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# Review of emission factors for incident fires

Science summary SC060037/SS3

The Environment Agency's National Air Quality Modelling and Assessment Unit (AQMAU) has carried out a review of emission factors of various air pollutants from open, uncontrolled fires. These emission factors are required in order to produce computer modelled predictions of the distribution of air pollution in the event of a major fire.

The Buncefield incident in December 2005 highlighted the need for a more coherent approach to air monitoring during major incidents. As a result, the Environment Agency has been given a new role to co-ordinate air quality monitoring and modelling during such incidents. During a major incident impacting on air quality the Environment Agency may be required to provide a best estimate of the rate of pollutant emission to on-call modelling service providers (such as the Meteorological Office).

This review has helped to improve our readiness to respond to incident fires by providing the Environment Agency with a more accurate and readily accessible list of emission factors for fires than was previously available.

An emission factor is a numerical value that relates the amount of pollutant released to the atmosphere to the activity associated with the generation of that pollutant. Emission factors from well-defined individual (point) sources are readily available in the literature, but emission factors from open, uncontained sources are frequently less accessible.

When fires occur in situations with ideal combustion conditions (i.e. the presence of excess oxygen, the effective mixing of air and fuel and a sufficient amount of time above the ignition temperature of the material being burnt) organic substances are converted to carbon dioxide and water with minimal production of other pollutants. Open burning generally results in less than ideal combustion conditions. As a result such fires can produce a number of pollutants, including soot, particulate matter, carbon monoxide, methane and volatile organic compounds.

The Environment Agency regulates a range of industrial, agricultural and waste management premises in England and Wales. From April 2006 to May 2007 there were over 450 incidents involving fires at these sites recorded on the National Incident Recording System (NIRS). AQMAU reviewed the NIRS reports of fire incidents involving emissions of air pollutants (reported as 'visual' smoke) and categorised them into thirteen sub-sets (waste, metal, chemicals, vehicle, building, timber, tyres, paper, oil, plastic, bonfire, fireworks and other). They then carried out a detailed literature review to identify emission factors associated with each incident sub-set.

The AQMAU report contains tables of open burning emission factors for a range of pollutants from a number of burning sources. These sources include; municipal and household waste, pesticides and insecticides, buildings, timber, scrap tyres, paper, oils, agricultural plastic film, plastic bags, bonfires and a range of materials used in training fire-fighters.

A number of gaps in emission factor data were identified. These include emission factors from; fireworks, chemicals, insulated copper wire, buildings, vehicles, domestic waste and landfill cells. The identification of emission factors in these areas will allow the Environment Agency to produce a more complete picture of emissions from open burning. Emission factors from forest fires and biomass burning were not considered in the current review.

Additionally, the use of the identified emission factors can be hindered by the need to be able to estimate the amount of material available to burn and the rate of burn. A database of such values would help.

This summary relates to information from Science Project SC060037, reported in detail in the following output:

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