Historic nitrogen deposition: Long term trends

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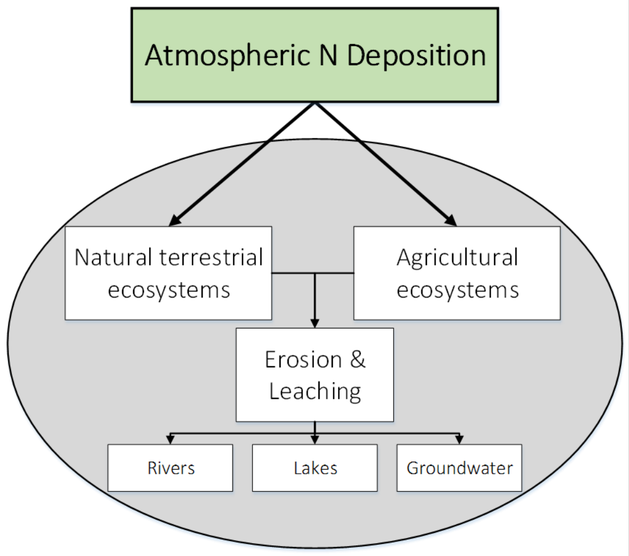
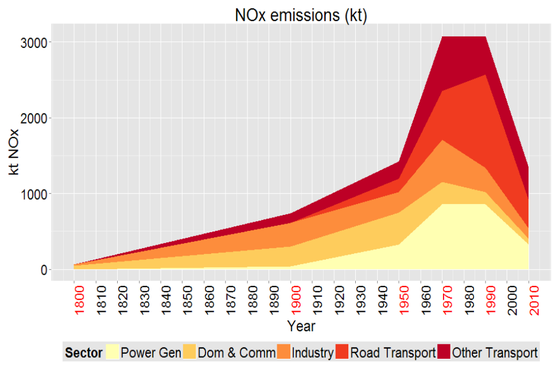
Introduction

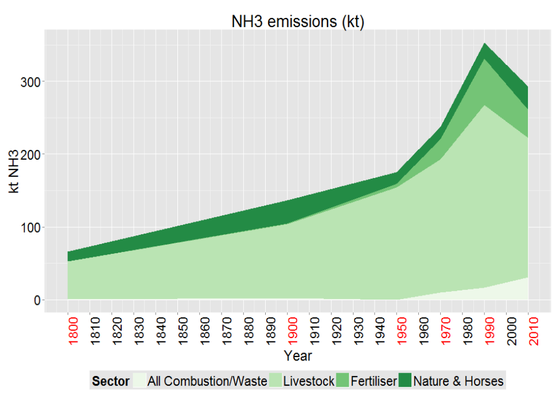


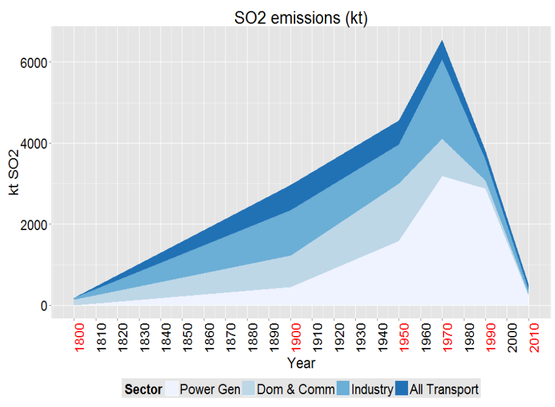
The legacy of nitrogen (N) accumulation and its spatial distribution is an important part of assessing current threats to ecosystems and the ecological response to accumulated N-pools over time. As part of the NERC Macronutrients Long Term Large Scale (LTLS) project, historic UK N deposition and its spatial distribution have been quantified back to 1800.

This work reconstructs an N deposition timeline over six time slices (2010, 1990, 1970, 1950, 1900, 1800) which involves research into historical trends of emissions, their sources and respective spatial distributions, and utilises auxiliary data including historic population, agricultural statistics and practice and land cover data. Additional measurements were made to quantify emissions from domestic fuel burning between 1800-1950.

Emission Estimates







NO_y emissions

- Emissions of NO_y were historically dominated by the combustion of fossil fuels (particularly industry and domestic fireplaces) but in 2010, 60% of NO_y came from the transport sector.
- Distribution is based on proxy datasets such as population, working population, transport networks and research into power generation activities.

NH_x emissions

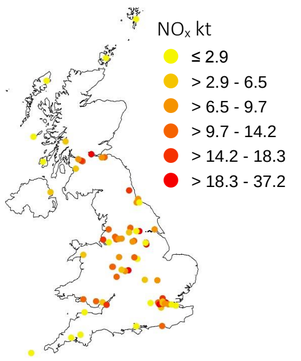
- Approximately 75 – 90 % of UK NH_x emissions are estimated to originate from agricultural activities. Activities associated with cattle farming in particular, are a dominant source throughout the UK (~50 – 70 % of agricultural NH_x emissions)
- Non-agricultural sources comprise 10 – 25 % of total NH_x emissions and include non-agricultural horses, road transport, composting and anaerobic digestion

SO_x emissions

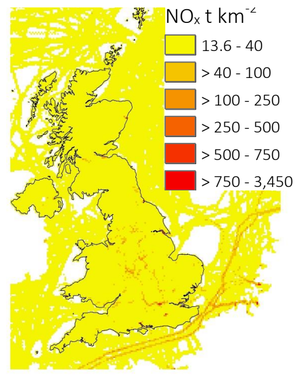
- Emissions of SO_x are important for atmospheric chemistry in the deposition process. SO_x emissions are largely produced by combustion of fossil fuels in industry and the power generation sector (together accounting for 77% of emissions in 2010).
- The same datasets that were used to distribute NO_y were used for SO_x (E.g. working population datasets were derived in order to distribute historic industry).

NO_x emissions

Power Generation: 1970

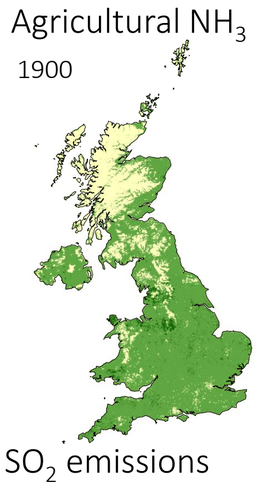


Other Transport: 1950

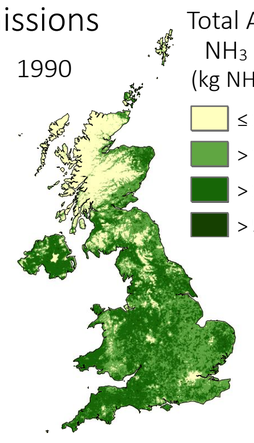


Agricultural NH_3 emissions

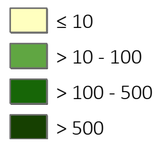
1900



1990

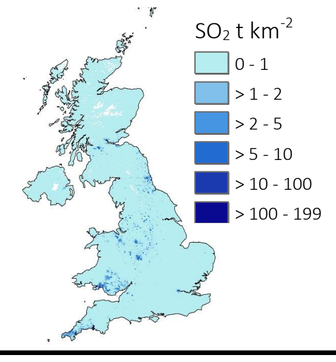


Total Agricultural NH_3 Emissions (kg NH_3-N ha^{-1} yr^{-1})

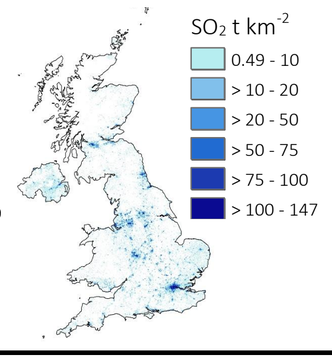


SO_2 emissions

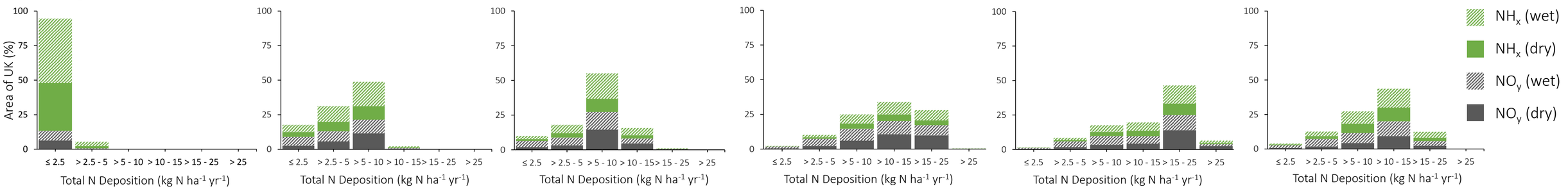
Industry: 1800



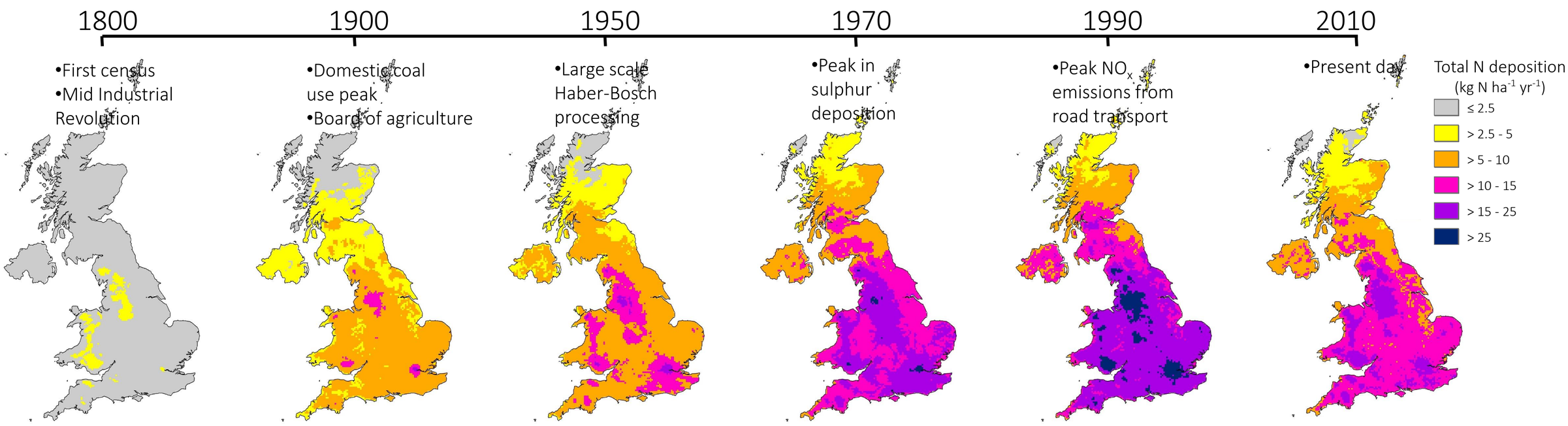
Public/Commercial: 1950



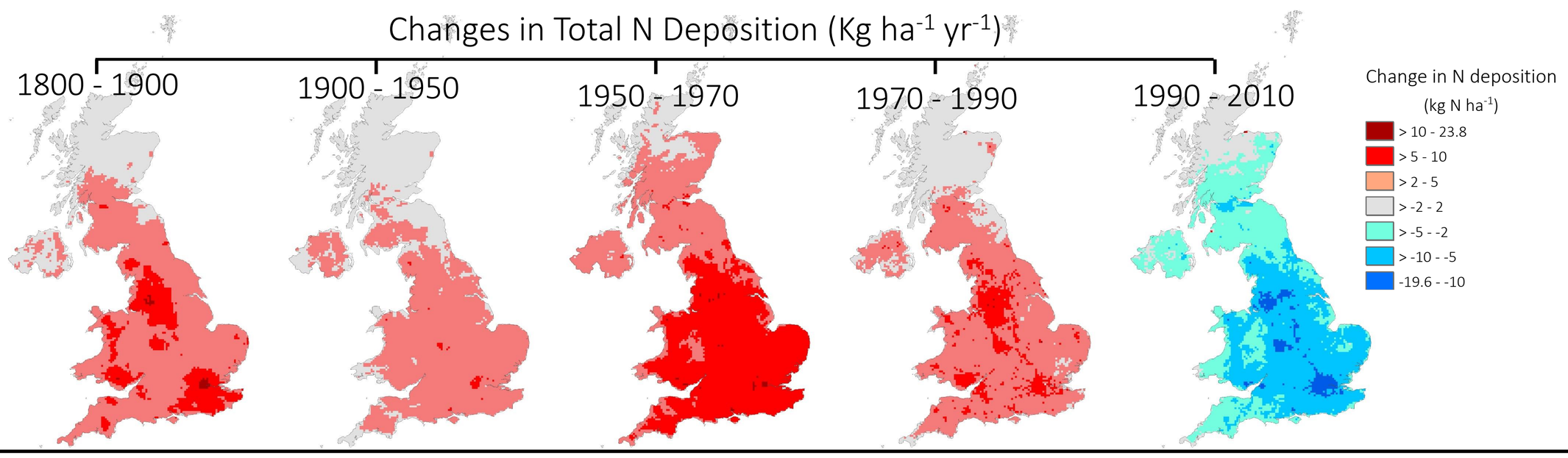
Nitrogen Deposition Time Series



Total N Deposition (Kg ha^{-1} yr^{-1})



Changes in Total N Deposition (Kg ha^{-1} yr^{-1})



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