

CLIMATE CHANGE: A MATTER OF CRITICAL URGENCY FOR LEISURE & RECREATION PLANNERS

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Introduction

“Which part of flood plain do planners not understand?”
Ralph Tabor, in “And Another Thing”, letters to *The Age*, March 25, 2021, p. 17

This brief pithy letter from Ralph Tabor was in response to intense, high rainfalls and widespread flooding across most of eastern NSW during March 2021. Farmers and residents complained that planners, Councils and the NSW state government had allowed developers to build new residential areas across the Nepean River and other flood plains. This prompted another local resident to ask “where does the flood water go when the flood plain is filled with asphalt, concrete and roofs?”

From a leisure and recreation perspective, the flooding of floodplains causes major damage to sporting facilities and programs. Sports fields, golf courses, riverside trails, changerooms, club rooms, practice facilities, picnic and play grounds, and car parks can be damaged or washed away while sport and leisure schedules and timetables are thrown into disarray.

Along the Nepean River, across much of western Sydney and along much of the NSW coast, the intensity of the March 2021 rainfall, the high total falls over very short durations and the subsequent flooding are proof that Australia is already suffering from climate change and is facing what has been described as a “supercharged” climate (Climate Council, 2021). The impacts of climate change are expected to occur at a more rapid and more destructive rate over the coming years. Significantly, the global and Australian greenhouse gas abatement targets that have been set to date are insufficient to slow and stop global warming and the climatic and environmental catastrophes this will engender. Even if met, impacts will continue to grow until a substantial reduction in atmospheric carbon is achieved (Intergovernmental Panel on Climate Change, 2018). There will be, amongst many other impacts, more severe drought, higher temperatures, more intense rainfall, more severe storms, more bushfires, higher sea levels and coastal erosion (Climate Council of Australia, 2021). The impacts will not be uniform but almost universally, they will be detrimental to natural ecosystems across the world, to all forms of human endeavour and to the physical condition of the earth.

Australia has the dubious honour of leading the world in many of these impacts and yet it is lagging badly behind in terms of the actions needed to mitigate, reduce and adapt to them. Unless government at all levels and all individuals in the community take concerted action, catastrophic changes will occur across the earth over the coming century and these changes could be expected to take thousands of years to overcome. Interestingly, little seems to have been written by leisure and recreation providers and planners regarding how they should deal with climate change. That said, Veal (2017) highlighted the seriousness of the issue and discussed ways in which action has been taken by leisure providers to mitigate and adapt to change. Veal outlined some of the ways in which leisure and tourism contribute to greenhouse gas emissions and indicated that these industries have responded in several ways including seeking ways to reduce emissions, assessing the possible impacts of abatement measures on the industries and identifying adaptation strategies. Veal also provided examples of how leisure industries are starting to adapt to climate change. More recently, Marriott, Tower and McDonald (2021) have highlighted the projected extent of potentially catastrophic impacts of climate change on human endeavour over the coming decades and note the importance of both mitigation strategies designed to stop or minimise change and adaptation strategies. Particular attention is given to how each might be pursued by leisure and recreation planners and lists of strategies are provided.

In light of the above, the purpose of this paper is threefold:

- To highlight some of the key global and national research reports into climate change that leisure and recreation planners and providers must be aware of and the identified actions needed to mitigate, adapt to and avoid potentially catastrophic impacts of climate change on the leisure and recreation industry

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- To identify ways by which leisure and recreation planners and providers can contribute to minimising greenhouse gas emissions and mitigate and adapt to the more severe impacts of climate change, and
- To set out a preliminary course of action for leisure and recreation planners and providers so as to avoid the impacts of climate change on the resources they provide for their communities and clients.

This paper starts from the philosophical perspective that the science is right: human urbanisation, forest and woodland clearance, population growth, burning of fossil fuels, monoculture cropping and soil degradation (to list some well-known examples) over the last 200 years, and in particular, over the past 50 years, have dramatically changed the composition of the earth's atmosphere. And this change is continuing. The consequences of the change, which are already being felt through dramatic and generally poorly understood "weather changes" (Hannam, 2021), will be the severe disruption of past climatic regimes such that they will threaten the wellbeing of all humans, human activity and global ecosystems. These changes are intensifying *are not readily reversible*. They are having dramatic impacts already and can be expected to have catastrophic impacts in the short, medium and long term future. To minimise the impacts and to avoid even more severe global climate and weather change, further action is needed *now* to reduce global climate change gas emissions and to facilitate carbon capture and storage or "carbon sequestration". This action must be fully underway within 5 years.

Some Key Climate Change Reports

Leisure and recreation planners and providers cannot ignore the present and emerging impacts of climate change. Rather, they must respond because many of their activities generate greenhouse gases and their facilities and programs contribute to the impacts of climate and weather change. In addition, the changes that are occurring will have a significant disruptive impact on the resources and activities for which leisure and recreation planners and providers are responsible. Unfortunately, their specific responses to date have been quite limited and have been largely embedded in wider more generalist actions of government and other agencies. In other words, there is not an identifiable body of work that guides effective action by leisure and recreation planners and providers and this shortcoming must be addressed.

Amongst the thousands of papers and reports now being published on a daily basis, are eight recent and important papers that the Australian leisure industry should review and integrate into its thinking and planning. In some sort of "drilling down" order of immediate relevance to Australian audiences, these are:

- the special UN-initiated report of the Intergovernmental Panel on Climate Change (2018) and the 2021 Summary report of the 6th IPCC review
- the 2021 Australian Academy of Science paper, *The Risks to Australia of a 3°C Warmer World*
- *Aim High, Go Fast: Why Emissions Need to Plummet This Decade*, released by the independent advocacy agency, the Climate Council of Australia in early 2021
- *The Australian Natural Disaster Resilience Index* (Parsons, et. al., 2019)
- The UNFCCC (UN Framework Convention on Climate Change) report, (undated but published around 2018) UN Sports for Climate Action Framework
- the detailed technical report, *Climate Change in Australia*, (CSIRO and Bureau of Meteorology, 2015) and the associated *State of the Climate* (Bureau of Meteorology and CSIRO, 2020)
- *Game, Set, Match: Calling Time on Climate Inaction*, also prepared by the Climate Council of Australia (2021), and
- *Future Proofing Community Sport & Recreation Facilities. A Roadmap for Climate Change Management for the Sport and Recreation Facilities Sector*, prepared by the Sports Environment Alliance and published by the Victoria Government in 2018.

Together, these reports provide a starting point or "primer" for understanding the dire position the world is in as a result of climate change; the strategies that need to be pursued to minimise the current impacts and more severe impacts in future; the variable situation in Australia and our national capacity to respond, and the steps that leisure and recreation planners, providers and programming organisations need to pursue to avoid the worst of the impacts. The reports are reviewed in the following pages. All can be downloaded free on the internet via the respective organisations that have prepared them. There are many other reports that could be added to this list and readers are encouraged to explore these. Where there is some degree of repetition between the reports, this should serve to stress that importance and urgency of the issues and the fact that there is widespread agreement on the problems and the solutions.

The first report cited above, **The Intergovernmental Panel on Climate Change (IPCC)** report was released in 2018 in response to a UNFCCC (United Nations Framework for Climate Change) request to provide an assessment of and guidance “on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways”. In what must be one of most powerful and important pieces of integrative and analytical scientific analysis ever written, the report provides a comprehensive analysis of scientific research into human-generated global warming within the context of the actions needed to contain warming to 1.5°C. It uses comprehensive data evaluations to plot the pathways to containing warming and analyses the projected climatic changes, their overall and regional impacts and the risks associated with them ².

The IPCC report predicts potentially “catastrophic” and long term impacts “for centuries to millennia” with these projected to vary in intensity across different parts of the earth. They include higher global temperatures, greater temperature extremes, increases in the frequency, intensity and amount of heavy rain, greater flooding, increases in the frequency and intensity of drought, sea level rises of 0.26 to 0.77 m. by 2100 (with rises to continue well beyond that year), species loss and extinction on land and in the oceans, increased ocean acidity and reduced oxygen, ice shelf melting and an ice-free Arctic. From a human perspective, there are projected to be severe impacts on health, livelihoods, water supply, food security, human security and economic development.

Chapter 4 of the IPCC report details a diverse range of mitigation and adaption strategies that can be pursued and the costs and benefits of these. It stresses that the lesser and slower the action on the strategies, the greater will be the global temperature increases and the greater will be the challenges and ability to adapt.

Some of the critical IPCC conclusions and recommendations for action that are pertinent both internationally and in Australia are:

- Expand and accelerate climate change mitigation and adaption and transformational measures. Mitigation means to make less severe or potentially, stop; adaption is defined as responding to and preparing for the impacts of climate change while transformational adaption entails restructuring social and ecological systems in order to better deal with change and contribute to minimisation
- Significantly raise the “level of ambition” of all countries in dealing with climate change including the use of local, national and international financial, technological and indigenous population resources. In other words, there is a need to do far more across a very broad range of situations and contexts
- Strengthen and expand current adaption practices, improve governance by all relevant agencies and aim for universality of bottom-up initiatives by individuals and communities, while avoiding maladaptation (ie: pursuing initiatives that eventually have negative impacts)
- Improve energy efficiency in industry –which is highly feasible-- as a means of reducing emissions. Complement this with greenhouse gas-neutral processes, carbon dioxide removal and the uptake of electrification, hydrogen, bio-based feedstocks and carbon capture and storage. However, the report stresses that at present, “institutional, economic and technical constraints” are limiting such action
- Strengthen adaption and mitigation through changed and improved global and regional land use practices, agricultural/food production, dietary choices, ecosystems transitions and changes in human behaviour
- Recognise that bringing adaption and mitigation initiatives together can be effective although an over-emphasis on seeking multiple trade-offs will reduce the speed of change and implementation
- Recognise that although carbon dioxide dominates long term global warming, the reduction of other “short-lived” gases such as methane and black carbon will bring significant benefits in reducing warming
- Acknowledge that most greenhouse gas removal strategies have constraints and that a mix of strategies varying across locations, activities and time frames will be needed
- Be aware that the speed and scale of the transitions needed to restrict global warming “have no documented historic precedence” and will require complex planning, institutional strength, coordination and disruptions
- Acknowledge that behavioural change and demand-side management will be critical to emissions reductions. A focus on low-emissions investments will be important but this will require stronger policy

² A further and more recent report of considerable importance is *Net Zero by 2050: A Roadmap for the Global Energy Sector*, International Energy Agency, 2021

frameworks and a change in global and national financial systems, and

- Accept that a great deal more knowledge is needed about how to best implement and strengthen global responses to climate change.

(de Coninck, et. al. 2018, Ch 4)

Many of the issues and recommended actions of the 2018 IPCC report are of a far “higher order” than those which can be addressed directly by leisure planners and providers. Yet what planners and providers create has the potential to contribute to and be severely impacted by climate change and as such, their actions must be couched in this higher order context and should be guided by wider regional, national and global initiatives and priorities.

The data underpinning the IPCC report has been revised on a regular basis and each day brings new data and findings that endorse its conclusions and recommendations.

As the current review was being finalised for publication (August 2021), the IPCC released the *Summary* volume of its sixth assessment of the state of global climate change (IPCC, 2021). As the full report is not expected until mid 2022, it has not been possible to review it in detail here although an unprecedented number of daily news reports have highlighted the dire state of the findings and the extent to which Australia is failing to fulfill its responsibilities in tackling this unfolding disaster. The severity and urgency of the actions called for by the Summary report cannot be underestimated or ignored although governments continue to do so.

The 2021 IPCC Summary report indicates that the climate change impacts are now more serious, more demanding of action and more urgent than was previously projected. It indicates that the science is now more extensive and more rigorous and the findings and conclusions are now “givens” rather than the earlier predictions.

In their review of the IPCC 2021 Summary report, scientists from the Australian Climate Council have drawn the following key conclusions (Climate Council, 2021):

- The scale and pace at which humans are altering the climate has no precedent
- Climate change and its impacts are accelerating and are going to be even more severe than previously projected, as demonstrated by recent floods in Germany and Japan, wildfires in southern Europe and western Canada and windstorms in Australia. The heatwaves, droughts, floods, extreme weather events, heavy rain downpours, coastal flooding and droughts of the past will become “standard” conditions for many parts of the world
- Stronger action to mitigate climate change is urgently needed as the changes projected for 20-30 years hence are more likely to now occur within 10 years and the 1.5°C of warming goal of the Paris Accord will be overshoot, and
- There is growing evidence of the likelihood of “tipping points”, when key changes become unstoppable, such as the destruction of ice caps and the Atlantic Gulf Stream.

Importantly and invaluablely, the IPCC Summary report provides information specific to Australia and through interactive maps, allows various climate change scenarios to be reviewed and evaluated.

Readers of the current paper are urged to add a review of the IPCC 2021 Summary paper and the forthcoming 2022 full report to their research and analysis.

The Risks to Australia of a 3°C Warmer World, (Australian Academy of Science, 2021), is the second report reviewed here. It brings the IPCC report close to home, highlighting the severity of the climate and weather change challenges faced by Australia. Significantly, the report argues that:

The only way to reduce the risk of...unpredictable and dangerous (climate change) outcomes is...a substantial reduction in the emissions of greenhouse gases into the atmosphere. Our planet’s living systems have evolved over thousands of years in a temperature range that includes relatively minor fluctuations around the long-term average. However, most (ecosystems) cannot evolve quickly enough to accommodate the rapid increases in average temperatures we now observe and feel. (Australian Academy of Science, 2021, p. 7.)

Published three years after the 2018 IPCC report, the Australian Academy of Science report states that:

The total emission reductions currently pledged by the Australian and international governments through the United Nations Framework Convention on Climate Change Paris Agreement (of 2015) (UNFCCC), even if implemented on time, will translate as average global surface temperatures of 3°C or more above the pre-industrial period by 2100. (Australian Academy of Science, 2021, p. 7.)

A temperature rise of 3°C is double the Paris Agreement target and the Academy of Science projects that such an increase will lead to “devastating climate change” that will impact ecosystems, food production, settlements and community health and wellbeing. Further, “tipping points” are likely to occur when “sudden and accelerating changes in large climate systems” occur. The report argues that “limiting climate change to 1.5°C is now virtually impossible” and that “a rapid transition to net zero greenhouse gas emissions is required if the international community is to limit warming to “well below 2°C””, the figure agreed to by the Paris Agreement (Australian Academy of Science, 2021, p. 8.) The upcoming Glasgow meeting on climate change is expected to demand commitments to more stringent greenhouse gas emission targets and that these be reached sooner than the Paris Agreement date.

The Academy of Science argues that climate change of the scale projected would see ecosystem destruction, large scale tree, bird and mammal deaths and species redistribution and extinctions due to drought, increased heat, fire and floods and the loss of coastal geophysical and ecosystems through rising sea levels and storm damage. Tourism and recreation would be dramatically impacted. “At 3°C of global warming, many of Australia’s ecological systems would be unrecognisable” (Academy of Science, 2021, p. 9).

Agriculture, fisheries and aquaculture, food security and, in many parts of the country, food production, would be dramatically impacted by reduced river flows and water availability, greater temperatures and heat stress, erosion of grazing land, the destruction of soil fertility, structure and overall ecology, flooding and increased fire risks especially in forested areas.

In cities and towns, global warming of 3°C is projected to lead to coastal erosion and flooding with resultant property and infrastructure damage or abandonment and the need for seawalls and resistant ecosystems such as dunes and mangrove wetlands. Energy security would be put at a high risk due to heat, bushfires, storms, and greater demand levels. In terms of human wellbeing, the Australian Academy of Science report indicates that the “elderly, young, unwell, and those from lower socio-economic backgrounds (will be) at increased risk” (p.11). Heatwaves and heat stress will worsen medical conditions while bushfires will cause loss of life and make heart and lung disease conditions worse. Water shortages and reduced water quality will be common and climate-related infectious diseases will increase.

In recommending action, the Academy of Science report argues a need for Australia to:

- Develop and implement policies, including emission reduction targets and technologies, that will deliver “deep and rapid cuts in emissions” in the economy to accelerate the transition to net zero greenhouse emissions within the next 10-20 years
- Develop a strategic plan for developing and introducing low to zero emissions technologies, to identify market and investment opportunities, and to develop “offshore renewable energy, green hydrogen fuels”, minerals for low-emission technologies, mass-scale storage, embedded renewable energy, and more efficient and low...emission transport systems...” (Australian Academy of Science, p. 12)
- Develop strategies, readiness for and effective adaptive responses to, the projected climate- and weather-related disasters that a global temperature increase of 3°C will bring
- Improve the understanding of climate change impacts, tipping points and compounding impacts on human and natural systems
- Develop strategies for addressing climate change impacts on food production, food imports and the resilience and capacity of supply systems
- Remove greenhouse gas emissions from electricity generation and distribution, increase energy efficiency, reduce emissions from industrial activities and buildings and electrify the transport sector
- Reduce non-energy related greenhouse gas emissions from industrial processes and agriculture
- Pursue the capture of greenhouse gases through land and water-based biosequestration and technology
- Stop deforestation and land degradation and accelerate revegetation of cleared and degraded land

- Shift energy export industries to zero emissions as a matter of urgency and become a clean energy exporter
- Exploit the “new economy” minerals used in batteries and other low-emission technologies
- Initiate research to better understand and to reduce the impacts of climate change on community health and wellbeing, and
- Develop a better understanding of the ecosystem management techniques traditionally used by Aboriginal and Torres Strait Islander peoples and pursue a broader dialogue with the wider Australian community on the steps needed to avoid global warming, and to mitigate and adapt to its impacts.

(Australian Academy of Science, p. 12-14).

Importantly, the Academy of Science report argues strongly that transitioning early to net zero emissions will reduce the scale of climate change impacts and as such, reduce the extent to which mitigation and adaptation strategies are needed. It argues that sector-by-sector transition policies including support for regional areas and economies and for vulnerable groups will be needed. It sees a critical step being “a phase-out of coal-fired energy generation, no expansion of the gas industry, electrification of transport, heating and energy and making homes and buildings more energy efficient” (p. 12). The leisure and recreation provision industries must be one of these sectors.

As with the Intergovernmental Panel on Climate Change report, that from the Australian Academy of Science reaches well beyond what leisure and recreation planners and providers can address. Yet, beyond highlighting the importance of broad climate change impacts at the regional and city levels and individual case studies, the report does not provide guidance to specific localised impacts or potential responses. That said, in discussing coastal living, the report provides a set of valuable principles to guide action. These are:

- *Avoid* climate change impacts by identifying no-build areas and using planning regulations to prevent development in high risk areas
- *Accommodate* climate change by adjusting and modifying uses and activities to offset or negate impacts eg: raise road levels, build on piles, relocate essential infrastructure
- *Protect* coastal assets from climate change by using soft (eg: plantings) and hard (eg: sea walls), and
- *Retreat* from climate change-impacted areas by withdrawing uses and/or abandoning those at risk.

In a similar vein, the report recommends that urban planners should consider the use of passive cooling (using shade and air movement), the use of buildings’ thermal mass to retain and store heat and the climate-responsive selection of building materials.

Thus, whatever leisure and recreation planners and providers do *must* be couched in terms of how their actions will contribute to achieving the overall outcomes demanded by both the IPCC and the Academy of Science. Initiatives that ignore the directives of these two critical reports could lock in a century of negative impacts and lost opportunities while existing and new provision will suffer. At the same time, leisure and recreation planners will need to take far more concrete actions within their own specialist areas (2).³

The third key report reviewed here is ***Aim High, Go Fast: Why Emissions Need to Plummet This Decade***, (Climate Council of Australia, 2021). This is, in some ways, a development of the themes in the Australian Academy of Science report and yet another urgent call for immediate action on climate change. The report, together with an excellent 2021 one-hour Special Briefing available on the Climate Council web site, presents several core conclusions:

- Climate change is accelerating and the ecosystems that have sustained human life and society are being severely damaged. Global warming is projected to “overshoot” the widely accepted limit of 1.5°C in the 2030s. If this occurs, “drawdown” (ie: practices and technologies that can both stem and begin to reduce excess greenhouse gases in the atmosphere) will be necessary. If global warming overshoots, ecosystems will be severely damaged and there will be an increased risk of “abrupt, dangerous and

³ A very recent study which was released during the preparation of this review and which warrants close scrutiny is National Environmental Science Programme, 2021. *Climate change in a land of extremes*, Earth Systems and Climate Change Hub. The Hub operated from 2015-2021 under the auspice of the CSIRO and in partnership with the Bureau of Meteorology and the University of NSW, ANU, Monash and Melbourne Universities and the University of Tasmania. It’s work was designed to ensure that Australia’s policies and management decisions on climate change are informed by the latest Earth systems and climate change science (see <http://nespclimate.com.au/> for full details and related reports)

irreversible changes to the climate system”

- There is no safe level of global warming and *every fraction of a degree of increase that is avoided matters*. Warmer weather may help some tourism and agricultural industries but overall, it has far more serious negative impacts
- In response to accelerating climate change, society must reduce climate change gas emissions *this decade* if warming is to be kept below 2°C. Current actions are too slow and timeframes are too long. Australia should accept a “fair share of the global effort” to avoid temperature increases and it presently has much of the technology to do this. Awaiting the development of “new” technologies, as advocated by the Australian Federal government, will be too late, and
- Australia has all the resources needed to shift to renewable energy, to decarbonise the economy and to thus “avert climate catastrophe”. “To play its fair part in the rapid, sustained emissions reductions required globally, Australia should aim to reduce its emissions by 75% below 2005 levels by 2030, and to net zero by 2035” (the present Federal government target is 26-28%). “Achieving net zero by 2050 *will be a decade too late* with the subsequent disruptions threatening the maintenance of “well-functioning” human society.

(Climate Council of Australia, 2021).

A brief discussion is warranted on the concept of “drawdown” noted above. Stopping carbon emissions *will not eliminate the excess levels of carbon already in the atmosphere* (just as the end of a rainstorm does not stop the flooding). Hence, action to draw CO₂ and other greenhouse gas levels down will be needed if they are to not continue causing global warming. Drawdown can be achieved by natural processes such as reforestation, tree planting, re-establishing wetlands, strengthening soil ecology and sequestration and by oceanic absorption. However, these processes are slow and efforts to develop technological solutions will need to be pursued as well. It has been estimated that to stop catastrophic climate change, as much as 10 billion US tons of CO₂ may need to be captured from the atmosphere each year through to 2050 (Kaufman and Rathi, 2021).

Technical carbon capture and storage is a part of the drawdown process and is designed to reduce greenhouse gas emissions and potentially, reduce their levels in the atmosphere. These processes offer the potential to remove and store large quantities of CO₂ and other gases, but require heavy capital investment and energy. Carbon capture and storage projects are well advanced in the oil and gas producing industries and where oil and gas are used as major industrial fuels. With CO₂ levels as high as 15 percent of the emissions, CO₂ capture levels of over 99 percent have been achieved. Storage is generally not a great problem as the gases can be pumped underground or used for other industrial purposes and products. There are now mining sites in Australia where mandated carbon extraction is being applied, yet a great deal more research and investment is needed to make the processes more effective and viable before widespread adoption can occur. Even those mandate on Australia’s north-west shelf have not yet succeeded⁴. On top of that, it is exponentially more difficult to capture CO₂ at sites that use comparatively small amounts of fossil fuels and even more so to implement “direct air capture” or carbon scrubbing from the general atmosphere. With a natural concentration of only 0.04 percent, atmospheric scrubbing of CO₂ is technically very complex and hence costly. To date, little progress has been made and experimental plants are presently only capable of achieving 1,000 tons a year, although at least one US plant capable of capturing one million metric tons of CO₂ a year is projected to come on line in 2024 (Kaufman and Rathi, 2021). A related issue will be that if the technology is eventually successful, the gases that are captured will need to be condensed and stored under pressure as it is probable that not all the 12 billion tons that needs to be captured each year will find other uses *so they will need to be stored*. Given that carbon capture research and development has been under way for more than two decades, progress is clearly painfully slow and as a consequence, even greater efforts need to be made on natural sequestration.

The Australian Disaster Resilience Index, (ADRI), is the fourth report that provides a valuable contribution to future planning and provision of leisure and recreation opportunities across Australia. This was prepared by the University of New England and the Bushfire and Natural Hazards Cooperative Research Centre, Melbourne (Parsons, et. al., 2020). From a natural hazards perspective, the report defines resilience as a situation in which “people are learning to live with a changing, unpredictable and uncertain environment”. Disaster resilience is also seen as a combination of *coping* and *adaptive* capacities. Coping reflects the use of available resources and abilities to address adverse situations while adaption reflects the capacity to adjust through learning, change and transformation (ADRI, p. 4).

The natural hazard events identified in the report include “bushfires, cyclones, floods, heatwaves, earthquakes and tsunamis”. Many of these are caused by or exacerbated by global warming and climate change and all have impacts across the social, economic, natural, political and built environments. The report notes that the cost of these impacts is projected to double by 2030 from \$18.2 b.pa. in 2016 and to cost \$33b. pa., in 2050. The increases will be exacerbated by climate change, population growth and socio-economic disparities, and geographic settlement patterns.

⁴ See O’Malley, N. “WA carbon capture plan misses target”, *The Age*, July 20, 2021, p. 13

The ADRI report argues that

“The effects of natural hazards on Australian communities are influenced by a unique combination of social, economic, natural environment, built environment, governance and geographical factors...”.

In this context the report sets out to measure and map

“...the capacities of social, economic and government systems to prepare for, respond to and recover from a natural hazard event, and to learn, adapt and transform in anticipation of future natural hazard events...”

(The Australian Disaster Resilience Index: a summary, p. 4)

The ADRI uses data on 67 measures of a community’s “coping capacity”, with these covering social character, economic capital, emergency services, planning and the built environment, community capital and information access. A further 6 indicators measure “adaptive capacity”, these covering social and community engagement and governance and leadership. The indices are used to create a composite index, to map *the capacity for* disaster resilience across Australia and to analysis the factors which contribute to resilience. Disaster resilience indices have been calculated for 2,214 Australian Bureau of Statistics Statistical Areas. The analysis shows that extensive rural, inland and northern areas of the country have far lower resilience capacities than coastal, metropolitan, south-eastern and south-western areas of the country. Yet it is of interest that some of the areas deemed to have moderate to high resilience were amongst some of the areas worst hit by the bushfires of 2019/20. The full results can be accessed directly by the public through the ADRI mapping website – www.adri.bnhcrc.com.au-- and provide an understanding of organisational and societal capacities to cope with and adapt to natural disasters. The ADRI can be used to establish a background for individual councils in relation to their disaster resilience capacities and readers are referred to the website for fuller details on specific locations.

Although the ADRI cites the “natural environment” and “geographic factors” as elements that influence the effects of natural hazards on Australian communities, the analytical process does not provide any information or analysis of these or of the risks they generate. In the context of “geographic”, the ADRI is instead concerned with how the strengths of and barriers to disaster resilience vary *from place to place* ie: geographically. However, there are major and diverse environmental and geographic factors which leisure and recreation planners and providers need to consider from a resilience perspective. These include, for example:

- Latitude and the consequent current and projected propensity to suffer from cyclones
- Projected changes in rainfall totals, seasonal patterns and river flows
- Propensity to suffer from short, heavy rainfall, storms, and flooding
- Projected changes in temperature regimes, winds and other weather/climate elements and events and the consequences for bushfires, soil erosion, drought
- Location on coastlines and/or river banks and coastal vs inland or far interior locations
- Elevation above sea level/river levels, variations in relative relief, and flood plains
- Terrain character, and
- Soil conditions and potential for erosion.

While many of the weather and climatic examples cited above generally occur at a district and sub-regional level, geographical and geophysical factors can also be confined to very small areas. As such, detailed on-site analyses or GIS-based analysis is likely to be needed to assess risk and disaster potentials. In the context of the ADRI, the lead author of the Index has indicated that the ADRI “can be overlain onto risk maps to determine the intersections between, for example, areas of high risk of bushfires and areas of low disaster resilience” (Parsons, pers. com., 2021). Such analyses would be invaluable and some of the resources for undertaking this work are reviewed in the following paragraphs.

The UNFCCC (UN Framework Convention on Climate Change) is the framework under which the IPCC has worked since 1988. The UNFCCC report, *UN Sports for Climate Action Framework*, the fifth report reviewed here, is one of the organisation’s regular research publications on climate change issues and developments. It provides a brief summary of the current and projected impacts of climate change on sport and the opportunities for sport to become a leader in climate change initiatives. However, the key value of the report lies in its *framework* of five key principles for action on climate change. These are:

1. Undertake systematic efforts to promote greater environmental responsibility
2. Reduce the overall climate change impact
3. Educate for climate action
4. Promote sustainable and responsible consumption, and

5. Advocate for climate action through communication.

These principles provide an invaluable structure for action on climate change and will be returned to in the following section of this report.

The **Australian Bureau of Meteorology**, the CSIRO and state government agencies address a number of the gaps identified in the ADRI report. At the heart of the Bureau of Meteorology work of relevance to the present study are the detailed technical report, *Climate Change in Australia*, (CSIRO and Bureau of Meteorology, 2015) and *State of the Climate* (Bureau of Meteorology and CSIRO, 2020). The *State of the Climate* report presents data and maps to explain the changes which have and are continuing in Australia's climate. Specific statistics and maps are provided on temperatures, fire weather, rainfall and heavy rain, stream flows, tropical cyclones, snowfall, ocean surface temperatures, ocean heat content, sea levels, ocean acidification, ice sheets and ice shelves, greenhouse gases and the global carbon budget and projected future climatic features. Of particular value is the fact that these data can be overlaid on the ADRI maps.

In terms of the future climatic features, the Bureau of Meteorology report indicates that over the coming decades, Australia can expect, in keeping with the findings of the earlier reports:

- Continuing warming with more extremely hot days and fewer extremely cold days
- Lower winter rainfall totals across southern, eastern and south-western Australia with more drought periods, a longer fire season and more dangerous fire weather days
- More intense short duration heavy rainfall "events"
- Fewer tropical cyclones and large variations from year to year and with more of those that do occur being of a high intensity
- More intense weather impacts along the east coast with the severity heightened by continuing sea level rises and more extreme levels. Upper projections suggest rises of 0.6 to 1.1m. by 2100 with regional variations in the rise
- Marine heat waves that are more frequent, longer, more extensive and intense
- Continuing warming and acidification of oceans with regional variations in these, and
- Yearly temperatures that are warmer than they would have been without human influence and decade and twenty year averages which will be higher than those of the immediately preceding periods.

(Australian Bureau of Meteorology, 2020, p. 22)

In essence, the BoM report argues that the years which currently have the worst climatic conditions will become the *average* years of the future. It is evident that leisure and recreation planning and provision initiatives across Australia will need to respond to these projected conditions.

The overall directions of change discussed in the Bureau of Meteorology *State of the Climate* report are treated in greater depth in a significant number of other resources available from the Bureau. The web site, *Climate Change in Australia* (climatechangeinaustralia.gov.au) provides a wealth of data and interactive tools and state-specific reports. It provides an overview of Australia's climate system and the changes that are occurring; summary statements of climate change trends; an overview of the projected changes in each state and territory; guidance re the downloading of specific data sets; relevant reports and papers and information on several research and special projects. There is not room here to review any of the specific details of the Bureau of Meteorology and CSIRO research and findings or the *Climate Change in Australia* web site. However, both provide invaluable resource materials and leisure and recreation planners and providers should undertake an analysis of the data and sub-reports that are pertinent to their situations.

The seventh report of immediate relevance to this review is ***Game, Set, Match: Calling Time on Climate Inaction***, released by the Climate Council of Australia in 2021. The report has comprehensive references and in keeping with the earlier reports, outlines the extent to which global and national climate change has occurred and highlights the characteristics and extremes of the changes. The report sets out to assess:

- How climate change and the resultant increases in extreme weather events can, and are, impacting on and threatening many sports. Extreme weather events are those "near the end of the range of observations for the variable" (IPCC 2012, p. 5 as cited by the Climate Council), and include extreme heat, intense rainfall, powerful cyclones, hail storms, severe droughts and dangerous fire weather

(Climate Council, 2021, p. 9)

- How some sports (and particularly, summer sports) may become unplayable due to climate change and extreme weather events
- How climate affects sport from a health, social, economic and infrastructure perspective, and
- What sport can and is doing to combat climate change.

(Climate Council, 2021, p. 6)

In the Climate Council report, climate issues and problems faced by a group of high profile sports are used in association with Australian and overseas case studies to illustrate impacts and possible actions. Appendix 1 provides a summary chart of the impacts identified in the report, specific examples and a number of mitigation and adaptation strategies. The report concludes with a “Climate Action Toolkit” that lists eight key initiatives that sport should pursue to mitigate and adapt to climate change. These are:

- Promote active and public transport options
- Stay informed re climate change research and information
- Power your sport with renewable energy
- Use the powerful voice of sport to call for climate action
- Invest in climate action and avoid fossil fuel sponsorships
- Develop emission-reduction strategies within individual sports
- Keep game days safe, and
- Join forces with other national and international sporting efforts and with other agencies to promote and initiate climate change action.

(Climate Council, 2021, p. 72)

The Climate Council review is invaluable in the context of the present paper through its listing of the specific impacts which particular sports are and will encounter in addition to a set of actions which can be taken to both mitigate the impacts of climate change and /or adapt to it. Yet from a sports perspective, the focus of the impacts and action strategies tends to be on programmatic initiatives rather than on the built environment. Further, while cast in a sports context, many of the action proposals are pertinent well beyond the sporting world and should be pursued by all leisure and recreation (and other) groups, organisations and agencies.

The final report reviewed here is ***Future Proofing Community Sport & Recreation Facilities. A Roadmap for Climate Change Management for the Sport and Recreation Facilities Sector***, prepared by the Sports Environment Alliance and published by the Victoria Government in 2018. The report details the evidence of climate change across Australia and more specifically in Victoria, and identifies many of the impacts of the change on leisure and recreation highlighted in the previous Climate Council report. This interactive report provides a seven-stage “roadmap” designed to allow sport and recreation venues “to be nimble and resilient to climate change through commitment, mitigation and adaptation...” (p. 5). The seven stages of the roadmap, each of which has a checklist of actions, are:

1. *Promise to protect*, which focuses on committing to a sustainable, environmentally-responsible future evaluating past initiatives, assessing climate change risks, determining the resources available for action and drawing from the experience and learnings of others
2. *Rally team planet*, which argues the need for a working group/committee to guide action and the benefits of collaboration with other organisations and stakeholders
3. *Baseline and set your goals*, which highlights the importance and process of setting goals and action objectives, identifying priorities for action and strong outcomes, defining and applying measures of success and monitoring and evaluating prevailing climate change conditions and responses to these
4. *Become leaner, faster and cleaner*, which details the actions leisure and recreation provision organisations can take to “mitigate” or reduce their contribution to climate change drivers while also reducing the severity of the effects of climate change

5. *Changing the game through adaption*, which outlines how leisure, sport and recreation can change the way things are done in order to minimise the impacts of climate change
6. *Shout, cheer, kick goals for the planet*, which highlights how leisure and recreation organisations can use the awareness of them and their popularity as a base for promoting climate change awareness and action, and
7. *Keeping check*, which stresses the importance of measuring the outcomes of the actions taken and monitoring both climate change conditions and organisational preparedness and capacity to take action.

The *Future Proofing* report details a range of actions which will help achieve each step of the roadmap. The strength of *Future Proofing Community Sport and Recreation Facilities* lies in the structured set of action steps it provides, the detailed lists of strategies provided and the checklists for action. These are returned to in the following section.

Together, the foregoing reports provide an invaluable baseline for understanding global climate change and its causes; for understanding the nature and scale of climate change in Australia, its emerging impacts and the regional variations in these; for collating, assessing and presenting information on the varying capacities of regional Australia to deal with natural disasters, and for identifying the current and projected impacts of climate change on sport, recreation and leisure across Australia. They also provide a basis for understanding how the leisure industry and sporting and recreation participants, clubs and organisations can and will need to respond over the coming years. As such, the reports provide a framework for a structured set of possible actions to be incorporated in to the work of leisure and recreation planners and providers.

Climate Change Initiatives by Local Government in Relation to Leisure and Recreation Planning and Provision

As part of this paper a review was undertaken of climate change policies and documents published by a sample of Australian local government authorities. The Councils selected included a state capital city, suburban metropolitan councils, and both regional inland and regional coastal councils across the three eastern Australian mainland states. They were selected because of their differing geographic situations, their varying action capacities, the often quite distinct climate and weather change challenges they face and the author's knowledge of them from previous research.

The review does not include an assessment of state and federal climate change policies, initiatives or directives and it is recognised that these could be expected to provide "higher order" guidance or establish a mandatory framework for action by individual Councils. Such an analysis and the relevance and impact of state and federal policies and action to leisure and recreation planning and provision *on the ground* at the local government level needs to be undertaken and in any initiatives they take, Councils should ensure that they review relevant state and federal guidelines and/or requirements. Yet despite state and federal policies –and some state policy statements are very strong on achieving net zero emissions by 2050-- it would appear that not a lot of the state or federal work has been carried over to local government policies or action.

Further to the above, it is acknowledged that the number of Councils covered was not extensive and it is possible that other councils have a differing experience to that reported below. It is also possible that unpublished papers or documents exist in a number of Councils. However, the view has been taken that where these are not publicly available, they provide little guidance to the community in understanding and/or responding to climate and weather change. Where other reports do exist, it would be useful to have a mechanism whereby they could be collected and shared.

The review found that:

- Excellent and often quite extensive work has been done by some Councils in preparing both "generalist" and issue/site specific climate change policies and action guidelines. This is especially the case in capital city and larger metropolitan Councils. Several exemplary reports warrant promotion as models for other Councils
- There is widespread preparation of policies in relation to water management, energy use and waste management
- In proactive Councils, there is generally a good level of awareness of and affiliation with regional, state, national and international bodies concerned with addressing climate change, and
- There have been significant initiatives on some mitigation activities including in particular, tree planting; the extension of green belts and parklands; installation of solar energy systems on municipal

buildings; the management of water use, harvesting and re-use to reduce consumption; coastal resilience; community education and engagement programs, and greenhouse gas emissions measurement and monitoring.

At the same time however, the review indicates that:

- Some Councils and individual Councillors cited on Council web sites are still at the point of questioning climate change science and debating whether action should be taken to address climate change. These Councils generally do not have climate change policies. Others have (possibly mandated) natural disaster action plans –with no links to climate change— while still others are in the process of developing what appear to be quite sophisticated and advanced policies (but have no published documents at present). Several Councils were reviewing and updating past policies, some of which are as much as 8-10 years old while still being on the Council web sites
- Regional and rural Councils prepare “state of the environment” and environmental sustainability reports which appear to be action mandated by state legislation rather than internally-driven action policies. Climate change management or action plans are generally not part of these
- Some regional Councils have developed broad policies designed to manage the risks generated by climate change, to strengthen disaster resilience and to help with recovery from “natural disasters” (rather than from than “extreme” or “hazardous” conditions created by climate change, with particular emphases being on disaster management, water security, natural area management and coastal erosion and inundation. In general, specific action plans in response to known local or regional climate change threats were not identified, this suggesting a lack of detailed local knowledge and/or a lack of the technical capacity to design appropriate actions as implied in the earlier Australian Disaster Resilience Index review. This suggests the need for greater support and guidance from higher levels of government and other relevant agencies and organisations eg: via Emergency Management Australia
- It would appear that quite a few Councils are working in isolation in seeking to address climate change issues when in fact they would benefit substantially from regional support and cooperation
- Some regional and rural Councils have tended to use external consultants and agencies to prepare reports on each of climate change and environmental management progress and compliance as they do not have the in-house expertise to do so. This is of concern as there is a danger of “template” style reports being prepared (because the local knowledge simply is not there), of “tick the boxes” reporting, and of issues being given insufficient attention and of limited community engagement. The whole topic can also be readily overlooked between reporting periods
- Most of the policies and many of the initiatives that have been taken are “generic” In nature in that they could have been taken by any Council across Australia. This most probably reflects the view noted earlier that “any action is seen as being better than no action” and the fact that many Councils are uncertain as to what specific local actions they should prioritise, can afford and what outcomes these would achieve. While the generic nature of action is not a problem within itself and possibly allows for some useful inter-Council comparisons, the lack of specific action on known local issues is of concern
- Most of the initiatives that are proposed or have been taken focus largely on broad scale climate change *mitigation* (eg: installation of solar power, tree planting), while local *adaptation* and *avoidance* strategies are overlooked. While this is again unquestionably invaluable action, it most probably reflects uncertainty as to the most important or effective specific local actions and the greater ease of taking mitigation action. Ultimately, it could mean that locally-emerging crises are overlooked or are not responded to appropriately.

Where mapping is used to highlight impact-susceptible areas within Councils, disclaimers are used to cover any potential liabilities on the part of the Councils and no action plans could be found in relation to the mapped projected conditions. In this context it would seem somewhat contradictory that action on local issues such as flooding, cyclone impacts, tidal surges, drought and the impact on water supplies is being left to state and national agencies which often do not seem to have the will or the resources to act

- The implementation of policy driven initiatives appears to occur on a case by case basis and there are few “industry/portfolio” action plans or *programs*. To illustrate, rather than developing climate action policies for the leisure and recreation industry, for all infrastructure development, for local businesses, for health and community services or (in rural areas), for farming and water management, Councils tend to pick off “low hanging fruit” that they can readily deal with. While important in terms of climate change mitigation, these actions do not necessarily add up to a comprehensive policy. Of greater concern is that this approach tends to create a Council-only or Council-focused process and program of action which does not give direction or support for action by the wider mix of communities. In other

words, there is limited guidance for organisations other than the Councils themselves in terms of what they should do to contribute to the overall municipal effort on mitigation, adaption or avoidance

- None of the Councils reviewed had a leisure and recreation planning and development climate action policy. While some references were made to problematic leisure and recreation situations caused by climate change (such as damage to playing fields due to drought or extremely wet weather), none of the suggested actions (such as assessing the option for installing synthetic playing fields) were tied back to climate change. Nor did the greater majority of the Councils have household climate change action guidelines (except in relation to waste management, which in some contexts can be seen as somewhat marginal), health and community wellbeing guidelines, or local retail, wholesale or service industry climate change action guidelines and support processes, and
- Few of the inland regional councils appeared to have defined policies relating to action to mitigate the increased intensity of droughts, rainstorms, heatwaves, extreme floods or reduced river flows or other climate change events, nor did they have either generic or municipal-specific strategies for addressing these issues.

As noted previously, the review of Council policies undertaken for this paper was by no means exhaustive and did not cover unpublished or internal reports and guidelines and it is probable that quite a few Councils have these. If so, their greater availability would be of considerable benefit to other Councils which still have a long way to go, as would greater levels of state and Federal government assistance and guidance. However, if what has been reviewed here is indicative of what the state of action is at the local government level and if other internal documents do not exist, the current position is of serious concern.

The Implications of Climate Change to Leisure and Recreation Planning and Provision

The foregoing reviews have detailed a diverse array of critical information and strategies that must be understood and pursued by governments at all levels, by industry, businesses and individuals, and by leisure and recreation clubs, organisations planners and providers across Australia. Understandably, a number of the reports detail what might be described as “high level” initiatives which it can be difficult for leisure and recreation planners to interpret in concrete terms and to develop specific action recommendations from. Yet these should not be overlooked: planning studies and provision initiatives should ideally, be couched in terms of these broader goals wherever possible and certainly, within the context of the goals, objectives and actions of any wider agency or organisation of which they are part. Others of the reports provide very specific guidance as to what leisure and recreation planners and providers can do to mitigate climate change and to adapt to its emerging impacts. Perhaps most importantly, three of the reports (*Game, Set, Match* from the Australian Climate Council; the UN *Framework Convention on Climate Change* and the Victoria Government’s *Future Proofing Community Sport & Recreation Facilities*) provide a framework or steps for action. These steps have been reviewed in association with an earlier, unpublished framework prepared by the author in 2020 to create an integrated framework for action. This is detailed in the following paragraphs.

In light of the foregoing research review and that of present local government authority initiatives on climate change, it is evident that the present situation is so dire, *any* action to minimize the extent of climate change is valid. Initiatives as diverse as stopping the use of fossil fuels, changing the mix of materials when building leisure and recreation facilities, planting trees, and building resilience to avoid or minimize storm, fire and flood impacts are all valid initiatives. However, of these examples, only stopping the use of fossil fuels, tree planting and the restoration of natural ecosystems strike at the heart of the climate change catastrophe: the first limits the continuing addition of greenhouse gases to the atmosphere while planting trees and ecosystem rehabilitation contribute to carbon sequestration. So these initiatives must be given a high priority. Yet even here, the right species of trees need to be planted and these may take 20-30 years before their optimum impact is felt while the adaption of buildings can avoid damage immediately. Overall however, the scientific evidence indicates that stopping the use of fossil fuels should be given the highest priority. Yet this alone will be insufficient as even when that is achieved, *the concentration of greenhouse gases in the atmosphere will still be far too high to stop further change* and major action will be needed to drawdown greenhouse gas concentrations. And this is where stopping land clearing and planting trees, along with carbon capture technologies will be critical.

So all initiatives are important but some are more important and urgent than others. In this context, care will be needed to ensure that what actions are taken are the *best* actions. The selection of less effective strategies and the problem of maladaptation (ie: the selection of inadequate or inappropriate responses), could lead to negative side effects and years of wasted effort. Two simple examples illustrate this. First, if a tree planting initiative was to select an inappropriate species for a particular area, it may be a decade or more before the deficiencies /inadequacies were identified and alternative species were planted. In this situation, carbon sequestration and drawdown could be seriously hampered. Second, a strong emphasis on adapting existing buildings to changed rainfall, storm and flood conditions may require a lot of expense and not resolve the problems when by comparison, the deployment of new building technologies on new buildings at more appropriate locations would be far more effective and more energy efficient.

From the perspective of the leisure and recreation industry, it is proposed that leisure planners and providers follow six successive steps in addressing climate change, with each building on the one before. The more that is done on the early steps, the less will be the need for the latter steps. That said, given the evidence showing that climate change is occurring at the upper levels of projections, as much as possible should be done on every step. The steps of the framework argue that:

1. Each leisure and recreation organisation and any related parent bodies must know what their present position is, what they face with regard to climate and weather change factors and their impacts, where they want to be, and the scale of their resources and capacities. From this knowledge they will be able to establish situational baselines regarding explicit threats to them, and an understanding of the resources and capacities that they have. They will then be able to prepare statements of values, goals and objectives and develop priorities for action and mechanisms of action
2. Taking action alone may achieve little. Rather, there is a need to build immediate and wider organisational and community awareness of the projected scale and impacts of climate change so as to create an understanding and acceptance of the proposed actions and possible solutions
3. The community and leisure and recreation planners and providers must be clear on and agree on what action they can take to reduce and minimise the causes of climate change
4. Leisure and recreation planners and providers must identify the actions they can take to reduce or mitigate the impacts of climate change on existing leisure and recreation facilities, programs and services and to adapt to the changes that are occurring
5. Leisure and recreation planners and providers must ensure that new planning and provision initiatives *avoid* the climate change impacts that would otherwise occur, and
6. Leisure and recreation planners and providers must monitor and evaluate the initiatives they pursue and as necessary, adjust them as a result of that monitoring and evaluation.

These steps are detailed further in the following chart, with the specifics drawn from the work of the author and the reports reviewed in this paper. The steps and the details within each of them should be viewed as a draft so that refinements and additions can be made to them as deemed appropriate.

Step 1: Establish information baselines, values, goals and objectives

<p>Purpose: The purpose of this step is to establish information baselines on and a detailed knowledge of the range and severity of critical local/ regional climate change threats, and on the local/regional resources and skills available to deal with these. The baseline information is then used to guide the preparation of a statement of values, goals and objectives and to develop the priorities and achievable strategies/tools for action.</p>
<p>Rationale: Establishing baselines provides a data base on the current situation and a basis for decisions on values, goals, objectives, the priorities and frameworks and mechanisms for action. Further, it provides a base point for the progressive evaluation of the action framework and it's values, goals and objectives, the actions taken and of the short, medium and long term success of these actions.</p> <p>Discussion: In the context of the present paper, establishing base line data should be undertaken within a leisure and recreation planning and provision framework. However, the overall process will be more effective if this work is undertaken as part of a wider organisational review and assessment.</p> <p>Values statements could be expected to cover broad ideals such as "protecting our communities and the earth from the impacts of climate change" or "Ensuring that all actions by our organisation are initiated in keeping with climate change mitigation principles and strategies". Ideally, goals should be action-oriented and provide the basis for a set of objectives with the latter being measurable. Several, or a mix of approaches could be adopted. The goals of the Paris Agreement on climate change could be used, or those proposed in the reports reviewed in this paper (including for example, achieving organisation-wide and community carbon neutrality by 2035. Alternately, each of the subsequent steps in this action framework could be used as goals ie: Building awareness, Reducing the projected severity of climate change etc</p>
<p>Actions:</p> <ol style="list-style-type: none"> 1.1 Establish an organisation-wide planning committee(s) for the purpose of collating, evaluating and prioritising climate change issues, threats and action needs and preparing a leisure and recreation situational baseline analysis. If deemed appropriate, establish sub-committees for the different areas of an organisation's operations eg: planning, building and maintenance, managing and programming. Appoint a project coordinator or coordinators 1.2 Run intra-organisational workshops to review, discuss and assess the data and conclusions of the papers detailed in this report and to draw common themes and directions from them

- 1.3 Review and evaluate the implications of relevant state, national and international policy statements, protocols and regulations impacting on climate change initiatives as a basis for ensuring that no useful guidelines are overlooked and that where appropriate, compliance is achieved
- 1.4 Liaise with other relevant agencies and bodies (eg: Bureau of Meteorology, CSIRO, the University of New England re the Australian Disaster Resilience Index, relevant state bodies and other local and regional organisations) re pertinent local/regional data, reports, research and policies pertinent to climate change
- 1.5 Liaise with other local governments bodies and their associations to learn from their experience
- 1.6 Prepare a situational baseline analysis report and disseminate this to relevant organisations, individuals and the community for feedback and comment. The report should include an assessment of the present condition and climate and weather change threats to all leisure and recreation facilities, programs and services. As adding such details to existing inventories or creating new inventories will require some effort, an initial listing of key at-risk resources may need to be dealt with. This can then be added to over subsequent periods
- 1.7 Use the situational baseline analysis report to guide the preparation of a *draft* "Leisure and Recreation Industries Climate and Weather Change Action Plan" including goals, objectives and action priorities with both a global, national, regional and specific local leisure and recreation planning and provision focus. Disseminate a draft of the goals and objectives document and seek feedback and responses; revise as appropriate
- 1.8 Establish indicative budgets and timelines for action within the resourcing capacities of the organisation(s); seek funding assistance for this process where deemed necessary
- 1.9 Ensure that the specifications, briefs and contracts for all new leisure and recreation planning, provision, upgrading and redevelopment initiatives contain specific provision for climate change analyses and responses
- 1.10 Establish mechanisms to monitor and evaluate the inputs, outputs and outcomes of the action framework. *Inputs* are defined as the resources needed to implement the agreed actions. *Outputs* are the short to medium results achieved by the actions (such as measured reductions in use of fossil fuels) and *outcomes* are the long term consequences of the actions, and
- 1.11 Commission triennial independent professional audits of the policy and action framework and reviews by leading national and state climate change agencies.

Step 2. Build awareness of climate change

Purpose:

The purpose of this step is to build awareness and support across relevant organisations and in the community for the values, goals and objectives proposed in Step 1.

Rationale:

Climate change is impacting on the lives of everyone and everything on Earth and this is projected to intensify. As such, building awareness of the scope and scale of climate change and its impacts across all components of an organisation and the community or communities served is critical to the success of any climate action program. Importantly, awareness must be developed in a positive, constructive manner so that people do not reject the evidence and so they accept that action can be effective in reducing risks and impacts. A positive stance will also serve to stimulate thinking about and the demand and support for action by government and organisations and individuals in a community.

Discussion:

Any organisation or community that does not adequately understand the causes and consequences of weather and climate change is more likely to contribute to those causes and to suffer the consequences of it. As such, scepticism regarding climate change must be countered and organisations and the community must be made aware of the diverse range of specific impacts and how they can be addressed.

Planning agencies should use a diverse mix of case study materials, educational and communication tools and resources to build organisational and community awareness. Principles 1, 3 and 5 of the *UN Sports for Climate Change Framework* (United Nations, undated) warrant a further review in this context as does "Future Proofing" (p 22 of the same report).

Actions:

- 2.1 Run intra-organisational workshops to review, discuss and assess the data and conclusions of the papers detailed in this report and to draw common themes and directions from them
- 2.2 Prepare materials which demonstrate how leisure and recreation organisations can "embed climate solutions in their operations" (Climate Council, *Game, Set, Match*, p. 71) and which promote the enhanced environmental protection, jobs and other economic and social opportunities and benefits which early action will generate
- 2.3 Prepare promotional and educational materials, run public workshops, community and promotional events and information sessions using the reports reviewed in this paper, other materials and where possible, case studies of

local/regional action. Provide specific leisure, recreation and sporting information in these materials and develop strategies for involving the community in initiatives designed to counter climate and weather change⁵

- 2.4 Where opposition to and uncertainty about the needed changes are identified, develop strategies to engage with those who are concerned in a professional, respectful manner and work to identify ways in which they can contribute to the desired outcomes. Promote the opportunities, social and economic benefits and jobs that action on climate change will create and how success in abating change will bring significant environmental and quality of life benefits. Stress the scientific basis of the changes that are needed, be professional, do not get alarmist and let people and the community be part of the solution
- 2.5 Actively promote the values, goals, objectives and action plans developed in Step 1 and promote the most recent findings and information on climate change
- 2.6 Issue regular bulletins explaining the actions taken toward achieving the goals and objectives established in Step 1
- 2.7 Actively support research into climate change by universities, public agencies, non-for-profit bodies and community groups and individuals. Use promotional materials to disseminate the findings and demonstrate the commitment of the organisation to climate change action
- 2.8 Provide support for and help promote not-for-profit organisations promoting climate change awareness and action
- 2.9 Pursue the recommendation in the *Goal, Set, Match* report (Climate Council, 2021) to use the “star appeal and influence of elite athletes, clubs and national teams, as well as global sporting events”, to call for strong action and leadership and to “embed climate solutions in the operations of leisure and recreation organisations and group (p. 71). Provide advice on appropriate strategies to pursue, and
- 2.10 Join forces/affiliate with other national / international sporting efforts and with agencies and become signatories to and join national and international action groups to promote & initiate climate change action.

Step 3. Take action to reduce the projected severity of climate change

Purpose:

This step focuses on taking a wide array of actions to reduce the projected severity of climate change by reducing or eliminating the creation of greenhouse gases by the leisure and recreation industries

Rationale:

Climate change will only be contained by reducing or eliminating the present high levels of greenhouse gas emissions and by greenhouse gas sequestration. As such, leisure and recreation planners and providers should contribute to the actions that can be taken to pursue these objectives

Actions:

Within the professional technical and financial capacities of the organisation (and where possible, with external assistance and guidance):

- 3.1 Adopt and implement validated international, national and local/regional and appropriate local strategies to reduce and eliminate the use of energy sources, products and services which generate greenhouse gases. Promote this action and the reasons behind it to the community
- 3.2 Eliminate the use of greenhouse gases when providing, operating and supporting leisure and recreation facilities, programs and services. Actions should include:
 - elimination of the use of fossil fuel-generated power and installation of solar, wind, tidal and water-driven/hydro power generation
 - use of cogeneration
 - use of smart technologies to reduce power use
 - use of storage batteries and micro/ local area power networks
 - use of electric vehicles and provision of vehicle charging equipment
 - co-location of venues, programs and services to reduce the duplication of buildings, staffing, heating/cooling and other running costs
 - use of carbon tariffs where equipment and materials have to be imported from countries not having as stringent carbon reduction goals, and
 - use of “offset” reductions through other greenhouse gas reduction actions when it is not possible to eliminate some identified emission sources
- 3.3 Undertake energy audits and introduce technologies and leisure and recreation programming changes that reduce energy use and increase energy efficiency. Strategies to be assessed should include:
 - only using non-fossil fuel energy

⁵ Leigh and Terrell provide an excellent discussion of and case studies on volunteering in the community and strategies for engaging community members. See Leigh, A and Terrell, N., 2020. *Reconnected: A community builder's handbook*, La Trobe University Press, Carlton, chapter 3, “Volunteering”

<ul style="list-style-type: none"> • double glazing • use of energy efficient building materials and insulation and construction techniques to reduce heat loss and undue heat exchanges • movement-sensitive lighting, and • changed programming times (to avoid weather extremes and subsequent scheduling disruptions, optimise use of daylight, optimise venue use etc)
3.4 Manage operational materials and equipment purchasing to focus on long life, recyclable and sustainable materials and sustainably-sourced items; minimise packaging, food and energy wastage; optimise reuse and recycling
3.5 Adopt exclusive use of electric vehicles and support their wider promotion; encourage vehicle pooling, active and public transport, load sharing of supply /maintenance vehicles, free public transport, bike paths and other similar strategies
3.6 Identify service provider organisations which use, market or sell greenhouse gas-generating technologies and products and liaise with them to encourage them to discontinue the relevant practices
3.7 Discontinue sponsorship arrangements with organisations which do not eliminate use of greenhouse gas-creating technologies
3.8 Work with individual leisure and recreation groups and associations and other nearby/like Councils to identify and implement strategies that will reduce and eliminate their specific greenhouse gas emissions. Sharing facilitates learning and can add significantly to avoiding inappropriate actions and evaluating the outcomes of the actions taken
3.9 Initiate and/or support multiple strategies that contribute to sequestration of greenhouse gases. Those evaluated should include: <ul style="list-style-type: none"> • plantings/increased plantings of carefully selected tree, shrub and grass species at all leisure and recreation venues • reservation and protection of natural woodland, grassland, marine seagrass and kelp areas and other similar areas (and their secondary use for leisure, recreation and educational purposes) • re-planting undeveloped/unused land (even if only for a short time); planting green corridors through urban areas (using streets and backyard and soil ecology/sequestration initiatives) • “re-greening” cities by restricting tree removing, mandating minimum garden sizes, and street closures to create parks • replacement of grass with trees to assist with reducing wind and evaporation, rainfall infiltration, reduced use of fuels for mowing and of weedicides, and reduced irrigation of parklands in summer • reduction in the numbers of turf sports fields through the installation of fewer, higher use-supporting synthetic playing fields as one synthetic field can replace up to four grass fields. Former playing fields can be replaced with trees, shrubs and grasslands to contribute to greenhouse gases sequestration, and • rationalisation of golf courses to develop a hierarchy of 9, 15 and 18 hole courses with lower order courses reduced to 9 holes so that the eliminated fairways can be turned back to bushland and carbon sequestration reserves <p>While few if any organisations will be able to meet the frequent call to “plant a million trees”, every single tree in each street, reserve, roundabout and sports ground reserve counts toward such a goal and makes a contribution to the sequestration of greenhouse gases. Some organisations are planting advanced/more developed trees to speed the process up although this is questioned as these would have to have previously been grown to an advanced stage, be available and be affordable. Further strategies include converting under-used play spaces to urban forests and the replacement of permanently-sealed car parks with grass-reinforcement products made from recycled materials to allow retention of grass, infiltration of water and reduced runoff</p> <p>A final and critical strategy for carbon sequestration is providing support for and taking action on technological research, innovation and action on carbon capture and storage. As indicated in the earlier reviews, reaching zero net emissions will not remove existing greenhouse gases from the atmosphere and as revegetation and other ecological solutions may take decades to deliver their optimum benefits, technological solutions still need to be pursued. Yet success so far has been severely limited and the techniques which exist are very expensive and energy demanding, and</p>
3.10 Issue regular bulletins explaining the greenhouse mitigation strategies being used, the extent of progress and the measured inputs, outputs and outcomes (see Step 6 for further details)

Step 4. Reduce climate change impacts on *existing* leisure and recreation facilities, programs and services

<p>Purpose: Australia has billions of dollars invested in leisure and recreation facilities, programs and services and in the infrastructure that services them. These assets are used to support hundreds of thousands of self-initiated and structured programs and activities for millions of people every day, thereby providing for their physical and mental wellbeing. Many of the resources and the uses made of them will need to be adapted and modified if they are to avoid the depredations of climate change and continue to be viable and useful to the community. This step defines some of the actions that should be considered and implemented to retain the viability of existing opportunities.</p>
<p>Rationale: Existing leisure and recreation assets are increasingly being impacted by severe weather conditions generated by climate change. However, abandoning the existing opportunities would be quite onerous, expensive and a serious constraint on the provision of leisure and recreation opportunities. Thus, in the immediate to longer term it will be more effective to retrofit</p>

what has already been provided. A diverse array of strategies will need to be pursued to adapt what is provided to either minimise or eliminate climate change impacts.

Actions:

4.1 Liaise with CSIRO, Bureau of Meteorology, state governments, health agencies and relevant sports associations to identify projected local /regional climatic changes and their likely impacts in terms of eg: temperature, humidity, wind, rainfall, smoke. Use the information to review and revise leisure and recreation programming. Actions for consideration (and for the possible formalisation of regulations around) include:

- rescheduling of susceptible sporting and recreation activities and/or susceptible participant groups re time of day, season(s) of competition, location of play, length of seasons, duration of play and frequency of competition. In relation to the last point, playing fortnightly rather than weekly (or, as is sometimes the case, even more frequently) could reduce the climate change impacts on individual's health and wellbeing while reducing facility demands by as much as 50 percent
- cancellation of activities under pre-determined extreme weather conditions
- introduction of temperature, wind, humidity, rainfall and storm limits on when individual outdoor leisure and recreation activities and competitions can be pursued
- introduction of umpire interchanges and increased player interchanges
- application of seasonal closures where extreme weather and other conditions are likely to prevail eg: cycling routes, hiking trails, 4WD trails
- restrictions on training, pre-season and full season games to protect playing surfaces and allow other uses and users
- making optimal use of daylight use of outdoor venues to minimise energy use for indoor heating/cooling, lighting and humidity regulation
- optimising use of natural lighting in indoor venues
- moving activities in highly susceptible areas to indoor venues where microclimatic conditions can be managed
- changing competition schedules
- reviewing insurance conditions, requirements and fee scales and taking action to reduce problematic conditions and reduce premiums

The above changes should be developed in association with the community and leisure and recreation groups and the reasons for and of them should be explained.

4.2 Boost all emergency services capacities

4.3 Retrofit existing outdoor and indoor formal and informal venues to:

- provide solar, wind, hydro and battery storage power
- put all services underground
- provide artificial and vegetative shade for sun and storm protection in compliance with Cancer Council and other appropriate guidelines, in the second instance, to also contribute to greenhouse gas sequestration
- protect playing surfaces through restrictions on training and pre-season games
- replace asphalt with grass reinforcement carparks
- increase use capacity and free up of land for other purposes by replacement of turf with artificial playing surfaces
- expand site plantings to enhance greenhouse gas sequestration
- install new/upgraded drainage from rain and storm water in keeping with CSIRO/Bureau of Meteorology guidelines on rainfall intensities, runoff capture, storage and recycling and/or controlled release
- upgrade heating and cooling systems in indoor facilities in keeping with projected temperature and humidity extremes
- ensure compliance with BAL (Bushfire Attack Level) rating requirements in all localities presently and projected to be subject to bushfires
- ensure the engineered/structural capacity to cope with stronger winds, cyclones and heavier and more frequent rainstorms and rainfall totals

Where retrofitting is neither practical nor financially viable, relocate buildings, plant and equipment that could be damaged by weather extremes, bushfires and flooding and/or abandon or relocate the assets in their entirety

4.4 Use Environmentally Sustainable Design principles and environmentally-friendly materials in rebuilding and upgrading projects

4.5 Where a venue has multiple playing fields, convert some to synthetic fields (which support 4-5 times the use rate) and reallocate the remaining fields to revegetation, wetlands and other greenhouse gas abatement projects. Wetlands are particularly important because when located in coastal areas they can place a significant role in reducing the impacts of higher tides and rising sea levels while overall, they support a complex, diverse and more balanced set of ecosystems, and

4.6 Redeveloping leisure and recreation sites to avoid or minimise the short term impacts of climate change. Actions could include installation of automated sprinkler systems and removal of tall trees from the perimeter of buildings and informal leisure spaces in fire- and storm-prone areas; construction of sea walls and river embankments to protect coastal and riverside assets; enlargement of local drainage systems; double glazing of buildings, and upgrading of cooling/heating systems.

Step 5. Avoid the impacts of climate change

Purpose:

The purpose of this step is to ensure that the often extensive retrofitting of Step 4 is avoided while Step 3 mitigation strategies are also furthered.

Rationale:

Step 4 detailed a wide array of actions to adapt to climate change. Effective planning and provision of new leisure and recreation opportunities should seek to pre-empt the impacts of climate and weather change while minimising the contribution to them.

Actions:

- 5.1 Review the climate change mitigation and adaptation strategies discussed in Steps 3 and 4 and build these into planning, design, development and programming specifications for all new leisure and recreation facility, program and services initiatives
- 5.2 Review, and as needed, revise the Steps 1 and Step 4.1 baseline data on the mix of important local and regional climate and weather change projections and in the light of this, seek professional technical inputs on the design and provision implications of the data eg: changed rainfall regimes and the water collection and management implications; changed temperature regimes and the design consequences to building heating and cooling, and wind and storm intensity projections and the implications to the engineering of buildings. Work in conjunction with like agencies, leisure and recreation organisations, professional bodies and appropriate state and federal governments and their agencies to develop new facility, program and service provision standards and guidelines or to adopt those presently used in those parts of the country that already experience the projected new climatic and other weather conditions eg: Bushfire Attack Levels (BAL), cyclones
- 5.3 Do not use coastal areas and floodplains which are projected to be, or are already subject to, erosion, storms, rising sea levels and/or inundation unless the assets developed are unlikely to be damaged by these events. If these areas *have* to be used, relocate all support buildings and all optionally-located infrastructure away from impact areas and use flood/erosion resistant materials wherever possible
- 5.4 Do not drain, clear, fill/raise ground levels of low-lying or wetland areas to permit their use for leisure and recreation purposes. Wherever possible, re-purpose or reassign these areas for use as wetlands, reforestation/revegetation, floodwater holding/overflow basins and similar purposes. As part of use reassignment, remove river/ drainage channel and coastal embankments. Use these areas for informal/casual leisure and recreation pursuits including planting/ conservation activities, birdwatching, walking, education
- 5.5 Develop new or expand existing leisure and recreation pursuits and opportunities that will not be impacted by climate change, together with appropriate participation rules and guidelines for these
- 5.6 Move leisure and recreation activities to indoor venues wherever possible to avoid changed climate and weather conditions and extremes, to achieve higher use levels, more diverse uses (including non-leisure and recreation activities) and to reduce the area of land needed for leisure and recreation provision
- 5.7 Reduce travel to leisure and recreation venues and activities and the energy use associated with this by developing more effective hierarchies of provision on a multi-organisation local, district and regional basis. This will mean that while many activities will still be able to be pursued at some skill level locally, higher order provision and duplication is avoided
- 5.8 Evaluate the capacity to reschedule competitions to fortnightly, monthly or less frequent round-robin, multi-team events rather than weekly competitions as a means of reducing/containing demands while still providing opportunities for participation
- 5.9 Only support the provision of co-located and multi-use venues. Do not support provision of facilities that can only support one dominant use activity. In this context, review the provision of 9, 12 and 18 hole golf courses and develop regional networks and hierarchies of courses. Wherever appropriate, reduce 18 hole courses to 9 or 12 holes and the number of sports fields and reallocate the remaining land to other greenhouse gas mitigation purposes and low impact leisure and recreation uses ⁶
- 5.10 Discontinue provision of or support for leisure and recreation pursuits that require high energy inputs if they cannot readily access a sufficient and equitable supply of renewable energy sources eg: ice skating
- 5.11 Pursue co-location of leisure and recreation facilities, programs and services in order to reduce duplication of and encourage sharing of roads, parking, water, power, sewerage, security, management, staffing and support facilities etc; to optimise management of climate change related issues eg: solar collection and battery storage, rainfall/waste water

⁶ There has been a dramatic drop in participation rates in most formal sports over recent decades which, together with the ageing of the population, suggests that the level of supply of formal outdoor sports needed in the past may not be needed in future. The conversion of playing fields and similar facilities to synthetics will further reduce demands. See Andrew Leigh and Nick Terrell, 2020. *Reconnected: A community builder's handbook*, La Trobe University Press, Carlton, pp. 29-35

management, land requirements, fire management and venue viability, and to counter less efficient and effective duplication

5.12 Assume responsibility for leisure and recreation provision levels and use allocations (rather than responding to the demands of individual sports and recreation pursuits) and assess whether provision has reached “peak sport” ie: a sufficient level of provision to equitably meet community expectations. In light of this assessment, decide whether further provision for some activities is justified to achieve an equitable supply and balance of opportunities. The assessment should be made in the context of the earlier recommendations re achieving higher use rates, reduced duplication, use of synthetics and reorganisation of competition times and duration, and

5.13 Acquire/retain open space or undeveloped land rather than allowing it to be developed for uses that could exacerbate climate change and its impacts. Manage this land for climate change abatement and appropriate leisure and recreational purposes. A linked initiative could entail the creation of green corridors aligned to prevailing winds through new and existing residential and rural areas with these to play a role in flushing heat and providing cycling and walking opportunities.

Step 6. Evaluate the performance and success of the actions that are taken

Purpose:

This step is designed to measure and evaluate the success of the leisure and recreation planning and provision strategies that are implemented to mitigate, adapt to and avoid the impacts of climate change.

Rationale:

Unless the actions undertaken to mitigate, adapt to or avoid the impacts of climate change can be measured and assessed, there is no way to determine whether they are appropriate or have been effective. Overall, the leisure and recreation industry has a poor record of assessing the value of what it provides, leisure all too often being seen as a positive good which will naturally be beneficial in whatever form it takes. Most frequently, measures of achievement are expressed in terms of the scale of the *inputs* of capital assets, staffing and program numbers, with these are matched by *outputs* data on the incomes generated, and on the daily, weekly, seasonal and annual attendance figures. Yet such data are essentially no more than an indication of the “effort” put in to make the provision and of the *efficiency* of the inputs. This efficiency is measured by outputs such as costs and incomes per square metre, per program and grouped and total attendance numbers. However, they are not measures of the immediate, medium term and long *outcomes* of the expenditures, staffing, programs and effort. And most importantly, they are not measures of what leisure and recreation provision is made for, these being the social, cultural, health, wellbeing and economic benefits which a community, not just participants, as a whole can gain from provision and participation.

In this context, actions taken by leisure and recreation planners and providers to mitigate, adapt to and avoid climate change and its impacts need to be reviewed and evaluated in terms of each of the inputs made (and the climate change costs of them), the outputs of those initiatives and the short, medium and long term outcomes of the actions. A failure to undertake this important step in the planning and provision process is likely to lead to wasted and/or inappropriate actions, wasted expenditures, accidental exacerbation of climate change processes, and maladaptation, all of which can have serious negative consequences.

Actions:

- 6.1 For each initiative recommended in Steps 1-5, work in association with sport and recreation providers, the community, other agencies and other/nearby Councils to develop techniques/tools and statements that measure:
- the *inputs* used to initiate the action. Inputs include, for example, the physical facilities and land used /managed/ protected; staffing/management numbers, skill levels and capacities; equipment; expendables, and planning, legal and legislative processes and approvals. Measures may be in dollars, energy and other resource requirements, numbers of people, time requirements or a combination of these and other parameters
 - the *outputs* of the program of action in terms of for example, the number of leisure and recreation venues converted from fossil to renewable fuels per year/program time unit; the extent of and the specific programming schedules that are changed and the number/percent of people impacted/protected; the number, types and locations of trees planted; the number and types of actions taken to retrofit leisure and recreation venues; the amount and types of land that have been converted /recovered/ acquired for reallocation to mitigation and adaption initiatives, and if possible, the immediate and longer term projected greenhouse gas emission reductions, and
 - the *outcomes* of the initiatives. Outcomes should be measured in terms of the short (say, 1-3 years), medium (4-8 years) and long term (9 years plus) beneficial outcomes. Disbenefits (ie: negative outcomes) should also be measured in order to provide an indication of the *net* beneficial outcomes. Negative outcomes could include the loss of playing fields in declared flood zones and the additional costs of tree care and maintenance

Short term benefits could include reduced negative health impacts on leisure and recreation participants and reductions in program cancellations. Medium term beneficial outcomes might include the reduction of flooding and storm losses, reductions in travel expenditure and times and reallocation of facilities and land to other more effective climate change mitigation uses. Some of the long term benefits could include a reduction in the maintenance costs of playing fields, increased community leisure engagement at the local level, and most importantly, measurable, sustainable reductions in or elimination of the use of fossil fuels and greenhouse gas emissions.

Potential disbenefits which might emerge and require programmatic, facilities and marketing responses could include a reduction in the array of leisure and recreation opportunities available and the impacts of shorter activity and

competition seasons and reduced outdoor activity hours. Where disbenefits are seen to be substantial, strategies for alleviating the impacts should be devised, assessed and if practical, implemented

6.2 Develop tools and techniques to measure and evaluate the health and wellbeing of the community via:

- (a) longitudinal studies to assess levels before and after the initiatives proposed in steps 1-5 or the use of regional, state and national studies
- (b) an assessment of the health and wellbeing of leisure and recreation participants who pursue differing mixes and levels of engagement by comparison with non-participant community members.

Use the findings of the analyses in (a) and (b) to review and as deemed appropriate, revise the climate and weather change mitigation, adaption and avoidance strategies that have been developed and implemented

6.3 Publish and promote the findings of 6.1 and 6.2 and use these to review, revise and update the goals and objectives developed in Step 1 and the subsequent mix of initiatives developed in Steps 2-5, and

6.4 Share the evaluation findings of this Step with the wider community and other/nearby Councils and agencies as a means of alerting them to what have been effective and less effective actions.

Conclusion

This paper has sought to highlight the findings of a number of critical international and Australian research reports into climate and weather change, the emerging catastrophes these are bringing to human activity and wellbeing and to the survival of earth and its ecosystems. The paper has sought to highlight the urgency of action that is needed and to highlight the significant contribution that leisure and recreation planners and providers must make to that action. The report has found that at present, the level of engagement by local government authorities in the battle against climate change is highly variable and that a great deal more needs to be and can be done, especially in the areas of leisure and recreation planning and provision. The paper has provided a framework for help guide this action. *The framework should be seen as a draft and readers are invited to review, refined, added to and share it. Feedback to the author is welcome.* Taking action on the steps recommended in the framework will mean that not only will global mitigation issues start to be more effectively addressed by the leisure and recreation industry, but so will local issues along with strategies for adapting to and avoiding the impacts that continue to emerge on a daily basis.

Appendix 1: A summary of issues, impacts and strategies identified in *Game, Set, Match: Calling Time on Climate Inaction*, (Climate Council of Australia, 2021)

Impacts/Issues	Example Sports Impacted	Mitigation	Adaption
Continuing greenhouse gas emissions; climate change	All; as per specific examples below plus negative mental health impacts across the community; reduced community togetherness, social interaction & inclusion; reduced economic benefits due to reduced event viability; building/asset damage; higher maintenance & operational costs; lost state & regional revenue due to flooding, coastal erosion, heat cancellations, disruption, insurance costs	<p>Power sports facilities with renewables & storage; use off-grid power networks</p> <p>Establish targets, & eventually, net zero targets & strategies to reduce emissions; implement emission offsetting strategies</p> <p>Encourage active & (preferably free) public transport to venues/ activities; bike hire; cycleways</p> <p>Provide electric vehicle charging</p> <p>Adopt carbon neutral strategies</p> <p>Seek renewable & climate-friendly sponsor-ships; ban fossil fuel sponsorships</p> <p>Demonstrate & call for strong action on climate change</p> <p>Support sports groups promoting climate awareness & action</p> <p>Use national & international sporting bodies & associations to make calls for action, provide resources, encourage action, modify operations</p> <p>Encourage sporting organisations to sign up to the UN Sports for Climate Change Framework</p> <p>Run climate neutral events</p> <p>Pursue initiatives to reduce water, energy & materials use</p>	Change the scheduling of matches & events; plan events in keeping with climate change and weather extremes; specify participation codes in face of weather extremes
c	<p>Tennis: heat exhaustion, dizziness, hospitalisation of players; ambulance treatment of audience</p> <p>Cycling: damage to road courses; reduced spectator crowds</p> <p>Football/soccer: s</p>	<p>Development of weather & heat policies by many sports; review of clothing & equipment to increase cooling; sports medicine reviews & revisions</p> <p>Changes/reductions of race stages; cancellation of associated events; greater presence of doctors</p> <p>Postponement & rescheduling of matches; cancellation of trial games; moving trails to evening start times</p>	Suspension of all play & individual matches

Impacts/Issues	Example Sports Impacted	Mitigation	Adaption
Temperature increases & increased intensity & frequency of heatwaves (cont)	Cricket: hospitalisation of players Triathlon: heat exposure Lake & river water sports: increase in toxic blue-green algae blooms Snow skiing: reduced snow cover & season length	Cancellation of matches Involvement of paramedics	
Bushfires: earlier starts & longer seasons; increased number of very high fire danger days; smoke inhalation	Tennis: smoke inhalation, breathing; abandoned events/relocated Cricket: matches abandoned AFL: changed training plans, indoor training Football/Soccer: matches abandoned		
Drought: impacts on rainfall totals, seasonality, runoff, soil moisture, human physical & mental health	Outdoor sports: player injuries, damaging/difficult ground maintenance; increased water & energy use; higher insurance premiums due to injuries Community sport: less time from essential work tasks by rural workers for sports involvement; abandonment of participation, significant increase in injuries; reduced or delayed competition seasons & pre-season training due to ground closures from hard grounds, water restrictions & costs, poor turf conditions		
Intense rainfall: more intense rainfall events, increased magnitude of daily falls & hourly events	Community & professional sport: flooding of venues; turf & facilities damage; abandoned games		
Rising sea levels, more intense storms, swells, sub-surface conditions, winds	Surfing: greater wave power; greater incidence of larger waves & wave height; stronger winds; changing coastlines, sub-surface conditions/ characteristics & wave form, direction, angle & swell patterns; loss of some surfing locations through erosion; less healthy oceans & community support capacities		

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