International Institute for Applied Systems Analysis
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science for global insight

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Component 5

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C5: Integrated risk analyses and policy tools

Overall objective:

- Make findings of ECLAIRE relevant for (today’s?) response strategies

Tasks:

- Quantifications of economic benefits of ecosystems (WP18)
- Integration of climate change effects into impact assessment (WP19)
- Implications of/for mitigation and adaptation strategies (WP20)

WP18:

Quantification of economic benefits of ecosystems

Novel Thresholds and Model Endpoints

Summary of key ecosystem functions by habitat type, and their sensitivity to air pollution

Ecosystem function	Sensitivity to air pollutants			Significance for habitat types			
	N	O_3	S	Grassland	Cropland	Forest	Shrubland
NPP	●	●	●	H	H	H	H
Decomposition	●	●	●	H	H	H	H
Below-ground C allocation	●	●		H	H	H	H
Senescence		●		[illegible]	H	H	L
Flowering/fruiting	●	●	[illegible]	[illegible]	H	H	M
Water use efficiency	?	●	[illegible]	[illegible]	H	H	L
CH_4 emission	●	●	[illegible]	L	L	L	H
N_2O emission	●		[illegible]	H	H	M	M
Nutrient/pollutant retention	●	●	●	H	H	H	H
DOC production	●	●	●	M	L	M	H
BVOC emission		●					
Ozone uptake		●					
Biodiversity	●	●	●	H	L	H	H

Others ?

WP 18: Work in progress (2)

ECLAIRE D12.1

and what is actually feasible with current knowledge

Monetary evaluation of benefits

- Achieved:
  - Defining an appropriate structure for the description of effects through an accounting framework
  - Defining a modelling strategy that meets the requirements of CBA for policy applications, requiring good quality results on a short time scale
  - Joint workshop with TFIAM/NEBEI

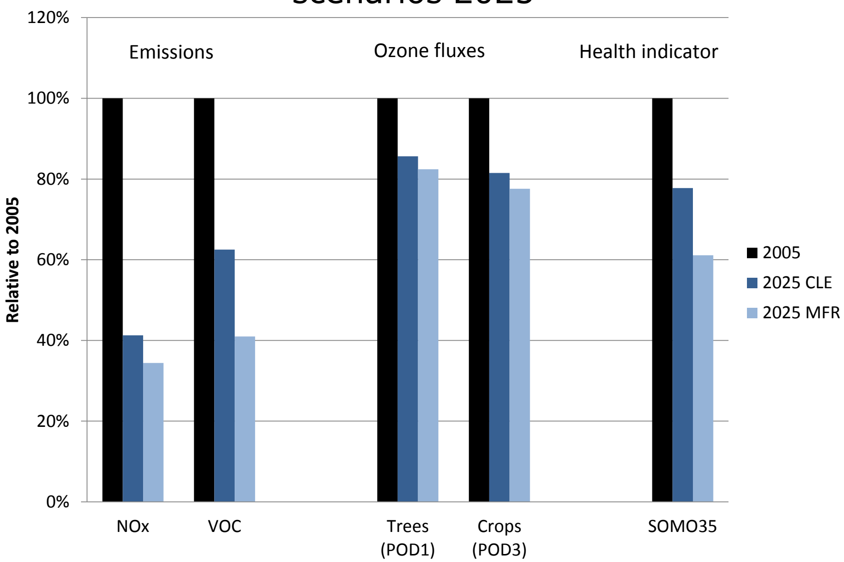
- Planned for 2014:
  - Discussions with those developing and running detailed models to consider how their results can be approximated for CBA in policy analysis
  - Further development of the accounting framework concept, population with data
  - First analysis

WP19:

Integration of climate change effects into impact assessment

Ozone fluxes: Implemented in GAINS Scenarios for 2025

Ozone indicators for European emission reduction scenarios 2025



The O_3 flux calculations have been introduced into GAINS.

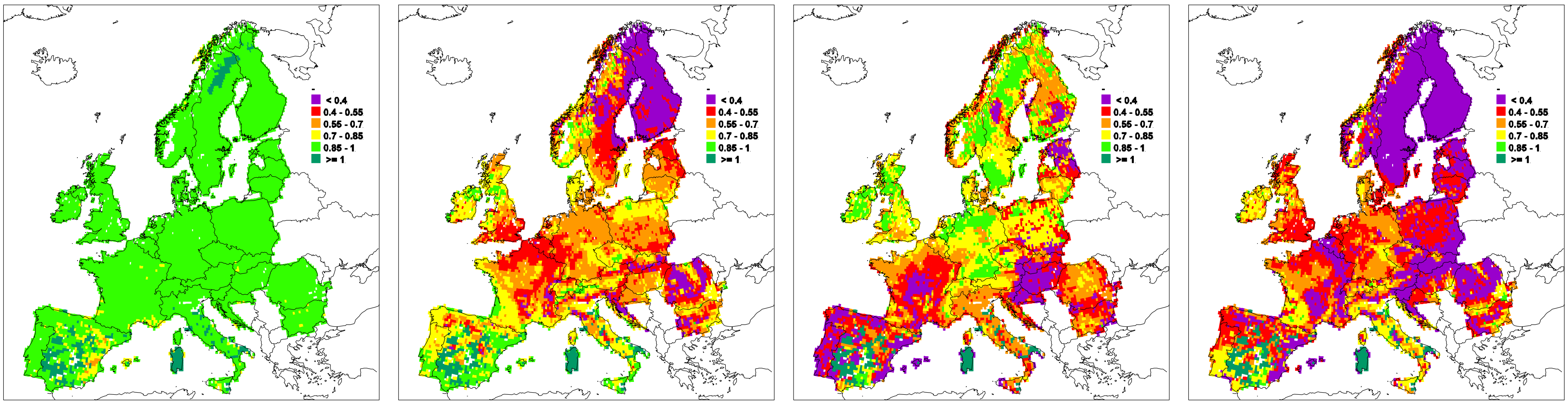
Initial scenario calculations raise further questions:

- Is the current parameterization validated and robust? Are ozone fluxes strongly influenced by hemispheric background ozone?
- If so, then
  - Should vegetation damage be taken up by HTAP?
  - Critical impact of climate change on ozone fluxes?

- A policy message for ECLAIRE?

Draft Illustration of regional use of vegetation index

Simulated (PROPS model) Czekanowski index under changing climate and air quality scenarios



Current Air quality
+ climate

Current Air quality
+ A1 Δ climate.

Max. feasible
reduction of N-air
pollution
+current climate.

Max. feasible
reduction of N-air
pollution
+ A1 Δ climate.

Source: CCE,
Hettelingh et al.

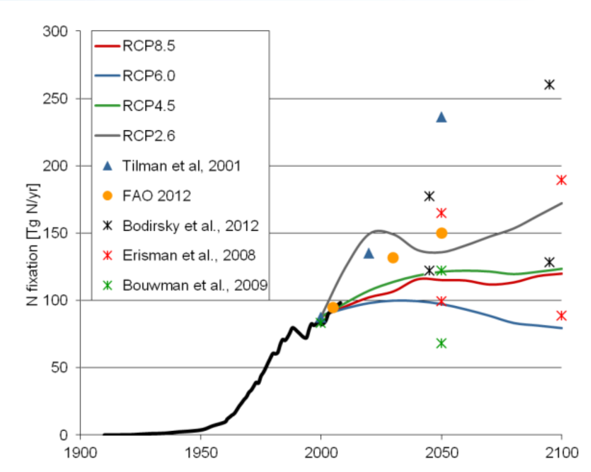
Climate change strongly alters occurence probability

WP20:

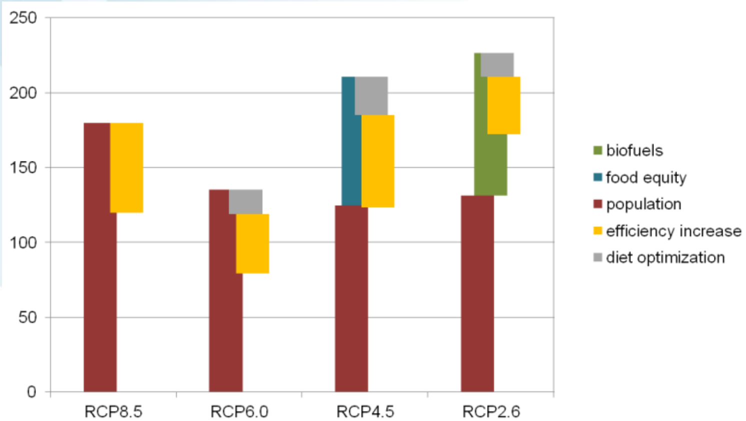
Implications of/for mitigation and adaptation strategies

(1) Long-term N emission scenarios

Global Nr emissions



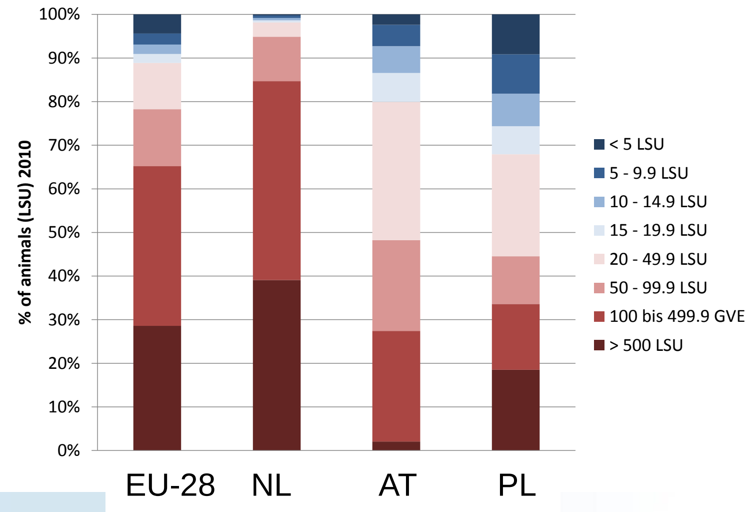
Expected Nr need in 2100



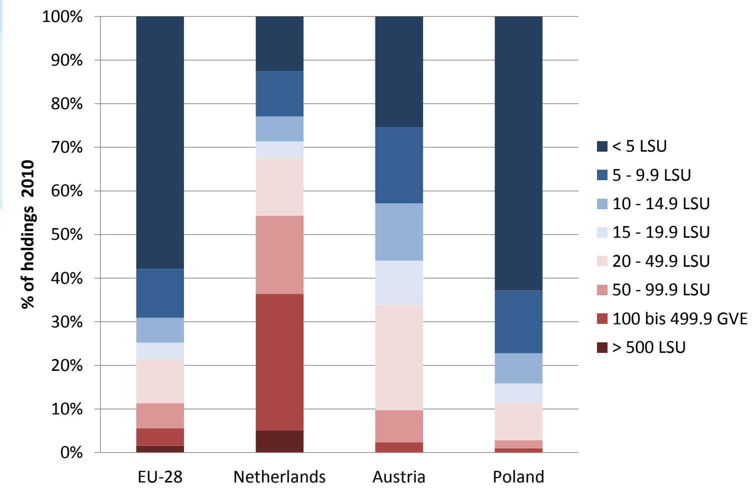
- IIASA 2012 workshop:
  - RCP scenarios suggest fast, abrupt and strong deviation from historic trends, with relative small variations because of similar (baseline) assumptions
- Review paper in Climatic Change
  - N for biofuels is important – the dip around 2050 indicates turnover to full plant biofuels
  - N fixation rates are not directly linked to efforts for carbon reductions
- Nitrogen will now be included in SSPs
  - Discussion on appropriate (baseline?) assumptions for the five SSP storylines

(2) Structural changes in agriculture: Many emission control measures are more practical/cheaper at large/industrial farms

Distribution of animals by farm size



Size distributions of holdings



- Uneven distribution of farm sizes:
  - e.g., farms > 100 LSU:
    - 65% of animals (LSU) in EU-28
    - 5% of EU farms
    - 290,000 farms
- Large differences in farm sizes across Europe, e.g.:
  - farms >100 LSU:
    - Netherlands: 85%
    - Austria: 28%
  - farms <5 LSU:
    - Netherlands: 13%
    - Poland: 63%
- Scope for targeted policy intervention:
  - 75% of animals are on 10% of farms

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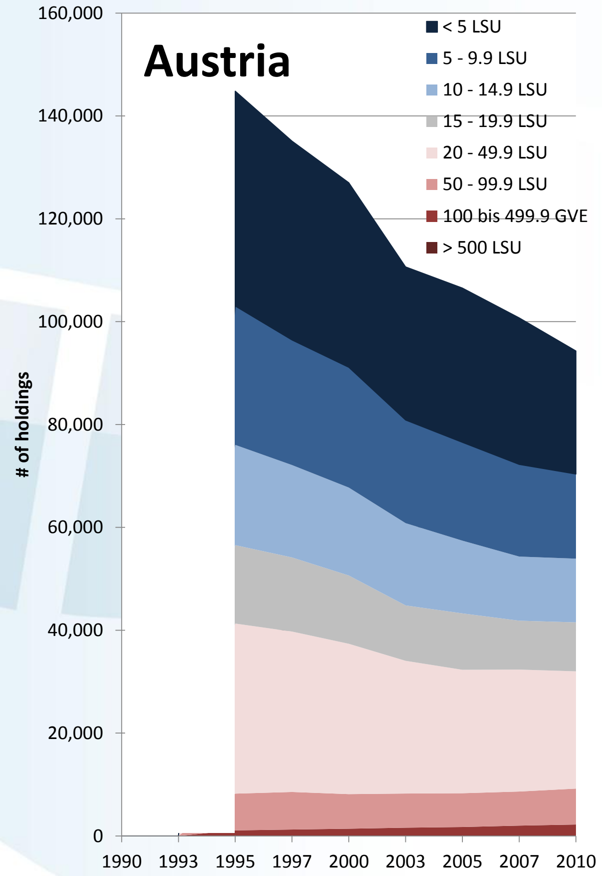
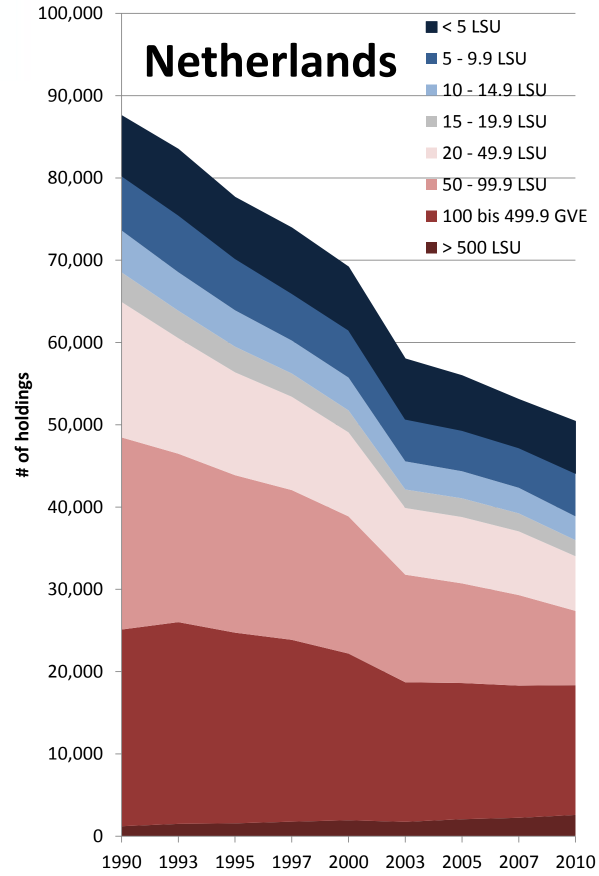
(2) Structural changes in agriculture:

Farm sizes have changed considerably in the past, and changes are expected to continue





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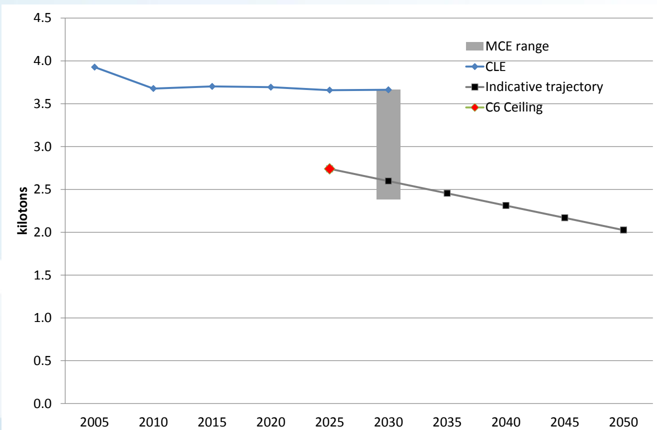
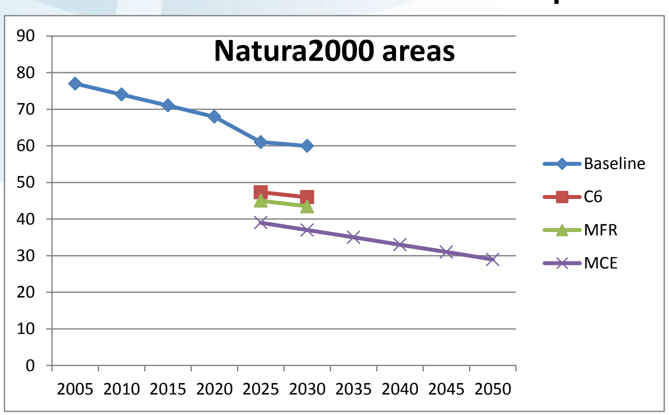
(2) Structural changes in agriculture:
Impacts on mitigation potentials

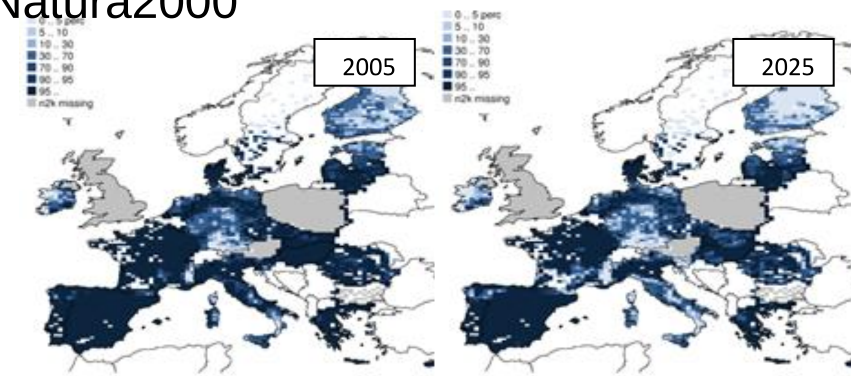
NH$_3$ emissions: TSAP target trajectory



- It can be expected that the restructuring and shifts towards larger farms will continue.
- This will increase the mitigation potential for agricultural emissions in the long run.
- Initial analysis has been used for setting long-term targets for 2013 TSAP revision.

N excess deposition at Natura2000





(3) Synergies and trade-offs between NH_3-CH_4-N_2O mitigation

- Synergies of ambitious NH_3 targets with CH_4 and N_2O emissions emerged as a relevant question for the TSAP review
- Under regimes where disposal of manure is the primary objective, scientific literature has identified a number complex of trade-offs.
- But aren't there synergies in other areas where manure application could reduce fertilizer (N) input?
- Need for a more holistic approach