


Non-technical abatement measures for agricultural emissions

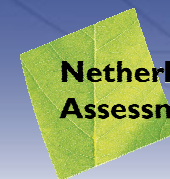
Corjan Brink
based on work by various colleagues



Netherlands Environmental
Assessment Agency

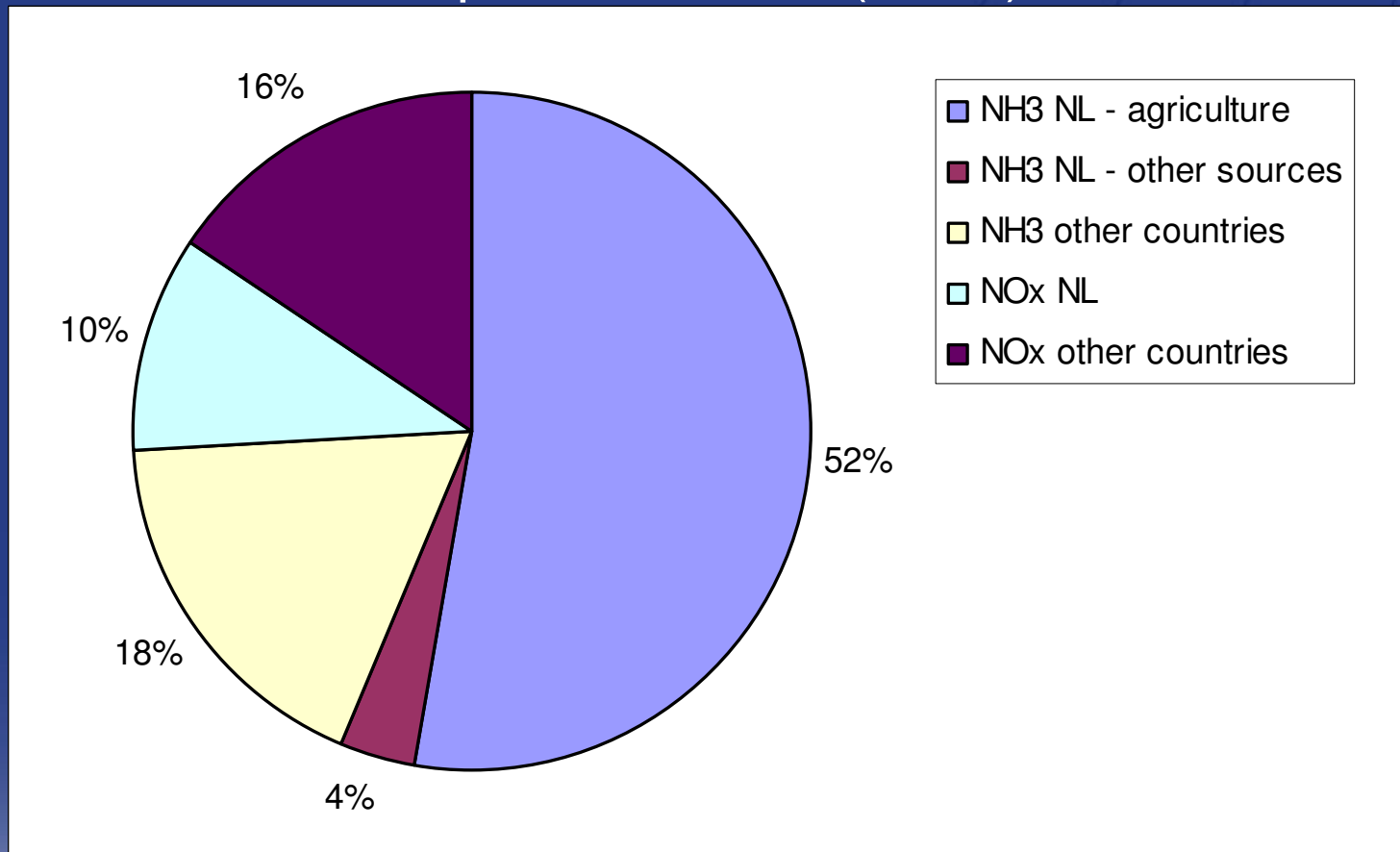
Diet changes

- meat consumption ? environmental pollution
 - one of the most polluting parts of our diet
- alternatives with less environmental pollution
 - fish (limited potential, other environmental impacts)
 - novel protein foods (NPFs)
- replacing 40% meat by NPFs in the Netherlands
 - reductions in CH₄ (9%), NH₃ (9%), N₂O (3%) emissions (2030)
 - reduction in land requirements
 - meat more expensive than NPFs ? direct savings consumers
- But...
 - welfare cost?
 - implementation? (e.g. tax on meat?)



NTM for NH₃ from agriculture

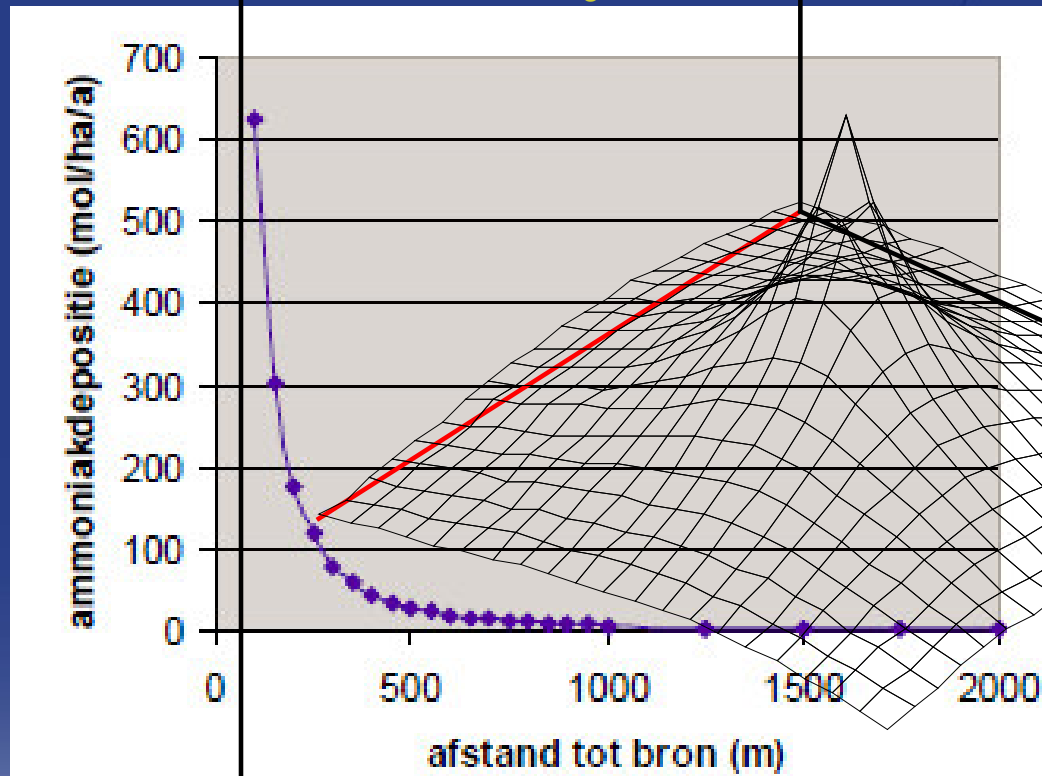
- Sources of N-deposition in NL (2000)



Abatement of NH_3 from agriculture

- deposition NH_3 relatively close to source

deposition from 800kg NH_3 at farm



0.903

Abatement of NH₃ from agriculture

- sources of emissions near nature reserves have relatively large impact on biodiversity
- 20% of NH₃ emissions deposited within 1000m
- remaining part contributes to background deposition levels

So...

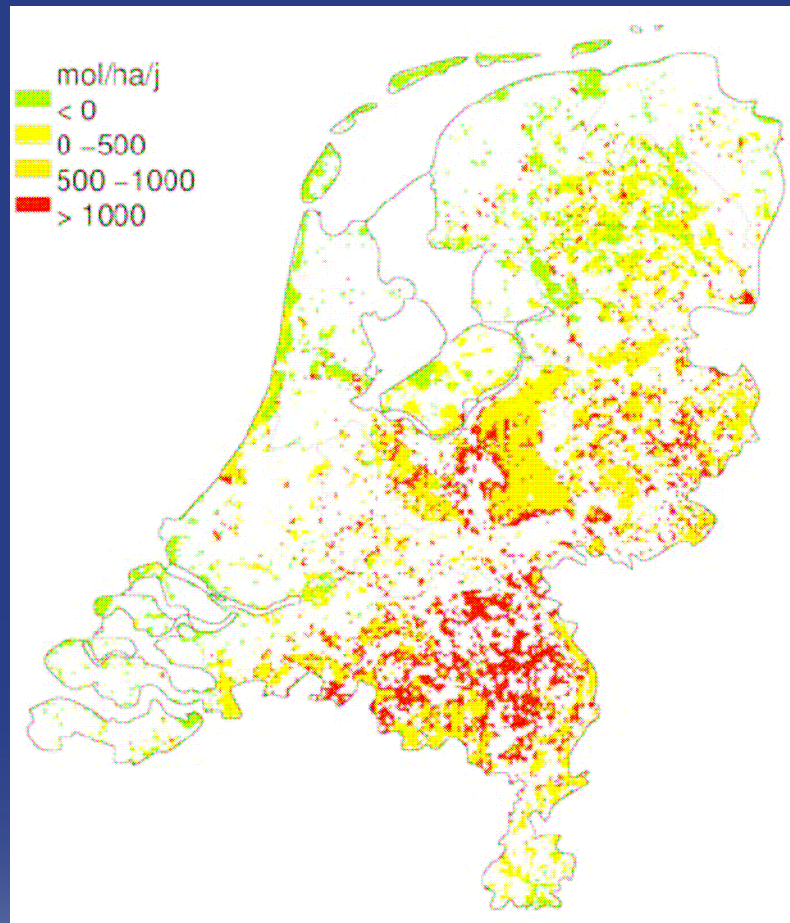
- NH₃ abatement close to nature reserves most effective

But...

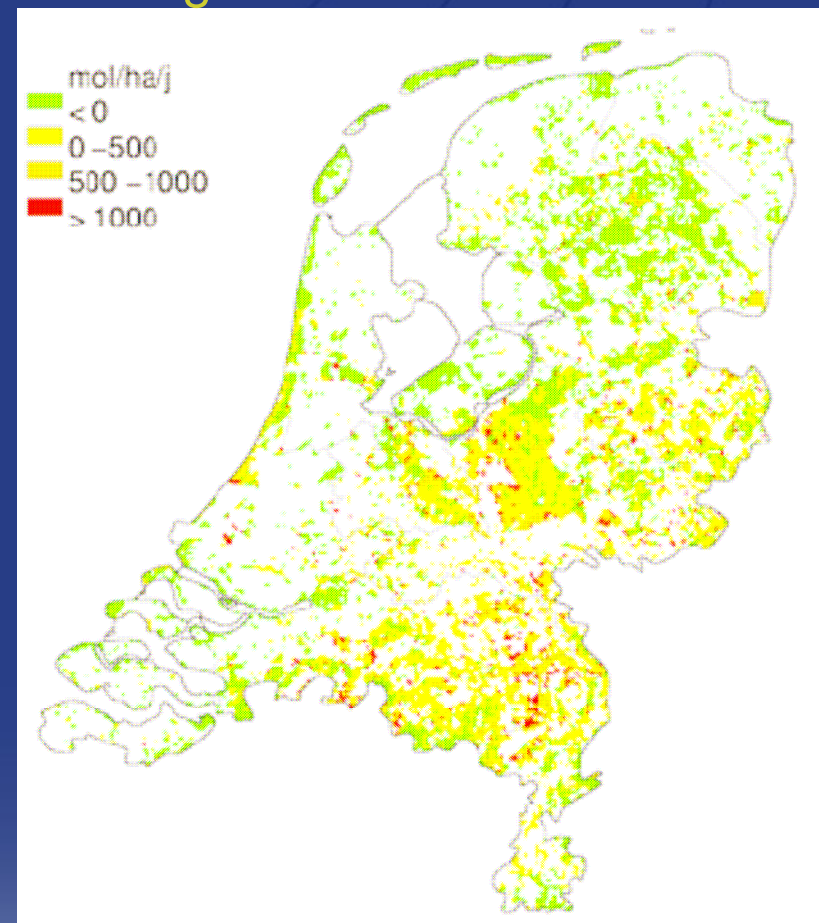
- in the Netherlands background concentration high
⇒ abatement close to nature reserves not sufficient

Exceeding critical loads for N deposition

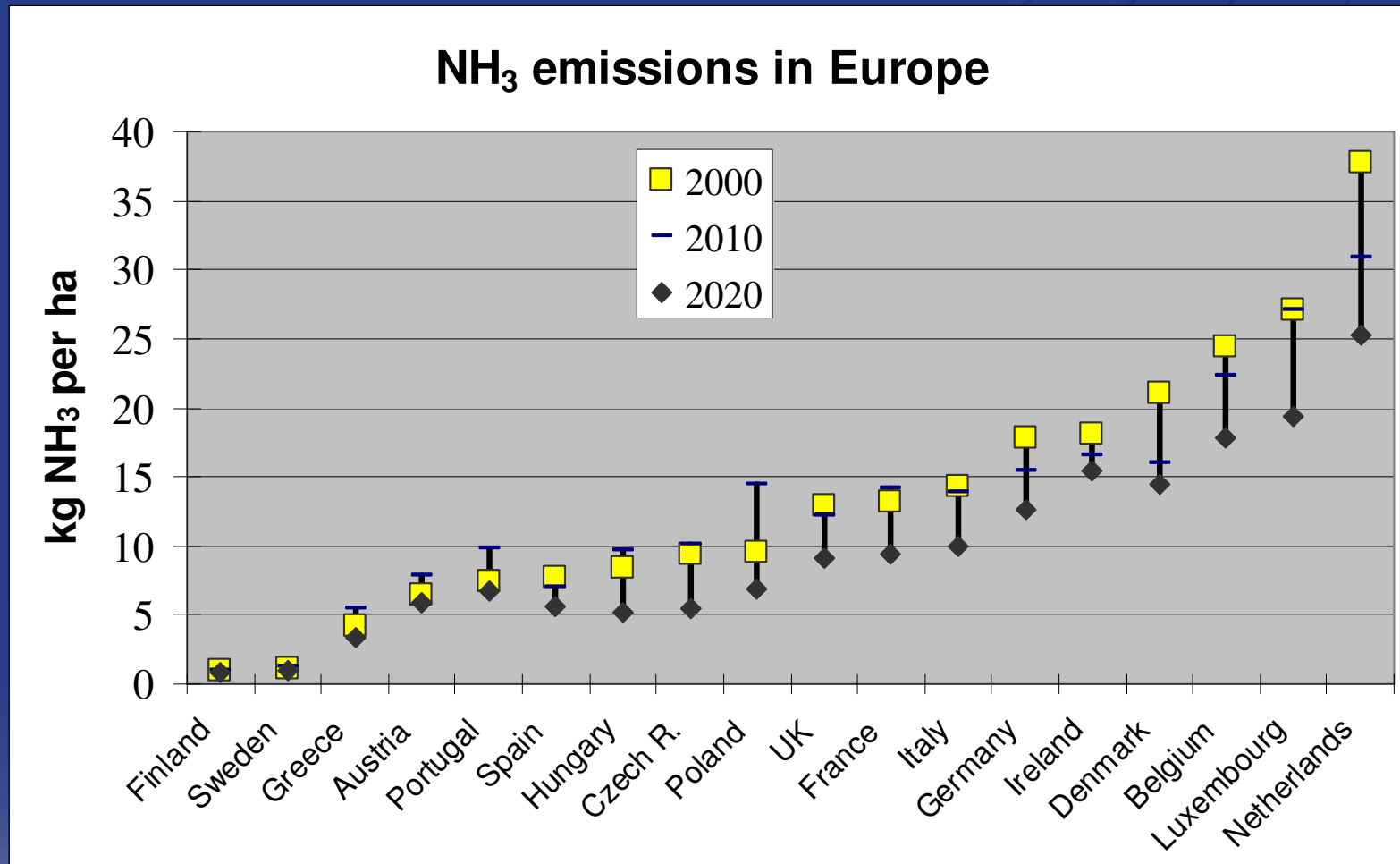
2000



2010 – generic measures

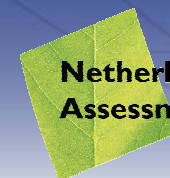


Netherlands vs. Europe



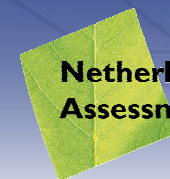
Measures for agricultural NH₃ emissions

	Generic reduce emissions and background deposition	Location specific reduce deposition on a specific nature reserve
Technical	✓ general rules for manure storage, application, animal houses, etc.	✓ local implementation of technical measures
Non-technical	✓ buying up livestock quota	✓ relocation of farms ✓ closure of farms ✓ restrictions on farming within certain areas



Location specific NH₃ abatement

- Options
 - local implementation of technical measures
 - IPPC takes into account local environmental conditions
 - buffer zones (250m) around nature reserves in which economic expansion is restricted
 - relocation or closure of farms
- General conclusions
 - Non-technical measures (relocation, closure) relatively expensive
 - in specific areas they can help to reduce N deposition exceeding critical loads cost-effectively
 - location specific abatement more efficient with lower background concentration levels



Cost-effectiveness

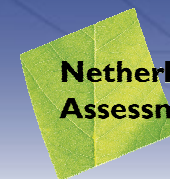
- Measure effect:
 - kton/yr reduction in emissions
 - mol/ha/yr reduction in deposition (average/on specific area)
 - ecosystem protection percentage
 - Mmol/yr reduction accumulated exceedance
- Cost-effectiveness

	technical generic	technical location-spec.	non-techn. generic
emissions (€/kg/yr)	0.4 – 25 (9.0 avg.)	9.2 (avg.)	3.6
exceedance (€/mol/yr)	0.2 - 4 (1.7 avg.)	1.2 (avg.)	0.4

- cost-effectiveness of relocation in most favourable situations can be as low as ~€0.2/mol/yr

Non-technical vs. technical measures (local)

- Relocation/closure:
 - can be cost-effective for farms dominating N-deposition on specific natural areas ? local reduction may amount to 1000 mol/ha/yr
 - relocation ? no reduction emissions
 - closure more effective than relocation - emissions removed
- Technical measures
 - location specific implementation of technical measures with high reduction potential more efficient than relocation/closure
 - e.g. air scrubbers (reduction NH_3 >90%; also reduction PM_{10})



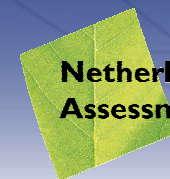
Non-technical vs. technical measures (local)

Cost (for average farm)

- relocation €450,000
- closure > €500,000 (based on price livestock quota)
- air scrubber €300,000 (NPV; invest. €100,000-€150,000)

Spatial scale analysis:

- high level of spatial detail required for calculating effect (and cost-effectiveness) of location specific abatement
- studies for the Netherlands:
 - 5x5 km ('96) ? 1x1 km ('01) ? 500x500 m (present)



Implementation

- various difficulties with relocation in NL
 - high level of fragmentation of nature reserves
 - conflicting interests of many stakeholders
 - not all stakeholders involved in decision-making process
 - farmers less willing to relocate than expected
 - existing but unused rights (e.g. for expansion) remain valid
 - governments hesitant to pay for damage due to loss of rights
 - insufficient funds
- Promises for ‘deposition tax’?
 - levy tax on contribution of farm to critical load exceedance
 - let farmer opt for relocation, closure, technical measures

