DIOXINS FROM DOMESTIC SOURCES: ESTIMATING EMISSIONS, IDENTIFYING CONTROLS AND ENGAGING THE PUBLIC

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Introduction

1. Good progress has been made in recent years in reducing emissions of dioxins, furans and dioxin-like polychlorinated biphenyls (PCBs), mainly from industrial sources. This paper describes an evaluation of household sources of dioxins and dioxin-like PCBs – burning of solid fuels in the home; burning of household waste by members of the public; and bonfires.

2. As a signatory to the Stockholm Convention on Persistent Organic Pollutants, the UK is required to take measures to reduce emissions of persistent organic pollutants. The draft UK Dioxins Strategy contains identified three key aspects of domestic sources requiring further research:

   - To identify combustion conditions required to reduce emissions of dioxins and dioxin-like PCB emissions from domestic solid fuel combustion (coal or wood)
   - To review information on the uncontrolled burning of household and garden waste with a view to reducing emissions of dioxin and dioxin-like PCBs
   - To identify how educational campaigns could be used to disseminate best practice for reducing dioxins and dioxin-like PCB emissions from domestic sources.

Methods

3. The project team carried out a literature review of information on emissions of dioxins, furans and dioxin-like PCBs from domestic combustion sources. A review of published information on effective public engagement strategies was also carried out, although less information was identified in this area. This information was evaluated in the light of the research team's experience, taking account of advice provided by the UK Dioxin Strategy Group (see www.defra.gov.uk/environment/chemicals/dioxins-strategygroup.htm). The factors most likely to affect emissions of dioxins and furans from domestic combustion sources were identified. Based on this, the key messages for a public engagement campaign were identified, together with options for campaigns with a range of budgets.

Results and Discussion

Factors influencing emissions of dioxins and dioxin-like PCBs

4. Emissions of dioxins and dioxin-like PCBs from domestic combustion sources are affected both by the nature of the materials burnt, and by the way in which they are burnt. Studying the factors affecting emissions of dioxins and dioxin-like PCBs is difficult because of the need to control all the factors which can affect emissions. However, we can be reasonably confident that:

   - Poor combustion conditions are likely to give rise to increased emissions of dioxins and dioxin-like PCBs.[1,2] These conditions could result from a lack of air in the combustion zone, or by burning unseasoned or wet materials.

- The presence of copper and other metals in the materials being burnt can give rise to increased emissions of dioxins and dioxin-like PCBs.[3,4]

- Other factors being equal, an increased level of chlorine in the materials being burnt is also likely to give rise to an increase in emissions of dioxins and dioxin-like PCBs.[5,6]

Estimated emissions inventory

5. Estimates were made of emissions of dioxins and dioxin-like PCBs to air and in the ash arising from UK domestic combustion sources (see Figures 1 and 2).

Figure 1 Estimated annual UK emissions of dioxins and furans to air from domestic combustion

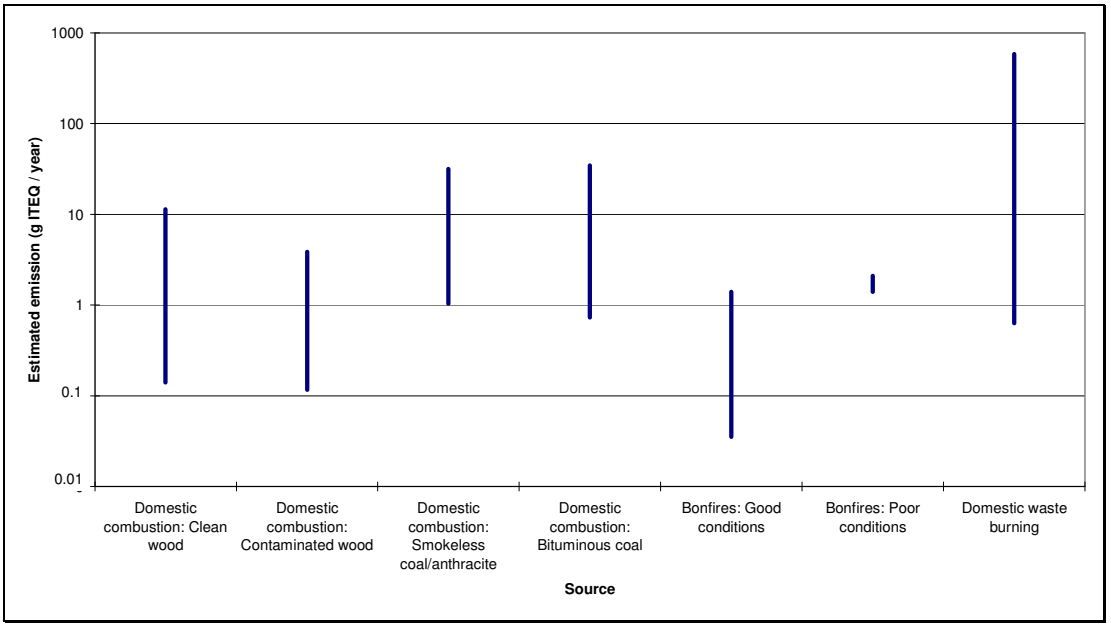
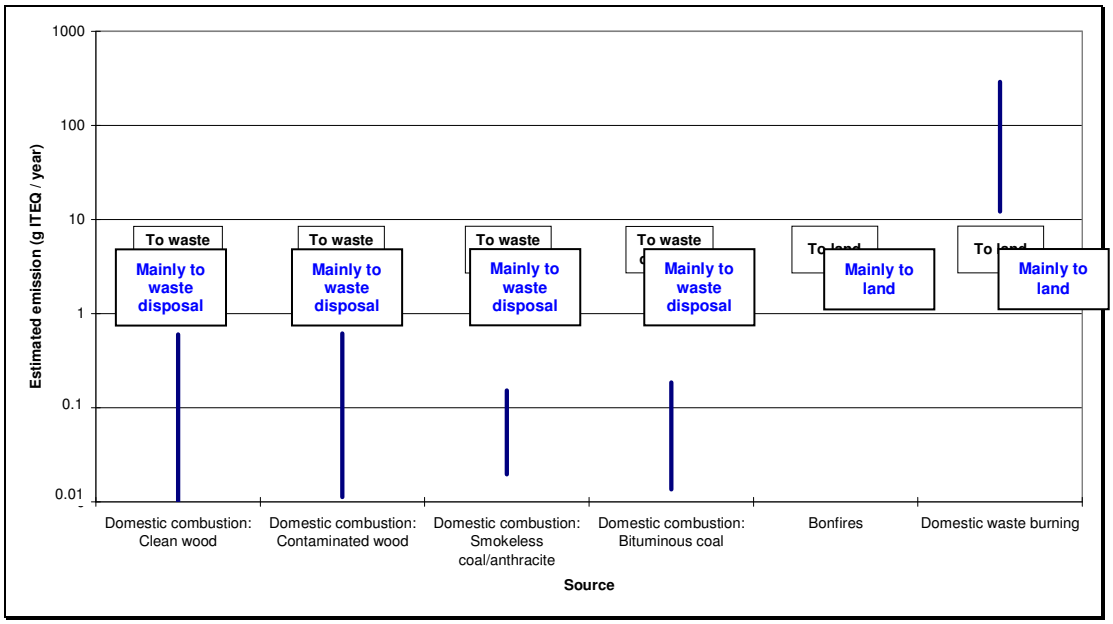


Figure 2 Estimated annual UK emissions of dioxins and furans in solid residues from domestic combustion



6. Although subject to considerable uncertainty, the data indicated that emissions from burning household waste could be the main source of emissions, followed by domestic coal burning. Bonfires and wood burning in fireplaces and stoves are likely to be less significant, although bonfires could be an important source of dioxins and dioxin-like PCBs in residues left at the site of the fire.

7. The emissions estimates in Figures 1 and 2 are consistent with the current UK national atmospheric emissions inventory estimates for 2003:[7]

   Domestic coal and solid fuel: 3.3 grams TEQ dioxin and furan

   Domestic wood combustion: 0.22 grams TEQ dioxin and furan

   Bonfire Night: 6.8 grams TEQ dioxin and furan

8. Domestic waste burning does not appear in the National Atmospheric Emissions Inventory as a source of dioxins and furans, although the category "accidental fires" is estimated to result in 58 grams TEQ of dioxin and furan emissions per year. The total estimated inventory from all sources is 324 grams TEQ dioxins and furans.

Public engagement strategies

9. A public engagement campaign would be an important part of a strategy to reduce emissions of dioxins and dioxin-like PCBs from these sources. This would need to be combined with other national and local measures to encourage and enable members of the public to play their part in reducing emissions. The most effective way of engaging members of the public in reducing emissions of dioxins and dioxin-like PCBs is to render the most polluting activities socially unacceptable. Successful campaigns to achieve this have been mounted in the past – for example, campaigns to make it unacceptable to travel

in a car without a seatbelt, or to drink and drive. Such campaigns would require a sustained investment in a simple, consistent message over a long period of time.

10. Based on our current understanding, the three key messages to convey in a public engagement campaign are as follows:

- Campaign 1 : "*Don't burn household waste indoors or outdoors, and especially not waste containing plastics*"
- Campaign 2 : "*For people who have coal fires, choose coal with a low chlorine content, and make sure the fire burns efficiently*"
- Campaign 3 : "*Don't burn waste on bonfires – in particular, avoid burning plastics*"

11. A public engagement campaign with a national scale impact would cost around £5 million/€8 million, as in a recent national UK recycling campaign. This included a national TV/press/billboard advertising campaign, a launch with celebrity endorsement supported by information leaflets, and a web-based resource.

12. A medium-scale campaign could cost in the region of £200,000/€300,000. This could be designed to have a wide reach but would necessarily have a lower impact. A medium scale campaign may include measures such as the production of leaflets with distribution to households either nationally, or focused in target areas where there is a particular problem. It may also be appropriate to develop online guidance. A lower budget campaign could cost typically £10,000/€15,000. A lower budget campaign may include measures such as the production of leaflets/guidance for distribution through local authorities. Its success would be dependent on the commitment of local authority departments to promotion of the project aims.

Acknowledgments

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