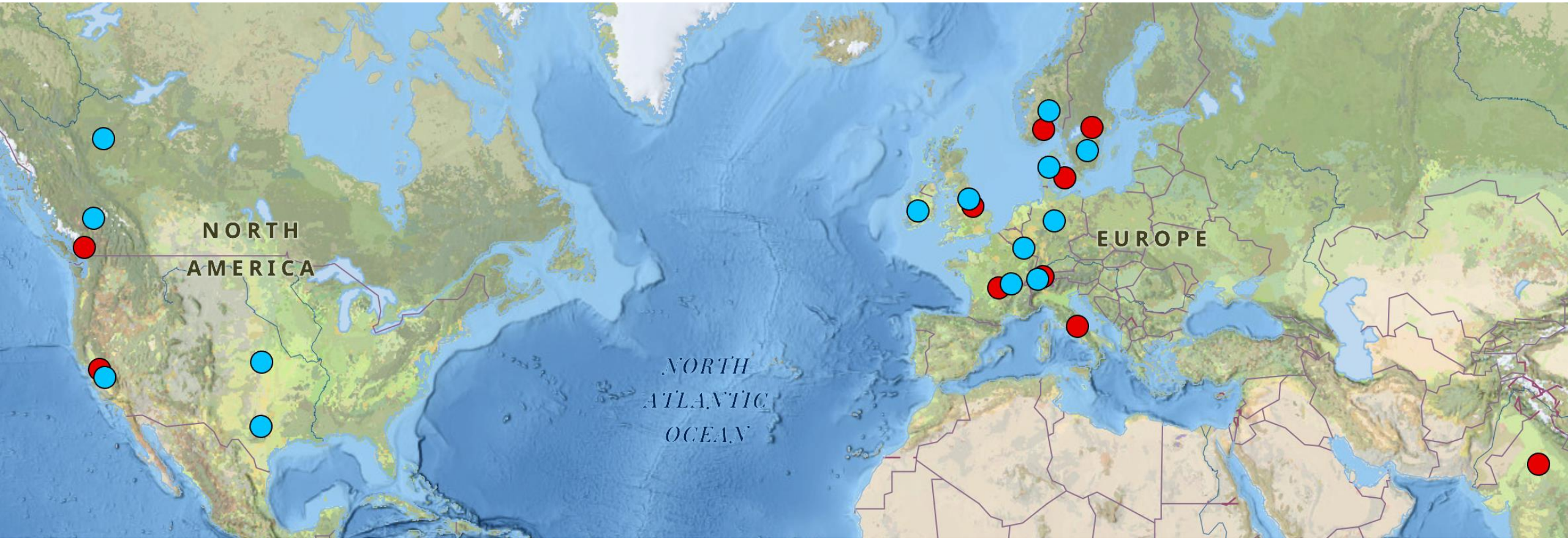
- 8 metodekapitler
- 38 cases

Ingen bog uden

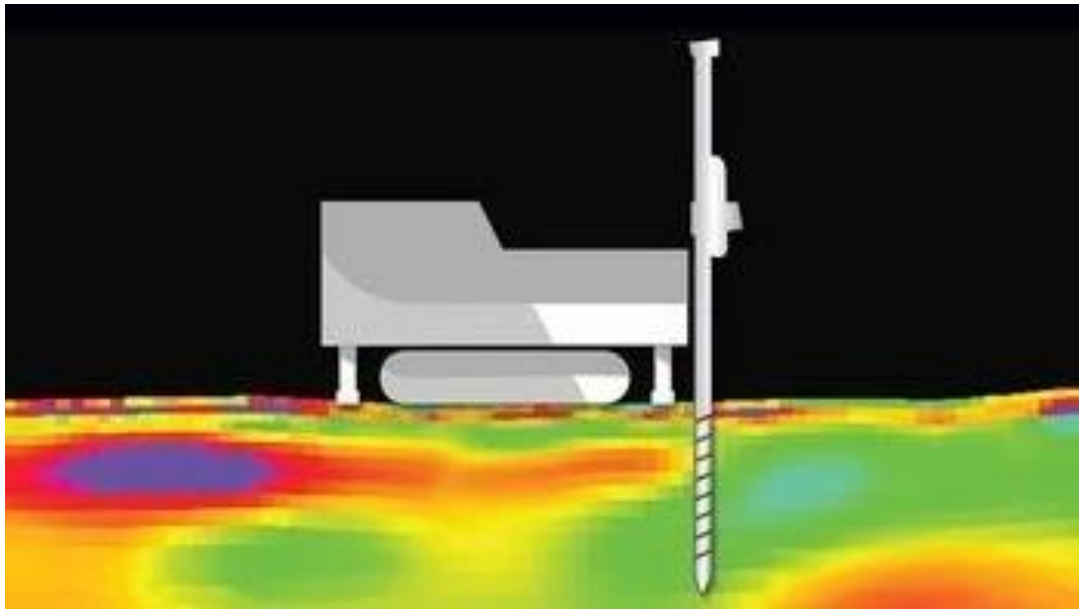
- 43 medforfattere
- 12 reviewere
- Utallige supporters

- Metoderne i bogen - og brugen af dem - er hverken udtømmende eller fyldestgørende
- Ikke offshore
- Ikke grundvand/ressource

Medforfattere og case lande



Hvad er geofysik?



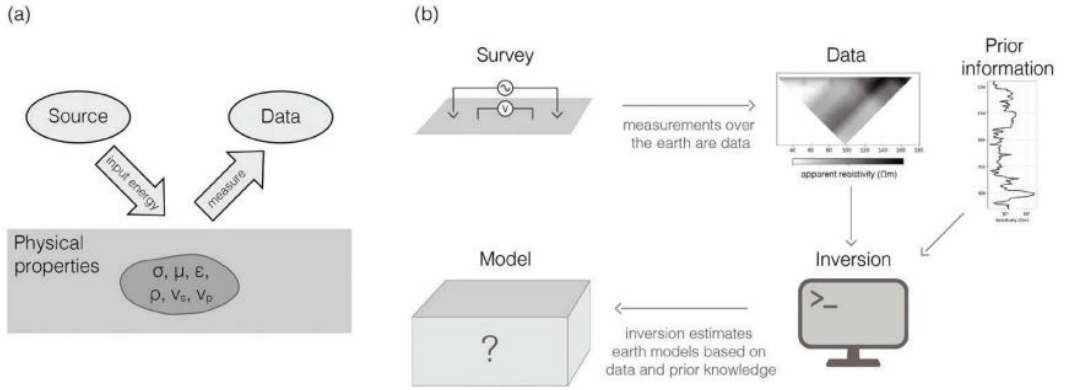


Figure 1.2 (a) Generic geophysical experiment. (b) Role of inversion for processing geophysical data to estimate a physical property model of the subsurface.

Oldenburg et al, 2022

Hvad har geoteknikeren brug for?

Basic properties

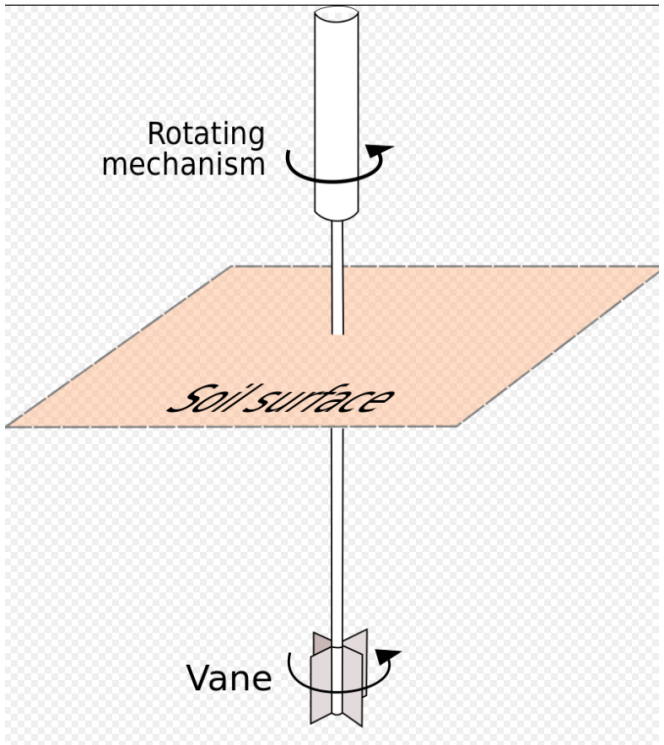
Strength

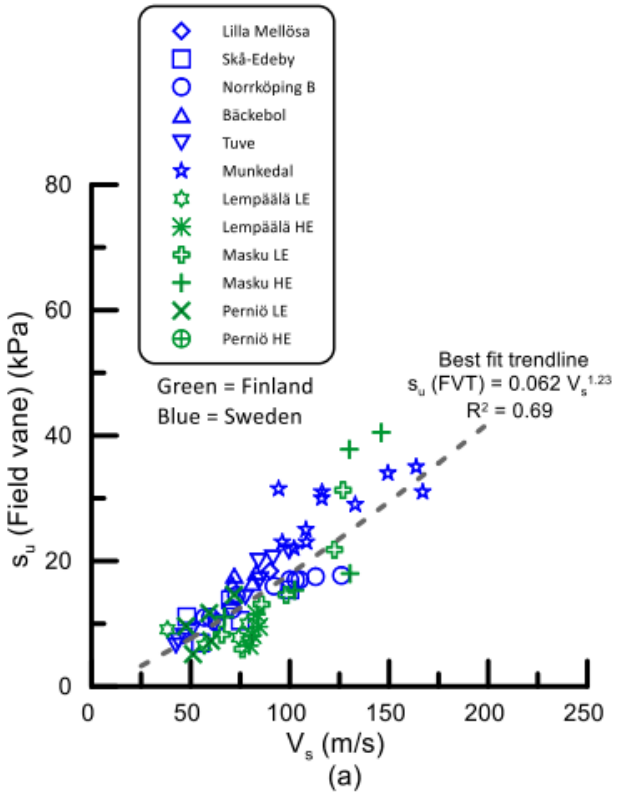
Stiffness

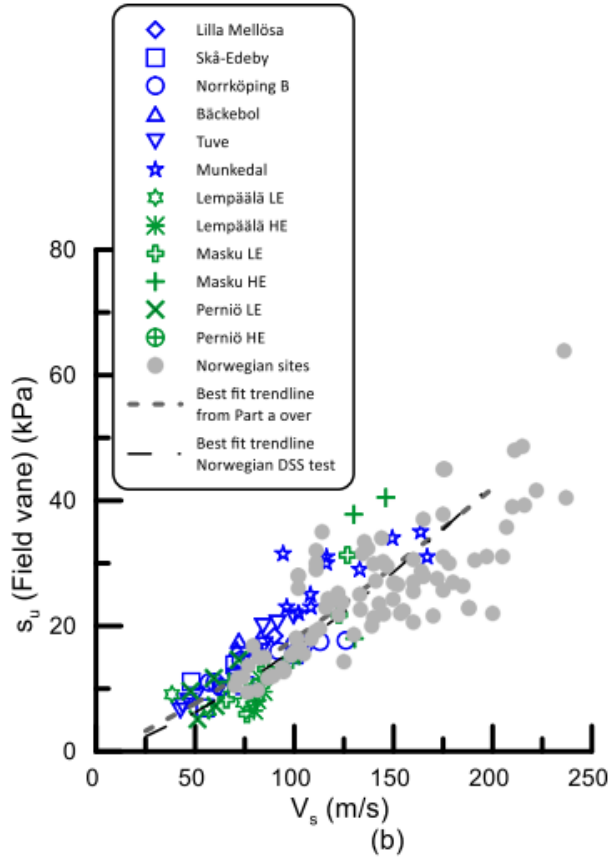
Inginørerne kan lide koder: Eurocode 7

Geoteknikerens relationer – Vs og styrke

- https://youtu.be/za_MXhUYIoM
  VIA: Randi Warncke Nissen



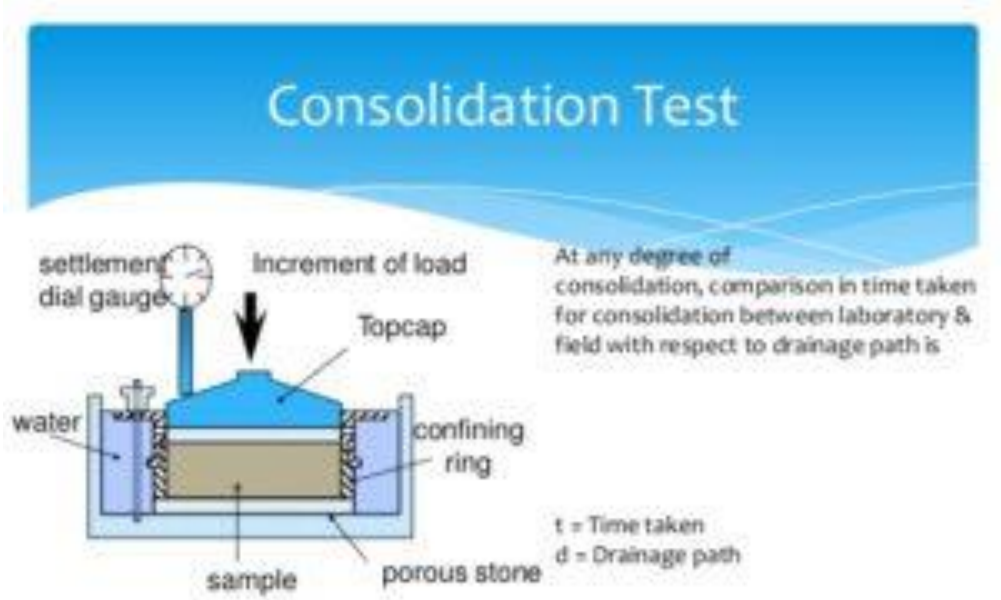




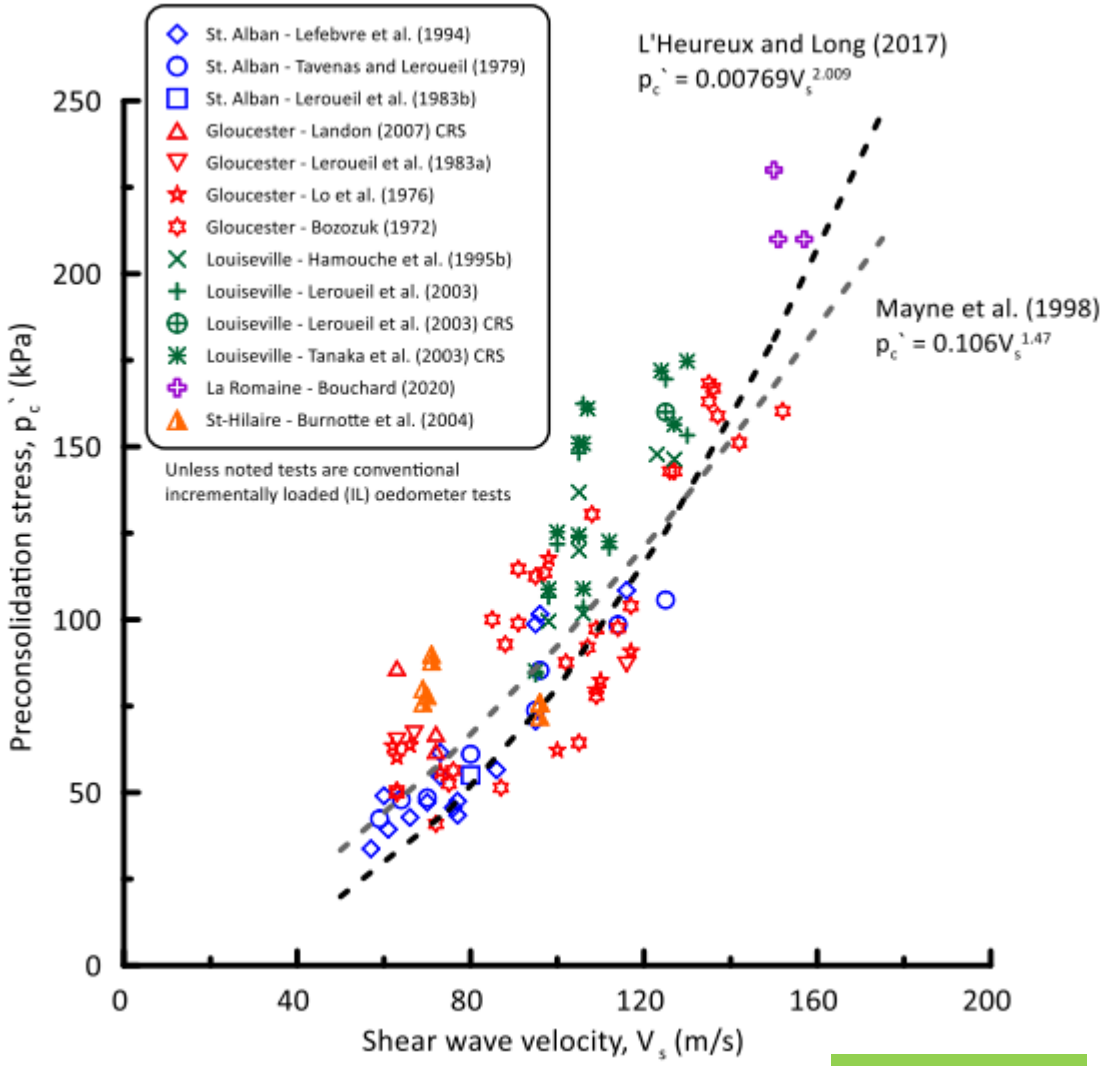
Long, 2022

Geoteknikerens relationer – Vs og laboratoriemålt stivhed

- Konsolideringstest (Oedometer test)

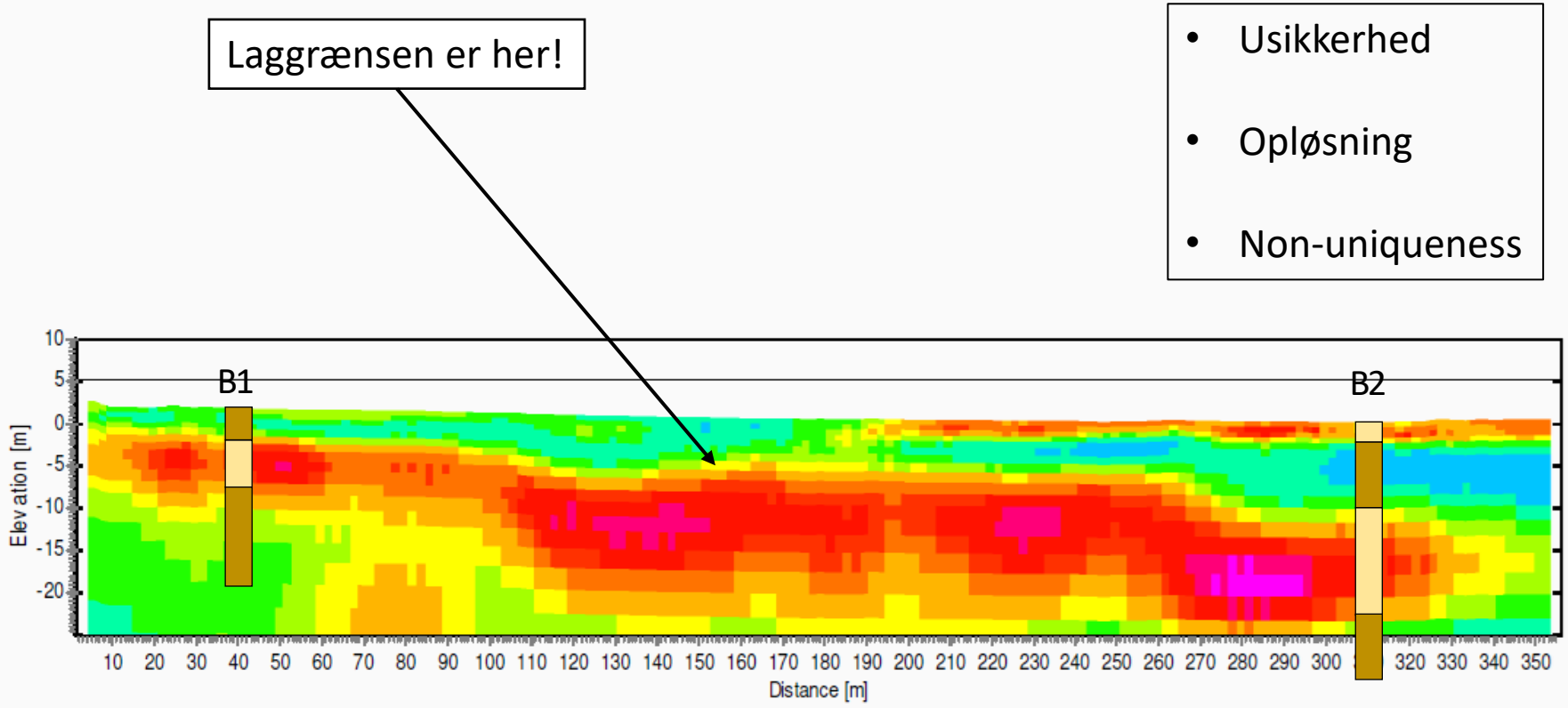


ReadCivil - The Civil Engineers Magazine, 2022



Long, 2022

Hvornår og hvordan bruge geofysik?



- Usikkerhed
- Opløsning
- Non-uniqueness

Usikkerheder

Anlægsprojektets BIM tegning med mm præcision

VS

Geofysik

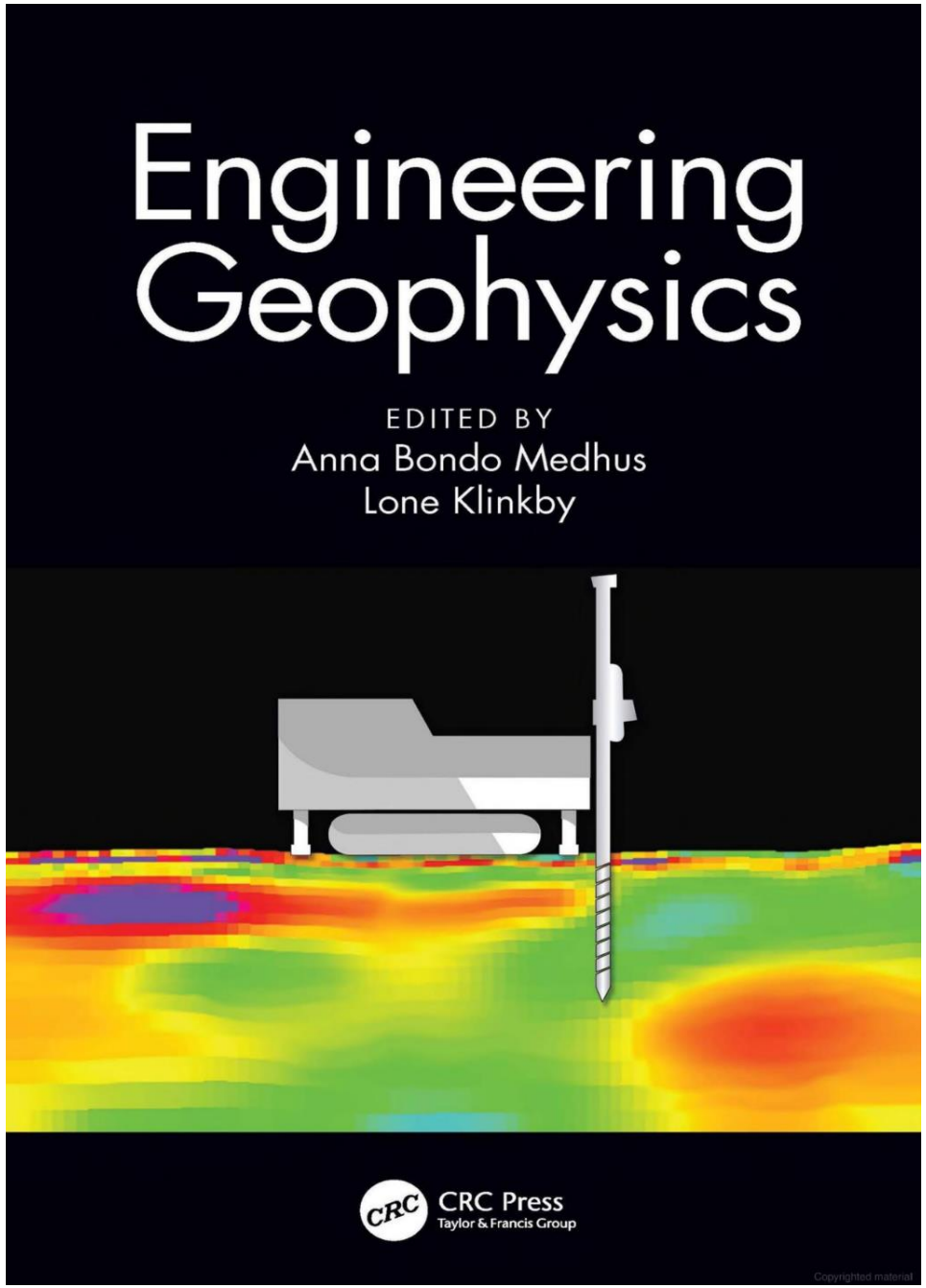
Table 10.1 Comparison of different source types.

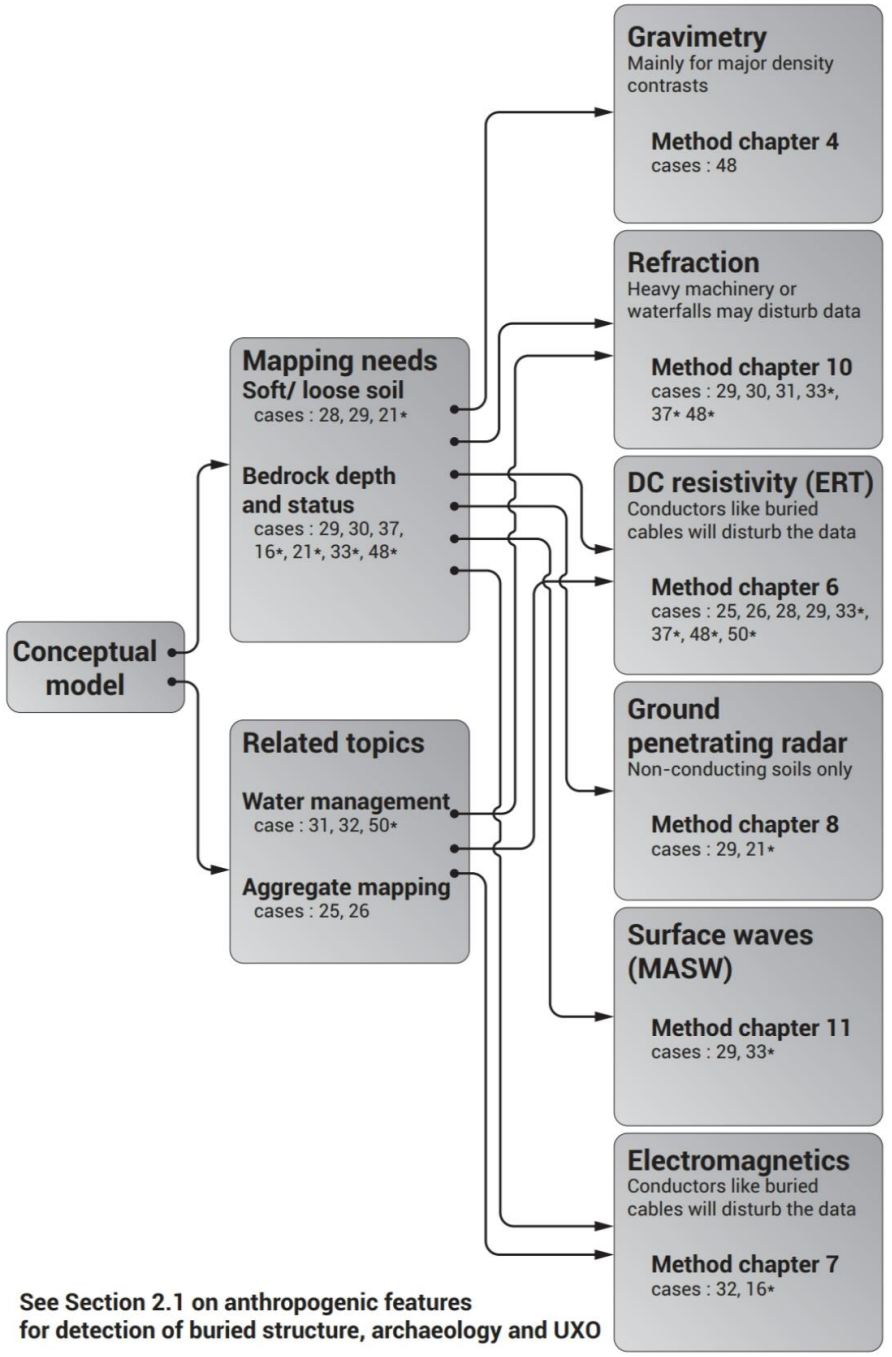
Source type	*Purpose*	*Typical max. depth of investigation*	*Resolution*	*Notes*
Sledgehammer	Understand shallow layer geometry High data coverage Multiple blows at the same location are possible for stacking to higher quality.	Max. 1/5 of layout length including offset shot Typically not deeper than 10–15 m, but very site-dependent, potentially as deep as 50 m at quiet times and with competent soils/ rock.	Depends on the number of shots and geophone spacing. Horizontal: Depends on geophone spacing, decreasing with depth. Vertical: Depends mainly on wave frequency. Risk of hidden layers: A velocity inversion (downwards decreasing velocity) is unresolved. Tomographic approaches may potentially resolve these. Thin layers can be challenging to resolve. A layer must be visible in several geophones to be identified. Specific theoretical calculations using synthetic models is the best way to investigate what survey setup can resolve the expected velocity contrasts and layer dimensions.	Does not work with soft soils. Fastest method, requires a strong person for a higher amount of energy. Heavier hammer means higher quality but slower data collection or larger crew needed. Depending on site conditions, a crew of 3 people may collect between 100 m to 1 km/day.
Seismic shotgun	Good in soft soils; not applicable in hard rock	Max. 1/5 of layout length including offset shot Depth of penetration similar to that of the sledgehammer. Often gives improved definition of first arrivals compared to sledgehammer.		Useful for soft soils to stiff soils. Requires special ammunition. One-shot equals approximately 1 g of explosives. The shot damages the hole. Thus stacking is impossible unless more holes are available.
Accelerated weight drop	When information from a greater depth is required	Max. 1/5 of layout length including offset shot Depth of investigation depends on the weight used		More energy provides a better signal-to-noise ratio.
Explosives	When information from great depth is required	Max. 1/5 of layout length including offset shot Depends on the amount of explosives. Softer sediment requires more potent explosives for the same penetration.		Survey time: It takes longer to collect the data (including drilling boreholes), but better data quality may mean less time required for data analysis and inversion.

Zelt, 2022

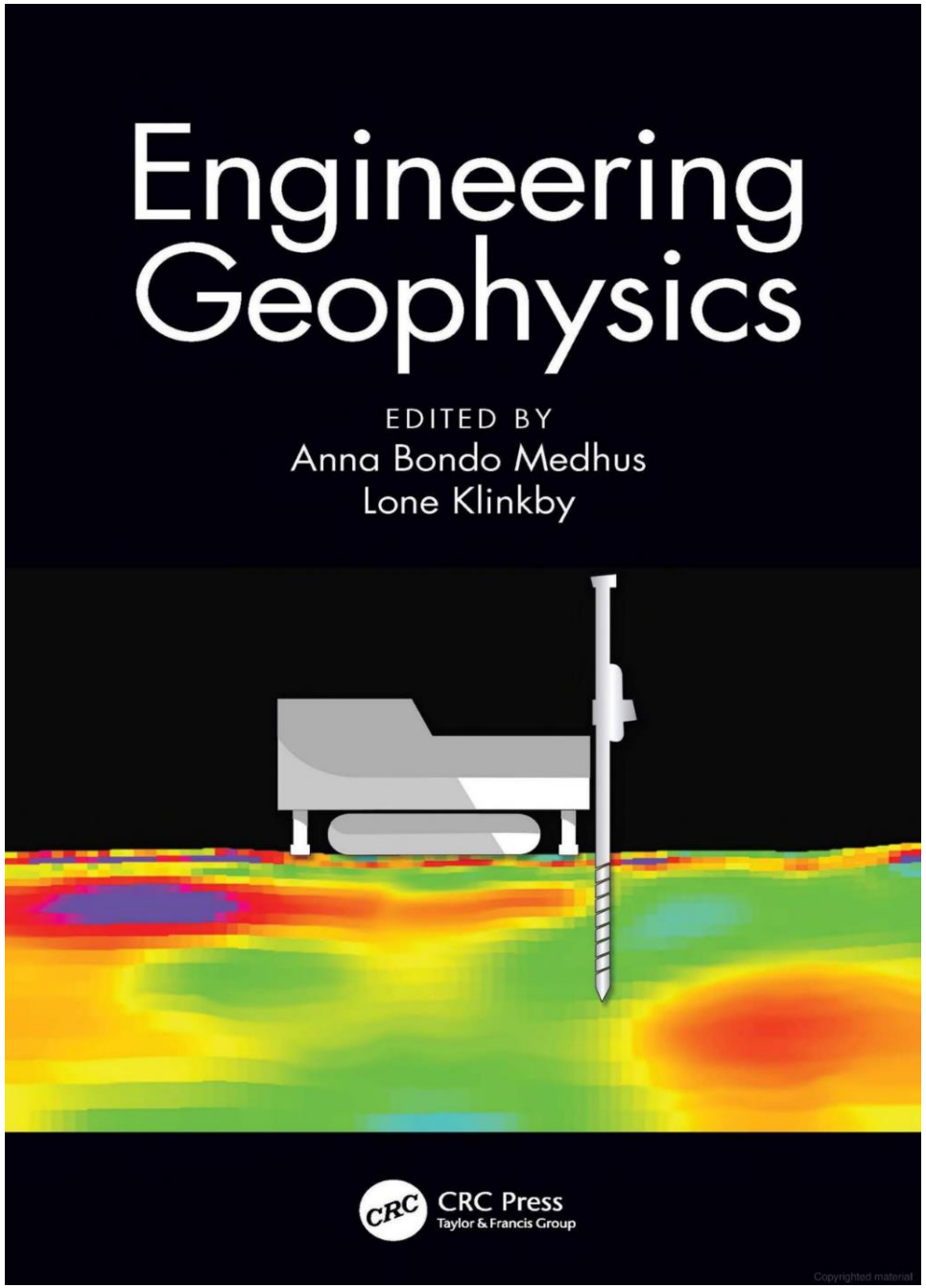
Hvad er spørgsmålet?

Start med den konceptuelle model ?





See Section 2.1 on anthropogenic features for detection of buried structure, archaeology and UXO



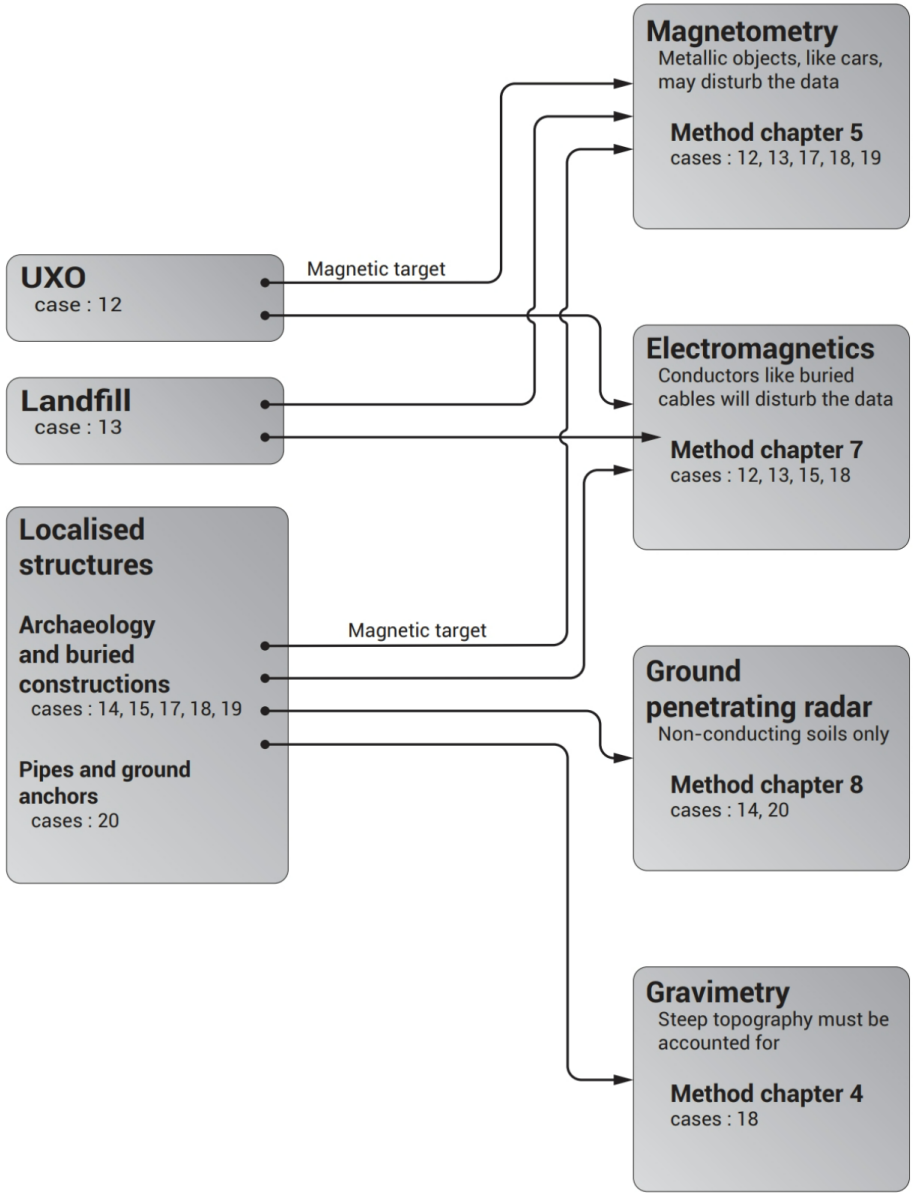
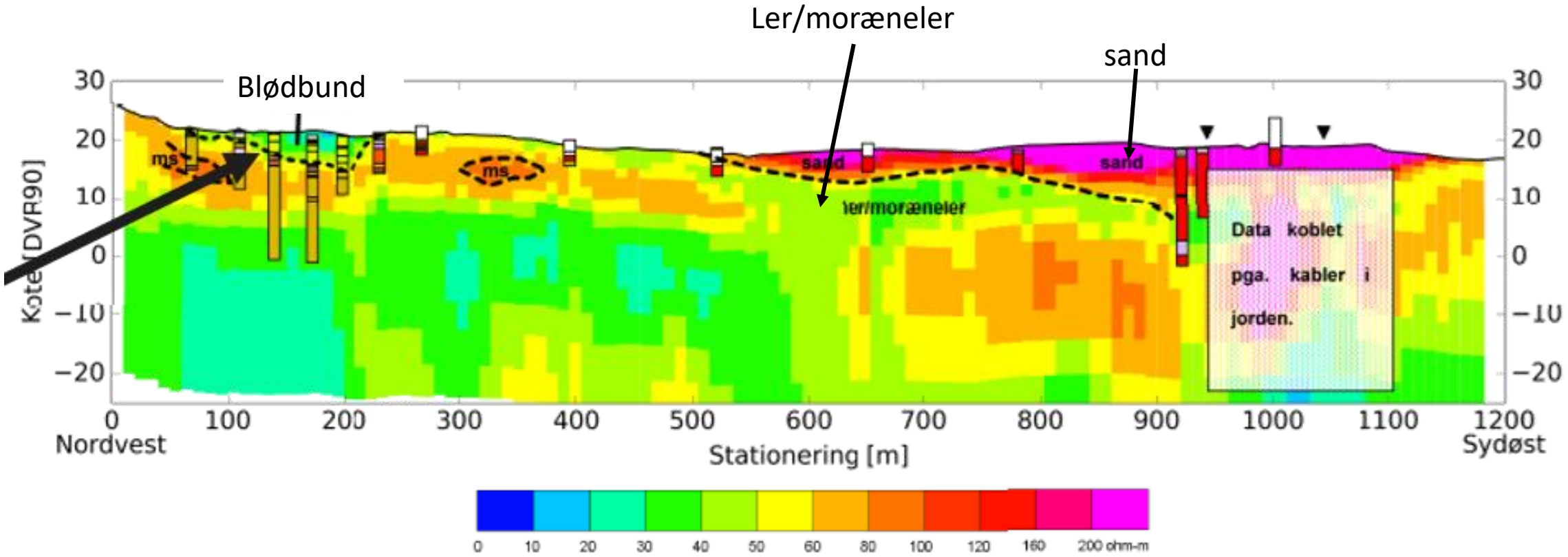


Figure 2.1 Flowchart summarising suggested solutions for mapping of anthropogenic features based on cases received from several contributors.

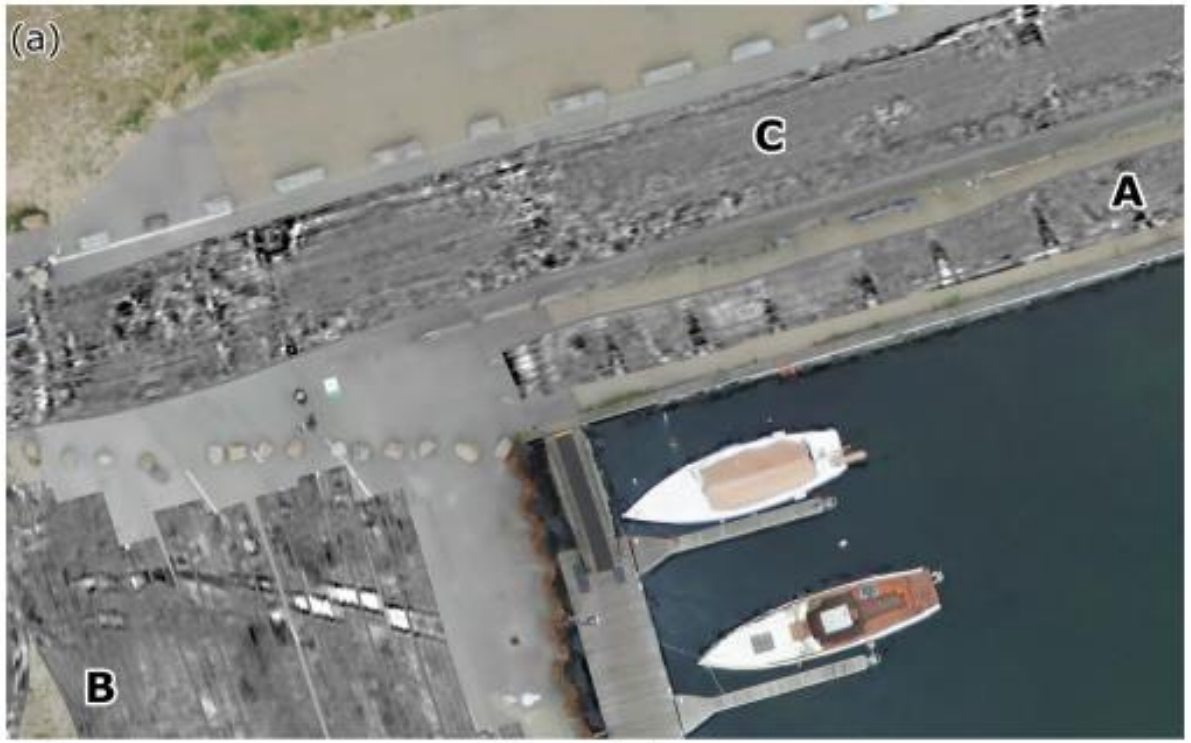
Risiko minimering

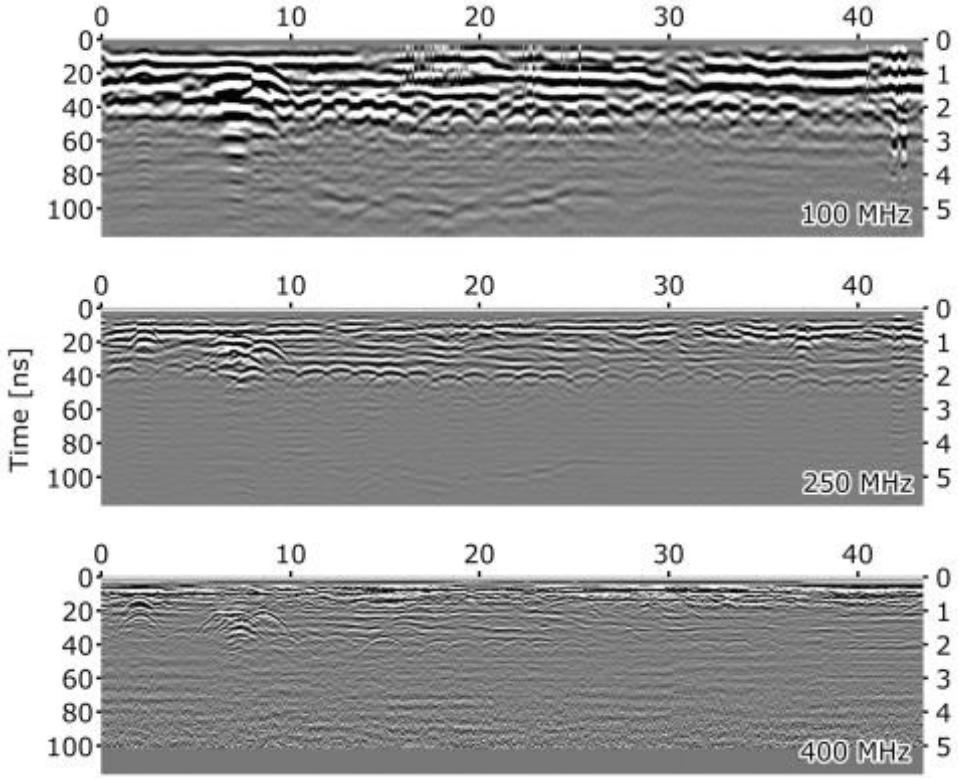


COWI, 2022

Case - Jordankre – hvor ligger de?

- Strukturer der ikke kan kortlægges med geoteknik





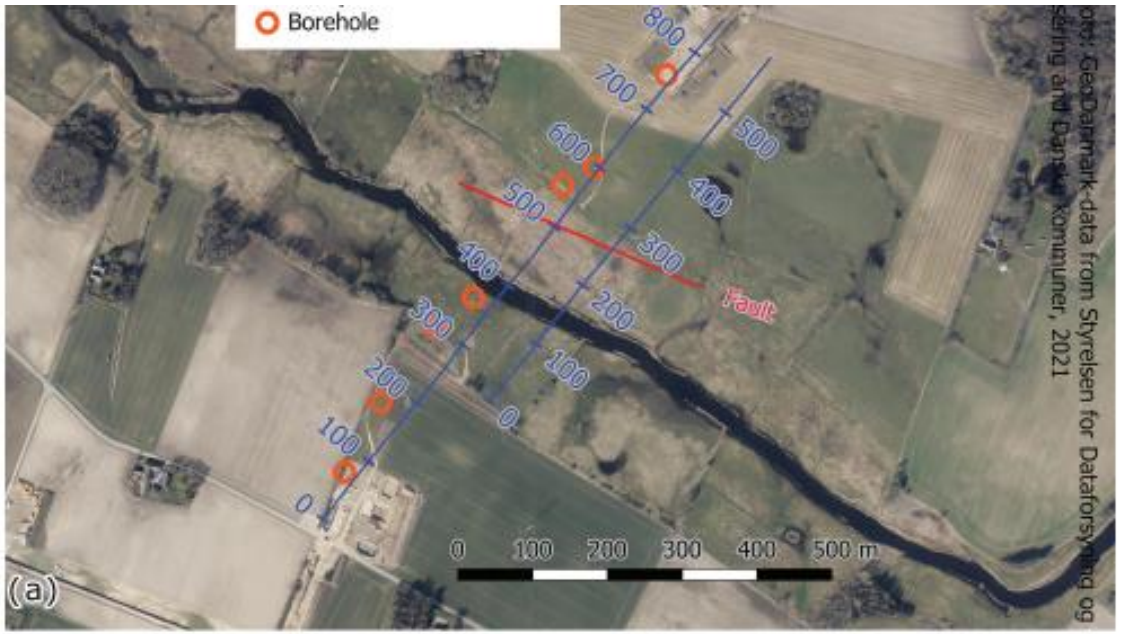
COWI, 2022

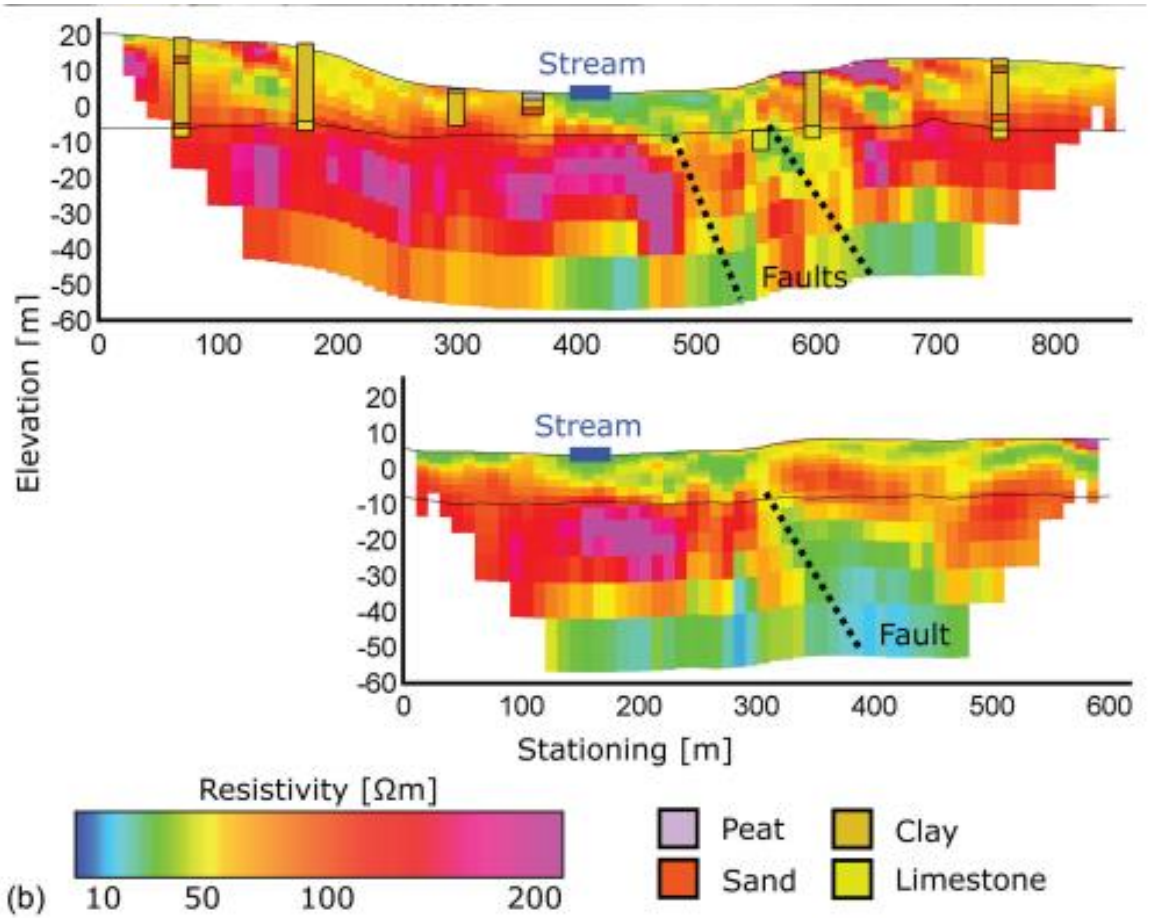
Hvordan udvider vi geo-samarbejdet for ingeniørprojekter på land?

- Har du talt med din Geotekniker idag?
- Har du husket at forventningsafstemme?

Case - Susåen – er det sikkert at bore HDD?

- Entreprenøren var klar
- Boringer kunne ikke afdække risiko
- Metodevalg





COWI, 2022