For our Environment

Umwelt Bundesamt

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German experiences in developing agricultural emission scenarios and assessing mitigation options

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Section II 4.1 „General Aspects of Air Quality Control“

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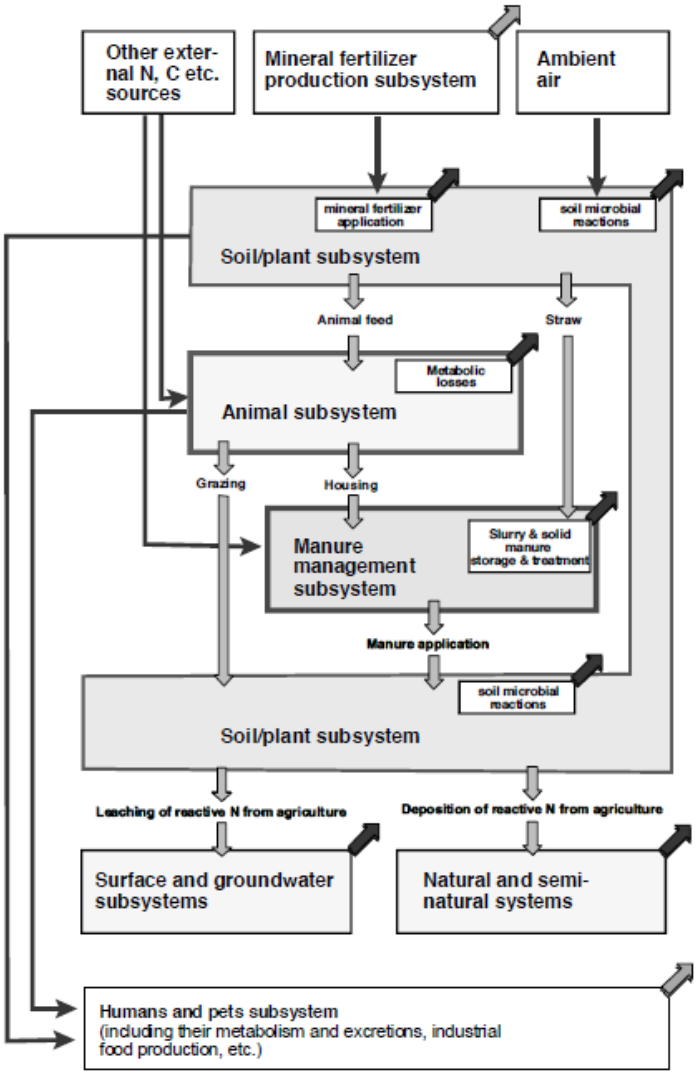
Methodology

- The model **GAS-EM** (developed by the Thünen-Institut) is used to calculate gaseous and particulate emissions from animal agriculture and crop production.
- It uses a mass flow approach with animal specific excretion rates. The N flow through different stages of the manure handling chain is simulated.
- GAS-EM is used for the compilation of our annual emission inventory as well as for the development of emission scenarios (up to 2030).



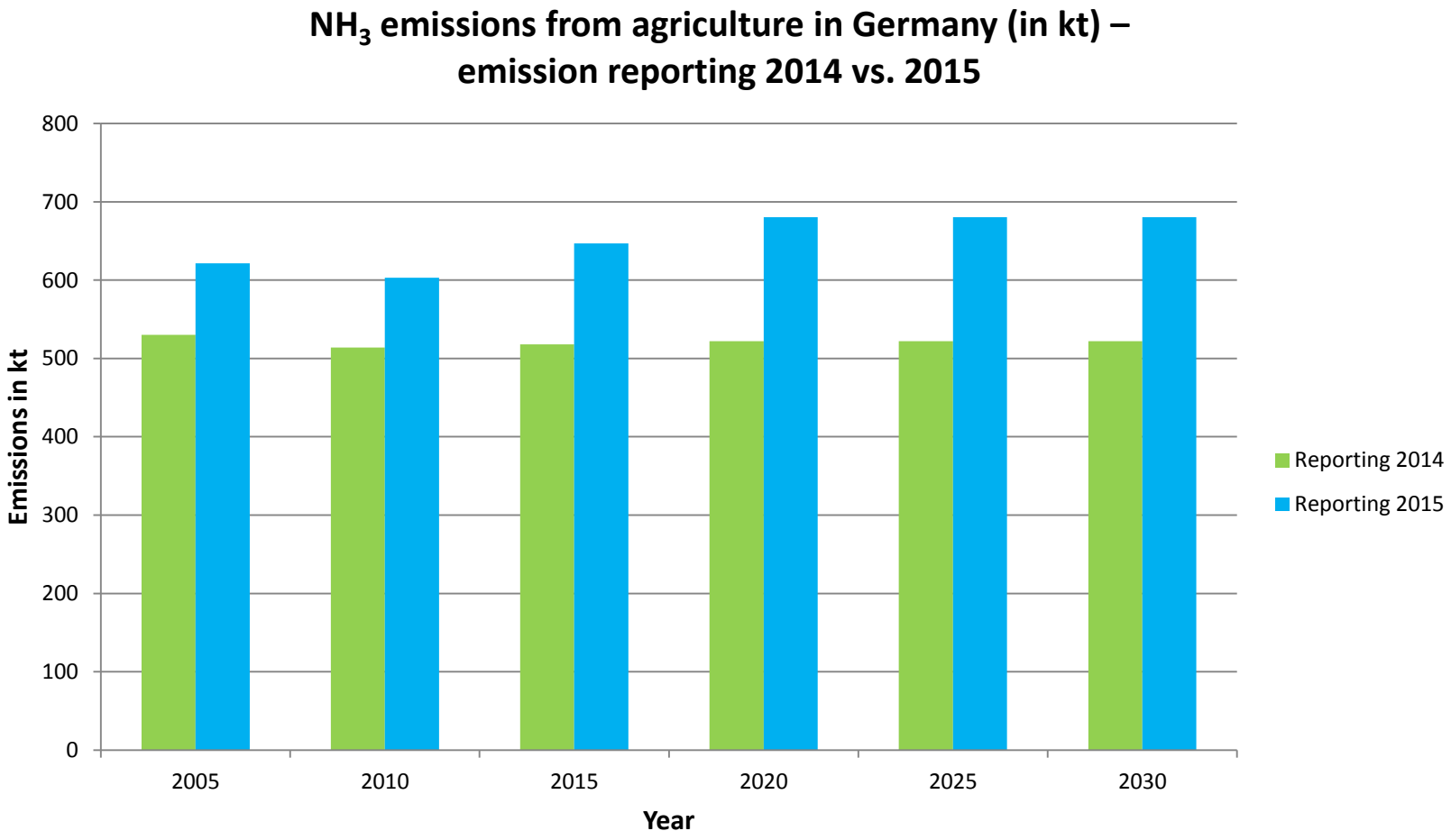
Mass flow in agriculture
Source: Thünen Report 1, 2013

NH_3 emissions from agriculture in Germany – reporting 2014 vs. 2015

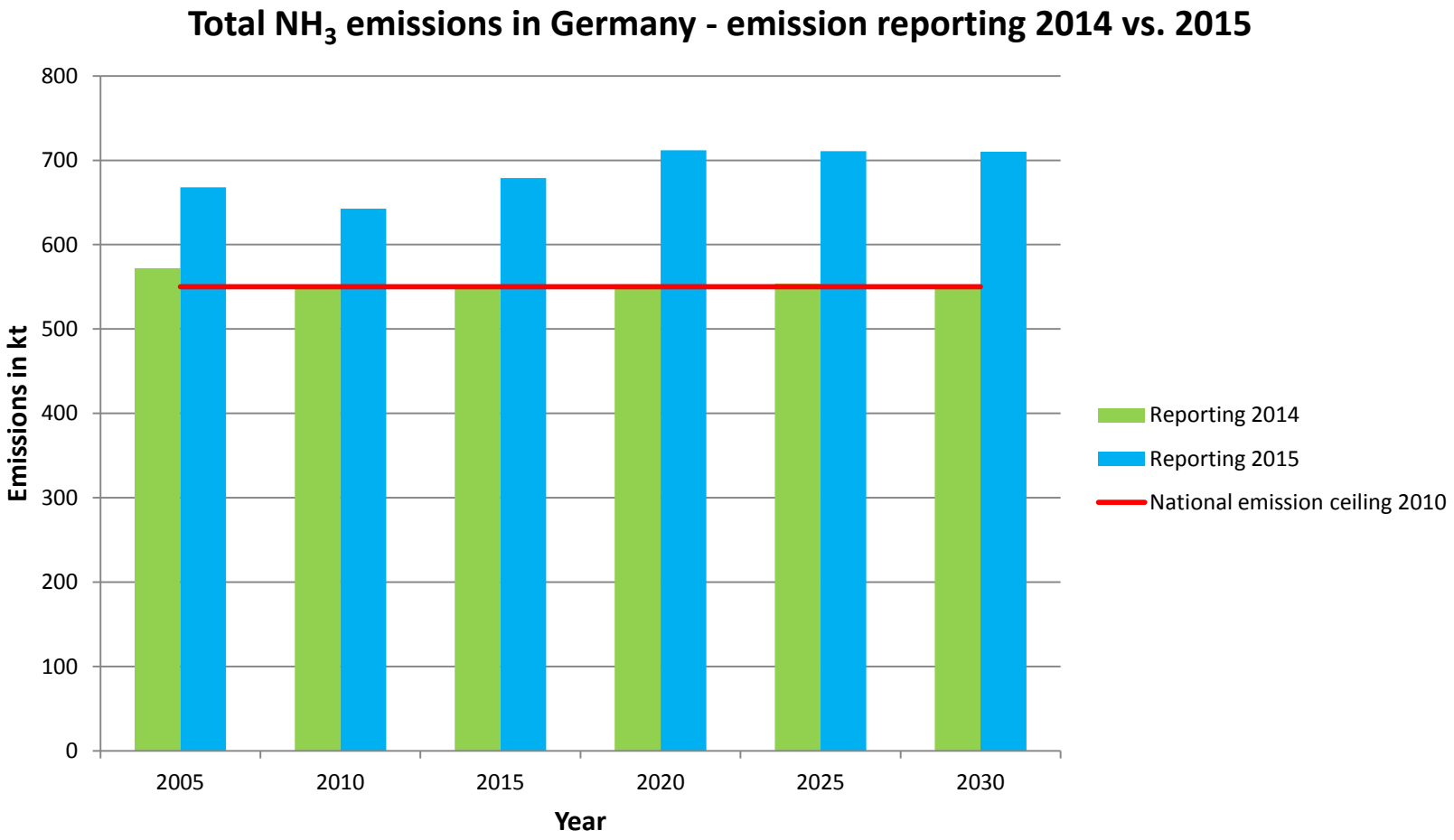
- Significant changes between emission reporting 2014 and 2015:
  - **New emission factors for mineral fertilizer application according to the new EMEP Guidebook (2013)**
  - Update of poultry numbers
  - New calculation method for emissions from horses
  - Changed methodology for estimating fermented manure

→ NH_3 emissions reported in 2015 are about 20-30% higher compared to emissions reported in 2014.

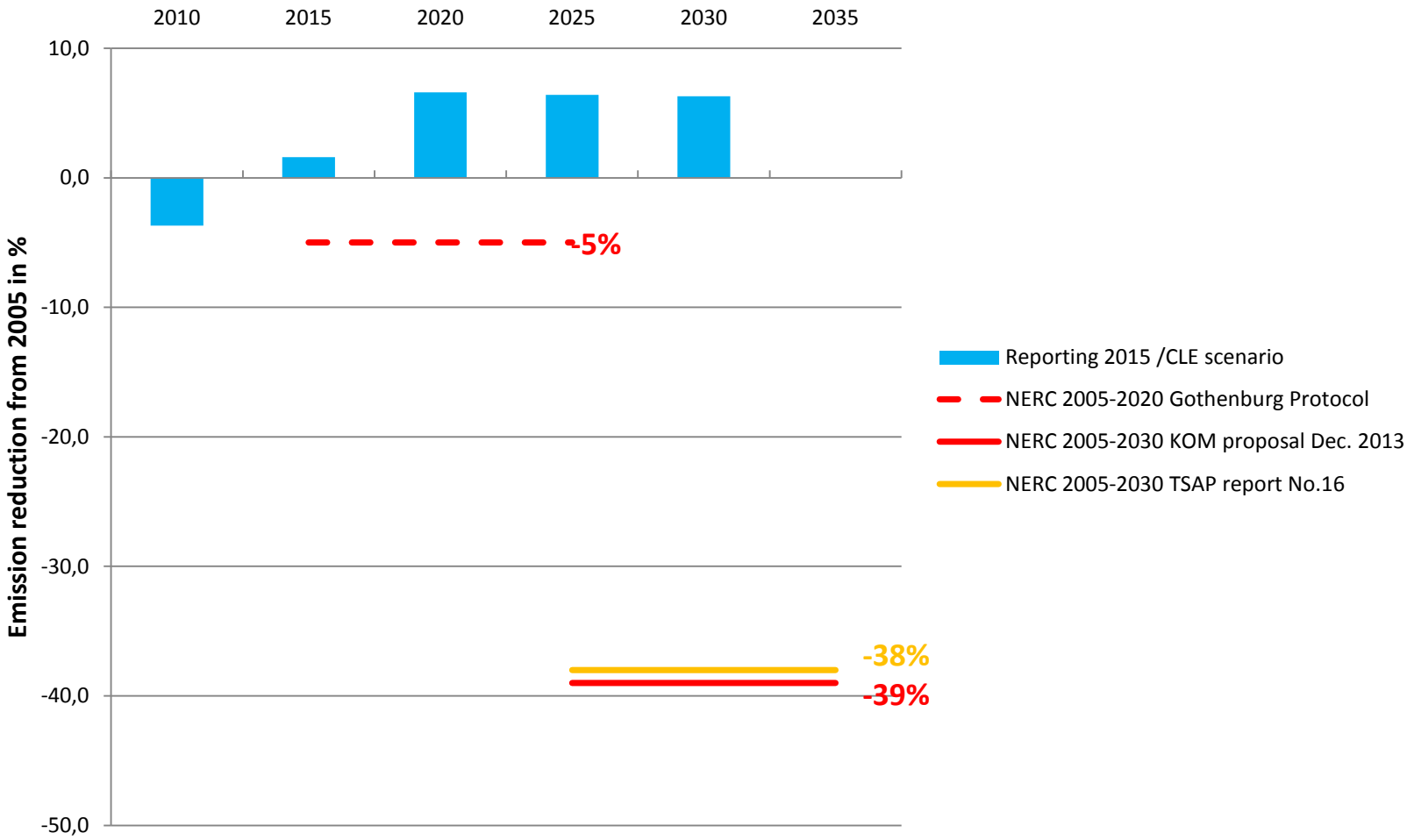
NH_3 emissions from agriculture in Germany – reporting 2014 vs. 2015



Total NH_3 emissions in Germany – reporting 2014 vs. 2015



Reduction of NH_3 emissions in Germany (reporting 2015) – Attainability of NERCs



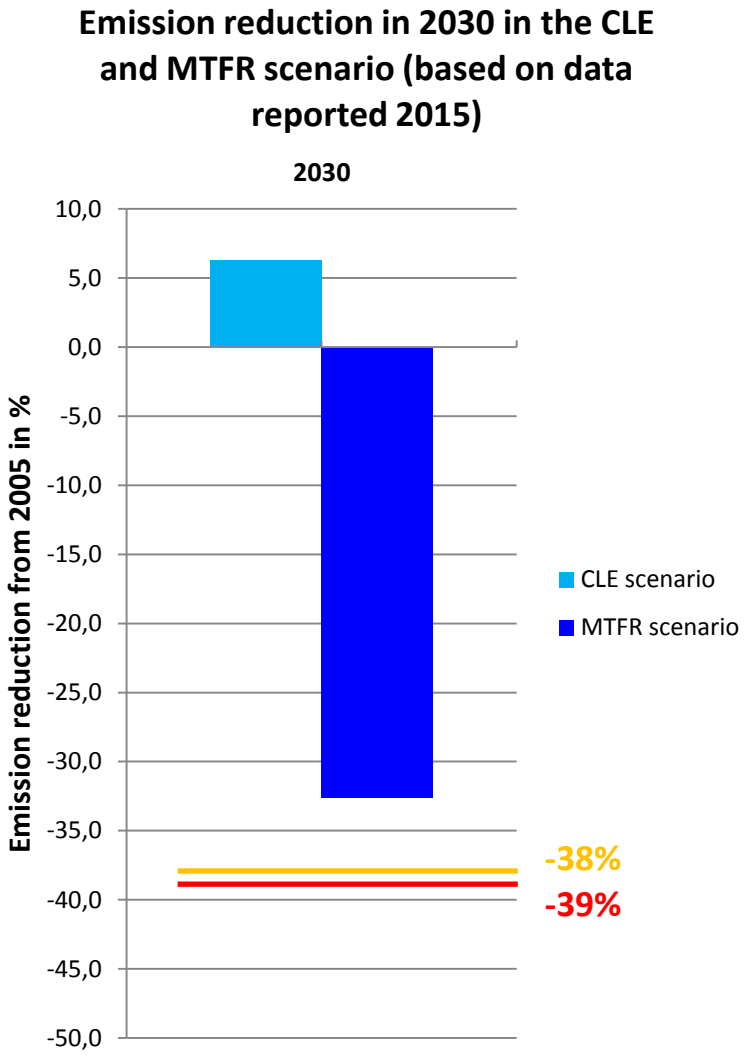
Additional Measures to reduce NH_3 – short-term measures

- Additional short-term measures are needed to comply with the 2010 NEC and the NERC for 2020.
- Possible short-term measures are
  - Incorporation of manure and slurry within 1 hour
  - Low-emission application of manure, slurry and digestates with trailing hose to arable land
  - Covered manure storage
- **Technical reduction potential of all short-term measures: 70 kt NH_3**

Additional measures to reduce NH_3 – long-term measures

- Low-emission application of manure and slurry (trailing hose → arable land, trailing shoe → grassland or deep injection) and incorporation within 1 hour
- Low-emission animal housing (mainly air purification in animal houses (pigs and poultry))
- Covered manure storage
- Low-protein animal feeding (pigs)
- Low-emission application of urea and (if possible) urea substitution
- Substitution of energy crops (maize) by manure in anaerobic digesters
- Gas-tight storage of digestates

→ **Technical reduction potential of all measures: 260 kt NH_3 (2030)**



Additional Measures to reduce NH_3

- Additional measures are available and have significant reduction potentials
- Especially low-emission application of manure and slurry can reduce emissions in the short term.
- But the implementation of these measures is difficult because there is strong political opposition from different Federal States and national farmer associations.

Other pollutants (CH_4, N_2O, PM)

- Additional measures like the substitution of energy crops (maize) by manure in anaerobic digesters and gas-tight storage of digestates can also reduce emissions of CH_4 and N_2O.
- Additional measures like low-emission animal housing systems (air purification) can contribute to reduce PM emissions from agriculture.

Other pollutants (NO_x, NMVOC)

- Germany reports NO_x and NMVOC (since 2015) emissions from agriculture.
- But agricultural NO_x and NMVOC emissions are not included in GAINS and thus in the proposed emissions reduction commitment for Germany.

→We need a good documentation which sources have to be included

Abolishment of the milk quota

- Especially larger farms will benefit from the abolishment of the milk quota, while smaller farms will give up dairy farming.
- Since 2011 we observe a slight increase of dairy cow numbers and a significant increase of the milk yield per cow. It is likely that the abolishment of the milk quota will strengthen this trend. This would result in higher emissions from dairy farming.

Conclusion

- Due to methodological changes NH_3 emissions reported in 2015 are about 20-30% higher compared to emissions reported in 2014.
- Attainability of emission reduction commitments is only possible, when far-reaching additional measures are implemented.
- Additional measures with significant reduction potentials are available but the implementation is difficult due to strong political opposition.
- The abolishment of the milk quota might result in higher emissions from dairy farming.

Thank you for your attention!

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http://www.umweltbundesamt.de/en/topics/air