



# Nitrogen in The Netherlands

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Teams, June 12 2020



# Louis Bolk Institute (since 1976)



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Raad  
van State

rtv Oost

Eric Helder  
Persstaatsraad

Het Programma Aanpak Stikstof bevat de basis voor toestemmingen  
voor activiteiten die stikstofuitstoot kunnen veroorzaken.





## What is Natura 2000?

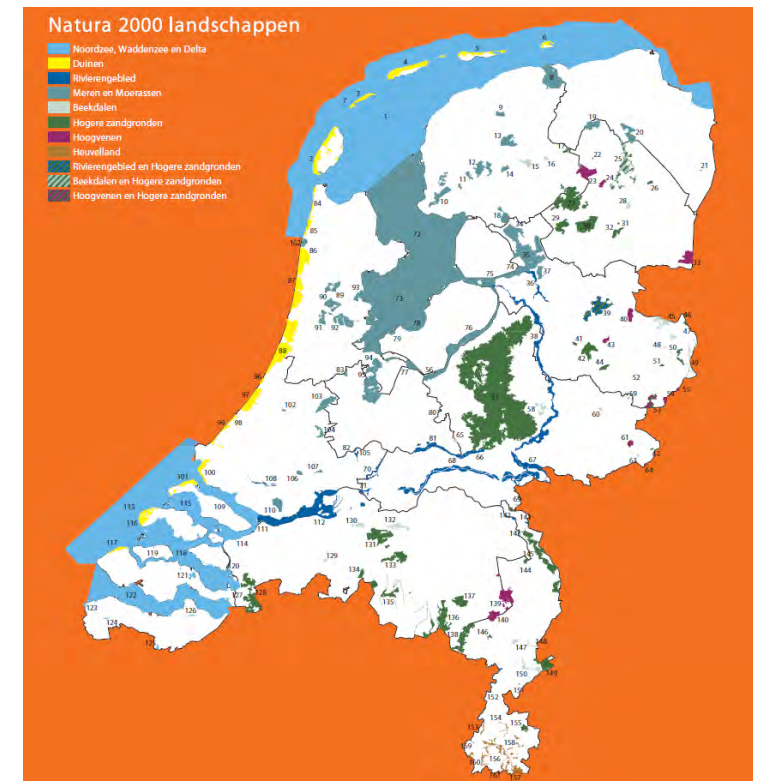
European network of nature areas with for Europe important flora and fauna.

### Aim:

- Prevent further decline in biodiversity
- Sustainable protection of plants, animals and habitats against negative impacts of human activities.

### Legislation:

- European: Bird directive (1979) and Habitat directive (1992)
- Translation into Dutch legislation: Nature Protection Law

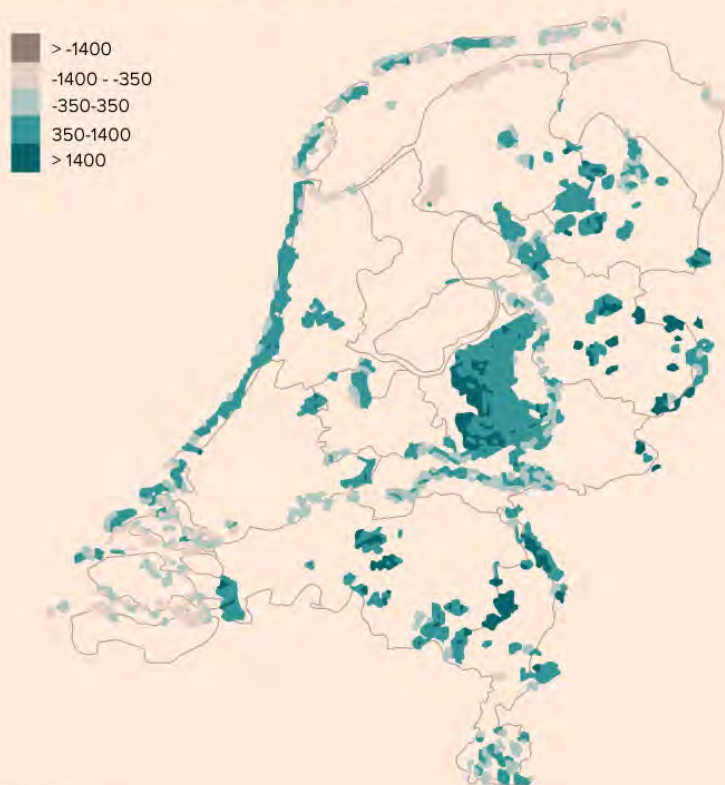


# Nature and nitrogen: not a new problem

## Critical load exceedance

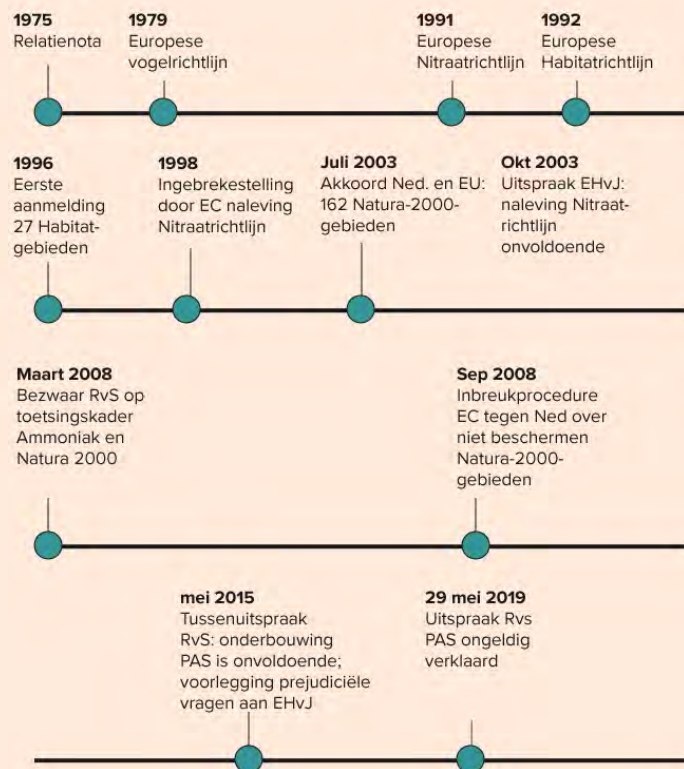
### Overschrijding depositiewaarde stikstof

Natura 2000-gebieden en hun vervuilingsgraad in mol/ha/jaar



## Timeline

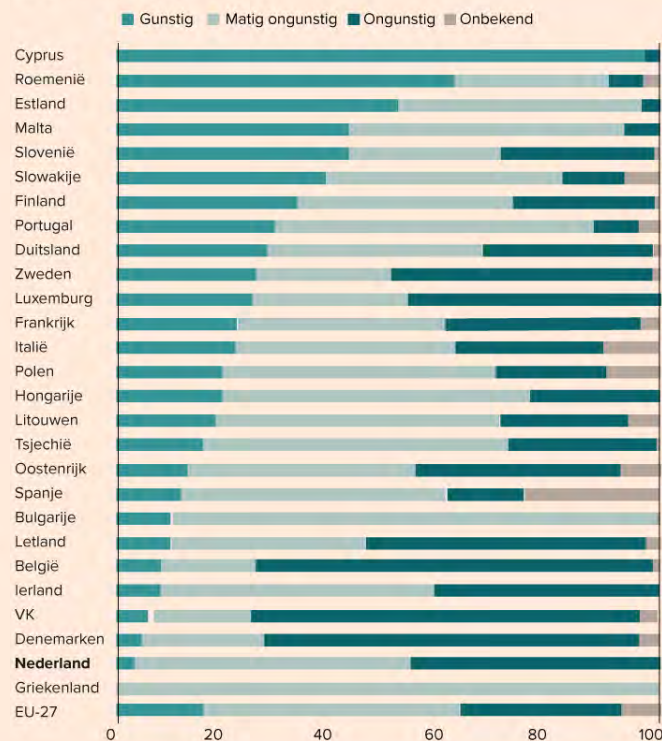
### Tijdslijn



## Nature conservation status

### Staat van instandhouding natuur EU27

In % habitattypen (2007-2012)

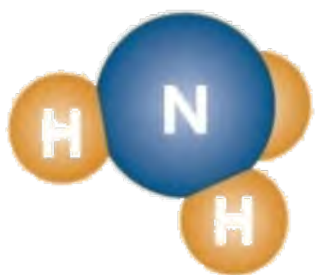


© FD | CM | Bron: Commissie Remkes

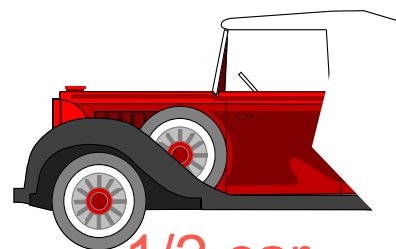
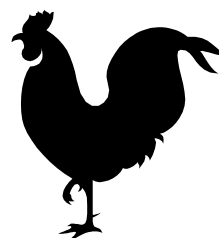
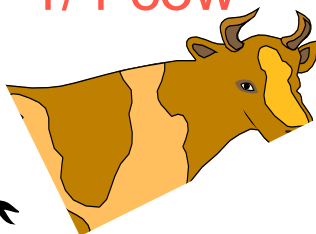
FD, 9 juni 2020

## N in The Netherlands

For each random citizen ...



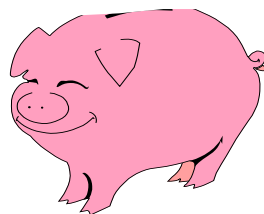
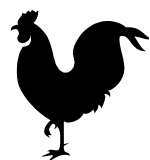
1/4 cow



1/2 car



14 kg fertilizer



1 pig



8 chicken



# Anthropogenic sources of nitrogen



Fossil fuels:  
Nitrogen with oxygen

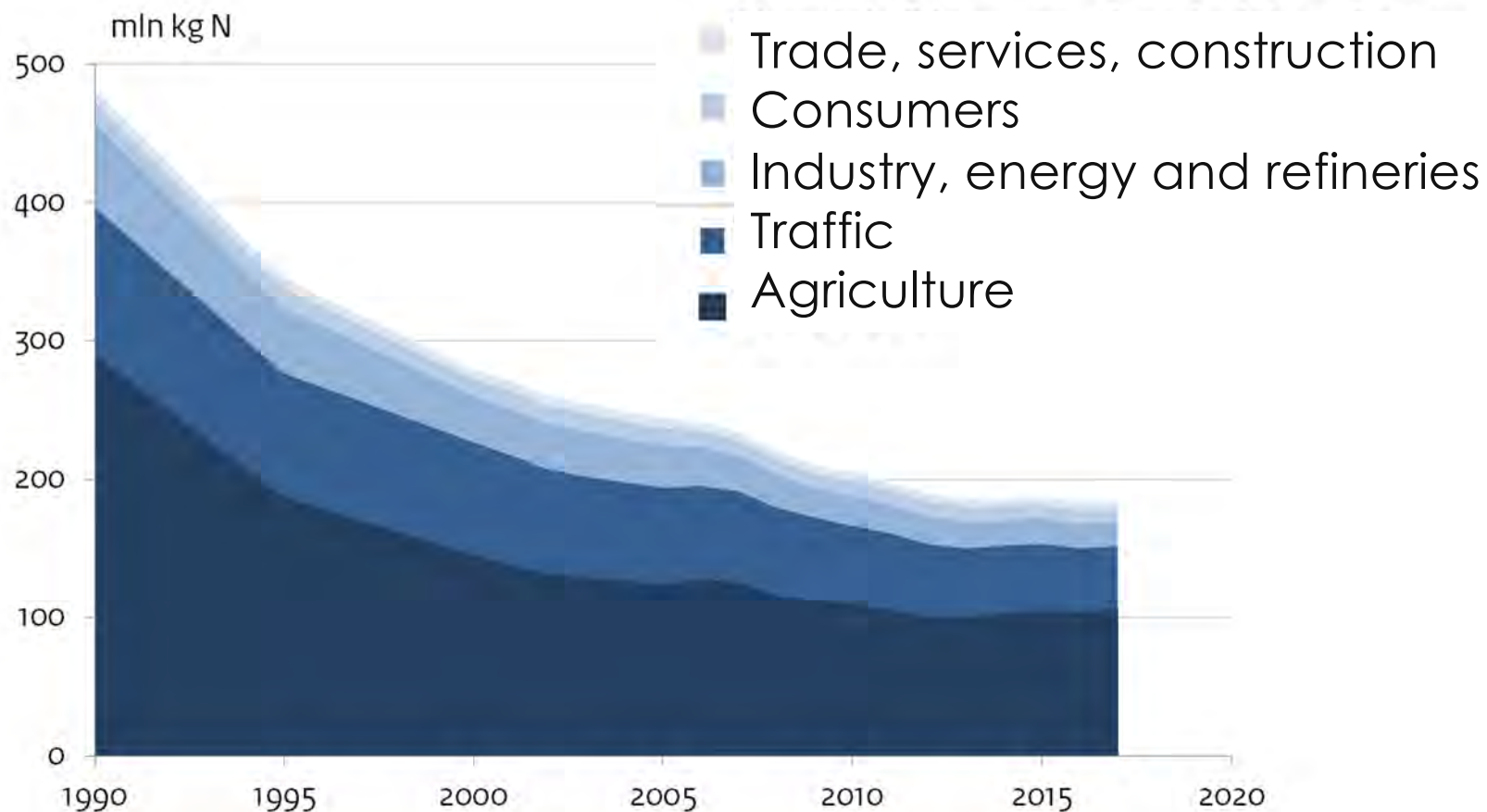


Agriculture:  
Nitrogen with hydrogen





## Emissions of nitrogen compounds per sector



Bron: Emissieregistratie

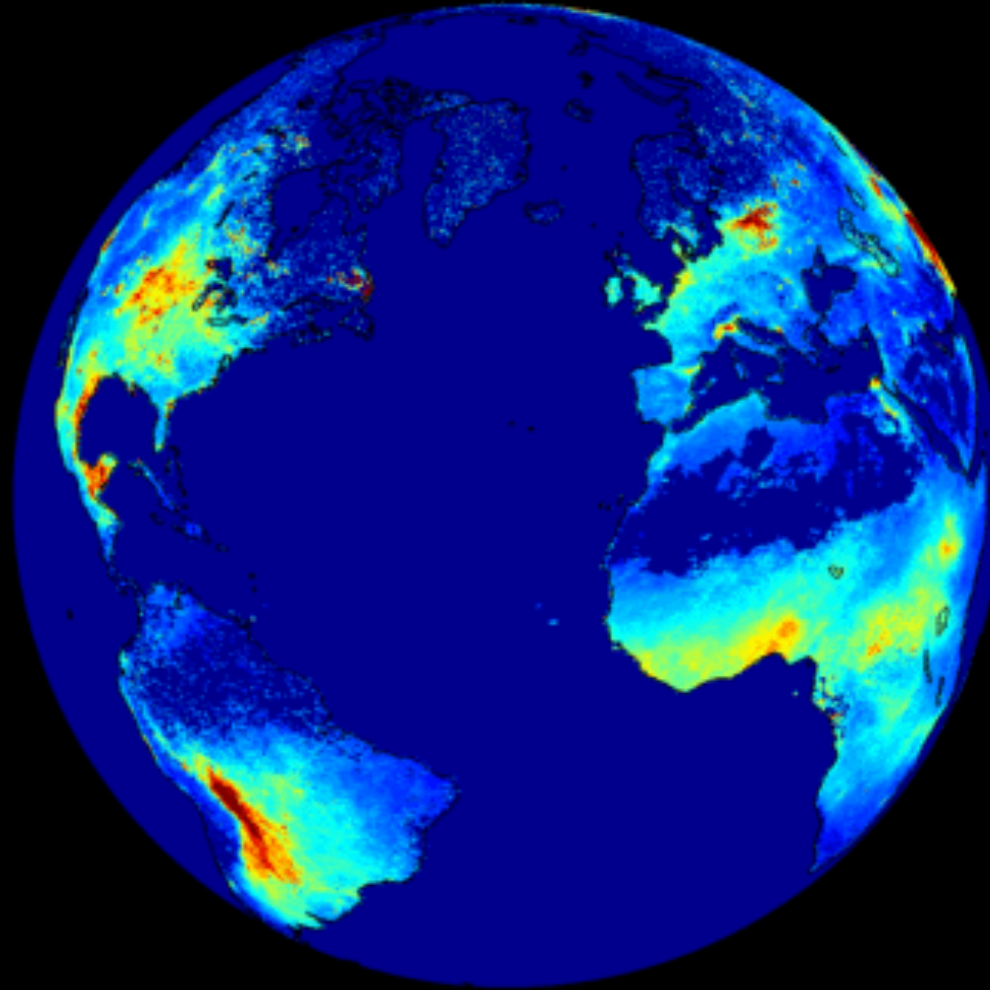
RIVM/okt19  
op basis van [www.clo.nl/nlo18325](http://www.clo.nl/nlo18325)



## Emission, dispersion and deposition of nitrogen compounds



# Ammonia satellite observations

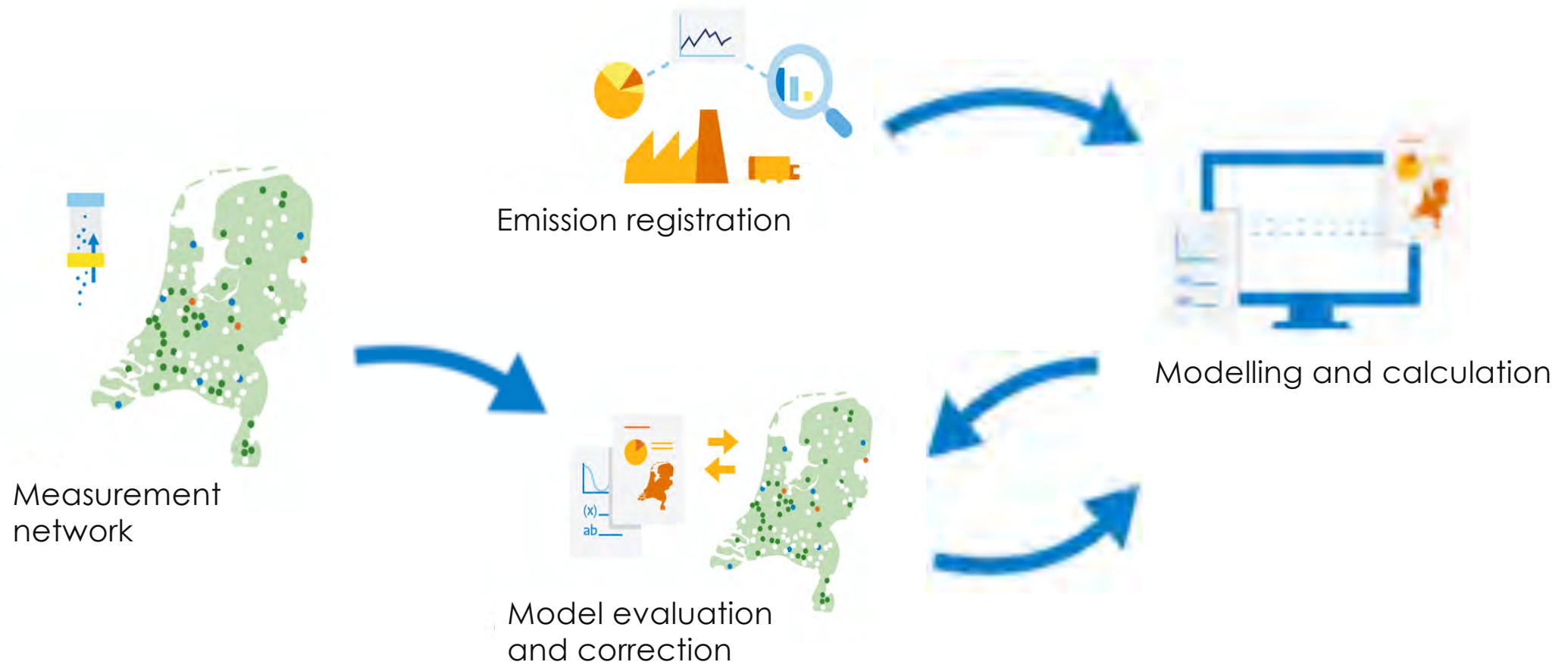


Van Damme et al. 2014  
Dammers et al. 2017

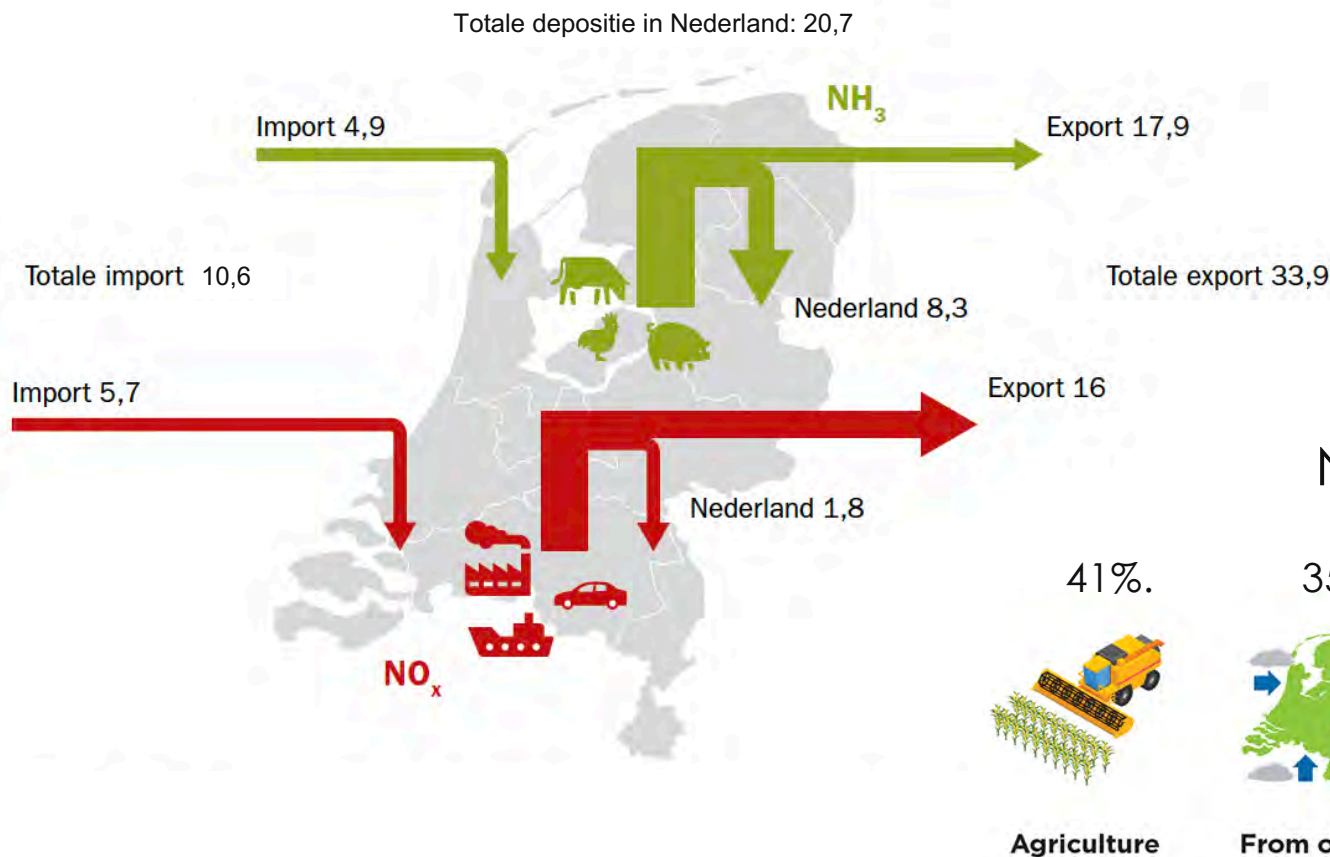
2011  $\text{NH}_3$  distribution



# Measuring and modelling of deposition



# Spatial distribution of nitrogen deposition and source attribution



Klein et al. 2019



## Nitrogen effects: fertilizing nature

### N-poor semi-natural ecosystems



*Biodiversity forest*



*lichens*



*herb-rich grasslands*



*pristine rivers*

### N-rich ecosystems



*Loss of: forest biodiversity*



*lichens*



*monoculture grasslands*



*fish dieback*

## Too much Nitrogen: In a Cascade



Air quality



Ecosystems



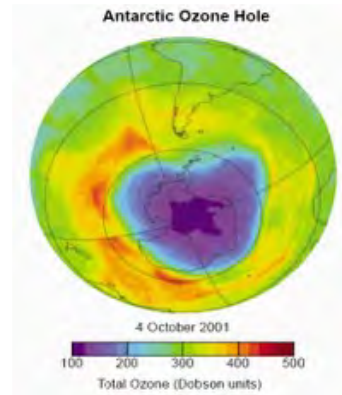
Acidification



Eutrophication



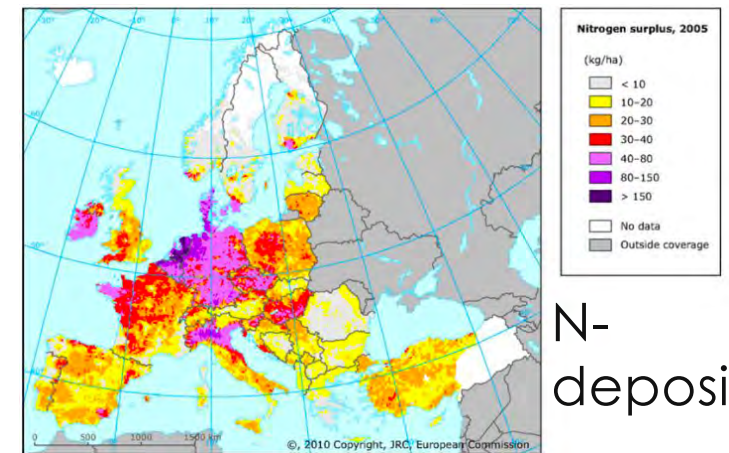
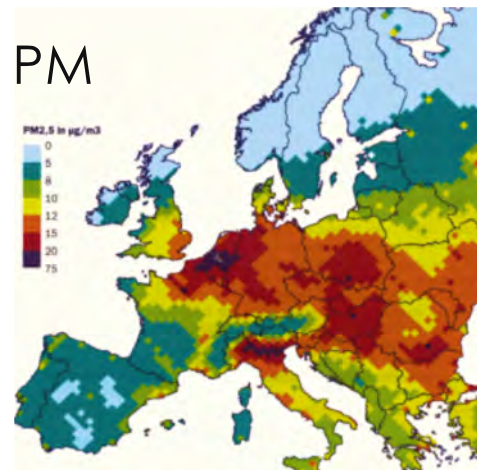
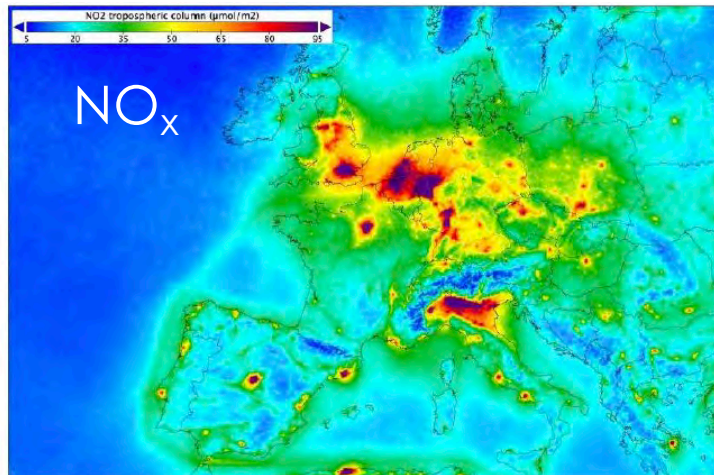
Global Warming



Ozone Hole

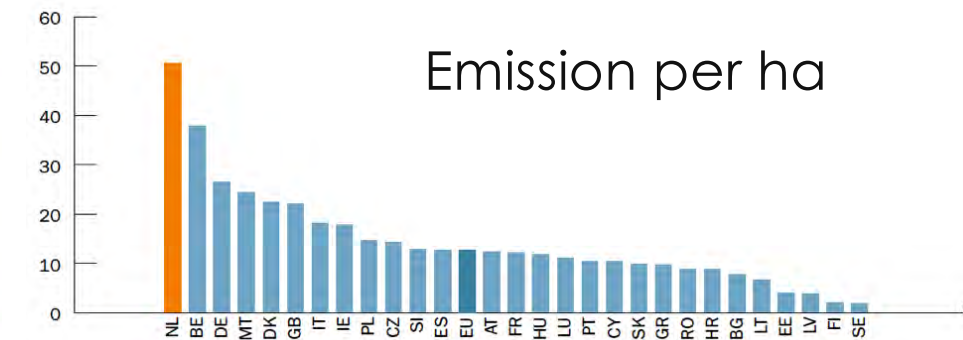
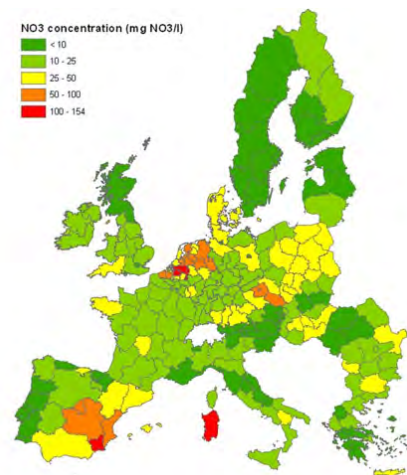
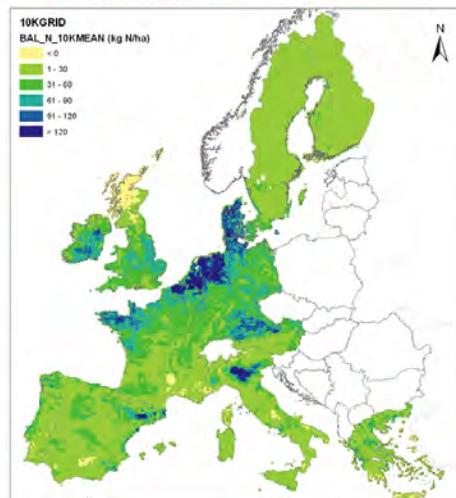


# Netherlands the nitrogen 'Hot spot' of Europe



N-deposition

N surplus  
in kg/ha



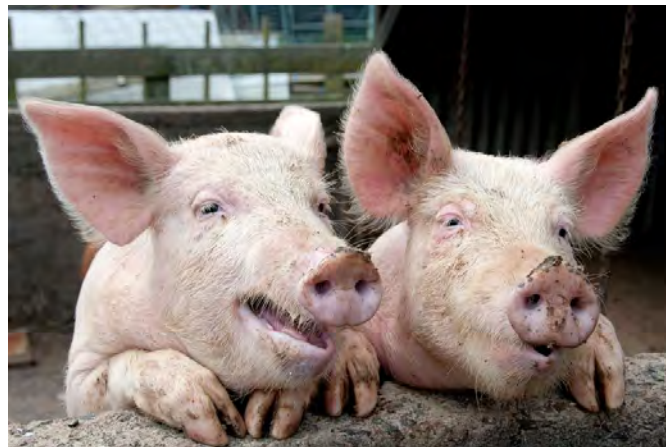
NO<sub>3</sub> groundwater

## The current nitrogen policies





## Short term measures (Spoedwet)



=



- 30%



## Draft Bill by the government: structural approach

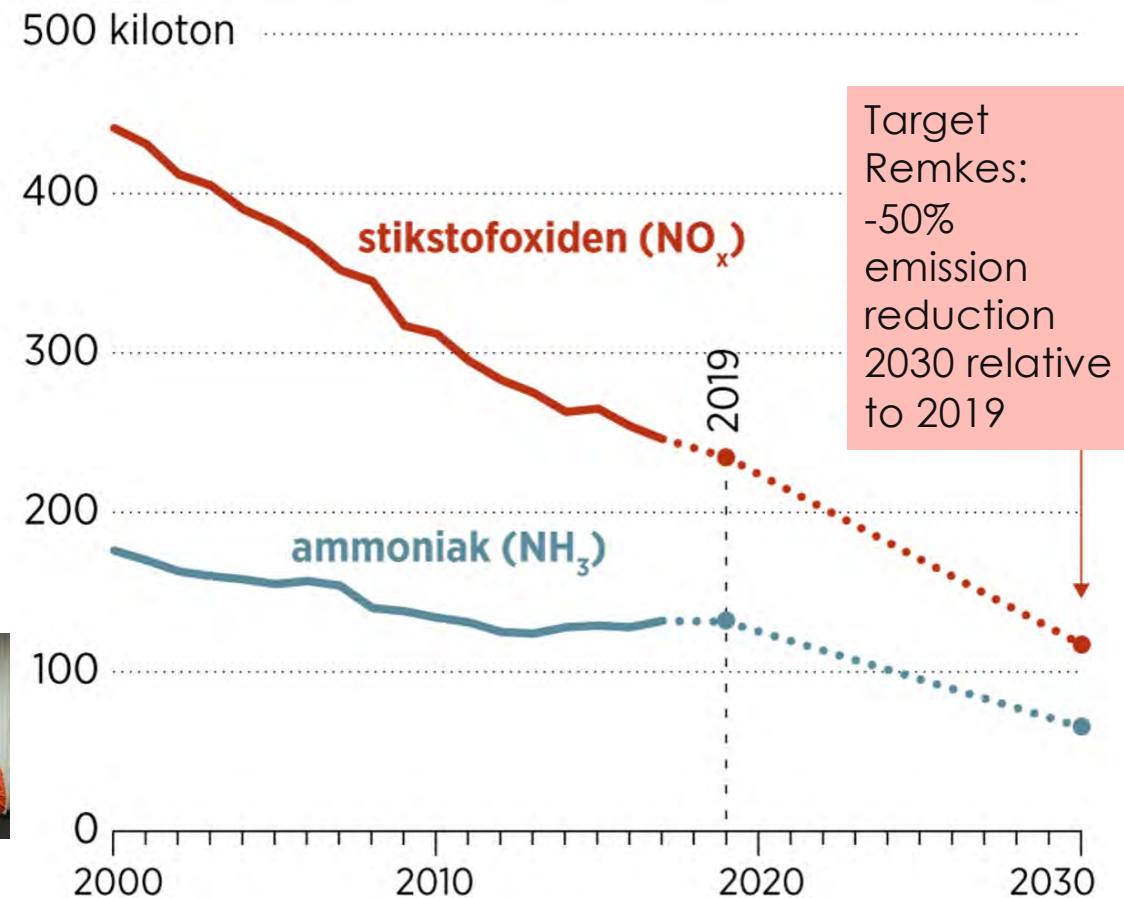
- Target value 2030: 50% surface area N2000 protected
- 3 billion € for nature restoration



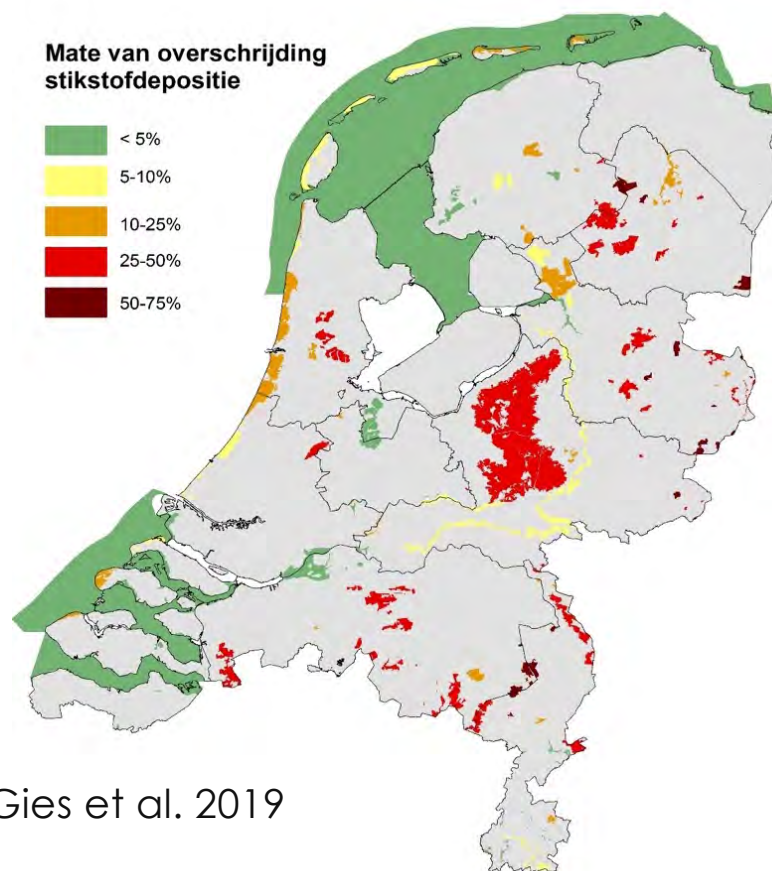
- All sectors reduce emission: net -26%
- 0,5 billion € for buy-out pig breeders
- 1 billion € voluntary buy-out dairy farmers
- Reduction of N in feed
- Emission poor housing systems

## Proposal Commission Remkes *Not everything is possible everywhere*

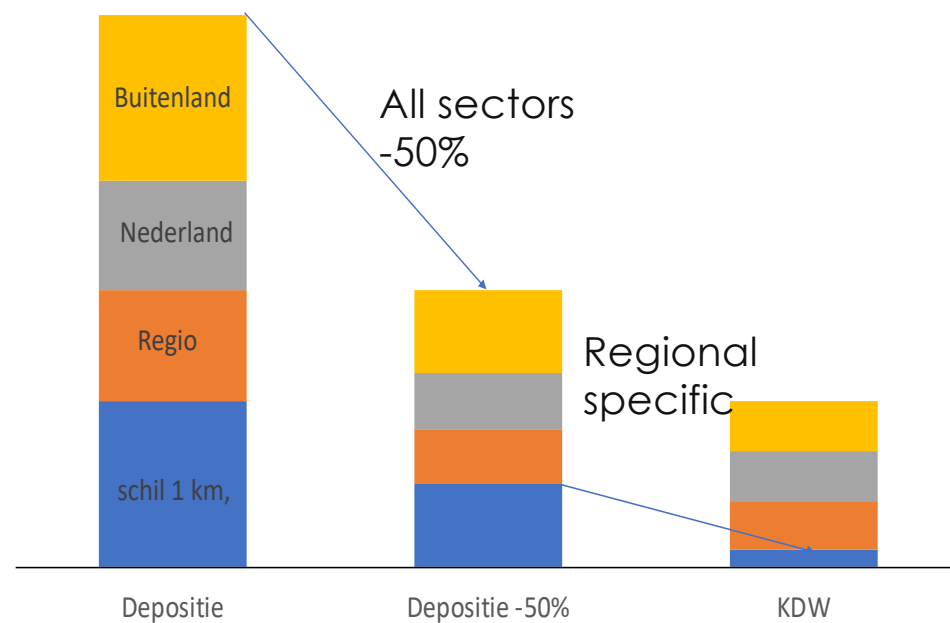
- Nature central: recovery measures and nitrogen reduction
- -50% emission reduction in 2030:
  - NO<sub>x</sub>: generic reduction different sectors
  - NH<sub>3</sub>: region specific
- Result obligation
- In 2030 74% of the Natura 2000 areas protected (nitrogen)
- In 2040 deposition below the critical load everywhere
- 2050 recovery of habitats



# Exceedance of critical loads of Natura 2000 areas and approach



Gies et al. 2019





## Long term NOx: climate and clean air agreements: technological solutions

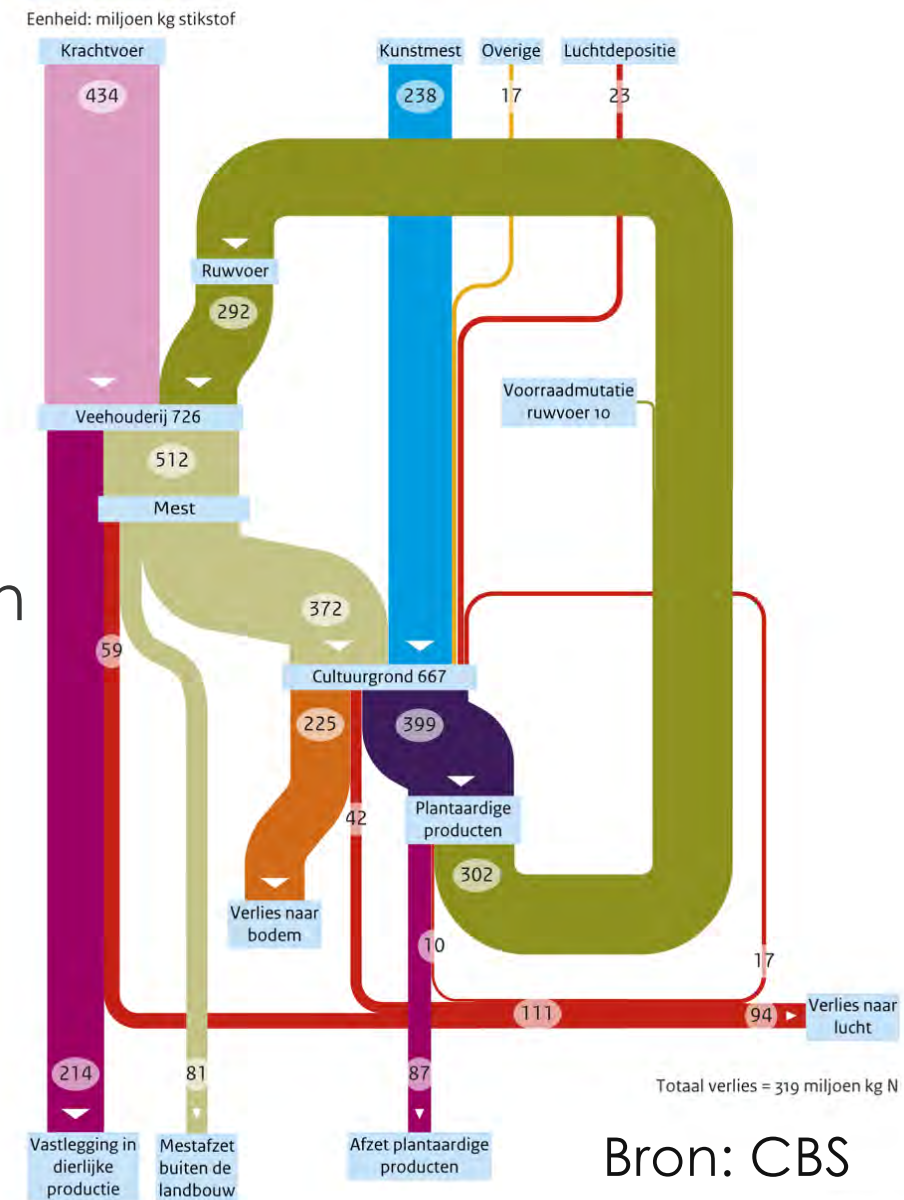


### DOEL SCHONE LUCHT AKKOORD

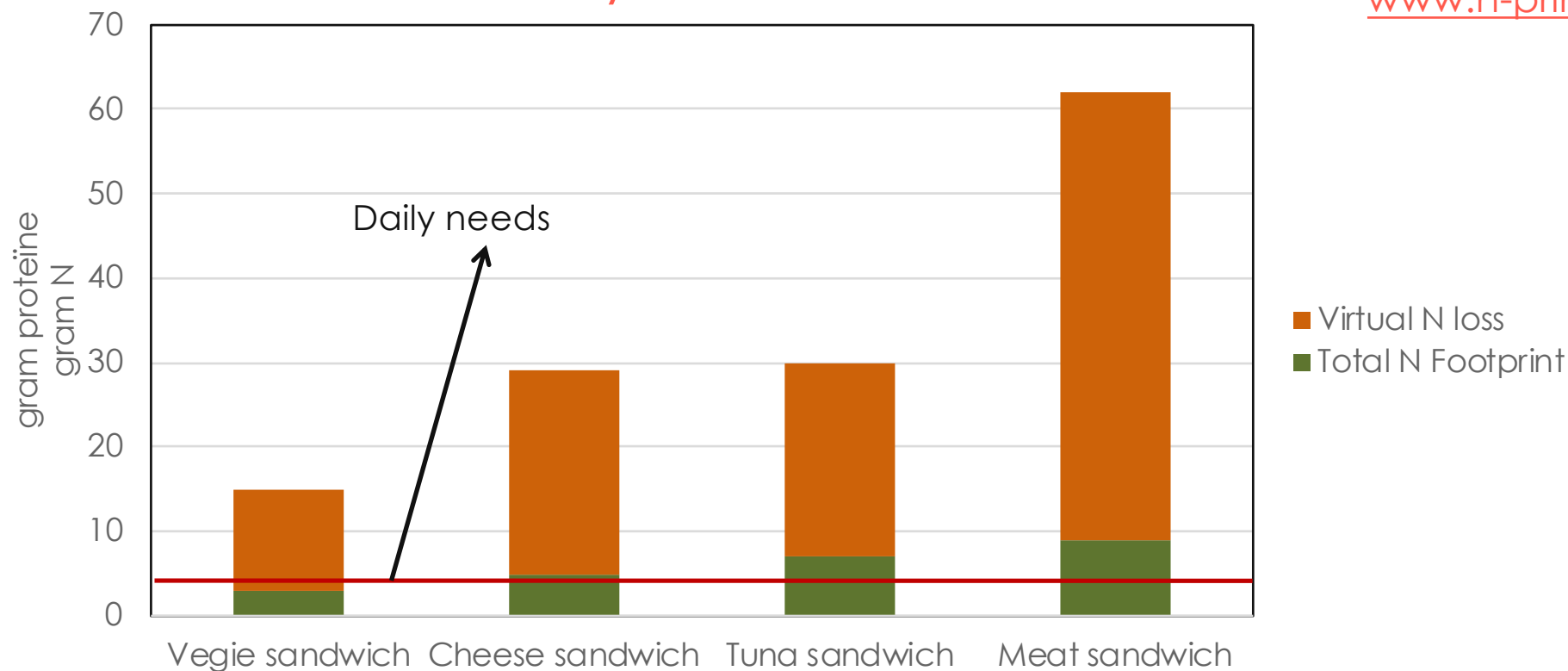


# N in Dutch agriculture

- Nutrients in balance
- Modernise manure policy
- Customized spatial policies
- Reduction in local nitrogen deposition
- Better monitoring



## What did you have for lunch?





Thank you for your attention



Erismann et al. 2015

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