An environmental, social and economic exploration of climate change impacts on Australian freshwater tourism: a rapid review of the literature

Heather Downey, Hannah Barbour, Joanne Adams and Evelien Spelten

Abstract

Purpose – *The impact of climate change on Australian freshwater ecosystems has been clearly acknowledged, yet little is known about how climate change affects Australian freshwater tourism. This rapid review of the literature aimed to explore this pressing issue using lenses of environmental, social and economic justice.*

Design/methodology/approach – *A systematic search of electronic databases and available grey literature was completed in February 2023. Database searching identified 417 records. After removal of 36 duplicates, 381 records were screened, with 336 articles excluded. Another four publications were identified through hand-searching and a final review of 20 publications was completed in May 2023.*

Findings – *Very few publications examined climate change impacts on Australian freshwater tourism, and there was a paucity of Indigenous-led research despite increased recognition of Indigenous water rights. Publications observing freshwater tourism's vulner ability to climate change, particularly in the Murray Darling Basin, emphasised inaction and communities' unpreparedness despite long-term acknowledgment of this issue.*

Originality/value – *This is the first review of literature that addresses climate change and Australian freshwater tourism. Research that centres Indigenous cultural knowledge of Country and is codesigned with rural communities is required to understand and respond to the urgency of climate change impacts on freshwater ecosystems and communities.*

Keywords *Climate change, Economic justice, Environmental justice, Freshwater tourism, Social justice*

Paper type *Research paper*

Heather Downey, Hannah Barbour, Joanne Adams and Evelien Spelten are all based at the La Trobe Rural Health School, La Trobe University, Albury-Wodonga and Bendigo, Australia.

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Introduction

Australia is the world's driest inhabited continent, with between 55% and 75% of the country categorised as arid or semiarid regions (Zaman *et al.*, 2012). Large rivers and permanent lakes comprise less than one percent of Australia's total land mass (CIA, 2023). In this dry, diverse and expansive nation, freshwater features, namely lakes, rivers and dams, provide tourism opportunities, both directly, through activities including swimming, boating, fishing, rafting and water skiing, and indirectly, through non-aquatic pursuits such as bird watching, hiking and camping, and accommodation and hospitality (Downey *et al.*, 2022, 2023, 2024).

In Australia, total tourism spending contributes approximately 3% of Australia's GDP (Productivity Commission, 2015). Recent data suggest that freshwater tourism, or the business of providing accommodation, food and activities for tourists in and around lakes and rivers that contain little salt, in contrast to the sea (Dictionary of Leisure, Travel and Tourism, 2011) in regional and remote

Australia has grown progressively (Aither, 2022) and is economically significant. For example, in Australia's largest river system, the Murray Darling Basin (MDB), tourism contributes as much to the economy as irrigated agriculture, approximately $7.5bn annually, including overnight stays (MDBA, 2018). Freshwater tourism generates income for local people and businesses and attracts and retains community residents (Wheeler *et al.*, 2023). In remote areas where Indigenous Australians comprise 45% of the total population, an estimated 12,000 to 16,000 people own ecotourism businesses (Akbar and Hallak, 2019), accounting for nearly 25% of these regions' economic output (Tourism Research Australia, 2011).

However, Cheer *et al.* (2021) point out that unprecedented climate change is the most impactful crisis now and in the future. In Australia, global warming, characterised by climate variability and extremes, has caused a series of environmental disasters, including prolonged drought, bushfire and unprecedented flooding (Colloff *et al.*, 2016; Cox, 2022), that raise environmental, social and economic justice issues (Cheer *et al.*, 2021; Australian Academy of Science, 2022). The extreme and often unpredictable nature of climate patterns have issued dire consequences for Australian freshwater tourism and communities' social and economic wellbeing (Downey *et al.*, 2024). Critically, future projections suggest a future with far less water (Bureau of Meteorology, 2020; MDBA, 2024; World Meterological Organization, 2023).

Advancing understanding of the impacts of climate change on sustainable economic activities, such as Australian freshwater tourism, addresses the aims of the United Nations' Sustainable Development Goals (SDGs), including mandates for "Clean Water and Sanitation" (SDG 6) and "Climate Action" (SDG 13) ("The 17 Goals"). Importantly, understanding the relationship between freshwater and tourism responds to the need for "concrete, integrated, and targeted policies and actions to eradicate poverty, reduce inequality, and end the war on nature" (UN, 2023a, p. 5).

Freshwater has long been recognised as one of the most critical and scarce natural resources for the tourism industry (World Tourism Organization, 2003). However, the direct effects of a changing climate, particularly an increasingly water-constrained environment (Lehmann, 2010), on Australian freshwater tourism remain understudied (Downey *et al.*, 2022; Turton *et al.*, 2010; Wheeler *et al.*, 2023).

Our interest lies in how climate change has impacted Australian freshwater tourism, including in Indigenous communities disenfranchised from their sovereign lands and waters by colonist policies (Australian Academy of Science, 2022). Our review examines this topic comprehensively and incorporates a critical perspective on the environmental, social and economic consequences of Australia's changing climate. By addressing the question, "How is Australian freshwater-based tourism affected by climate change?" we aim to amplify the voices of those involved in the tourism sector, which to date have been rarely heard, and to provide valuable knowledge as we contemplate a future with more intense weather events and less water.

Methods

Systematic literature search

This article presents a rapid review of the literature, an approach to literature synthesis that streamlines the systematic review process by selectively modifying certain steps and constraining the review's scope while still aiming to produce information, albeit in a short time frame (Khangura *et al.*, 2012). Despite the well documented value of the rapid review approach for decision-makers and others requiring time-sensitive information (Tricco *et al.*, 2015, 2017), rapid reviews have been critiqued for their potential for bias and inconsistency that may yield poor quality results (Hartling *et al.*, 2015; Tricco *et al.*, 2015). To avoid such an outcome, we followed Khangura *et al.*'s (2012) framework that consists of five stages: (1) developing and refining the research question; (2) systematic literature search; (3) screening and selecting relevant studies; (4) narrative synthesis and (5) producing this review. The rapid reviewing methodology is now widely applied to examine the impacts of climate change in various fields, such as health and social care,

particularly future workforce issues (Spanos *et al.*, 2024; Tsakonas *et al.*, 2024), and implications for various cohorts such as perinatal families (Jones *et al.*, 2024) and members of the queer community (Kilpatrick *et al.*, 2024). However, its adoption within the tourism sector is a relatively recent development (see for example, Sharma *et al.*, 2021). Tricco (2017) argues for the use of rapid reviews as a means to deliver timely evidence, enabling policymakers to effectively address emergencies. Given the significant threat posed by urgent and unpredictable climate change to the tourism industry, conducting a rapid review of the existing literature is an appropriate approach.

The overarching review question was: How is Australian freshwater tourism affected by climate change? To ensure the retrieval of relevant evidence, we engaged an experienced university librarian to support the development of search terms. The search was performed by May 2023 on the Web of Science Core Collection, Informit and Hospitality and Tourism Complete databases and the platform ProQuest Sociology Collection, which searched the Sociological Abstracts, Sociology and Applied Social Sciences Index and Abstracts databases. Searches employed varied combinations of keywords, including (1) "Visit* Econom*", Tour*, "Indigenous* tour*" and "Eco-tour*"; (2) river*, lake* and freshwater; (3) "Climate change", "Climate extrem*" and "Global warm*" and (4) Australia (Appendix). Given the catastrophic impacts of Australia's millennium drought that commenced in 1997 and climate events that have since followed, we identified all relevant English language publications with full-text availability, from the years 1997–2023.

Results

The search resulted in 417 records that met the inclusion criteria: keywords appearing in the title or abstract fields (see Figure 1). We exported these records to Covidence (Veritas Health Innovation, 2018), a web-based software platform designed to manage the systematic review process, including support of the screening process. With duplicated data removed (36), two reviewers, HD and JA, then independently screened titles, and abstracts of the remaining 381 papers. Three hundred and thirty-six papers were excluded using criteria presented in Table 1. The second screening process, conducted by reviewers HD, JA and ES, consisted of independent full-text reading of 45 papers. After applying the inclusion and exclusion criteria that resulted in the exclusion of a further 29 papers, we reached a consensus to keep 15 empirical papers and one book chapter for analysis. A hand search identified two additional empirical papers and two reports.

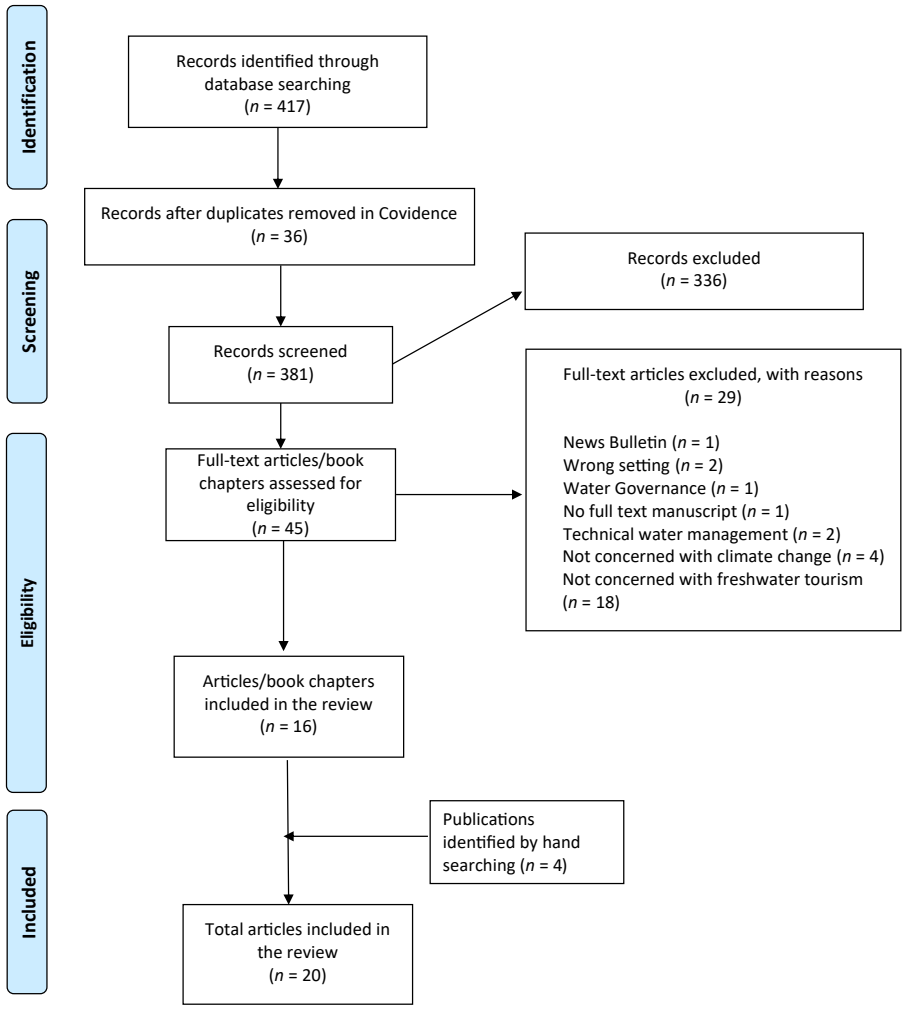
When reviewing full texts, reviewers also reached consensus that gathered data related to justice, specifically environmental, social and economic justice in the context of climate change impacts on freshwater tourism. Consequently, we chose to categorise results using these lenses (Table 2) We used the literature to define key terms, environmental, social and economic justice (Table 3). While recognising that environmental, social and economic injustice may occur simultaneously, this review presents and analyses each dimension separately.

Environmental justice

All 20 publications discussed environmental justice issues (Colloff *et al.*, 2016; Crase and Gillespie, 2008; Dawson, 2002; Gössling *et al.*, 2012; Hadwen *et al.*, 2012; Koehn, 2022; Lehmann, 2010; McCarthy *et al.*, 2014; Onagi *et al.*, 2016; Pyke *et al.*, 2018; van Dijk *et al.*, 2013; Howard, 2008; Willson *et al.*, 2021; Wheeler *et al.*, 2023; Bowman *et al.*, 2022; Turton *et al.*, 2010; Waters *et al.*, 2010; Jackson *et al.*, 2008; Wall, 2011; Dja Dja Wurrung Clans Aboriginal Corporation, 2014). Three themes emerged from the literature: the relationship between freshwater and tourism, the direct effects of a changing climate on freshwater tourism and government policy responses to water scarcity.

Sixteen publications firmly established the indirect and direct relationships between healthy freshwater systems and tourism (Colloff *et al.*, 2016; Crase and Gillespie, 2008; Gössling *et al.*,

Figure 1 PRISMA flow diagram



Source(s): Authors' own work

Table 1 Exclusion criteria

Inclusion criteria	*Exclusion criteria*
-Peer-reviewed scholarly articles -Books, Book chapters, Grey Literature -English language –1997–2023 -Australian	-scientific, e.g. about fish or microbes -saltwater -agriculture/farming

Source(s): Authors' own work

2012; Hadwen *et al.*, 2012; Koehn, 2022; Lehmann, 2010; Pyke *et al.*, 2018; Willson *et al.*, 2021; Howard, 2008; Wheeler *et al.*, 2023; Bowman *et al.*, 2022; Turton *et al.*, 2010; Waters *et al.*, 2010; McCarthy *et al.*, 2014; Dawson, 2002; Dja Dja Wurrung Clans Aboriginal Corporation, 2014). First, ensuring reliable access to freshwater enables the promotion and marketing of tourism

Table 2 Definition of key terms

Terms	*Definition*
Environmental justice	Manifests as pollution, natural disasters and environmental degradation that disproportionately impact marginalised communities. Principles include awareness of the consequences of climate change and ensuring everyone can participate in environmental decision-making advocacy aimed at safeguarding current and future generations' rights to safe and healthy environments
Social justice	Understands injustice occurs within national socio-political and cultural contexts. Social justice requires a societal-level approach to mitigating inequality, including ensuring access to opportunities, promoting equity, upholding fundamental rights and encouraging active participation within the community
Economic justice	Aims to address structural discrimination, specifically social and economic policies, and practices that further disadvantage marginalised people. The ultimate goal is to ensure access to meaningful work, adequate income and financial knowledge capability, and create equality of assets and wealth

Source(s): Adapted from Benner *et al.* (2021). Authors' own work

products, including golf, bushwalking, hunting, camping, birdwatching, health and wellbeing and food and wine (Lehmann, 2010; Gössling *et al.*, 2012; Hadwen *et al.*, 2012; Howard, 2008; Pyke *et al.*, 2018; Turton *et al.*, 2010), wildlife tourism (Willson *et al.*, 2021) and Indigenous cultural tourism (Dja Dja Wurrung Clans Aboriginal Corporation, 2014). Second, four publications emphasised freshwater bodies as significant drawcards for tourists, particularly in those regional and rural areas that hosted major events such as waterski racing (Howard, 2008; Waters *et al.*, 2010; Lehmann, 2010; Crase and Gillespie, 2008), and rowing regattas (Waters *et al.*, 2010; Lehmann, 2010). Finally, seven publications noted the appeal of inland waterbodies that enable recreational activities such as swimming, boating, fishing and whitewater rafting (Dawson, 2002; Koehn, 2022; McCarthy *et al.*, 2014; Howard, 2008; Wheeler *et al.*, 2023; Colloff *et al.*, 2016; Bowman *et al.*, 2022). At the same time, 12 publications across a wide date range observed catastrophic and incremental climate events such as floods, risks associated with rising temperatures and drought impacts on environmental features and tourism. Impacts of flooding on Australia's southeast states were diverse (Dawson, 2002; McCarthy *et al.*, 2014; Pyke *et al.*, 2018; van Dijk *et al.*, 2013; Koehn, 2022). Pyke *et al.* (2018) noted flood-related landslides and road closures over several months in Harrietville, Victoria. In Harrietville and the Richmond and Murray Rivers of NSW, significant rainfall over a short period resulted in hypoxic blackwater events where reduced oxygen levels caused large-scale fish and endangered species, such as crayfish and platypus, mortality that further impacted water quality (Koehn, 2022; Dawson, 2002; McCarthy *et al.*, 2014; Pyke *et al.*, 2018; van Dijk *et al.*, 2013) and recreational fishing tourism activities (Dawson, 2002; McCarthy *et al.*, 2014).

Four publications addressed the precarity of the summer season including how extreme heat and the risk and outcomes of fire events have deterred visitors (Pyke *et al.*, 2018; Willson *et al.*, 2021; Bowman *et al.*, 2022; Waters *et al.*, 2010). Heat waves and associated plagues of gnats and the fine dust from dry lakebeds that rose on windy days have resulted in heightened health risks for communities and visitors (Pyke *et al.*, 2018; Waters *et al.*, 2010). Localised fire risk in the Tasmanian wilderness resulted in parks and river closure (Bowman *et al.*, 2022), while in Harrietville, a small community with nature-based attractions including rivers, 37,000 hectares of bushland burned over two months in 2013 (Pyke *et al.*, 2018). Critically, Willson *et al.'s.* (2021) findings suggest that bushfires are increasing in intensity, with the 2019–2020 Australian bushfires burning more than 18 million hectares in southeastern states. Over a billion animals died, and a further 3 billion were impacted by injury and habitat loss. Ramifications of these fire events include reputational damage to place and Australia's vibrant wildlife tourism industry.

Table 3 Articles analysed in this review that addressed environmental, social and economic justice ramifications of climate change for Australian freshwater tourism

Author (Year)	*Objective*	*Dimensions of justice addressed*
Bowman *et al.* (2022)	To analyse river flows in the Tasmanian Wilderness World Heritage Area and their impact on whitewater rafting operations	Environmental
Colloff *et al.* (2016)	To examine adaptation services, or ecosystem processes and services that enhance people's capacity to adapt to change, for MDB floodplains and wetlands	Environmental Social Economic
Crase and Gillespie (2008)	To report estimations of the recreational worth attributed by visitors to Lake Hume across varying water quality and water level circumstances	Environmental Social Economic
Dawson (2002)	To examine the issues surrounding fish kill events in the Richmond River, New South Wales (NSW), and ways likelihood of similar events may be reduced in the future.	Environmental Social
Dja Dja Wurrung Clans Aboriginal Corporation (2014)	To affirm Dja Dja Wurrung Traditional Owners' aspirations, emphasising cultural heritage, including landscapes, language and customs and outline community's pathway for rebuilding and prosperity	Environmental Social Economic
Gössling *et al.* (2012)	To evaluate the existing water requirements of the tourism industry and pinpoint present and future management hurdles	Environmental Social
Hadwen *et al.* (2012)	To examine relationships between aquatic systems and recreation and tourism in inland Australia	Environmental Social Economic
Howard (2008)	To show that in the context of environmental flows to the Murray River, amenity, environmental and agricultural considerations are equally important	Environmental Social Economic
Jackson *et al.* (2008)	To examine the evolving significance of tropical rivers in Australia	Environmental Social Economic
Koehn (2022)	To review notable fish-kill events in the southern Murray–Darling River system and produce recommendations for future assessments, reporting and management.	Environmental Social Economic
Lehmann (2010)	To better understand the implications of an increasingly water constrained environment on tourism in the regional community of Dimboola	Environmental Social Economic
McCarthy *et al.* (2014)	To analyse the consequences of blackwater events on Murray crayfish populations within the Murray River	Environmental
Onagi *et al.* (2016)	To analyse an integrated approach to management of MDB waters	Environmental Economic
Pyke *et al.* (2018)	To investigate impacts of bushfire on Harrietville's visitor economy	Environmental Social
Turton *et al.* (2010)	To investigate anticipated climate change effects on the Australian tourism industry	Environmental Social Economic
van Dijk *et al.* (2013)	To isolate and measure the human-caused and natural factors contributing to the Millennium Drought and its consequences, aiming for enhanced strategies for future drought management	Environmental Social Economic
Wall (2011)	To investigate specific water saving options for sites in the northern MDB	Environmental Economic
Waters *et al.* (2010)	To examine meanings of the loss of Lake Boga for the tourism industry, and resident and visitor identity	Environmental Social Economic
Wheeler *et al.* (2023)	To examine the economic impact of projected climate changes, declining river flows and increasing salinity on recreation, fishing, and tourism in the MDB	Environmental Social Economic
Willson *et al.* (2021)	To explore the themes and sentiments in Twitter discussions regarding the 2019–2020 Australian bushfires and the devastating impact on wildlife	Environmental Social

Source(s): Authors' own work

Low flows during the Millenium drought, described as "the worst drought on record for southeast Australia" (van Dijk *et al.*, 2013, p. 1040) was a consistent theme (Bowman *et al.*, 2022; Crase and Gillespie, 2008; Hadwen *et al.*, 2012; Koehn, 2022; Lehmann, 2010; van Dijk *et al.*, 2013; Wall, 2011; Waters *et al.*, 2010). Water scarcity during this period impacted the scheduling of activities such as whitewater rafting (Hadwen *et al.*, 2012) while the increased presence of blue-green algal blooms caused public health concerns, with associated reduced visitation rates to rivers, lakes and dams (Hadwen *et al.*, 2012; Crase and Gillespie, 2008). In some cases, low flows further impacted visitation rates as increased toxicity in waterways threatened ecology (van Dijk *et al.*, 2013), particularly the habitats of many native fish and water birds (Wall, 2011), and riparian red gum forests (Lehmann, 2010), that draw visitors to freshwater ecosystems. Water scarcity during the Millenium drought also resulted in Victorian waterscapes, Lake Boga and the Wimmera River, running dry. The associated stench of rotting fish and cessation of tourism events such as rowing regattas kept visitors away (Lehmann, 2010; Waters *et al.*, 2010).

Eleven publications addressed future climate scenarios and the ramifications for waterscapes and tourism. Climate projections are for a hotter, more arid future with reduced annual rainfall in most Australian states (Bowman *et al.*, 2022; Colloff *et al.*, 2016; Hadwen *et al.*, 2012; Turton *et al.*, 2010; van Dijk *et al.*, 2013). Bowman *et al.* (2022) and Pyke *et al.* (2018) highlight that such change will issue increased fire danger and extended fire seasons. Critically, Australia faces a future with less water (Lehmann, 2010; Onagi *et al.*, 2016), which will impact flow seasonality (Colloff *et al.*, 2016; Gössling *et al.*, 2012; Onagi *et al.*, 2016; Bowman *et al.*, 2022; McCarthy *et al.*, 2014). As a result, unprecedented changes to floodplain and wetland ecosystems (Colloff *et al.*, 2016) and increased hypoxic blackwater events (McCarthy *et al.*, 2014), particularly in the southeastern states, are expected. This scenario raises an interesting tension. On the one hand, dry conditions will issue increasing demand for recreational water pursuits, particularly in inland Australia (Gössling *et al.*, 2012; Hadwen *et al.*, 2012). However, tourism in affected areas is predicted to become unsustainable due to less water availability, seasonal aspects, for example, a shortened period for whitewater recreation in Tasmania's Franklin River (Bowman *et al.*, 2022), competing demand for water resources, the transformation of wetlands to drylands and reduced riparian woodlands and forest areas (Colloff *et al.*, 2016; Gössling *et al.*, 2012).

Policy responses to reduced water availability have included the National Water Initiative (2004), which embraced Indigenous environmental knowledge established through connection to and care of land and waterscapes over millennia, in water planning for the first time (Jackson *et al.*, 2008). Also Water for the Future (2009), a ten-year agreement between the Australian, State and Territory Governments (Jackson *et al.*, 2008) that aimed to secure water supplies through climate change adaptation measures such as recycling and desalination plants. Turton *et al.* (2010 p. 437) and Wall (2011) also highlight the introduction of a range of water-saving measures along "the 'green,' 'clean', and 'sustainability' lines", including improved river operations and farm water use efficiency. The Water Act 2007 is the legislative framework for the Murray Darling Basin Plan, a strategy that aims to return the MDB river system to health through sustainable and integrated management (Jackson *et al.*, 2008; Onagi *et al.*, 2016; Wall, 2011) including buyback of 2,750 GL from irrigators for environmental purposes (Onagi *et al.*, 2016). Such affirmation of environmental water needs in Australian water policy challenges deeply held views that "waters are underutilised, if not wasted, as large rivers run from source to sea" (Jackson *et al.*, 2008, p. 284) and has resulted in fierce opposition, particularly from the irrigated agriculture industry (Onagi *et al.*, 2016). Specifically, MDB irrigation communities' sustained protests resulted in the redrafting of the MDB Plan and reducing the amount of water to be returned to the river system from 4,000 GL to 2,750 GL (Onagi *et al.*, 2016).

The marked absence of similar attention directed toward fire and flood mitigation policies in the publications reviewed here is of critical importance given climate disasters disproportionately affect marginalised communities (Benner *et al.*, 2021), such as those intertwined with freshwater ecosystems in regional Australia and strongly suggests that water scarcity has been viewed as an isolated climate issue. However, some authors argued the need for tourism stakeholders,

including Indigenous groups and leaders, to influence policy regarding sustainable water, land and energy management, fire risk reduction, consideration of amenity values and protection of cultural assets (Gössling *et al.*, 2012; Willson *et al.*, 2021; Howard, 2008). This recommendation may result in a more holistic approach to environmental policy and also suggests the importance of exploring aspects of social justice, particularly the fundamental human right of participation (Benner *et al.*, 2021).

Social justice

Of the 20 publications reviewed here, sixteen raised social justice issues. This body of literature addressed two themes: perceptions of and emotional responses to climate and environmental change, and equity.

Critically, some publications identified the media's powerful influence over public perceptions of environmental conditions in tourism destinations (Gössling *et al.*, 2012; Lehmann, 2010; Pyke *et al.*, 2018; Turton *et al.*, 2010; van Dijk *et al.*, 2013), observing relentless reporting of environmental crises, specifically, reduced flows, scant water availability, poor water quality and toxicity (Gössling *et al.*, 2012; Lehmann, 2010; van Dijk *et al.*, 2013) and fire events (Pyke *et al.*, 2018). The authors argued that such coverage, variously described as misleading and sensationalised (Pyke *et al.*, 2018), damaged popular tourism areas' reputations (Gössling *et al.*, 2012; Turton *et al.*, 2010; van Dijk *et al.*, 2013), decreased visitor numbers and reduced communities' confidence to promote destinations to tourism consumers (Lehmann, 2010). Willson *et al*. (2021) point out the role of emerging discourses, such as those in social media, that provide more accurate reflection of public sentiment concerning environmental events.

A further component was communities' emotional response to the consequences of environmental catastrophes (Pyke *et al.*, 2018; van Dijk *et al.*, 2013; Waters *et al.*, 2010). When Harrietville was ravaged by fire, residents experienced deep feelings of loss when two firefighters were tragically killed (Pyke *et al.*, 2018). Despite this, a few publications reported community and tourism stakeholders' continued uncertainty and scepticism towards climate change science (Turton *et al.*, 2010; Waters *et al.*, 2010), and in one case, residents' complacency about planning and preparing for increased risk of future fire events (Pyke *et al.*, 2018). Such a concerning lack of understanding serves to illustrate the interconnectedness of social and environmental justice, with Benner *et al.* (2021) pointing out the critical social need for awareness of climate change impacts.

Overall, drought-affected communities experienced poor emotional well-being, increased substance use, depression and suicide rates resulting from the combination of a harsh climate and loss of community cohesion and water-based recreational activities (van Dijk *et al.*, 2013). Reduced visitors to drought-affected Lake Boga led to community residents experiencing isolation (Waters *et al.*, 2010). Residents expressed anger towards authorities that was underpinned by perceptions that the lake should have been valued, protected and secured before it dried out. Eleven publications observed how the impacts of rapid environmental change raise issues of equity, which, when viewed from a macro perspective, may be understood as a "whole of society" responsibility (Benner *et al.*, 2021). Critically, increasing competition between the multidimensional values that freshwater aquatic systems have for the Australian population brings the politics and ethics of water management and access to the fore (Gössling *et al.*, 2012). Structural inequalities resulting from the continuing privileging of water for agricultural and mining needs, including its commodification through water markets, manifest as water insecurity for the environment, wildlife, tourism and communities in regional tourism destinations (Gössling *et al.*, 2012; Koehn, 2022; Wheeler *et al.*, 2023; Jackson *et al.*, 2008). Five publications noted freshwater's critical role in sustaining Indigenous cultural values (Colloff *et al.*, 2016; Dja Dja Wurrung Clans Aboriginal Corporation, 2014; Koehn, 2022; Wheeler *et al.*, 2023; Hadwen *et al.*, 2012). Water scarcity that decimated crayfish and fish populations and significant heritage sites located near freshwater sources (Koehn, 2022; Wheeler *et al.*, 2023) undermined Indigenous

cultures. Responses to water security in far northwest NSW, including water-saving initiatives at Menindee lakes, have further marginalised local Indigenous groups and tourism operators who prefer water in the lakes (Colloff *et al.*, 2016). The symbiotic relationship between the health of land and waters and Indigenous people's emotional, social and physical health was exemplified in the observation "when Country is sick we are sick" (Dja Dja Wurrung Clans Aboriginal Corporation, 2014, p.7).

Several publications proposed the benefit of stakeholder consultation and community involvement in environmental disaster preparedness and response, although none provided specific examples of Indigenous Peoples' participation and cultural consultation. Community forums were formed in Lake Boga and Harrietville, Victoria and Lake Hume, NSW, Cairns, Queensland and the Barossa Valley, South Australia and river recovery groups in the Richmond River area, NSW (Crase and Gillespie, 2008; Dawson, 2002; Pyke *et al.*, 2018; Waters *et al.*, 2010; Turton *et al.*, 2010). These community forums, comprised of stakeholders including local fire authorities, community members and groups and tourism operators, contributed to management plans and served as community communication mechanisms for emergency response projects and as conduits between communities and government. In Harrietville, community and tourism stakeholders reflected on the importance of communicating local knowledge as part of bushfire management strategy, as such events have profound environmental and health implications for tourism and recreational activities, including bushwalks, touring routes and freshwater activities (Pyke *et al.*, 2018). A further function of community forums was to lead adaptation and recovery initiatives, for example, a focus on the importance of producing food locally in the tourism destinations, Cairns, and the Barossa Valley (Turton *et al.*, 2010) and alternate tourism events such as Lake Boga's Dry Lake Bed Dinner attended by more than two thousand people (Waters *et al.*, 2010). These initiatives successfully supported the collective identity of communities enmeshed with freshwater tourism (Pyke *et al.*, 2018; Turton *et al.*, 2010). In sum, the inclusion of community voices in diverse preparation and response activities may have the potential to address some forms of social inequity. However, a key tenet of social justice is encouraging active participation within communities (Benner *et al.*, 2021), and the inextricable link between environmental and Indigenous health identified here demands the inclusion of Indigenous voices in community forums.

Economic justice

Not only are lakes, rivers and dams central to the identity of regional towns (Lehmann, 2010; Waters *et al.*, 2010), in many cases they are the economic lifeblood of communities and regions, attracting and retaining residents through better amenity, social and recreational opportunities and critically, providing income for local businesses.

Our search identified fifteen publications that concerned economic justice. Of these, six highlighted the economic value of tourism during usual climate conditions while thirteen observed the impacts of a changing climate on the tourism industry. Most focussed on sites in the MDB where international and domestic tourism pursuits, notably, camping, overnight stays, trekking, birdwatching, boating, skiing and recreational fishing generated AUD$300m and AUD$3bn respectively in 1997 (Howard, 2008). Tourism in the Murray River region alone was estimated at A$1.6bn in total value in 2006, before the impacts of the drought took hold (Howard, 2008), and amenity services such as tourism have now replaced primary production as the economic base of many Murray River towns (Howard, 2008; Wheeler *et al.*, 2023; Colloff *et al.*, 2016). For example, visitations contributed $30.5m per annum in the Coorong, South Australia, site of Ramsar-recognised wetlands, and the Murray Mouth (Wheeler *et al.*, 2023). When water levels are high, lakes also provide considerable economic benefit to regional communities; for example, in 2005, Lake Hume's recreational value was $3m per year (Crase and Gillespie, 2008). A particular point of focus was the significant economic benefit of recreational fishing, a pursuit that is increasing in popularity (Howard, 2008; Koehn, 2022; Wheeler *et al.*, 2023). As a result, economic output is now estimated at $353.81m in inland

NSW alone, "with an associated employment of 1,539 equivalent full-time jobs" (Wheeler *et al.*, 2023, p. 26). Critically, only one publication suggested the potential of freshwater tourism to create new opportunities for developing Indigenous economies (Dja Dja Wurrung Clans Aboriginal Corporation, 2014)

Tourism and agriculture in the MDB contribute equally to the economy in terms of export value, GDP and employment (van Dijk *et al.*, 2013), yet Onagi *et al.* (2016) analysis of the MDB Plan illuminates how the discourse has privileged the economic consequences of drought for the agricultural sector over all other industries. This is curious given others noted the significant economic impact of increased temperatures, reduced rainfall, vastly changed flow regimes and increased salinity on tourism (Crase and Gillespie, 2008; Howard, 2008; Lehmann, 2010; Turton *et al.*, 2010; Wall, 2011; Waters *et al.*, 2010; Wheeler *et al.*, 2023).

The impacts were far-reaching, affecting not only water-based and eco-tour operators (Jackson *et al.*, 2008; Waters *et al.*, 2010), also accommodation services and local businesses, with economic ramifications for communities and regions (Crase and Gillespie, 2008; van Dijk *et al.*, 2013; Waters *et al.*, 2010; Wheeler *et al.*, 2023). Drought reduced visitations along the Murray River alone resulted in a 5% reduction of gross regional product (GRP) in 2008 (van Dijk *et al.*, 2013). Rural communities' economic sustainability was sometimes threatened as lakes, rivers and visitors disappeared. Specifically, communities experienced service, winery and retail closures, cessation of significant tourism events that are important income sources and low motel and caravan park occupancy rates (Lehmann, 2010; Waters *et al.*, 2010). In other locations, drought-related algal blooms reduced tourist visitation and spending by a third (Crase and Gillespie, 2008). Some also noted the impact of such drought-related devastation on local housing and labour markets, specifically declining house prices and loss of full-time, part-time and casual employment opportunities (van Dijk *et al.*, 2013; Waters *et al.*, 2010; Wall, 2011). However, Colloff *et al.* (2016) noted that when faced with declining water flows, some southern MDB communities have transitioned from red gum timber and agricultural production to tourism and recreation which now serve as these communities' economic base. In this context, the continued privileging of agriculture in the water policy discourse strongly suggests economic injustice, specifically, the marginalisation of the tourism industry.

There was little literature that highlighted the economic consequences of flood and fire. Flood-related fish kills resulted in the decimation of recreationally valuable species and tourist opportunities (Hadwen *et al.*, 2012), however, specific economic evaluations of such losses are yet to be undertaken (Koehn, 2022). Harrietville, affected by flood and fire, in 2013, was a unique case study. The town's capacity to generate a nature-based tourism economy was thwarted for at least three months while roads remained closed (Pyke *et al.*, 2018).

Overall, the literature concerning economic justice suggests structural discrimination through policy (Benner *et al.*, 2021); notably the curious absence of freshwater tourism voices in water policy debates. Additionally, two critical gaps in the literature emerged that related to economic policy. First, there was a lack of discussion of policies that respond to economic losses in protracted disaster recovery periods, and second, an absence of attention to increasing insurance costs in the wake of environmental catastrophes. Regional Australians are most affected by climate change, and both these economic issues serve to further disadvantage regional tourism business owners.

Discussion

This rapid review utilised lenses of environmental, social and economic justice to report the impact of climate change on Australian freshwater tourism. In total 20 publications were identified with most focussed on southeastern Australia. Overwhelmingly, results show inextricable links between the dimensions of justice and raise many matters of urgency that have ramifications for tourism in the context of future climate change.

First, the wide date range of publications addressing environmental justice showed that the frequency and intensity of floods, fires, heatwaves and water scarcity have increased over the past 3 decades. These climate crises affect freshwater ecosystems, with specific climate events such as flood-related landslides, bushfires and drought impacting human health, wildlife habitats and tourism visitation rates. The long period of recognition of these climatic-related issues highlights the lack of action to address them. A few publications observed how water scarcity has led to policy responses, such as the Murray Darling Basin Plan with its focus on increasing environmental flows. However, results also suggested that the strength of the irrigated farming industry may be thwarting policy aims of restoring river health, an objective that is key to a thriving freshwater tourism industry. Critically, water scarcity is far more complex than its construction here as an environment/extractive use dichotomy (Howard, 2008). First, tourists require access to fresh water for drinking and sanitation purposes (Gössling *et al.*, 2012). Second, the lack of equal attention in the literature to bushfire and flood policy responses suggests that water scarcity is understood as a discrete environmental issue. This is surprising, given the wide date range of publications that observed the impacts of all climate disasters also suggest cyclical impacts. The increased frequency and intensity of catastrophic fires, for example, strongly suggests that climate extremes are interlinked; fires may be fuelled by vegetation growth after periods of heavy rainfall, such as floods, and access to water is critical to firefighting efforts (Fletcher, 2023), that, in rural Australian communities fall to small local fire services staffed by community volunteers (O'Halloran and Davies, 2020). Further, the lack of further analysis of a key water policy outcome, namely, increased environmental flows, strongly suggests that one important focus of future research may be examination of relationships between improved lake, river and wetland health and tourism rates and expenditure. Additionally, healthy freshwater ecosystems that enable activities including swimming, recreational fishing and Indigenous and wildlife tourism are key to a thriving Australian freshwater tourism industry. Publications that presented projected climate scenarios, particularly a hotter, drier future with reduced water availability served to emphasise the critical need to respond to climate change impacts and to address their root causes.

Second, a social justice lens illuminated key findings that focussed on perceptions of freshwater ecosystems and climate change, and equity concerns particularly in regional areas that are already disadvantaged in terms of socio-economic status, and employment, health and welfare outcomes (AIHW, 2024). However, the absence of nuanced analysis of these issues in the literature raises some notes of concern.

Publications revealed tourists' deep appreciation of Australian freshwater ecosystems yet also highlighted the mainstream media's power to negatively influence public perceptions of environmental conditions and reduce visitations. The literature strongly suggested that rivers, lakes and dams also shape the identity of many regional towns. Yet, some publications pointed to structural inequalities in water management, including the marginalisation of Indigenous peoples, tourism operators and communities. Consequently, it may be empowering for community residents, including tourism business operators, to share local knowledge of climate extremes and impacts and environmental disaster preparedness.

Results concerning scepticism regarding climate change science in some regions (Turton *et al.*, 2010; Waters *et al.*, 2010) have congruence with recent data that indicates that while 77% of the Australian population viewed drought and water shortages as critical threats and 67% expressed similar concerns around bushfires and floods, only 59% identified climate change itself as a significant threat (Kassam, 2020), and suggest a compelling need to develop communities' insight. Climate change is not merely a scientific issue but also a deeply social and political one, shaped by media, political ideologies, cultural values, levels of trust in scientists, community interactions and local narratives (Bevan, 2020; Carvalho, 2010; The interpreter, 2024). Consequently, attitudinal change is a multifaceted task that Carvalho (2010) and The interpreter (2024) argue may be achieved by media providing greater contextual detail about the current state of scientific climate change research, and by leading change from within groups, such as freshwater tourism operators. Further, publications noted communities' long-term

experience of individual and social well-being and community solidarity issues resulting from environmental crises (Pyke *et al.*, 2018; Waters *et al.*, 2010; Dja Dja Wurrung Clans Aboriginal Corporation, 2014; van Dijk *et al.*, 2013). The work of Willson *et al.* (2021) suggests the potential of social media as a medium to unite disparate people through a common cause, express concern and make links between Australian experiences of climate-related devastation and the global climate emergency. Consequently, online spaces may provide alternative avenues for raising awareness of climatology and the provision of targeted and well-considered social and emotional support. WHLM (2024) argues that such support may enable communities to contribute effectively to environmental disaster recovery and response strategies.

Critically, there was a paucity of Indigenous-led or co-designed research among the publications included in this review. Given the cultural importance placed on connection to land, water and environment in Indigenous societies, the inclusion of Indigenous cultural considerations in water policy, the high number of Indigenous ecotourism businesses and the tenacity shown by Indigenous Peoples in the face of ongoing settler-colonialism (Australian Academy of Science, 2022), the curious lack of examples of Indigenous perspectives and experiences suggests that the freshwater tourism discourse may have been colonised. This is despite increased recognition of the importance of ensuring the security of Indigenous rights to water, including for cultural purposes and enterprise developments such as water-based cultural tourism (O'Donnell *et al.*, 2021). Indigenous knowledges have played a critical role in land and water management over millennia, and it is imperative that they are valued accordingly.

Results concerning economic justice showed that freshwater ecosystems serve as the economic backbone of many regional Australian communities by attracting residents and visitors and supporting local businesses. They are also an important national economic generator. The breadth of dates of publications observing the theme of freshwater tourism's vulnerability to climate change, particularly in the Murray Darling Basin, emphasised the lack of effective responses despite long-term acknowledgment of the issue. The impacts extended beyond freshwater-based tourism operators to encompass accommodation services and local businesses, with droughts leading to significant reductions in visitations, and economic downturns that threaten regional communities' sustainability. Curious gaps in the literature included the lack of similar economic analysis of the impacts of floods and fire, and no mention of economic support to businesses and rising insurance costs in the aftermath of climate related disasters. In sum, our rapid review strongly suggests prolonged government disinvestment and disinterest in the climate issues experienced by the Australian freshwater tourism industry, and that globally, governments have failed to respond effectively to the threats posed by climate change.

There are several limitations of this rapid review. The first is the absence of key terms: environmental, social and economic justice from our search. Inclusion of these terms may have yielded further results. Second is the scarcity of publications identified; the time-limited nature of a rapid review suggests that there is a possibility that not all potentially relevant publications were included. A systematic review would permit exhaustive, comprehensive database, hand and grey literature searching. An external review of search terms may have achieved more sophisticated search strategies that included specific terms relating to Indigenous cultural knowledge of Country. Despite this, rigour is demonstrated though our clear documentation of the review process, which is a significant strength of our review.

Conclusion

This rapid review is the first to examine the impacts of climate change on Australian freshwater tourism. Understanding the impacts of Australian climate extremes contributes knowledge that may benefit the future of tourism globally. The implications for the future are sobering and results accentuate the pressing need to confront climate change challenges. Water scarcity is a critical issue and the increasing focus on achieving Indigenous water justice provides a compelling and

interesting overlay that could impact freshwater tourism in many jurisdictions in the future. However, our review highlights a need for further research that centres Indigenous cultural knowledge of Country and is codesigned with Indigenous and non-Indigenous regional communities to better understand and respond to all the urgent climate issues illuminated in our analysis. It is only by considering the environment holistically that effective change may be achieved.

References

AIHW (2024), *Australia's Welfare 2023 Insights Data*, Australian Institute of Health and Welfare, Canberra, CAT no. AUS 246).

Aither (2022), *2022 Murray-Darling Basin Social and Economic Conditions Report*, Canberra, Murray Darling Basin Authority, available at: https://www.mdba.gov.au/publications-and-data/publications/murray-darling-basin-social-and-economic-conditions-report (accessed 28 November 2023).

Akbar, S. and Hallak, R. (2019), "Identifying business practices promoting sustainability in aboriginal tourism enterprises in remote Australia", *Sustainability*, Vol. 11 No. 17, 4589, doi: 10.3390/su11174589.

Australian Academy of Science (2022), *Future Earth Australia*, Australian Academy of Science, Canberra.

Benner, K., Pope, N. and Strawn, E. (2021), "Setting the stage for justice-driven social work practice", in Benner, K., Loeffler, D. and Pope, N. (Eds), *Social, Economic, and Environmental Justice: Building Social Work Practice Skills*, New York, Springer Publishing, pp. 1-13.

Bevan, L.D., Colley, T. Dr. and Workman, M. Dr. (2020), "Climate change strategic narratives in the United Kingdom: emergency, extinction, effectiveness", *Energy Research and Social Science*, Vol. 69, pp. 1-13, doi: 10.1016/j.erss.2020.101580.

Bowman, D., Fernon, B.A., Marte, K. and Williamson, G.J. (2022), "Analysis of seasonal and interannual river flows affecting whitewater rafting on the Franklin River in the Tasmanian wilderness world heritage area", *Journal of Outdoor Recreation and Tourism-Research Planning and Management*, Vol. 37, p. 7, doi: 10.1016/j.jort.2021.100481.

Bureau of Meteorology (2020), "State of the climate 2016", available at: http://www.bom.gov.au/state-of-the-climate/2016/ (accessed 17 November 2020).

Carvalho, A. (2010), "Climate change as 'grand narrative': interview by Filippo Bonaventura", *Journal of Science Communication*, Vol. 9 No. 4, pp. 1-4.

Cheer, J.M., Lapointe, D., Mostafanezhad, M. and Jamal, T. (2021), "Global tourism in crisis: conceptual frameworks for research and practice", *Journal of Tourism Futures*, Vol. 7 No. 3, pp. 278-294, doi: 10.1108/jtf-09-2021-227.

CIA (2023), "The world factbook – Australia", *Central Intelligence Agency*, available at: https://www.cia.gov/the-world-factbook/countries/australia/ (accessed 7 January 2024).

Colloff, M.J., Lavorel, S., Wise, R.M., Dunlop, M., Overton, I.C. and Williams, K.J. (2016), "Adaptation services of floodplains and wetlands under transformational climate change", *Ecological Applications*, Vol. 26 No. 4, pp. 1003-1017, doi: 10.1890/15-0848.

Cox, L. (2022), "With another La Niña under way, experts warn Australia's east coast remains at high risk", *The Guardian Australia*, 25 September, 2022.

Crase, L. and Gillespie, R. (2008), "The impact of water quality and water level on the recreation values of Lake Hume", *Australasian Journal of Environmental Management*, Vol. 15 No. 1, pp. 21-29, doi: 10.1080/14486563.2008.10648727.

Dawson, K. (2002), "Fish kill events and habitat losses of the Richmond River, NSW Australia: an overview", *Journal of Coastal Research*, Vol. 36, pp. 216-221, doi: 10.2112/1551-5036-36.sp1.216.

Dictionary of Leisure, Travel & Tourism (2011), *Dictionary of Leisure, Travel & Tourism*, 3rd ed., Bloomsbury, London.

Dja Dja Wurrung Clans Aboriginal Corporation (2014), *Dhelkunya Dja Dja Dja Wurrung Country Plan 2014-2034*, available at: https://djadjawurrung.com.au/wp-content/uploads/2021/04/Dhelkunya-Dja-Country-Plan-2014-2034.pdf (accessed 10 June 2024).

Downey, H., Green, J. and Spelten, E. (2024), *Climate Shifts: the Impacts on Albury-Wodonga's Freshwater Tourism*, pp. 1-16, doi: 10.26181/25764159.v1.

Downey, H., Spelten, E., Holmes, K., MacDermott, S. and Atkins, P. (2023), "A green social work study of environmental and social justice in an Australian river community", *Social Work Research*, Vol. 47 No. 3, pp. 207-219, doi: 10.1093/swr/svad013.

Downey, H., Spelten, E., Holmes, K. and Van Vuuren, J. (2022), "A rapid review of recreational, cultural, and environmental meanings of water for Australian river communities", *Society & Natural Resources*, Vol. 35 No. 5, pp. 556-574, doi: 10.1080/08941920.2022.2032894.

Fletcher, J. (2023), *Water Supply & Climate Change: the Impact of Water Stress on Fire Protection Systems*, Oklahoma State University, Stillwater, pp. 1-74.

Gössling, S., Peeters, P., Hall, C.M., Ceron, J.-P., Dubois, G., Lehmann, L.V. and Scott, D. (2012), "Tourism and water use: supply, demand, and security. An international review", *Tourism Management*, Vol. 33 No. 1, pp. 1-15, doi: 10.1016/j.tourman.2011.03.015.

Hadwen, W.L., Boon, P.I. and Arthington, A.H. (2012), "Aquatic ecosystems in inland Australia: tourism and recreational significance, ecological impacts and imperatives for management", *Marine and Freshwater Research*, Vol. 63 No. 4, pp. 325-340, doi: 10.1071/MF11198.

Hartling, L., Guise, J., Kato, E., Anderson, J., Belinson, S., Berliner, E., Dryden, D.M., Featherstone, R., Mitchell, M.D., Motu'Apuaka, M., Noorani, H., Paynter, R., Robinson, K.A., Schoelles, K., Umscheid, C.A. and Whitlock, E. (2015), "A taxonomy of rapid reviews links report types and methods to specific decision-making contexts", *Journal of clinical epidemiology*, Vol. 68 No. 12, pp. 1451-1462. e1453, doi: 10.1016/j.jclinepi.2015.05.036.

Howard, J.L. (2008), "The future of the Murray River: amenity Re-considered?", *Geographical Research*, Vol. 46 No. 3, pp. 291-302, doi: 10.1111/j.1745-5871.2008.00524.x.

Jackson, S., Stoeckl, N., Straton, A. and Stanley, O. (2008), "The changing value of Australian tropical rivers", *Geographical Research*, Vol. 46 No. 3, pp. 275-290, doi: 10.1111/j.1745-5871.2008.00523.x.

Jones, A.T., Tremblay, É., Costeux, A., Strus, J.A. and Barcket, A. (2024), "What tools are available to assess climate and environmental health impacts on perinatal families with an equity lens? A rapid review of the Canadian context", *BMC Pregnancy and Childbirth*, Vol. 24 No. 1, 680, doi: 10.1186/s12884-024-06761-z.

Kassam, N. (2020), *Lowy Institute Poll 2020*, Lowy Institute, Sydney, available at: https://poll.lowyinstitute.org/report/2020/climate-change-and-global-warming/ (accessed 13 January 2025).

Khangura, S., Konnyu, K., Cushman, R., Grimshaw, J. and Moher, D. (2012), "Evidence summaries: the evolution of a rapid review approach", *Systematic Reviews*, Vol. 1 No. 1, pp. 1-9, doi: 10.1186/2046-4053-1-10.

Kilpatrick, C., Higgins, K., Atkin, S. and Dahl, S. (2024), "A rapid review of the impacts of climate change on the queer community", *Environmental Justice*, Vol. 17 No. 5, pp. 306-315, doi: 10.1089/env.2023.00.

Koehn, J.D. (2022), "Key steps to improve the assessment, evaluation and management of fish kills: lessons from the Murray-Darling River system, Australia", *Marine and Freshwater Research*, Vol. 73 No. 2, pp. 269-281, doi: 10.1071/mf20375.

Lehmann, L.V. (2010), "And then there was water, the role of freshwater in regional tourism", in *Council for Australian University Tourism and Hospitality Education*, Hobart, Tas, pp. 858-877.

McCarthy, B., Zukowski, S., Whiterod, N., Vilizzi, L., Beesley, L. and King, A. (2014), "Hypoxic blackwater event severely impacts Murray crayfish (*Euastacus armatus*) populations in the Murray River, Australia", *Austral Ecology*, Vol. 39 No. 5, pp. 491-500, doi: 10.1111/aec.12109.

MDBA (2018), *A Healthy Environment Is a Healthy Community*, Canberra: Murray Darling Basin Authority, available at: https://www.mdba.gov.au/news-and-events/newsroom/healthy-environment-healthy-community (accessed: 19 April 2024).

MDBA (2024), *Climate Change*, Murray Darling Basin Authority, Canberra, available at: https://www.mdba.gov.au/climate-and-river-health/climate-change (accessed 19 April 2024).

Onagi, E., Uitto, J.I. and Shaw, R. (2016), "Climate change and integrated approach to water resource management in the Murray-Darling basin", Uitto, J.I. and Shaw, R. (Eds), *Sustainable Development and Disaster Risk Reduction*, Tokyo, Springer-Verlag, pp. 173-187.

O'Donnell, E., Godden, L. and O'Bryan, K. (2021), *Cultural Water for Cultural Economies*, University of Melbourne, available at: https://law.unimelb.edu.au/__data/assets/pdf_file/0008/3628637/Final-Water-REPORT-spreads.pdf (accessed 18 August 2024).

O'Halloran, M. and Davies, A. (2020), "A shared risk: volunteer shortages in Australia's rural bushfire brigades", *Australian Geographer*, Vol. 51 No. 4, pp. 421-435, doi: 10.1080/00049182.2020.1813949.

Productivity Commission (2015), "Australia's international tourism industry", *Canberra: Productivity Commission Research Paper)*, available at: https://www.pc.gov.au/research/completed/international-tourism (accessed 28 November 2023).

Pyke, J., Law, A., Min, J. and de Lacy, T. (2018), "Learning from the locals: the role of stakeholder engagement in building tourism and community resilience", *Journal of Ecotourism*, Vol. 17 No. 3, pp. 206-219, doi: 10.1080/14724049.2018.1505586.

Sharma, G.D., Thomas, A. and Paul, J. (2021), "Reviving tourism industry post-COVID-19: a resilience-based framework", *Tourism Management Perspectives*, Vol. 37, 100786, doi: 10.1016/j.tmp.2020.100786.

Spanos, S., Dammery, G., Pagano, L., Ellis, L.A., Fisher, G., Smith, C.L., Foo, D. and Braithwaite, J. (2024), "Learning health systems on the front lines to strengthen care against future pandemics and climate change: a rapid review", *BMC Health Services Research*, Vol. 24 No. 1, p. 829, doi: 10.1186/s12913-024-11295-3.

The interpreter (2024), *Changing the Narrative of Climate Change*, The Lowy Institute, available at: https://www.lowyinstitute.org/the-interpreter/changing-narrative-climate-change (accessed 21 January 2025).

Tourism Research Australia (2011), *The Economic Importance of Tourism in Australia's Regions*, Tourism Research Australia, Canberra.

Tricco, A.C., Antony, J., Zarin, W., Strifler, L., Ghassemi, M., Ivory, J., Perrier, L., Hutton, B., Moher, D. and Straus, S.E. (2015), "A scoping review of rapid review methods", *BMC Medicine*, Vol. 13, pp. 1-15, doi: 10.1186/s12916-015-0465-6.

Tricco, A.C., Langlois, E.V. and Straus, S.E. (2017), "Rapid reviews to strengthen health policy and systems: a practical guide", available at: https://iris.who.int/bitstream/handle/10665/258698/9789241512763-eng.pdf (accessed 10 January 2025).

Tsakonas, K., Badyal, S., Takaro, T. and Buse, C. (2024), "Rapid review of the impacts of climate change on the health system workforce and implications for action", *The Journal of Climate Change and Health*, doi: 10.1016/j.joclim.2024.100337.

Turton, S., Dickson, T., Hadwen, W., Jorgensen, B., Pham, T., Simmons, D., Tremblay, P. and Wilson, R. (2010), "Developing an approach for tourism climate change assessment: evidence from four contrasting Australian case studies", *Journal of Sustainable Tourism*, Vol. 18 No. 3, pp. 429-447, doi: 10.1080/09669581003639814.

UN (2023a), "The sustainable development Goals report 2023: special edition", available at: https://unstats.un.org/sdgs/report/2023/ (accessed: 29 November, 2023).

UN (2023b), "The 17 Goals", available at: https://sdgs.un.org/goals (accessed 29 November 2023).

van Dijk, A., Beck, H.E., Crosbie, R.S., de Jeu, R.A.M., Liu, Y.Y., Podger, G.M., Timbal, B. and Viney, N.R. (2013), "The Millennium Drought in southeast Australia (2001-2009): natural and human causes and implications for water resources, ecosystems, economy, and society", *Water Resources Research*, Vol. 49 No. 2, pp. 1040-1057, doi: 10.1002/wrcr.20123.

Veritas Health Innovation (2018), *Covidence Systematic Review Software*, Veritas Health Innovation, Melbourne, available at: https://www.covidence.org/terms/ (accessed 18 August 2020).

Wall, J.R. (2011), "Menindee lakes - water savings, environmental flows and water supply", *34th IAHR World Congress - Balance and Uncertainty*, Barton, A.C.T.: Engineers Australia.

Waters, E., McKenzie, F., McCarthy, C. and S, P. (2010), "The Drying Lake - lake Boga's experience of change and uncertainty", *Department of Planning and Community Development (Vic)*, available at: https://search.informit.org/doi/10.3316/apo.167201

Wheeler, S.A., Xu, Y., Zuo, Z., Haensch, J. and Seidl, C. (2023), *Identifying the Water-Related Economic Values of the Murray-Darling Basin and Rating the Quality of Water Economic Studies*, Murray Darling Basin Authority, Canberra.

WHLM (2024), *Women Rising, Empowering Flood Recovery*, Women's Health Lodden Mallee, Bendigo.

Willson, G., Wilk, V., Sibson, R. and Morgan, A. (2021), "Twitter content analysis of the Australian bushfires disaster 2019-2020: futures implications", *Journal of Tourism Futures*, Vol. 7 No. 3, pp. 350-355, doi: 10.1108/jtf-10-2020-0183.

World Meterological Organization (2023), "El Nino expected to last at least until April 2024", available at: https://wmo.int/media/news/el-nino-expected-last-least-until-april-2024 (accessed 29 November 2023).

World Tourism Organization (2003), "Climate change and tourism", *1st International Conference on Climate Change and Tourism*, pp. 1-55.

Zaman, M.A., Rahman, A. and Haddad, K. (2012), "Regional flood frequency analysis in arid regions: a case study for Australia", *Journal of Hydrology*, Vol. 475, pp. 74-83, doi: 10.1016/j.jhydrol.2012.08.054.

Appendix

Table A1 Data base search strategy

	Search terms
S1	"Visit* Econom*" OR Tour* OR "Eco-tour*" OR ecotour* OR "Sustain* tour*" OR "Sustain* develop*" OR "conserve* tour*" OR "First Nation* OR Indigenous* OR Aboriginal* tour*" OR "Paddle steam*" OR "wake board*" OR "house boat*" OR houseboat OR "Paddleboard* hire" OR "Canoe* hire" OR "Kayak* hire" OR Recreation*
S2	river* OR lake* OR freshwater OR riparian
S3	"Climate change" OR "Climate extrem*" OR "Global warm*" OR "La Nina" OR "El Nino" OR Flood* OR Bushfire* OR Drought*
S4	Australia*
S5	1 AND 2 AND 3 AND 4
S6	1997–2023. English

Source(s): Authors' own work

Corresponding author

Heather Downey can be contacted at: H.Downey@latrobe.edu.au