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WORK SHOP 2022 MADRID

Managing ammonia and nitrate in the Netherlands under EU policies

repercussions for agriculture and livestock

Hans van Grinsven

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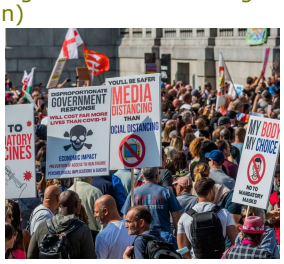
Trust of farmers in science and government declining (but not for average Dutchman)



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December 2021; new cabinet – high ambitions

- Climate: In 2030 at least **55%** emission reduction GHG
  - Ref 1990; 2020 -**25%**; cumulative budget 2035 is **35 billion €**
- Nature: In 2030 is (in Europa) **70%** species and habitats in a good status
  - Currently Netherlands **10%**
- Nitrogen: In 2030 the N deposition load in **74%** of area with N sensitive nature is below Critical N load
  - Currently **25%**; cumululative budget up to 2035 **25 billion €**
- pm: WFD: In 2027 in **100%** waters good ecological status
  - Currently N and P≈**50%** (+5% in 2027), biology **15%**

All national targets derive from EU policies

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The Dutch nitrogen 'crisis'

- EU Birds and Habitats directive (BHD); Nitrogen deposition important cause of deterioration of specific types of nature
- May 29, 2019; Dutch Council of State declared the *argumentation* to *permit* nitrogen emissions in conflict with EU Habitats Directive
- So called 'PAS'-policy for nitrogen and nature became useless
- Permitting new emitting nitrogen activities became very difficult
  - Including projects to solve the eminent Dutch housing crisis (>300,000 houses), while these project contribute less than 1% to the national emissions
  - Dutch agriculture contributes 40% to N deposition: Puts farmers against citizens

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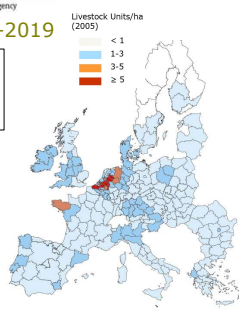
Structure Dutch agriculture 2016-2019

1.8 million hectare	
54%	grassland
11%	silage maize
28%	arable
7%	horticulture

54000 Holdings	
50%	Dairy and grazing
20%	Arable
16%	Horticulture
14%	Intensive livestock

Livestock million	
4.0	cattle
1.4	dairy cows
12.5	pigs
100	chicken
1.5	goats & sheep



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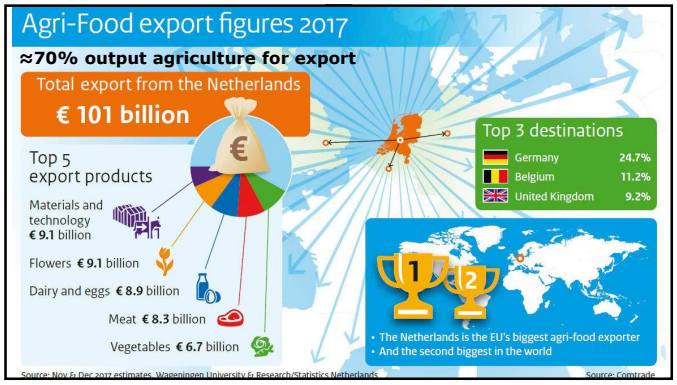
Agri-Food export figures 2017
≈70% output agriculture for export
Total export from the Netherlands
€ 101 billion
Top 5 export products
Materials and technology € 9.1 billion
Flowers € 9.1 billion
Dairy and eggs € 8.9 billion
Meat € 8.3 billion
Vegetables € 6.7 billion
Top 3 destinations
Germany 24.7%
Belgium 11.2%
United Kingdom 9.2%
1
2
• The Netherlands is the EU's biggest agri-food exporter
• And the second biggest in the world
Source: Nov & Dec 2017 estimates, Wageningen University & Research/Statistics Netherlands
Source: Comtrade

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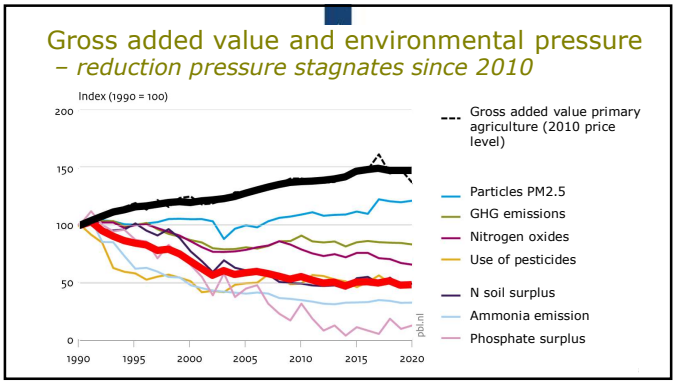
Gross added value and environmental pressure
– reduction pressure stagnates since 2010
Index (1990 = 100)
200
150
100
50
0
1990
1995
2000
2005
2010
2015
2020
pbl.nl
Gross added value primary agriculture (2010 price level)
Particles PM2.5
GHG emissions
Nitrogen oxides
Use of pesticides
N soil surplus
Ammonia emission
Phosphate surplus

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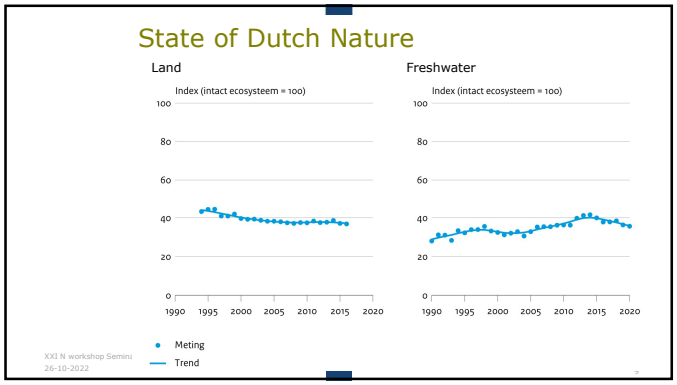
State of Dutch Nature
Land
Freshwater
Index (intact ecosysteem = 100)
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Meting
Trend
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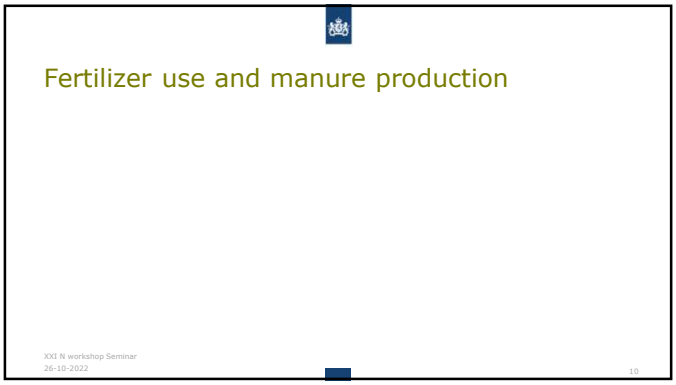
Fertilizer use and manure production
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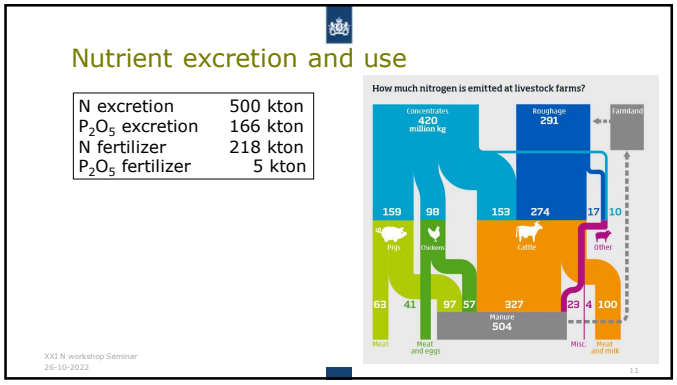
Nutrient excretion and use
N excretion 500 kton
P2O5 excretion 166 kton
N fertilizer 218 kton
P2O5 fertilizer 5 kton
How much nitrogen is emitted at livestock farms?
Concentrates 420 million kg
Roughage 291
Farmland
159
98
153
274
17
10
Pigs
Chickens
Cattle
Other
63
41
97
57
327
23
4
100
Manure 504
Meat
Meat and eggs
Misc.
Meat and milk
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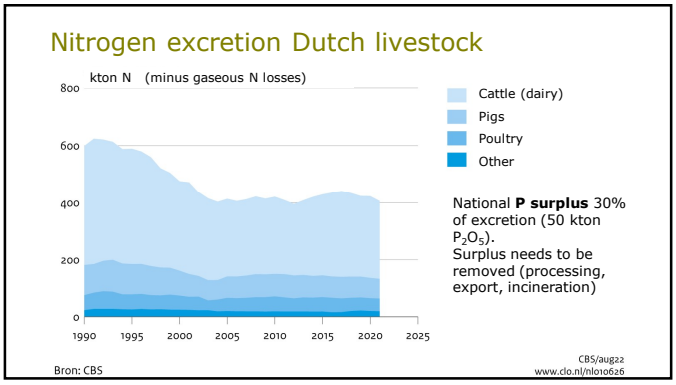
Nitrogen excretion Dutch livestock
kton N (minus gaseous N losses)
800
600
400
200
0
1990
1995
2000
2005
2010
2015
2020
2025
Cattle (dairy)
Pigs
Poultry
Other
National P surplus 30% of excretion (50 kton P2O5).
Surplus needs to be removed (processing, export, incineration)
Bron: CBS
CBS/aug22
www.clo.nl/nlo10626

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Ammonia emission and N deposition

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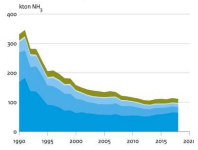
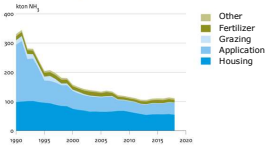
Ammonia emission

Emission ammonia – by livestock type



≈fifty-fifty from Dairy-meat

Emission ammonia – by process



≈fifty-fifty from Housing-application

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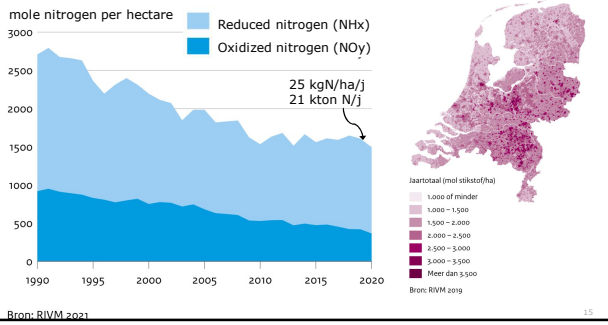
Nitrogen deposition



Bron: RIVM 2021

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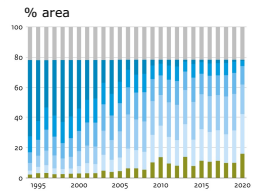
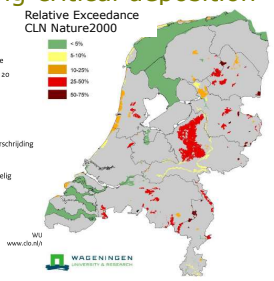
Area land nature exceeding critical deposition



Bron: RIVM, provincies; bewerking WUR



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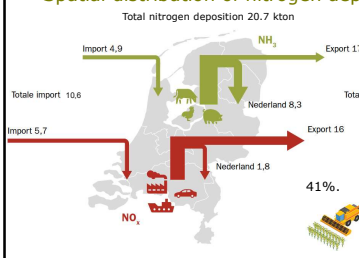
Spatial distribution of nitrogen deposition and source attribution



Sector contribution to N deposition on Natura 2000 areas, RIVM

Klein et al. 2019

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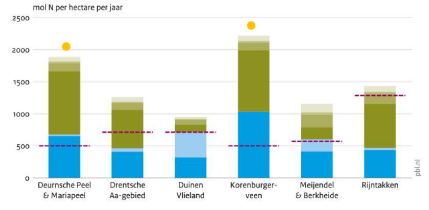
At 100% reduction of Dutch emission sources still exceedance of Critical N loads in Natura2000 areas

- areas where exceedance persists even after 100% reduction of Dutch (■) emission sources



Dutch Emission sources
- Other
- Industry
- Traffic
- Agriculture

Other sources
- Shipping
- International

- Critical Nload

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Policy response to N Crisis – 3 stages

1. November 2019 Emergency Act Nitrogen (Budget >2 billion €)
   - Reduction speed limit 100 km/hr, feed, buy out livestock quota
2. April 2020 Structural approach Nitrogen (Budget 6 billion €)
   - 3 billion € Nature restoration
   - 2 billion € Nitrogen emission reduction from agriculture, traffic and industry
   - 1 billion € construction sector
   - › July 1, 2021, parliament passed Act and Program for Nitrogen reduction and Nature restoration
     - Legal obligation to bring 74% of area with N sensitive nature below Critical N load in 2035 (50% in 2030)
3. December 2021, cabinet Rutte IV, coalition agreement (2021-2024)
   - Budget 25 billion € (up to 2035); 74% target advanced to 2030

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Allocation budget 25 billion €, reserved in coalition agreement of December 2021

	billion €
– Voluntary buy-out of farmers	7.4
– Depreciation of land	6.9
– Technology & innovation	2.7
– Nature based agriculture	2.5
– Nature area & recovery	2.3
– Implementation	2.1

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Modelled effects of options to solve N crisis

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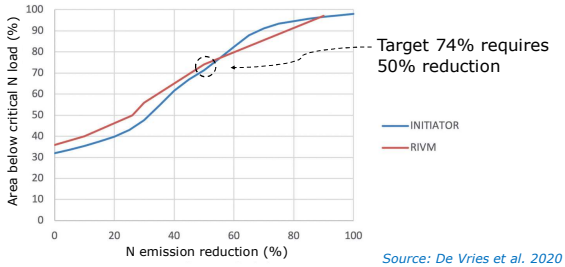
Effect emission reduction – exceedance CL



Source: De Vries et al. 2020

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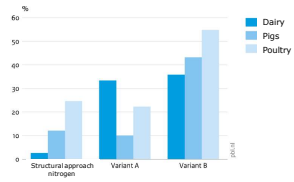
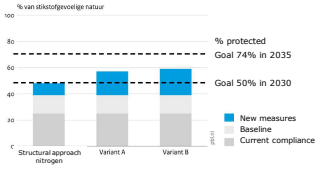
Target 74% area below critical N load not achieved when livestock is halved

Reduction of livestock number relative to Ref2030



% N sensitive nature araes below critical N loads in 2030



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1st order socio-economic effects 30% cut livestock

	Loss in added value in full chain (billion €/y)	Loss in jobs in full chain (x 1000)
Dairy sector	2.5	48
Pig sector	1	16
Poultry sector	0.5	7.5

Source: Co Daatselaar, Wageningen Economic Research

WAGENINGEN UNIVERSITY & RESEARCH

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Achievability 50% recduction

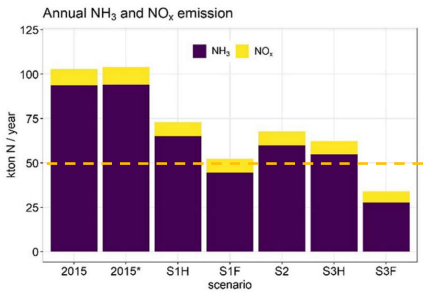
S1H: Emission reduction technology, 50 % implementation

S1F: full implementation

S2: 50 % livestock reduction

S3H: S2 + S1H

S3F: S1 + S1F



Source: De Vries et al. 2022

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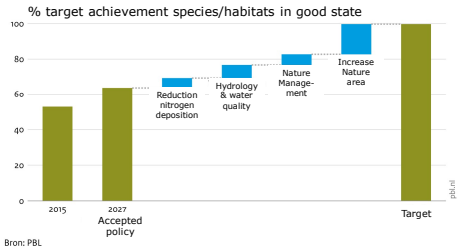
Full achievement 74% target goes beyond nitrogen



Bron: PBL

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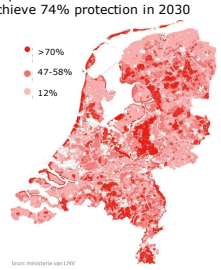
The map that ignited the farmers protest

Exceedance CLs Natura 2000 in 2017

Required emission reduction to achieve 74% protection in 2030



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Advice "Remkes" to cabinet October 5, 2022

- Restoration of constructive dialogue between cabinet and farmers
- Acknowledged that government made huge mistakes
- Remove peak N emitting activities away from sensitive ecosystems (500-600 farms in one year)
- Extensify agriculture in "leaky" soil-water systems
- Financial compensations and future perspectives within EU rules
- In 2025 and 2028 reality checks on achievability of 74% protection target in 2035 (40% in 2025, 50% in 2030)

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N surplus, nitrate leaching and water quality The next crisis?

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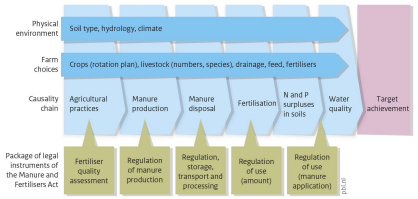
Dutch Manure & Fertilizer Act targeting improvement of water quality

Intervention points in the Dutch Manure and Fertilisers Act in relation to agricultural activities and water quality



National approach:

- EU Nitrate Directive
- EU Water Framework Directive

Protecting quality of soil, groundwater and surface water

Source: PBL

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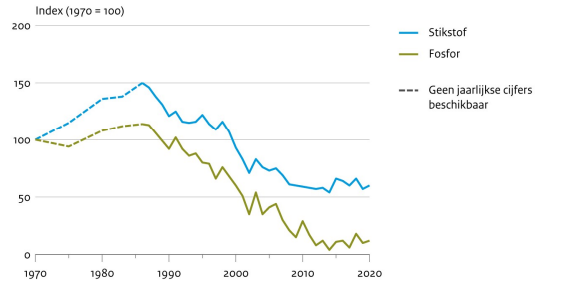
Nitrogen and phosphorus soil balance



Bron: CBS

CBS/mrt22
www.clo.nl/nl009621

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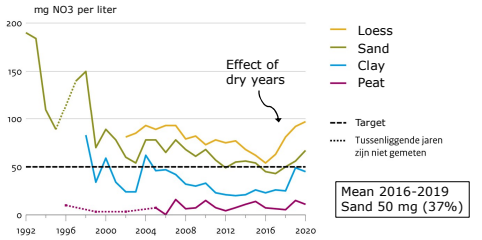
Nitrate concentration leaching from farms



Bron: RIVM, Landelijk Meetnet effecten Mestbeleid (LMM)

RIVM/mrt22
www.clo.nl/nl027113

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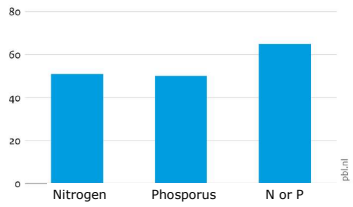
Share regional water bodies meeting nutrient standards (2016-2018)



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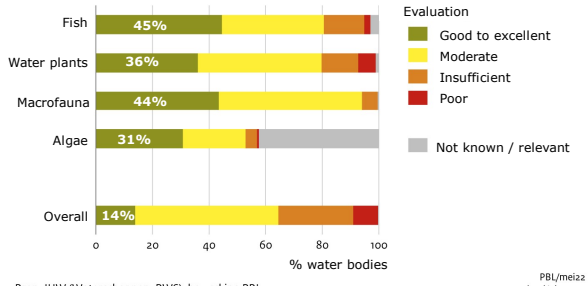
Evaluation biological water quality 2021 for WFD



Bron: IHW (Waterschappen, RWS); bewerking PBL

PBL/mei22
www.clo.nl/nl142105

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Nitrogen Application standards and derogation

- Total Effective Nitrogen (crop-soil dependent ≈600)
- Manure N
  - Default 170 kgN/ha
  - Derogation since 2006; 230 - 250 kgN/ha (farms with >80% grassland)
  - Derogation applies to 0.67 million ha (additional 50 kton manure N)
- September 2022, EC draft decision to end derogation in 2026
  - Insufficient improved water quality: derogation was temporary
  - Another setback for livestock famers

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Consequences of derogation decision

- Default 170 kgN/ha;For polluted areas (sand, loess; to be defined) **20% cut of application standard manure N** to 136 kgN/ha
- Fertilizer-manure free **bufferzones** of 3 m along waters (max 4%)
- **Reduction of excretion ceiling** by 22% relative tot 2002 ceiling; additional required reduction almost 10%
- Four years to implement, and with financial compensation
- Overal effect: reduction legal manure application space by 10-15%
- Will reduce the total N input and N surplus grassland substantially
- Risk increased manure surpluses, disposal cost, synthetic N?

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Final observations and conclusions

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Conclusions

- After **>10 years of lack of progress** to protect and restore terrestrial and aquatic ecosystems **EU and courts intervene** in environmental regulation for Dutch agriculture
- **System change** needed; with **unprecedented budget** and set of ambitious instruments that should be effective within 5-8-13 years
- Restoration of ecosystems requires a **joint up approach beyond N** (hydrology, management, CC) which is far from operational
- **Align interventions** for livestock reduction, LU changes and end of derogation (to avoid manure surplus and increase of synthetic N use)
- **Full achievement** of N deposition and water quality targets is out **of reach**; need better understanding effect of extent of exceedance?
- And what if polluting activities move abroad? need for **joint up** - internatiional **transboundary approach**

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Risks of policies for N and nature

- Delayed implementation
  - Buy out schemes for "peak polluters"; unwilling when business is good like now
  - Continued stagnation of permits for housing, infrastructure
  - Costly lock-ins, stranded assets
- Effect of low emission technology over-estimated, energy intensive
- Generic approach; Insufficient restoration of most threatened nature areas
- Differentiated approach; (regions, farms); Complexity, more delays
- Promised financial compensation may clash with EU rules for competition and national subsidies

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EU directives and derived national policies

- Nitrate Directive, Water Framework, NEC, Birds and Habitat
- Distinguish Goals, Objectives and Instruments
- EU goals are formulated in general terms (protection of human health, ecosystems, habitats ..; prevent detoriation)
- National objectives and instruments are more specific
- EU verdicts based on proof of action plans (measures 🇳🇱😊) AND proof of effects (positive trends 🇳🇱😐) rather than achievement of specific targets
- Infringement starts after prolonged lack of progress

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Transition: other dietary choices and relocation…..

- Potential of farm measures and technology insufficient
- Less overconsumption of energy and protein and shift from animal- to plant-based proteins

Global Food Security

Halving nitrogen waste in the European Union food systems requires both dietary shifts and farm level actions

- Rethink concept of national comparative advantages (soil, climate, infrastructure)
- Mitigate and relocate N polluting activities to less N sensitive areas
- Bring pigs to the cereals instead of cereals to the pigs

ORIGINAL ARTICLE

Reducing external costs of nitrogen pollution by relocation of pig production between regions in the European Union

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Thank you

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