UK shipping inventory

TFEIP meeting
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Agenda

- Background and previous shipping inventory
- New methodology summary
- Results: key changes in emissions compared to 2017 UK’s National Atmospheric Emissions Inventory
Previous shipping inventory in NAEI good but has limitations

- **Good**
  - Bottom-up tier 3 method based on Lloyd’s (LMIU) data
  - Domestic/international split by port origin/arrival
  - Detailed consideration of vessel types, engines, fuels
  - Spatially distributed (5x5km) based on estimated routes
  - 2007 base year of activity data

- **Limitations**
  - **Incomplete**: poor capture of vessels not engaged in international trade (smaller vessels, fishing vessels, offshore, service)
  - **Accuracy could be improved**: Blanket assumptions on vessel speeds (→ engine loads)
  - **Spatial accuracy could be improved**: No capture of actual vessel routes limits spatial granularity
    - E.g. poor understanding of vessels starting/finishing at same port

Methodology and assumptions

**New methodology summary (1)**

- New bottom-up methodology using terrestrial Automatic Identification System (AIS) activity data from the Maritime and Coastguard Agency (+more recent 2014 base year)

- Emission factors updated for most pollutants to match International Maritime Organization global inventory

- Minor changes to approach to estimate time series back to 1990 from base year – still using trends in DfT statistics as proxies for activity trends.

- NAEI estimates for inland waterways updated to account for new model
- No change to existing NAEI estimates for naval, to/from Gib./OTs
- Forecasts now account for four major ports’ specific growth forecasts
Benefits of new methodology

More complete activity dataset: improved domestic vessel coverage and actual routes travelled

Domestic class A position density

Inter-island passenger

Offshore

Fishing

Offshore

Service

Entec (2010)
Highly granular raw activity data
- Vessels uniquely identified
- Vessel positions up to every 3 seconds when in range of terrestrial AIS network
- Unknown route (+destination) of vessels after leaving range of terrestrial AIS

Emissions estimated for every vessel position, accounting for:
- Vessel type, engine power (main, auxiliary, boilers) of each vessel
- Engine load, accounting for speed and draught at each position
- Time (duration) until next position
- Speed dependent emission factors
- Location (at berth, at sea in a sulphur control area or not)

Consecutive vessel positions linked as passages, allocated UK domestic / crown dependencies / UK international / transit
Key headlines

- More complete activity dataset for vessels on domestic voyages, including vessel categories not previously covered
- Improved engine emission calculation, and accounts for source not previously covered
- Increased domestic emissions compared to existing NAEI
- Model estimates compare well to leading academics’ European shipping inventories
- Low uncertainty emission calculation for most large vessels (85% of total emissions)
- More robust spatial allocation of inventory

- Results are sensitive to the approach taken to define domestic/international
  - High uncertainty in dom./int. allocation when vessels go out of AIS range
Increased (2.5x) 2014 fuel consumption compared to existing NAEI
Results sensitive to approach taken to define domestic/international

**DOM Domestic**

**CD Crown Dependencies**

In addition to fuel oil and gas oil, inland waterways also includes approx. similar quantities of DERV and petrol as gas oil.

**Results**

- Fuel oil
- Gas oil

**Existing NAEI DOM**

- Fuel oil
- Gas oil

**New model DOM+CD**

- Fuel oil
- Gas oil

CD adds ~1.5% fuel consumption

Scope of new model:

- 1A4ciii Fishing
- 1A3dii Domestic Water-borne navigation (non-fishing)
- Between UK and Overseas Territories
- Naval
- Inland waterways


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