Improving estimates of NH3 emissions from anaerobic digestion and integration with other inventory sectors

Anaerobic digestion (AD) is a microbial process that degrades organic material, such as manures or food, in the absence of oxygen producing biogas for energy production and a nitrogen rich digestate product. The digestion process can also effect pH and available nitrogen (N) levels due to mineralization of organic N and volatile fatty acids, which effects the subsequent volatilisation of ammonia (NH3) into the atmosphere, particularly from the application to land of the digestate produced as a fertiliser. The AD industry has grown rapidly in the UK over the last decade; emitting an estimated 12kt of NH3 in 2017 (or 4% of all NH3 emissions in the UK) compared to 0.5kt NH3 in 2007 (0.2% of all emissions). Understanding how NH3 emissions occur from AD and the spreading of digestates is crucial not only for localised effects of nitrogen deposition and air quality challenges but also because the UK’s projected NH3 emissions are now above the 2020 commitment under the EU National Emissions Ceiling Directive.

This study reviews the current methodology used to estimate NH3 emissions from the AD industry in the UK and suggests a 30% reduction in emissions to ~8 kt, principally due to a higher than known uptake of low emission spreading technologies and increased knowledge in the N content of the digestates produced. The study also integrates the agricultural inventory of the UK by taking into account the new ammoniacal nitrogen content of digested manures (over standard manure spreading) and, furthermore, creates a mass flow of materials across the waste sector (including composting, AD, landfill and incineration) to allow for integrated assessment on air pollutant emissions when diverting materials from one process to another for environmental, energy and/or other purposes.