Peatlands & rewetting - scientific issues in climate policies

Trending Topics in Biology and Chemistry of Soil and Water

16 May 2023, Jeroen Veraart (Wageningen Environmental Research), Bart Kruijt (Wageningen University)

WAGENINGEN
UNIVERSITY & RESEARCH

natuurlijke klimaatbuffers

Nationaal Onderzoeksprogramma
Broeikasgassen Veenweiden

Natuurmonumenten

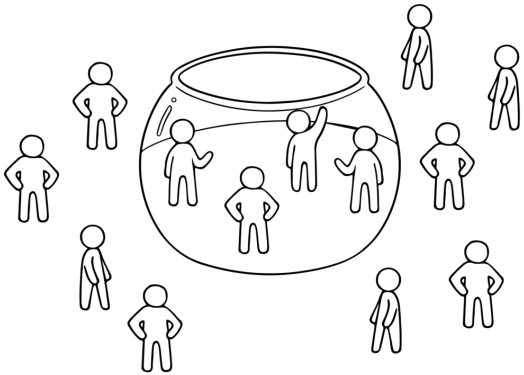
Contents

Presentation

- Introduction (Jeroen Veraart, Wageningen Environmental Research)
- Peatland restoration for climate change mitigation (Gerald Jurasinski, Greifswald Univ.)
- CH_4 and CO_2 emissions in Camphuysen/Onlanden (i.o. Bart Kruijt)
- Policy implications (Jeroen Veraart)

Fishbowl session:

- Discussion



WAGENINGEN
UNIVERSITY & RESEARCH

The benefits of peatland restoration for Europe

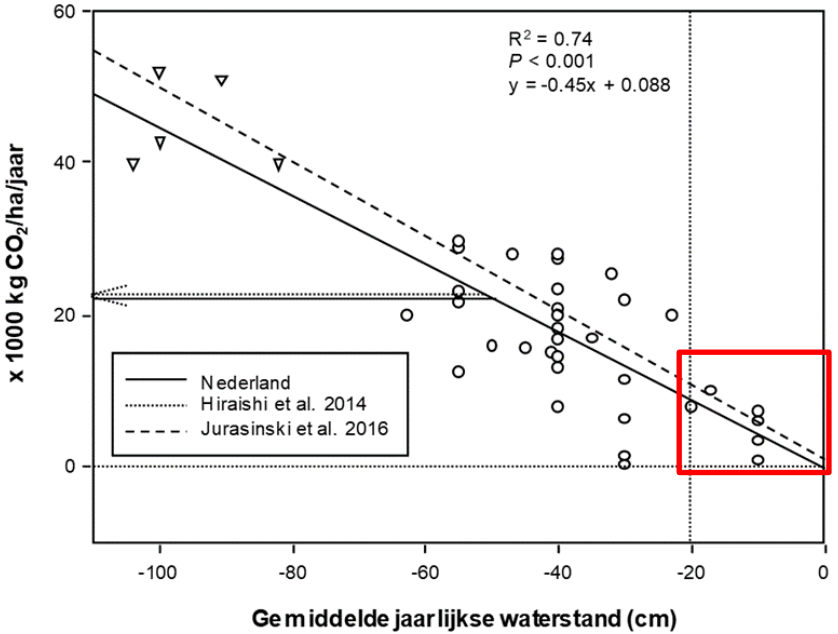
Berlin, Germany, 26-28 April 2023 Wednesday

https://life-peat-restore.eu/

- Peatland restoration for climate change mitigation

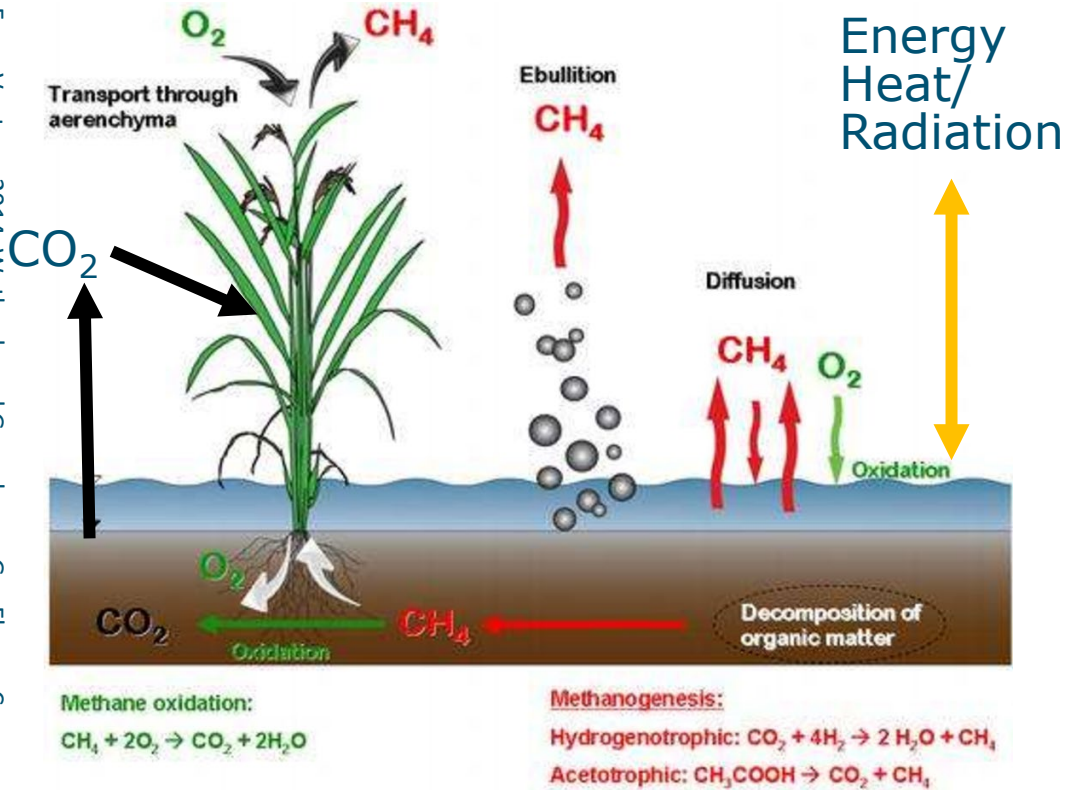
  Prof. Gerald Jurasinski

  University Greifswald, Germany



WAGENINGEN
UNIVERSITY & RESEARCH

Basics GHG emissions in peat & wetlands

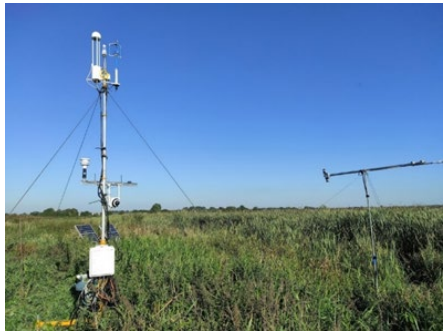


From Ventura, 2014, Wetlands and Greenhouse Gas Fluxes: Causes and Effects of Climate Change – A Meta-Analysis

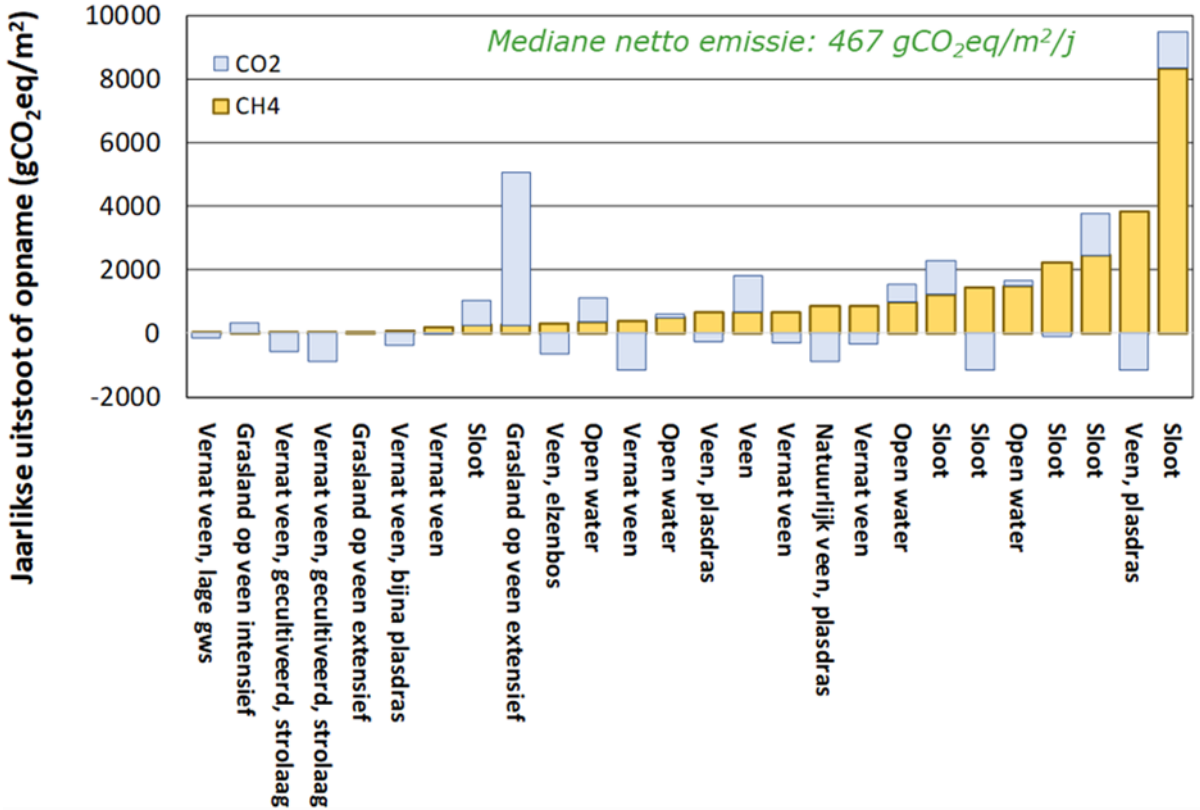
- *CH_4 emissions are complex and show high variablity*
- *CO_2 emissions from wetlands are better understood*

WAGENINGEN
UNIVERSITY & RESEARCH

Methane emissions as measured in NL, B en DE



Meetlocaties:
CH4 en CO2 tegelijkertijd gemeten
Kamermetingen en/of EC



WAGENINGEN
UNIVERSITY & RESEARCH

Jacobs et al., 2020

Methane Global Warming Potential (GWP)

- Methane disappears faster in the atmosphere than CO_2
- Methane is stronger GHG than CO_2

Policy question:

Creating new wetlands result in an increase of GWP?

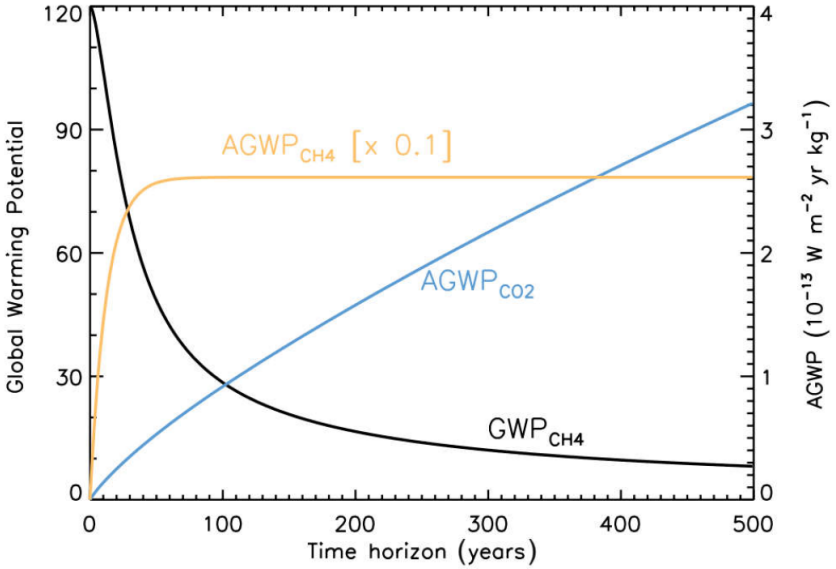
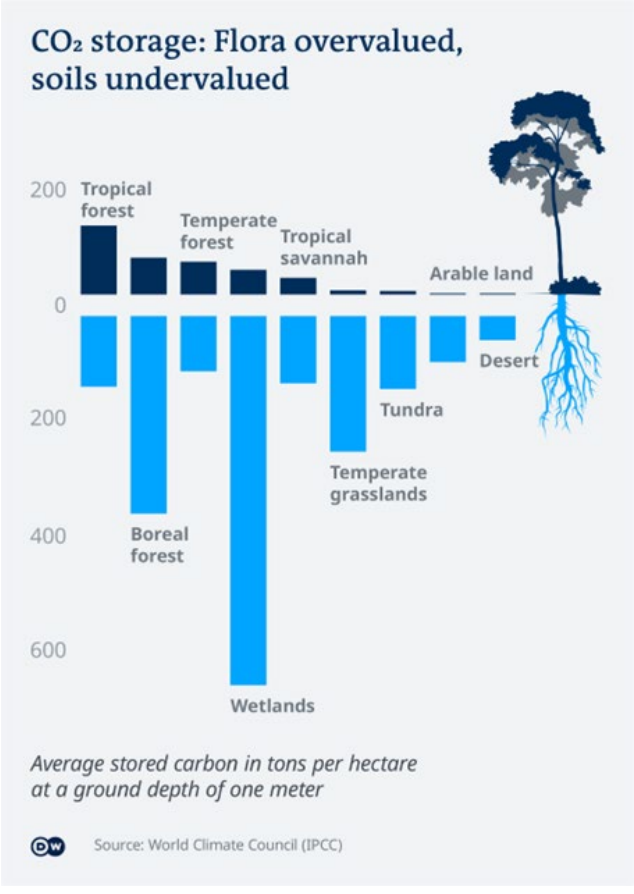


Figure 1: Time Horizon Impact on Methane AGWP and GWP (Figure 8.29 in Myhre et al. 2013[4]).


NABU

Wetlands and climate policies

- Dutch climate agreement:
  - Wet nature (mineral, organic soils)
  - Forests
  - Organic soils (agriculture)
- Uncertainty: Wetlands are a sink for CO_2 but also CH_4 source

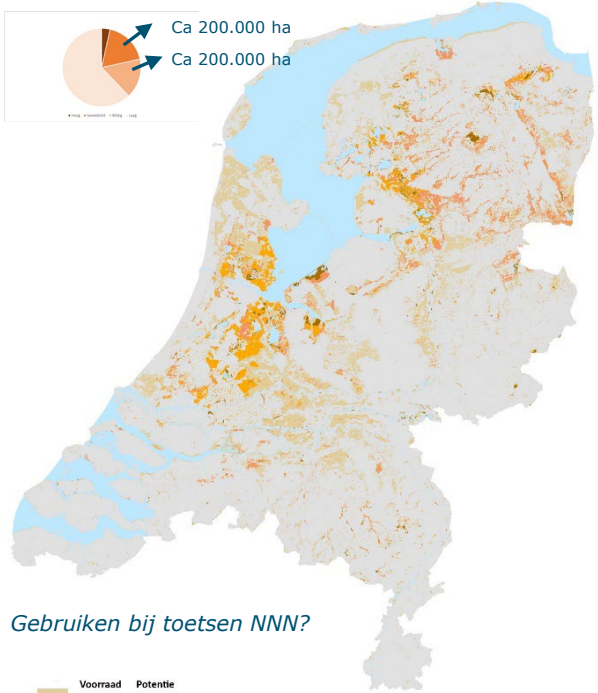


WAGENINGEN
UNIVERSITY & RESEARCH


Een heel simpel liedje over best wel ingewikkeld onderwerp!
00:41
0.4 MTCO2-eq
Veel, weinig?

Rewetting in existing natural areas or elsewhere?

Met ook agrarische SNL typen (12000 km2)



Gebruiken bij toetsen NNN?

Wösten et al., 2020

Binnen natuur (2500 km2)

Gebruiken bij toetsen Antiverdrogingsbeleid?

Definition of wetlands in LULUCF

WATER EN NATURE policies

- Sea, Salt marshes
- Hoogveen, trilveen, veenmosrietland en vennen
- Moeras beheertypen bij o.a. beek en rivier , moerassig bos
- Laagveen/grasland
- Open water

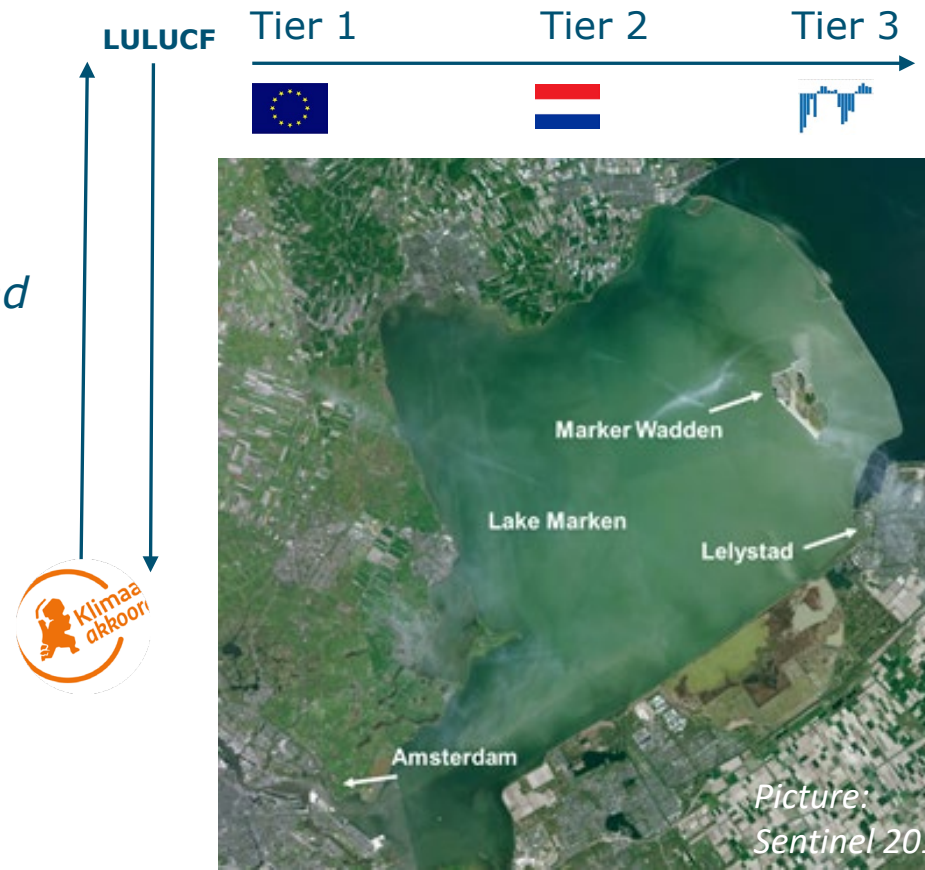
LULUCF

	Bos	Grasland	Wetland
		✘	✘
			✘
	✘		✘
		✘	
			✘

WAGENINGEN
UNIVERSITY & RESEARCH

LULUCF Methodiek - Wetlands

- Land use change
- Emissiefactors per land use type
- *Management*
  - *Natural ←→ managed wetland*
  - *Hydrology*
  - *Water Quality*
  - *Vegetation*



WAGENINGEN
UNIVERSITY & RESEARCH

Dutch experiences: Onlanden & Camphuys

WAGENINGEN UNIVERSITY & RESEARCH

natuurlijke klimaatbuffers

Locations

Onlanden

Polder
Camphuys

WAGENINGEN
UNIVERSITY & RESEARCH

Vegetation

WAGENINGEN
UNIVERSITY & RESEARCH

Climate policies in this area

- >5 million m3 Water retention capacity (surface water) to protect city Groningen for water nuisance
- Restoration of 1100ha peat bog nature (In Dutch: laagveenmoeras)
- Reduced GHG emisions (in CO2-eq $ha^{-1}jr^{-1}$) compared to agricultural areas (*proven*), on the long-term a netto GHG sink? (*in research*)

Veraart et al, 2019; Zingstra & Vertegaal, 2021

De Onlanden

Groningen City

Monitor locations GHG emissions (Kruijt e.a)

What do we measure at this location?

- CO_2 *flux* = netto CO_2 exchange of entire ecosystem
  NEE = GPP (opname) – Reco (uitstoot)
- CH_4 *flux = see CO_2 flux*
- *Heath flux & evaporation*
- Radiation energy
- Normalized Difference Vegatation Index (groenheid)’ & webcam foto’s
- Basics meteorology (wind, air/soil temperature, etc.)
- Water levels

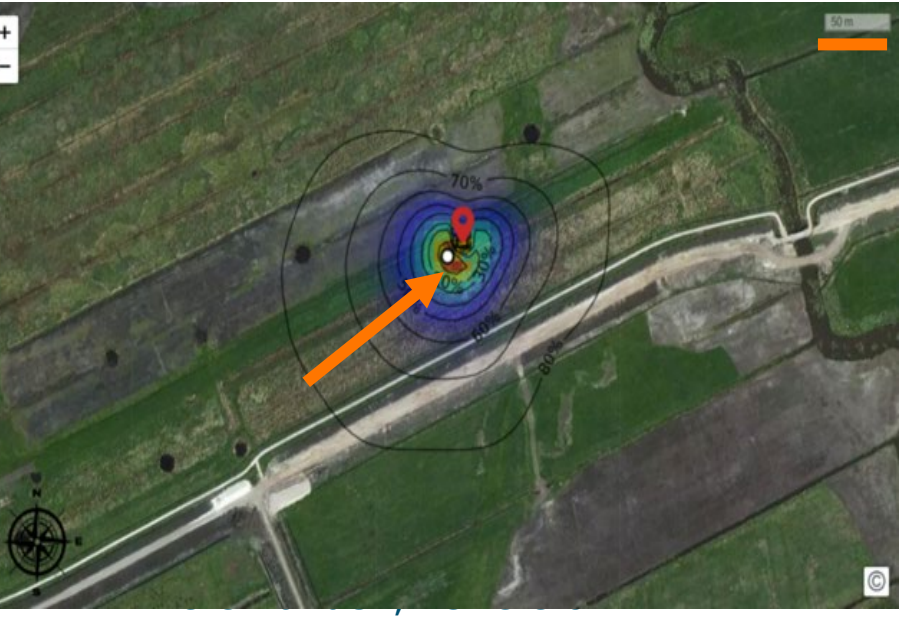
Monitoring at two locations

WAGENINGEN
UNIVERSITY & RESEARCH

natuurlijke klimaatbuffers

The footprint of the measurements

Onlanden



Polder Camphuys, Paterswolde

WAGENINGEN UNIVERSITY & RESEARCH

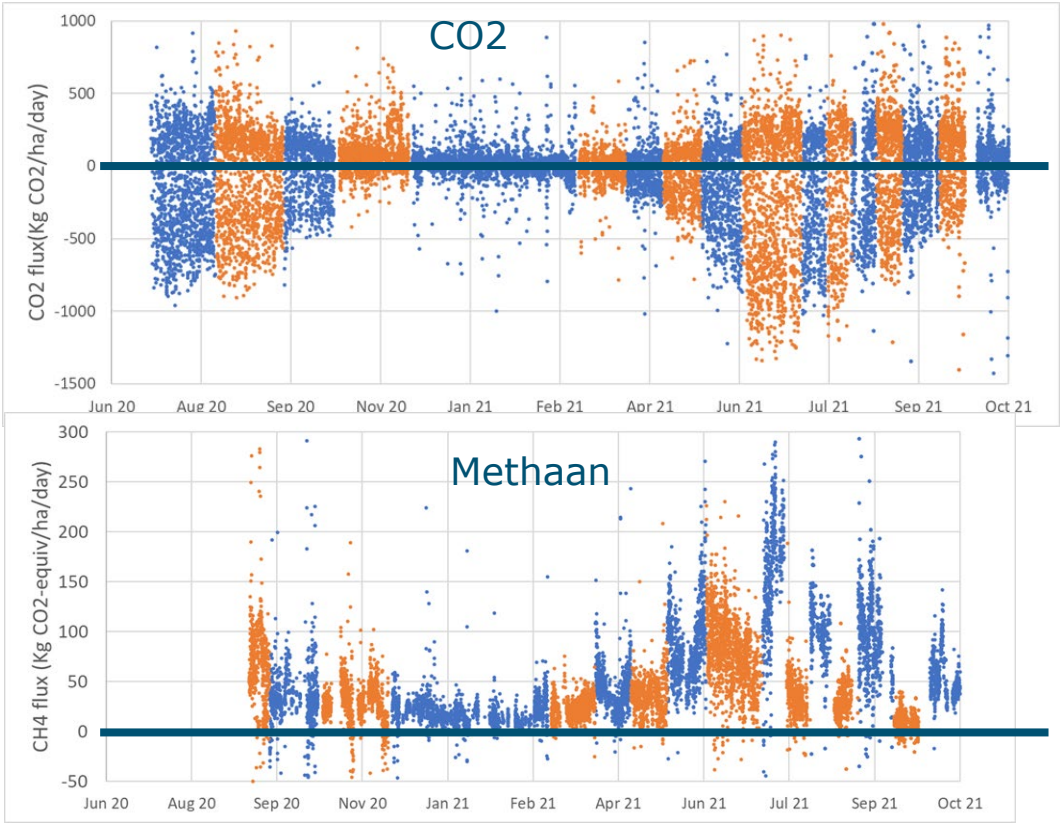
100years

Natuurmonumenten

Measurements in the Onlanden region

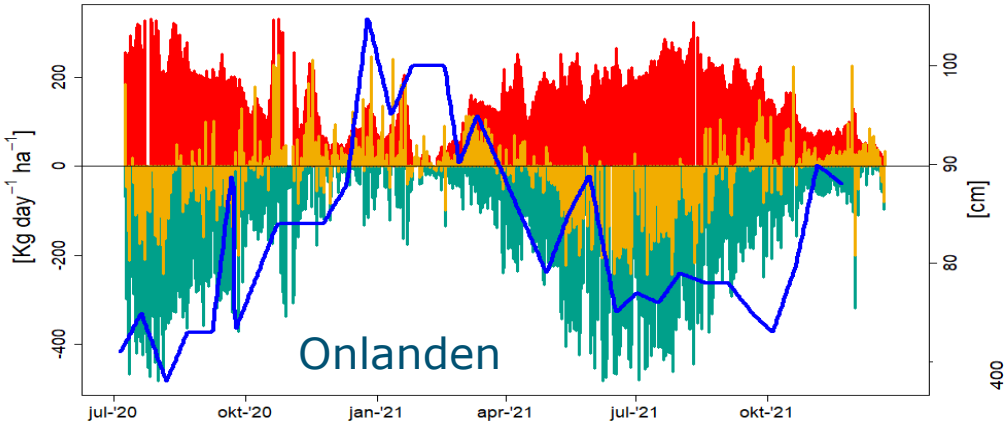
- Polder Camphuys/Onlanden

  (BO Klimaatenveloppe)

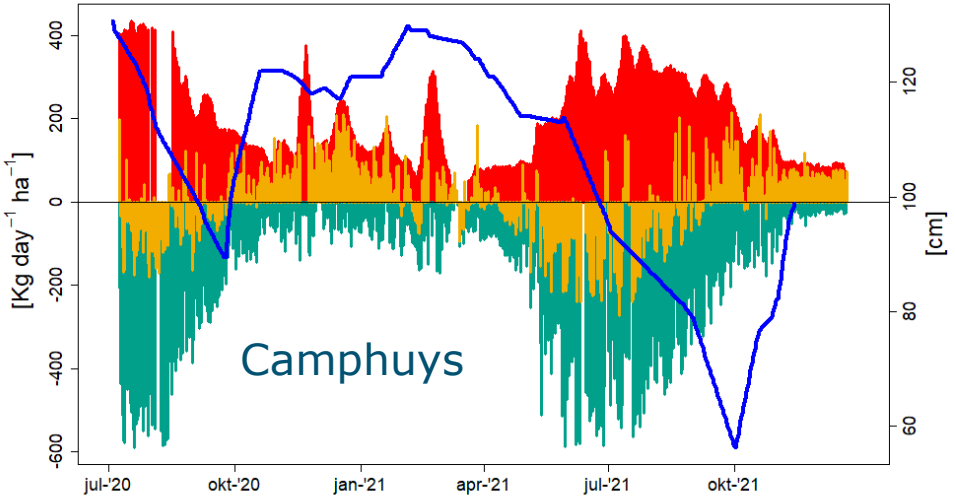


Bron: WU/NM, Bart Kruijt e.a.) http://climatexchange.nl/sites/Onlanden_Camphuys/

CO_2 fluxes



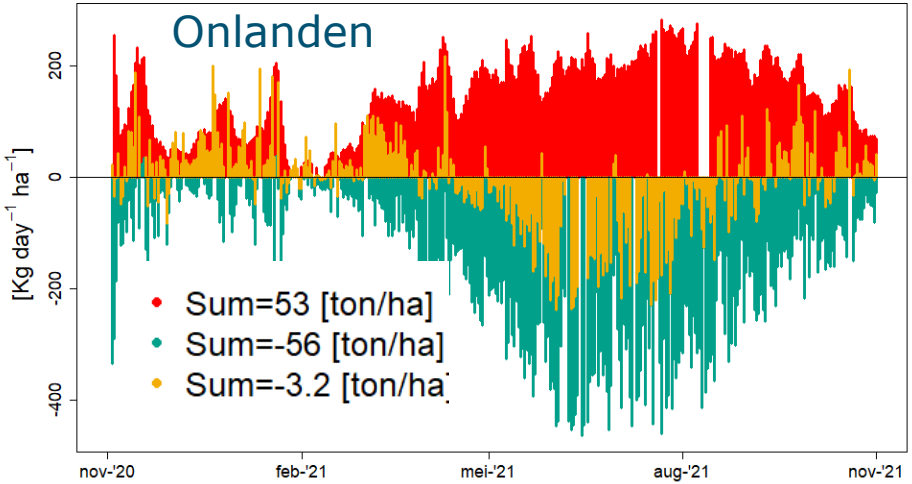
- RECO = uitstoot
- GPP = opname
- NEE = netto uitstoot
- WL (Y^{nd}) = waterpeil (relatief)



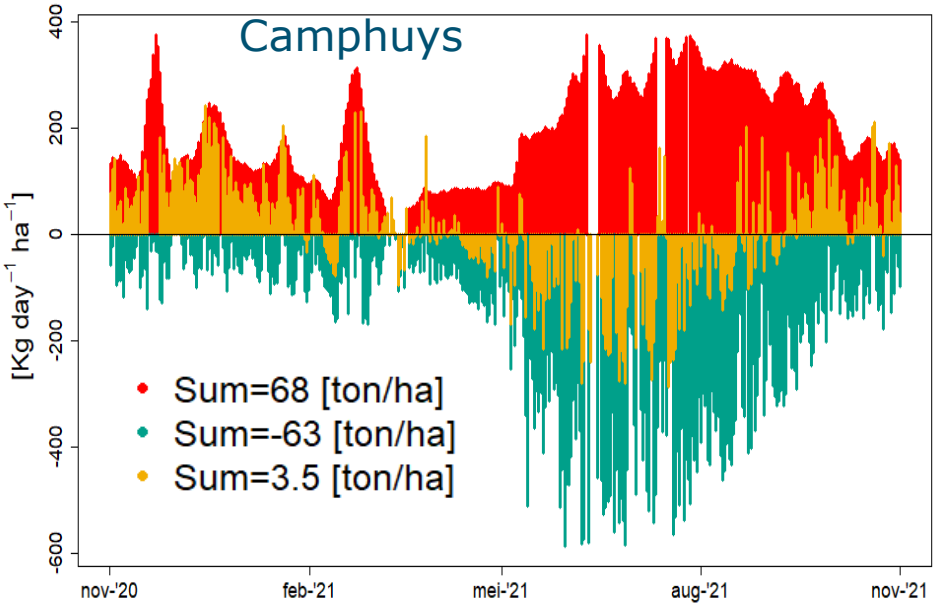
More information: Kruijt e.a., 2023

WAGENINGEN
UNIVERSITY & RESEARCH

CO_2 year balance (2020-2021)



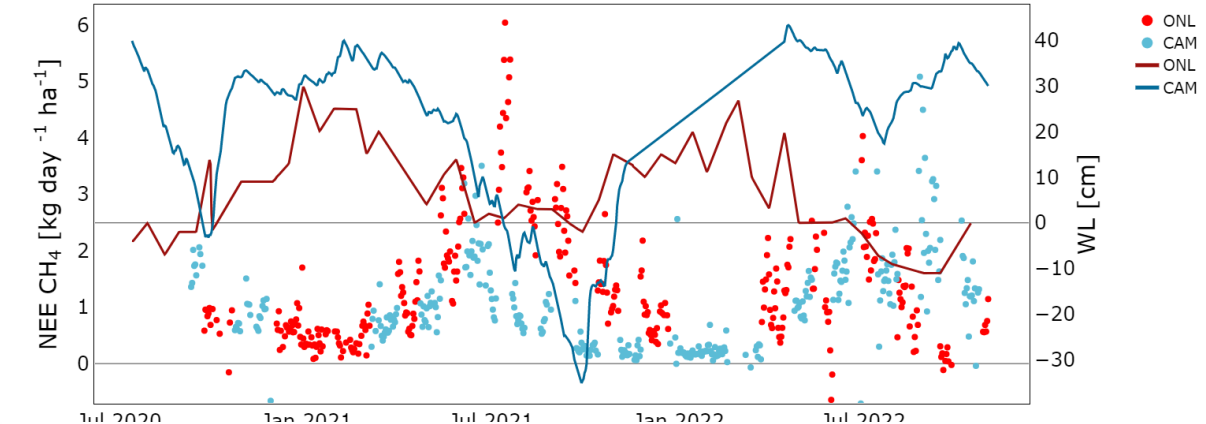
- RECO = uitstoot
- GPP = opname
- NEE = netto uitstoot
- WL (Y^{nd}) = waterstand (relatief)

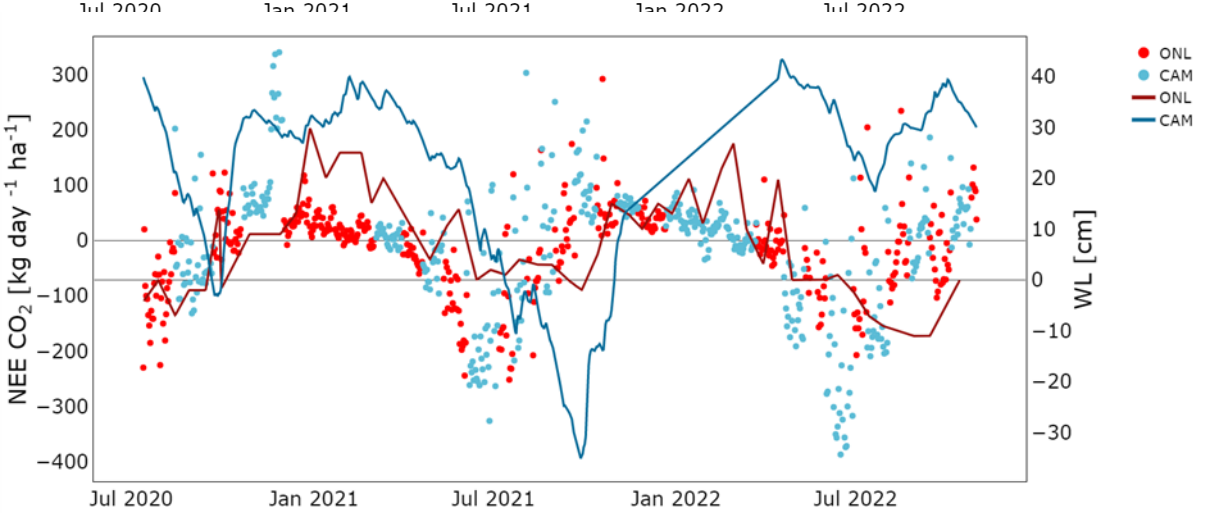


More information: Kruijt e.a., 2023

WAGENINGEN
UNIVERSITY & RESEARCH

Methane fluxes and water levels (up to 2023)





Onlanden

CO_2 : sink

CH_4: source

CO_2-eq: source

Camphuys

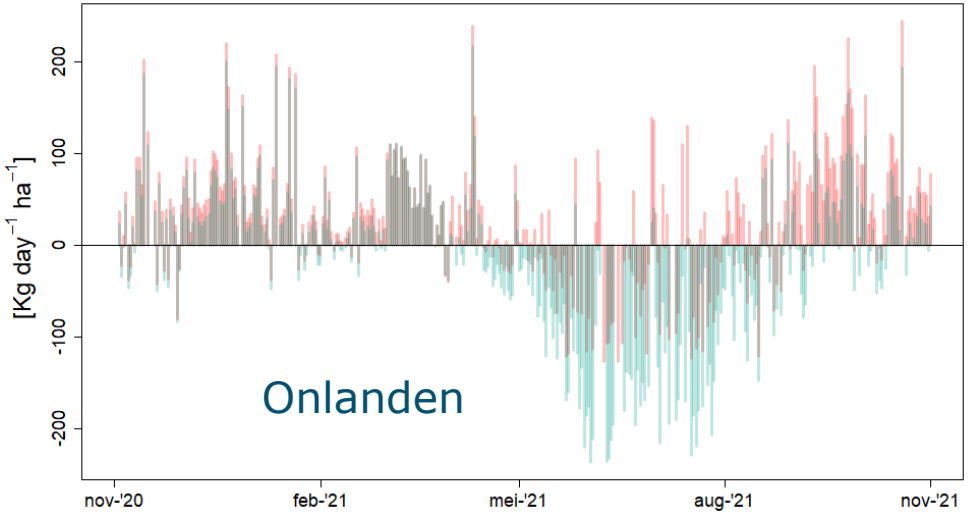
CO_2 : sink

CH_4: source

CO_2-eq: sink

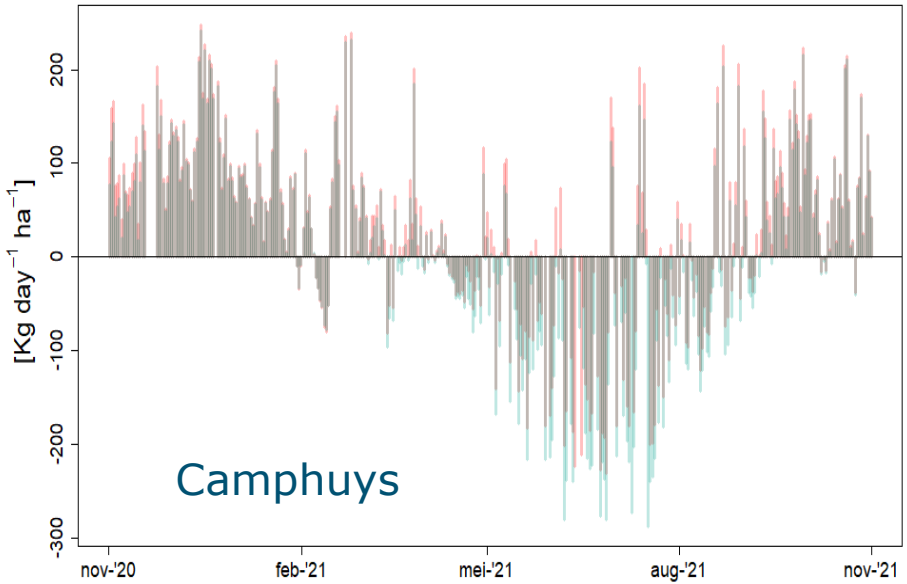
More information: Kruijt e.a., 2023

GWP budget in CO_2 equivalents



- GWP (CO_2+CH_4)
- NEE (CO_2)

- Sum=10 [ton/ha]
- Sum=-3.2 [ton/ha]



- GWP (CO_2+CH_4)
- NEE (CO_2)

- Sum=9.5 [ton/ha]
- Sum=3.5 [ton/ha]

WAGENINGEN
UNIVERSITY & RESEARCH

First conclusions (from example)

- Monitoring 2020-2022 included 2 dry years
- Both sites are a small source of CO_{2-} eq, but significant lower emissions compared to peat in agricultural use . At least 5 years are necessary to calculate reliable year budgets.
- CH_4 emisions are dependent of water tables, so manageable?
- CO_2 fluxes are reasonable predictive at these sites thanks to monitoring
- The wetland is also a buffer for heat (learnt from summer 2020)

Fishbowl

Start

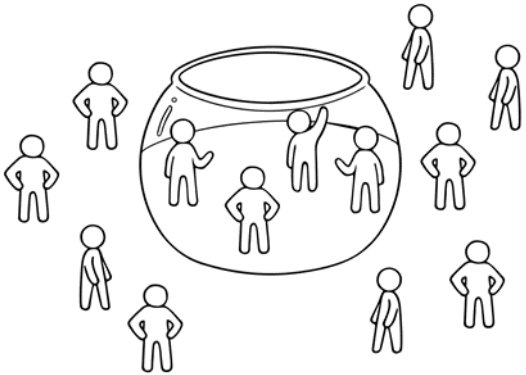
- 5 persons

Kick off discussion point

- Methane emissions are a limitation for rewetting peatlands

Progress

- Do you want to join the current discussion or introduce a new discussion point: tap the shoulder of 1 of the people in the fishbowl



Thank for your attention

More information?

Jeroen.veraart@wur.nl

Bart.kruijt@wur.nl

See also:

- www.klimaatbuffers.nl
- Kansenkaart klimaatbuffers
- www.waterlandschappen.nl
- Follow the fluxes in Onlanden live
- Klimaatenveloppe Natte natuur
- Nature-based Solutions for Climate Resilient and Circular Food Systems

Acknowledgements

LNV (BO-43-126-007) , Natuurmonumenten, NOBV, STOWA.

Special credits goes to Boukelien Bos (CNK), Wiebe Borren (Natuurmonumenten), Querijn Smeele (Natuurmonumenten)

WAGENINGEN UNIVERSITY & RESEARCH

natuurlijke klimaatbuffers

Nationaal Onderzoeksprogramma Broeikasgassen Veenweiden

Natuurmonumenten