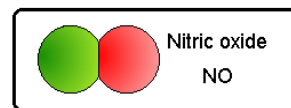
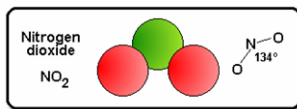
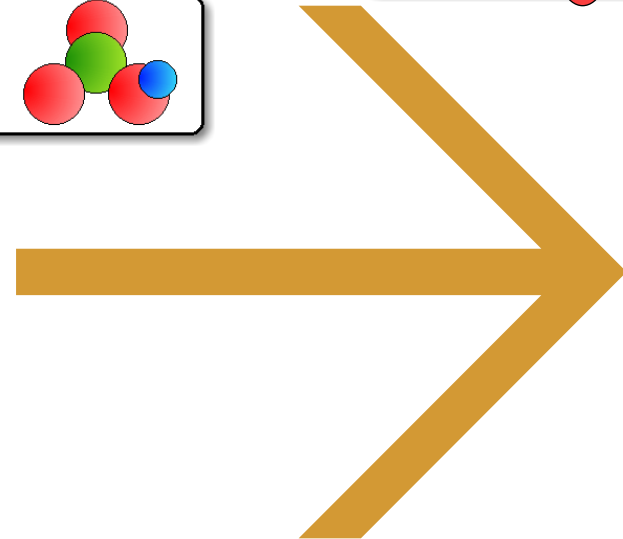
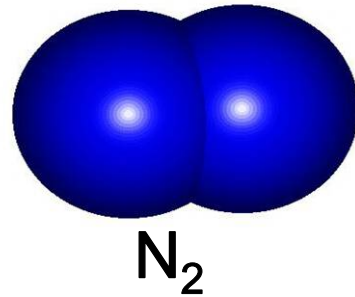
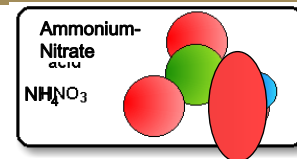
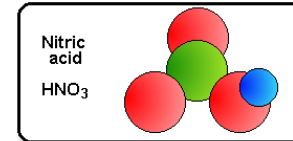
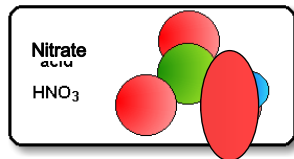
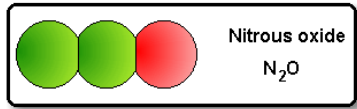


Dutch nitrogen policy experiences

TFRN meeting, 21-23 May 2008 Wageningen
Kaj Sanders, Dutch ministry for the environment





Outline

- 'Nitrogen' policy in the last three decades
- Trends in nitrogen emissions
- Integrated nitrogen assessment and policy
- Nitrogen visualisation
- Conclusion



Dutch 'nitrogen' policy

- Environmental policy started out as single issue, single compound policy
- Nitrogen related focus on agriculture, industry, energy and transport
- In the 1980s and 1990s the focus shifted from compartments to themes



Dutch 'nitrogen' policy

Agriculture

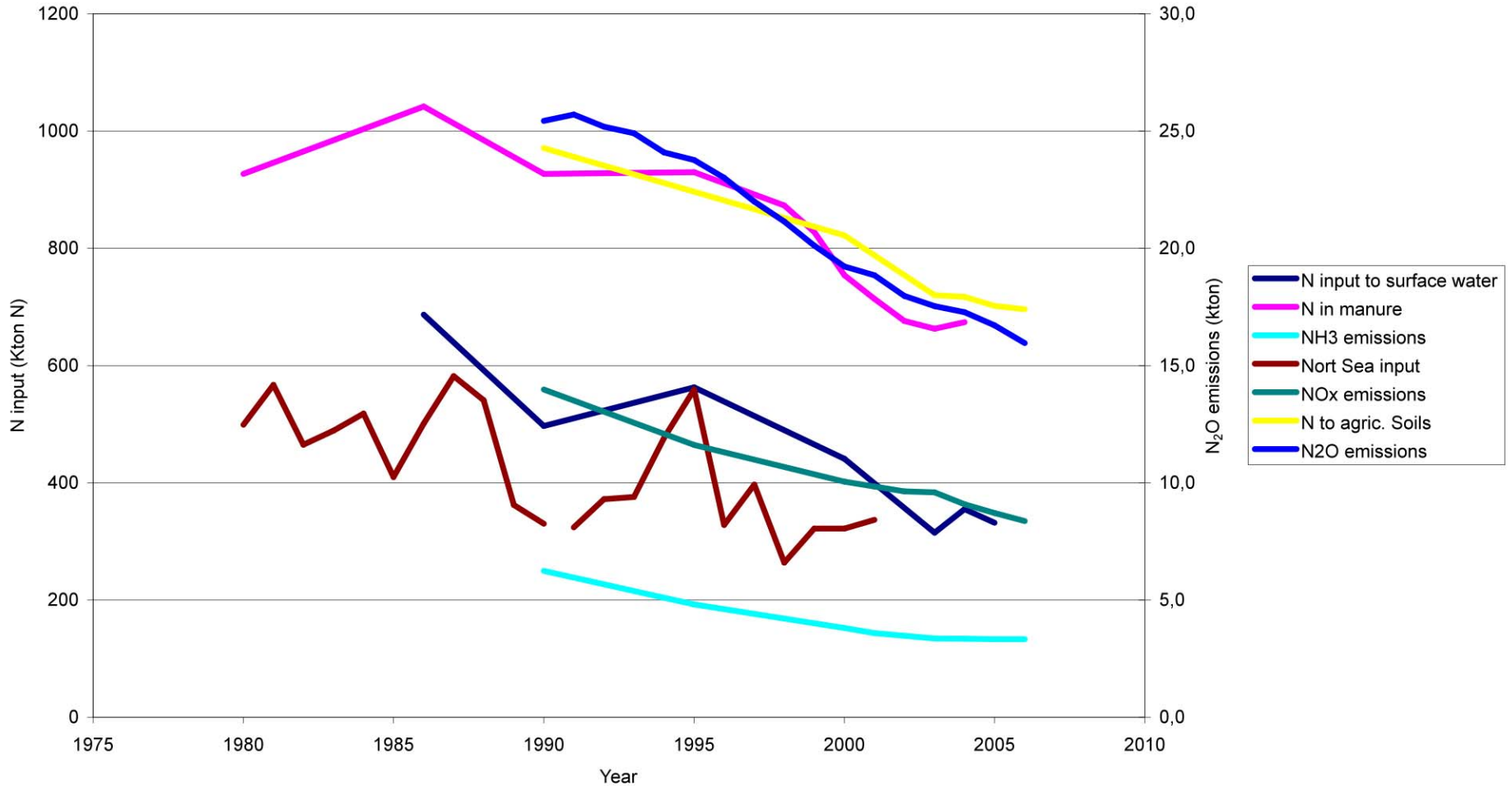
- Low emission application
- Covering manure storage
- MINAS, lowering nitrogen application standards
- Milk quota, combined with increasing productivity

Other Nr sources

- Waste water treatment
- Catalysts in cars
- Low NO_x industry
- Gas instead of coal
- Energy efficiency improvement



Trends in nitrogen emissions 1990-2005





Trends in nitrogen emissions and environmental quality (1990-2005)

Air pollution

NH₃ - 46%

☹️/☹️

NO_x - 38%

☹️/☹️

Ambient air quality

O₃ -75%

☹️/☹️ (hot spots)

NO₂ -21%

☹️/☹️ (hot spots)

Climate change

N₂O -16%

😊/☹️ (including Kyoto mechanisms)

Water quality

NO₃⁻ - 33%

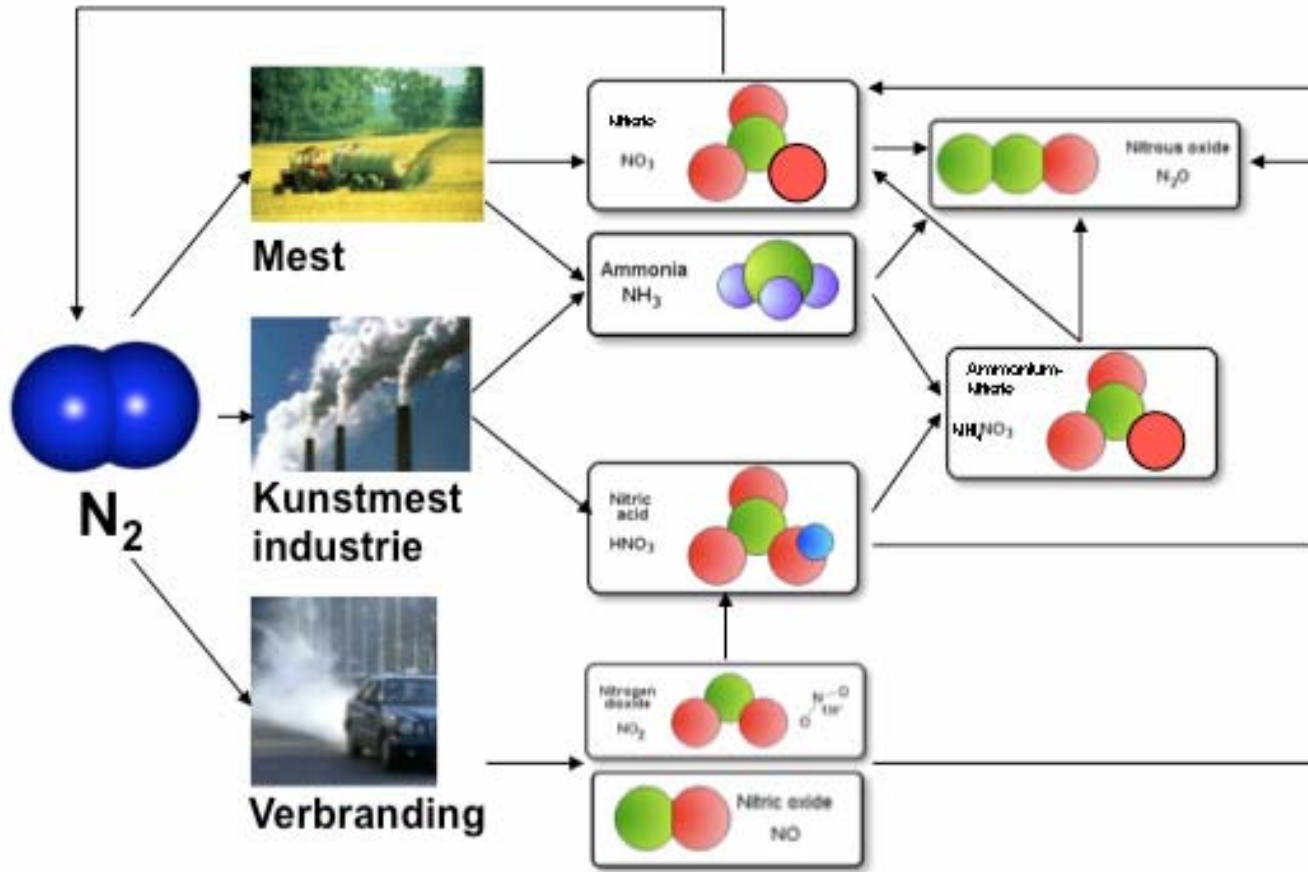
😊/☹️ (sandy soils)

N-total - 25%

☹️/☹️ (Water Framework Directive)



Nitrogen policy: the cascade



Sources

Environmental quality



Effects



Integrated nitrogen assessment

- Integrated assessment modelling
 - RAINS, GAINS
 - Integrated nitrogen models (Nitrogenius, Initiator, Nitrogen Cockpit)



Integrated nitrogen assessment

Economic sector	Technical measures	Impact on reduction of				Cost effectiveness
		NH ₃	NO _x	N ₂ O	NO ₃	
Agriculture	Reduce/optimize fertiliser use	++	++	++	++	high
	Decrease livestock in balance with carrying capacity of the soil	+ / + + +	+ / + + +	+ / + + +	+ / + + +	
	Reduce imported fodder	+ / + + +	+ / + + +	+ / + + +	+ / + + +	middle
	Low emission application manure	+	-	-	-	middle
	Manure processing (ferment.; gasific.)	+	0	0	0 / +	middle/high
Industry	Low NO _x industry	+	+	?		middle
	Energy saving industry	+ / +				high
	Shift from oil and coal to gas and renewables	+ / + + +				
	Combined heat and power	+				high
	CO2 sequestration	+ / + + + ?				?
Energy	Shift to renewable energy (wind, solar)	++				middle?
	Energy from biomass	- / 0	-	0 / 0	- / 0	
Transport	Biogas from manure	0 / +	+ / 0	0	0	
	Modal shift transport: road → water	+ / + + +				high
Households	Reduced growth of aviation (freight and pas.)	+ / + + +				
	Low NO _x and soot cars (Euro 5 and beyond)	+				
	More efficient cars and less car km's	+				
	Housing: energy efficient and sustainable (EPC)	+ / +	+ ?			
	Energy saving and efficient equipment	+ / -	+	+		
	Other 'Green' lifestyle aspects (e.g. less meat)	++	++	++	++	
	Improved municipal water treatment and waste process.	+ ?	0 / -	+	+	



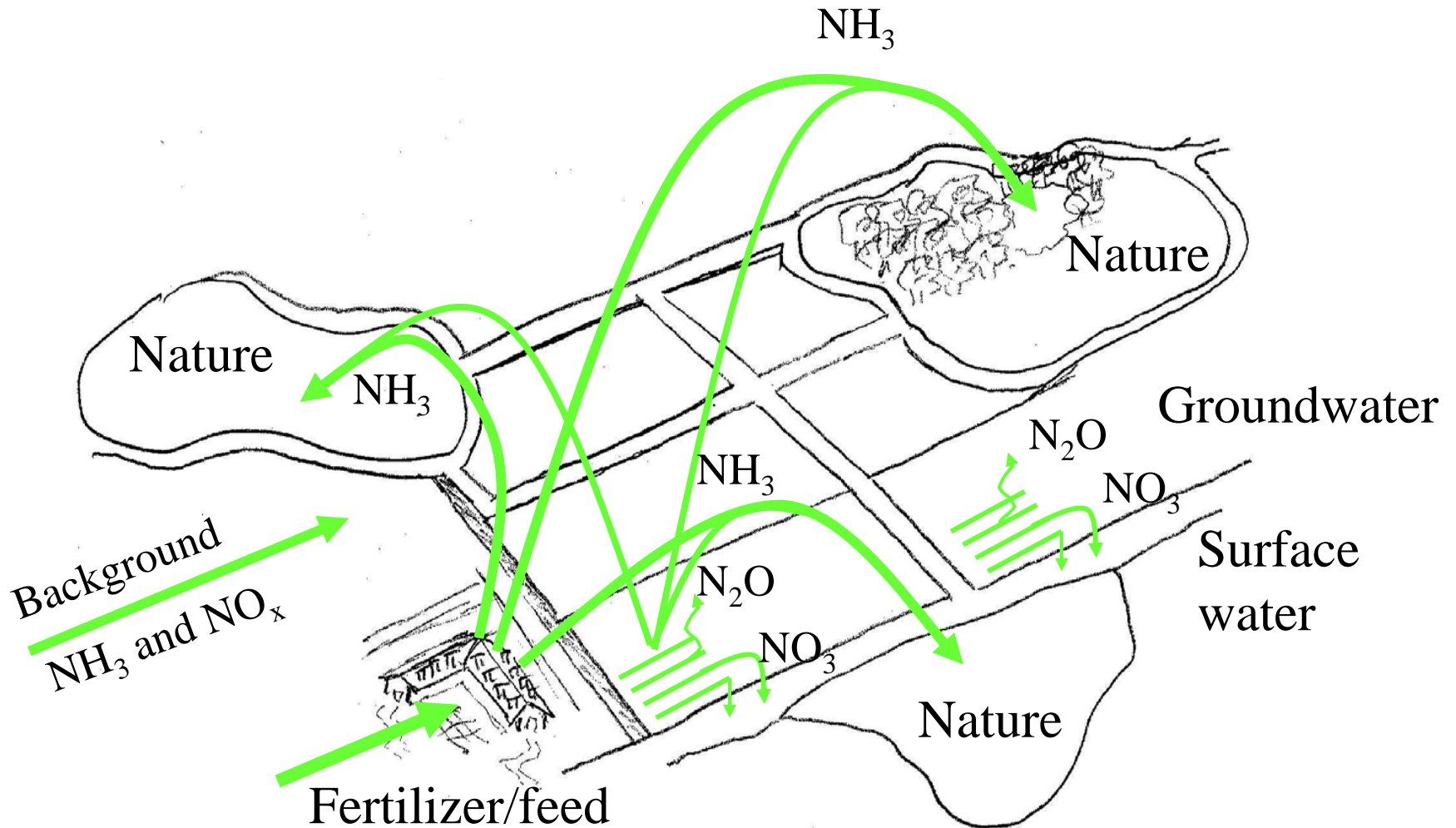
Integrated nitrogen policy

- Promote synergies, avoid trade offs
- Prevention of N_r creation
 - Optimize nitrogen use efficiency in agriculture
 - Influencing diet, demand for meat
 - Minimize NO_x creation in fuel combustion
 - Relation with climate policy
- Pilot studies, nitrogen ceilings, manure processing
- International exchange of experiences and solutions



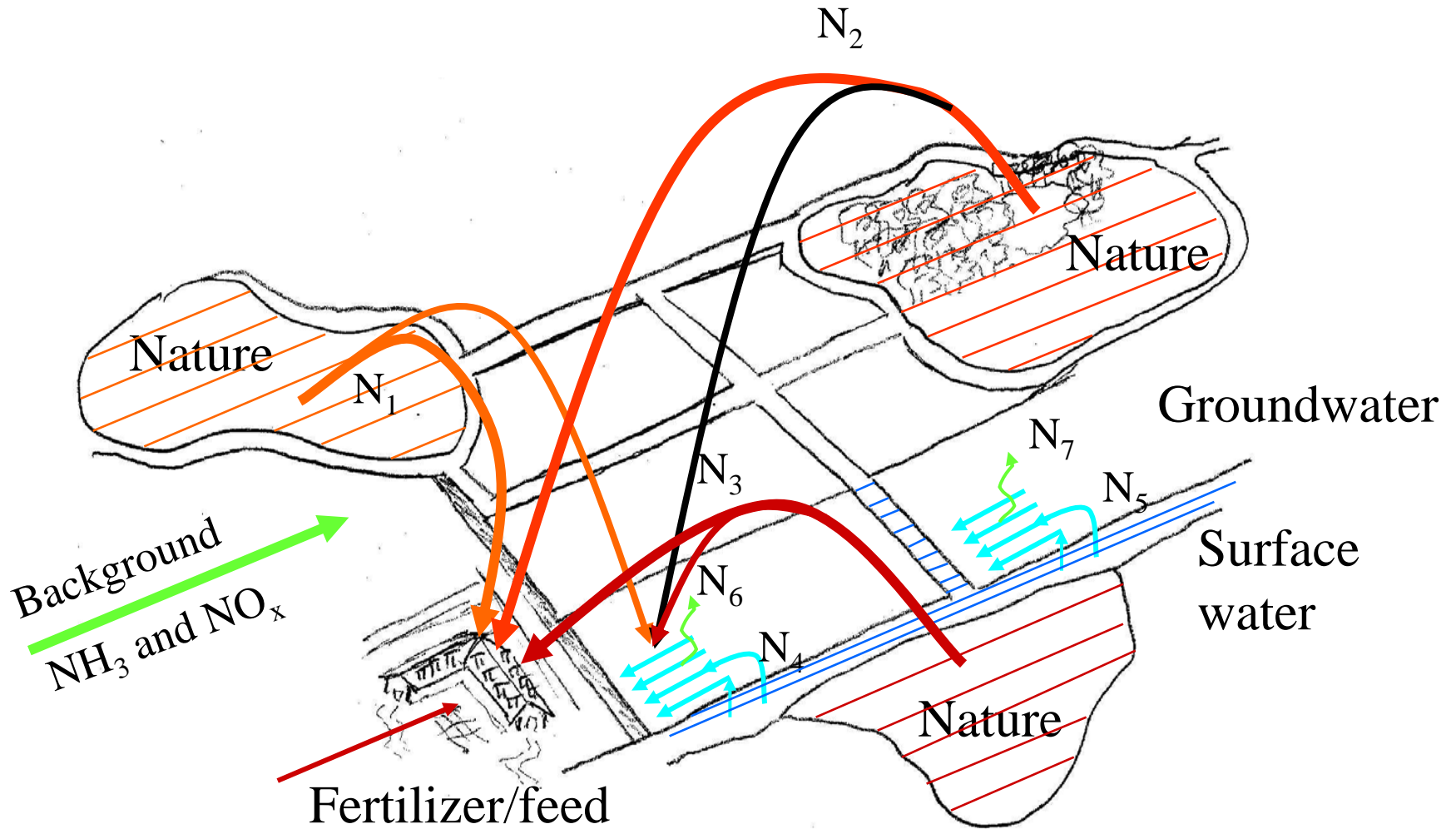
Nitrogen ceilings

Spatial optimisation of nitrogen emissions





Nitrogen ceiling at farm level



Nitrogen visualisation



- Developed for the fourth international nitrogen conference to facilitate communication
- The visualization consists of three parts:
 - The animation of the development of nitrogen sources
 - The animation of the effects
 - The 'cockpit' where you can see what the consequences are of certain policy choices

<http://www.initrogen.org/visualization.0.html>



Nitrogen visualisation, the cockpit



<http://www.initrogen.org/visualization.0.html>



Nitrogen visualisation, the cockpit



<http://www.initrogen.org/visualization.0.html>



Nitrogen visualisation, the cockpit



<http://www.initrogen.org/visualization.0.html>





Nitrogen visualisation, the cockpit



<http://www.initrogen.org/visualization.0.html>





Nitrogen visualisation, the cockpit



<http://www.initrogen.org/visualization.0.html>





Nitrogen visualisation, the cockpit



<http://www.initrogen.org/visualization.0.html>





Conclusions

- Refine integrated approach nationally
 - Close nutrient cycle, continue pilot studies
 - Integrate nitrogen consideration in other policy areas
 - For instance, biobased economy, climate policy, development cooperation etc.
- Further integration of nitrogen policy and research at European level
 - UNECE TF Integrated Nitrogen
 - EU (COST 729, ENA, NitroEurope)
- Continue international cooperation
 - UNEP-GPA, GPNM, INI, nitrogen conferences, etc
 - Use communication tools like visualisation