Monitoring Wildland Fire Smoke: *Manitoba's Common Operating Picture*

National Smoke Forum 2014

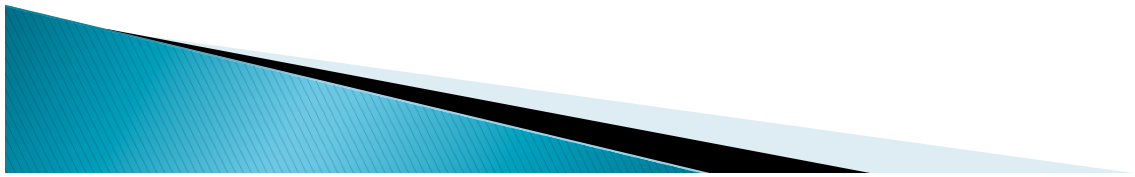
The problem with smoke

- Represents a major risk for the health of the people and the environment.
- Health impacts often include:
  - increased mortality,
  - increased hospital admissions due to respiratory and cardiovascular diseases,
  - increased emergency room and outpatient visits.
- Has potential to cause voluntary or planned evacuation through effects on health, economy, and overall community well being.
- Federal and Provincial jurisdictions are now compelled to use an **evidence-based** approach to health protection around wildland fire smoke events.

Build on our success

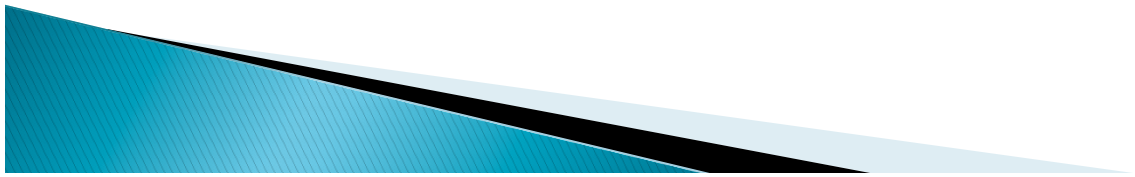
- That 2012 ‘light bulb moment’ demonstrated the benefits of increased surveillance and consistent messaging during a smoke event.

- How can we repeat this success and expand it across the entire province?
- Can we use web-based GIS applications like our COP to better visualize and disseminate information?
- Can we create our own sensor network to augment NAPS?



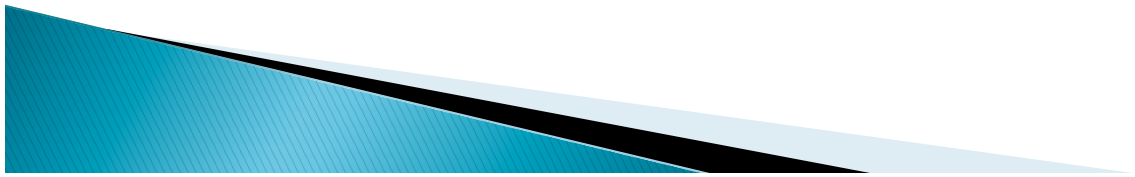
The Vision

- To establish a network of air quality monitors (sensors) that can measure particulate matter in the field and transmit that data in near real-time.
- Take advantage of the 5 existing NAPS stations across Manitoba to increase coverage area of the network.
- To leverage predictive models such as BlueSky and Firework which provide data in a spatial context indicating where and when air quality may be an issue.



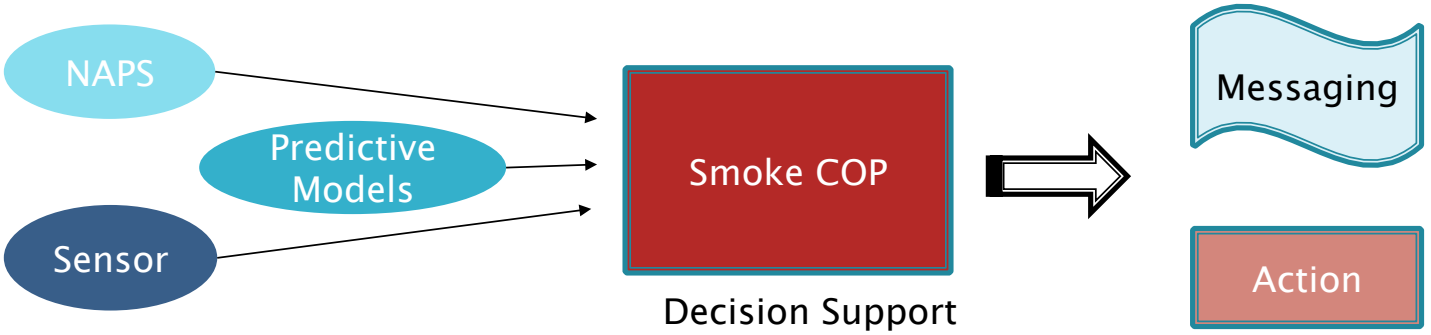
The Vision

- With lead time provided by predictive models deploy additional sensors to specific areas of concern.
- Present this and other data in a GIS-based Common Operating Picture (COP) application allowing disparate sources of information to be brought together and easily visualized / analyzed.



The Vision

- By amalgamating these various tools, ODM would thereby enhance its capabilities for effective risk management and decision making using an evidence based approach.



Our Partners

- ODM could not successfully implement such a monitoring program without various partners and the expertise they provide:
  - **Blue Sky**
  - **Environment Canada**
  - **Health Canada**
  - **Manitoba Hydro**

Putting it all together

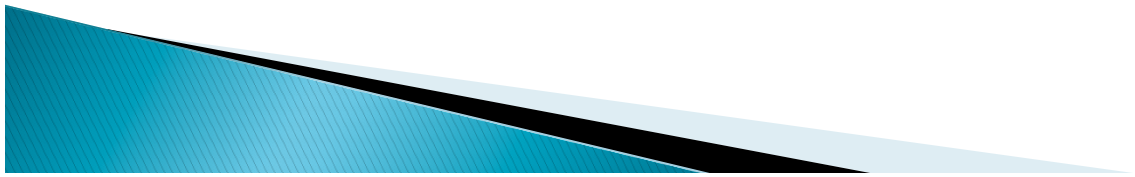
The Monitor

- The *TSI Dust Trak II* monitor measures aerosol contaminants i.e. particulate matter such as dust, smoke, fumes and mists.
- Units are housed in Pelican cases along with *Netronix Thiamis ICUs (Intelligent Control Unit)* that are GPS enabled and allow remote transmission of data captured by the Dust Trak monitor via Internet, Cell, or Satellite.
- Data transmitted by the Thiamis is sent to the Netronix DataCenter.
- Completely Portable.

A Complete, Deployable Monitor

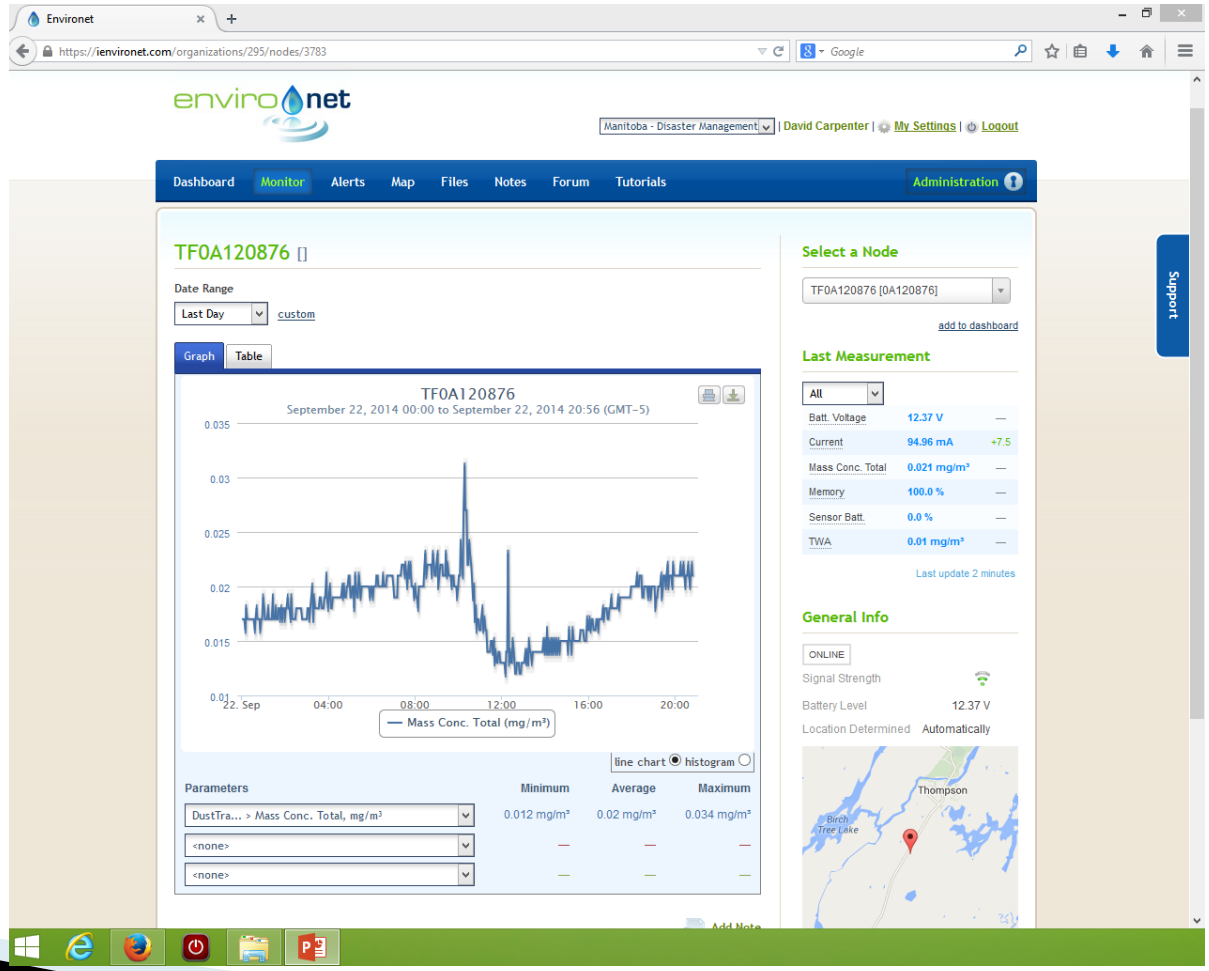
Environet

- Environet is a web-based application provided by the Netronix Group.
- Used to activate / deactivate and administer Thiamis ICU's in the field.
- Also provides a dashboard to view results from smoke monitors as well as their current location on a map (basic).
- Set up alerts to notify individuals using email or SMS when various thresholds are met or exceeded by the monitors.
- An API is also available to access the data (used by ODM to pull into our own database for further analysis/ visualization).



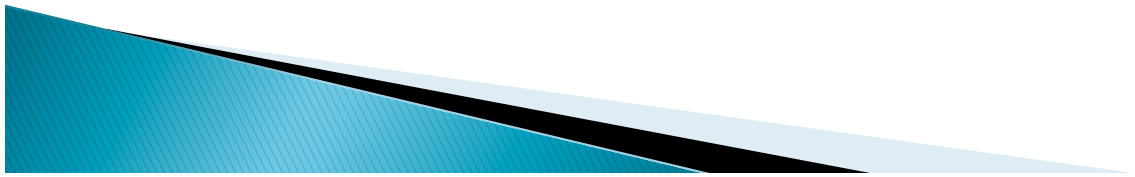
Environet

Demo



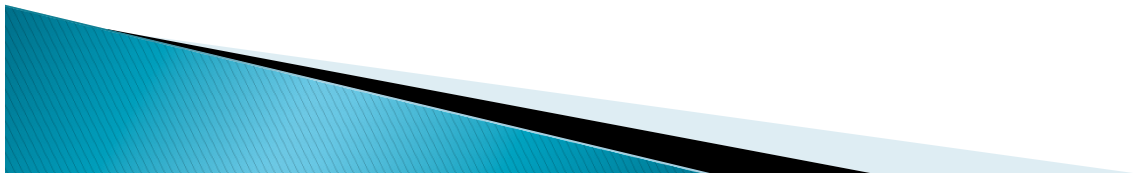
The Smoke COP

- The Smoke COP is a cloud-based GIS application providing a single spatial dashboard through which a user can visualize:
  - Location and current readings from deployed Smoke Monitors and NAPS stations,
  - Current wind and weather information,
  - MODIS Hotspots and known wildland fire locations from Manitoba Conservation,
  - Results of predictive air quality models**,
  - Relevant supporting information;
    - Location of Hospitals, Nursing stations, etc.
    - Regional Health Authority Boundaries
    - Etc.



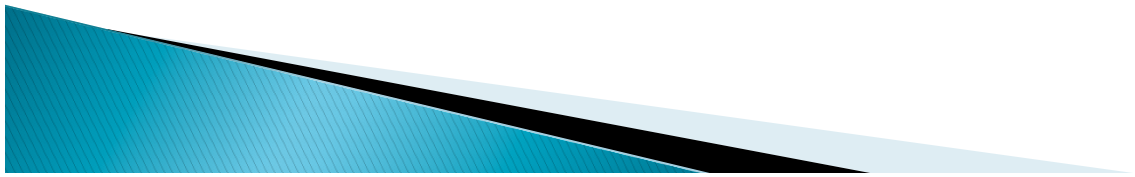
The Smoke COP

- Application written using the ESRI Javascript API.
- Server hosting the site is based in the Amazon Cloud.
  - ArcGIS Desktop
  - ArcGIS Server
  - SQL Server Express
- Cloud provides maximum flexibility.
  - excellent dissemination
  - no hardware to maintain, reliable



The Smoke COP

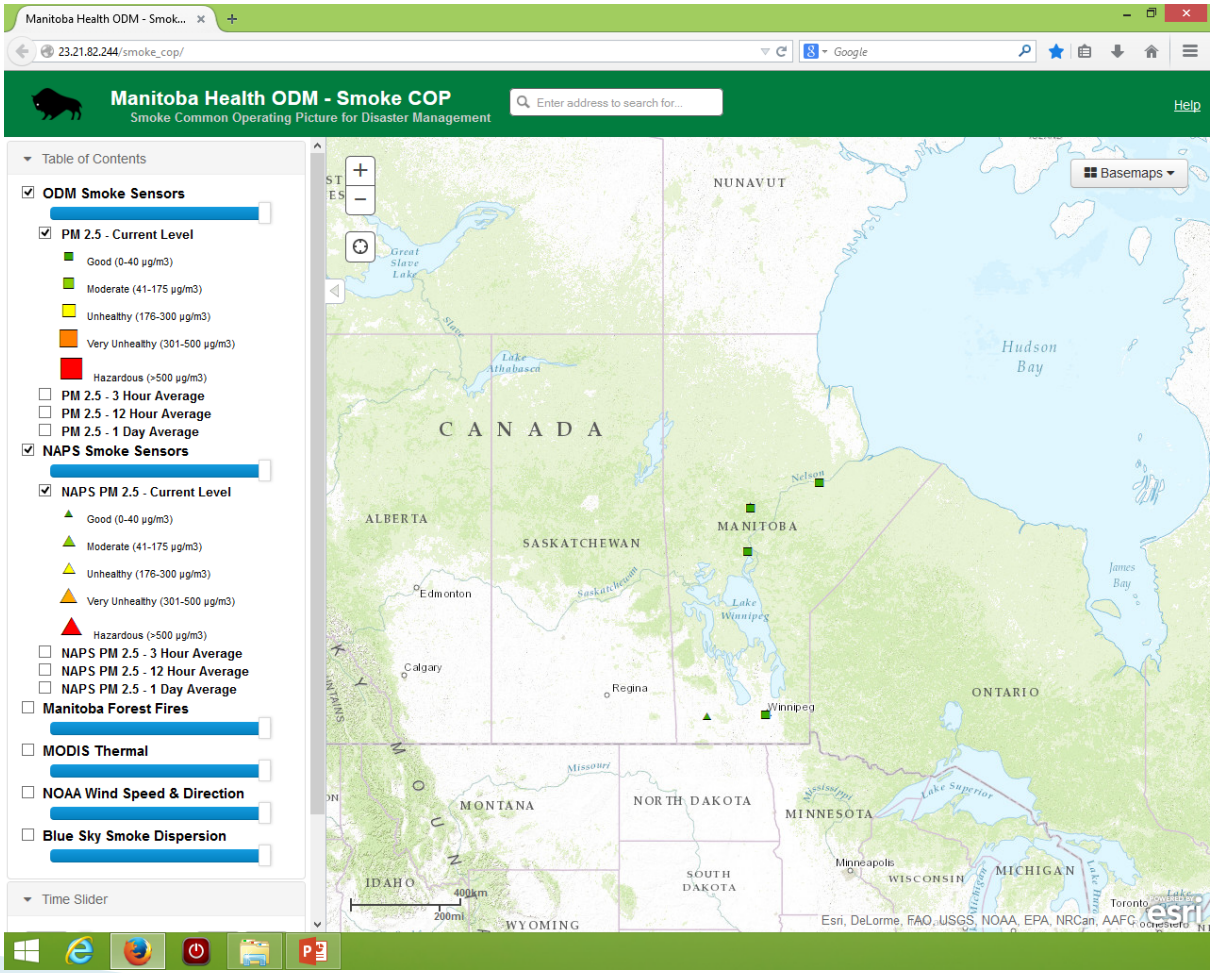
- One primary goal of the Smoke COP was to try and remain active consumers of data:
  - avoid the storage, manipulation, and re-publishing of information.
  - go to the source and use web services whenever available.
    - This proved challenging....



The Smoke COP

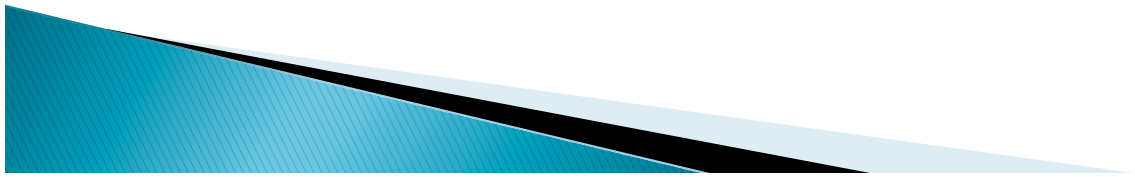
- Web scraping used to access NAPS data from website.
- MB Fire Locations; download shapefile daily, store, and re-publish.
- Could not add Firework or BlueSky directly to COP
  - BlueSky .KML format not compatible with ESRI utility
  - Firework not yet available as a public facing web service
- Example

Smoke COP Demo



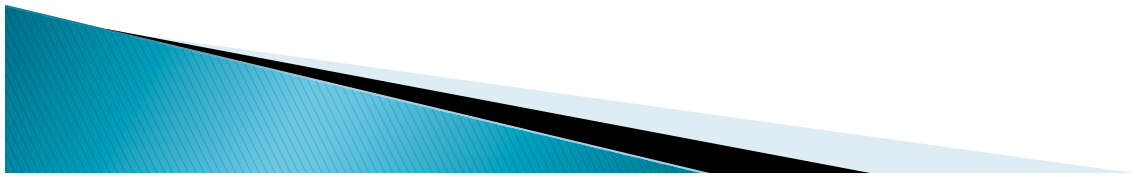
2014 Results

- Large fire events in the NWT provided the opportunity to see the smoke monitors in action and allowed the testing of Environet triggers.
- Some communications related issues with the monitors were encountered, these were successfully dealt with by early August.
- Predictive models and other data was not available in a format that could be easily consumed in the Smoke COP.
- Despite the issues experienced during the pilot season, a solid foundation exists for 2015.



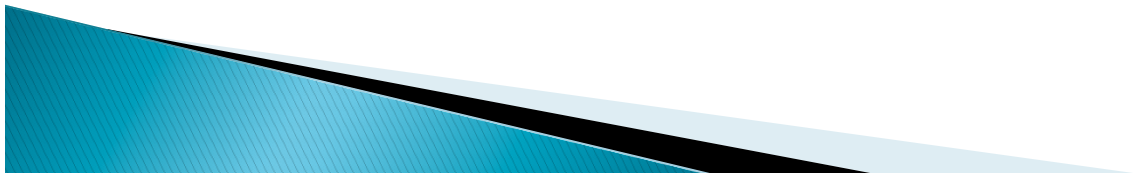
2015

- Smoke monitors will be deployed to Manitoba Hydro offices (Spring),
- SmokeCOP ideally will include live connections from Firework and BlueSky,
- Deploy additional monitors to smoke effected areas based on predictive models,
- Further analysis to corroborate predicted levels vs actual monitor readings,
- Implement messaging.



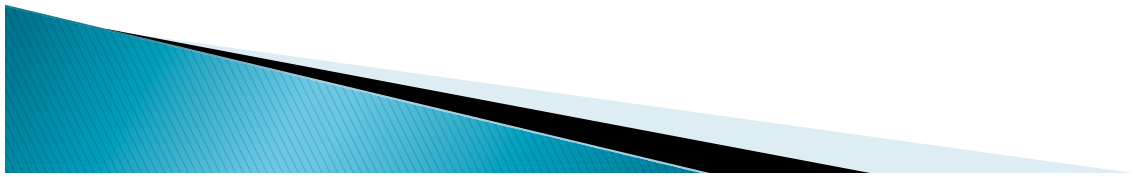
Health Perspective

- The health sector plays a key role in warning the public of extreme air pollution events to lessen their adverse impact on vulnerable populations



Health Messaging

- Health messaging/communication "the process of promoting health by disseminating messages through mass media, interpersonal channels and events”
- Health messaging and communication is vital to protect the health of a community, especially during emergency events



Speed and Accuracy of Information

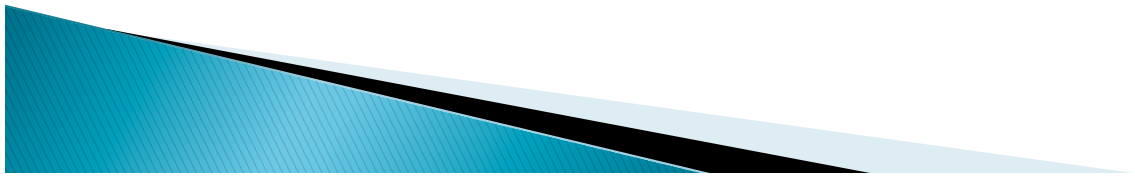
- Smoke COP provides us with real-time data on PM2.5 levels in smoke affected areas in Manitoba

Interpreting Data for the Public

- Provide the public with health information in a way they can understand
  - What's going on?
  - How serious is it?
  - How long it will last?
  - What should I do to protect myself?

Challenges in Current Messaging

- ***Consistency*** in messaging from different channels on the same event
- ***Appropriate*** health messaging:
  - Don't want to message too little or too much



[–] **For_The_Fail** 4 points 1 month ago

Is it safe to breathe that?

permalink

[–] **RambleMan** [S] 10 points 1 month ago

No. It is currently rated as "Hazardous".

Anything over 300 is Hazardous. We're at 611.

permalink parent

[–] **F35_Lameduck_2** 4 points 1 month ago

So does everyone walk around in gas masks.. or do they just stay indoors for the whole summer.. or?

permalink parent

[–] **RambleMan** [S] 6 points 1 month ago*

This rating is specifically related to the forest fires and the winds keeping the smoke on the city. It's not usually like this.

Today, personally, I've sequestered myself in my apartment with two air purifiers and an air conditioner running and I'm still having some difficulty breathing. I had lung issues as a child, though that periodically surface.

There are people outside. I saw someone cycle by. I know friends are out on the lake fishing. Yesterday I was out kayaking for a few hours while the smoke was much less dense.

There is no well-communicated message about what to do - we're all monitoring ourselves and deciding individually how best to cope.

Oh, and Government of Canada's website provides "not available" currently. We're getting our information from a Chinese website/mobile app.

We need lots and lots of rain to put out forest fires and wind to push this smoke away.

AQI	Air Pollution Level	Health Implications
0 - 50	Good	Air quality is considered satisfactory, and air pollution poses little or no risk
51 -100	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
101-150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
151-200	Unhealthy	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects
201-300	Very Unhealthy	Health warnings of emergency conditions. The entire population is more likely to be affected.
300+	Hazardous	Health alert: everyone may experience more serious health effects

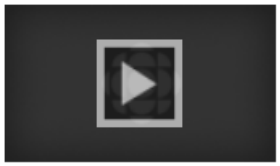
Smoke Projects – Health Canada

- Development of Special Air Quality Statements
- First Nation Special Air Quality Statements
- Messaging for Simultaneous Heat and Smoke events.

Moscow heat, smoke double death rate

Wildfires, scorching temperature produce thick smog

The Associated Press Posted: Aug 09, 2010 9:04 AM ET | Last Updated: Aug 09, 2010 6:39 PM ET



Fires rage in Russia 2:36

Deaths in Moscow have doubled and are now averaging 700 people a day amid a sweltering heat wave and poisonous smog from wildfires, a top Russian health official said on Monday.

Moscow health chief Andrei Seltsovky blamed weeks of unprecedented heat and suffocating smog for the rise in mortality compared with the same time last year, Russian news agencies reported.

He said city mortuaries are close to their capacity, with 1,300 bodies.

Acrid smog blanketed Moscow for a sixth

Conclusion

- The need for smoke monitoring is significant for both emergency managers and health professionals
- Through the use of tools like SmokeCOP, and the development of smoke specific health messaging, provincial and local agencies can be better equipped to protect public health and safety