Possibilities for National Aspirational Targets

Maximilian Posch & Rob Maas

PBL/CCE

Bilthoven, Netherlands

Aspirational targets: The Nitrogen Challenge

	MFR 2050 with 80% reduction of CO_2 emissions	No damage to health & ecosystems
SO_2	80 %	50 %
PM / Black carbon	80 %	50 %
NO_x	*50 %*	80 %
NH_3	*30 %*	80 %

Indicative European wide emission reduction percentages (+/- 10%) based on TFIAM/ACCENT-workshop 5-6 March 2009

Context & Content

-Request WGSR: can aspirational targets be set at the national level?

-Assumption is that (national) cost-curves for 2050 cannot be known (otherwise we could use GAINS)

- Continuation of looking into ‘equitable’ emission reductions and their consequences for environmental targets (critical load exceedances) → per km^2 of per person ??

- Focus on where pollution is high (convergence per km^2) or where reduction potential seems high (convergence per person).

Equitable emissions of S and N (CLE 2010) with respect to:

1. Equal emissions ***per unit area*** of a country (tS|N/km^2)
   Top 5 and last 5:

S		NOx-N		NH3-N		total N	
BG	4.410	LU	3.259	NL	3.230	NL	5.837
BA	4.012	NL	2.607	BE	2.146	LU	5.161
MD	1.727	BE	2.320	LU	1.901	BE	4.466
PL	1.682	GB	1.350	DK	1.617	DK	2.695
BE	1.617	DK	1.078	IE	1.531	DE	2.458
			…				
AT	0.182	NO	0.187	LV	0.179	EE	0.362
FI	0.092	EE	0.176	RU	0.164	LV	0.317
LV	0.085	FI	0.139	SE	0.095	NO	0.248
SE	0.067	SE	0.138	FI	0.084	SE	0.233
NO	0.034	LV	0.137	NO	0.060	FI	0.222

No change in emissions of IS, AM, AZ, GE, KZ, ASI, NOA, VUL

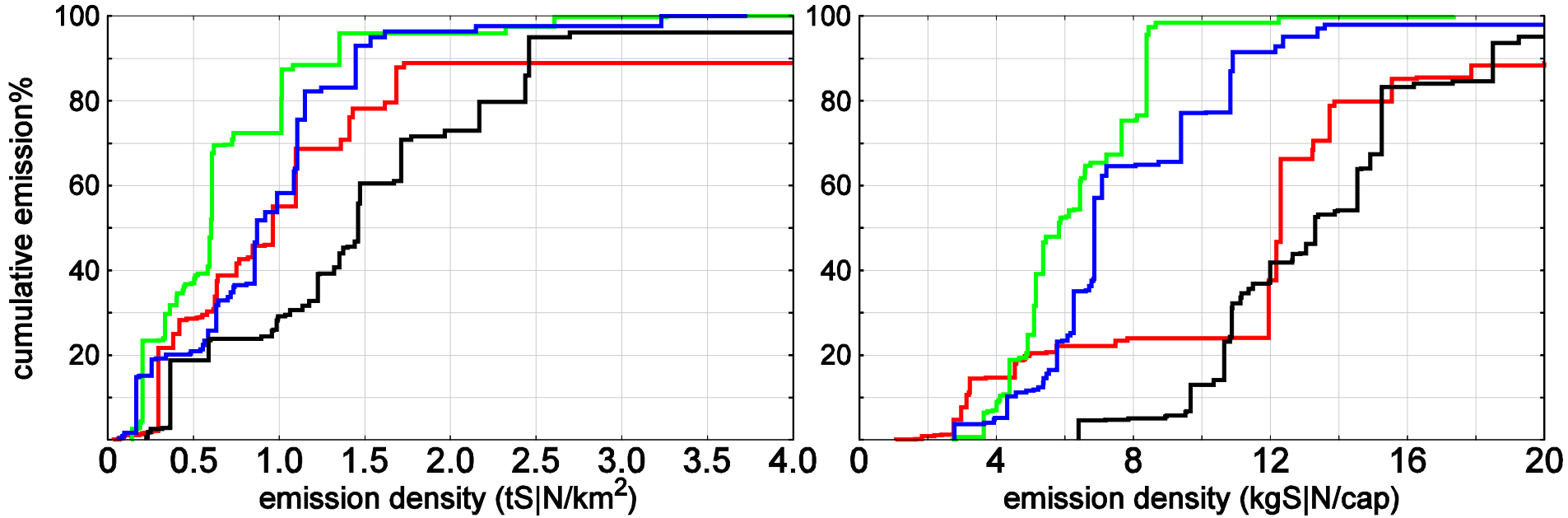
Equitable emissions of S and N (CLE 2010) with respect to:

2. Equal emissions ***per capita*** in a country (kg S|N/cap)
   Top 5 and last 5:

S		NOx-N		NH3-N		total N	
BG	64.337	LU	17.336	IE	23.749	IE	30.497
BA	52.609	NO	12.237	LT	13.580	LU	27.448
MK	19.984	FI	8.644	BG	13.374	BY	20.799
BY	17.862	BY	8.432	BY	12.366	DK	20.249
EE	16.264	RU	8.379	DK	12.148	BG	19.245
			…				
NO	2.191	LV	3.892	NO	3.948	LV	8.969
NL	1.823	LT	3.740	GR	3.921	SK	8.923
AT	1.822	TR	3.625	BA	3.649	BA	7.854
DK	1.625	CH	2.816	MT	2.847	MT	7.174
CH	1.066	AL	2.717	TR	2.770	TR	6.395

Data: Eurostat, populations as of 1 Jan 2009 [2005]

… and the same in graphical form:



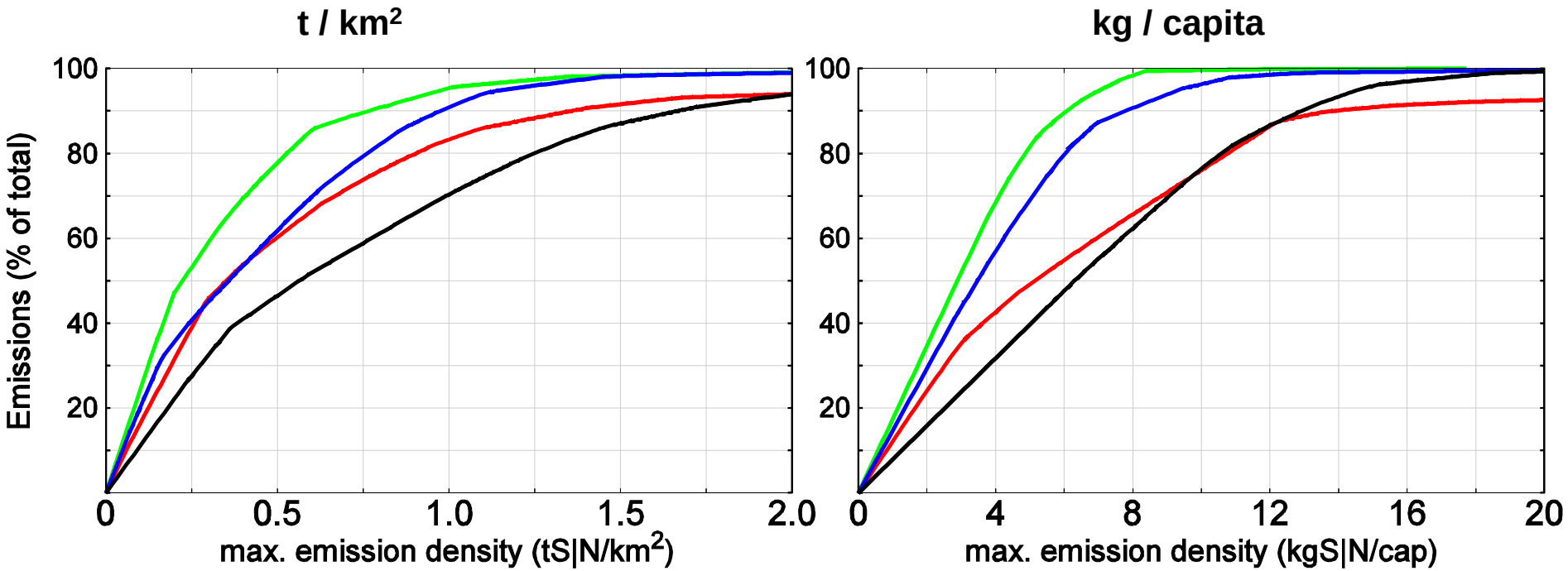
Cumulative distributions of countries' CLE2010 emissions as function of their areal (left) and per capita (right) emission densities (red=S, green=NOx-N, blue=NH3-N, black=total N).

European emissions – and CL exceedances – as function of a maximal emission density

$$y = \sum_k \min \{ x, x_{2010,k} \}$$

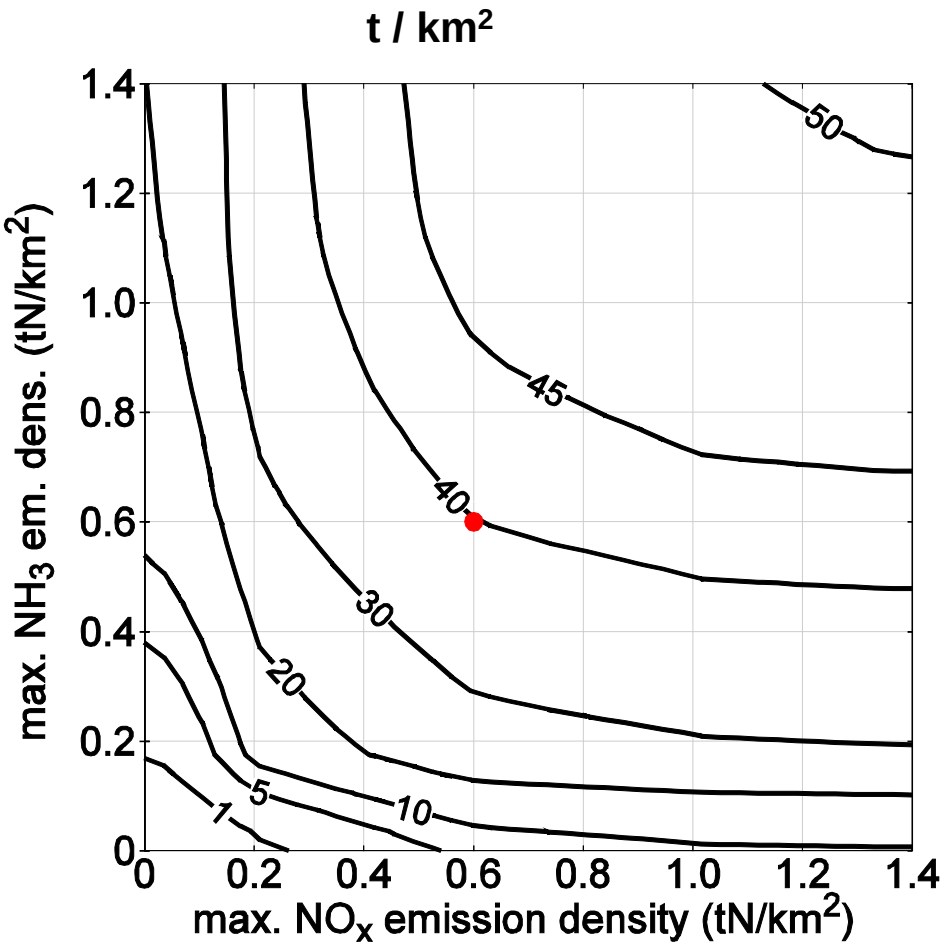
x = maximum emission density

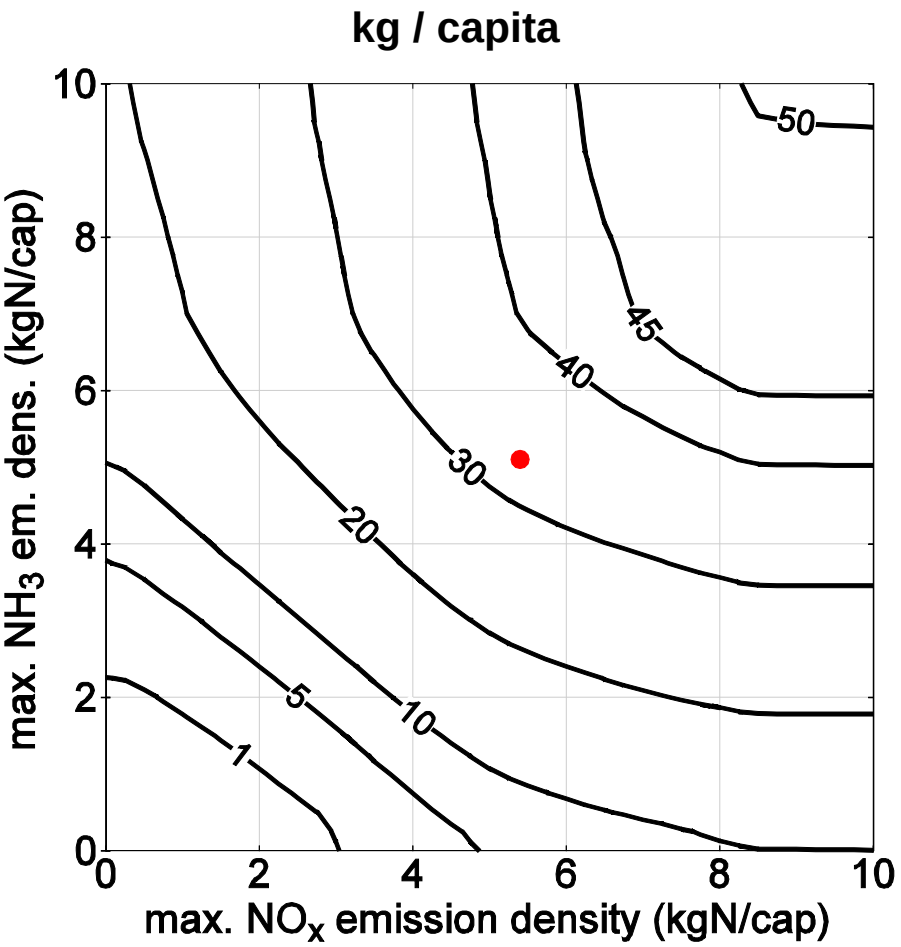
$x_{2010,k}$ = CLE2010 emission density of country k



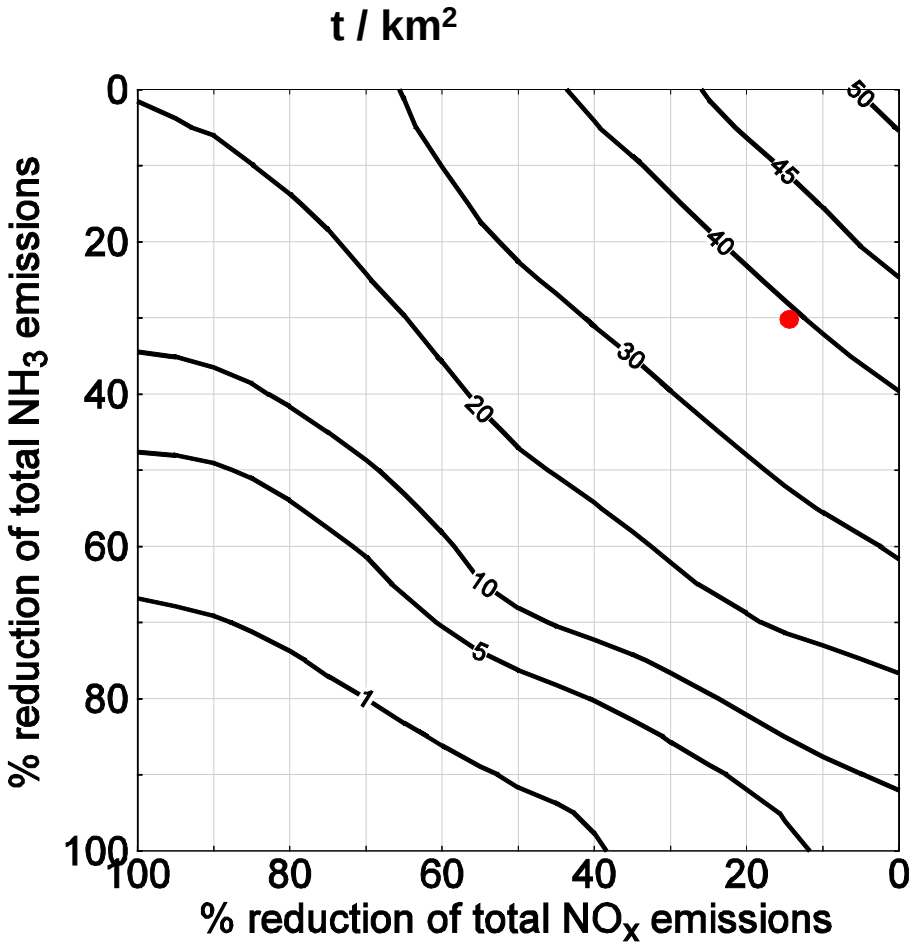
red=S, green=NOx-N, blue=NH3-N, black=total N

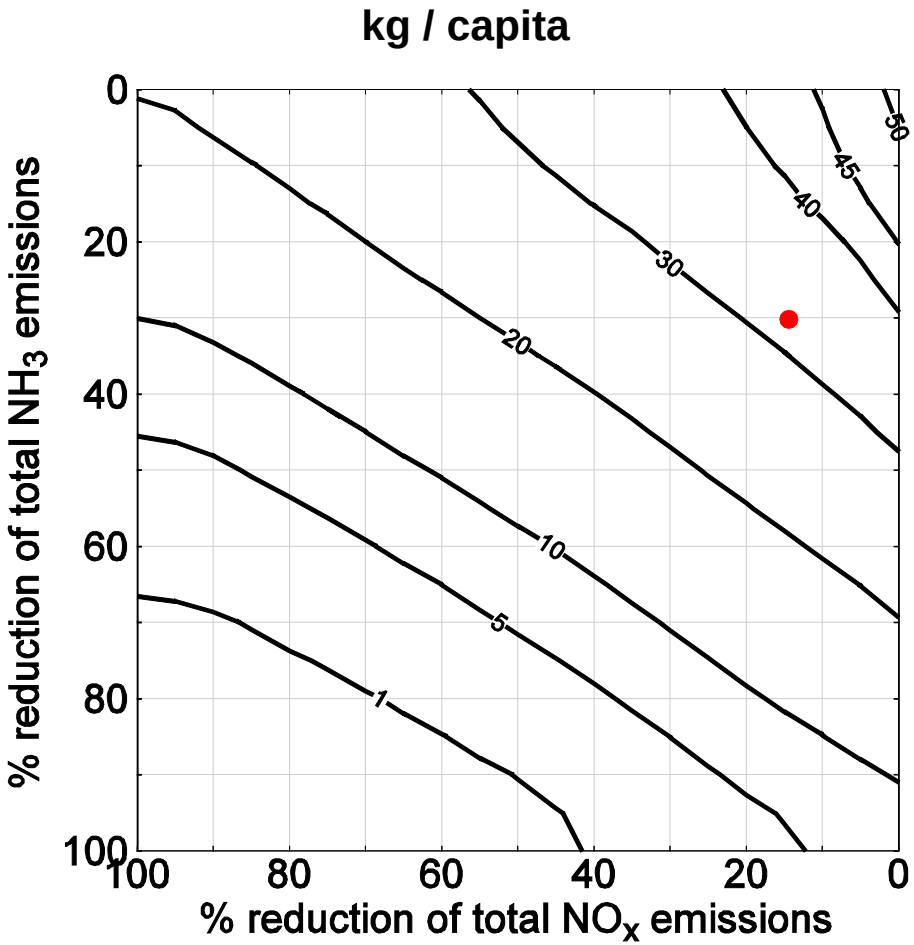
European ecosystem area where CLnutN is exceeded as function of maximum emission densities:



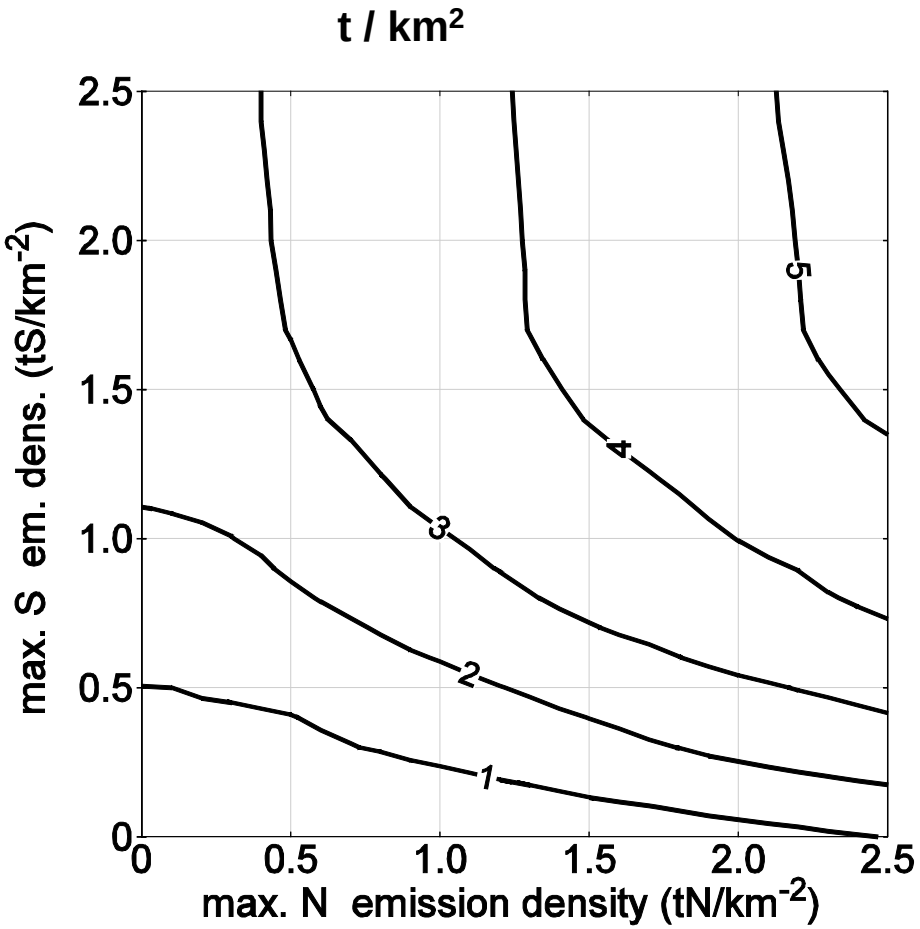


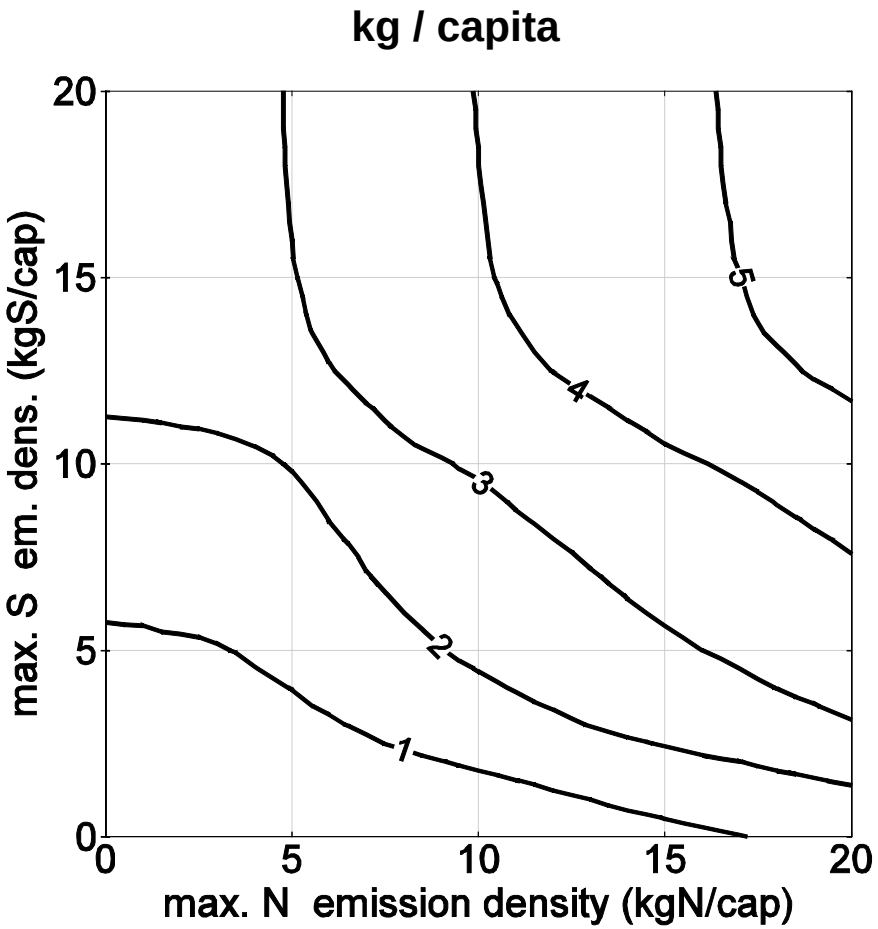
European ecosystem area where CLnutN is exceeded as function of overall emission reductions driven by declining maximum emission densities:



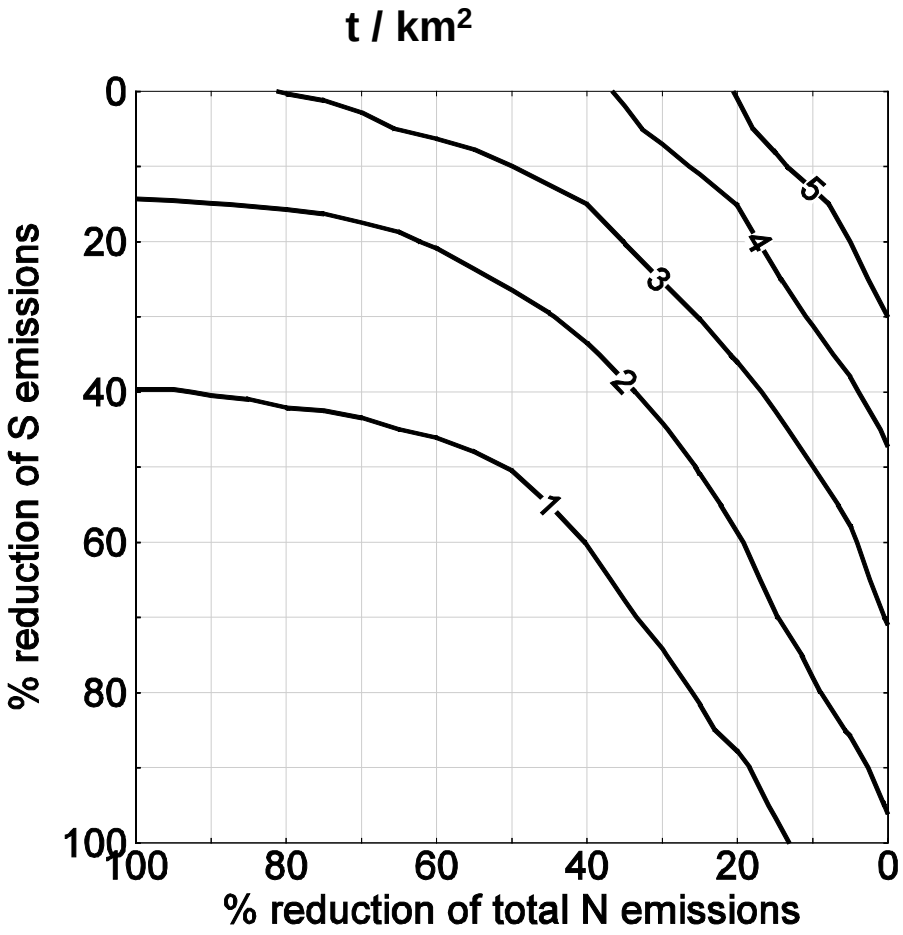


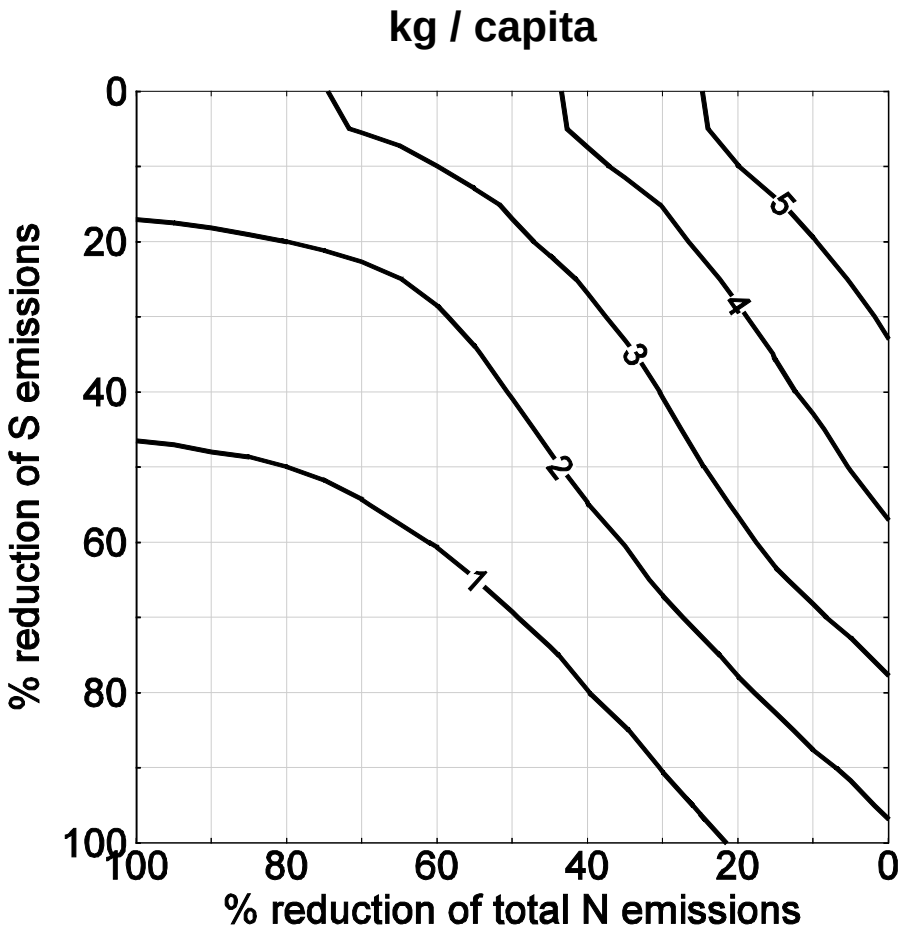
European ecosystem area where acidity CLs are exceeded as function of maximum emission densities:





European ecosystem area where acidity CLs are exceeded as function of overall emission reductions driven by declining maximum emission densities:





Percent emission reduction → emission densities:

Reducing overall emissions by 50% (S and N) in this equitable way would require the following reductions in individual countries:

S:		NOx:		NH3:	
BG	78.2%	NL	73.1%	NL	75.0%
BA	76.1%	BE	59.6%	LU	71.7%
MD	44.4%	LU	54.3%	BE	67.3%
PL	42.9%	DK	46.3%	DK	45.8%
BE	40.6%	IE	43.3%	DE	40.6%
MK	40.5%	DE	39.9%	GB	40.1%
HU	32.9%	CH	30.3%	IT	32.6%
RO	31.8%	IT	24.5%	IE	25.7%
CS	29.3%	FR	21.4%	CH	17.5%
TR	12.3%	MD	20.3%	FR	14.7%
		GB	20.0%	MD	12.6%
		RO	12.1%	PL	0.7%
		BG	5.3%		

Countries not in column → no reduction required

Remarks:

(a) Not effects-based!

(b) Linearised EMEP model stretched to limit!

(c) Interesting, but probably difficult to agree upon …

Conclusions:

- Isolines for areal and per-capita as function for the max. density look very different for low densities.
- For the same overall emission reductions, max. per capita reductions are environmentally more beneficial (smaller area exceeded) than per area reductions.
- Fairly low max. emission densities don't mean big emission reductions.

Caveat: Assuming linearity of the EMEP model for (very) low emissions may damage your credibility!

… but then … ☺

Outlook:

- Work will continue …
  (on an off-and-on basis & w/o commitment)

- Other equity measures will be considered:
  e.g., GDP, agricultural area (for NH_3) etc.

- Combining different equity measures for the involved pollutants will be investigated
  (e.g. S in kg/cap and N in t/km^2)

- Looking forward to comparisons with optimised (or any other) scenarios!