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### **Recent trends in and preparedness for extreme weather events**

We appreciate the opportunity to provide a submission to this Inquiry. Friends of the Earth Australia is a national, membership-based environmental NGO which has been active for more than 4 decades.

While we understand that the Committee must respond to its Terms of Reference, we feel that it is important to remember that responses to extreme weather will be forms of adaptation, and hence will only deal with part of the problem that humanity is confronted with as a result of climate change. The number of extreme weather events linked to climate change will only start to decline once local and global communities act to reduce greenhouse emissions at sufficient scale. Any meaningful adaptation responses must also contain strong mitigation measures, including the establishment of strong domestic emissions reduction targets and international agreement on deep emissions reduction targets in the post Kyoto Protocol framework.

Many state governments in Australia have effectively given up on mitigation measures. In Queensland the government is pursuing an aggressive program to expand Australia's involvement in the coal industry. In Victoria, the government has walked away from action to reduce emissions through removing the 20% reduction target from the *Victorian Climate Change Act 2010*, and instead opted for a defeatist approach to only planning for adaptation. There is a huge need for leadership by the federal government to reduce Australia's greenhouse emissions. Without a program that leads to deep cuts, any approach based on ensuring '*effective national coordination of climate change response and risk management*' could ultimately be an exercise in futility.

We welcome the establishment of this inquiry and hope that you are able to use it to advance the mitigation/ abatement agenda as well as improving our understanding of threats from extreme weather and the mechanisms required to respond effectively.

The issue of increased incidence of extreme weather events can be expected to impact on all Australians in some way in coming years. It will be the poorest and the most vulnerable who will be impacted most (including the elderly, the ill and the young). Like climate change more broadly, this is primarily a human rights issue as much as it is a physical process. Accordingly, our responses to extreme weather must be based on the understanding that different populations will be impacted to differing degrees.

There are a growing number of excellent programs across many parts of the country aimed at reducing the impacts of extreme weather on individuals and communities. These are run by all levels of government plus many NGOs and community organisations.

We would note that residents of public housing and many low income individuals and families in the private rental market are often disproportionately impacted by extreme events such as heat waves due to poor quality housing stock. Housing without adequate insulation will normally see residents using more energy to warm or cool their living spaces, adding another dimension of hardship to already vulnerable people.

It is imperative that there be a nationally co-ordinated program that provides funds for audits and retrofits of all public housing infrastructure. A similar program for houses in the rental market is also required. This will require co-ordination with state and territory governments and financial contributions from both levels of government.

A key outcome from this Inquiry should be a clear process to carry out mapping of all existing programs related to preparedness for extreme weather to ensure:

- Communication and information flow and opportunities for synergy and efficiencies in delivery of programs and services,
- A plan to ensure strategic intervention where there are obvious gaps (eg a local government area where there is no heatwave program that provides cool spaces on days of extreme heat or support services for elderly people)
- Commitment to retrofit of all public housing stock to ensure readiness for the impacts of climate change, rising energy costs and extreme weather.

Given that there is still substantial misinformation being put forward by some vested interests and media outlets which deny the link between climate change and extreme weather, there is a continuous need for the federal government to 'make the connections' and communicate the link between climate change and extreme weather risks. It would be logical to develop communication programs in conjunction with emergency services and public health organisations.

We wish to address the following terms of reference.

*(a) recent trends on the frequency of extreme weather events, including but not limited to drought, bushfires, heatwaves, floods and storm surges;*

*(b) based on global warming scenarios outlined by the Intergovernmental Panel on Climate Change and the Commonwealth Scientific and Industrial Research Organisation of 1 to 5 degrees by 2070:*

*(i) projections on the frequency of extreme weather events, including but not limited to drought, Friends of the Earth Australia submission. Recent trends in and preparedness for extreme weather events. 2*

*bushfires, heatwaves, floods and storm surges,*

We are aware that a range of climate change specialists will be making submissions to this inquiry and therefore will limit our response to a small number of the TOR. We would refer you to the following submissions already received and available on the Committee website as being of considerable significance in terms of providing information about extreme weather:

Sub 3: Adjunct Professor Alan Pears

Sub 10: LIVE and David Spratt

*(ii) the costs of extreme weather events and impacts on natural ecosystems, social and economic infrastructure and human health,*

Given that climate science clearly shows that incidence of extreme weather events will be driven by climate change, the two issues need to be considered as being essentially the same problem.

There are many possible examples that could be given that would show that climate change driven extreme weather will impact on *social and economic infrastructure*, and hence entire communities. We will focus on one sector, the snow industry of south eastern Australia in order to highlight the financial burden that is expected to develop as a result of climate change and climate change related extreme weather. There are a number of other sectors and entire regional economies elsewhere in Australia which will be negatively impacted in similar ways.

We have not attempted to summarise the likely *impacts on natural ecosystems* in the areas of south eastern Australia where this industry is located. This information is widely available. See for instance:

*Climate and Weather of the Australian Alps.*

<http://www.australianalps.environment.gov.au/learn/pubs/climate.pdf>

*Garnaut Climate Change Review. Impact of climate change on Australia's alpine areas.*

[http://www.garnautreview.org.au/ca25734e0016a131/WebObj/01-JAlpineareas/\\$File/01-J%20Alpine%20areas.pdf](http://www.garnautreview.org.au/ca25734e0016a131/WebObj/01-JAlpineareas/$File/01-J%20Alpine%20areas.pdf)

*Climate change impacts on Australia's alpine ecosystems*, Rachel Slatyer, 2010

[http://eview.anu.edu.au/anuuj/vol2\\_10/pdf/ch05.pdf](http://eview.anu.edu.au/anuuj/vol2_10/pdf/ch05.pdf)

### **The double impact of extreme weather**

With the gradual changes that will come as a result of climate change, economic sectors in Australia – such as agriculture and tourism – will need to develop strategies to adapt to changed conditions and circumstances. Increases in extreme weather events, even though driven by the ‘background’ warming, could be a secondary impact, but one that is much harder to plan for. In this sense, extreme weather could be seen to constitute a ‘second wave’ of climate change impact.

*We have decided to focus our submission on one industry to show how this double impact is connected but also discrete, and hence requires two sets of adaptation measures. Some factors, such as prolonged extreme bushfire risk may ultimately be beyond any adaptation strategy.*

### **The core problem: climate change**

The winter sports industry/community is dependent upon predictable, heavy snowfall, but climate change is expected to contribute to warmer winters, reduced snowfall, and shorter snow seasons. Short term erratic weather events can also impact significantly on individual winters, and also out of season activity (often called the 'green' season). It is estimated that almost one third of all visitation to ski resorts occurs outside the official ski season.

A recent US study, *Climate Impacts on the Winter Tourism Economy in the United States*, commissioned by Protect Our Winters (POW) and the Natural Resources Defense Council (NRDC), shows that the U.S. ski and snowmobile winter sports industry is currently worth an estimated \$12.2 billion each year, and has already felt the direct impact of decreased winter snowpack and rising average winter temperatures. As the authors note in the report, "climate change spells trouble for all businesses dependent on winter weather including snowboarding, snowshoeing and skiing. The shrinking numbers of winter sports tourists also affect restaurants, lodging, gas stations, grocery stores, bars" and other businesses.

Source: [http://protectourwinters.org/climate\\_report/report.pdf](http://protectourwinters.org/climate_report/report.pdf)

Here in Australia, winters are already becoming warmer and more erratic, and this impacts on the quality and quantity of snow, and hence the viability of the snow industry.

Science suggests that without determined action to reduce climate change, we can expect to see less and less reliable snow falls in coming years.

According to Dr. David Bain, in the high Alps from 1950 to 2007 there has been an increase in winter temperatures approaching 1°C, and over much the same period (1957 to 2011), Australia has seen a slow decrease in snow depth. The mid-winter snow depths have only decreased a small amount on average, whereas spring snow depth has dropped by almost 40%. The obvious impact here is that as the resort season becomes shorter in many years, making it more difficult to make a profit on expensive infrastructure that is located in resorts year round.

Source: <http://themountainjournal.wordpress.com/environment/climate-change/climate-change-and-the-ski-industry-an-australian-perspective/>

According to the government commissioned report '*Caring for our Australian Alps Catchments*', the Alps face an average temperature rise of between 0.6 and 2.9 degrees centigrade by 2050, depending on how much action the international community takes to combat climate change.

The *Caring for our Australian Alps Catchments* report says that our ski slopes could be completely bare of natural winter snow by 2050 unless concerted action is taken against global warming.

Source: <http://www.climatechange.gov.au/~media/publications/water/australian-alps-catchments/Caring-for-our-Australian-Alps-catchments-20110922-PDF.pdf>

In terms of this sector, winter is the season where most profit is made and employment is generated. This income helps to make resorts economically viable over the whole year, which will usually see long periods of minimal visitation.

While resorts have invested in extra snow making capacity and are seeking to build visitation outside of the winter months, the majority of infrastructure and income is based around winter sports. A primary adaptation response to a decline in natural snow cover has been investment in snow making equipment. However, this strategy will become more expensive in coming years as energy prices rise, and this will impact on resort profit margins and hence viability. Additionally, there is the prospect of resorts having less available water for snow making as rainfall declines, and fewer nights cold enough to support snow making activity. As was highlighted in the 2012 document the *Alpine Resorts Strategic Plan*, “cost pressures are a major problem for many on-mountain businesses and site holders”.

### **The secondary impact: extreme and erratic weather**

Rain, snow and other precipitation is expected to decrease by up to 24% over the next four decades, accompanied by more bushfires, droughts, severe storms and rapid runoff, causing heavy erosion. So, the ‘bed rock’ of the economy – predictable and deep snow cover – becomes less and less consistent, while ancillary ‘one off’ events will add to the cumulative negative economic impacts. Erratic and extreme weather can be expected to compound the slow impacts of climate change. What precipitation we get could become more erratic or occur in short and damaging downpours. It is likely there will be more storm events in summer, which could be expected to impact on outdoor recreation and especially organised events like bike rides and festivals.

There are a range of different reasons why people visit alpine areas. These can be roughly broken into a series of categories, and taken together they give an indication of the total tourist potential of an area:

- Winter tourism (eg snow boarding/ skiing)
- Active tourism (eg walking, bike riding)
- Business tourism (eg seminars, conferences)
- Itinerary and cultural tourism
- Health (wellness) tourism
- Other forms of tourism, like hunting and fishing, food and wine tourism, etc

source:

[http://www.academia.edu/689244/Effects\\_of\\_climate\\_change\\_on\\_Romanian\\_mountain\\_tourism\\_Are\\_they\\_positive\\_or\\_mostly\\_negative](http://www.academia.edu/689244/Effects_of_climate_change_on_Romanian_mountain_tourism_Are_they_positive_or_mostly_negative) (pp 49 and 50)

A large part of the tourism drawcard in the Alps is the natural environment. People come to walk, ride, run, relax, and generally be in the outdoors. This summer tourism helps keep economies afloat. Extreme weather can be expected to impact on tourism numbers in the ‘green’ season.

Apart from individual tourists being swayed from visiting the region in extreme heat or during storms, it should be remembered that a growing part of tourism in the Alps outside winter is based around calendar events – bike rides, music festivals, cultural events and so on. These are especially vulnerable to the random nature of erratic weather, where an annual fixture could be ruined by unseasonal weather that makes the event unpleasant or even unviable.

While higher altitudes mean cooler environments, and hence offer a tourism drawcard in summer, the impacts of increased fire risk could make it more difficult for visitors to actually get into mountain regions.

As noted by Chris Hammer recently, “an average increase in summer temperatures will increase the frequency of bushfires, perhaps exponentially. The modelling cannot be precise on this, but the direction is clear”.

Source: <http://www.theage.com.au/opinion/politics/hotter-seasons-to-bring-bountiful-harvests-for-antipodean-grim-reaper-20130108-2ceu1.html#ixzz2HRNmEFs4>

As was shown by the Black Saturday fires in Victoria, extreme weather on top of long term drying can greatly worsen fire activity. As noted in the Climate Commission report *The Critical Decade*, “when combined with high wind speeds and low humidity, perfect conditions for an unprecedented natural disaster were created”. The report notes that the estimated cost of the Black Saturday bushfires to Victoria was approximately \$4.4 billion.

Source: [http://climatecommission.gov.au/wp-content/uploads/120719\\_VIC-report-web-version\\_final.pdf](http://climatecommission.gov.au/wp-content/uploads/120719_VIC-report-web-version_final.pdf)

The 2003 and 2006/2007 fires in Alpine regions in Victoria are an indicator of what could come with enhanced global warming. These fires shut down much of the tourism sector across north eastern Victoria, with subsequent impacts on businesses reliant on summer tourism. There were large impacts on both ‘active’ and ‘food’ based tourism, as visitors were often unable to visit areas outside of main transport corridors, and some agricultural producers reported impacts on output and reduced value of some products (for instance, some grapes were tainted because of a ‘smoky’ taste after the 2007 fires in Victoria). The alpine resorts are all relatively isolated and often only have one or two points of road access and hence can become difficult to evacuate in the case of fires. It is not hard to imagine that a continued increase in fire risk under days of extreme weather could see emergency services having to close off entire alpine communities to non residents on a regular basis.

Bushfires can be expected to threaten infrastructure as well as buildings. Costs of replacement could become another drain on financial viability of resorts.

According to the Garnaut review (p 19) ‘there is currently a lack of information relating to the future intensity and frequency of storm events. These events have the potential to be particularly damaging to the infrastructure in alpine areas which already experience high winds during storm events”.

The erratic and extreme weather will also be felt in winter, with corresponding impacts on economies. The US ‘*Climate Impacts*’ report notes that in that country, the downhill ski resort industry is estimated to have lost \$1.07 billion in aggregated revenue between low and high snow fall years over the last decade. If the snow is bad in a particular season because of rain events or warm weather, many people will simply cancel or shorten their holiday. So even if there is some snow cover, erratic weather can still have impacts. A recent example occurred in the winter of 2011, where a good start to the winter in Victoria lead to strong bookings in resorts. However, an early transition to warm weather resulted in a short and lacklustre season, with many jobs ending and businesses closing early.

### **Economic impacts**

Shorter winters will be devastating for local economies.

More than 1 million people currently visit the Australian resorts each year. In Victoria, the alpine resorts are estimated to have contributed \$570 million and 5,800 Full-Time Equivalent jobs to the Victorian economy in winter alone for 2011 (source: *Alpine Resorts Strategic Plan 2012*, p13). The flow on effects of this industry is felt in towns throughout north east Victoria and around the Snowy Mountains, along routes to Melbourne, Canberra and Sydney, and niche agricultural economies which are, in part, supported by snow-based tourism. To take one example of the scale of local benefits, the 'gross regional profit' of the Alpine Shire in Victoria was increased by about \$130 million in 2011 because of the presence of the alpine resorts. The negative impacts of the 2009 bushfires on tourism figures for Murrindindi Shire in this same period indicate what climate change and extreme weather events could mean in future for all shires across the state which rely on tourism for significant parts of their economic activity.

According to the *Economic Significance of the Australian Alpine Resorts* report (2011), the combined benefit for the three Australian States with alpine resorts in 2005 is calculated to be \$1.3 billion, with 17,050 annual equivalent employment opportunities.

As the US report concludes about the impacts of climate change: "all of this translates into less snow and fewer people on the slopes, which results in massive economic hardship for resorts, states, local communities, businesses and their employees." The Garnaut review suggests (p10) that "in some cases alpine towns that rely predominately upon the snow industry may no longer be viable and migration of residents may occur, resulting in stranded infrastructure."

### **Issues to consider in developing adaptation strategies**

The key message is that without slowing climate change, we will witness the economic collapse of the current snow industry. The timeline for this is not clear, but the trajectory certainly is. Therefore, the best adaptation measures that will allow the snow industry to survive will be serious mitigation activity which aims to limit overall warming. It can be argued that this is the case for most sectors in Australia, including agriculture.

One of the current adaptation strategies employed by resorts – increased use of snow making machines - can be problematic in terms of both its economic costs and environmental impacts. It was noted in the Garnaut review (2008) that intensive use of snow making equipment is likely to 'impact negatively on flora and fauna' within resort boundaries.

In terms of framing adaptation response to climate change and extreme weather in this sector, there are a range of issues to consider here:

- What additional resources will be required to police, road authorities (eg Vic Roads in Victoria) and fire fighting services, to ensure alpine resorts can be safely kept open during times of extreme fire risk;
- Possible compound impacts of increased insurance costs for businesses located in alpine resorts;
- Increased damage to resort infrastructure, including ski lifts, as a result of storm events, high winds and lightning strike;
- The ability of relatively small communities to sustain volunteer fire-fighting units;
- If community safety points are to be created in alpine villages where there are no large open spaces such as sports ground, where will they be built? If creation of such sites involves purpose built facilities, how will these be funded?;

- Alpine communities will need an audit of the fire safety of existing housing and commercial stock, which may result in retrofitting to increase safety ratings and to meet building codes for high risk areas;
- Evidence presented to the Victorian Bushfire Royal Commission showed that houses closest to forested areas were most at risk of burning in a fire event. The fact is that much of the appeal of alpine resorts is that they exist 'within' the surrounding snow gum woodlands. How can this physical layout be sustained whilst adequately protecting houses and buildings?
- Resorts are reliant on long distance transfer of power through heavily forested areas. Renewable energy produced on site (wind or solar) could reduce the need to maintain these power connections in high risk areas.