BlueCAN
clear water for the climate

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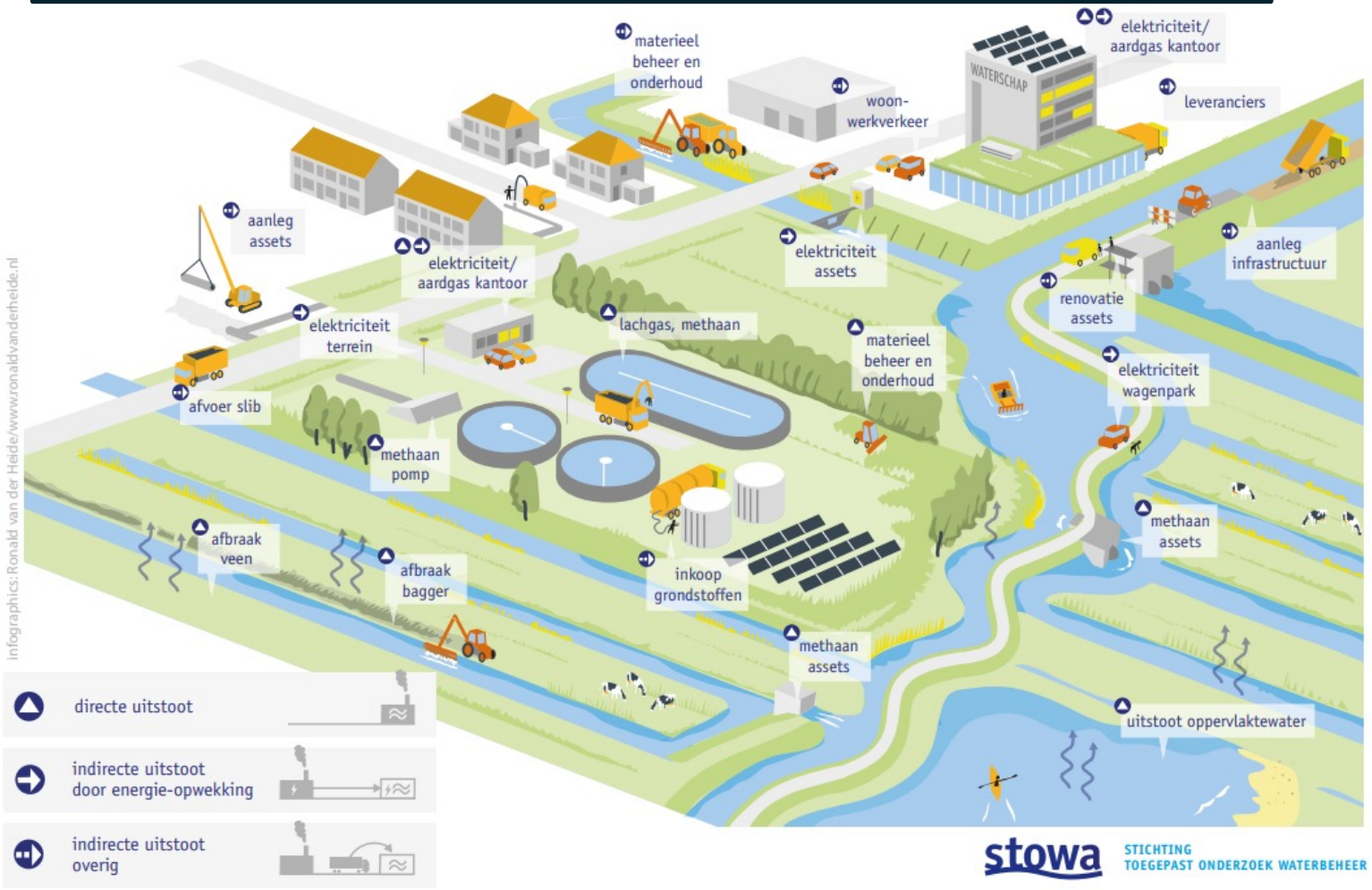
EMISSIONS OF GREENHOUSE GASES RELATED TO WATER MANAGEMENT AND TREATMENT



infographics:Ronald van der Heide/www.ronaldvanderheide.nl

stowa STICHTING TOEGEPAST ONDERZOEK WATERBEHEER

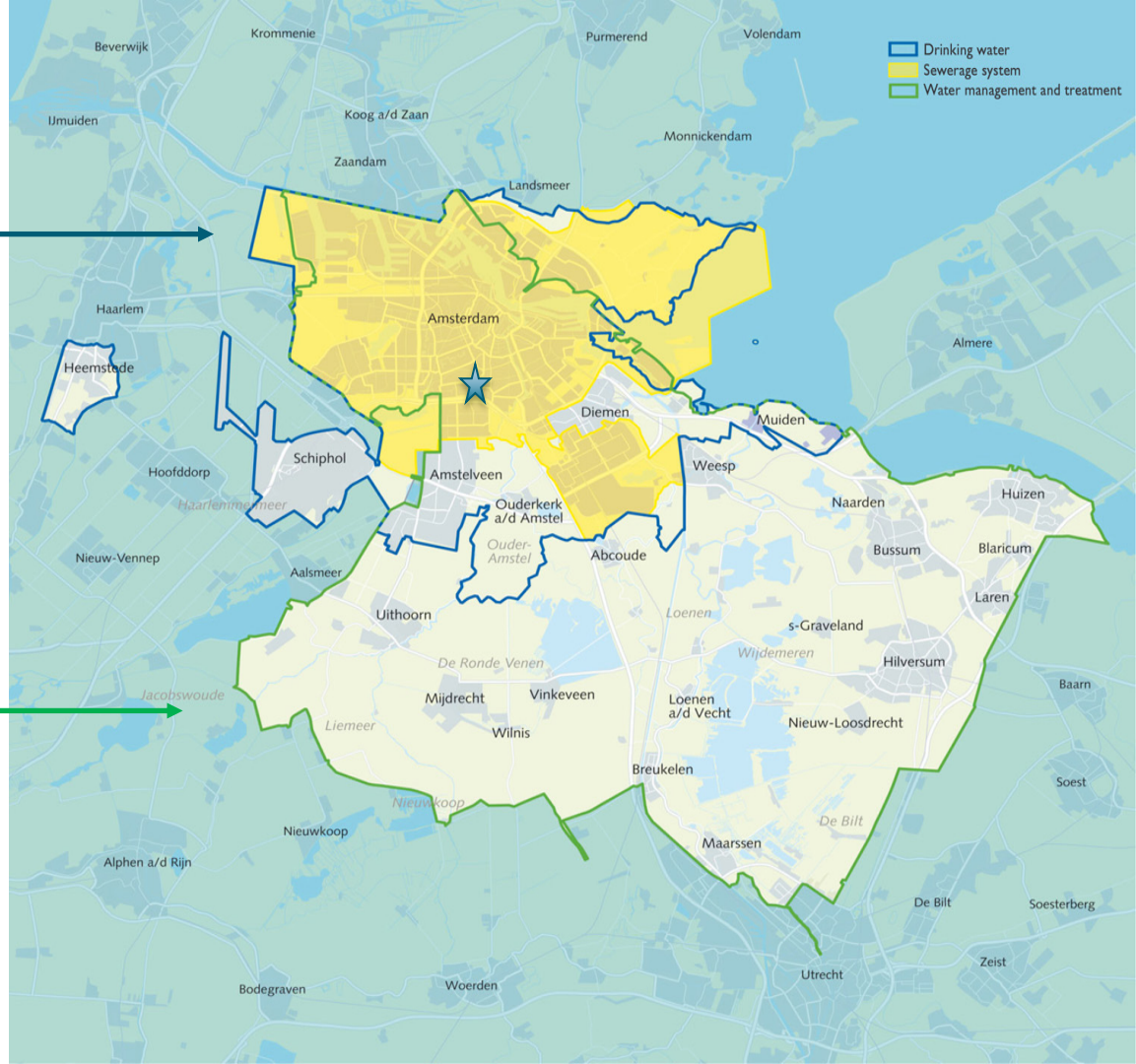
Waternet

Blue/yellow:

Municipality of Amsterdam (drinking water production and distribution, sewerage system)

Green lined:

Dutch Water Authority Amstel, Gooi and Vecht



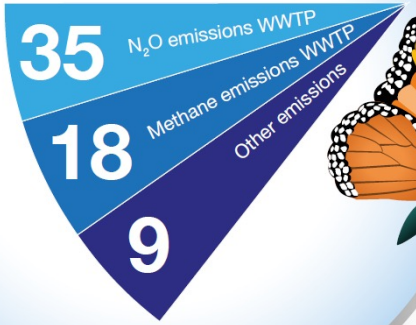
waternet
waterschap amstel gooi en vecht
gemeente amsterdam

Climate impact and opportunities AGV

waterschap amstel gooi en vecht

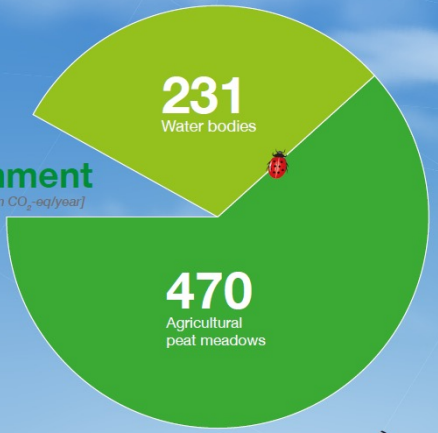
Business operation

Emissions 2017 [kton CO_2-eq/year]



Environment

Emissions 2017 [kton CO_2-eq/year]

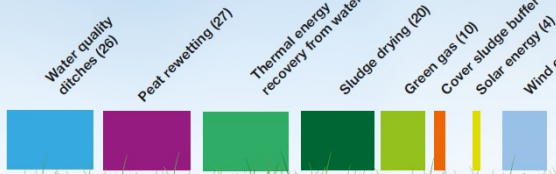


Measures 2019

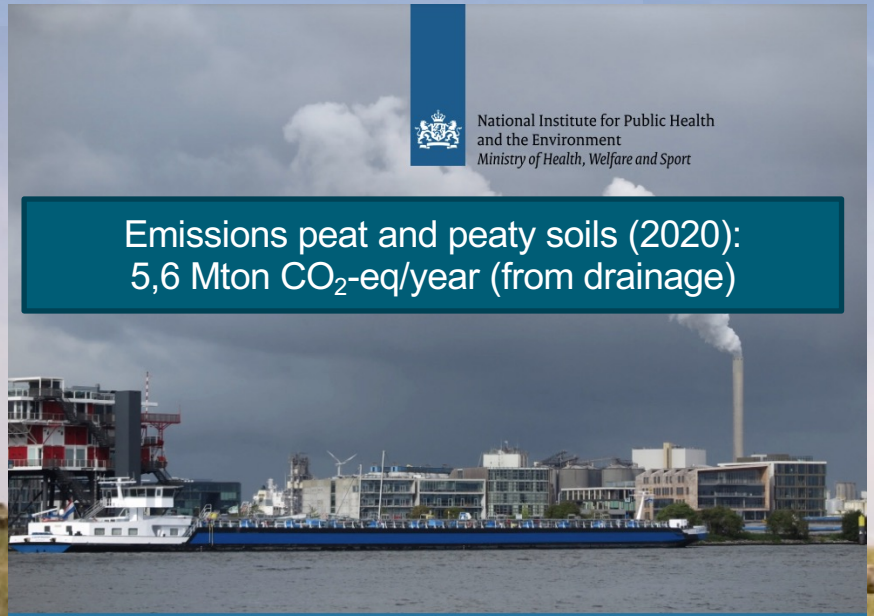
Implemented until 2019 [kton CO_2-eq/year]

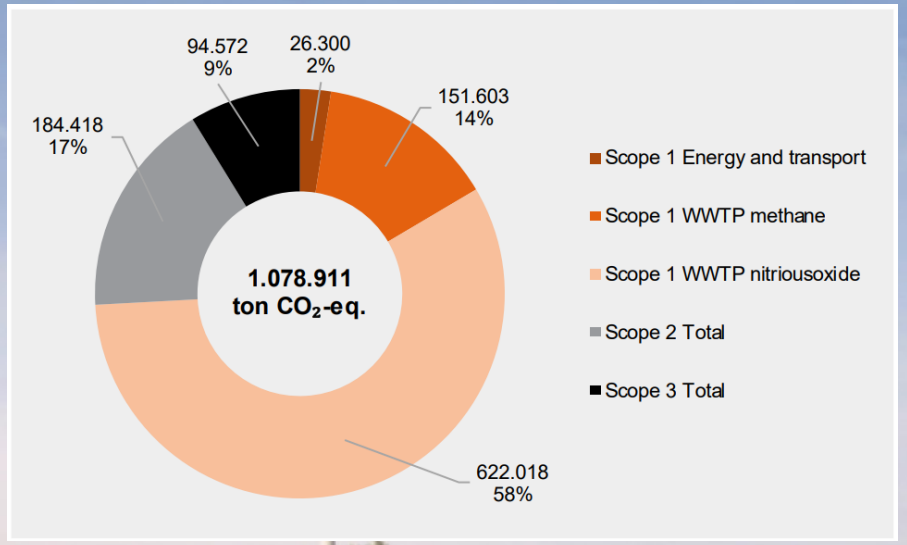
Measures till 2030

Opportunities till 2030: still to do [kton CO_2-eq/year]



Climate impact of Dutch waterboards





GHG emissions surface waters 5% of NL (STOWA): ~9 Mton CO_2-eq/year

The strategic vision 'Towards climate neutrality' was unanimously adopted by all 21 water boards on October 14, 2022. Water boards are aiming for climate neutrality in 2035. In addition, various regulations and policies are currently in preparation, both at the national and European level.

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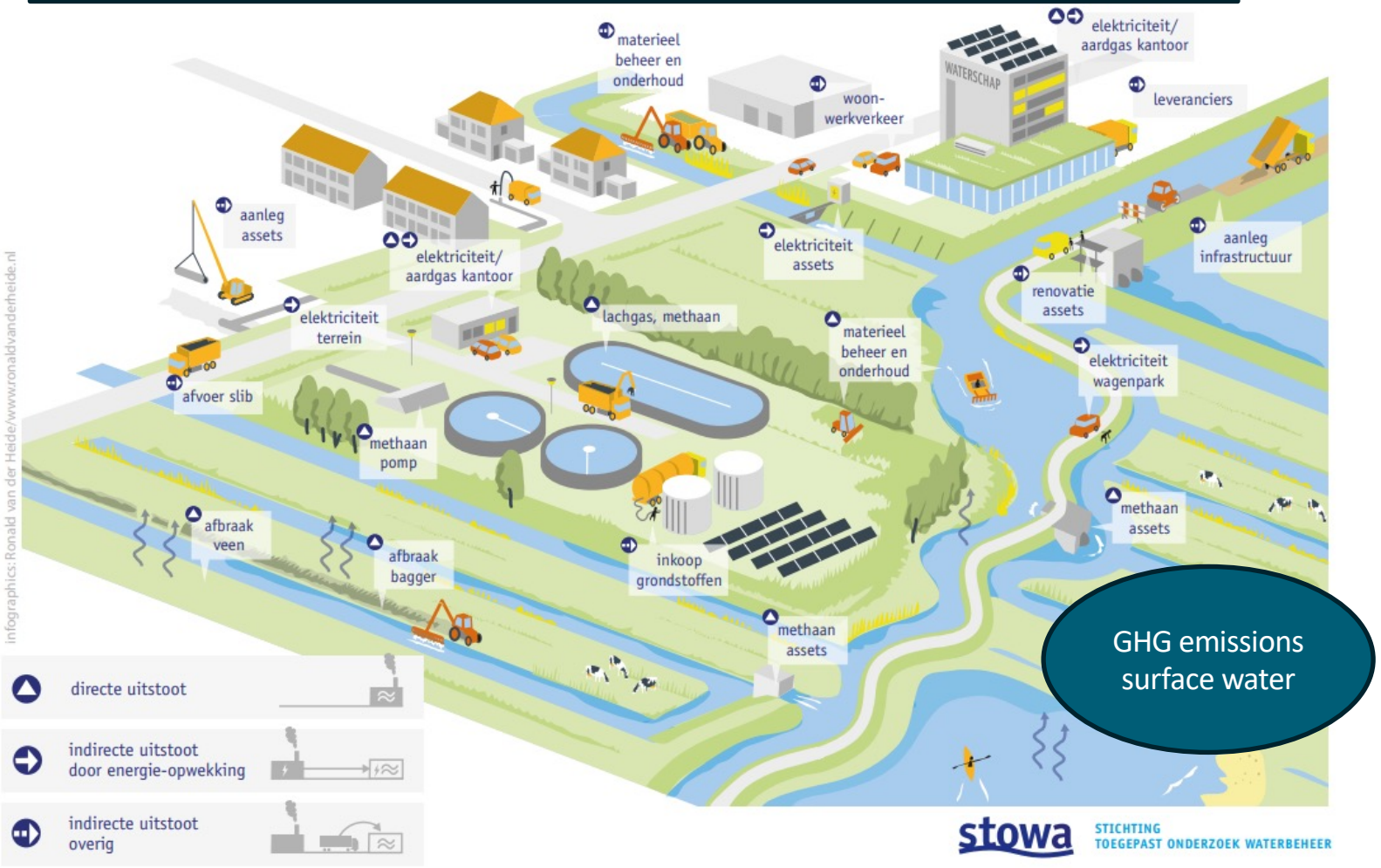


GHG emissions surface water

stowa STICHTING TOEGEPAST ONDERZOEK WATERBEHEER

Carbon cycle in shallow lakes

Effect on Greenhouse gases

CO_2 uptake, CO_2 release

Methane release

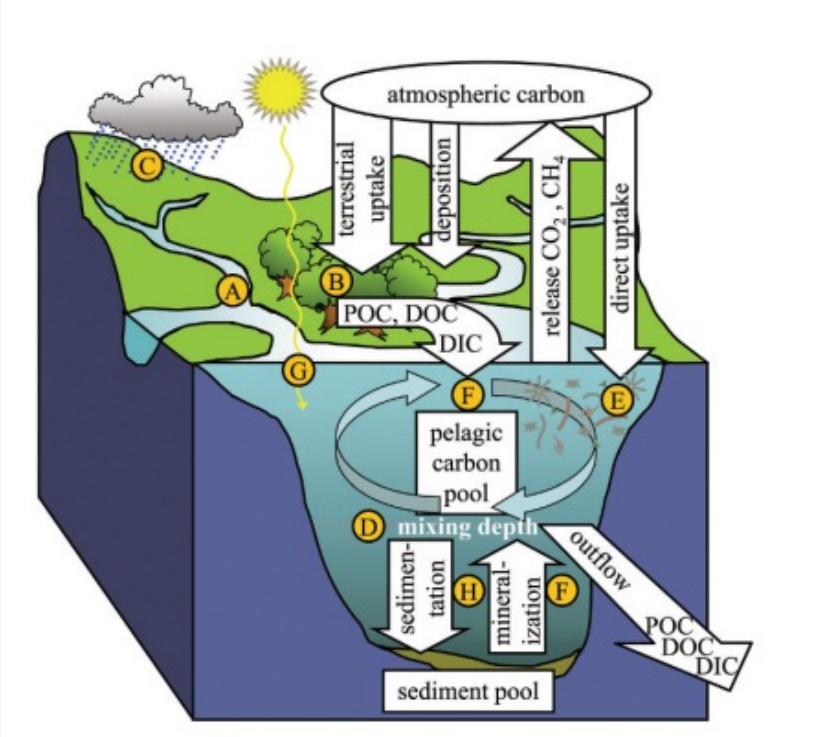
Sedimentation, Mineralization

Relevant gases

CO_2 (how important is it?)

Methane (28x CO_2)

(Nitrous oxide (265x CO_2)

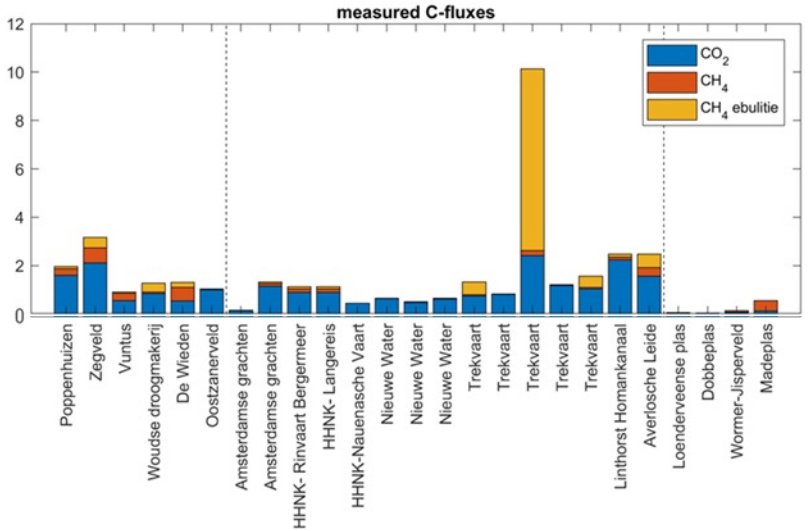


https://aslopubs.onlinelibrary.wiley.com/doi/pdf/10.4319/lo.2009.54.6_part_2.2298

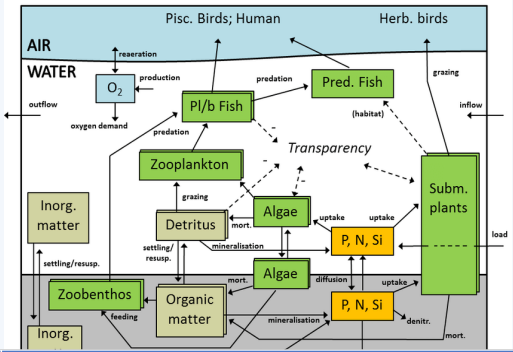
Research approach

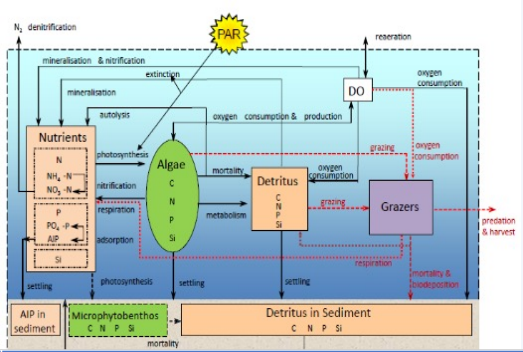
Modelling + measurements

Measurements



PCLake + Delft3D-ECO: GHG-modelling





	PCLake	Delft3D-ECO
Total Organic Carbon (TOC)	Algae, aquatic plants, and detritus (alternative states)	Algea and detritus (no aquatic plants)
Methanogenesis and related processes (CH4)	NO (partial information on carbon fluxes in water and sediment)	YES (full information on carbon fluxes in water and sediment)
Total inorganic Carbon (TIC)	NO (partial carbon balance)	YES (closed carbon mass balance incl chemical equilibrium CO_2 and pH)
Sedimentation and resuspension	YES Sedimentation, resuspension, and bioturbation by fish	NO Only nett sedimentation of algae and detritus, no bioturbation

GHG-model

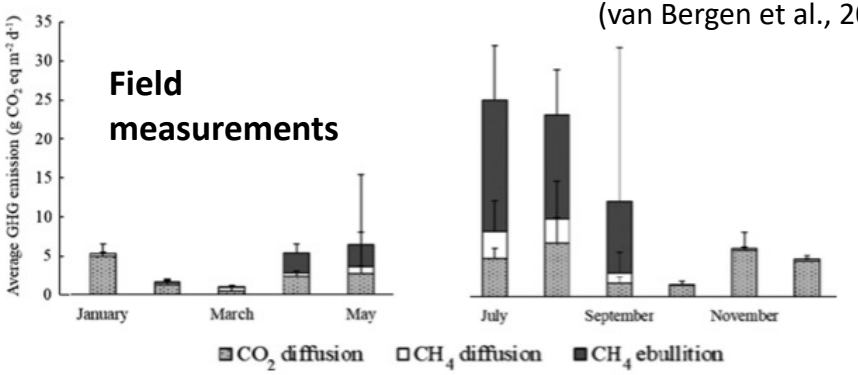
Combine strong points of both models:

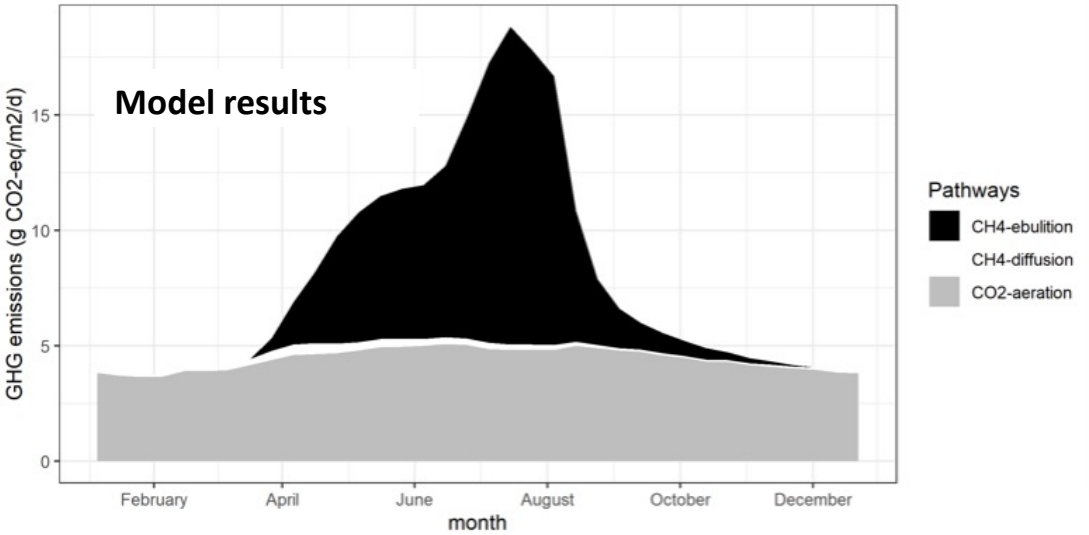
➔ BlueCAN model

Calibration

- Use of published field measurements from a eutrophic pond in temperate climate (Van Bergen et al. 2019)
- Year round data
- Patterns comparable

(van Bergen et al., 2019)





Emission patterns model

Oligotrophic: decomposition~ uptake

→ (low) CO_2 emissions

Mesotrophic: decomposition> uptake

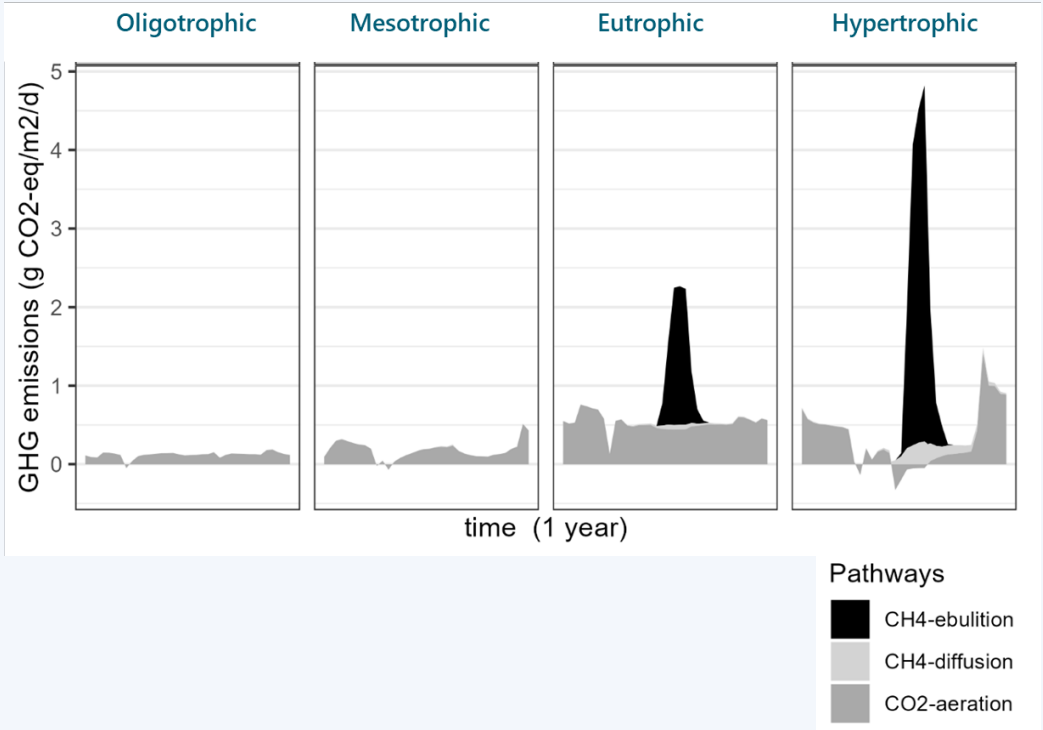
→ CO_2 emissions in winter

Eutrophic: anoxia in sediment

→ CH_4 production

Hypertrophic:

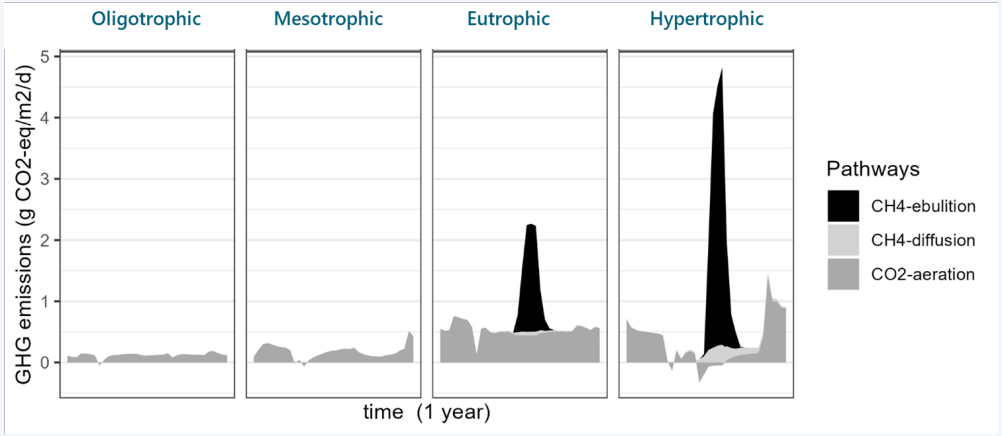
→ CH_4 emissions + CO_2 uptake



Improve water quality to reduce GHG emissions

Link between water quality & GHG emissions →

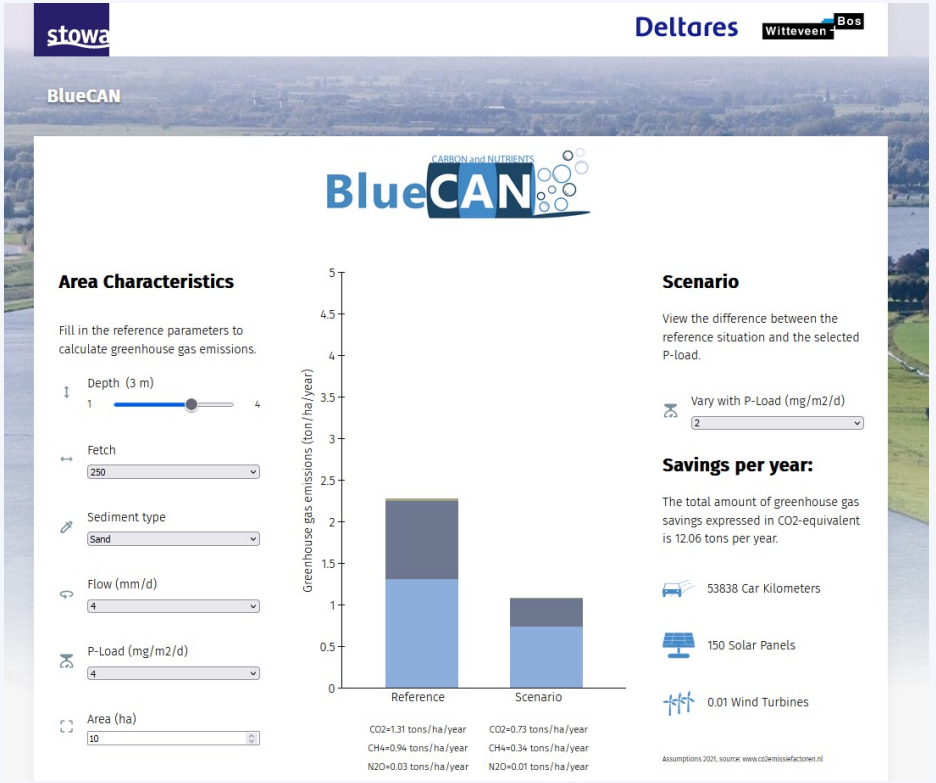
Improvement of water quality can reduce greenhouse gas emissions.



BlueCan metamodel

Model your own system:

https://digitalsolutions.witteveenbos.com/en/quality-of-life/clean-water/bluecan



Concluding remarks

- GHG emissions from surface waters are relevant
- Water quality is a driver for GHG emissions
- BlueCan quantifies GHG emissions