

Dynamic Smoke Modelling and Community Impacts of Smoke

Research Fact Sheet

Forests, Fire and Regions Group invests in an *Emergency Risk Management Research* agreement with the Bushfire and Natural Hazards CRC that delivers critical science research to support policy and operational practices. This project '*Dynamic smoke modelling and community impacts of smoke*' is part of this work and commenced in November 2017. It is due to be completed by June 2019.

The Project

As public land managers, the Department of Environment, Land, Water and Planning (DELWP) and Parks Victoria undertake planned burning to reduce the impact of major bushfires on communities.

To reduce the impact of major bushfires, including smoke impacts, DELWP aims to optimise opportunities to achieve planned burning, while minimising the impact of smoke on the community.

The latter is achieved using a smoke management framework, which includes AQFx (a smoke forecasting system), and other capability requirements needed for the agencies, communities and industries to better prepare for smoke events.

The project will enhance the framework through:

- The development of a visual analysis system (AQVx) for generating and displaying near real-time (NRT) smoke intelligence data for Victoria. This is achieved by combining AQFx spatial smoke forecast data with surface, radar, and satellite NRT data sets in order to provide real-time, integrated data, including trends for smoke plumes which are impacting Victorian communities.
- The development and deployment of a school STEM curriculum focussing on the construction, deployment and analysis of data from low-cost particle sensors. This represents an important approach for engaging with communities who are potentially impacted by ambient smoke.

- In conjunction with the previous point, the development and deployment of an app (AirRaterSmoke) which enables users to log the presence of smoke; to photograph visible smoke plumes; and to record smoke-related health symptoms.
- Investigation of a data management strategy for collecting, collating and analysing public health data to better understand the impact of smoke on the community and inform smoke management decision making, including community health thresholds.

Project Outputs

The *Dynamic smoke modelling and community impacts of smoke* project will deliver:

A Visual Analysis Tool (Figure 1)

A system tailored for interpreting the current state of smoke impacts in Victoria, how this has evolved over the past 24 - 72 hours, and how it is likely to evolve over the next 24 hours. Inclusive in this capability will be the ability to undertake a qualitative assessment of current model performance and to use this information to factor uncertainties into the forward forecast and subsequent decision making.

In addition, an air quality desk will be maintained at the State Control Centre for a 1–2-week period where AQVx will be featured.

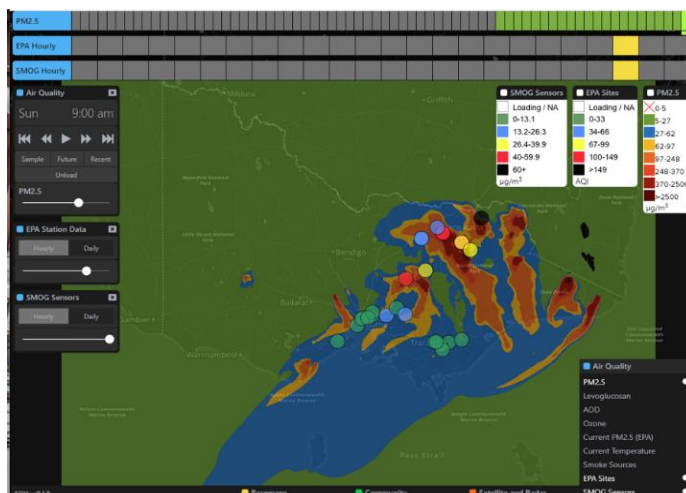


Figure 1: Visual Analysis (AQVx) tool

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STEM and low-cost sensors (Image 1)

The project will deliver a STEM curriculum based on the outcomes from a deployment at Anglesea and Boolarra Primary Schools. The project will also deliver intelligence on the use of emerging sensor technology, with in particular sensor data quality and how to derive meaningful air quality information from collated data sets. This intelligence gathering will help to develop the framework to enable sensor-based networks to be deployed in other communities.



Image 1: Smoke sensors installed at a private property in Gooramadda, Victoria

Photo: Jacinta Cooper (CSIRO)

The AirRaterSmoke App (Figure 2)

The AirRaterSmoke app will be made available to relevant community members identified through the STEM activities discussed above. DELWP personnel will also have access to the App.

The app will utilise highly specific locational data which, when combined with the measured and monitored smoke emission data, will ensure that communities receive clear information on the forecast and current exposures resulting from smoke emissions.



Figure 2: Screenshot of the AirRater Smoke App

Policy and Operational Implications

The optimal application of the smoke management framework and the associated tools will allow DELWP decision makers to address the following questions:

- What is the real-time status of smoke exposure within a Victorian community and what has been the trend over the last 24-48 hours? How is this likely to trend over the next 24 hours, particularly if a program of prescribed burning is in progress?
- When assessing the forecast trends in smoke exposure using the smoke forecasting system, how realistic and accurate are the predictions of smoke spread, dissipation and constituent concentrations? What are the biases and what is the level of uncertainty?
- What is the relationship between smoke exposure and community impacts? How does the community respond to the impacts and what actions are considered reasonable to mitigate their risks?

The Research Team

The project is being managed by the Bushfire and Natural Hazards CRC and is led by Dr Martin Cope (CSIRO) and Dr Fay Johnston Menzies (University of Tasmania). They are joined by Dr Fabienne Reisen, Dr Yi Qin, and Dr Chris Roulston (CSIRO), and Dr Amanda Wheeler, Dr Grant Williamson, Dr Penny Jones and Dr Chris Lucani (University of Tasmania).

Project Status (May 2019)

The AQVx prototype has been completed and deployed to DELWP, the Environment Protection Authority (EPA) Victoria and Bureau of Meteorology users. A training session was provided as part of the deployment, together with an online information and feedback site. AQVx is currently catering for 4 – 8 users per day.

Low cost SMOG units have been deployed to regional DELWP offices in the Hume Region. SMOG units together with school curriculums have been provided to Anglesea and Boolarra Primary schools and the students are currently involved in building and deploying the sensors. All of the SMOG units are communicating with the Cloud.

Following extensive publicity, AirRater Smoke was made available for download as an Android or IOS app. To date there have been 27 downloads.

The team managed an air quality desk at the State Control Centre for the week leading up to Easter and are now in the process of finalising data collection, reviewing comments on the AQVx information site and planning for project completion in June 2019.