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Submission to the Senate Inquiry on "The impacts on health of air quality in Australia".

Roles of the Bureau of Meteorology and state agencies

Since the 1970s, the Bureau of Meteorology (the Bureau) has contributed to the monitoring and prediction of air quality by the appropriate State authorities such as Environment Protection Agencies. Monitoring and modelling have been done by the state environment agencies while the Bureau's role has been to provide numerical weather prediction guidance to those agencies performing modelling. The Bureau's contributions have included:

- Meteorological observations, both surface and vertical profiles;
- Numerical weather guidance as input to air shed modelling, such as the Australian Air Quality Forecasting Scheme (AAQFS[1]);
- Dissemination to the public, via the media, of Air Pollution Alerts issued by State authorities. For example, in the Launceston, Tasmania air shed the Bureau has issued advice messages when meteorological conditions are predicted that match criteria determined by the State authority;
- Atmospheric Dispersion Modelling products that indicate the spread of airborne materials in the event of certain incidents, fulfilling its responsibilities to World Meteorological Organisation (WMO) Environmental Emergency Response procedures; and

[1] AAQFS was a partnership between the Bureau, CSIRO and State agencies that provided air quality forecasts for Sydney, Melbourne and Adelaide using a fixed inventory of pollutants.

- Operating a Volcanic Ash Advisory Centre in Darwin - one of nine centres globally that monitor and provide alerts when volcanic ash plumes might impact on aviation safety.

Historically the major focus for the relevant state agencies and the Bureau has been on industrial pollution, with agencies typically measuring nitrous oxides (N O x) , sulphur dioxide, (SO2) carbon monoxide (CO), ozone (O3) and hazardous fine particulate matter (PM10 and PM2.5) mainly around capital cities and other air sheds such as the Latrobe Valley in Victoria. Modelling of the airflows in and around these areas has generally assumed an inventory of fixed point sources of pollution within the area of study.

Domestic Wood burning

The effects of domestic wood burning have been identified as a health hazard in areas where topography and prevailing weather conditions during winter have resulted in higher concentrations of fine particulate matter. An example of this has been in the Tamar Valley in northern Tasmania through the late 20th century. However, measures and initiatives to reduce pollution in Launceston have been broadly successful, assisted by the Bureau's warning service which has been aimed at informing local residents of weather conditions conducive to poor air quality due to smoke accumulation. The warnings have included action statements generated by local authorities which are aimed at educating local residents on the correct and efficient use of their wood fired heaters.

Planned Burning

In air sheds such as the Tamar and Swan Valleys (in Tasmania and Western Australia respectively), the level of particulate matter from planned vegetation burning (e.g. prescribed fuel reduction burns and forestry management) has contributed to observed declines in air quality. With pressure on Land Management Agencies to increase the level of prescribed burning to reduce the risk of large wildfires, the build-up of smoke from vegetation fires during autumn especially is becoming an issue.

The Bureau of Meteorology and the Bushfire Cooperative Research Centre

The Bureau, together with the Bushfire Cooperative Research Centre (Bushfire CRC) has developed a qualitative tool that has been used by land management agencies in several States to assist them in planned vegetation burns, with the aim of reducing their impacts (primarily smoke or particulate matter) on local communities.

While the Bureau does not monitor air quality as part of its observations of meteorological parameters, the Bureau does manage the Cape Grim Baseline Air Pollution Station in conjunction with CSIRO. This station measures the chemical composition of air originating over the ocean to our southwest and this provides a baseline for observations made by other organisations around Australia and around the world.

Future needs and developments

The negative impacts on health from all types of vegetation fires, both wildfire and planned, have been identified by health authorities.

Land management agencies commonly use fuel reduction (prescribed) burns to mitigate the risk of serious wildfires. For safety reasons the bulk of these planned burns are conducted during autumn. However, in many areas, autumn is commonly associated with stable atmospheric conditions and light winds. This commonly results in poor air quality in areas surrounding the fires that can impact

on people when burns are conducted near populated areas. Moreover, burns that are conducted with cooler fires to protect biodiversity tend to be associated with increased smoke. Consequently, accurate modelling of smoke behaviour and dispersion is required when either of these kinds of fires are conducted close to populated areas.

Medium to large wildfires predominantly occur during periods when the atmosphere is warm and less stable. In these situations, the smoke generated tends to be dispersed more quickly and is less of an issue for nearby residents. In the largest bushfires however, the volume of smoke is such that Air Quality Index (AQI) values of hazardous levels can be experienced at locations many kilometres distant from the fire.

Current atmospheric dispersion modelling has largely evolved using point based sources of limited duration, which is appropriate for industrial incidents. The Bureau's current Smoke Modelling Subscription service is used by several Land Management Agencies and provides qualitative results from point based sources with the assumptions that there is no pre-existing smoke prior to the planned burning ignition and that the fire stops emitting smoke after a few hours. There are limitations to the accuracy of this model for forecasting the accumulated smoke levels from fires that persist over many hours, large fires as described above, or the smoke from multiple prescribed burns conducted over several days.

To improve the existing smoke dispersion models therefore, there is a need for improved modelling of the dispersion or accumulation of smoke from multiple smoke sources in an area. Another improvement required is the ability for models to evaluate the movement of smoke from fires with a finite area. Current models assume the smoke source is a single point. Moreover, these components require the flexibility to be modelled over temporal periods ranging from hours to days.

To assist authorities in assessing community risk associated with smoke, improved predictions of the chemical components of smoke are also required. Research currently being undertaken by the Bushfire CRC is obtaining an improved understanding of the composition of bushfire smoke produced from differing vegetation types[2]. The primary focus of this research has been to improve fire-fighter safety, however it also has the potential to improve modelling and prediction of air quality for the general community.

As with all air pollution modelling, the forecast state of the weather comprises a fundamental input, so the Bureau's specialist fire weather services, which are devoted to providing accurate, timely forecasts to fire fighters and forest managers, will continue to provide the cornerstone of all efforts to improve air quality. Improvements in meteorological modelling will therefore also result in improved forecasts of air quality, both for smoke from vegetation fires and urban air quality.

[2] **Operational readiness of rural firefighters Air Toxics,** Bushfire CRC, Melbourne. http://www.bushfirecrc.com/projects/c-11-3/operational-readiness-rural-firefighters-air-toxics Retrieved 1 March 2013