



Assisting Mitigation of Bushfire Threat in Regional Australia through MODIS Imagery Based Media GIS

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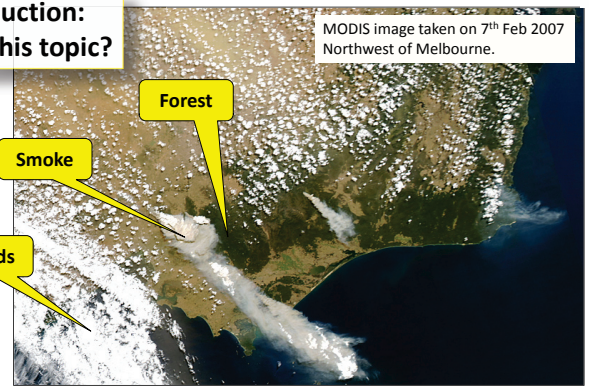
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Introduction: Why this topic?



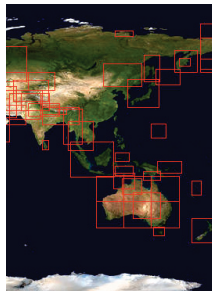
The Black Saturday bushfires in Victoria killed 174 and caused over \$2.5 billion in damages, while destroying over 2000 homes.

Flow of the presentation

- Introduction: why this topic?
- MODIS & Environmental monitoring
- Media GIS
- Bushfire risk in Australia
- Linking Media GIS with bushfire disaster mitigation efforts
- Methodology
- A case study
- Conclusions

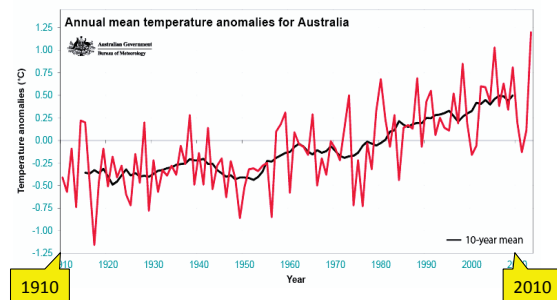


MODIS, a user friendly global satellite image coverage



Introduction: Average annual temperature is increasing!

The growing positive trend in the **average annual temperature** of Australia indicates the possible adverse impact from the temperature to cause more bushfires.



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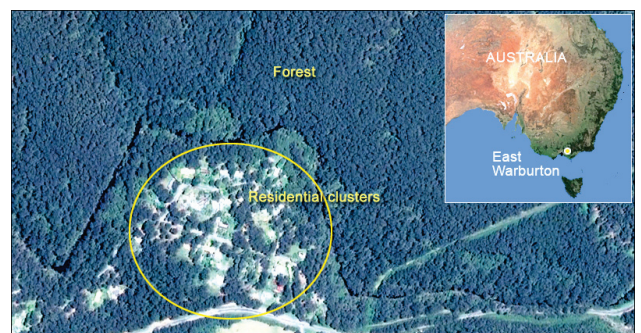
Introduction: Why this topic?



- Bushfire is the dominant natural hazard in Australia. From **1967 to 1999**, total bushfire damage was about \$2.5 billion, with total deaths of 223 people.
- The deadly Black Saturday bushfire in Victoria, occurred in **2009** killed 174 people and injured 500. The total damage by this fire was over \$2.5 billion.

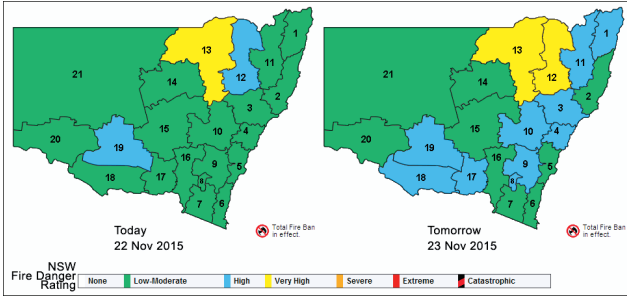
Introduction: Risk factors : Living near the bush

The high risk factor in settlements closer to bush (Image shows an area east to Melbourne).



Ongoing actions

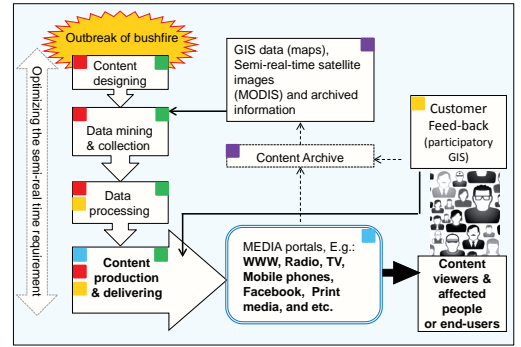
In NSW, Australia, daily fire warnings and forecasts are issuing. These information can be linked to Media GIS bushfire contents too.



Methodology

The Media GIS content production has to focus on five basic standards:

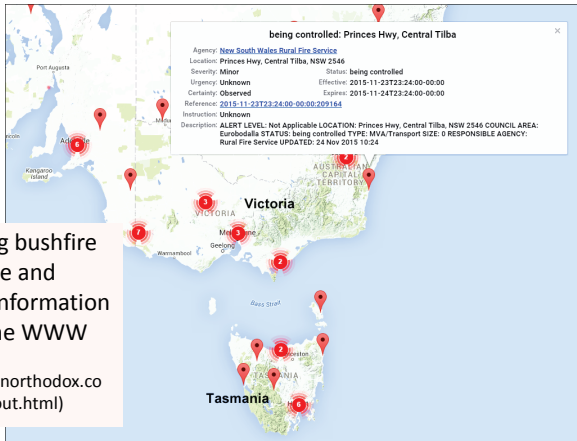
- accuracy,
- high aesthetic quality,
- speed,
- low cost, and
- reusability



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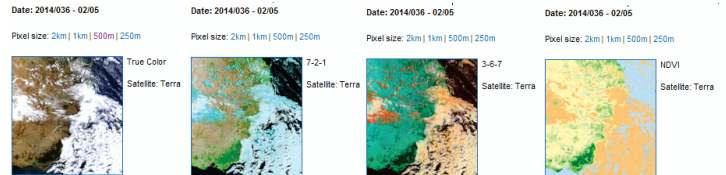
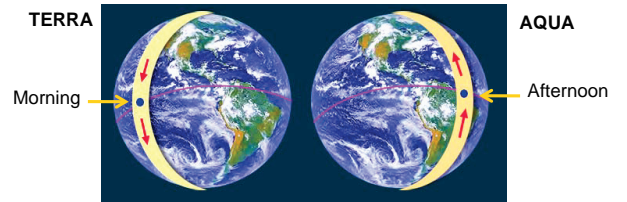
Ongoing actions

Monitoring bushfire in real-time and updating information through the WWW (source: <http://www.unorthodox.com.au/fire/about.html>)



MODIS imagery & Environmental monitoring

Terra MODIS and Aqua MODIS are viewing the entire Earth's surface every 1 to 2 days and collect data in 36 spectral bands.



Media GIS

Media GIS can be considered as a sub-section of GIS.

It is a computer-based system that;

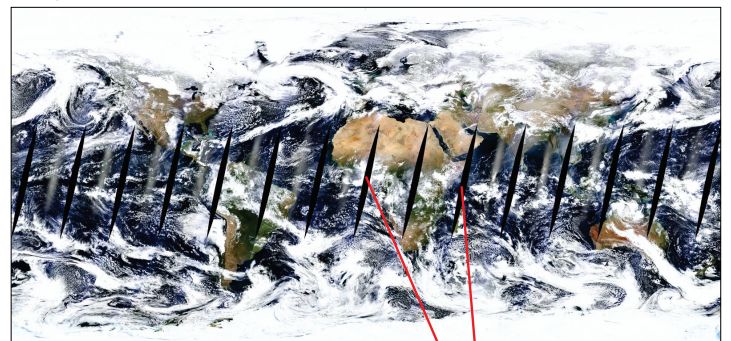
- explore,
- collect,
- maintain,
- store,
- analyse, and
- distribute,

graphic contents of *natural disasters* and *other spatially significant incidents*, to use in *electronic* and *print media*, with a *high aesthetic quality*.



MODIS covers the entire earth in 1-2 days

MODIS Terra composite for March 28th, 2013.
Images: NASA LANCE-MODIS

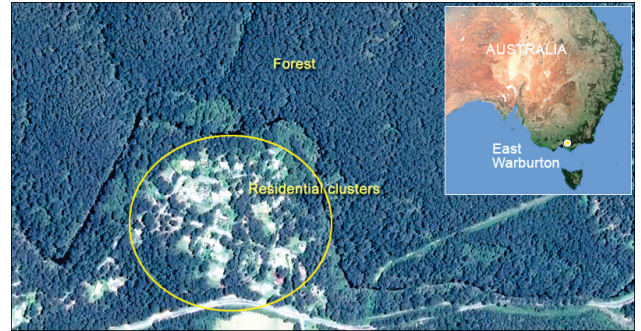


MODIS Bands and spatial resolution

Primary Use	Band	Bandwidth (nm)	Pixel Size (m)
Land/Cloud/Aerosols Properties	1	620 - 670	250
	2	841 - 876	250
	3	459 - 479	500
	4	545 - 565	500
	5	1230 - 1250	500
	6	1628 - 1652	500
	7	2105 - 2155	500
Ocean Colour/Phytoplankton/ Atmospheric Water Vapour	8 - 19	405 - 965	1000
Surface/Cloud and Atmospheric Temperature, various cloud information	20 - 36	3.660 - 14.385 Bandwidth (µm)	1000

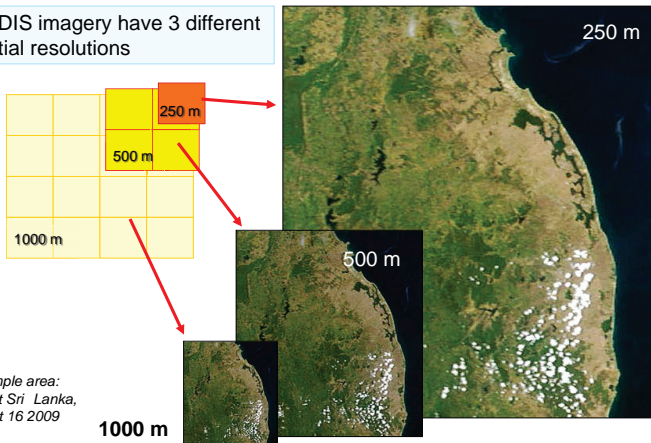
Bushfire risk in Australia

The high risk factor in settlements closer to bush (Image shows an area east to Melbourne).



MODIS spatial resolution

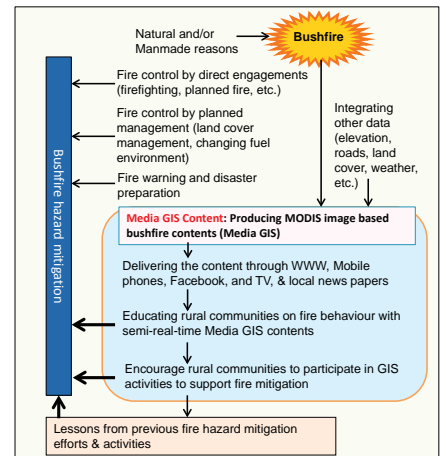
MODIS imagery have 3 different spatial resolutions



Methodology

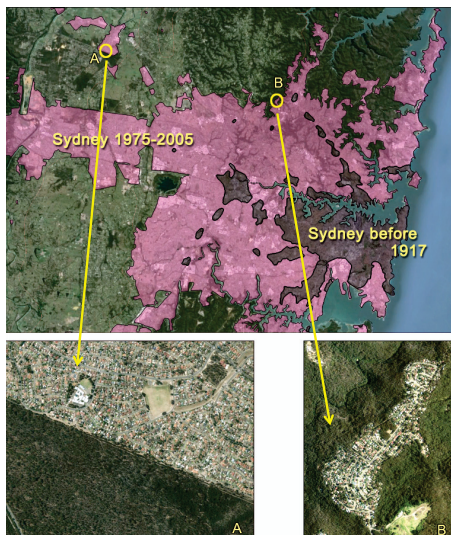
The diagram explains the approach to produce the 1st content on a newly started bushfire (natural disaster).

Media GIS content production is explained previously.



Bushfire risk in Australia

The ever expanding Australian urban and residential areas are facing bigger damage from possible bushfires. The risk factor in settlements next to or surrounded by bush is high. Some of the suburbs of Sydney, are such examples.



Linking Media GIS with bushfire disaster mitigation efforts

- Educate rural communities through Media GIS contents based on daily MODIS imagery.
- The well established electronic communication in Australian society can be used to approach rural communities.
- Once the access established (bushfire mitigation forums?), it is fair to assume a very positive feedback from local communities, in a disaster.
- Media GIS contents will guide people to understand the developments of the fire together with other relevant information such as nearby towns, extent of forest cover, and other high risk areas.



Linking Media GIS with bushfire disaster mitigation efforts

- Media GIS analysis will be based on available government information, fire warning, satellite images, Google Earth images, and other geographic (elevation, road network, etc.) and social (rescue centres, hospitals, etc.) information.
- When the participation from local communities activated, media contents can be enriched with very useful disaster mitigation information, such as **local damage extents, high risk areas, spots with safety**, etc.
- In a future step of this study, it will investigate the forest lost and gain in Australia using data extract from global forest watch database to identify hot spots to meagre with recent bushfires and daily satellite images of ongoing fires.



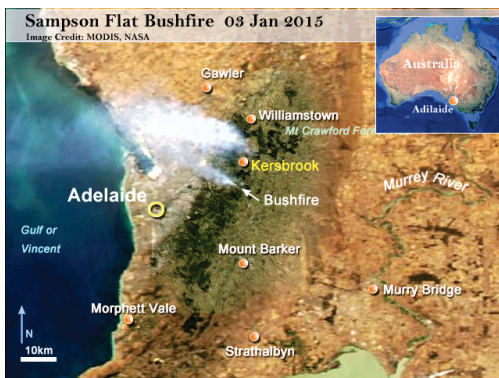
Linking affected people using bushfire contents: Smartphones?

'....Smartphones have a capability that few people take advantage today. A feature called **tethering** lets a phone go beyond talk, email and Web surfing to act as a **mobile hotspot** that can supply Web access to nearby computers, tablets and other devices.

.....Like dedicated mobile hotspot devices, these phones connect to a mobile data network and then act as a Wi-Fi router, distributing the bandwidth to nearby clients.'

Source: <http://www.computerworld.com/article/2499772/mobile-wireless/mobile-wireless-wi-fi-tethering-101-use-a-smartphone-as-a-mobile-hotspot.html>

Case study



MODIS + Google Earth image + Area information + Basic map elements

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Linking affected people using bushfire contents: Tethering through Smartphones



Source: <http://androidactivity.com/>

Authorities should explain about tethering to local residents in high risk areas. In a disaster situation, mobile companies should let people to use the **tethering facility freely**.

Linking affected people using bushfire contents: Smartphones?

Bushfire Media Contents can be uploaded to mobile phones through the internet (as a web content or through Facebook).

- In a disaster, power and land line telephone can be easily interrupted.
- In such a situation, unharmed mobile phone antennas may provide some connectivity.
- Also, authorities can available all Wi-Fi accounts in the affected area for any mobile phone in vicinity to access.



Linking affected people using bushfire contents: Smartphones?

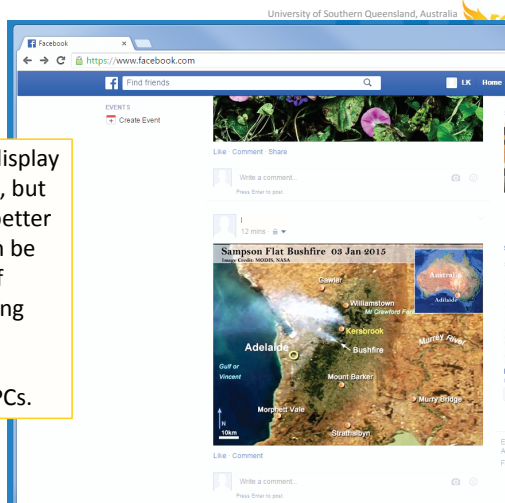
When bushfire media content posted, at least some of the smartphones in affected area may link by available Wi-Fi links or through **tethering technique** (mentioned in previous slide) and start to **feed** local information.

This information is useful as **participatory GIS** data in content update.



Facebook?

Smartphones can display Facebook accounts, but PC display gives a better view. **Facebook** can be the fastest mean of communication using images, due to its availability in smartphones and PCs.



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Conclusions

- MODIS images can be successfully used to produce “semi real time” **Media GIS contents** to display natural disasters (floods, forest fire, drought, etc.).
- Contents must optimize the **aesthetic quality, accuracy** and production **speed**.
- Content produced for bushfire can be used to educate rural communities in Australia, to attract the participation of those communities for **disaster mitigation efforts**.
- The well-established electronic media in Australia can be a vital support in this task (data interoperability).
- The case study presented in this study is showing the basic quality of one Media GIS content of bushfire.
- When the content is fresh, **graphically attractive**, and **geographically accurate**, viewers will get a better understanding about nature of disasters. That increases the public involvements in disaster mitigation efforts.

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<http://www.dailytelegraph.com.au/newslocal/the-hills/dural-bushfire-threat-eases-after-firefighters-respond-to-blaze-at-quarry-rd/story-fngr81f-1226730818965>

Thank You