Effect of resolution of input data on modelled N_2O fluxes at landscape scale

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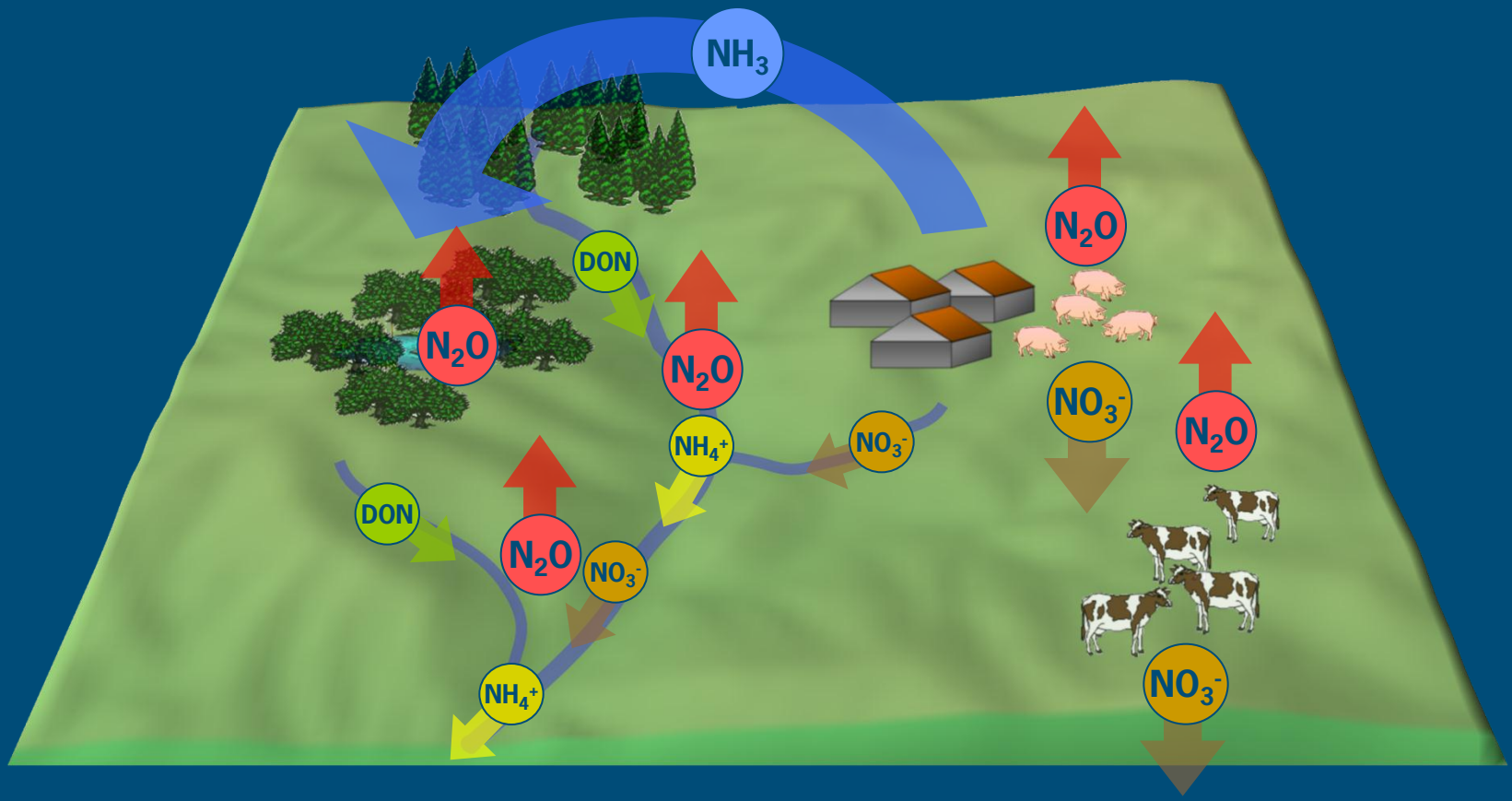
Outline

- Introduction
- Modelling N_2O at landscape scale
- Comparing dataset with different resolutions
- Effect of resolution on N_2O emissions
- Conclusions

Landscape interactions



Noordelijke Friese Wouden

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Noordelijke Friese Wouden

Landscape characteristics:

Area: Approx. 500 km^2

Intensive dairy farming

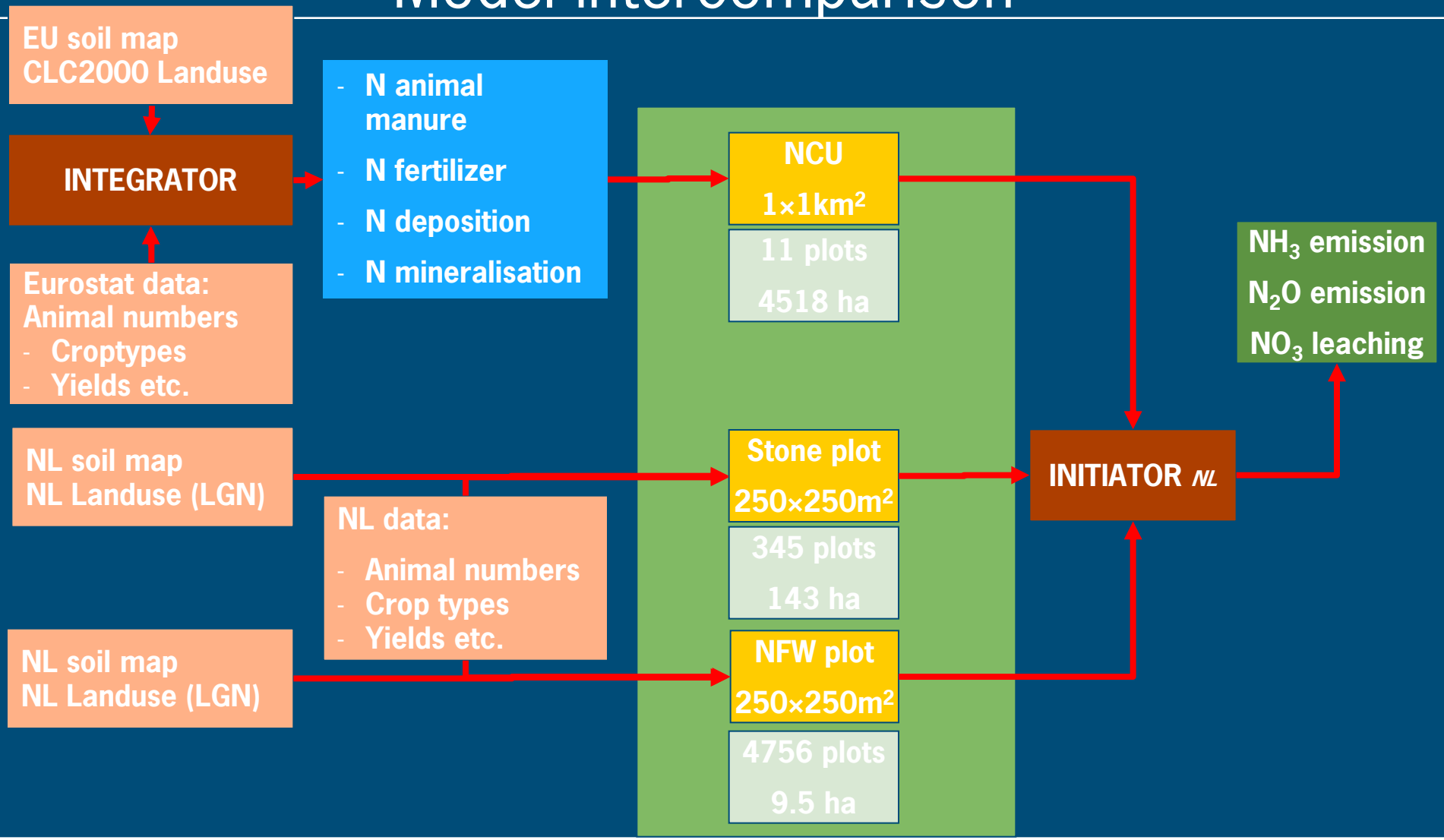
Hedgerows

Flat, Pumped drainage

Models and data available

- INTEGRATOR
  - European scale data:
    1 km x 1 km at NCU level (11 plots, 4518 ha)
- INITIATOR2 - NL
  - National scale data:
    250 m x 250m at STONE plot level (354 plots, 143 ha)
- INITIATOR2 – NFW
  - Regional scale (landscape) data:
    250 m x 250 m at parcel level (4756 plots, 9.5 ha)

Model intercomparison



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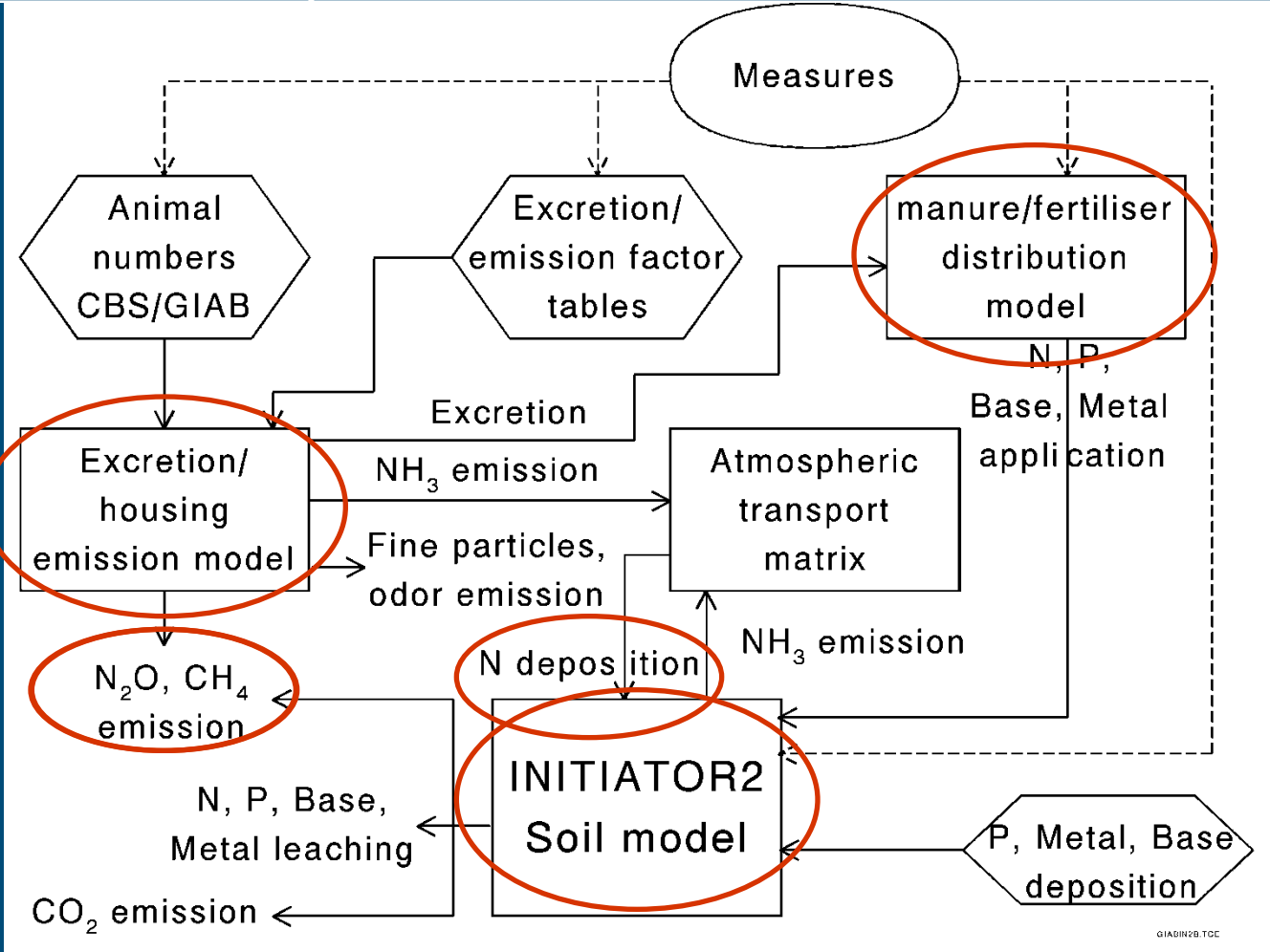
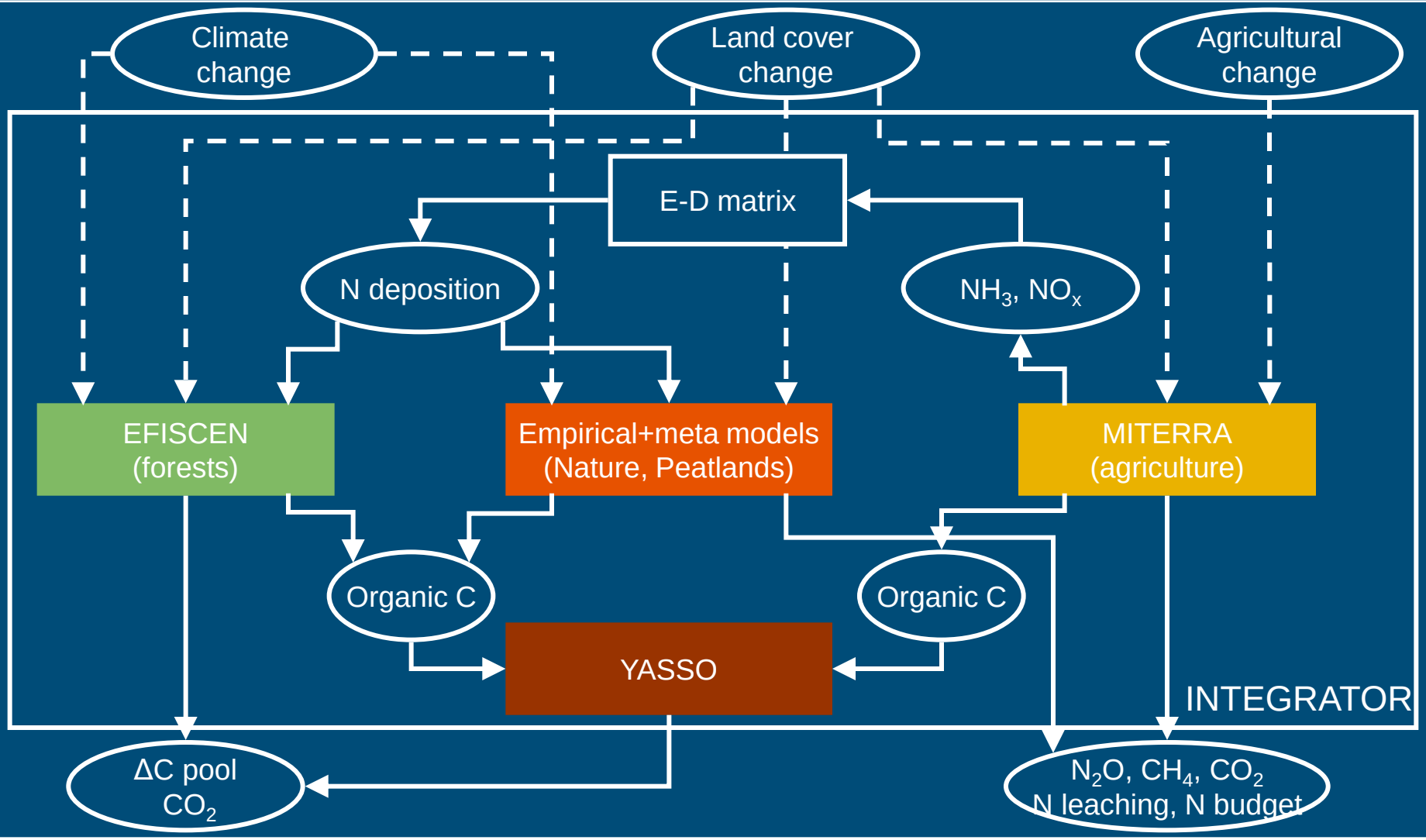
Modelling N2O at landscape scale

NL/NFW: INITIATOR2 model



EU: INTEGRATOR model

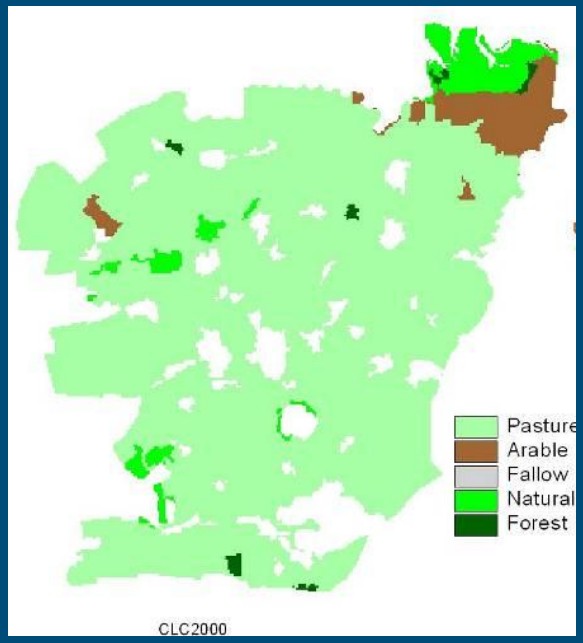


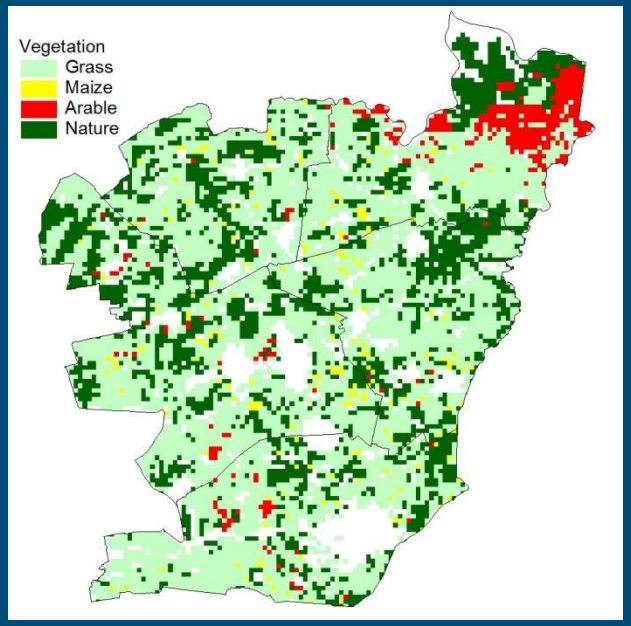
Overview scaling differences

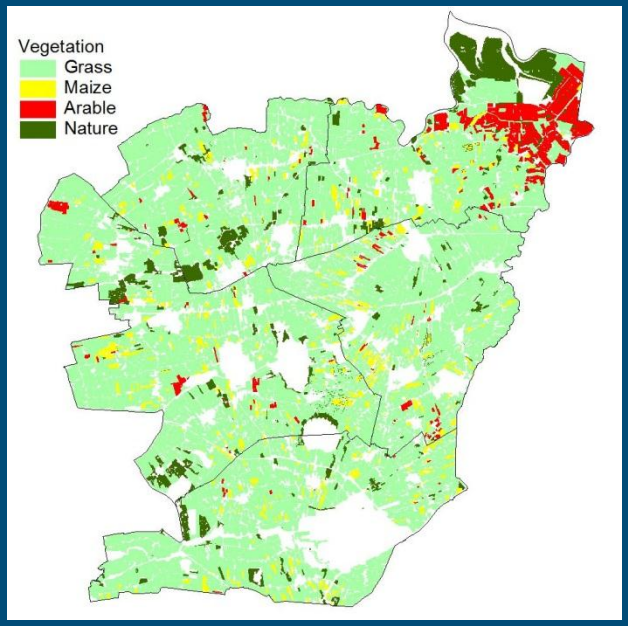
Aspect	EU: Europe	NL: National	NFW: Landscape
Aim	Quantify effects of EU policies on NH_3, N_2O and CH_4 emissions and N- en P-surpluses.	Quantify effects of Dutch policies on NH_3 emissions and deposition, GHG emissions, N, P leaching	Monitoring of effects of management changes in a region
Scale	NCUs	STONE plots	NFW plots
Animal numbers	RAINS	CBS	CBS
Soil data	Not included	National soil database	National soil database
N manure input	Manure distribution at NUTS2 level	Manure distribution at municipality level	Manure distribution at farm level
N fertilizer input	Downscaling FAO data to NUTS 2 level	Based on national management and statistics	Based on national management and statistics
N Deposition	European scale modeling EMEP	National scale modeling OPS	Regional scale modeling OPS

Comparing dataset with different resolutions

Land Use: European, National, Regional

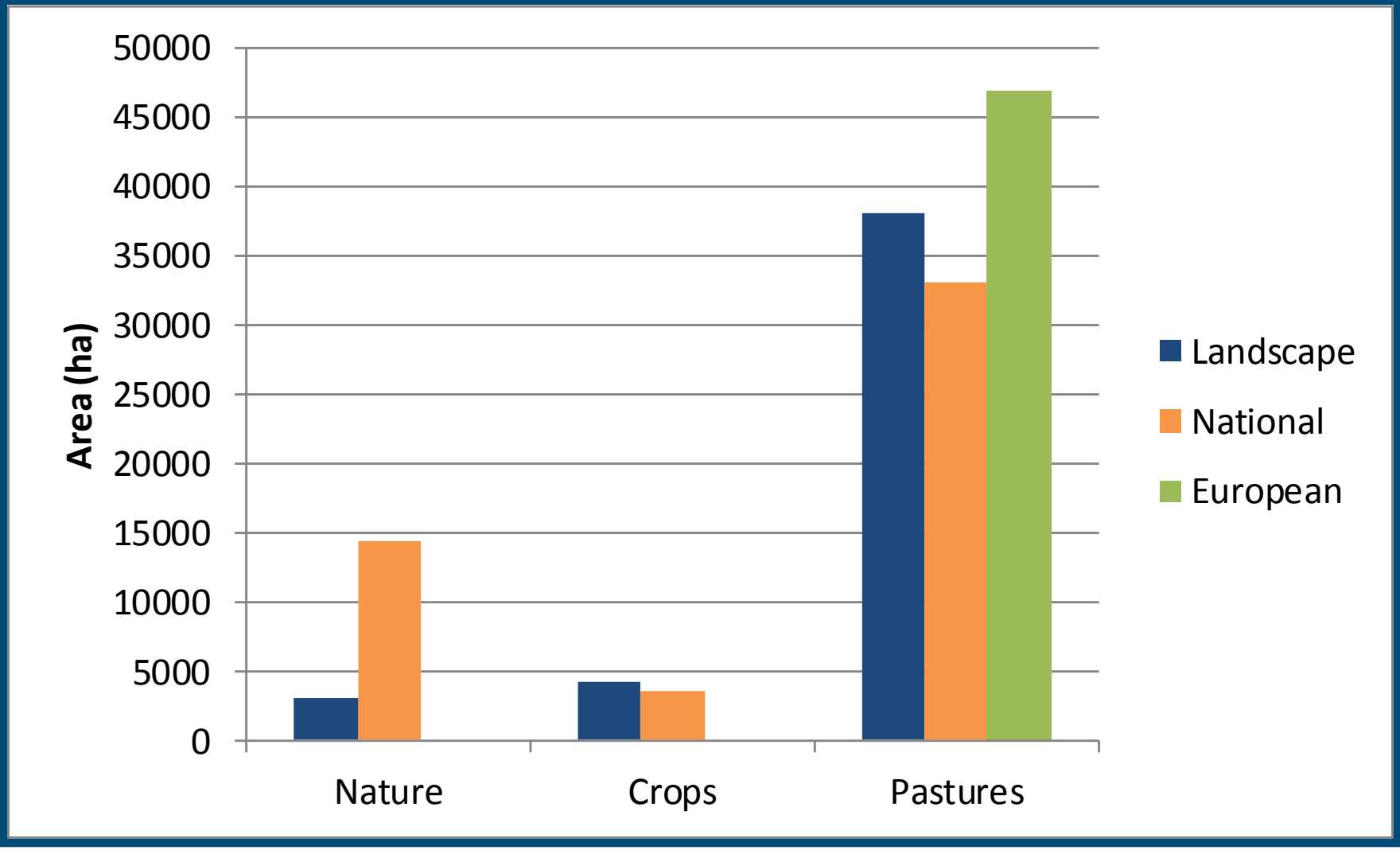






- EU landuse (CLC2000) Map/INTEGRATOR clusters
- NL landuse (LGN3+) Map/INITIATOR2 clusters
- NFW Landuse (BRP) Map/INITIATOR2 NFW clusters

Areas according to different data sources



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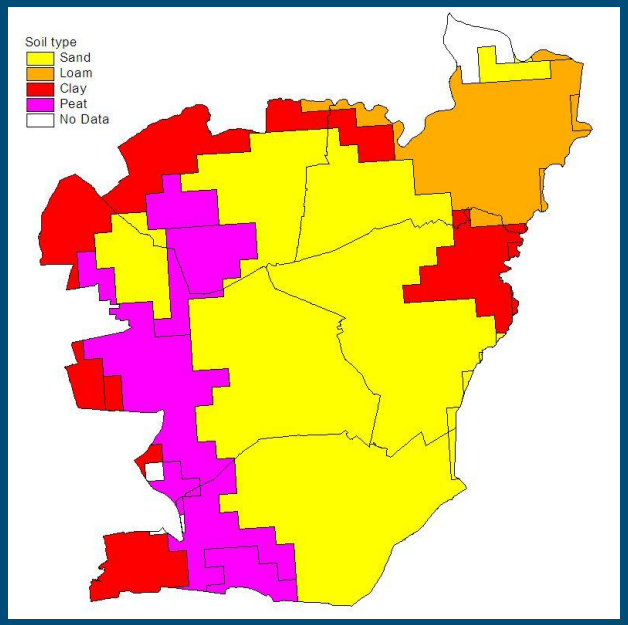
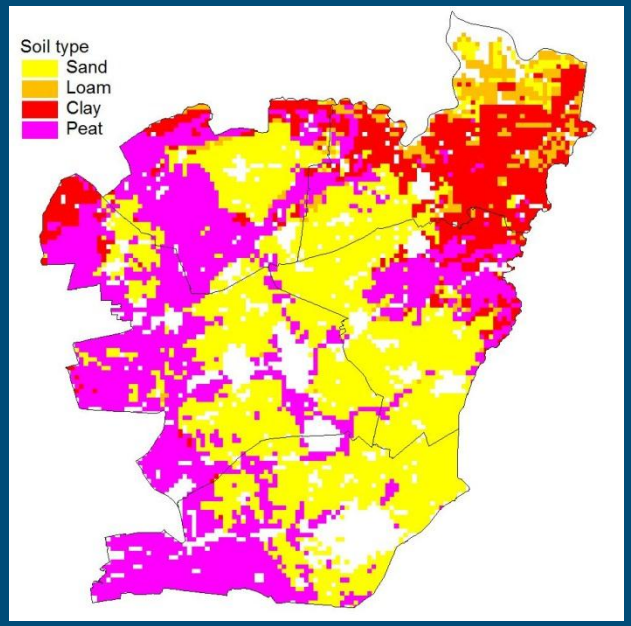
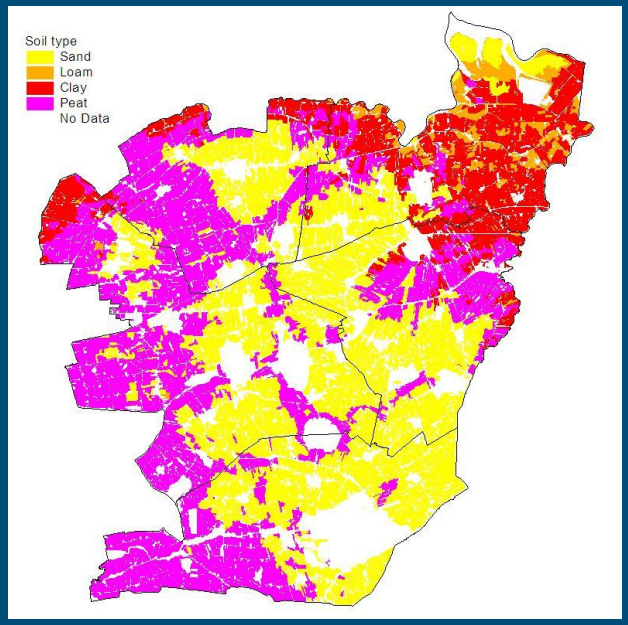
Soil type: European, National, Regional

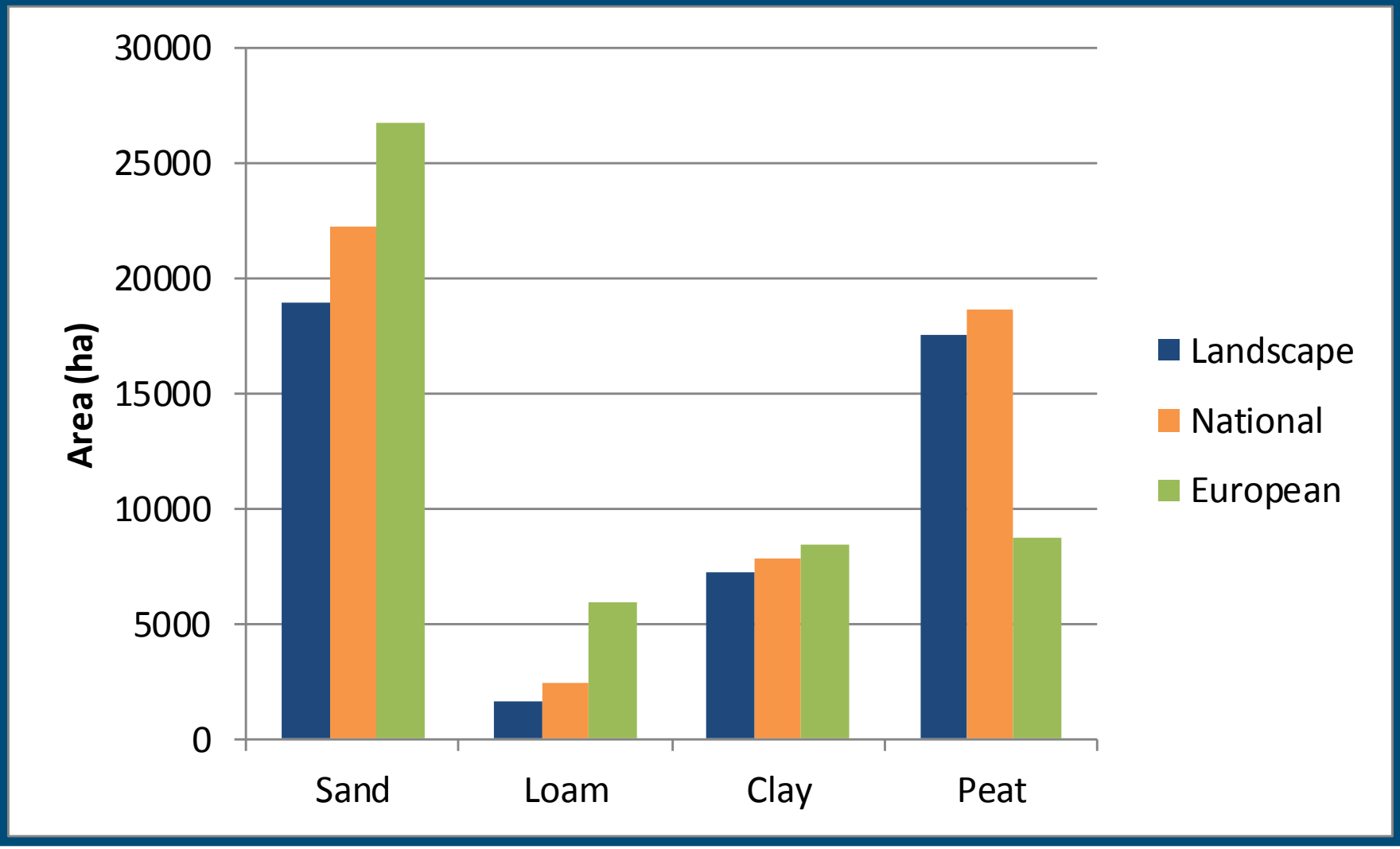






- EU Soil Map/ INTEGRATOR clusters
- NL Soil Map/ INITIATOR2 clusters
- NL Soil Map/ INITIATOR2 NFW clusters

Areas according to different data sources



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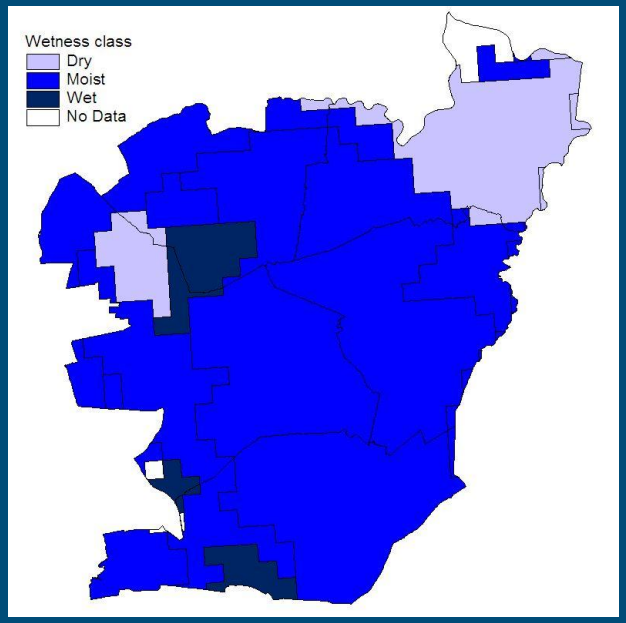
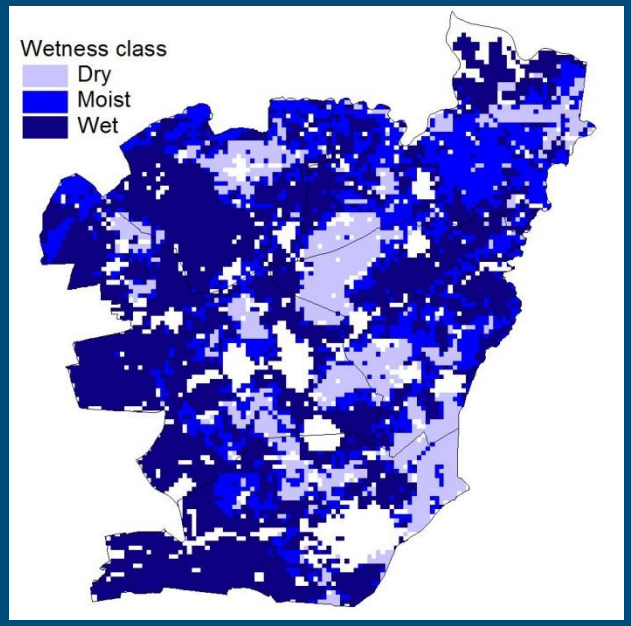
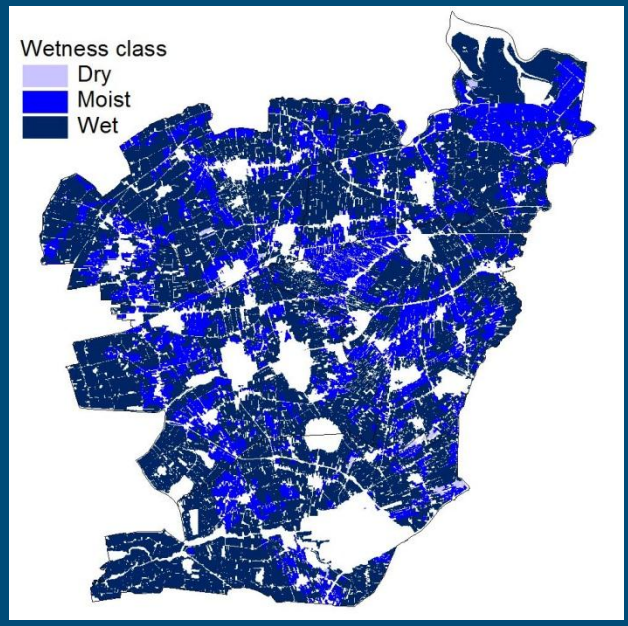
Wetness class: European, National, Regional







- EU GT Map/ INTEGRATOR clusters
- NL GT Map/ INITIATOR2 clusters
- NL GT Map/INITIATOR2 NFW clusters

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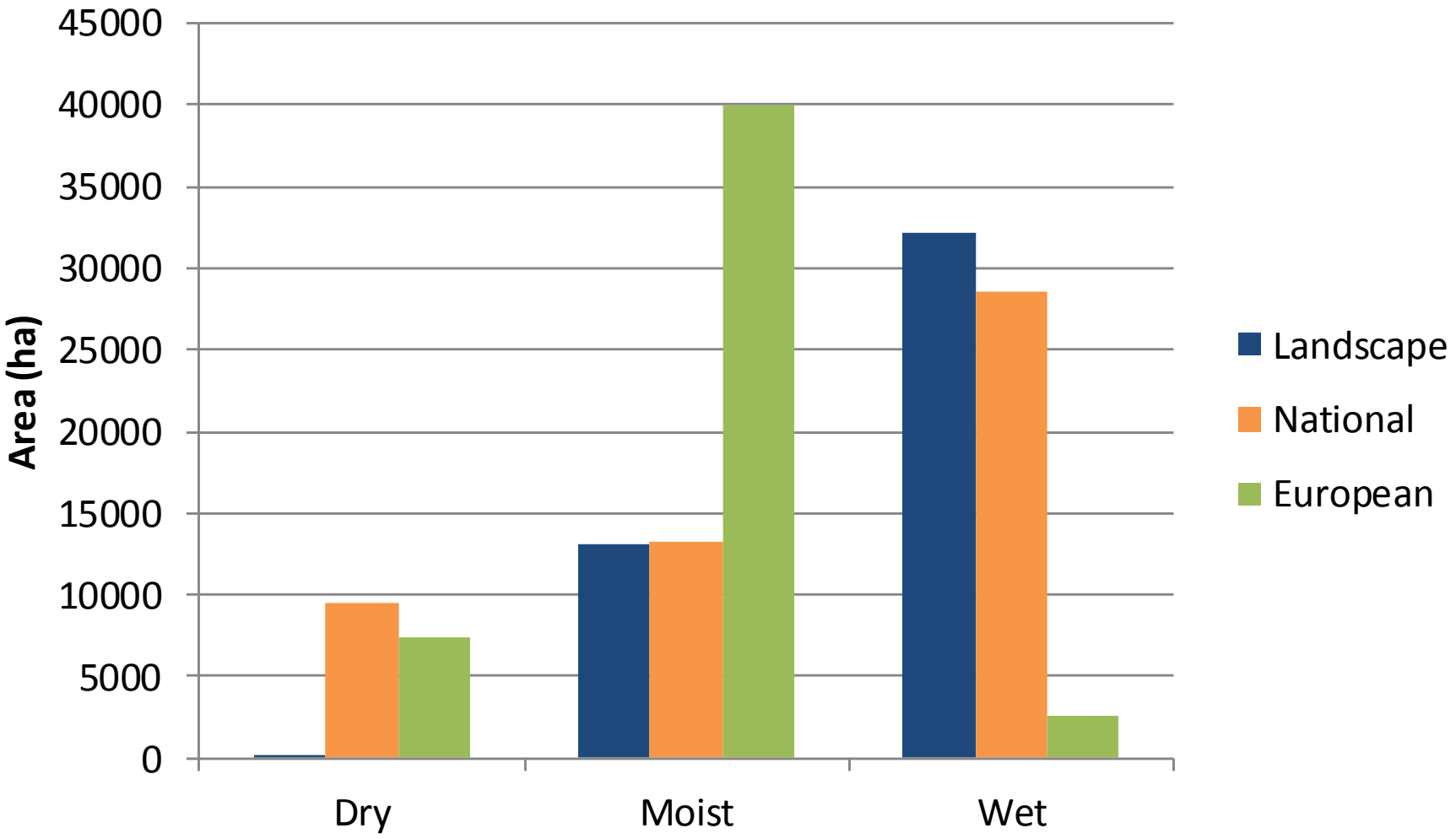
Areas according to different data sources



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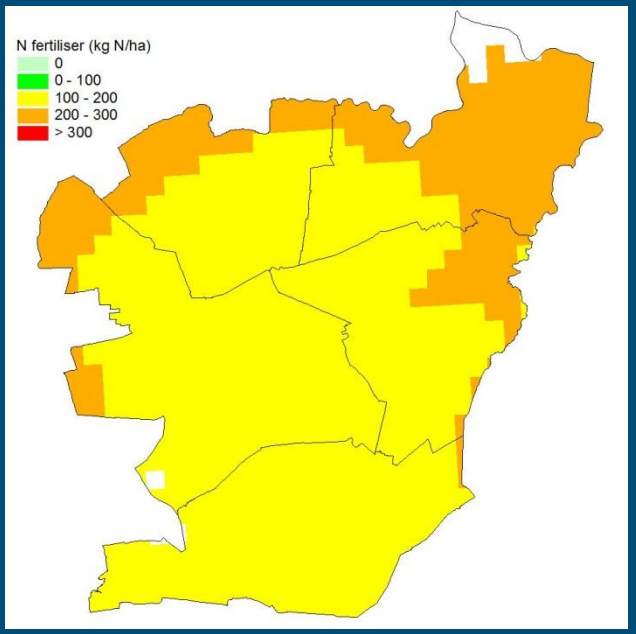
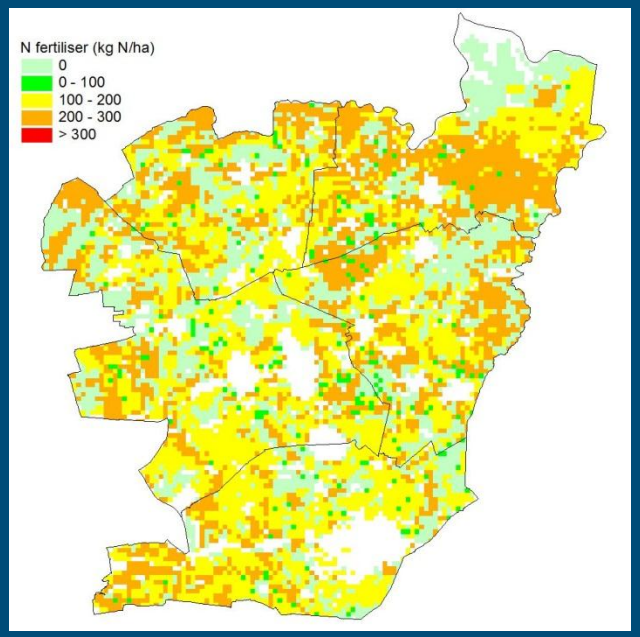
Effect of resolution on N_2O emissions

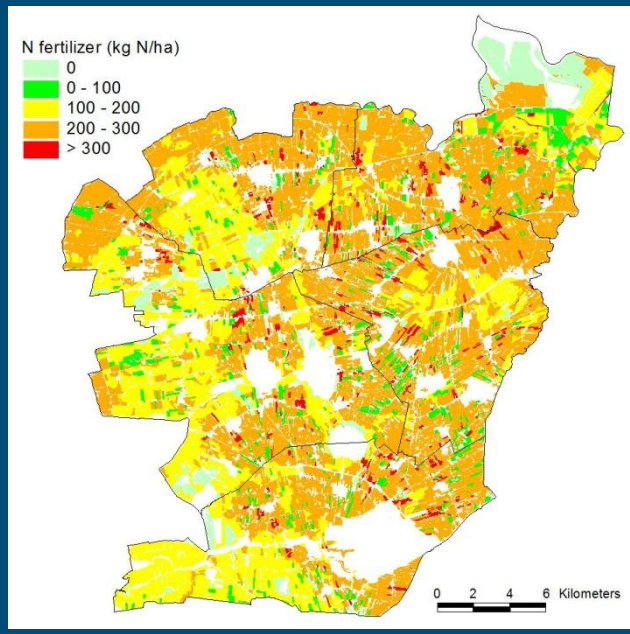
Fertilizer use 2007 (kg N ha^{-1})



European

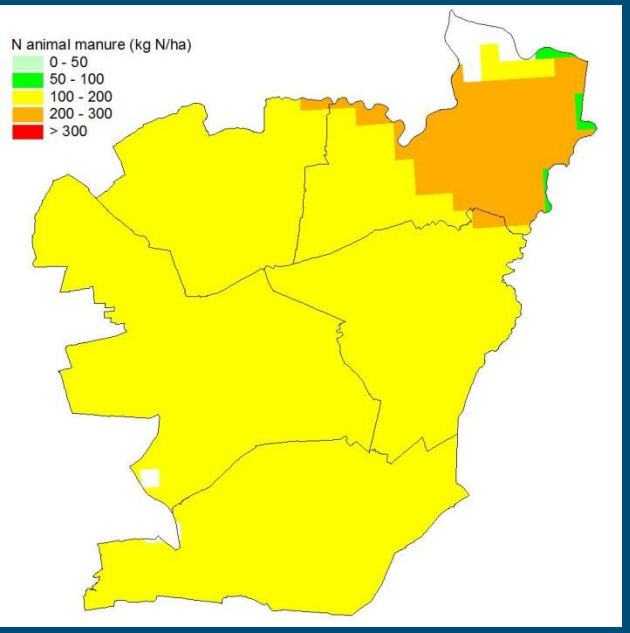


National

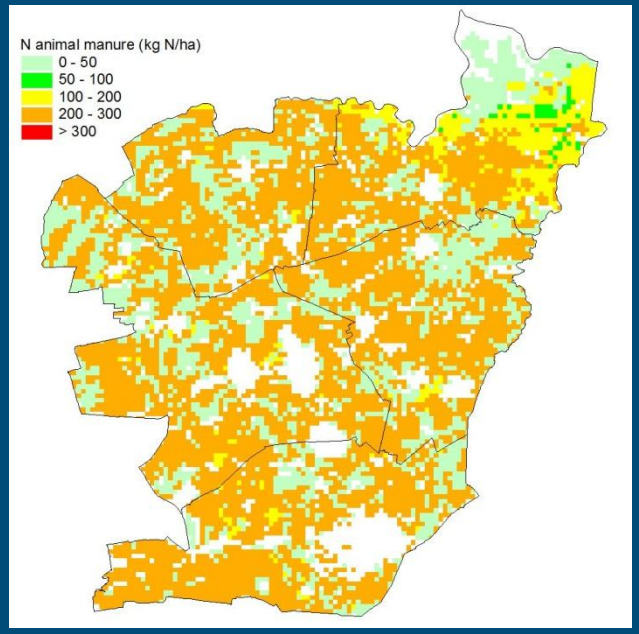


Landscape

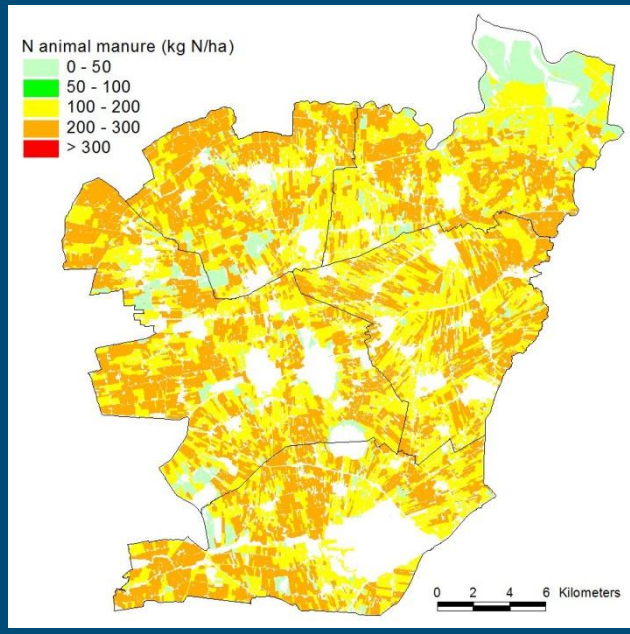
Application animal manure 2007 (kg N ha^{-1})



European

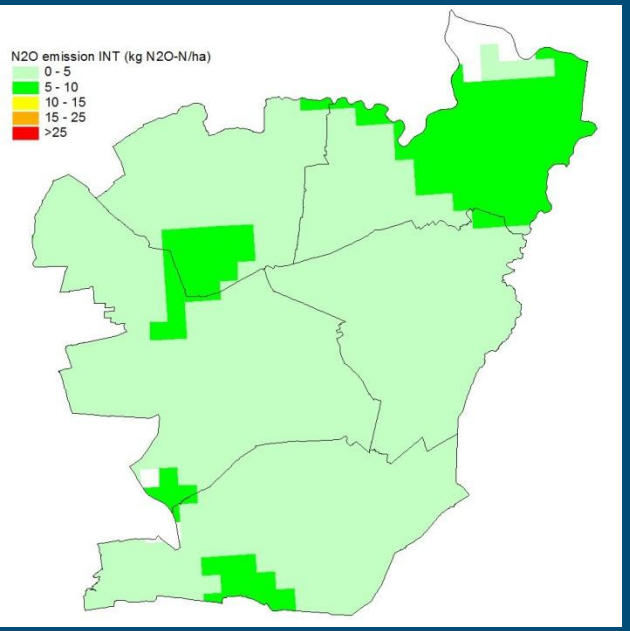


National

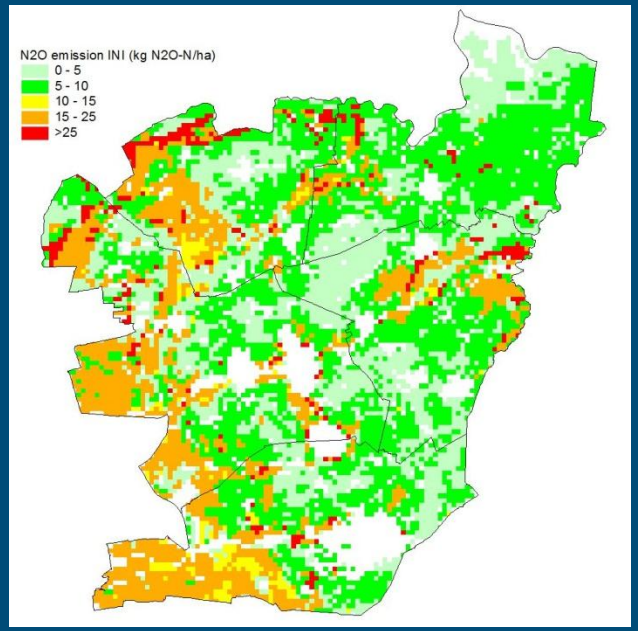


Landscape

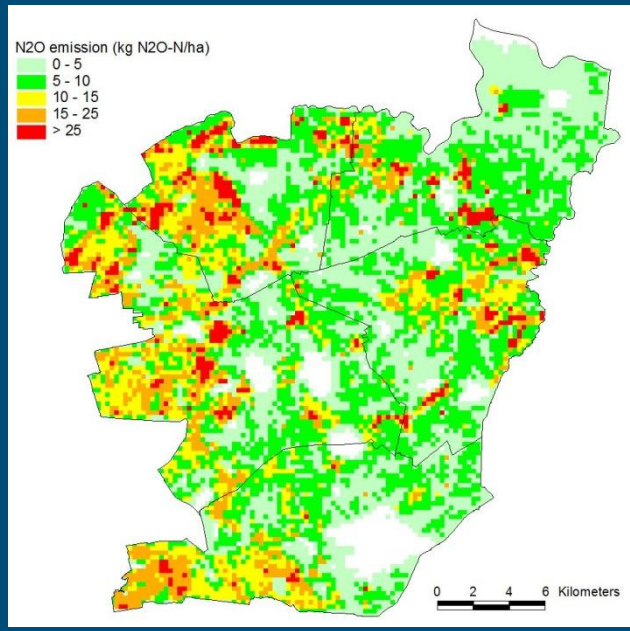
N_2O emission 2007 (kg N_2O-N ha^{-1})



European



National



Landscape

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Effect on N_2O fluxes in NFW due to difference in resolution

Resolution	Area	N_{am}	N_{fe}	N_2O_{emh}	N_2O_{denis}	N_2O_{emdi}	N_2O_{emgw}	N_2O_{emt}
	(km^2)	(kton N)		(kton N_2O-N)				
EU	▲ 499	▲ 8.6	– 9.7	– 0.02	▼ 0.17	▼ 0.01	▲ 0.02	▼ 0.22
NL	▼ 367	▲ 8.3	▼ 7.4	– 0.02	▼ 0.40	▼ 0.03	▲ 0.02	▼ 0.47
NFW	– 423	– 8.2	– 9.7	– 0.02	– 0.43	– 0.04	– 0.01	– 0.50

- N_{am} = animal manure
- N_{fe} = fertilizer

- emh = housing emission
- denis = soil emission
- emdi = ditch emission
- emgw = groundwater emission
- emt = total emission

Conclusions

- Large scale data are biased:
  - Grassland areas: NFW~NL<<EU
  - Peaty soils: NFW~NL>>EU
  - Wet soils: NFW>NL>>EU
- The higher the resolution, the higher the N_2O emission; mainly due to soil emission
- Lower N_2O emission estimates based on coarse European data are due to an underestimation of peat soil and wet areas
- This may have consequence for the European estimates

Thank you

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