



NAIAD – NAture Insurance value: Assessment and Demonstration

Mutual benefits of KINDRA and NAIAD An urban groundwater perspective

Morten Ejning Jørgensen – City of Copenhagen

Peter van der Keur – Geological Survey of Denmark and Greenland (GEUS)



KINDRA final conference, Brussels, 27th Feb 2018

About NAIAD

The NAIAD Project aims to operationalise the insurance value of Nature Based Solutions (NBS) to reduce the human and economic cost of risks associated with water: floods, including groundwater flooding, and droughts by developing and testing - with key insurers and municipalities - the concepts, tools, applications and instruments (business models) necessary for its mainstreaming. This is done for 9 demonstration sites (DEMOS) covering a wide range of NBS in Europe.

Budget: M€ 5,081,176

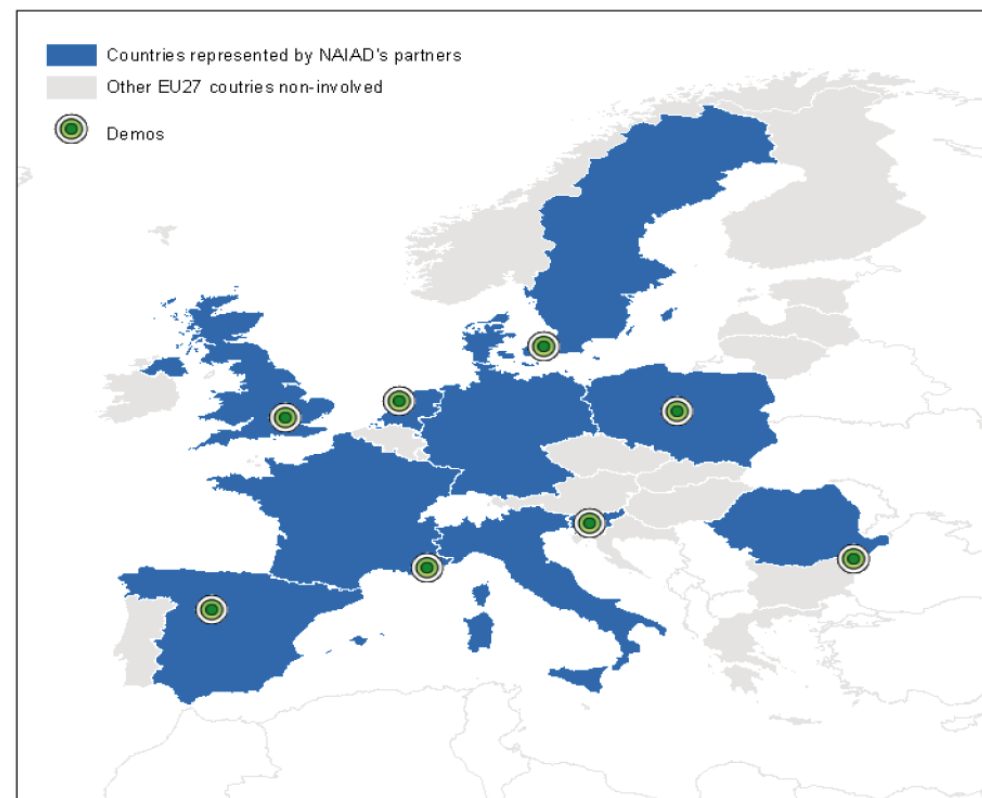
Funded by the European Commission under the H2020 Program: CALL: SCC5-2016-2017

Start: 1st December 2016

End: 30th November 2019



KINDRA final conference, Brussels, 27th Feb 2018



About NAIAD

The Consortium

The consortium is built as a complementary group of institutions bringing different expertise to NAIAD and with the engagement with relevant stakeholders groups at Living Lab DEMOs, at local, national and European scale. It is composed by 23 partners categorised as:

- 3 Universities and Education research institutes [KCL, UPCT, UNS]
- 8 Research centres [CNR-IRSA, HZG, SIWI, IRSTEA, ERCE, GEOCOMAR, UNESCO-IHE,]
- 4 Small/Medium size Enterprises with a focus on applied research [ICA, AmbioTEK, BDG, FF DELTARES]
- 3 Public bodies with key competences in applied research [IGME, GEUS, BRGM]
- 2 Public bodies with key competences in management [CHD, CPH]
- 2 Non Profit involved in local development [ISKRIVA, REVIVO]
- 1 Insurance sector [CCR]

Partners

1. CONFEDERACION HIDROGRAFICA DEL DUERO, CHD, Spain
2. BUREAU DE RECHERCHES GEOLOGIQUES ET MINIERES, BRGM, France
3. KING'S COLLEGE LONDON, KCL, United Kingdom
4. I-CATALIST SL, ICA, Spain
5. EUROPEJSKIE REGIONALNE CENTRUM EKOHYDROLOGII POLSKIEJ AKADEMII NAUK, ERCE Poland
6. ZAVOD ZA IHTIOLOGIJO IN EKOLOGIJO RAZISKAVE REVIVO, REVIVO, Slovenia
7. CONSIGLIO NAZIONALE DELLE RICERCHE, CNR, Italy
8. INSTITUTO GEOLÓGICO Y MINERO DE ESPAÑA, IGME, Spain
9. HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FÜR MATERIAL- UND KUSTENFORSCHUNG GMBH, HZG, Germany
10. AMBIOTEK COMMUNITY INTEREST COMPANY, AMBIOTEK, United Kingdom
11. STIFTELSEN STOCKHOLM INTERNATIONAL WATER INSTITUTE, SIWI, Sweden
12. INSTITUTUL NATIONAL DE CERCETARE-DEZVOLTARE PENTRU GEOLOGIE SI GEOECOLOGIE MARINA GEOECOMAR, GEOECOMAR, Romania
13. GEOLOGICAL SURVEY OF DENMARK AND GREENLAND, GEUS, Denmark
14. BUSINESS DEVELOPMENT GROUP SRL, BDG, Romania
15. CAISSE CENTRALE DE REASSURANCE, CCR, France
16. UNIVERSIDAD POLITÉCNICA DE CARTAGENA, UPCT, Spain
17. ZAVOD ISKRIVA, ISKRISCE ZA RAZVOJ LOKALNIH POTENCIALOV, ISKRIVA, Slovenia
18. INSTITUT NATIONAL DE RECHERCHE EN SCIENCES ET TECHNOLOGIES POUR L'ENVIRONNEMENT ET L'AGRICULTURE, IRSTEA, France
19. UNIVERSITE DE NICE SOPHIA ANTIPOLIS, UNS, France
20. STICHTING IHE DELFT, UNESCO-IHE, Netherlands
21. KOBENHAVNS KOMMUNE, CPH, Denmark
22. FIELD FACTORS BV, Field Factors, Netherlands
23. STICHTING DELTARES, Deltares, Netherlands



KINDRA final conference, Brussels, 27th Feb 2018



Project purpose

NAIAD is aiming to:

1. Develop and assess the value of Nature Based Solutions (NBS) approaches in response to flood and drought risks at 9 demo sites across EU (3 urban, the other 6 peri-urban and rural),
2. Deliver replicable methods for its implementation,
3. Work on development of financial instruments and novel business models in support for their financing and implementation,
4. Contribute to academic knowledge on NBS planning, increase capacity of policy decision makers to integrate NBS in development planning and contribute to general awareness of need of NBS and socio-economic opportunities (co-benefits) arising with their implementation at local, regional or EU level.



KINDRA final conference, Brussels, 27th Feb 2018



The Copenhagen role in NAIAD

The participation in NAIAD is interesting for Copenhagen for the following reasons:

- NBS in Copenhagen help to mitigate urban flooding due to cloudburst events
- Enhance the knowledge of the hydrodynamic conditions in the groundwater bodies crucial for NBS implementation.
- A more improved insight into how the groundwater level will behave under climate changes which is particularly important in order to protect the city from the threat of a rising groundwater level
- More knowledge of the impact and insurance value of nature-based solutions implemented in the city
- A basis for making decisions for politicians and other decision makers to choose the right solutions for the benefit of the city and stakeholders.




KINDRA final conference, Brussels, 27th Feb 2018



The Copenhagen role in NAIAD

Danmark d
grundvand e





Store vandmængde

DANMARK

8

Stig
lanc




Højt grund
bredere va

Midt- og Vestjylland | 1°

Søg på TV MIDTVEST


Stigende grundvand og dårlig høst koster
landmænd milliarder







MEST LÆSTE LIGE

raproblem: Vores
kan ikke følge med

le grundvand er et stort og overset







KINDRA

NAIAD

KINDRA final conference, Brussels, 27th Feb 2018

Copenhagen Climate Adaptation Plan



The Copenhagen Climate Adaptation Plan was adopted in 2011.

Instead of initiating a costly overhaul of the old sewer system, the City Council decided to go for a surface solution, and combine it with the construction of four large underground pipes and tunnels.

The Copenhagen climate adaptation strategy relies on the remodelling of the city scape, adapting squares, streets, lakes, and parks to better cope with future cloudbursts.



KINDRA final conference, Brussels, 27th Feb 2018



Copenhagen Climate Change Adaptation Plan



Implementation of NBS is dependent on the shallow groundwater level as it locally can increase the level due to infiltration and this can hamper sewage system functioning.

The effects of NBS in Copenhagen are influenced by:

- Groundwater level rise caused by increased precipitation and infiltration to the aquifers, aggravated by climate change
- Sea level rise causes a permanent rise in groundwater level in the coastal areas. Short term rises can occur in case of storm surges.
- The surrounding catchment in which Copenhagen is embedded and future changes in land use.

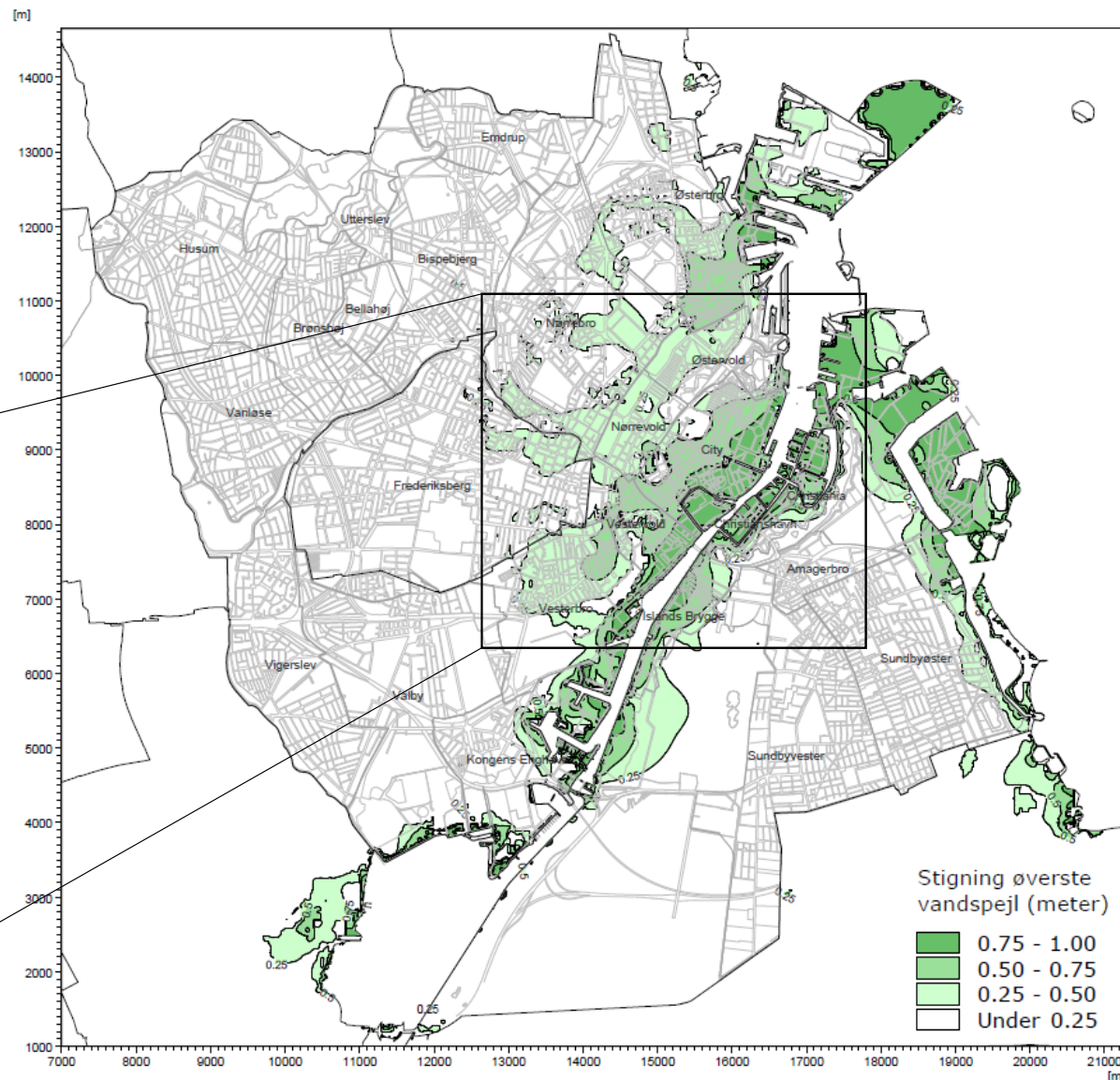
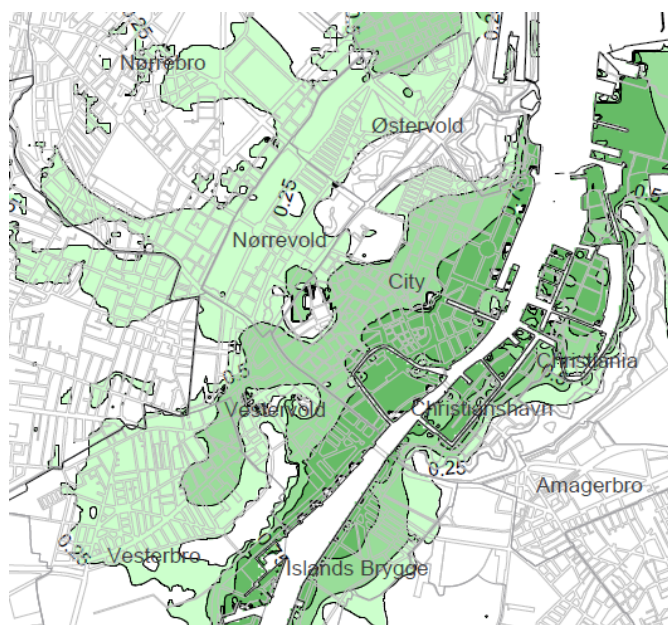


KINDRA final conference, Brussels, 27th Feb 2018



Effect of Sea Level Rise

The map shows the simulated maximum increase of the upper water level, if the water level in the sea rises 1 meter.

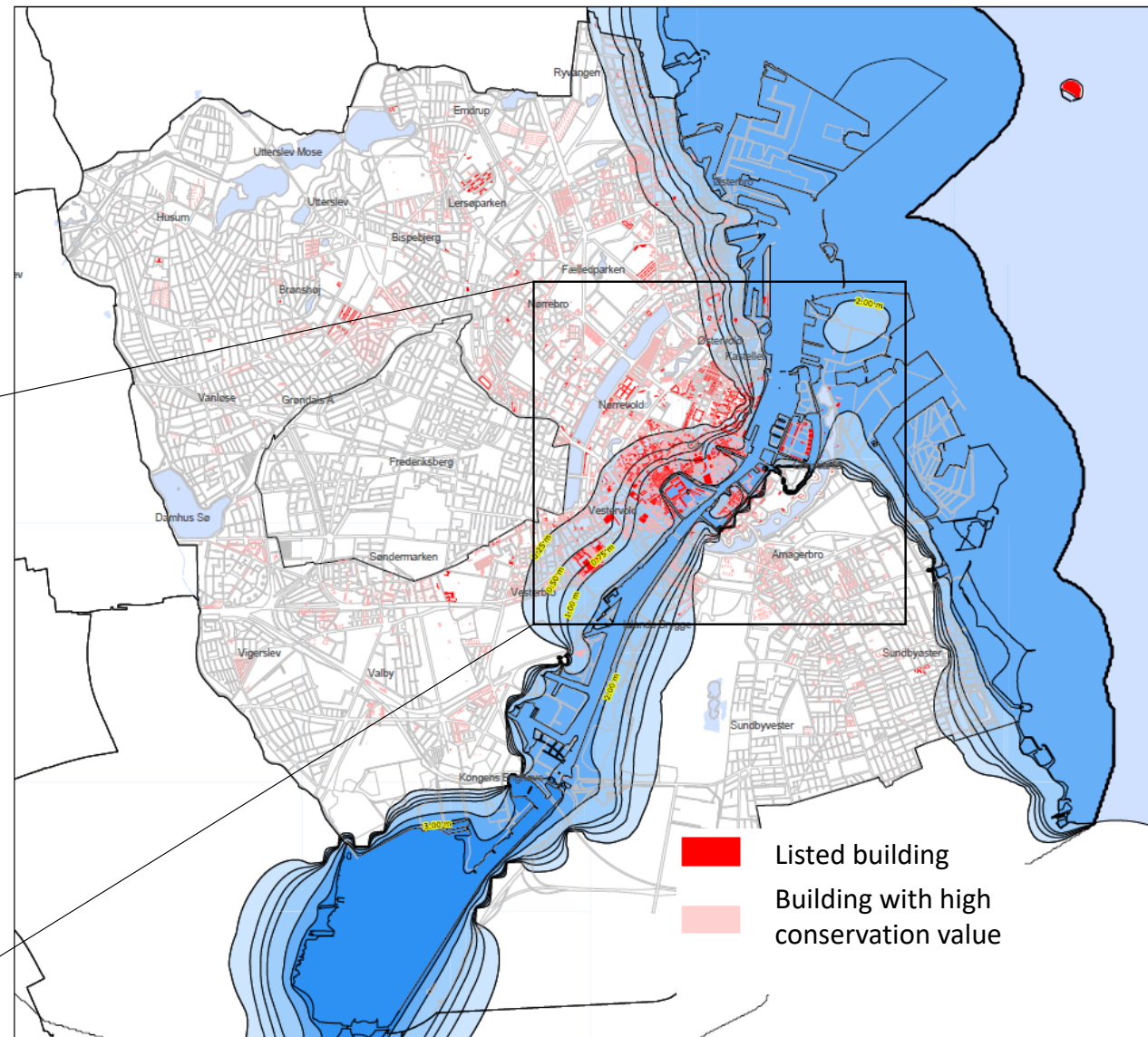
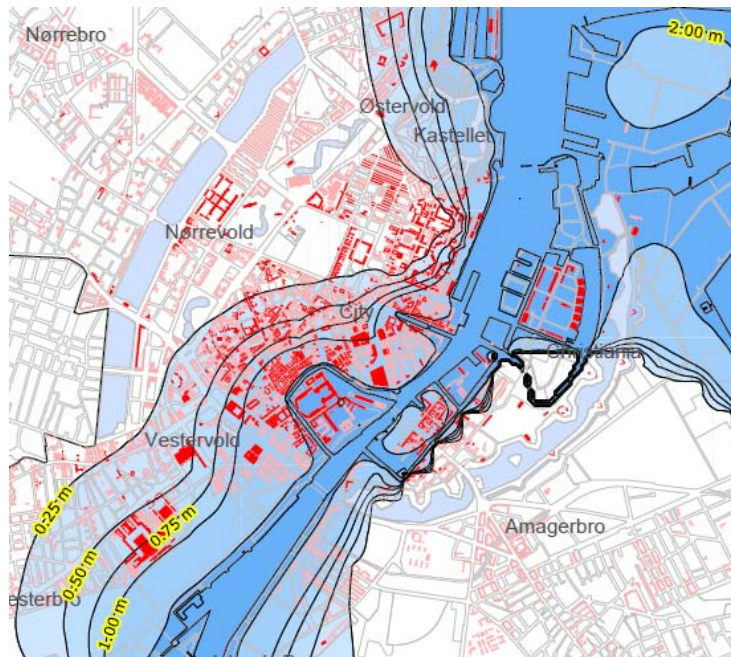


KINDRA final conference, Brussels, 27th Feb 2018



Storm surge effect on groundwater level

The risk map shows the simulated maximum groundwater level rise in the primary aquifer for all storm surges scenarios.



KINDRA final conference, Brussels, 27th Feb 2018

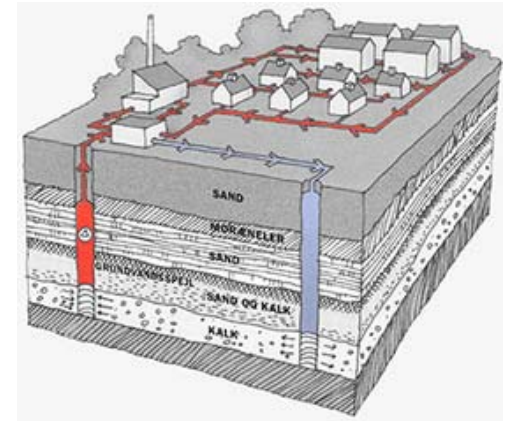
KINDRA

NAIAD

The Copenhagen Demo

- No abstraction from city wells for the drinking water supply in the city.
- Groundwater is primarily used for energy storage, irrigation and as process water in the industry
- Groundwater - a resource and a threat!?
- A rising groundwater level is a threat to subterranean structures such as cellars, pipes, sewers and traffic infrastructure and can cause swamping and soaking of the top soils in low areas and may subsequently cause surface flooding

Groundwater energy storage



The Copenhagen Demo



Groundwater model setup for urban City of Copenhagen and surrounding catchment

Groundwater related knowledge important:

- Hydrogeology below City of Copenhagen
- Deep and shallow groundwater dynamics
- Impact of shallow groundwater and sewer / drainage systems
- Interaction of urban part of Copenhagen with surrounding catchment
- Climate change impact on groundwater levels
- Sea level rise impact on groundwater
-



KINDRA final conference, Brussels, 27th Feb 2018



Copenhagen – Increased understanding of the complex groundwater dynamics

Achieved by:

- Better understanding of the geology and hydrogeology of the Copenhagen underground
- Groundwater monitoring



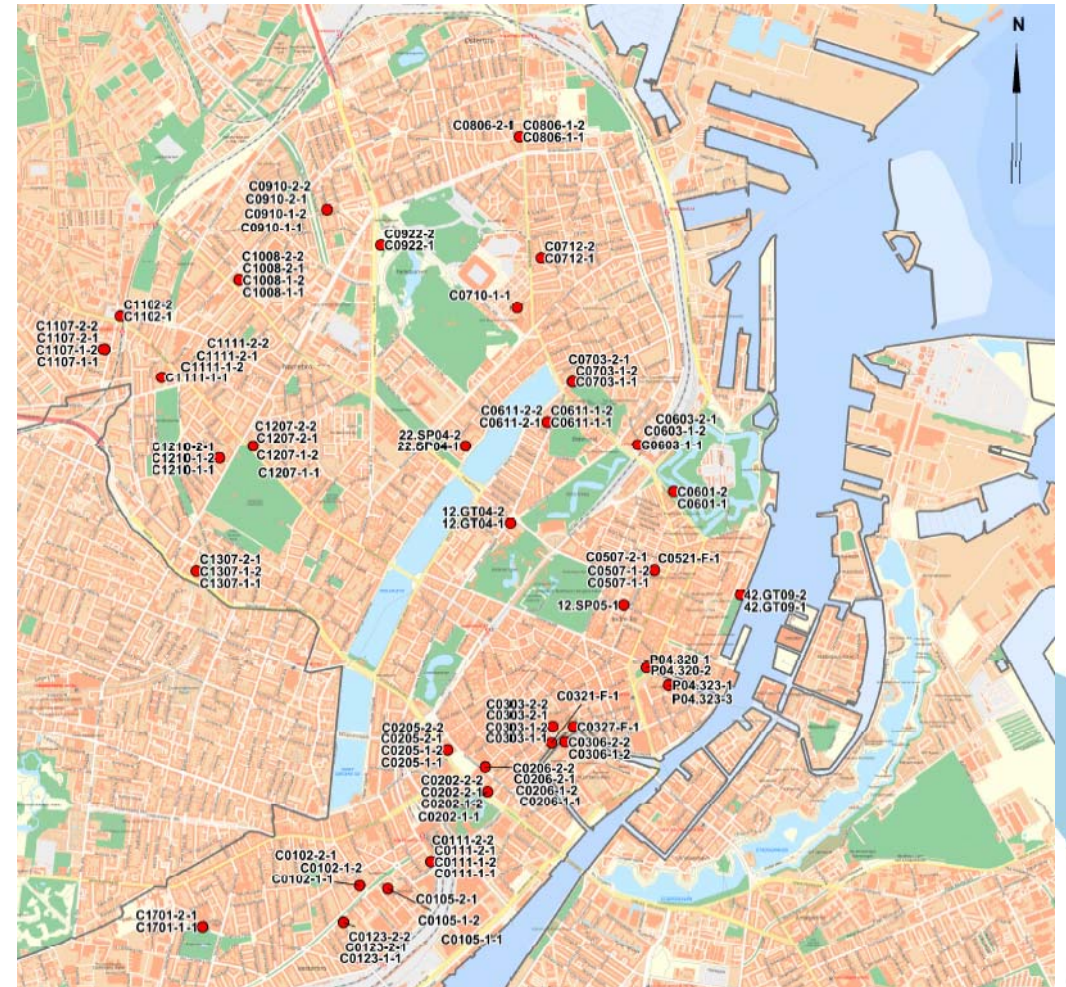
KINDRA final conference, Brussels, 27th Feb 2018



Groundwater monitoring

The City of Copenhagen is establishing a monitoring network of boreholes. The boreholes are equipped with loggers or divers to continuously measure the water table.

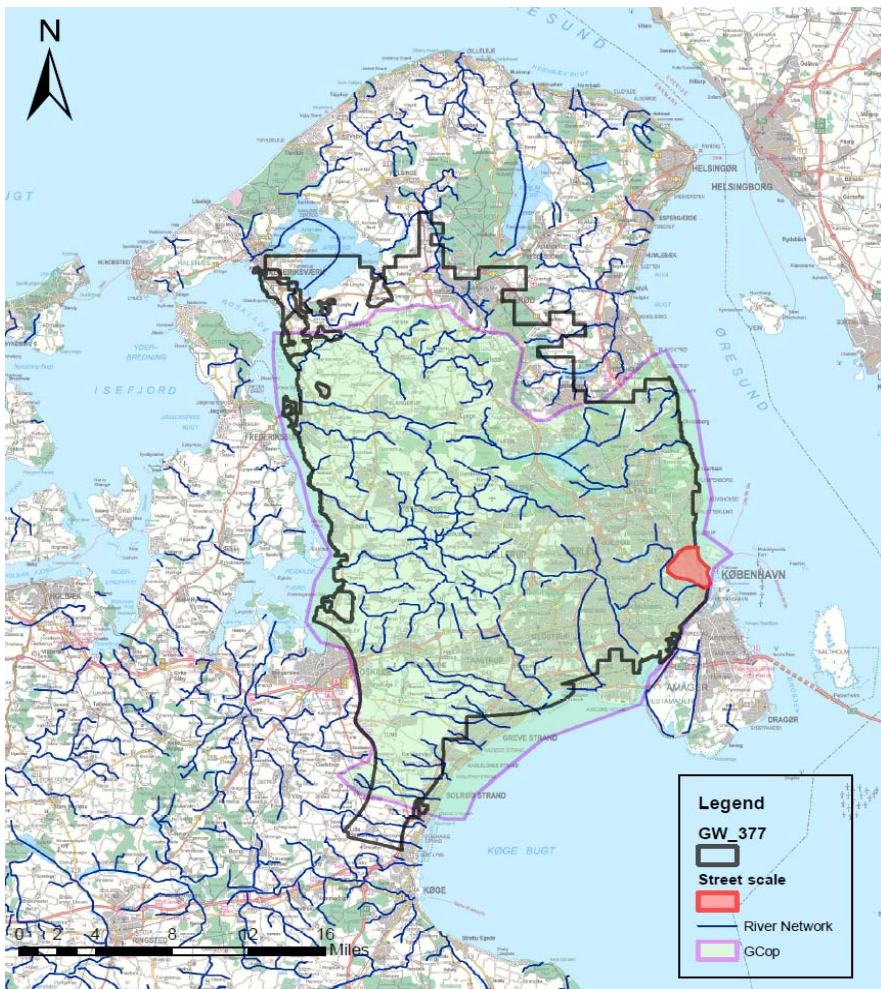
Both the upper and lower groundwater level is monitored to better understand the behavior of the two aquifers and to indentify the risks/hazards to subterranean structures.



KINDRA final conference, Brussels, 27th Feb 2018



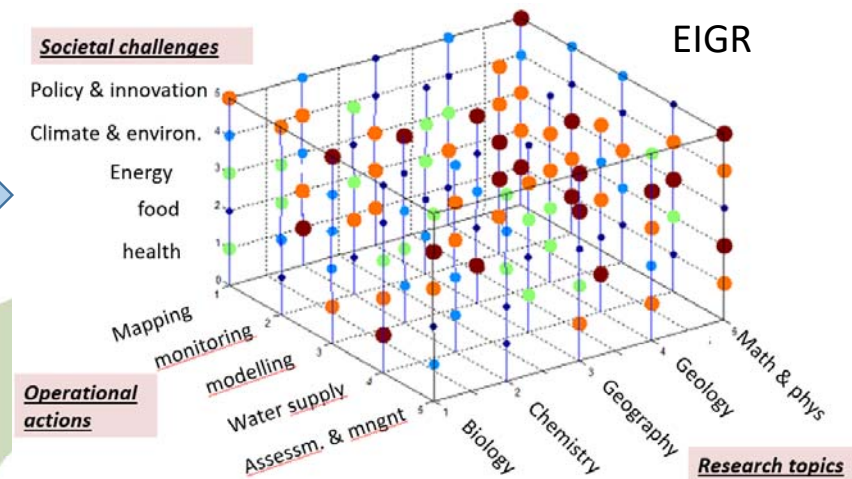
NAIAD



KINDRA final conference, Brussels, 27th Feb 2018

Groundwater research in urban hydrology crucial
For addressing water quality and quantity and effects of
Natural hazards

EIGR research and knowledge important for addressing
Groundwater management in cities like Copenhagen



Thank you for listening !



KINDRA final conference, Brussels, 27th Feb 2018

