Multi-pollutant mid-term GAINS scenarios for HTAP; *Progress*

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Introduction

- First baseline (2005-2030) made available after the Geneva meeting – based on the ECLIPSE V4a dataset

- New baseline in the making but progress slower than expected

- Harmonization of estimates (EDGAR-GAINS-REASv2-HTAPv2) for the past years not completed

Considered scenario types

- **CLE – 'current legislation'** - efficient implementation of existing environmental legislation

- **NFC – 'no further control'** - a hypothetical calculation showing how emissions would develop if implementation of control measures was 'frozen' at the level of __(?)__
  - Earlier 2005 values were used; Should we make it consistent with the discussion on development of 'air pollution' stories for SSPs where a differentiation is made between low (2010) and high income countries is made (2020)? Or 2005-2010?

- **MFR – 'technical maximum feasible reduction'** – implementation of BAT measures considering economic lifetime of technologies and selected other constraints but assuming no institutional and political barriers
  - **FIT** – More 'realistic' version of MFR where more constraints (also regionally specific) would be considered…*longer term development*
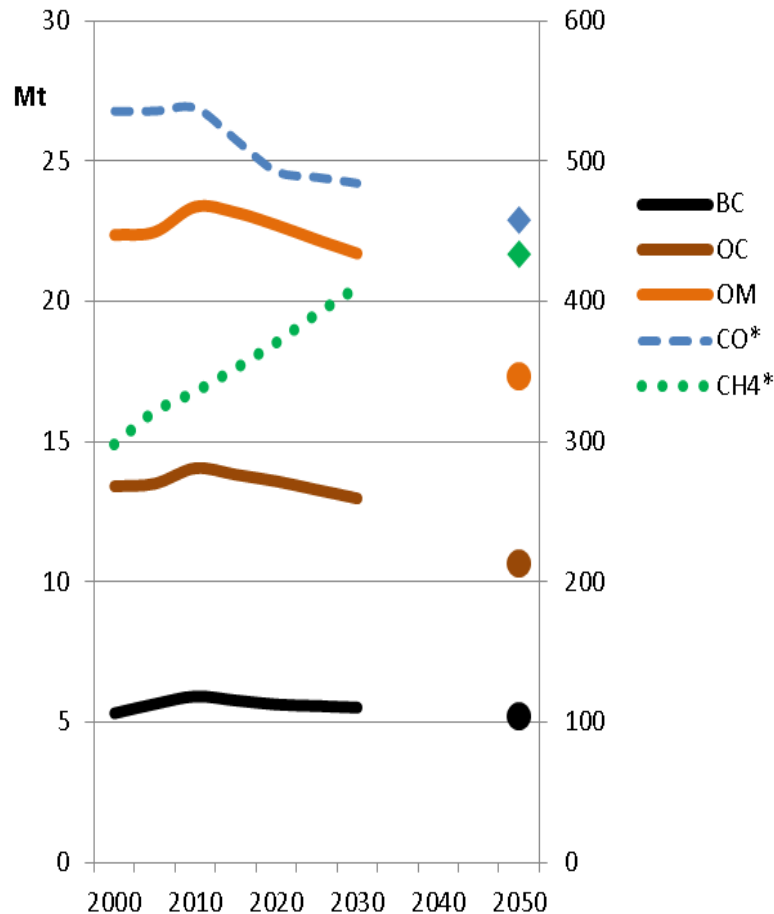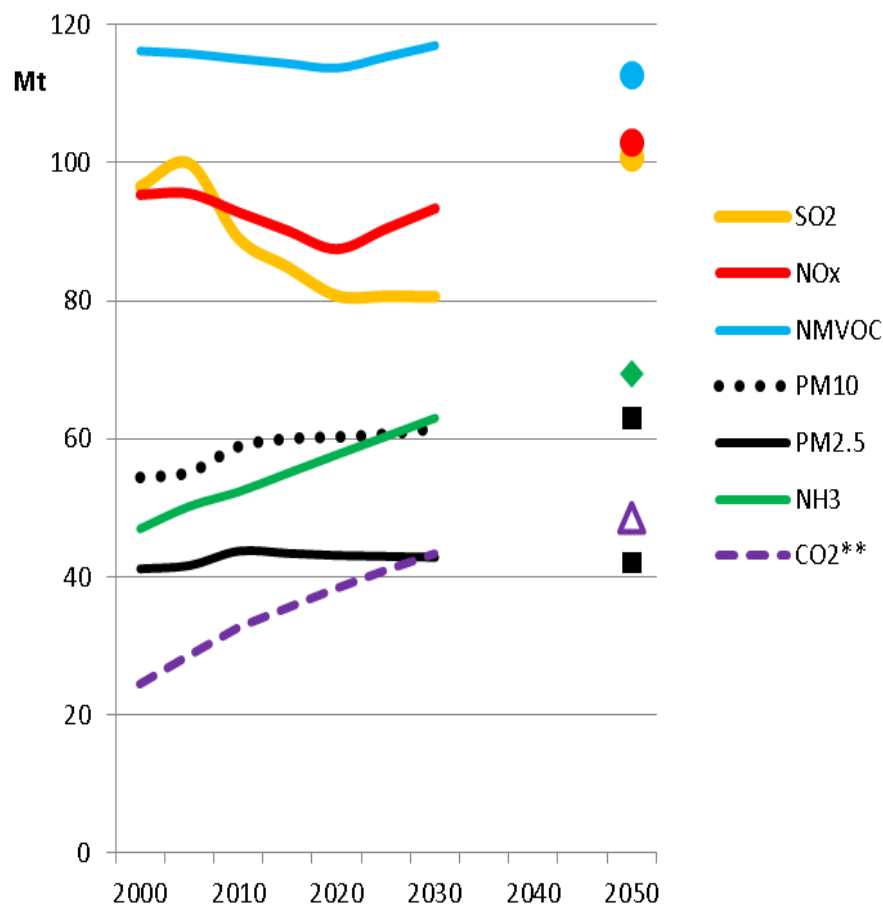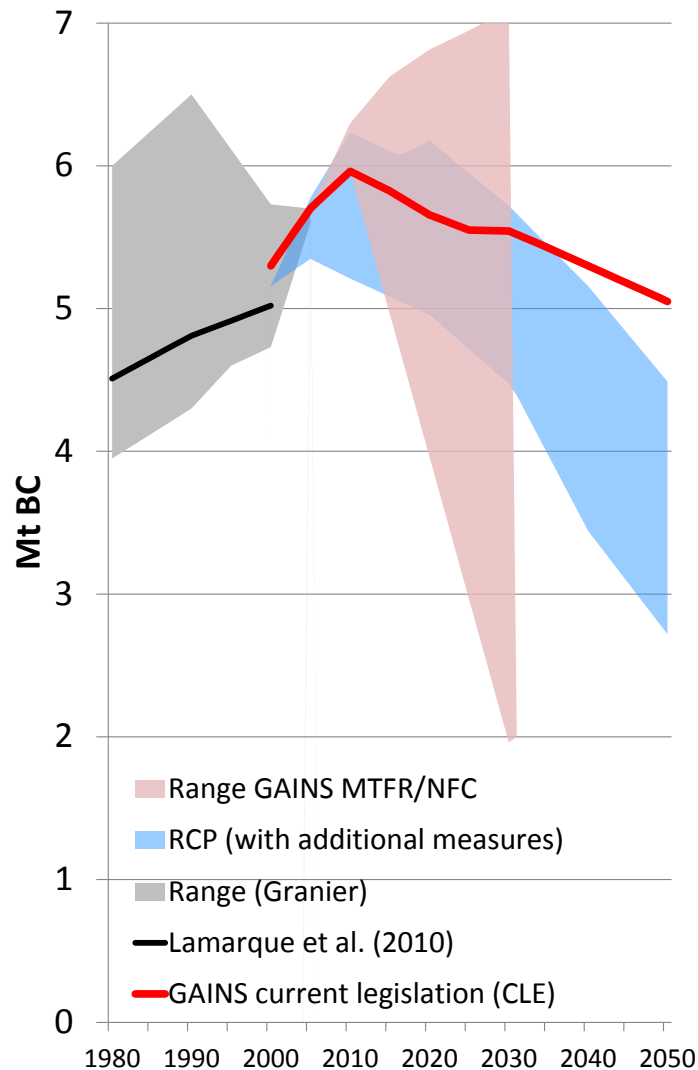
ECLIPSE V4a

- Activity data: WEO (IEA 2011) [updated statistical data for 2010 (IEA)], FAO 2012, PRIMES, CAPRI, National stat.

- Pollutants: SO_2 (consistent with Klimont et al (2013, ERL), NO_x, NMVOC, NH_3, CO, CH_4, PM (incl. BC, OC, OM)

- CLE scenario available for 2005, 2010, 2030, 2050

- MTFR scenario available for 2030 and 2050

- All emissions available for RCP sectors and gridded 0.5°x0.5° (netCDF)

- For Europe TSAP review results included (consistent with report #9 December 2012; available form GAINS web)

- International aviation and shipping and open biomass burning (forests, savannah) originate from RCP and GFED but are also included in the dataset stored on the ECLIPSE web (eclipse.nilu.no)

- Gridded data sets available via GEIA - ECCAD portal (www.geiacenter.org; eccad.sedoo.fr)

ECLIPSE V4a

Global emissions of air pollutants and methane in the baseline scenario (CLE). (*) For CO and CH_4 the right hand scale is used, (**) for CO_2 the units are Gt.

Projections of future BC emissions

Legend:
- Range GAINS MTFR/NFC
- RCP (with additional measures)
- Range (Granier)
- Lamarque et al. (2010)
- GAINS current legislation (CLE)

Y-axis: Mt BC (0 to 7)
X-axis: 1980, 1990, 2000, 2010, 2020, 2030, 2040, 2050

- Baselines suggest declining BC from current pollution controls and hypothesized transition to cleaner energy

- Global RCP climate scenarios make optimistic assumptions (faster access to clean energy, autonomous penetration of Euro-6, etc.)

- GAINS points out importance of dedicated BC control policies

New GAINS emission set

[*v5.0 in preparation*]

- Recalibration of 2010 energy data in GAINS (based on country stats from IEA) followed by revision of past time series for 1990-2005.

- Two baselines drawing on the IEA projections (Energy Technology Perspectives 2012); i.e., 6°C scenario consistent (until 2035) with the current policy scenario from World Energy Outlook and 2°C mitigation scenario – comparable to the WEO 450ppm

- For Europe include the final TSAP (Review of NEC Directive) results

- For China working with Tsinghua University to consideration the 12th 5-year plan and new spatial distribution for power sector (from MEIC system)

- Adding explicitly kerosene wick lamps and diesel generators

- Updating global estimates for solvent use and oil&gas prod. and distr., including geographical shift in oil and gas production in the Arctic

- Updating parameterization and list of technologies for brick production

- Revision and update of transport sector structure for South Asia, Africa and Latin America

- Some of the above is already implemented … but more updates under way

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New and updated elements in the GAINS database

- **Diesel Generators** – new estimates of fuel use, global coverage, to be used from V5 onwards

- **Wick lamps** – estimates of kerosene use for lighting from Lam et al. (2013) reproduced but updated this summer in collaboration with N. Lam, global coverage and projections, to be used from V5 onwards

- **Brick manufacturing** – new structure of the sector and new emission factors introduced, global coverage and projections, to be used from V5 onwards

- Filling gaps in estimates for NMVOC emissions from **solvent use and oil and gas production**

- **Gas flaring** – working towards improved spatial distribution

Oil and gas production, energy consumption in transit and petroleum shipping and the September sea-ice extent in 2030 and 2050;
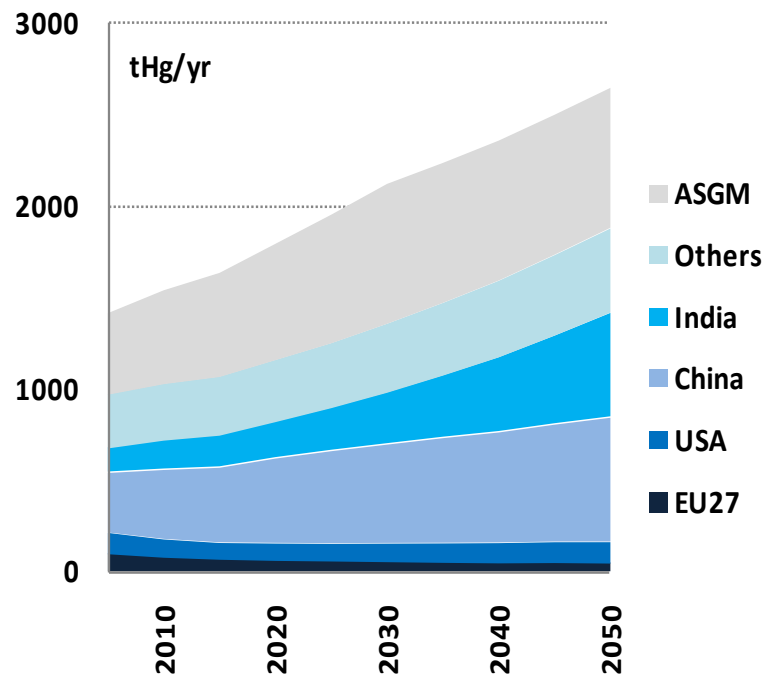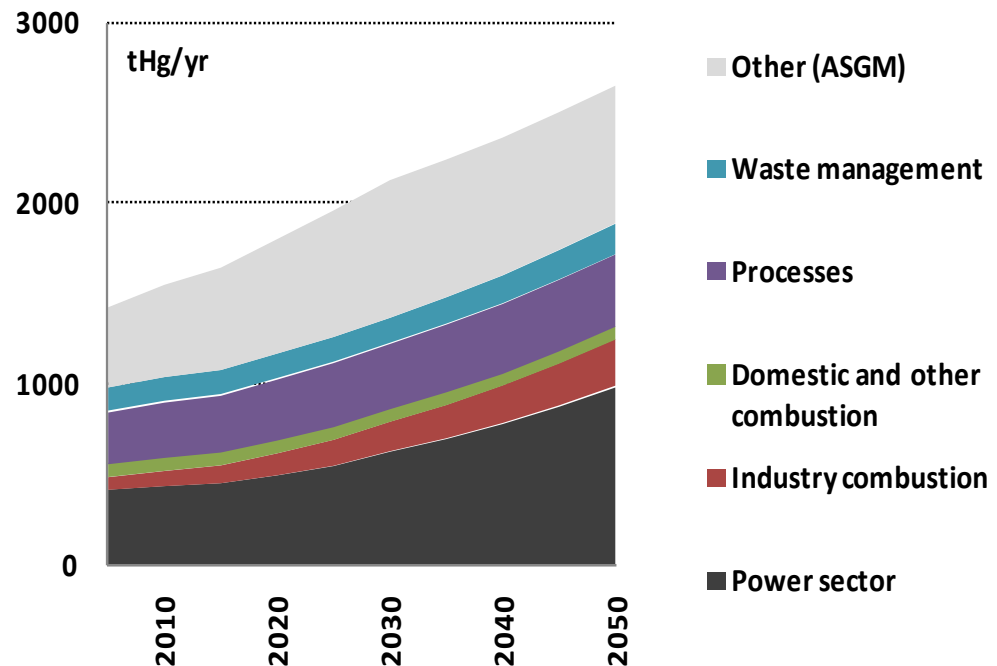*Source: Peters et al. (2011, ACP)*
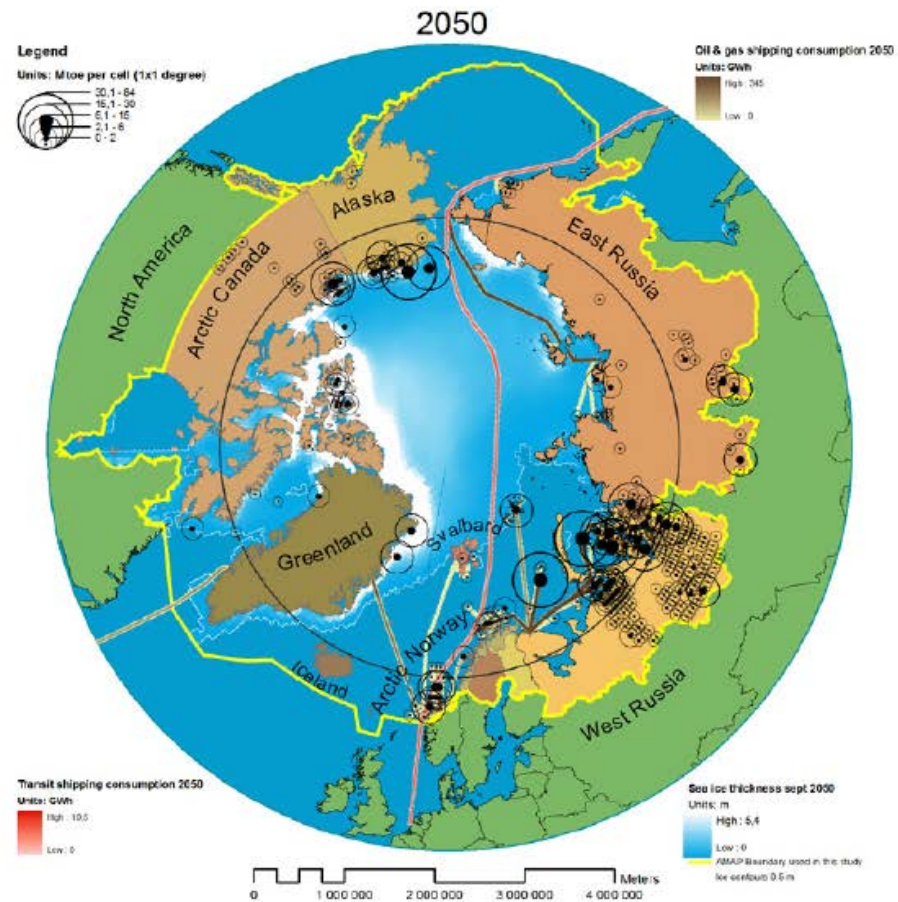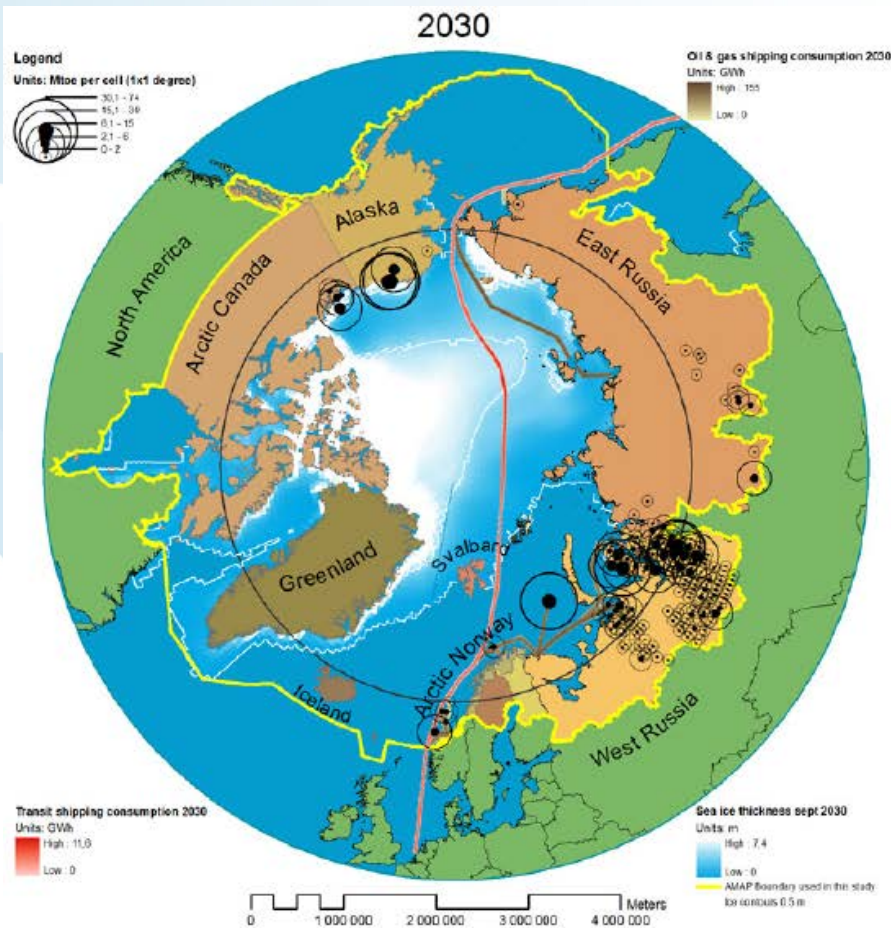
GAINS mercury

- Global baseline and mitigation scenarios developed in GAINS and a paper published
  Rafaj *et al.* (2013) Scenarios of global mercury emissions from anthropogenic sources. Atmospheric Environment **79**, 472-479

- Interested to know more?

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Global mercury emissions: Baseline evolution 2010 - 2050

by regions

tHg/yr

Legend:
- ASGM
- Others
- India
- China
- USA
- EU27

by sectors

tHg/yr

Legend:
- Other (ASGM)
- Waste management
- Processes
- Domestic and other combustion
- Industry combustion
- Power sector

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Outlook

- 1990-2010 update should be completed before X-mas

- Projections imported by X-mas and validated in the first week of January 2014

- V5 Baseline will be presented end of January at the ECLIPSE meeting (Reading, UK)

- NFC and MFR scenarios will be done beginning of February

- Working on a new GAINS global viewer version that will be publically accessible and allow to view and download activity data and emissions aggregated to 26 global regions, RCP sectors, and also gridded sets.