National Position Paper
Climate Change

This Position Paper states Parks and Leisure Australia's response to climate change.

Summary

The Paris Climate Change Conference agreement focuses on a global action to reducing greenhouse gas emissions and limiting global warming to below 2 degrees, with an equal focus on mitigation and adaptation.

Australia's Climate is Changing

• On current trends, Australia will experience by 2030:
  • 1.1 to 2.9% increase in temperature
  • Increase in frequency and intensity of extreme weather events including fire, drought and flooding
  • Variations in rainfall across regions
  • .6 to .19m rise in sea levels

What is the Impact of Climate Change on Parks and Leisure?

• Our parks and leisure will need to respond to this climate change impact across:
  • Sociology, demography and wellbeing
  • Physical activity
  • Sport and recreation infrastructure
  • Irrigated public open spaces
  • Natural environment
  • Coastal recreation

Parks and Leisure Australia accepts the consensus of the World’s scientific community that we are experiencing global warming due to the greenhouse effect caused by human activity.

Call for Action

• All governments, business, community and industry must:
  • Develop plans to reduce carbon emissions
  • Cooperate and partner in mitigation and adaptation actions
  • Participate with the United Nations and other nations on reducing carbon emissions

• PLA will adapt by:
  • Growing recreation and leisure opportunities
  • Strengthening communities through good use of leisure time driving improved social, economic and physical activity benefits
  • Promote and enhance the importance of parks and leisure to the growth and development of people, places and communities
Introduction

The parks and leisure industry

Every industry and community sector in Australia is being affected by climate change. The parks and leisure industry, more than many others, will feel the growing effects of the changes, and be called on to assist the amelioration and adapt to these changes. As an industry we must respond to this global challenge, as well as providing leadership to the community and the industry. This position paper outlines the key climate change issues at a national level for the parks and leisure industry, and articulates Parks and Leisure Australia’s position.

Global climate change

Our global climate is changing. Over the last hundred years, increases in air and ocean temperatures have been observed, along with melting of glaciers and ice sheets and general rises in sea level. This additional heat has had further effects, affecting atmospheric and ocean circulation, which then influences wind and rainfall. Ocean acidification is also occurring as the seas absorb a greater proportion of carbon dioxide. There is evidence of increased frequency and intensity of extreme weather events such as heat waves, wildfires, tropical cyclones, cold snaps, droughts and floods.

Although the earth’s climate is known to have changed over pre-historic times, the changes currently occurring are far more rapid than previous changes. The three major global temperature records (the USA’s National Aeronautics and Space Administration GISTEMP and National Oceanic and Atmospheric Administration’s National Climatic Data Center; and the Hadley Centre of the UK Met Office) all show that the earth’s atmosphere has warmed by around 0.85 degrees Celsius since 1880. Most of this warming has occurred since the 1970s. The decade of 2001-2010 was the world’s warmest on record.

The strong consensus of the scientific community is that global warming is caused by human activity. In simple terms, the burning of fossil fuels (such as coal, oil and natural gas), agriculture and land clearing all result in more carbon dioxide, methane nitrous oxide and water vapour in the air. These gases trap an increased amount of solar radiation in the earth’s atmosphere, making the climate warmer. This is the so-called Greenhouse Effect.

Climate change in Australia

In Australia, temperatures have increased by 0.9 degrees since consistent national records began in 1910. Extreme hot days in Australia are getting hotter, with significant increases since the 1990s. Sea surface temperatures around Australia have risen steadily since 1900. Due mainly to thermal expansion of the water in oceans, sea levels have risen too, although rates of sea level rise vary over space and time. However, since 1993, sea level rise in the north and north west of Australia has been between 7 and 11 millimetres per annum and between 2 and 5 millimetres on the central and southern coasts.
The Millennium drought (1997-2009) in south eastern Australia was the nation’s worst drought ever recorded. Research on climate change conditions at the time suggest that the drought was at least partly attributable to the effects of global warming.

What is being done globally to address climate change?

Over decades, scientist have been building a record of climate history through geological evidence from borehole temperature profiles, deep ice cores, flora and fauna records, glacial processes, analyses of sediment layers, and evidence of past sea levels. More recent data are provided by the instrumental record. Predictive models have been developed based on the historic information, and knowledge of natural systems and processes.

In 1968, the United Nations decided to hold the first United Nations Conference on the Human Environment in Stockholm, Sweden from 5 to 16 June 1972. Known as the First Earth Summit, it adopted a declaration that set out principles for the preservation and enhancement of the human environment, and an action plan. It also raised the issue of climate change for the first time, warning of activities that could lead to climate change.

Over the next 20 years, as part of efforts to implement the 1972 decisions, concern for the atmosphere and global climate slowly gained international attention and action. In 1988, The Intergovernmental Panel on Climate Change (IPCC), a forum for the examination of greenhouse warming and global climate change, was established.

The United Nations Conference on Environment and Development was held in Rio de Janeiro in 1992. It set a new framework in its Rio Declaration and Agenda 21, which reflected a global consensus on development and environmental cooperation. 158 nations had signed up to the United Nations Framework Convention on Climate Change (UNFCCC) by the end of that year. The aim of the Convention was to stabilize atmospheric concentrations of "greenhouse gases" at a level that would prevent interference with the climate system.

In 1997, the Kyoto Protocol to the UNFCCC aimed to reduce the industrialized countries' overall emissions of carbon dioxide and other greenhouse gases by at least 5 per cent below 1990 levels in the commitment period of 2008 to 2012.

Recent actions

The 2007 Fourth Assessment Report of the InterGovernmental Panel on Climate Change, found:

- Warming of the climate system is unequivocal, as evidenced by increases in global average air and ocean temperatures, the widespread melting of snow and ice, and sea level rises.
- Most of the global warming since the mid-20th century is very likely due to human activity
- Benefits and costs of climate change for society will vary by location and scale.
- Published evidence indicates that the costs of climate change are likely to be significant and to increase over time.
- The resilience of many ecosystems is likely to be exceeded.
The Paris Climate Change Conference of 2015 sought a universal, legally binding agreement to combat climate change effectively and transition towards resilient, low-carbon societies and economies. The agreement focuses equally on mitigation - that is, efforts to reduce greenhouse gas emissions in order to limit global warming to below 2°C – as well as adaptation to existing climate changes. These efforts will take into account the needs and capacities of each country. The agreement will enter into force in 2020 and will need to be sustainable to enable long-term change.

Likely regional impacts of climate change in Australia

Scientific assessment and research has been provided by a collaboration between the Australian Government Department of the Environment, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Bureau of Meteorology (BoM). Climate Change in Australia (CCIA) is a comprehensive website and suite of reports providing information about climate change projections for Australia¹.

Australia has 54 natural resource management (NRM) regions, which are defined by catchments and bioregions. Many activities of organisations and ecosystem services within the NRM regions are vulnerable to impacts of climate change. For the CCIA modelling and research, these NRM regions are grouped into ‘clusters’ which largely correspond to the broad-scale climate and biophysical regions of Australia. The clusters are diverse in their history, population, resource base, geography and climate. Therefore, each cluster has a unique set of priorities for responding to climate change. The figure below details the NRM clusters.

Climate projection

For each of the key climate parameters, projections have been made about potential changes. These projections are based on models, which tend to produce some variability in projection values. These models are continually being refined as more data become available.

In order to gain an appreciation of the likely changes, it is necessary to consider a range in greenhouse gas emission levels. A summary of the climate change projections is presented using intermediate and high greenhouse gas emission levels. Two timelines, 2030 and 2090, have also been adopted in presenting these data, with the average from 1986 – 2005 used as the reference data.

Projections presented include summary key messages and associated confidence level, being ‘very high’, ‘high’, ‘medium’ and ‘low’. Full reports and data can be accessed on the Climate Change in Australia website².

¹ http://www.climatechangeinaustralia.gov.au
**Key climate change messages for Australia**

In the next few decades, Australia faces a less certain climatic future, with more variables and a consequent less reliable predictive capacity. Regional variations will continue to be considerable across this large continent. Within these parameters, the following projections have been developed for the Climate Change in Australia website, and are summarised below:

**Average temperatures**: Average temperatures are projected, with very high confidence, to increase in all seasons across all clusters. Rises in temperature will be within the range of 0.3 to 1.5 $^\circ$C for the near future (2030) and 1.1 to 2.9 $^\circ$C by late this century (2090) under intermediate emission scenario. Using high emission scenarios temperature increases are projected to be in the range of 2.3 to 5.4 $^\circ$C by 2090.
Extreme temperature events: Hot days and heat waves (days above 35 oC) are projected to increase across all areas with high to very high confidence levels.

Potential evapotranspiration: Potential evapotranspiration is projected to increase across all clusters with high confidence levels.

Rainfall: Variation in rainfall is unclear due to the complex interactions of rain bearing systems and influences. In the near future natural variation is expected in rainfall patterns for all clusters except the Southern and South Western Flatlands where there is high confidence that there will be a decrease in rainfall, particularly in spring. Long term indicators are that there will be a decrease in rainfall by the end of the century, however this is with low to medium confidence levels. There is also diversity in the seasonal variation amongst the clusters.

Extreme rainfall events: Even though mean annual rainfall could decline, heavy rainfall intensity is projected to increase with high confidence across all clusters.

Drought: Time spent in drought conditions is projected to increase in the long term with medium confidence in all clusters except the Wet Tropics and the Monsoonal North.

Sea level rise: Mean sea level and the height of extreme sea level events is projected to rise across all clusters with high confidence. Rises in sea level will be within the range 0.06 to 0.19 m for the near future (2030) and 0.27 to 0.66 m by late this century (2090) under intermediate emission scenarios. Using high emission scenarios sea level rises are projected to be in the range of 0.38 to 0.89 m by 2090.

Fire weather: There is high confidence that climate change will result in a harsher fire-weather climate in the future. However, there is low confidence in the magnitude of the change to fire weather. This depends on the rainfall projection and its seasonal variation.

Tropical cyclones: Tropical cyclones are projected to become less frequent, but the proportion of the most intense storms is projected to increase with medium confidence in the Wet Tropics and Monsoonal North.

The table below presents a summary of the key messages for the 8 clusters.
### Summary of CCIA Climate Change Projections and Key Messages

<table>
<thead>
<tr>
<th>Description</th>
<th>Central Slopes</th>
<th>East Coast</th>
<th>Monsoonal North</th>
<th>Murray basin</th>
<th>Southern Slopes</th>
<th>SSW Flatlands</th>
<th>Wet Tropics</th>
<th>Rangelands</th>
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<td>Average Temperature (°C)</td>
<td>Increase (VH) 0.6 to 1.5 1.4 – 2.7 3.0 to 5.4</td>
<td>Increase (VH) 0.4 to 1.3 1.3 to 2.5 2.7 to 4.7</td>
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<td>Increase (VH) 0.4 to 1.1 1.1 to 2.0 2.5 to 4.0</td>
<td>Increase (VH) 0.5 to 1.1 1.2 to 2.0 2.6 to 4.0</td>
<td>Increase (VH) 0.3 to 1.1 1.0 to 2.0 2.3 to 3.9</td>
<td>Increase (VH) 0.6 to 1.4 1.5 to 2.9 2.9 – 5.3</td>
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<tr>
<td>Extreme temperature events</td>
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<td>Increase (H)</td>
<td>Increase (H)</td>
<td>Increase (VH)</td>
<td>Increase (H)</td>
<td>Increase (H)</td>
<td>Increase (H)</td>
<td>Increase (VH)</td>
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<tr>
<td>Potential Evapo-transpiration</td>
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<td>Increase (H)</td>
<td>Increase (H)</td>
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<td>Rainfall</td>
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<td>Decrease (M-H)</td>
<td>Variable (M)</td>
<td>Decrease (H)</td>
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<td>Extreme rainfall events</td>
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<td>Increase (H)</td>
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<tr>
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<td>Increase (VH) 0.06 to 0.17 0.28 to 0.65 0.38 to 0.85</td>
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<td>No Change (H)</td>
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<tr>
<td>Tropical Cyclones</td>
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<td>N/A</td>
<td>Less frequent</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Less frequent</td>
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**Notes:** Projections for varying timeframes and emission scenarios are represented by different formatting options as follow.

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<th>Formatting option</th>
<th>Example</th>
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<tr>
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<td>Confidence level</td>
<td>Brackets</td>
<td>(VH) - Very High (H) - High (M) - Medium</td>
</tr>
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</table>

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Specific issues for the parks and leisure industry

Climate change impacts in Australia

Australia faces significant environmental and economic impacts from climate change across a number of sectors, including water security, agriculture, coastal communities, and infrastructure.

Scientists advise climate change will cause increases in mean average temperature, to the frequency and intensity of extreme weather events and a likely decrease in average annual rainfall in many regions. Rising sea levels pose a significant risk to coastal communities, while the world’s oceans could become too acidic to support coral reefs and other calcifying marine organisms.

The Climate Change in Australia reports on the impacts of climate change can be accessed on the Australian government website4.

The impacts on the parks and leisure sector are significant and widespread, and will vary regionally. In this Paper, these impacts have been described using the following themes:

- Sociology, demography and wellbeing.
- Physical activity.
- Sport and recreation infrastructure.
- Irrigated public open space.
- Natural environment.
- Coastal recreation.

Sociology, demography and wellbeing

Over the last 150 years, Australia has changed from a high fertility, high mortality to the current low fertility, low mortality demographic profile. One of the main reasons is the concurrent increase in life expectancy. Australia’s fertility is relatively high with natural increase continuing, unlike some other countries. Net migration since WW2 has resulted in significant population increase, fluctuating between 1.4% and 2.1% per annum.

Since the mid 1970s, there has been a debate around issues of population and the concept of a ‘Big Australia’. Arguments on both sides have been emotive, and climate change has been advanced as a reason to limit Australia’s population. While there is no doubt that an increasing population will tend to consume more resources and to exacerbate the effects of climate change, it must be recognised that other factors are just as important – the structure, distribution and stability of that population; the amount of resources consumed per head of population; the global rather than national impact of climate change; and the extent to which population growth is already locked in through natural increase.

There are many potential impacts of climate change on wellbeing, some major, some minor,

and some even positive rather than negative. Effects will be variable across the country. Key issues for the recreation and leisure industries include:

- Human health impacts of high temperatures, where old people, young children and people in poor health will suffer greater morbidly on extreme temperature days.
- Changes in rainfall patterns may cause disruption to industries particularly in rural areas, with effects on structural employment, viability of particularly rural communities, and resultant physical and mental health of the population.
- Distribution of diseases may change, with an increased likely spread of mosquito-borne diseases such as dengue fever.
- Structural changes in recreation industries such as decreases in the length of the snow season in the Australian Alps; spread of insects damaging the tourism industry in some locations; loss of coral reefs in key locations; and loss of suitable agricultural land for recreation-based industries such as vineyards and wineries.
- In some locations, daytime sporting fixtures and events may need to shift to night time to avoid extreme temperatures. This may require additional ground lighting, different surface management and other infrastructure changes, and may disproportionately impact some rural areas.
- Particular impacts on indigenous communities in central Australia where health support services and health outcomes are already very poor, community resilience is low, and temperature increases will be greatest.

Some commentators argue persuasively that cities can be more efficient and less consuming of resources than more dispersed settlement patterns. If so, Australia is in a good position to retro-fit its cities, where most Australians already live. For the recreation and leisure industry, this will mean working for more equitable access to health services; good access to parks and recreation activities; greener cities with moderated climates. Particular attention will have to be paid to people living in rural and regional Australia, especially in the Murray-Darling Basin and parts of Western Australia, to ensure that industries and communities are viable or can be supported to good transitions, and community and economic services including recreation are kept strong.

**Physical activity**

Parks and recreation facilities provide for opportunities for wide sectors of the population to engage in sport and recreation activities to achieve personal benefits. In particular, the role of sport and recreation in improving health and well-being benefits is gaining prominence as the population ages and public health costs escalate.

Changing climate may make it more difficult for some people to exercise on days of extreme heat. In some parts of the country, there will be increased solar exposure and greater risks of skin cancers for people engaging in outdoor activity.

Current urban settlement trends are likely to continue, and be reinforced by climate change. Population growth continues in larger cities and regional centres, and in coastal areas. This will increase the requirement for recreation opportunities in these areas. In addition, rural areas with declining populations will face particular issues in retaining even current levels of
facility provision.
Increasing levels of chronic disease linked to relatively low physical activity participation rates and growing obesity require urgent policy.

**Sport and recreation infrastructure**

Australians participate in a diverse range of sport and recreational activities that occur across an equally diverse range of settings that are often categorised as informal and formal activities. Similarly each activity relies upon a wide variety of infrastructure. Parklands, sports fields, play spaces, skate parks, aquatic centres, cycle ways and nature trails all require support infrastructure.

Climate change will undoubtedly affect how we recreate into the future, which will in turn affect the design and provision of supporting infrastructure. All three tiers of government will continue to examine how climate change will impact on a range of infrastructure investments including the prioritisation of limited funds.

Provision of shade will become increasingly important, along with flexible indoor/outdoor options for some sports. Multi-use courts and facilities will be required, often with greater cost implications.

In some parts of the country, provision of aquatic facilities will be in greater demand. If beach areas become constrained through coastal erosion, more people may seek to swim at indoor facilities.

In some parts of Australia, climate change will impact on the quality and resilience of sports playing surfaces and other natural surfaces. These impacts will be variable in different regions. In areas increasingly affected by drought, there may

**Irrigated public open space**

Climate change will impact on the management of urban open space in a number of ways:

- Increased temperatures and evapotranspiration will result in higher demand for water by turf and landscape plants.
- With more frequent extreme temperatures some plant species will be at risk.
- Likely reductions in rainfall will reduce the amount of rainfall-harvested water for irrigation.
- Increased water requirement by plants and reduced rainfall will result in an increased requirement for irrigation to maintain irrigated landscapes.
- There will be greater need for irrigated landscapes in city centres to mitigate the ‘urban heat island effect’ by cooling the urban built environment.
- More frequent and severe droughts will impact on plants/trees, water sources and plant irrigation demand.

Additional risks include potential damage to open space structures and trees as a result of an increase of intense storm activity. Also, with warmer conditions and generally lower yields
from catchments, stagnant water storages will be more conducive to algal blooms.

**Pen space adaptation strategies**

A key strategy to counter the impact of urban heating is through increased areas of vegetation. Transpiring plants, which convert the energy of the sun into water vapour through evaporation, use up large amounts of energy that would otherwise cause heating of the air, as a result of absorption by hard surfaces, road, pavements and buildings.

Strategies, such as tree planting to increase canopy area and irrigating grassed areas, significantly improve the capacity of the urban areas to cope with the higher temperatures and continue to provide functional spaces, during hot dry conditions.

These strategies, which revolve around adapting or modifying the natural environment, are classified as being Adaptation strategies. Other strategies, which include increasing the permeability of urban surfaces, water sensitive urban design (WSUD) elements and green roofs and green walls, increased biodiversity are also adaptation strategies.

The following are strategies that may be adopted to reduce the impact of climate change on public open space:

- Select species that are better suited to future climate and also are more water efficient and drought tolerant.
- Reduce supplementary water demand/requirement through mulching, soil improvement.
- Increase the amount of green space, including tree canopy, to moderate high urban temperatures.
- Reduce dependence on potable water supplies.
- Develop alternative water sources including water-sensitive urban design.
- The increased use of treated water will require consideration of water quality and its compatibility with urban horticulture. Sound water and soil management skills are required to manage this water effectively.
- Protect and improve water quality discharges to the environment including waterways and bays.
- Improve irrigation management practices to ensure efficient water use.

**Natural environment**

Climate change will impact on biodiversity management and will be affected by our ability to predict the ecological changes and interactions, as well as the differential climate changes. Ecosystems will also be subject to interactions with other processes that threaten the resilience of biodiversity, including urban development, land clearing and natural resource extraction. Planning will need to broadly anticipate extensive changes in biodiversity that are not entirely predictable.
Under predicted climate scenarios, very few widespread habitats are likely to disappear completely by 2050, but pockets of disappearing habitats may be found at local to sub-regional scales. Generally, plants and amphibians appear to be more at risk of losing preferred habitats than mammals and reptiles.

Unpredictable changes in habitat suitability for particular ecological communities may be expected for parts of Australia, with parts of the interior and the rangelands showing the greatest overall tendency to change in this way. It will be difficult to predict what changes will occur in these habitats or how they will need to be managed, so there will be a need for greater monitoring and adaptive management.

Habitat extent and connectedness will diminish, due to climate change and land clearing, which may result in local species extinctions. Mammals in particular are facing losses in the extent of their preferred habitats in northern Australia, whereas reptiles face such losses in the south.

There is a very real risk that increased ocean acidification and bleaching may also result in widespread loss of coral reefs. Quite apart from the loss of ecological function and biodiversity, this will have significant ramifications for Australia’s tourism and fishing industries. Combined with sea level rise and increased severe storm frequency and intensity, there may also be adverse changes to coastal erosion regimes.

Coastal recreation

Australia’s population is very concentrated in cities, with 89% of us living in urban areas, and 85% living within 50km of the coast. This means that the greater proportion of Australians are living in cities and in a coastal, or at least coastal hinterland environment. In part this has happened due to Australia’s generally mild climate, fertile soils in many areas supporting productive horticultural and other food crops, combined with expansive sandy beaches, and some spectacular coastal scenery. Consequently, Australians have based a great deal of their recreational activity in coastal settings.

These advantages are under threat with sea levels that have been rising for some decades, and that are projected to rise further in the future. Erosion is already widespread in coastal areas, and will worsen with projected sea level rises. Large coastal engineering schemes will be required to protect urban areas and infrastructure from inundation, but large stretches of the coastline will remain exposed to risk.

More frequent storm surges associated with extreme weather events are likely to cause greater damage than sea level rise on its own. Damage can be expected to coastal infrastructure including recreational facilities for tourism, boating, lifesaving and beach recreation. While it is anticipated that there may be slightly fewer cyclones, it is also expected that these storms will be more intense and damaging.

It is likely that some beaches will be lost, along with coastal infrastructure such as roads and buildings. This in turn will intensify recreational pressure on remaining coastal areas, with more people competing for a diminishing resource. There is no doubt that the coast will continue to be a popular recreational destination for boating, swimming and many other activities. However, access to these special places will become more expensive and more constrained.
Parks and Leisure Australia position on climate change

Scientific basis

Parks and Leisure Australia accepts the consensus of the world’s scientific community that:

- Global climate change is real.
- Most of the global warming since the mid-20th century is very likely due to human activity.
- Benefits and costs of climate change for society will vary by location and scale.
- Costs of climate change are likely to be significant and to increase over time.
- The resilience of many ecosystems is likely to be exceeded.

Mitigation

Parks and Leisure Australia calls on all levels of government, business, community and industry to:

- Develop and implement plans to reduce carbon emissions to keep temperature increase to no more than 2 degrees Celsius.
- Cooperate with each other for the good of our entire community and future generations.
- Participate fully with the United Nations and other nations to develop and implement cooperative actions to reduce carbon emissions.

Adaptation

Parks and Leisure Australia commits as an industry to play its part in developing climate change adaptation measures to:

- Maintain and grow the range of recreation and leisure opportunities for all Australians.
- Strengthen communities through good use of leisure time for the social, environmental, economic and physical wellbeing of all Australians.
- Promote and enhance the vital importance of parks.
Further resources

There is an almost overwhelming amount of information on climate change available on the Internet. This Paper could not hope to capture, let alone maintain currency of the breadth of resource data relevant to our industry. However, there is some basic information starting points, which may be useful.

United Nations Environment Program: Intergovernmental Panel on Climate Change (IPCC)  
http://www.ipcc.ch/

Australian Government: Department of the Environment  

Australian Government: Climate Change in Australia  
http://www.climatechangeinaustralia.gov.au

Australian Government: CSIRO State of the Climate  

Australian Government: Climate Change Authority  

Australian Government: Bureau of Meteorology  

Prepared by: PLA Advisory  
1 October 2016

Acknowledgements:  
The PLA National Board and PLA Advisory would like to acknowledge and thank following contributors to this Position Paper:

- Richard O’Byrne, Greg Dingle, Tim Rowe and Damien VanTrier (Vic).
- Daniel Bennett and Garard Charlton (SA).
- Brad Sutton (NSW).
- David Deeley (WA).

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