

# Increasing the availability of freshwater for agriculture by improving local hydro(geo)logical conditions



Dieter Vandevelde  
Horsens, 22/10/2019

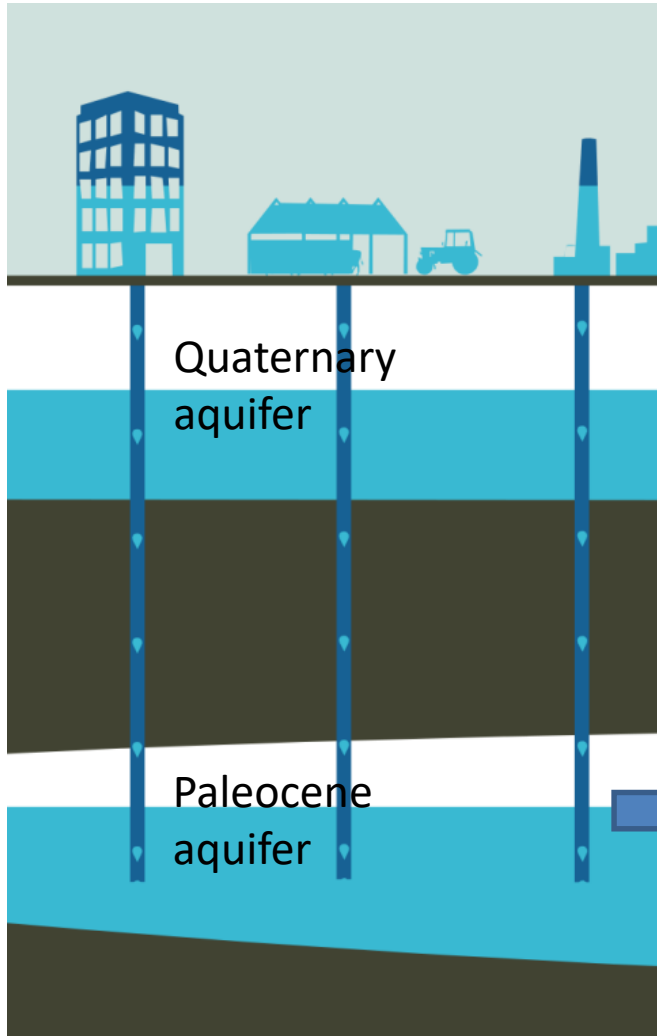
# Topsoil project Belgium



Google earth

© 2016 Google  
US Dept of State Geographer  
© 2009 GeoBasis-DE/BKG  
Image Landsat

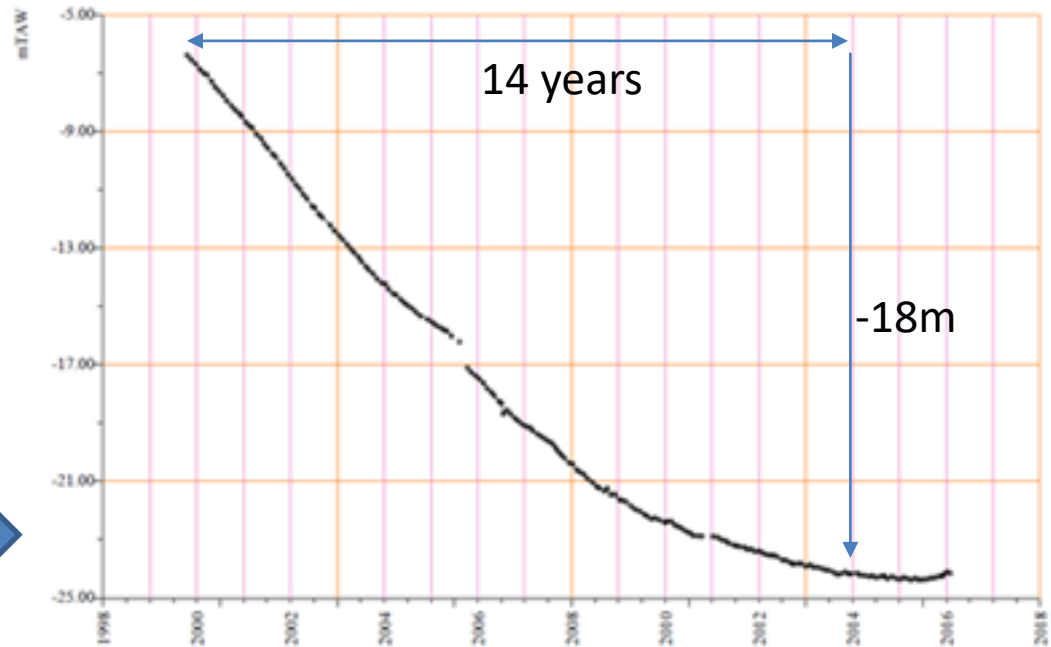
# Water scarcity



**groundwater level confined Paleocene aquifer**

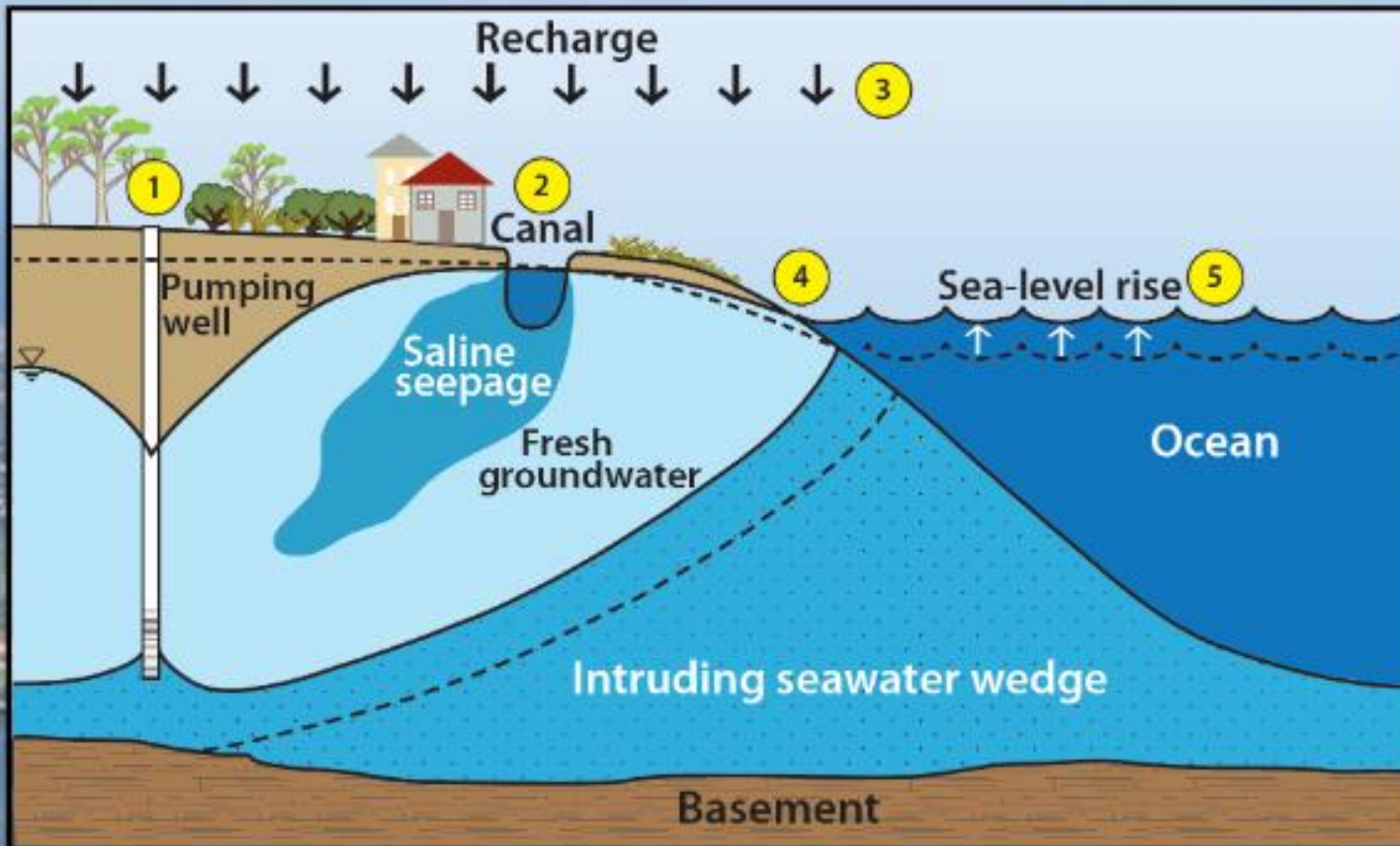
Putcode eigenaar: 3-0077

Filtrenummer	Type	Onderkant (m-MV)	Lengte (m)	Diameter (mm)	Aquifer
1	peilfilter	147.00	5.00	125	1010





# Seawater intrusion mechanisms



- Original condition
- Modified condition
- 1 Excessive pumping
- 2 Land-use change (e.g. canal development)

- 3 Reduction in recharge
- 4 Overtopping, caused by sea-level rise, storm surges, and tsunamis
- 5 Sea-level rise

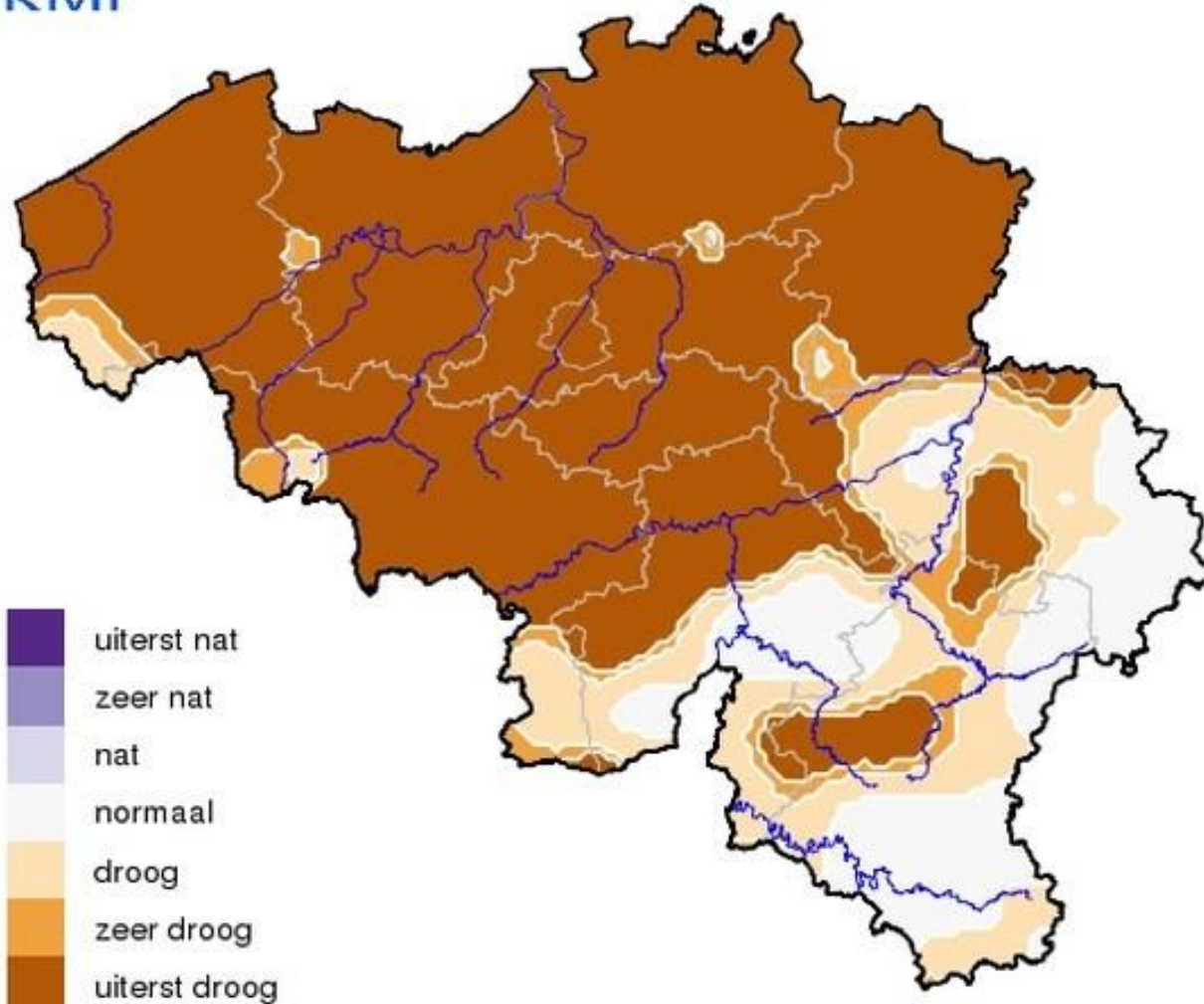
*"Understanding Seawater Intrusion" (Poster designed by Adrian D. Werner; Peta E. Jacobsen & Leanne K. Morgan)*

# Drought



## Droogte-index (SPI-3), waarnemingen en voorspellingen (10 dagen)

Waarnemingen van 05/05/2018 tot 23/07/2018 en voorspellingen tot 02/08/2018



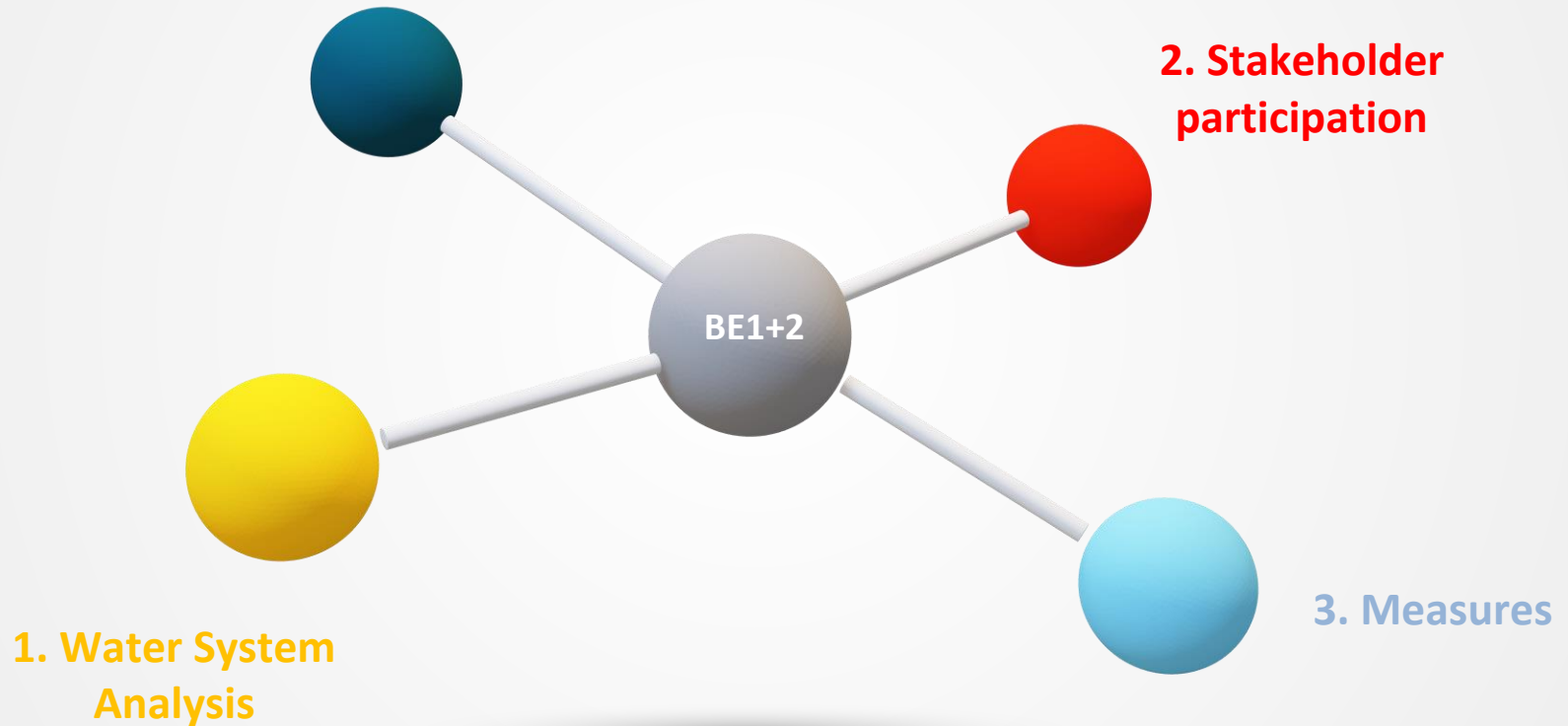
*“Complexity is the new normal. It challenges us to change, to seek real innovation, and thus to inspire coming generations.” (H. Ovink, Rebuild by Design)*

## Challenge

- ▶ Need to increase availability of fresh water
  - to investigate possibilities for fresh water storage
  - to specify the necessary measures
  - Plan of approach: 4 steps

## Plan of approach

### 4. Implementation



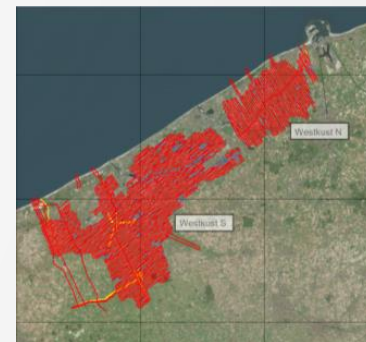


# Water system analysis

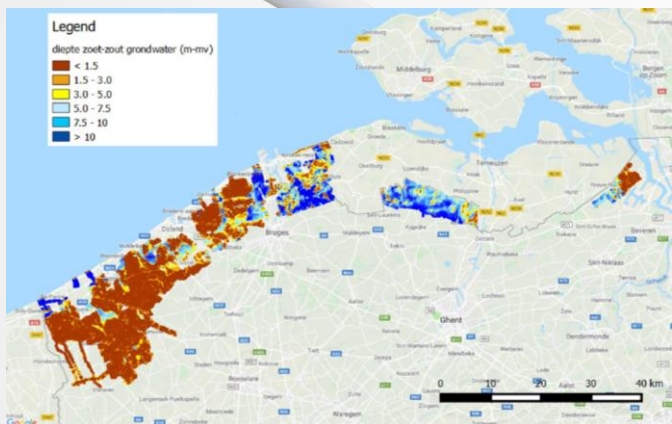
Mapping fresh-salt water distribution



TDEM-survey (SkyTEM)

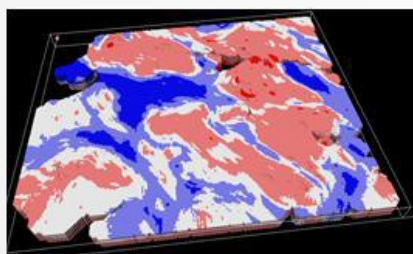
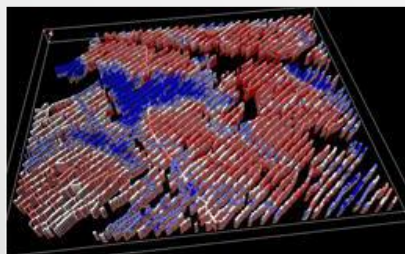


2400 km of flightlines

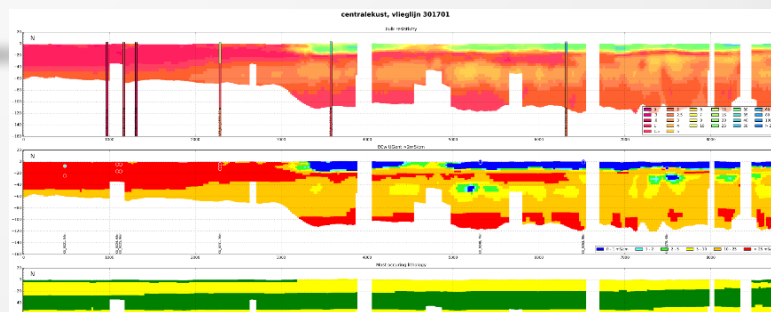


Salinity map

2D → 3D

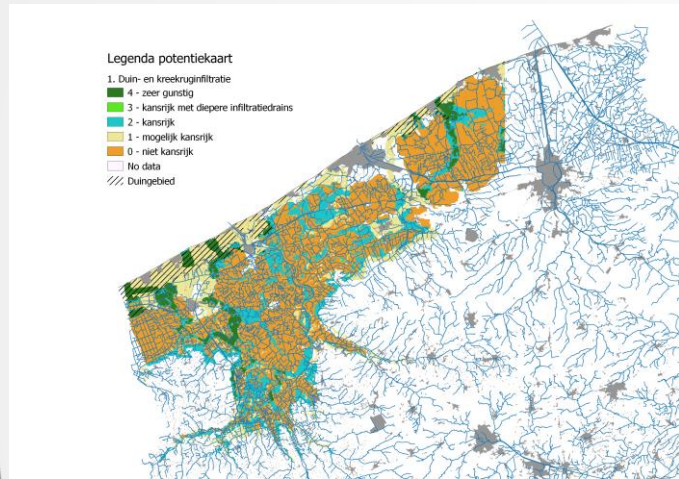


2D profile



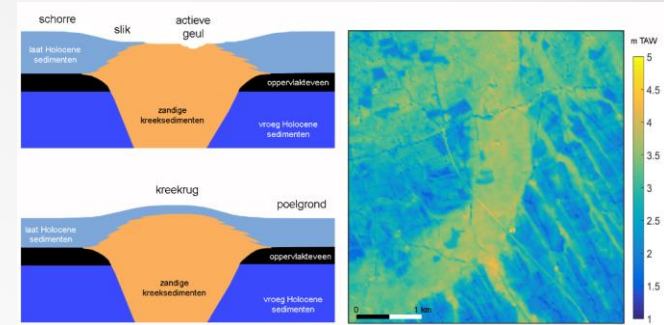
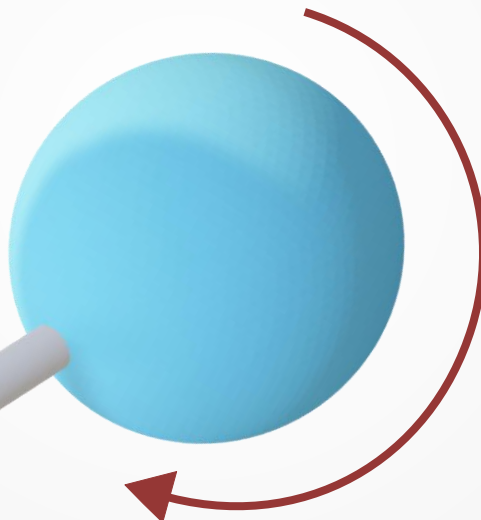


Map showing potential for creekridge infiltration

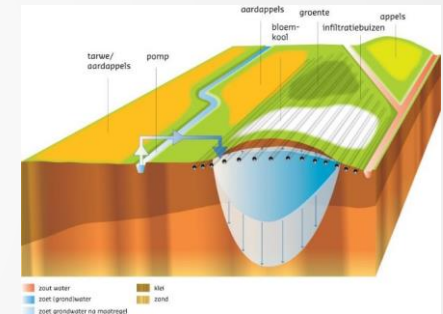


# Measures

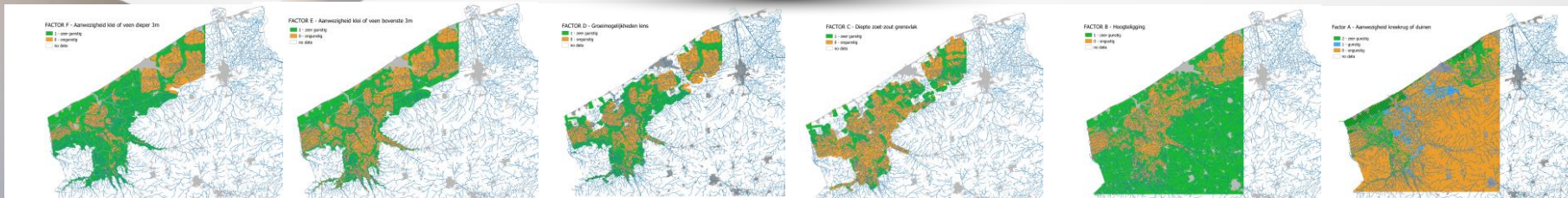
Selection of suitable measures

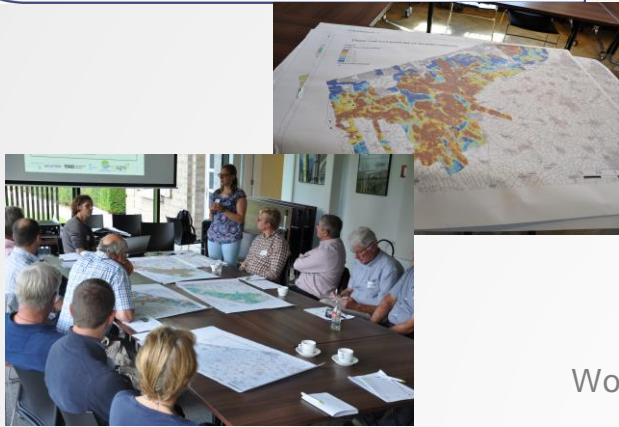


Creek ridges – former tidal gullies filled with sandy sediments

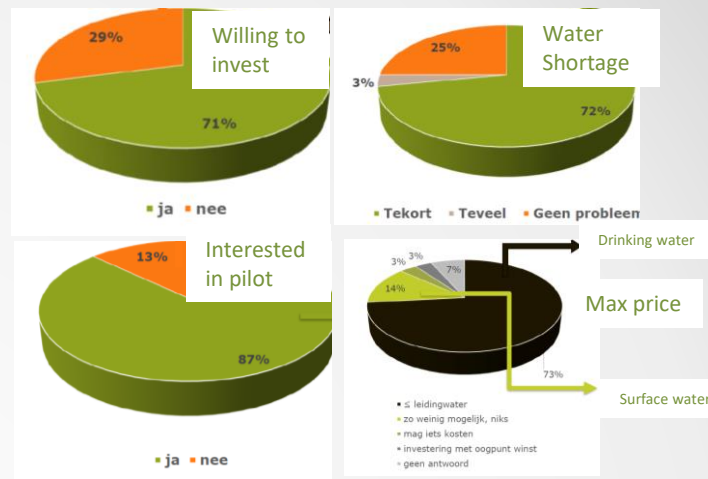


Creekridge infiltration system  
Determining factors:





# Stakeholder Participation



Workshops

Interviews

Meetings

Field visits

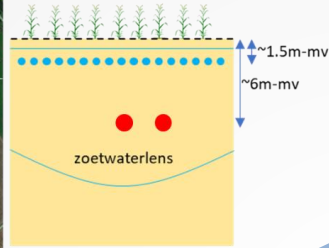
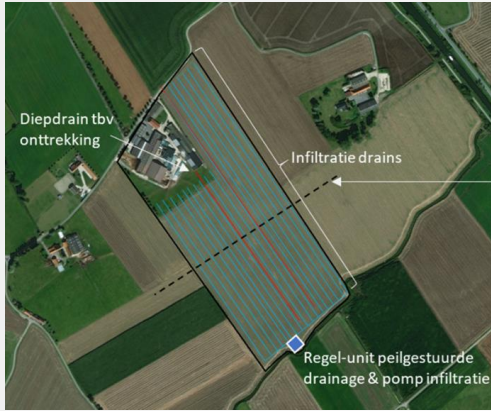
Selection of a location suitable for creekridge infiltration



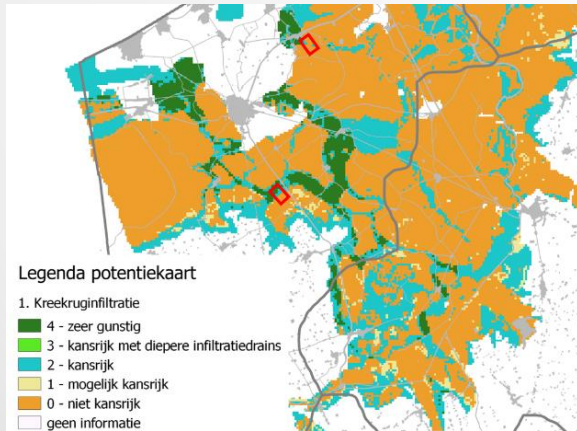


# Implementation

roadmap and cost-analysis



Conceptual model



Selection of suitable locations for creekridge infiltration

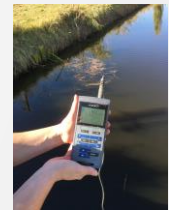
Cost-analysis

Investment cost (2ha)	Total cost (EUR, VAT excl.)	EUR/yr Amortisation over 15 yrs	EUR/yr Amortisation over 20 yrs
Infiltration and extraction wells (horizontal wells)	18 940,00 (15 yrs) / 19 540,00 (20 yrs)	1262,67	977,00
Electricity supply	4 500,00	300,00	225,00
Surface water devices:			
level-controlled system	5 000,00	333,33	250,00
extraction pump	5 000,00	1000,00*	1000,00*
Groundwater extraction pump	500,00	100,00*	100,00*
<b>Total investment</b>		<b>2 996,00</b>	<b>2 552,00</b>

\* Amortisation of 5 years

Roadmap

- monitoring network
- final design
- licence application
- construction of the installation
- Monitoring, reporting, evaluation

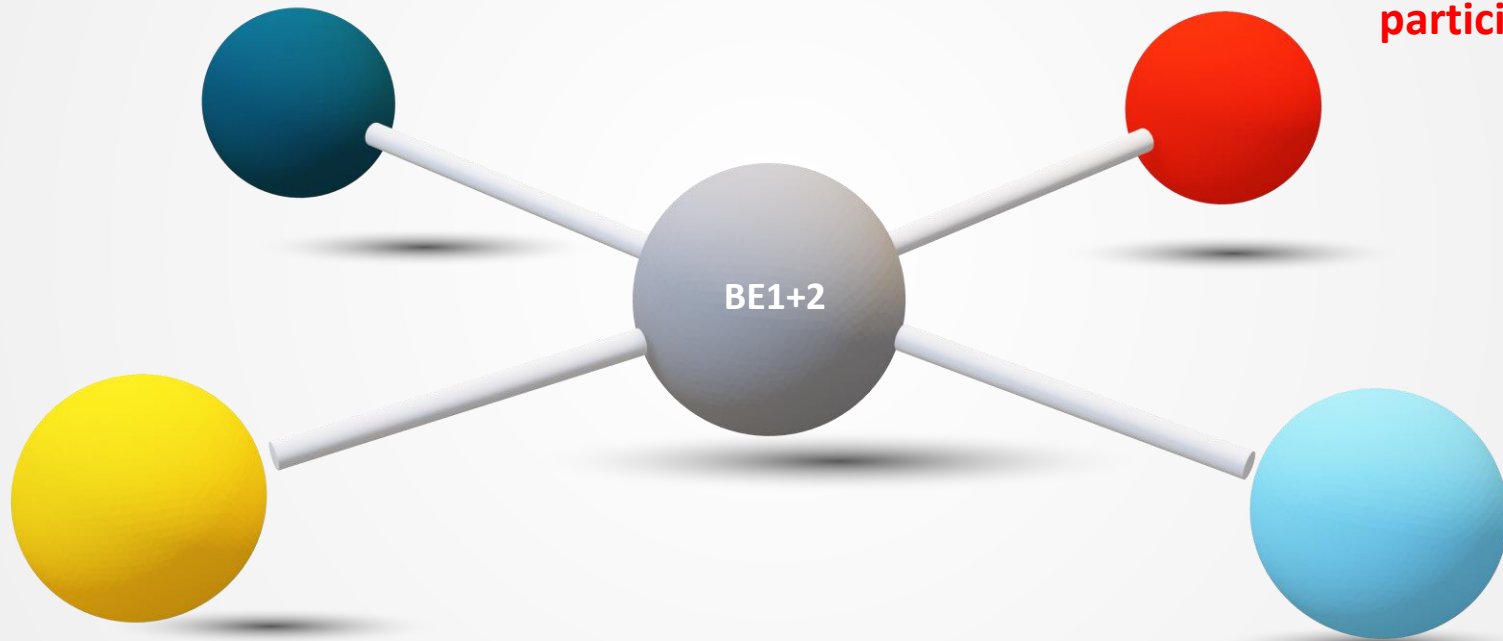




## Plan of approach

4. Implementation

2. Stakeholder participation



1. Water System Analysis

3. Measures

## Most important outcomes for BE1+2

- 2D & 3D salinity distribution
- Salinity map (depth of fresh-salt water interface)
- Map showing the potential for a specific measure
- Knowing the interest and opinions of farmers by interviews, workshops and field visits
- Roadmap and cost-analysis for implementing a creekridge infiltration system

# Thank you



 [www.topsoil.eu](http://www.topsoil.eu)