Solid Fuel Burning

Study to provide evidence on the scale of emissions from domestic solid fuel burning in Bristol and provide policy options to reduce emissions

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Introduction

- Clean Air Day 2019 – Mayor of Bristol speech to *improve air quality for the most vulnerable*

- Commitments on

  - raising awareness of, and enforcing the existing smoke control legislation in commercial and domestic settings

  - gathering evidence on the emissions of pollution from Non-Road Mobile Machinery

- Road transport emissions will be controlled through existing policy such as Clean Air Zone process.

- This presentation covers domestic Solid Fuel Burning (wood and coal).

- Main pollutant emitted by solid fuel burning is Particulate Matter (PM), which has the greatest health effects.

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Approach

- Worked with Aether – experts in emissions inventories
  - ➤ Looked at all available data sources
  - ➤ Bottom up estimate (local data)
  - ➤ Top down estimate (national data)
  - ➤ Emissions = Activity * Emission Factor
  - ➤ Stakeholder consultation

- Emissions estimates rely on availability and robustness of activity data (and emission factors)

How do we Estimate Emissions?

- ## Bottom Up Approach

  ➢ Emissions calculated using location-specific activity data combined with emission factors. The quality of the result is inherently linked to the availability of local data.

- ## Data Sources

  ➢ BEIS (Dept for Business, Energy and Industrial Strategy) survey of wood use (data available at SW level)

  ➢ HETAS (Heating Equipment Testing and Approvals Scheme) – information on new installations

  ➢ RHI (Renewable Heat Incentive)

- ## Top Down Approach

  ➢ Emissions based on the scaling of published UK emissions data to Bristol. Uncertainty of UK level data will be increased by the scaling factor used.

- ## Data Sources

  ➢ National Atmospheric Emission Inventory (NAEI) scaled by population.

  Air Pollutant Emissions = Activity X Emission Factor

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Outcomes

- ## Top Down Approach

  ➢ Solid fuel represents approx. third of total PM_{10} and half of $PM_{2.5}$ emissions in Bristol

- ## Why the difference between approaches?

  ➢ SW data scaled to Bristol likely to be over-estimating (would expect higher solid fuel burning in rural areas)

- ## Bottom Up Approach

  ➢ For wood burning bottom up approach estimated ~3 times that of the top down approach

  ➢ For coal burning, results comparable

Activity	Pollutant	Estimated tonnes in Bristol 2014 (bottom up)	Estimated tonnes in Bristol 2014 NAEI (top down)	Ratio
Wood Burning	PM_{10}	791	241	3.3
	$PM_{2.5}$	772	235	3.3
Coal Burning	PM_{10}	20	22	0.9
	$PM_{2.5}$	20	22	0.9

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Available Policies and Measures

- Few policies and measures available

- Information and awareness raising

  ➢ Hard to assess effectiveness, especially among people who have had e.g. a stove installed

  ➢ Using dry wood over wet will make a difference but will not eliminate the source

- Clean Air Act/Smoke Control Areas

  ➢ Very difficult to enforce in current form

  ➢ Penalises home owners and not equipment/fuel suppliers and installers

  ➢ Amendments under Environment Bill will improve slightly but won't enable e.g. solid fuel bans

- "Creative" use of planning or other policies

  ➢ Little evidence for this (unlike NRMM)

  ➢ Difficult to justify without quantifying the problem, difficult to quantify the problem without better activity data…

- Better activity data is key to underpinning more action

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Recommended Policy Options

- Package 1 (could be started in the short term with relatively low levels of resource)
  - ➢ Baseline activity data improvement campaign
  - ➢ Information and awareness raising
  - ➢ Lobbying Government

- Package 2 (need additional resource and lead in time)
  - ➢ Cleaner heating programme, primary users
  - ➢ Cleaner heating programme, secondary users
  - ➢ Enforcing the smoke control area

  - ➢ In order to quantify any of these packages, a robust bottom up estimate would be needed

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Recommended Policy Options

1. Baseline activity data improvement campaign

➢ Survey - proportion of households using solid fuel, what fuel they are using, the frequency of use and type of appliance. Geographical distribution. Repeatable.

➢ Working with HETAS (is installation is new, or a replacement and the type of appliance being installed). These data could be used to extrapolate data from the household survey in intervening years.

2. Information and awareness raising

➢ Fuel use; burning less, buying 'ready to burn' fuel, season freshly chopped wood before burning, using approved solid fuels

➢ Maintenance, choosing an appliance, knowing the law

3. Cleaner heating programme, primary users

➢ Subsidise the upgrading of solid fuel heating systems to lower polluting alternatives, where they are the primary source of heat.

4. Cleaner heating programme, secondary users

➢ Subsidise the removal of solid fuel heating systems (fireplaces and stove), where they are a secondary source of heat (i.e. casual users).

5. Enforcing the smoke control area

➢ Include publicity around enforcement

6. Lobbying Government

➢ Work with, and lobby, central Government to influence policy changes that support air quality improvements in Bristol (UK100?)

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Uncertainty

- ## Top Down Approach

  ➢ Uncertainties in national data include number of stoves in operation, type of appliance, what fuel being burnt, frequency of use etc.

  ➢ Additional uncertainty scaling national data to Bristol

- ## Uncertainty in emissions factors

  ➢ Many variables are not accounted for in simple emission factors, e.g. type and condition of the wood used (varying from kiln dried wood pellet to unseasoned logs), whether it is mixed with coal, the state of repair/maintenance of the stove and the conditions of use.

- ## Bottom Up Approach

  ➢ No local activity data (number of stoves in operation, type of appliance, what fuel being burnt, frequency of use etc)

  ➢ Additional uncertainty scaling regional data to Bristol

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Uncertainty- top down

Description	Impact
Number of stoves/open fires in operation nationally	High. given recent trends (Air Quality Expert Group, 2017), there is likely to be an underestimate in the NAEI data
Type of appliances in use (e.g. CAA exempt, ecodesign etc)	High. Primary emissions of PM from advanced stoves (e.g. Ecodesign compliant) can reduce by nearly 90% when compared with an open fire.
Proportion of different fuels being burnt nationally (wet wood, dry wood, salvaged wood, coal, bituminous coal)	High. For example, emissions for wet wood are up to four times that of dry
Frequency of use (hours per year)	High. Wood consumption in the NAEI seems to be out of proportion in comparison with other countries (ie lower), although the UK has less of a tradition in using wood has home heating fuel.

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Uncertainty – Scaling national or regional datasets

Description	Impact
Scaling NAEI data to the Bristol level	Medium: assumes that Bristol has the same average rate of solid fuel use as appears nationally. The dataset will include areas where coal use remains relatively high but the inclusion of other urban areas in the dataset mitigate some of this uncertainty.
Scaling BEIS wood survey data to the Bristol level	High: The dataset covers the whole of the South West and is predominantly rural in coverage. The small number of datapoints in the survey will also add uncertainty to the data.
Using household numbers as the scaling metric	Medium: assumes that emissions scale with household number whereas other factors, such as relative wealth or housing density may also be important factors in determining solid fuel use.

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Summary

➢ Residential wood combustion is now the most significant source of $PM_{2.5}$ emissions in the UK, according to the latest national data.

➢ Emissions estimates rely on the availability and robustness of activity data (and emission factors).

➢ Despite uncertainties, there is convincing evidence that solid fuel burning is a significant source of PM, and therefore action should be taken. Wood burning, in particular, is an increasing source (both relatively and absolutely).

➢ Bottom up data sources in particular are lacking. Work is needed to reduce the key uncertainties at both national and local level.

➢ Priority on data relating to the primary type of fuel used (wood, coal or mixed), the type of wood fuel used (pellets, chips, seasoned logs, unseasoned logs, waste wood) and the size/capacity of the appliance used

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