

Reactive nitrogen flows between pool “Energy and Fuel” and the Atmosphere in the Eastern European demonstration region

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Abstract

Fuel nitrogen and atmospheric nitrogen form reactive nitrogen compounds during combustion. Reactive nitrogen is exchanged between the EF pool and AT. All other flows in this sector are composed of inactive forms of nitrogen. Nitrogen flows between the EE pool and the atmosphere were determined for EE demoregion. Between 2005 and 2017, there was a decrease in emissions of reactive nitrogen in the energy and fuel sectors to the atmosphere in the EE demoregion.

Keywords: energy, fuel, reactive nitrogen,

1. Direct and indirect effects of emissions in the EF sector on WAGES

One of the important tasks of research within the framework of the INMS project is to assess the effect of reactive nitrogen on the state of water, atmosphere, soil and greenhouse gas emissions (WAGES).



Nitrogen flows describe the temporary transport of nitrogen between different sectors or pools of nitrogen budget. The nitrogen contained in the fuel and atmospheric nitrogen is converted into reactive forms only during the combustion process, and therefore, chemically active nitrogen compounds are exchanged only between the EF pool and AT.

All other exchanges consist of inactive forms of nitrogen. (ECE/EB.AIR/119). Consequently, emissions in the Energy and Fuel sector directly affect the atmosphere and greenhouse gas emissions and indirectly on the state of water and soil.

2. Data collection

Data collection was carried out in accordance

with the revised Gothenburg Protocol and the Guidance document on national nitrogen budgets. Statistical data were collected and evaluated on the territory of the EE demoregion. Available statistics are presented by regions (oblast). EE Demoregion in Ukraine is located in the administrative regions: Vinnytsya, Ivano-Frankivsk, Lviv, Odessa, Ternopil, Khmelnytsky and Chernivtsi region. The administrative units of Romania (Botosani, Lasi, Vaslui, Galati and Tulcea) and territories of Republic of Moldova and unrecognized Transnistrian Moldovan Republic are also included in the territory of the EE demoregion. For calculations, we used the data of State Statistics of Ukraine by fuels combustions in regions, and the data of National Inventories of air pollutants and Greenhouse Gases for Ukraine and Romania, and the data of National Statistics of Moldova and the unrecognized Transnistrian Moldovan Republic.

3. Methodology

In our work, we used as a methodical guide Detailed Annexes to ECE/EB.AIR/119. The information needed to distinguish between the consumption of imported fuel and the consumption of fuel produced in the country is not available at the regional levels. Therefore, a simplified approach was chosen. This simplification does not affect the resulting Nr flow into the atmosphere, since the emission factors in the fuel combustion processes take into account the total emissions of each nitrogen-containing compound. The emission factors provided in the Guidebook (EEA 2013) and Guidelines (IPCC 2006) provide information on the total NO_x and N₂O emissions.

4. Results and discuss

Nitrogen flows between the EE pool and the atmosphere were determined for EE demoregion. Between 2005 and 2017, there was a decrease in emissions of reactive nitrogen in the energy and fuel sectors to the atmosphere in the EE demoregion (Table 1).

Table 1. Emission of reactive nitrogen

Year	2005	2010	2013	2016	2017
N _{total} ,Gg	33,86	32,2	28,0	24,5	25,2

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