Challenges to response operations of the 2009 black Saturday bushfires

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Abstract

The paper summarises operational issues contributing to high mortality during the "Black Saturday" bushfire disaster of 7th February 2009; and highlights emergency and disaster operations management implications. The paper is an outcome of research undertaken as part of a larger PhD project that utilised document and content analysis supplemented with face to face interviews with senior incident commanders. The research found that: poor information and communication, unusual fire behaviour and ambiguous evacuation policy were key challenges in emergency and disaster response operations. Further research into early warning risk communication, situation awareness and evacuation policy and logistics to reduce mortality is required.

Keywords: disaster operations; humanitarian operations; humanitarian logistics

Introduction

Disasters threaten societies everywhere in the world. While there is great variety in the way disaster operations and management is organized in different countries and different parts of the same nation, operational difficulties contributing to mortality and loss often appear to be similar across large scale disaster and emergency response operations. This paper summarises the key challenges to the Victoria State emergency and disaster response operations during the "Black Saturday" bushfires of February 7th, 2009 in Australia in which 173 persons perished (Victoria Bushfires Royal Commission of Enquiry 2009). The rest of the paper is structured as follows: the next section provides a brief overview of key bushfire and emergency operations literature. This is followed by a summary of the history of bushfires in the state of Victoria in Australia. The bushfire disaster is then discussed in three following sections: "before the events of Black Saturday", "events of Black Saturday" and associated impact of the fires. Operational challenges during the emergency response to the bushfires are discussed in the penultimate section while the paper ends with a summary and conclusion.

Bushfire studies and the emergency operations literature

Studies of bushfires and bushfire response operations have been approached from several perspectives such as risk and community vulnerability, environmental change/global warming; urban and regional policy, forestry/eco-system management, human behaviour, incident management and response, organising and coordination in crisis response as well as personal safety decision-making (e.g. Chen et al. 2010, Buxton et al. 2011, Johnson et al.

2012). However, studies of tactical emergency and disaster response operations are scant in the operations management literature. Nonetheless, an example of bushfires and bushfire response studies from climate change and forestry perspectives is Keely et al (2009) who argued that the majority of large fires are partly due to drought which contributes to high dead fuel loads, and that the topography of remote wilderness areas of rugged terrain makes access to fire fighters difficult which in turn results in anthropogenic ignitions being low, and stand age and fuel loads being high. Buxton et al (2011) investigated bushfires from the perspective of regulatory land use planning and focused on vulnerability of the public to bushfire risk at Melbourne's urban fringe.

Other studies such as Chen et al (2010) have highlighted features of emergency coordination and decision making in emergency and disaster response organizations. Chen et al (2010) examined the role of emergency coordination in response to the nature of a crisis and its complexity. They also highlighted the dynamic interdependencies amongst actors, available resources, information and emergency/ disaster operations decision-making. Chen et al (2010) also highlighted common characteristics of emergency operations such as: high risk of negative consequences if coordination decisions or emergency decisions are slow, ill-informed or insufficient; the complexity involved in the coordination of disaster and emergency response operations resulting from the vast network of activities and tasks to be undertaken, resources to be allocated, and the many actors to work with as cohesively as possible as well as interdependencies amongst actors; and the operational challenges of inaccurate and/or limited information such as decision-making under conditions of uncertainty and threat, limited resources, short-timeframes, high risks and the unpredictable development of unfolding events.

Chen et al (2010) also highlighted the many important tasks that are loosely formulated and directed to ill-defined, even possibly conflicting ends that often lack unequivocal criteria for deciding when the tasks have been completed. Such decision-making complexity is often resolved by creating small areas of certainty that can be handled more easily, or simplified into more precise forms that ignore features that are "messy" and unstructured, difficult to specify, or non-quantifiable which is commonly termed a framework of "bounded rationality" (Weick 1993).

History of bushfires in Victoria

Bushfires or "wild fires" are seasonal events in Australia and emergency and disaster personnel pride themselves on their effectiveness borne of experience. Significant bushfire events in Australia include the "Black Thursday" bushfires of February 6th 1851 which killed 12 people (The Australian 2011), and the "Red Tuesday" fires of 1st February, 1898 that burned down 260,000 hectares of land and killed 12 people (The Australian 2011). Between 1905 and 1926, several bushfire events burnt more than 100,000 hectares of land, and killed 60 people (The Australian 2011).

On February 14, 1926, 31 persons were killed at Warburton while 9 lives were lost in 1932 in South Gippsland (The Australian 2011). The January 13, 1939, "Black Friday," bushfires killed 71 people and destroyed the township of Narbethong (The Australian 2011). On 22 December, 1942, 10 people were killed near Wangaratta in Victoria, and 20 people died as a result of bushfires in Hamilton, Dunkeld, Skipton and Lake Bolac between 14th January and 14th February, 1944. In January, 1962 in the Dandenong Ranges on the outskirts of Melbourne, 32 people were killed in bushfires. Likewise, on 17th January, 1965, a bushfire caused 7 deaths near Longwood in Northern Victoria. On the 8th of January 1969, 280 bushfires broke out in Daylesford, Lara, Darraweit, Kangaroo Flat, Dulgana, Yea, and

Korongvale resulting in 23 deaths. Similarly, on February 12, 1977, in Western Victoria 4 people died in a catastrophic bushfire while the "Ash Wednesday" bushfires of 16 February 1983 resulted in 47 deaths (Romsey Australia 2011). A large fire on 14 January 1985 in Avoca, Maryborough, and Little River in Central Victoria killed 3 persons, and 5 major fires in the Dandenong Ranges on 21 January 1997 caused 3 fatalities. Reducing mortality rate seems to suggest a mastery of the prevention and the emergency operations management of bushfires until the 7th February, 2009 "Black Saturday" bushfires claimed 173 lives (Herald Sun 2009).

Before the events of "Black Saturday"

Before the fire disaster, there seemed to be unnoticed failures in the regulatory land-use planning regime and the building codes and laws which did not keep up with the spread of several small towns in a high fire-hazard area (Hughes and Mercer 2009). Controlled burning of forests for fuel load reduction was also inadequate while an increasing number of residents moved into the area who did not understand the possibility of a fire threat in spite of a long term drought and a severe and on-going period of heat wave (Turoff et al. 2013). Further, emergency and public officials seemed to hesitate to be pessimistic about the threat, and did seem not to want to contemplate the possibility of the extreme fire storm that occurred.

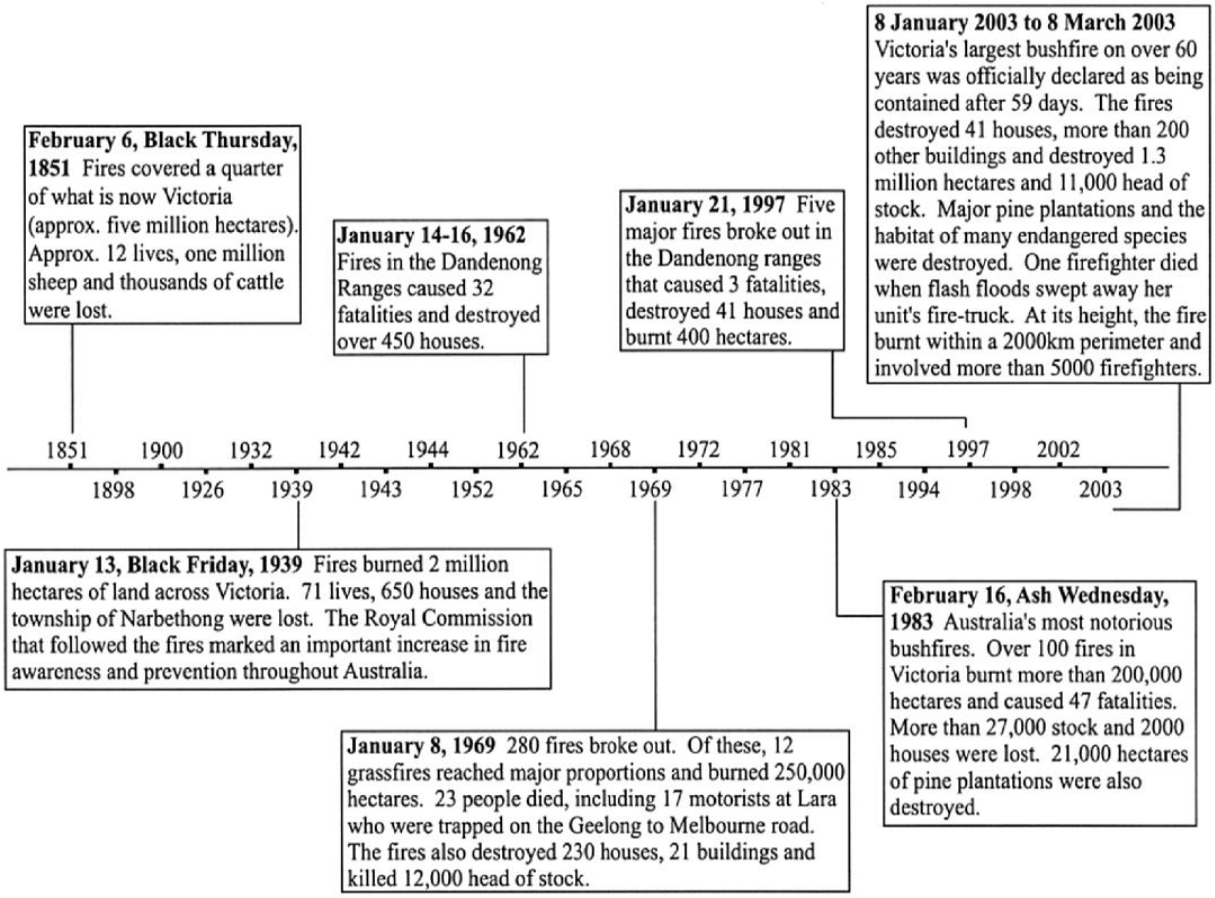

Fig.1: Major Victorian bushfires before "Black Saturday" (Adapted from Whittaker and Mercer 2004).

Events on Black Saturday

The "Black Saturday" bushfires were a series of bushfires that ignited, or were burning across Victoria on and around Saturday, 7th February 2009. The bushfires seem to have been caused by over-heated electricity cables due to excessive environmental heat from an on-going heat wave, and extremely high wind speeds which caused short circuits that resulted in sparks, circuit damage, more overheating, fire, and/or explosion (Victoria Bushfires Royal Commission of Enquiry 2009). Also, the unique geographical circumstances of high wind speeds, highly concentrated aromatic fuels in super-dry trees and high temperatures resulted in the fires spreading rapidly. However, other fires seem to have been lit by arsonists (Bryant 2008). The immediate and unanticipated consequence was that as many as 400 large individual fires were recorded on 7th February, 2009 and they were spreading fast thereby posing serious risks to communities (Victoria Bushfires Royal Commission of Enquiry 2009). By the afternoon of 7th February, 2009 the Bunyip State Park fire had overcome containment lines and hundreds more of other bushfires erupted as temperatures rose and wind speeds increased "spotting" and the distribution of flaming embers increased. Electric power lines fell in 125 km/h (78 mph) winds which further ignited other fires and the number of individual fires across Victoria increased into several hundred quite rapidly, with all fires "spotting" as a result of high wind speeds (Oloruntoba 2013). The "Black Saturday" bushfires were now rapidly under way with increasing ferocity.

After the ignition of fires, public officials now clearly realize with increasing alarm and some certainty that there could well be greater danger and destruction if the whole state becomes engulfed in flames. As a result, the Country Fire Authority, the Metropolitan Fire Brigade, the Army, the State Emergency Services (SES), the Directorate of Sustainability and Environment (DSE) and other government agencies made rapid and ad-hoc assessments of the danger, and made large scale efforts to suppress the bushfires or stop them from spreading.

Impact of Black Saturday

"Black Saturday" shocked the world by the quantum of lives lost (The Age 2009). "Black Saturday" involved over 300 separate large fires and 1000 smaller fires burning simultaneously in almost half of the State of Victoria. 173 people were killed with more than 500 people suffering fire-related injuries, and more than 300 people admitted to hospitals across Victoria State with severe burns (Bassed and Leditschke 2011). A number of the victims were citizens of the Philippines, Greece, Chile, Indonesia, New Zealand and the United Kingdom. The disaster destroyed over 1,834 homes and damaged thousands more leaving over 7,500 people homeless (Cameron et al. 2009). It was the worst bushfire disaster and Australian natural disaster ever, and amongst the worst ten bushfire disasters in the world regarding mortality (Cameron et al. 2009) while estimated losses were in the region of AUD 4.5 billion (Royal Commission of Enquiry, 2009). Such high mortality as a result of natural disasters is often associated with poor developing countries (EM-DAT 2010, Oloruntoba, 2013).

Operation challenges during the response

Bushfire-fighting expertise was sought and received from other fire-fighting and SES units from other Australian states. Bushfire-fighting expertise was also sought internationally from the United States (U.S.), Canada, Singapore, New Zealand, Indonesia and France who either

sent, or offered a range of logistics and fire-fighting assets and resources to Australia (ABC 2009) These countries also sent a range of bushfire experts and advisers to Australia (ABC 2009). In parallel with fire suppression efforts, public safety officials initiated emergency rescue of community members that were in immediate danger of the fires, provided disaster relief to evacuees and displaced persons, evacuated some areas in the path of the fires, and undertook salvage activities. Information challenges seemed to be at the heart of emergency response operations such as rescue, relief, command and control. Apart from information challenges, there were also operational challenges arising from the ferocity and chemical behaviour of the fires as well as evacuation policy ambiguity and related issues of a lack of formal disaster declaration, and each is briefly discussed below.

Information challenges

In undertaking fire suppression, rescue, relief and salvage activities, there seemed to be significant information, perception and situation awareness difficulties that challenged emergency and disaster decision-makers as the fires raged (Turoff et al. 2013). Ad-hoc and quick definitions and re-definitions are made of the unfolding situation by public safety officials in order to solve the pressing and simultaneous problem of emergency rescue and fire suppression. For instance, in the Horsham fire, disaster decision-makers were reliant on the radio broadcasts of the local station ABC Radio for some of their tactical decision-making. The radio station was in turn reliant on live phone calls from residents of affected areas who were supplying supposedly immediate and up-to-date information on the fires in the area. However, radio and telephone reports from the public were not always clear or accurate about the nature of the fires. Hence, there was uncertainty about the accuracy of information being received (ABC 2009).

Such information asymmetry is similar to the U.S air defence personnel in their command and control centre watching commercial TV during 9/11 to find out what was happening. Officials were listening to radio broadcasts in order to know what was unfolding. As a result, there was uncertainty in the Horsham fires about the movement, scale and intensity of the fires both by incident controllers and members of the public. Finding out information about what was happening with the fires was chaotic in terms of officials and people not knowing, and incident controllers were unsure whether present decisions will be adequate for the attainment of their desired goals as communication systems did not work as well as they should have: warnings were delayed while others were not warned at all. Emergency warning signals and sirens on TV and commercial radio were not even activated because of the speed and intensity of fire activity.

The resulting information uncertainty was also a barrier to proactive action by the public. Mere “preparedness” and “awareness” of fire warnings by the public before “Black Saturday” seems to have been inadequate as ambiguous warnings and cues without a clear perception of the severity of threat has been blamed for decisions by members of the public not to evacuate. Various countries make efforts to ensure that the implications of warnings and consequential actions required by populations were understood in advance of an event. For example, Bangladesh utilized 44,000 volunteers managed by the Bangladesh Red Crescent Society on bicycles and on foot to “retail” Cyclone warnings to community members. The volunteers in Bangladesh went door knocking from house to house and village to village to warn residents to evacuate to higher ground when Cyclone Sidr (in 2007) was imminent. Such “retailed” warning resulted in a significant reduction in the loss of life (Tatham et al. 2012).

In the Australian context communities after a life time of conditioning often listen to and accept instructions from public officials such as the police. Communities often seem to lack

the initiative (or a plan) to take risk avoidance initiatives without being directly told to do so, and so they often tend to await specific instructions/information from public safety officials and other authority figures, however, securing accurate information was as much a challenge for community members as it was for public officials (Victoria Bushfires Royal Commission of Enquiry 2009).

Information challenges in this case reflected information seeking behaviour about the environment from authority figures, and is evidence of a collapsed warning system. The lack of adequate warning information resulted in a desperate last minute spike in demand for up to the minute bushfire information by a section of the affected communities. However, the sudden spike in demand for public safety information from the usual sources of emergency and disaster information (e.g. police websites, emergency services web-sites; triple zero emergency phone numbers) resulted in the online and telephone information and warning delivery systems being overwhelmed (Victoria Bushfires Royal Commission of Enquiry 2009). This resulted in system collapse with over 80% of phone calls seeking crucial information going unanswered, and calls being abandoned by callers after several failed attempts. Public safety information websites also "crashed" as servers were unable to cope with the demand (Victoria Bushfires Royal Commission of Enquiry 2009). This is congruent with civil hazards being characterized by limited dissemination, or lack of warning which contributed to catastrophic outcomes (Oloruntoba 2013, Turoff et al. 2013).

Situational awareness, ferocity and fire behaviour

The ferocity and scale of the bushfires appears to have been under-estimated by both the public and public officials. This seemed to be a result of a combination of several factors such as poor situational awareness and an inability to detect current status in spite of the Bureau of Meteorology's wind speed updates to incident controllers and fire-fighters (Oloruntoba 2013). Short-comings in the ability of incident controllers to detect current status of the situation seems to have stemmed from coordination/command, control and information systems not being able to keep pace with the intensity, speed, and scale of the fires. And as a result of the scale of the fires, and Murrindindi shire having two major fires burning simultaneously, experienced fire fighters were in short supply. Available experienced fire fighters were spread thin over both and other fires. Hence, it appears that "bounded rationality" due to information and misperception challenges were also a challenge in the planning and decision-making regarding tactical decision-making on the day.

Another factor that was a major challenge was the unusual fire behaviour. Fires spotted up to 30 kilometres away, and as a result igniting areas up to 30 kilometres ahead of the fire front. The sheer ferocity and the speed of the fires caught firefighters unaware, and fire behaviour in places like Marysville has never been experienced before in the history of contemporary firefighting in Australia and in spite of the seasonal experience of fire fighting in Australia. Fire behaviour on the day was in the context of an intense firestorm fuelled by highly explosive chemical oils in the *Eucalyptus angustissima* trees in temperatures over 1200 °C (2,190 °F), and winds of over 120 km per hr. The firestorms have indeed been compared to some form of explosive chemical firestorm that generates *pyro cumulus* clouds of fireballs up to 15 km in the sky similar to the "mushroom" clouds associated with atomic and nuclear explosions (Victoria Bushfires Royal Commission of Enquiry 2009).

Evacuation policy and lack of disaster declaration

The Police in Victoria do not have the constitutional powers to compulsorily evacuate people unlike in other states such as Queensland. Nevertheless, it seems Marysville was effectively "evacuated" on "Black Saturday" based on "strong" Police advice. Marysville was evacuated at the last minute when a large firestorm was bearing down on to the town. However, some

residents elected to stay, unfortunately quite a few of those that elected to stay were the ones that died. It seems that sighting the fires was the catalyst for some community members to take Police advice and evacuate since to try to escape was the only option left. However, in spite of sighting fires, it seems that some members of the public rejected Police offer of evacuation perhaps because of the economic interest in their property (Oloruntoba 2013).

Also, the lack of a formal government declaration of a state of disaster on "Black Saturday" might have influenced some individual decisions to stay and protect their property thereby further compromising public safety (Oloruntoba 2013). A disaster is a political and a media event. Hence, when a disaster such as this occurs the media is surrounding it, and political and economic interests are at play. Although, it is unclear why political authorities did not formally declare a disaster; perhaps, such a declaration might have allayed the fear of economic loss amongst the public, and may be encouraged more and earlier self-evacuations and as such reduced the risk of mortality. A disaster is also economic in nature because when a disaster occurs and the government declares it a disaster, it relieves affected communities of the financial burden for the disaster as government becomes responsible for the financial cost. While human behaviour in emergencies and the nature of disasters is hard to predict, ineffective social, human, and information systems seem to have combined to result in inconsistencies and contradictions that rendered the emergency response operations grossly inadequate thus contributing to the losses on the day.

Summary and conclusion

As discussed in the paper, decision-making by emergency and disaster management officials require a specific approach that is developed based on an adequate understanding and appreciation of the social and economic context of the emergency as well as the operational reality on the ground. The evidence shows that this was not the case on Black Saturday. Perhaps public officials and community members might be more proactive if they had high quality information and situational awareness on the day. Some have argued that fire behaviour on the day makes the fires insuppressibly regardless of the number of fire fighters, aircrafts and fire engines which would seem to justify precautionary evacuations pre or post-ignition as a general principle because most of those who survived the fires self-evacuated early. Although controversial, emergency operations planners and decision-makers in this case and beyond may need to consider the precautionary principle in evacuation decisions such as the use of early and orderly mandatory evacuations for all.

Also, emergency and disaster operations planners and decision-makers may need to begin to monitor the impact of their operational emergency and disaster decision-making closer to real-time, perhaps using information technology such as satellites and drones. Receipt of such live feedback will constantly and regularly provide updates for operational decision-makers for forward planning purposes. Further, in considering evacuations, it may be useful for local authorities to develop the logistical ability to rapidly evacuate hazardous areas, and to have designated collection centres as well as have designated and prepared "safe" places of refuge in "at risk" communities.

Bibliography

Bryant, C. 2008. Understanding bushfire: trends in deliberate vegetation fires in Australia. Technical and background Paper No 27 *Australian Institute of Criminology*, Canberra.

Buxton, M., R. Haynes. D. Mercer. A. Butt. 2011. Vulnerability to bushfire risk at Melbourne's urban fringe: the failure of regulatory land use planning. Geographical Research 49:1–12.

Bassed, R. J. Leditschke. 2011. Forensic medical lessons learned from the Victorian Bushfire Disaster: Recommendations from the Phase 5 debrief. *Forensic Science International* **205** (1-3), 25: 73-76.

Business Spectator 2009 IAG says too early to estimate cost of fires, shares drop 9.5%. Business Spectator. Available at: http://www.businessspectator.com.au/bs.nsf/Article/IAG-says-too-early-to-estimate-cost-of-fires-$pd20090209-P3W3J?OpenDocument (accessed date Feb 9, 2009).

Benson, C., J. Twigg. M. Myers. 2001. NGO initiatives in risk reduction: an overview. *Disasters* **19** (3):199-215.

Cameron, P.A.,M. Biswadev, M. Fitzgerald, C.D. Scheinkestel. A. Stripp. C.Batey. L. Niggemeyer. M. Truesdale. P.Holman. R.Mehra. J. Wasiak. H.Cleland. 2009. Black Saturday: the immediate impact of the February 2009 bushfires in Victoria, Australia, Medical Journal of Australasia **191**: 11–16.

R. Chen., R. Sharman. H.R. Rao. S. Upadhyaya. C.P. Cook-Cottone . 2010. Coordination of emergency management: case study of October '06 snowstorm in Western New York, in: B. Van de Walle, M. Turoff, S.R. Hiltz,M.E. Sharpe (Eds.), Information Systems for Emergency Management, ISBN: 9780765621351.

H. Cameron, M. Bachelard. 2009. Huge Wandonga blaze kills 14 people, rips through homes. The Age. 2009. http://www.theage.com.au/national/huge-wandong-blaze-kills-14-people-rips-through-homes-20090207-80fv.html (accessed date Feb 9, 2009)

EM-DAT Disaster Statistics 1990-May 2010, Centre for Research on the Epidemiology of Disasters (CRED), Université Catholique de Louvain, Louvain-La-Neuve, available at: www.emdat.be (2010) (accessed date 6 June 2010).

Hughes, R., D. Mercer. 2009. Planning to reduce risk: the wildfire management overlay in Victoria, Australia. *Geographical Research* **47**:124–141.

P. Johnson., C. Johnson. C. Sutherland. 2012. Stay or go? Human behaviour and decision making in bushfires and other emergencies. *Fire Technology* **48**:137–153.

N. Kapucu. 2008. Culture of preparedness: household disaster preparedness. *Disaster Prevention and Management: an International Journal* **17**(4): 526-35.

Keeley, K.E., H. Safford. C.J. Fotheringham. J. Franklin. M. Moritz. 2009. The 2007 Southern California wildfires: lessons in complexity. *Journal of Forestry* **107**:287–296.

Oloruntoba, R. 2013. Plans never go according to plan: An empirical analysis of challenges to plans during the 2009 Victoria bushfires. *Technological Forecasting and Social Change* **80**(9):1674-1702.

K.E. Weick. 1993. The collapse of sense making in organizations: The Mann Gulch Disaster. *Administrative Science Quarterly* **38**:628–652

Tatham, P., R.Oloruntoba. K. Spens. 2012. Cyclone preparedness and response: an analysis of lessons identified using an adapted military planning framework. *Disasters*, **36**(1)54-82.

Turner, B.1976.The organizational and inter-organizational development of disasters. *Administrative Science Quarterly* **21**:378–397.

Turner, B.1976.The development of disasters—a sequence model for the analysis of the origins of disasters. *Sociological Review* **24:**753–774

Herald Sun 2009. Victoria under siege as fires rage across state.
Available at: http://www.news.com.au/heraldsun/story/0,21985,25022560-2862,00.html (accessed date Feb 9, 20010).

The Australian Newspaper Website 2011.A history of fatal Australian bushfires. Available at: http://www.theaustralian.com.au/news/a-history-of-fatal-bushfires/story-e6frg6of-1111118791100 (accessed 7 Dec 2011)

Romsey Australia. 2011. Summary of Major Bush Fires in Australia since 1851. Available at: http://home.iprimus.com.au/foo7/firesum.html (accessed date 29 October, 2013)

Turoff, M., S.R. Hiltz, V.A. Bañuls. G.Van Den Eede. 2013. Multiple perspectives on planning for emergencies: An introduction to the special issue on planning and foresight for emergency preparedness and management. *Technological Forecasting and Social Change* **80**(9): 1647-1656.

Victoria Bushfires Royal Commission. 2009 Interim Report. No.225-Session 2006-09. Victoria Government, Melbourne.

Victorian Bushfires Royal Commission 2009 Final Report. Available at: http://www.royalcommission.vic.gov.au/finaldocuments/summary/PF/VBRC_Summary_PF.pdf Melbourne (accessed date 31 Aug 2012).

Whittaker, J., D. Mercer. 2004. The Victorian bushfires of 2002–03 and the politics of blame: a discourse analysis. *Australian Geographer* **35**(2):259–287.