



Living on soft soils – subsidence & society

Consortiumdag NWA-LOSS project

10 maart 2023

UU, TUD, WUR, Deltares, TNO, WEnR

Min. Infrastructuur & Waterstaat, Min. Binnenlandse Zaken en Koninkrijksrelaties,

Prov. Utrecht/Zuid-Holland, Gem. Gouda, Platform Slappe Bodem,

Rijkswaterstaat, STOWA, HDSR, WDOD, Sweco, Tauw, NAM

Programma



- 09:30-09:35 uur Welkom & doel bijeenkomst
- 09:35-09:50 uur Voortgang & planning NWA-LOSS
- 09:50-10:20 uur Presentaties onderzoeksresultaten
- Philip Conroy (WP1.1): Enabling InSAR of the Dutch Peatlands with AI
 - Mandy van den Ende (WP4.2): Uitdagingen voor de sturing van bodemdaling in veengebieden
- 10:20-11:20 uur Postercarrousel (2 rondes)
- 11:20-11:30 uur Workshop afstemming resultaten LOSS met kennisgebruikers
- 12:30-14:00 uur Lunch

Programma



14:00-15:30 uur Algemene Ledenvergadering (General Assembly)

15:30-16:00 uur Borrel

16:00-17:00 uur Postdoc-bijeenkomst

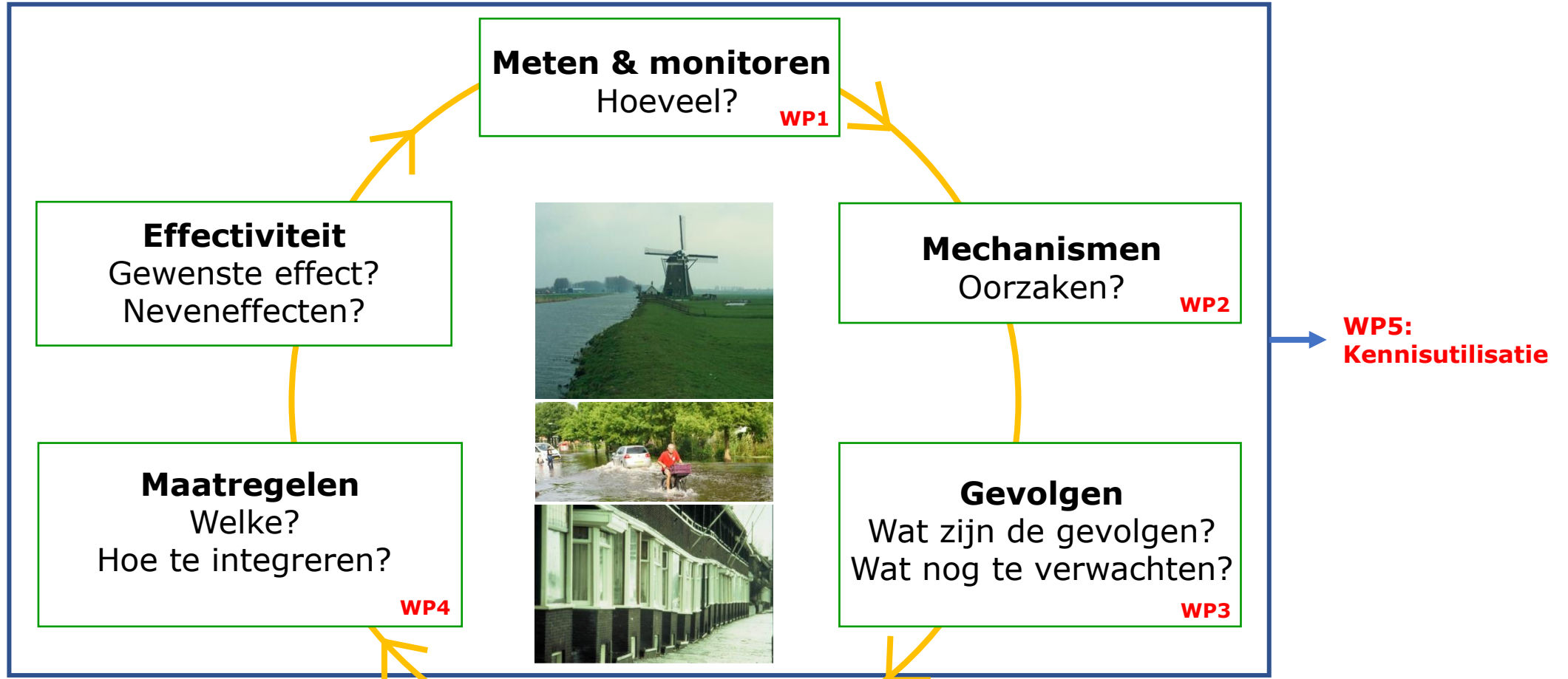
Doel LOSS



Ontwikkelen **integrale aanpak** om tot **haalbare, legitieme & duurzame oplossingen** te komen voor het beheersen van de negatieve maatschappelijke effecten van bodemdaling in Nederland.

- Door voldoende kennis onderbouwd beleid
- Handelingsperspectieven korte, midden-lange en lange termijn
- Integrale aanpak

Opzet programma



Type resultaat: kennis, technieken/methoden, data, modellen, handelingsperspectieven

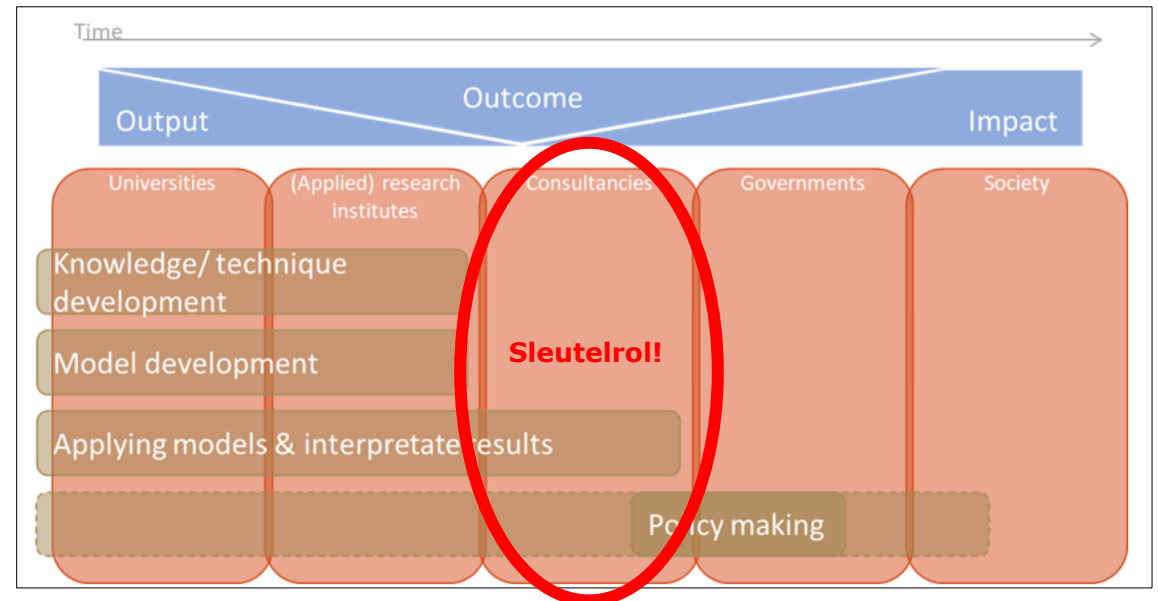
Voortgang



- Onderzoek 2,5 jaar: 11 PhD studenten, 3 postdoc onderzoekers, 1 TIM
- Consortiumbijeenkomst: vaststellen toekomst
 - geen interventie, geen netto CO₂-uitstoot, geen bodemdaling, max. 3 mm/jr daling, minste schade
- Symposium:
 - Betekenis 'bodem en water sturend' voor aanpak bodemdaling
 - Schade door krimp en zwel
- Werksessies adviesbureaus i.s.m. KBF
- Datamanagement workshops onderzoekers
- Veldbezoek meetlocatie en stakeholder Rouveen / bezoek PU-PZH

Van wetenschap naar praktijk

- Belangrijke rol ingenieursbureaus
gebruik wetenschappelijke kennis in maatschappelijke context
- Behoeftte aan uitvoering gebiedsgericht beleid → vereist kennis
- Continue dialoog nodig
- **Wat is hiervoor nodig?**
 - Organisatie
 - Juiste personen



Onderzoeksactiviteiten



- **Labexperimenten:** krimpgedrag klei, GHG emissie
- **Veldexperimenten:** microbiële afbraak veen, metingen extensometers
- **Tests:** respirometer, oedometer tests
- **Case studies:** N31, Almere, Oostvaardersplassen, meetsites, experimenten
- **Modelling:** MKBA, 1D bodemdaling, data-assimilatie koppeling diep-ondiep
- **Data-analyse:** methode interpretatie onderbroken tijdserie InSAR + verwerking data met contextuele informatie, reconstructie paleogrondwaterstijging voor GIA

Meetsite Nieuwolda

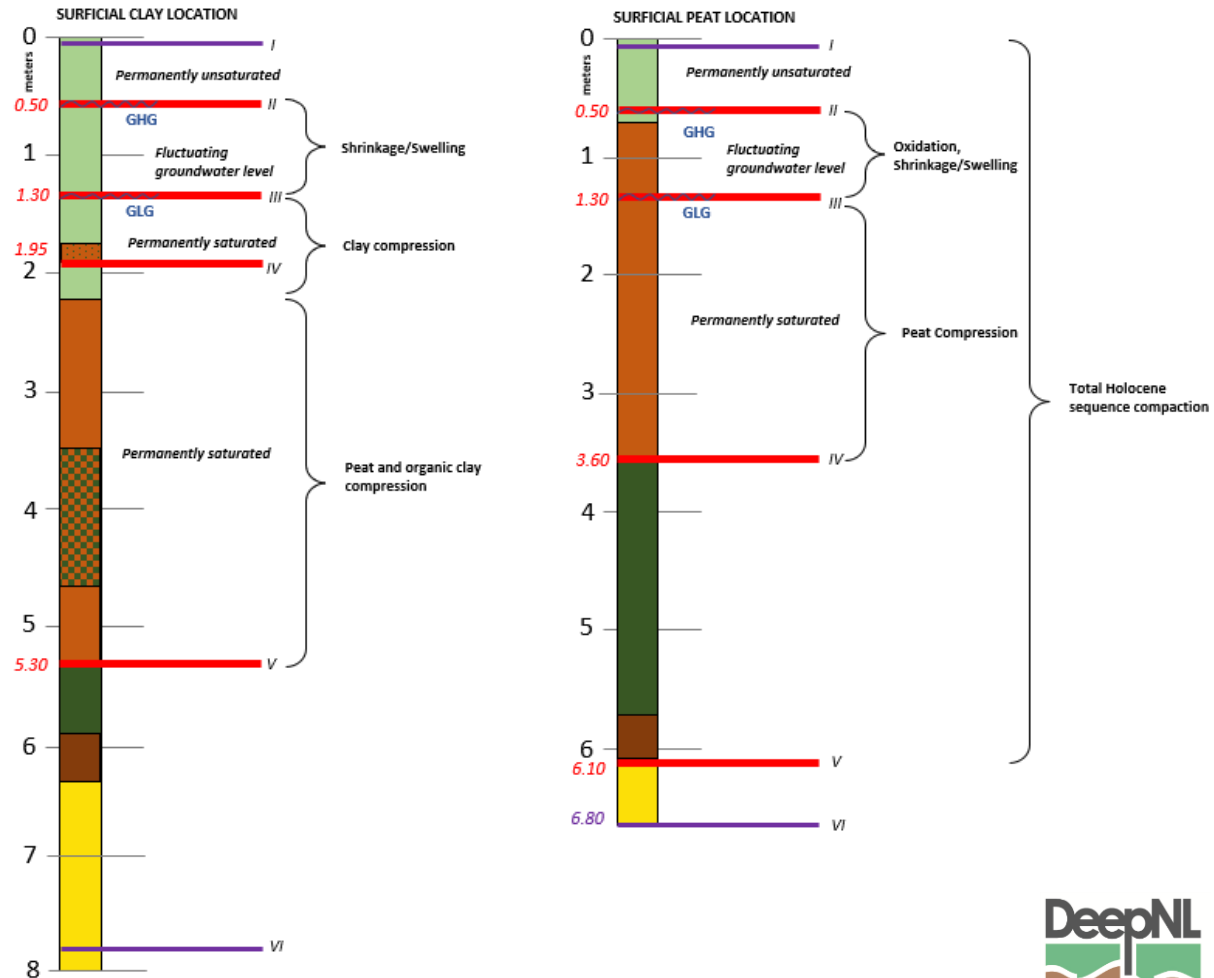


Kwantificeren bijdrage
ondiepe ondergrondprocessen
aan bodembeweging

- diep-ondiep
- akkerbouw op veen
- klei & veen



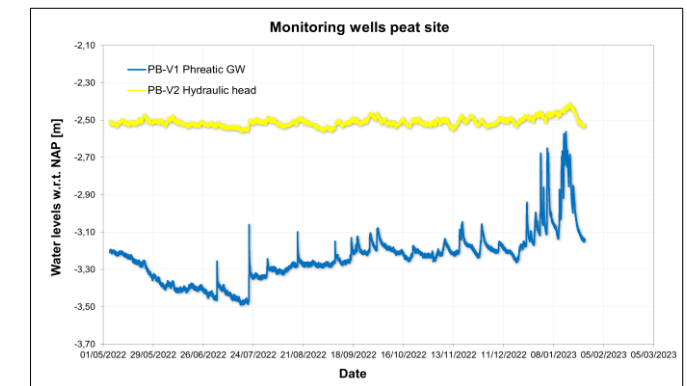
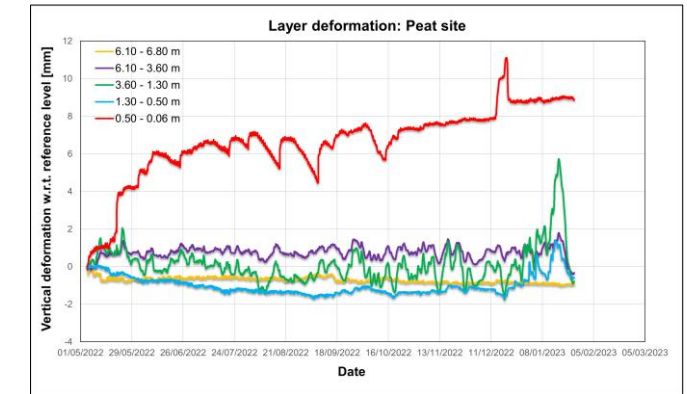
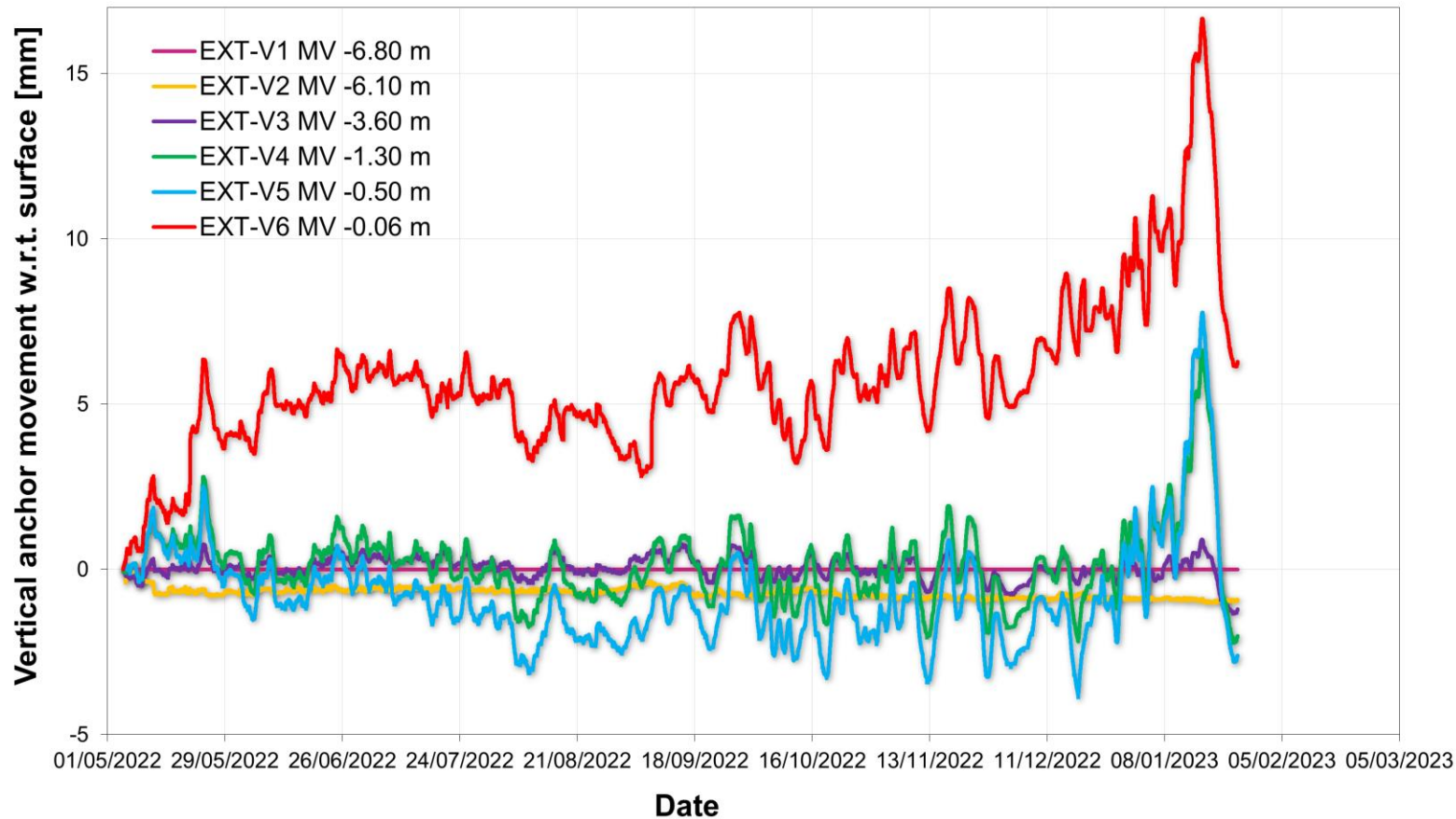
Foto: Chayenne Janssen



Meetsite Nieuwolda



Extensometer results peat site



Wetenschappelijke publicaties



IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, VOL. 60, 2022

5234611

Probabilistic Estimation of InSAR Displacement Phase Guided by Contextual Information and Artificial Intelligence

Philip Conroy^{ID}, Simon A. N. van Diepen^{ID}, Sanneke van Asselen^{ID}, Gilles Erkens^{ID},
Freek J. van Leijen^{ID}, *Member, IEEE*, and Ramon F. Hanssen^{ID}, *Senior Member, IEEE*

Abstract—Phase unwrapping, also known as ambiguity resolution, is an underdetermined problem in which assumptions must be made to obtain a result in SAR interferometry (InSAR) time series analysis. This problem is particularly acute for distributed

the Dutch have actively managed the water tables in the country for centuries using a system of dams and canals through which excess water can be pumped away. Thus, better knowledge of subsidence processes is needed for flood pro-

Wetenschappelijke publicaties



H2O ACTUEEL - H2O VAKARTIKELEN - H2O PODIUM - H2O MENSEN - H2O TECHNIJK - H2O PREMIUM - WATER MATTERS - WATERAGENDA - WATERVACATURES



De juridische (on)mogelijkheden voor het verminderen van broeikasgasemissies uit veen

VAKARTIKELEN 24 AUGUSTUS 2022



In dit artikel wordt besproken of en in hoeverre het juridisch gezien voor waterschappen mogelijk is om het peil in veengebieden in gebruik door landbouw te verhogen om broeikasgasemissies uit veen terug te dringen. De juridische mogelijkheden voor waterschappen blijken beperkt.

[Download hier de pdf van dit artikel](#)

Geschreven door Martijn van Gils, Frank Groothuijse (Universiteit Utrecht)

H2O ACTUEEL



Bestuur WDO Delta unaniem akkoord met peperdure versterking s...



Onderbelichte waterverhalen creatief in beeld gebracht...



Waterschapslasten met gemiddeld ruim 8 procent gestegen...



Waterskip Fryslân treft meer chemische stoffen aan in efflu...



Adviescommissie: steeds lastiger om verband te leggen tussen...

[Meer H2O Actueel](#)

Quantifying shrinkage of marine and fluvial clay deposits by means of soil-shrinkage curves

Authors: Bente Lexmond¹, Marc Nijboer^{1,2}, Cjestmir de Boer², Jasper Griffioen^{1,2}, Gilles Erkens^{1,3} & Esther Stouthamer¹

Affiliations: ¹Utrecht University; ²TNO Geological Survey of The Netherlands ³Deltares

Corresponding author: Bente Lexmond (b.r.lexmond@uu.nl)

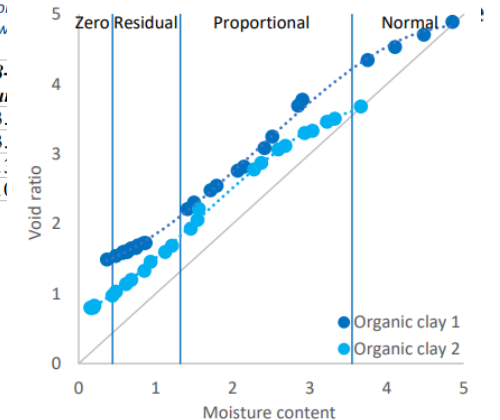
Theme: Mechanisms and Understanding of land subsidence; Foci: Coastal areas, Deltas & Sea Level Rise

Abstract

Shrinkage and swelling due to moisture content changes in clay-rich expansive soils are well-known and notorious phenomena, as they cause damage to infrastructure and change the hydrological and mechanical characteristics of the soil. Irreversible soil shrinkage also induces land subsidence.

Table 1. Composition of the organic fluvial (Montfoort) and inorganic marine (Abbenes) clay soil carbonate content, organic matter content, and grain size distribution. All values are given in w

Soil ID	Sample depth	CaCO ₃	Organic matter	<2 μm	2-8 μm	8-μm
Organic clay 1	95 cm	0.19	26.81	47.74	18.76	3.
Organic clay 2	95 cm	0.19	29.63	41.12	21.4	3.
Inorganic clay 1	185 cm	2.40	6.65	44.85	29.43	1.
Inorganic clay 2	185 cm	0.56	7.37	39.77	32.22	1.

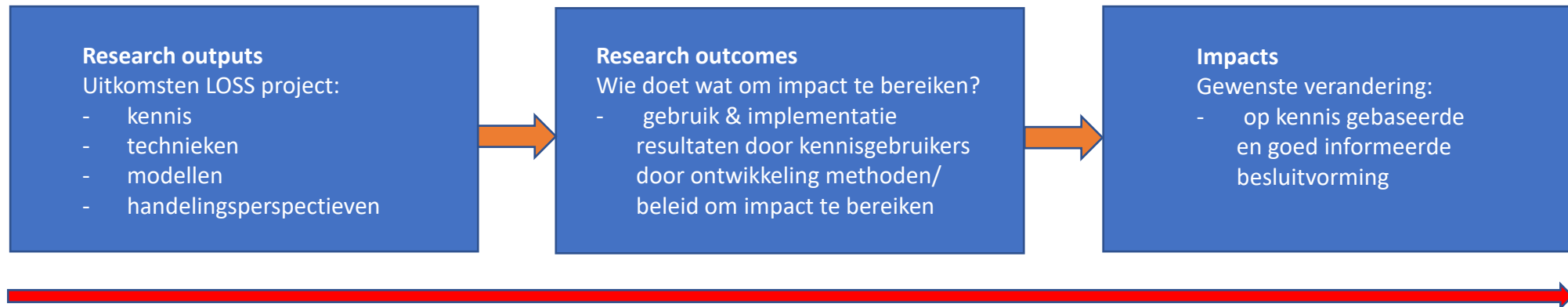


➤ Conference papers TISOLS + vele abstracts (int.) conferenties

Impactplan

Impacts

1. Toename bewustwording bodemdaling, impacts, handelingsperspectieven
2. Op kennis gebaseerde en goed geïnformeerde besluitvorming m.b.t. bodemdaling



Impactplan



	Outputs	Indicators	Outcomes	Indicators	Impact
→	<p>1. Quantification of relative importance and interaction of subsidence processes (biotic, abiotic) in different soft soil sequences.</p> <p>mechanismen</p>	<ul style="list-style-type: none"> - Parameterization & calibration process models. - Insight subsidence mechanisms. - Recommendations for optimisation or development of new mitigation measures based on process insights. 	<p>a. Successful pilots showing reduction potential for land subsidence (and GHG emission) (by: provinces, Water authorities).</p> <p>b. Change/substantiate criteria for subsidies concerning subsidence mitigation and GHG mitigation measures (by: government and private parties).</p> <p>c. Societal discussion on acceptable levels of land subsidence for the Netherlands and desired/acceptable changes in land use in peat meadow areas (by: NKB, KBF).</p>	<p>a1. Pilot location(s) is(are) implemented and meets set targets.</p> <p>b1. Concrete objectives for subsidence at national and/or regional level anchored in policy documents and/or law.</p> <p>b2. Changed/substantiated carbon credits for peat conservation measures that include targets for land subsidence.</p> <p>c1. Land subsidence is actively discussed in societal/political debates (national newspapers, talk shows, Twitter).</p> <p>c2. Integration of subsidence management in relevant policy fields.</p>	<p>1. <i>Raised awareness</i> of land subsidence, its impacts and action perspectives leading to <i>gain support</i> for acting on land subsidence.</p>
→	<p>2. Assessment performance of measures; individual & integrated.</p> <p>3. Establish accurate prediction of land subsidence under different societal and water management scenarios.</p> <p>maatregelen</p>	<ul style="list-style-type: none"> - Overview measures and establish success factors for performance. - Design and impact of mitigation measures; short-, mid- and long-term. - Assisting in the design of a relevant pilot study. - Including relevant subsidence processes in the predictive models. 			
→	<p>4. Information on land subsidence: causes, consequences, action perspectives for non-experts;</p> <ul style="list-style-type: none"> - Secondary school students - Interested lay people, including policy makers <p>informereren</p>	<p>1a. Course material</p> <p>1b. Course tested at high school.</p> <p>2a. Website + interested lay people (website visits, visits lectures etc.).</p> <p>2b. Newspaper articles</p> <p>2c. Contribution knowledge and materials to national visiting center for land subsidence (if continued).</p> <p>2d. Lectures/workshops given.</p> <p>2e. Documentaries: BBC, RTV, NPO</p>			

Impactplan



<p>5. Local-scale <i>physical</i> model forecasts (cm, GHG emission) with national coverage.</p>	<ul style="list-style-type: none"> - 1, 5, 10, 20, 50, 100 year ahead - Subsurface-subsidence module - Climate sensitivity module - Policy scenario module 	<p>d. Facilitation dissemination/ calculation/storage for (forecast) data, and models at a central location (by: NIB, research institutes).</p>	<p>d1. Centrally stored frequently updated forecast model outputs 1, 5, 10, 20, 50, 100 year ahead.</p> <ul style="list-style-type: none"> - Covering multiple regions. - Can add 'background rates' (add non-soft soil terms back to the LOSS modelling) 	<p>2. Knowledge-based, well-informed (public & private) decision making on land subsidence leading to mitigation and adaptation.</p>
<p>6. Local-scale <i>economic</i> model forecasts (mm to Euro) spatially explicit to asset scale with national coverage.</p> <p>MKBA</p>	<ul style="list-style-type: none"> - 1, 5, 10, 20 year ahead - Economic damage module - Policy impact module 	<p>e. Decision support at appropriate levels: national, regional, local. Developed models are suited to avoid that subsidence problems are only shifted in space or time. (by: regional governments, possibly national government)</p>	<ul style="list-style-type: none"> - Can add 'short term variability' ('impact of an ongoing heat wave') - Can add 'land-use change' impacts - Can add 'sea-level rise' and flood safety impacts. <p>e1. Stakeholders are informed about simulation/optimization tool for social decision making.</p>	
<p>7. Legal and institutional strategies to facilitate normative debate and improve the implementation of subsidence adaptation and mitigation measures.</p> <p>juridisch kader</p>	<ul style="list-style-type: none"> - Insight into responsibilities and legal instruments for public authorities to implement adaptation and mitigation measures in an efficient and effective way. - Insight into impact legal implementation strategies on public and private interests. - Insight into potential normative starting points for decision making (e.g. legitimacy, legality, solidarity). 	<p>f. Public authorities (municipalities, regional water authorities, provinces and the national government) in the selected case studies jointly use their (proposed) legal instruments to effectively and efficiently implement subsidence mitigation and adaptation measures, taking into account the developed legal strategies and assigning appropriate weight to the (long-term) negative effects of subsidence in their policy and decision making (integrated subsidence management).</p>	<p>f1. Considerations to change of policy, acts, regulations and decisions by public authorities involved because of the suggested legal implementation strategies and/or the long term negative effects of subsidence, evident from references to research output in policy documents, memo's, expert advice and explaining memoranda to legislation on different levels of government.</p>	

Time

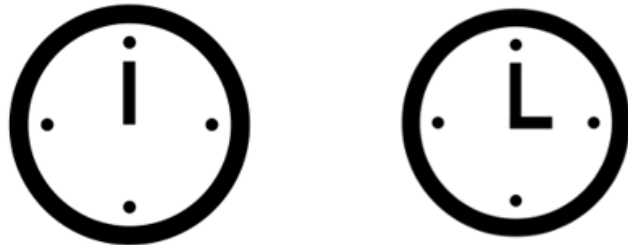
Impactactiviteiten



- Bijgedragen aan Kenniscentrum Bodemdaling en Funderingen
- Websites EN + NL
- Korte documentairefilmpjes bodemdaling Krimpenerwaard
- Vertalen wetenschappelijke artikelen voor NL professionals

Bodembeweging van de Nederlandse veengebieden monitoren met InSAR

Hoeveel tijd is er verstreken?



Het antwoord lijkt misschien simpel: drie uur! Maar in werkelijkheid is het iets ingewikkelder. Het kan ook zo zijn dat er vijftien uur zijn verstreken, of zeventenwintig. Het zou zelfs kunnen dat de rechterklok een beeld is van negen uur eerder.

Planning



- Aanstelling laatste 2 postdoc onderzoekers in komende maanden
- Jaarlijks symposium: 2 november 2023
- Aanpassen datamanagementplan
- Werksessies met stakeholders, o.a. adviesbureaus
- Uitvoeren communicatieplan
- Consortiumdag: 22 maart 2024

Planning



- Verwachting: dit jaar veel resultaten
- Ontwikkeling lesbrieven middelbare school onderwijs i.s.m. KBF
- TISOLS 2023:
 - Stakeholdersessie vrijdag 21 april 2023, Gouda
 - Presentaties onderzoeksresultaten
- Interactie met buitenlandse onderzoekers
- Start organisatie internationale workshop 2024
- Uitdaging:
 - hoe van output naar outcome?
 - hoe goed aanhaken en aangehaakt blijven bij uitwerking Bodem- en watersturend in ruimtelijk beleid?

Presentaties onderzoeksresultaten



- Philip Conroy (WP1.1):
Enabling InSAR of the Dutch Peatlands with AI



Philip Conroy (TUD)

- Mandy van den Ende (WP4.2):
Uitdagingen voor de sturing van bodemdaling in veengebieden



Mandy van den Ende
(UU-SD)