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Building relationships between First Nations Peoples and Western scientists to increase capacity to understand, respond and adapt to climate change

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ABSTRACT

Warning: *Aboriginal and Torres Strait Islander people should be aware that this paper contains name(s) of deceased person(s).*

First Nations and their People have stressed to Western scientists that Country is in distress and traditional knowledge is key to mitigating the impacts of climate change. Traditional Knowledge and Traditional Knowledge Methods used to read land and seascapes are intrinsically linked to climate by First Nations peoples and embedded in cultural practice passed down and entrusted across generations. Articles 2, 3, 4 and 5 of the United Nations Declaration on the Rights of Indigenous Peoples identify that all risks that threaten the continuation of cultural practice and obligation to maintain, strengthen and protect cultural knowledge infringe peoples' right to exist. Our most recent dialogue, the National First Peoples Gathering on Climate Change held in Cairns in 2021, investigated whether building connections with and among First Nations peoples and Western scientists had the potential to acknowledge and respect both knowledge systems for the benefit of all. Four key practices were applied to build a culturally safe space at the Gathering: (i) Indigenous governance; (ii) cultural protocols and co-design; (iii) deeply respectful partnerships for weaving knowledge; and (iv) Indigenous networks. Building connections among First Nations Peoples proved highly empowering. First Nations Peoples found the Gathering useful for synthesising and elevating a shared agenda woven across knowledge systems. Different perspectives shared on the impacts of climate change on people and Country built a mutual understanding, acknowledgement and respect, thereby building useability of both knowledge systems. Learnings from the Gathering are practical outcomes that First Peoples are sharing with communities. Several risks were also identified including: differing intergroup opinions about priorities, difficulty in understanding technical complexities, and in some instances, rejection of the worth of Western science. However, the Gathering allowed a space for creativity and recognition that climate justice is founded on respect and recognition for First Nations Peoples' leadership and cultural authority.

Keywords: agency, caring for Country, climate adaptation, climate change, climate risks, co-production, Indigenous knowledge systems, Indigenous partnerships, Traditional Owners.

In memoriam

In memory of Torres Webb. Torres was a talented, kind, caring and loving man. He worked with the Earth Systems and Climate Change Hub in the very early days of

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Indigenous Engagement activities in his role as Indigenous Engagement Officer at CSIRO. He was a very large part of the success of the work we are doing. His presence and involvement in the 2021 Gathering was a real highlight, especially when he entertained us with his infectious singing and guitar playing. Torres also was a lead author of this paper. Torres' legacy will live on in all we do.

1 Introduction

Climate change is an existential threat already leading to severe impacts on human and more-than-human life around the world and in Australia, one of the most vulnerable countries to extreme events (Masson-Delmotte *et al.* 2021; Pörtner *et al.* 2022). First Nations[1] people in Australia and globally hold fine-grained knowledge of climate impacts (Green *et al.* 2010; Wright *et al.* 2020), and a wealth of values, philosophies and worldviews that can inform and guide action and research (Cameron *et al.* 2021). First Peoples assert cultural and political rights to be involved in climate science and policy, because of the cultural authority they hold over their land and sea Country, and their knowledge of how it is changing (Griggs *et al.* 2013). Here, we present the results of action co-research, led by First Peoples with the support of a national science hub, to host a National First Peoples Gathering on Climate Change in Australia. Articles 2, 3, 4 and 5 of the United Nations Declaration on the Rights of Indigenous Peoples identify that all risks that threaten the continuation of cultural practice and obligation to maintain, strengthen and protect cultural knowledge infringe peoples' right to exist. Based on the recognition of these rights, the Gathering aimed to amplify First Peoples voices, build connections among people, and build understanding of both Indigenous and scientific knowledge of climate change and response. This paper focuses on collaborative analysis, by a team of Indigenous and non-Indigenous researchers involved in the project, of the Gathering's development and outcomes. First Peoples who came together at the Gathering are building on their earlier 2018 National Dialogue (Morgan *et al.* 2019), and continuing their agenda-setting through the National First Peoples Platform on Climate Change, which will highlight their self-determined voices and actions through co-design (Climate Systems Hub 2022).

First Peoples in Australia have noticed changes to their Country and culture since settler–colonial violence industrialised the landscapes, and attempted to suppress culture, traditional governance and social relations (Howitt *et al.* 2012; Lyons *et al.* 2020). Climate change is one of many factors, including mining, tourism and infrastructure development, that Australia's First Peoples identify as causing 'strange changes' and damage to their Country and culture (Petheram *et al.* 2010; Morgan-Bulled *et al.* 2021*a*). First Peoples continue to take action to protect their Country, listening to their Elders and holding a vision for repair and healing through Aboriginal worldview and practice – through yarning with Country, as explained by Bundjalung and Geonpul Aboriginal woman Mareese Terare (Terare and Rawsthorne 2019). In the Australian Aboriginal context, yarning is a cultural practice of storytelling, knowledge sharing and relationship building. Yarning helps to connect on a human level that respects both speakers and listeners, is conducted with deep respect, and is supportive of self-determination, cultural safety and inclusivity. Some actions are directly relevant to climate change – for example, using seasonal indicators helps with shifting harvests in response to shifts in fruiting time driven by climate change (Leonard *et al.* 2013). Indigenous fire management or cultural burning reduces the risk of wildfires in the extreme weather conditions driven by climate change (Mariani *et al.* 2022) and preserves carbon stocks in the landscape (Ansell *et al.* 2020).

First Nations people see value in the scientific knowledge of climate change and are interested in sharing knowledge to contribute to healing Country and finding solutions to climate change impacts (Griggs *et al.* 2013; Morgan *et al.* 2019). However, there is a long history of unethical and extractive research (Howitt 2020), with Indigenous people targeted as objects of colonial science, with their live bodies, material remains, culture and knowledge extracted to further the knowledge and purposes of the colonisers (Smith 1999; Louis 2007). Western science is often mistakenly seen as the only valid form of science, despite being rooted in colonial cultural structures, whereas newer perspectives argue that science itself is culturally situated and practiced differently across societies (see Held 2023). First Peoples are seeking to work with Western scientists who are prepared to look into the First Peoples' world with different eyes (Hale *et al.* 2022) and to develop relational understandings based on deep listening (Bakawa Country *et al.* 2015). Meaningful engagement between First Peoples and scientists needs to be 'founded on trust, respect, and recognition that the concerns, standpoints, needs and knowledge of all involved are legitimate' (Griggs *et al.* 2013, p. 7). However, Griggs *et al.* (2013) noted that these frameworks and relationships are poorly developed. Griggs *et al.* (2013) concluded that encounters were required to bring together all parties, develop an understanding of how each party works, recognise common ground and differences, develop a shared vernacular and negotiate common principles for further interactions.

Some progress has been made since 2012 in developing these critical frameworks. For example, the Indigenous-led

[1]The terms 'Aboriginal and Torres Strait Islander', 'Aboriginal', 'Indigenous', 'First Nations' and 'First Peoples' may be used interchangeably throughout this paper. Through using these terminologies, we seek to acknowledge and honour diversity, shared knowledge and experiences as well as the right of stakeholders to define their own identities.

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guidelines 'Our Knowledge, Our Way in Caring for Country', which details First Nations people's perspectives on positive applications of their knowledge in environmental management (Poelina *et al.* 2020) underpinned the first Australian State of the Environment (SOE) report co-authored by Indigenous people and Western scientists (Cresswell *et al.* 2021). Indigenous cultural governance is recognised as critical to navigate and apply the essential cultural and knowledge protocols (Whyte *et al.* 2016; Hill *et al.* 2020; Latulippe and Klenk 2020; Woodward *et al.* 2020). Weaving across science and Indigenous knowledge requires deeply respectful partnerships to work through the five knowledge co-production tasks – prepare, communicate, discuss, bring together and apply (Tengö *et al.* 2014; L Ford *et al.* 2020) (Fig. 1). Indigenous networks have been demonstrated to be vital for peer-to-peer learning, building solidarity and identifying how to support projects that keep Indigenous knowledge strong (JD Ford *et al.* 2020). Nevertheless, First Nations people in Australia, and particularly at the 2018 National Dialogue, identify a key gap remains in their efforts to connect their knowledge and practice with Country to the national climate change policies, activities and scientific evidence base (Morgan *et al.* 2019). A similar National Gathering of First Nations was held in Canada in 2020, and proved very useful with subsequent Gatherings in 2022 and 2024; in the United States of America (USA), the success of the first National Climate Change Tribal Leaders Summit in 2022 led to a further event in 2024 (Affiliated Tribes of Northwest Indians 2022).

To address the gap in the Australian context, we undertook Indigenous-led action co-research to investigate how building connections among First Peoples and scientists around climate change response through gatherings at the national level can produce relevant practical outcomes for community and build useability of both knowledge systems. The resultant National First Peoples Gathering on Climate Change (NFPGCC) was held in March 2021 in Cairns, Queensland, Australia (Morgan-Bulled *et al.* 2021*a*, 2021*b*).

2 Methods

Hosting the National Gathering followed methods to: (i) establish Indigenous governance and leadership; (ii) follow cultural protocols in co-design; (iii) foster respectful partnerships to weave knowledge; and (iv) strengthen Indigenous networks. This section details these methods, and for completeness, presents (v) methods of data collection and analysis.

2.1 Indigenous governance and leadership

The NFPGCC was supported through the Earth Systems and Climate Change (ESCC) Hub of the Australian Government's National Environmental Science Program (NESP). The Hub first approached the Yorta Yorta Nation Aboriginal Corporation (YYNAC) in 2015–2016 to host a national conversation, building on the earlier national First Peoples' dialogues with scientists about climate change convened in 2012 through the National Climate Change Adaptation Research Facility (NCCARF) (Griggs *et al.* 2013) (Fig. 1). YYNAC agreed the dialogue was consistent with the need for ongoing encounters to build trust and understanding between First Peoples and scientists and engaged in relationship building to co-host the 2018 Dialogue (see above; Griggs *et al.* 2013).

During the 2018 Dialogue, a cultural shift occurred, with First Nation Peoples stepping into the leading role with their own Statement (Morgan *et al.* 2019), through one of the first Indigenous-led sessions on climate change in Australia. Connections and two-way understanding grew (Fig. 1). Following the Dialogue, conversations between YYNAC and the ESCC Hub established a benchmark for an Indigenous-led Gathering, developed through co-design, to underpin future engagement between First Peoples and scientists around climate. Synthesis of the 'Statement' as a common view among First Peoples at the Gathering was viewed as very useful for future 'government-to-government' presentations and negotiations between the First Peoples and colonial governments now co-existing in Australia. These outcomes were highlighted through presentations to Australian government agencies in Canberra during 2019 (Fig. 1).

An Interim Steering Committee for the Indigenous-led Gathering emerged from First Peoples coming together, with support of the ESCC Hub, to present at the Indigenous Symposium on Climate Change at the Australian Meteorological and Oceanographic Society (AMOS) Conference held in Darwin from 11 to 15 June 2019, and subsequently at the World Heritage Forum. The group of Traditional Owners presenting at the AMOS Conference agreed to join an Interim Committee and work with the ESCC Hub team to further develop First Peoples' participation. The key to ensuring cultural safety for the Traditional Owners engaged in the Steering Committee was to recognise their role as one of participation on behalf of their First People – not representation of their First People. This difference is critical.

Following the AMOS Conference, the ESCC Hub sent the first invitation for additional participants to the YYNAC who provided ongoing cultural leadership building on the lessons from the 2012 and the 2018 national Dialogues (Fig. 1) The ESCC Hub invited other Traditional Owner groups and nations or organisations from diverse parts of Australia to join through letters to the Traditional Owners' governing body (usually an organisation created under diverse nation-state laws). These letters requested identification of a participant who was a valued member in the climate change space and provision of a written endorsement for their participation, noting their participation would contribute greatly to the co-design partnership with the ESCC Hub (nationally). Peak bodies with collections of Traditional Owner groups and nations were not invited. A mandate was achieved for the individual Traditional Owners' groups

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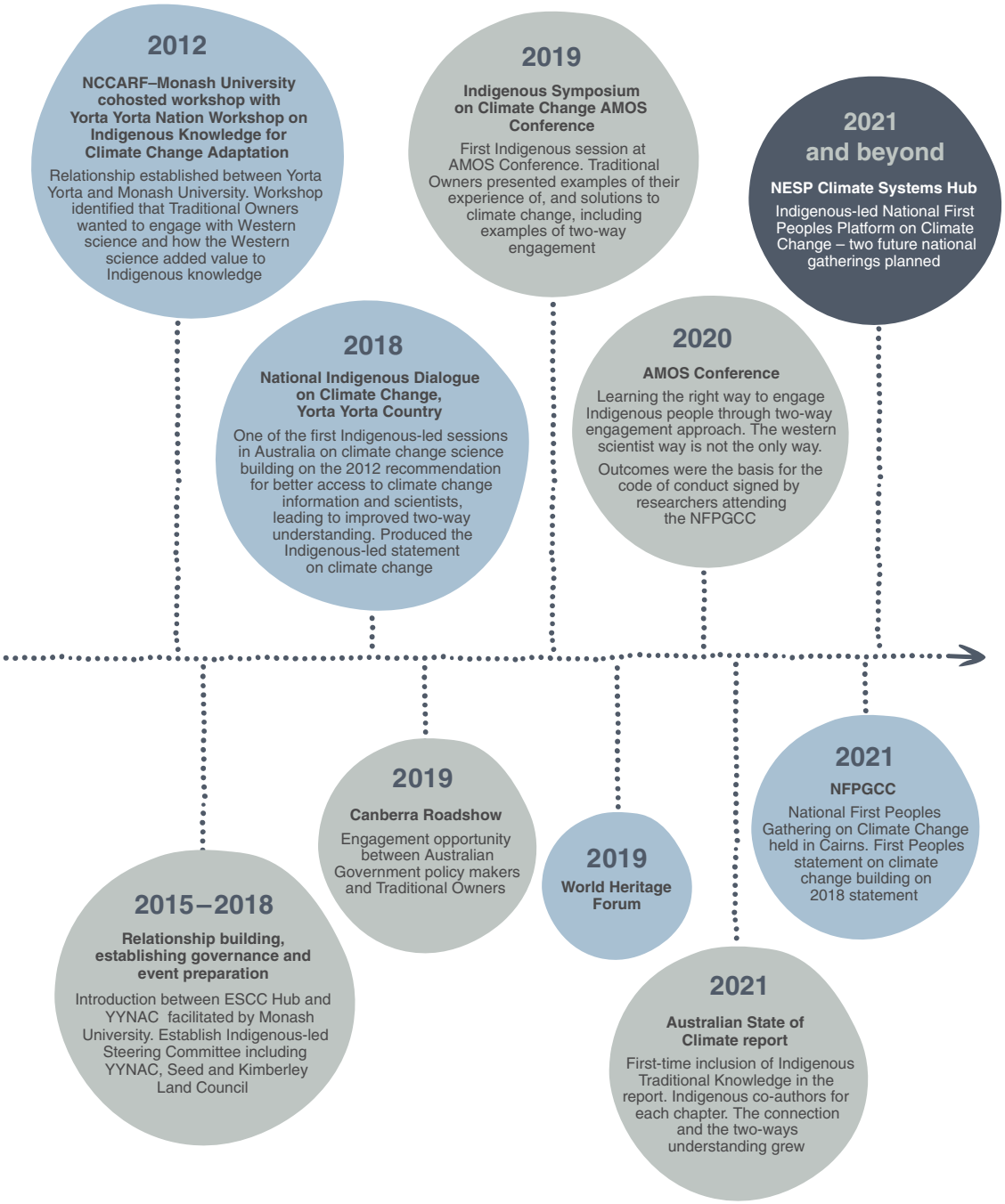

Fig. 1. Historical timeline of engagement process and associated outcomes (Pearce *et al.* 2020). The years 2018–2021 show the planning timeline for the First Nations-led national gathering using co-designed principles to develop culturally appropriate protocols and processes for the event. Other years show key historical events from before the implementation of planning in 2018 for the 2021 Gathering. (ESCC, Australian Meteorological and Oceanographic Society; ESCC, Earth Systems and Climate Change; NCCARF, National Climate Change Adaptation Research Facility; NESP, National Environmental Science Program; NFPGCC, National First Peoples Gathering on Climate Change; YYNAC, Yorta Yorta Nation Aboriginal Corporation.)

for all members to form the final Steering Committee. This culturally attuned and culturally sensitive process achieved great results in building trust, strengthening networks and building capabilities. The Steering Committee held 14 meetings and released a communique after each, except the last two, which were wrap-up meetings.

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2.2 Follow cultural protocols in co-design

Under guidance of the Steering Committee, the ESCC Hub began learning the right way to engage, with Western science recognised as just one, not the only, approach. A further Indigenous Symposium held during the following AMOS conference (Fremantle in 2020, Fig. 1) developed a set of co-design principles for climate scientists in working with First Peoples (Pearce *et al.* 2020). The Steering Committee adapted these principles, along with some material from a CSIRO project investigating co-development principles, to arrive at their own Co-design Principles and a Code of Conduct for scientists (appendix B in Morgan-Bulled *et al.* 2021*b*).

First Peoples' leadership in climate change began to attract attention nationally, and in 2020, two Yorta Yorta people were invited to join an Indigenous co-author team for the 5-yearly national SOE report – the first time this report has ever included Indigenous voices (Trewin *et al.* 2021; Fig. 1).

The Steering Committee faced challenging circumstances from COVID-19 during 2020. Hosting the National Gathering on Country, in line with cultural protocols that recognise Country as a participant in dialogues (Hughes and Barlo 2020) proved impossible. Steering Committee members were asked to present an expression of interest to co-host the Gathering, and Cairns, nominated by the Djungan Traditional Owners, was chosen as the best place to host the Gathering based on criteria including the ease of access from other parts of Australia, the Welcome from local Traditional Owners and the ability to hold a field day on Country. A Host Community Working Group, chaired by the Djungan member of the Steering Committee, was established with participants from the Gimuy Walubara Yidinji and Yirrganydji First Peoples for the Cairns region, and members of the Steering Committee and Organising Committee. This group held seven meetings and developed the cultural program for the Gathering.

A vital step in the cultural program was a message stick hand-over from the Yorta Yorta People, who hosted the 2018 National Dialogue, to the Gimuy Walubara Yidinji and Yirrganydji Peoples, who hosted the 2021 Gathering. Two message sticks were handed over, both made from red gum and both representing Yorta Yorta totems – the long-neck turtle and the emu. Gimuy Walubara Yidinji and Yirrganydji responded with stories about their own totems.

> Climate change impacts on a lot of our totemic species, we need to protect them. They are resilient, blackfellas on Country are resilient, they tried to get rid of us and the emu, but we still here. Jaba, your foot, stands on Country, that spirit that belongs to us, still stands on Country … We are the custodians, and the protectors of those species. We are given that from our old people. [Gudjugudju, Gimuy Walubara Yidinji Traditional Owner]

2.3 Foster respectful partnerships to weave knowledge

The Steering Committee co-developed consent processes to foster respectful partnerships and meet the required international Indigenous ethical standards for the Gathering. The Code of Conduct for scientists underpinned efforts to ensure that the journey forward was based on the learnings from past mistakes. Western institutions and people can listen to the voice of Australia's First Nations people through a dialogue of mutuality.

The Gathering included a First Peoples-led session to discuss ethics. Six members of the Steering Committee explained that the first and foremost goal of the consent process was to protect Indigenous cultural and intellectual property (ICIP) and make the Gathering a culturally safe space in which to share and learn. The Code of Conduct for scientists is to make sure that it was a respectful process, conducted on an equal footing. Discussions among participants followed, highlighting the key challenge of sticking to the process, not getting diverted by different agendas and ensuring that they continued to advocate for climate change action and mitigation. Mutual respect is critical:

> We manage through one law, and that is respect. [Djungan Paul Neal, Djungan Traditional Owner]

The processes for weaving knowledge emphasised that the scientific and Indigenous knowledge systems sit alongside each other as parallel systems that together can form a richer picture (Fig. 2). The Gathering aimed to establish a safe place where Traditional Owners and partners could come together, supported by cultural governance and relationships based on mutual trust and respect.

Weaving knowledge started with the first step of strengthen, prepare: First People members of the Steering Committee agreed to lead one of the four extreme event-related climate change themes for the Gathering – marine heatwaves; bushfires and heatwaves on land; extreme water events (floods, droughts); sea level rise and cyclones. Scientists with relevant expertise in these areas were selected. In the second step, communicate, the First Peoples and scientists came together (virtually or face-to-face) before the Gathering to develop and subsequently present their knowledges about that theme. In all cases, the scientific and First Peoples' knowledges were presented separately. The discuss step occurred over three sessions: first, some discussions followed the presentations; second, discussions on Country through field trips with the local Traditional Owners, designed to encourage Gathering participants to engage in discussion around these themes; and finally, yarning circles back at the conference venue aimed at producing tangible information that could be taken back and discussed with the Traditional Owner communities. These yarning circles are a discussion space for open and respectful dialogue, where mutual respect aims to provide

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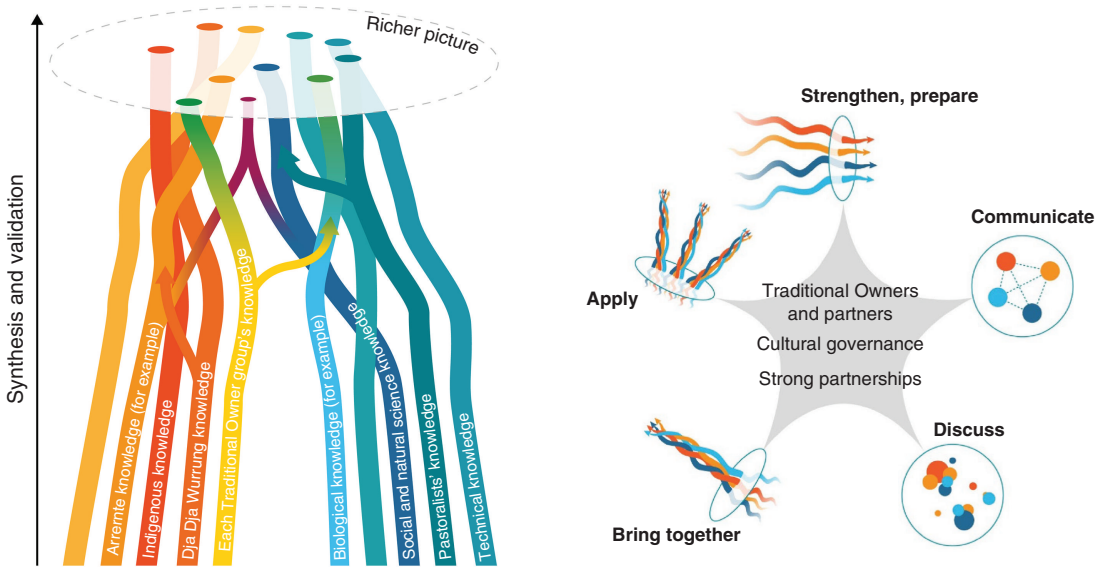

Fig. 2. Parallel knowledge systems can be woven together through respectful partnerships underpinned by cultural governance, using five key tasks (L Ford *et al.* 2020).

a culturally safe space to share knowledge alongside the building of trusted relationships. The bring-together step began in the yarning circles, with formulation of some novel two-way products being co-produced by First Nations peoples with Western scientists, and *vice versa*, and has continued through collaborative writing of a report (Morgan-Bulled *et al.* 2021*b*) and the present paper. The apply step occurred after the Gathering, for example through the inclusion of case studies from the Gathering as part of the recent Australian SOE Report (Janke *et al.* 2021; Trewin *et al.* 2021).

2.4 Strengthen Indigenous networks

The selection process for participants in the Gathering utilised a snowball sampling method that drew on existing Indigenous networks and sought to strengthen and extend these networks. The invitation was distributed by email to participants of the 2018 Indigenous Dialogue on Climate Change and through the networks of the Steering Committee. Follow-up phone calls sought to encourage nominations. Although the Steering Committee adopted a set of criteria for selection, all nominees were accepted. Wide participation from First Peoples across Australia was achieved (Fig. 3).

2.5 Methods of data collection and analysis

Documentary data collected included the public communiques of the Steering Committee, internal documents, minutes from numerous meetings and the Gathering report (Morgan-Bulled *et al.* 2021*b*). These data are publicly available. The Steering Committee adopted a plan for recording the Gathering, which used a team of six non-Indigenous co-authors. Oral material

Fig. 3. Locations of attendee First Peoples' groups and organisations.

was recorded through direct input to computers, with two recorders for each session to enable periodic stops for health and safety. Photos were taken of each section. Participants recorded their location and First Peoples group by hand on a paper outline map. Written evaluation forms, seeking both Likert-scale (Likert 1932) quantitative and written responses to questions that focused on the goals of the Gathering were completed by participants on the last day.

The first round of analysis involved thematic clustering, a method for examining qualitative data to identify common

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patterns that are relevant to the research investigation (Braun and Clarke 2006), descriptive statistics of the quantitative evaluation data and spatial analysis to locate First Peoples groups for the mapping data. These analyses were undertaken by eight of the co-authors, including one Indigenous co-author. The Steering Committee reviewed early drafts of the Draft Report drawn from this analysis to honour their unique First Peoples worldviews and ensure validity through critically reflexive review (Cameron *et al.* 2021).

The research was conducted in accordance with Ethics Clearance 086/17. The Gathering Report includes an ICIP Notice with information that the First Peoples as Indigenous knowledge holders assert ownership (which may be collective ownership), authority and control over their ICIP.

All co-authors of the Gathering report were invited to join the team to write this article, resulting in a diverse group of Traditional Owners, social, inter-disciplinary and biophysical scientists in three groups – coordinating lead authors, lead authors and contributing authors. A second round of data analysis, using thematic clustering, was applied to the Gathering report for the present paper. The final draft paper was circulated to all the participants for checking. The co-authorship order follows cultural protocols that placed the Indigenous authors as leaders in each of the three groups.

2.6 Ethics

The research was conducted in accordance with Ethics Clearance 086/17 received from the CSIRO Social and Interdisciplinary Science Human Research Ethics Committee.

2.7 Participant consent

Research participants gave their consent to participate in the National First Peoples Gathering on Climate Change and for the publication of the research findings.

3 Results

3.1 Impacts of the gathering on the connections among First Peoples and scientists

Three different types of connections were identified as triggering different benefits and risks through the Gathering: connections among First Peoples; connections among First Peoples and scientists; and connections among scientists.

3.1.1 Connection among first peoples

Many benefits were derived from the connections between First Peoples at the Gathering (Table 1, first row). Participants recognised that First Peoples are stronger together, building on commonalities and unity as the original inhabitants. This unity provided the ability to make collective statements, calling on others to join First Peoples in actions to combat climate change (Box 1):

> Coming together as one voice and people. We are stronger together and our connection to Country is needed more now than ever in our lifetimes. With our little footprints, we can provide a big future for next generations. A future our next generations are proud of. We are thankful for our ancestors and our people's resilience and provide a spirit that is still strong in our knowledge and our hearts. We can face a situation of doom and gloom and still bring strength to one another. [Bianca McNeair, Malgana Traditional Owner, Co-Chair of the Steering Committee for the Gathering]

Traditional Owners working locally can make local changes, but together, they can start to address some of the social structures and policies preventing action on climate change. Participants highly valued the international aspects, with a presentation by Lakota Indigenous peoples from North America and by Australian Indigenous people about global action on climate change and biodiversity. Making connections was also identified as a way to overcome the inequities between different First Peoples in terms of access to resources. Peer-to-peer learning was identified as a significant benefit by participants, who greatly enjoyed learning and sharing knowledge and experiences about different connections to Country and ways of bringing back Traditional Cultural Practices. Participants identified that coming together, particularly through the cultural activities including the Welcome ceremony, the message stick handover and the field trips on Country, were very helpful for strengthening kinship, cultural identity and wellbeing, and providing succession planning for the retirement of Elders.

Participants identified two risks associated with making connections among First Peoples through the Gathering (Table 1, first row). The first related to the inclusivity of participation – not enough Torres Strait Islanders were present, and not all First Peoples were able to be present. The second related to the inability to truly bring Country into the conversations. Owing to COVID restrictions, only one day of the Gathering was able to be held on Country:

> It has helped build new relationships but would have been better out on Country. A big flash hotel is not true Country and identity is better for us out on land. [Gathering participant, 26 March 2021]

3.1.2 Connection among First Peoples and scientists

Building connections among First Peoples and scientists was also identified as delivering many benefits but triggered many more risks (Table 1, second row). First Peoples recognised that scientists and their information have helped with practical solutions to the impacts of industrialisation and to anticipate cyclones, and that sea level mapping helps with

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Table 1. Benefits and risks of connections.

Type of connection	Benefits, opportunities	Risks, tensions

Among First Peoples	• Source of strength for one another; First Peoples are stronger together
	  • Ability to make collective statements
	  • Balancing inequities between different Traditional Owners groups
	  • Working together may enable the structural changes required
	• Peer-to-peer learning from other Traditional Owners
	  • Sharing knowledge and experience, the connection between Country and people
	  • Sharing positive actions to re-introduce Traditional Cultural Practices
	  • Learning and building networks with international First Peoples
	• Strengthening kinship, cultural identity and wellbeing
	  • Succession planning for when Elders retire
	  • Country as part of the conversation
		• Could be more inclusive – not all First Peoples were able to present and not enough Torres Strait Islander people attended
		• Not including Country as a participant

Among First Peoples and scientists	• Practical solutions
	  • Assist in addressing impacts of industrialisation
	  • Modelling sea level rise
	  • Helping anticipate cyclones
	  • Building knowledge
	• Two-way learning
	  • Easier to reach our goals as a community
	  • Mapping allows visualisation of complex stories into management plans
	  • First Peoples can understand impacts
	  • Creating opportunities for integrating local Traditional Knowledge by technology (e.g. Atlas of Living Australia, the Group on Earth Observations Indigenous Alliance)
	• Code of conduct for scientists to ensure a respectful process
	  • First Nations lead the conversation
	  • Recognition of the strength and knowledge of First Peoples
		• Science is not useful for First Peoples
		  • Research about what scientists want rather than communities
		  • Science relies on categorisation without taking account connections
		  • Scientific data are difficult to understand and access
		  • Science is too much jargon, and destructive of Country
		• Scientists dominated the conversation
		• Science is harmful to First Peoples
		  • Scientists just come in, yarn and leave
		  • Scientists steal information from First Peoples
		  • Vital that First Peoples' knowledge is not used against them
		• Lack of shared understanding and insight into potential benefit of an exchange of knowledge – scientists focus on climate change, whereas First Peoples focus on Country changing as a result of many factors
		• First Peoples bring many issues (such as societal and historic challenges) to the table that scientists do not perceive they have the capacity to address

Among scientists	• Great to spend time with fellow colleagues, to discuss how experiences went • The role of scientists should be to help Traditional Owners to get a seat at the table, to be part of the conversation	• Scientists not perceiving that it is within their capacity or responsibility based on project scope

planning for the future. According to Nykita McNeair, Malgana Traditional Owner:

> Two-way learning means it is easier to reach our goals as a community.

Participants shared positive experience of two-way learning in their home communities, for example through mapping that allowed visualisation of complex information to be included in management plans, and through sharing of scientific knowledge about restoring seagrass. Some participants identified that they had found new ideas from bringing Indigenous and scientific knowledge together and would have liked more time to unpack the ideas properly. The Code of Conduct signed by the scientists played a key role in underpinning respectful interactions. First Peoples reported an ability to lead the conversation and saw that scientists recognised the strength and knowledge of First Peoples.

> Having access to scientists is crucial to building our knowledge. All were friendly and easy to approach. [Gathering participant, 26 March 2021]

The technologies that are bringing together two-way knowledge, such as through the Group on Earth Observations Indigenous Alliance and the Atlas of Living Australia, are opening new opportunities for collaboration.

First Peoples also perceived risks that science was not useful, as it focused on topics important to scientists rather than communities, was difficult to access and understand, and was full of jargon (Table 2, row 2). Scientists were aware of this perception:

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Box 1 2021 First Nation Peoples statement on climate change

We, the participants attending the Gathering, acknowledge the voices of the Gimuy Walubarra Yidinji and Yirraganydji, whose lands we meet upon in 2021. Building on the 2018 statement from First Peoples on Yorta Yorta Land, we as First Nation Peoples of Australia recognise that overwhelmingly scientific and Traditional Knowledge is demanding immediate action against the threats of climate change.

When Country is healthy, we are healthy. Our knowledge systems are interconnected with our environment, and it relies on the health of Country. This knowledge is held by our Elders and passed on to the next generation. Solutions to climate change can be found in the landscapes and within our knowledge systems. Aboriginal and Torres Strait Islander peoples have the tools, knowledge, and practices to effectively contribute to the fight against climate change. We have lived sustainably in Australia for over 100,000 years.

First Nations people of Australia contribute the least to climate change, yet the impacts of climate change are affecting us most severely. We at the Gathering are calling for the following:

- A commitment from Federal Government to financially support an annual First Nations-led dialogue on climate change.
  - The annual dialogue should be a place where Aboriginal and Torres Strait Islanders can discuss the changing climate in their communities and is a valuable input to inform policy at all levels.
- A commitment for federal-level funding for an Indigenous-led climate action hub, which would fund both Indigenous-led mitigation and adaptation climate change projects. These projects could focus on:
  - Domestic emissions reductions through enabling reliable renewable energy supply to off-grid communities, Indigenous-led nature-based solutions.
  - Indigenous-led adaptation planning for communities and the recording and transmission of knowledges and experiences across the country.
- We call on all Australians to join us in acting on climate change and in protecting the environment. To work collaboratively with us, learn our laws and our ways and respect our knowledges to find solutions together to combat climate change.
- Climate action that links all levels of government so our people and communities can work collaboratively in an Indigenous-led fight against climate change.
- The right to manage Country. First Nations peoples must be involved in the national dialogue about climate change and be engaged on any decision that affects us and our Country. We call for these rights to be respected and observed on an international, national, state and local level. Our knowledge must be included in climate management frameworks.
- To look beyond ourselves, to include flora and fauna in climate planning and climate management frameworks so the plants and animals that support us can be represented.

We are seeing changes in the environment and the declining health of Country and people. We can see our native flora and fauna are suffering and the conditions of our lands, waters, seas and skies declining. For some of our people, it is an emergency because the climate crisis has already caused widespread damage. Our connection to Country represents climate science developed over countless generations; listen to us, work with us and together we can enact a change that will shape our future for all Australians.

> No evidence of how White science can help, my Country has been dramatically affected by White Man's science. [Gathering participant, 26 March 2021]

> Not clear how Western science was needed or whether wanted by traditional scientists. [Gathering participant, 26 March 2021]

Others perceived science and scientists as harmful, through scientists stealing First Peoples' knowledge and scientists at the Gathering not listening to First Nations at all, that the conversation was dominated by scientists' and government's voices. Some of the scientist participants perceived that it was not in their capacity to address the issues that First Nations wanted to bring to the conversation.

A lack of shared understanding about 'climate change' itself was also identified – Traditional Owners focus on their Country, and see changes from many factors, not just climate:

> We need a shared definition of climate change … our Country, your Country is changing. The actual definitions of climate change are problematic. [Sonia Cooper, Yorta Yorta Traditional Owner, cited in Morgan-Bulled *et al.* 2021*b*, p. 40]

Indigenous approaches to Country are deeply holistic, recognising the interconnectedness of ecosystems, climate, culture and spirituality as part of a unified whole. By contrast, Western scientific frameworks often compartmentalise different elements, studying them in isolation, which can overlook the integrated nature of human and environmental relationships.

3.1.3 Connection among scientists

Scientists identified that connecting with their scientific colleagues enabled them to understand both the benefits and challenges that they were experiencing at the Gathering. First Peoples also identified that a key benefit from scientists coming together is to make sure Traditional Owners are part of the conversation – but there is a concomitant risk that scientists may not have the capability to or accept responsibility for including Traditional Owners' inputs as valid data

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Table 2. Types of learning experienced in preparation for and at the Gathering.

Type of learning	Example from the Gathering co-research
Two-way learning	Participants noted how two-way learning helps them meet community goals, and to use to both Traditional Knowledge and science to measure climate change
Learning from Elders	Many participants discussed learning from Elders
Learning through peer-to-peer exchanges among Indigenous people	Participants reported high value from the opportunity to engage with other tribes and clan groups, and from the international presentations, and to discuss their climate change and caring for Country plans and solutions
Learning from Country	In the field, talking with Country, was identified as critical in the evaluation
Learning from First Peoples	Scientists reported learning a great deal from the First Peoples – about cultural protocols, about effective ways to communicate and engage, and about the concerns and priorities of First Nations people
Learning from scientists	Participants noted learning new ideas and practices from scientists, for example how to plant a tree in the ocean, and how to monitor water and seagrass, and use scientific projections to think about future climates
Co-learning projects	Participants identified opportunities to use new tools such as social media, audio-visual products, performances and workshops to help share knowledge between nations, and between Traditional Owners and Western science
Learning through all senses, not just through listening and seeing	Participants identified the need to learn through feel, see and touch methods, not just hear and see

in their research and in setting research objectives perceive the capability or responsibility for that role (Table 1, third row). Such feelings might arise for Western scientists through internal concerns (e.g. level of personal comfort with diverse knowledge systems and ethical considerations), external concerns (fear of rejection by the wider Western scientific community or peer reviewers) or viewing the issues as essentially in the political domain or a combination of all three.

As well as risks and benefits from the connections, participants highlighted the importance of the way the connections were made – by putting relationships first. It was vital to follow the local cultural protocols, with Traditional Owners from Cairns welcoming participants on the opening night and hosting them onto their Country to share their stories. The thematic discussions, based on a yarning approach, were seen as highly beneficial. The symbolism of the proper ceremony with message stick handover established connections with the previous national dialogues on climate change, hosted by the Yorta Yorta.

> The way you speak of your Country is truly inspirational and infectious. You are a people we can learn from and we are. Thank you for visiting Yorta Yorta Country in 2018 to stand strong together and move forward together. We thank you for the warm Welcome to Country, the song and open arms last night. It is an embrace that we will draw strength from when we return to our Country. [Sonia Cooper, Yorta Yorta Traditional Owner]

3.2 Impacts of the Gathering on the credibility of both knowledge systems around climate change response

Weaving across Indigenous and scientific knowledge systems both built and encountered barriers to the credibility of Indigenous and scientific knowledge systems. Credibility was enhanced through mutual reinforcement of findings and making visible ways in which the knowledge systems are complementary. Common applications using both knowledge systems were identified.

Substantial mutual reinforcement of findings occurred in relation to sea-level change and marine heatwaves. In considering sea-level change, First Peoples' understanding of past changes from oral history was combined with Western scientific understanding. Sea-level has varied significantly over past millennia in response to regular variations in the Earth's orbit around the sun, which have caused ice ages and interglacial cycles in Earth's past climate on approximate 100,000-year cycles (Masson-Delmotte 2013; Grant *et al.* 2014). Paleo sea level records are derived from analysing the ratio of oxygen isotopes (^{16}O and ^{18}O) in materials such as marine sediments or air bubbles trapped in ice cores (Yokoyama and Purcell 2021). Since the last Interglacial maximum, *c*. 130,000 years ago, sea levels dropped to a minimum at the peak of the last Ice Age *c*. 20,000 years ago when ~120 m of water in the oceans was frozen in large ice sheets covering land areas across the globe (Fig. 4). The oral history of First Nations people records aspects of this sea level history, including the flooding of the land bridge between mainland Australia and Lutruwita (Tasmania) and the formation of the Torres Strait Islands after the last Ice Age ended. The First Peoples timeline was presented using a rope across the stage with people as markers of key events (Morgan-Bulled *et al.* 2021*b*, pp. 16–17), giving a visually strong presentation of key data. Combining the history of sea level from both knowledge systems in a common timeline helps display the mutual reinforcement of the findings across the knowledge systems (Fig. 4).

Marine heatwaves have been identified through scientific research to cause loss of seagrass, kelp forests and coral reefs, and may have played a role in affecting mangroves (Smale *et al.* 2019; Holbrook *et al.* 2021). Critically, climate change has exacerbated the frequency, intensity and duration of

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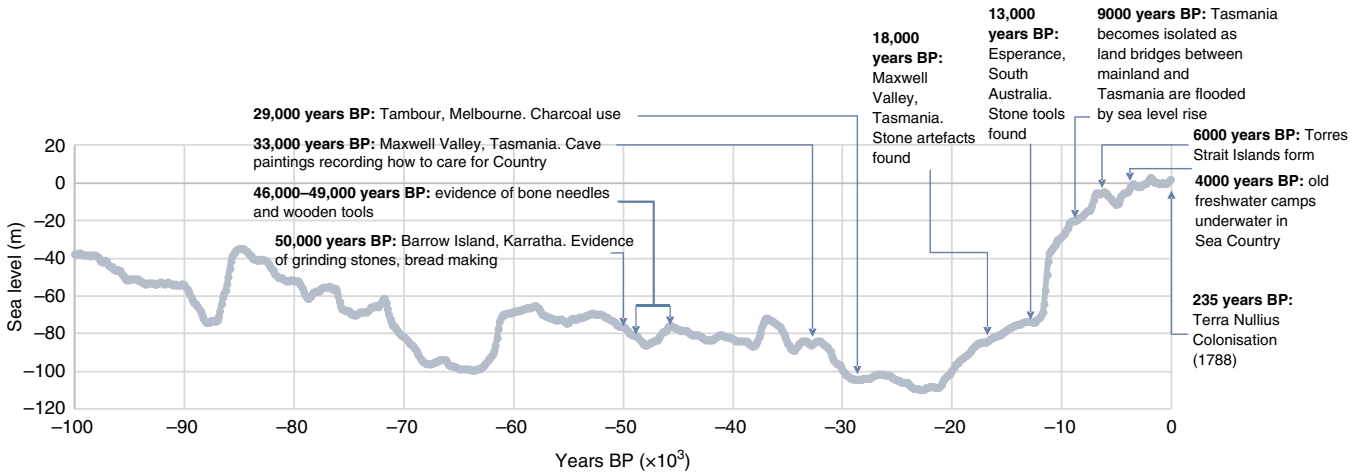

Fig. 4. Sea level variations over the past 130,000 years based on Grant *et al.* (2014), and timeline of dated Indigenous artefacts and lived experience of past sea level change captured in oral history (BP, before present).

marine heatwaves (Oliver *et al.* 2018), creating a series of cascading environmental impacts affecting resident plant and animal species and, in turn, Traditional Owners, through their deep connection to Sea Country. This is expected to only get worse through this century (Oliver *et al.* 2019; Holbrook *et al.* 2020).

Traditional Owners provided evidence that culturally important animals like dugong, turtles, fish, sea snakes, crabs, conch shells and prawns have been declining owing to increases in marine heatwaves associated with climate change. In Tasmania, loss of giant kelp has led to a decline in maireener (rainbow kelp shells), diminishing access to resources for making kelp baskets and shell necklaces and thereby to loss of cultural connections. In the Great Barrier Reef region, marine heatwaves are negatively affecting crocodile and turtle nesting success, as well as causing corals to bleach. Traditional Owners from the savanna and freshwater regions provided information about how changes on their Country flow through the rivers to affect marine ecosystems. However, the Torres Strait Islands can act as centres of resilience to marine heatwaves and strongholds for species such as green turtle owing to the cool upwelling of water around the Strait.

Seagrass is culturally significant for Malgana People (Gutharagudu or Shark Bay region, Western Australia) because it is relied on by dugongs and turtles, which are important for food and culture. The rangers continue to monitor seagrass in Shark Bay and work with scientists on the data, which are important to keep in the area.

> We are concerned about marine heatwaves because they're killing our seagrass and making our waters unhealthy. Seeing changes over time is concerning … it's disheartening and scary for me, but if we put our heads together, we can get a positive outlook. [Nykita McNeair, Malgana Traditional Owner]

First Peoples and scientists worked together to discuss and weave their knowledge about marine heatwaves in three geographically based groups: Western Australia–Northern Territory, Tasmania and Torres Strait–Great Barrier Reef. Both First Peoples and scientists present found that stories and conversations collectively flowed when using a 'cascading consequences' diagram (Fig. 5) to recall the consequences of intense and detrimental warm ocean (marine heatwave) events on Sea Country. This approach proved unifying in bringing Traditional and Western Knowledge systems together, and the diagram helped display the mutual reinforcement of the findings across the knowledge systems (Fig. 5).

The fine-scale understanding and connection of First Peoples with their Country was particularly evident in the bushfires and heatwaves on land thematic discussion. First Peoples from the Kimberley region displayed a painting (the Ngurrara Canvas), explaining:

> Looking at the painting – it's a map of our Traditional Country … to capture the stories and songlines of migration of animals across Traditional Country and when our mob moved off the desert because of climate change. [Peter Murray, Chair of the 10 Deserts Project]

Ngurarra rangers described how they worked together with scientists to develop a common application, using the knowledge of tracks from the Ngurarra Canvas to place weather stations for recording rising temperatures and monitoring water movement. The yarning circles identified how First Nations' knowledge and knowledge systems occur through connection to Country, Dreamtime stories, yarning across generations, storylines and song lines, and cave paintings and art. Western science is less directly engaged with Country, with a focus on the 'scientific method' of collecting data, analysing data and writing a paper or report. The fine-scale technological capability of scientists to project future

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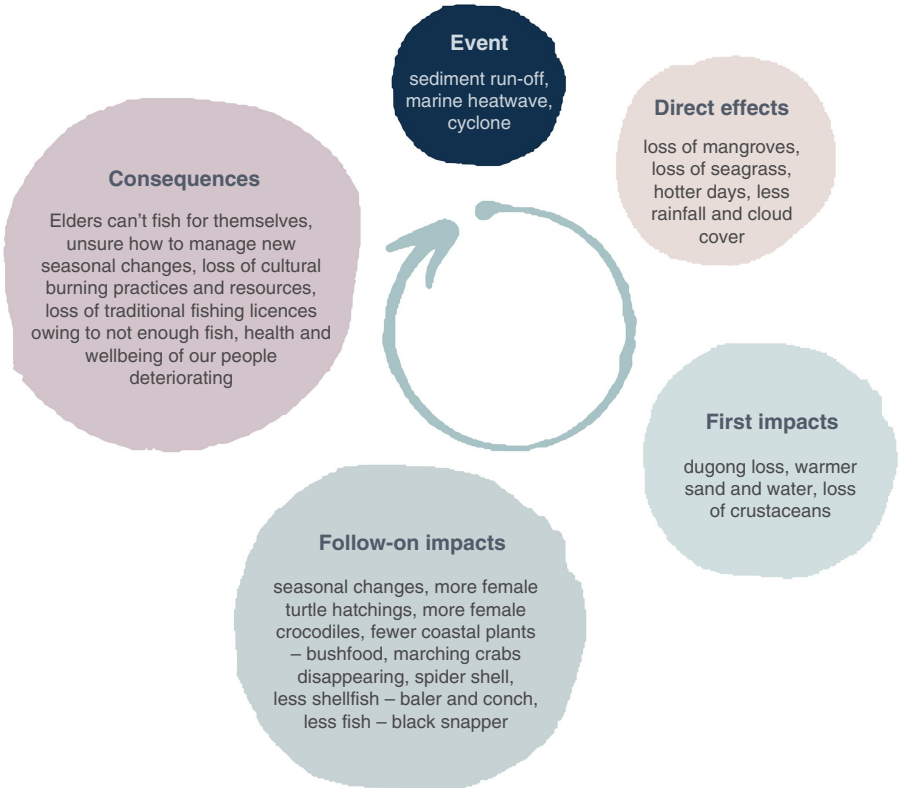

Fig. 5. Cascading consequences diagram used to facilitate discussion on the effects of marine heatwaves for regions in Western Australia and the Northern Territory.

temperatures was evident in the bushfires and heatwaves on land events, with projections demonstrating large increases in high-temperature days and the number of heatwaves. The workshop also revealed that there were barriers to enhancing credibility across knowledge systems. A lack of trust by First Peoples in Western systems, and a clear sense that Western society and people have been the perpetrators of human-caused climate change was evident among some participants. By contrast, the thematic discussions highlighted the local-scale climate change response efforts of First Nations People, many of whom are involving scientists within their Countries. For example, a seagrass restoration project in Gutharagudu (Shark Bay) is under way through a collaboration between Malgana rangers and the University of Western Australia that aims to better understand the genetics of the seagrasses to base restoration on sea grasses that can survive in a warmer climate. The cultural knowledge of Traditional Owners and Elders guides the location and activities to undertake restoration.

3.3 Impacts of the Gathering on producing practical outcomes for community

The Gathering provided many examples of First Peoples and scientists working together at the local scale, in the traditional territories of the First Peoples, to deliver practical outcomes through better understanding and responding to climate change in the community. The examples of the Ngurarra and Malgana rangers are noted above. Yorta Yorta described their cultural protocol for working with scientists on freshwater turtles in the Barmah Forest. The Butchulla Aboriginal Corporation (BAC) described how BAC provided on-ground assistance during the 2020 wildfires at K'gari (Fraser Island), including advice on using freshwater lakes, knowledge to identify and protect cultural assets, and resources to help firefighting, including a representative on the incident management team and community rangers to carry out fire mitigation work and front-line firefighting.

Nevertheless, BAC found it difficult to get a seat at the decision-making table and make it known that the fire was affecting rights to Country. There were also cultural differences in firefighting priorities – BAC wanted the fire to be put out straight away whereas the parks service was focused on threats to assets. This sense of frustration was shared by others involved in bringing cultural burning practices back at a local scale. Government agencies' planned burns are becoming fewer owing to extreme conditions making fires dangerous. However, the traditional indicator species suggest this is not the right approach. Participants identified that incorporating the traditional calendar for burning according to indicator species needs to gain more traction – Country was getting sick because even where cultural burning was set up, it was not truly culturally appropriate owing to a lack of cultural governance. Others reported that where there was a genuine thirst for more scientific information, there was often a lack of locally relevant data on indicators such as rainfall.

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Traditional Owners from the Torres Strait expressed frustration that their urgent needs for practical solutions to protect their islands from sea-level rise were not receiving effective response. Defence walls are currently being used to prevent islands being lost to the sea but are not a long-term solution.

> Myself and other Torres Strait Islanders who attended have left feeling discouraged because yet again our voices aren't heard and we are underrepresented. [Gathering participant, evaluation comment]

Acknowledgement was made to the Torres Strait Island delegate on how the conference could support their region.

A key solution to these barriers faced in producing practical outcomes for community was the idea of learning as the most practical outcome of all. Many different types of learning occurred at the Gathering and in the preparatory work for the Gathering (Table 2). Two-way learning, across the Indigenous and Western scientific knowledge systems, was identified as very helpful. Participants reported an intention to report back what they had learnt:

> A lot of information will be shared with community, especially the land-owning groups of my community. [Gathering participant, evaluation comment]

Participants requested a copy of the information from the Gathering in printed format with a summary and visual material, which was provided in the form of a full co-authored report and summary version available online (Morgan-Bulled *et al.* 2021*a*, 2021*b*).

Learning from Elders is a common priority among First Nations People:

> We grew up learning from our Elders … about different resources and how we can use those to manage Country. [Bianca McNeair, Malgana Traditional Owner]

Learning through peer-to-peer exchanges among First Nations groups and international Indigenous groups was highlighted as very valuable:

> Making connections with other mobs, learning we all have our own concerns, but we're all interconnected and seeing the value/opportunity in this. [Gathering participant, evaluation comment]

Reponses to the evaluation of the Gathering identified how critical it is for First Peoples to be on Country and learn with Country:

> The chance to be on Country transcends all levels in allowing for frank, effective communication. [Gathering participant, evaluation comment]

Participants also identified that the Gathering focused primarily on learning through hearing and seeing, and that more opportunities for learning through feel, touch and taste senses would be beneficial.

Some Traditional Owners found learning from Western science and the scientists to be extremely helpful, giving examples of learning about how to plant a tree in the ocean. Scientists identified a wide array of learning from the Gathering – about cultural protocols, about effective ways to communicate and engage, and about the concerns and priorities of First Nations people. Building on local co-learning projects was identified as a key way forward – using new tools such as social media, audio-visual products, performances and workshops to help share knowledge between nations, and between Traditional Owners and Western science. The First Peoples Statement from the Gathering (Box 1) called on governments to support an annual First Nations-led dialogue on climate change – continuing to foster learning.

4 Discussion and conclusion

Our Indigenous-led action co-research found that building connections among First Peoples around climate change response through a Gathering at the national level strengthens Indigenous knowledge systems and synthesises and elevates First Peoples' agendas. First Peoples were able to identify their common interests and lead the conversation, producing a First Peoples' collective statement relevant to climate change response.

Responding to the global phenomena of climate change demands the attention and collaboration of all interdisciplinary sciences – First Peoples ecological knowledge and deep sense of multi-generational responsibility for Country are paramount. In scale, disparities of isolation are no longer state by state, northern and southern hemisphere, global north and global south concern alone – the Earth is hurting, Country is hurting – climate change is an indiscriminate force. Australia's NFPGCC stepped into the paradigm of Western scientific inclusion, academic credibility, political flexibility and exceptional hope, both nationally and internationally. Maintaining a trajectory of confidence propelled by the Indigenous-led Steering Committee and ESCC Organising Committee required multiple systems approaches and capabilities.

The First Peoples' call for an annual First Nations-led dialogue that supports Aboriginal and Torres Strait Islanders resonates with other findings about the usefulness of such events, for example in Canada and the USA, as noted in the introduction (Affiliated Tribes of Northwest Indians 2022; Assembly of First Nations 2024). Onjisay Aki International Climate Summit, held in 2017 at Turtle Lodge Indigenous knowledge centre, highlighted how Indigenous knowledges and traditions provide a foundation for addressing climate change, regardless of connections to Western science, with key actions to be taken forward through connections – with

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Indigenous nationhood, traditions, spirit, the land and with each other (Cameron *et al.* 2021). First Peoples generate their own locally strategic climate change responses and adaptation pathways and benefit greatly from opportunities to exchange knowledge about these (Nursey-Bray *et al.* 2019; JD Ford *et al.* 2020).

Although First Peoples' agendas were elevated, the dominant government agencies and their agendas have not yet responded to either the statement released in 2018 (Morgan *et al.* 2019) or the 2021 statement (Morgan-Bulled *et al.* 2021*a*). The election in May 2022 of a new national government in Australia with a priority for action to recognise the First Peoples Voice and to address climate change presented new opportunities to take this agenda forward. The decision in September 2022 by the Human Rights Committee of the UN Council on Social, Economic and Cultural Rights that the Australian Government's inaction on climate change has violated their human rights adds to the pressure to act. An initial Government response has been to provide A$15.9 million over 4 years for action including the Torres Strait Climate Centre of Excellence (Lansbury *et al.* 2022).

The First Peoples call for action to collaborate and find solutions together with all Australians resonates with global initiatives. For example, the United Nations Framework Convention on Climate Change has established the Local communities and Indigenous Peoples Platform (Shawoo and Thornton 2019). The recent Intergovernmental Panel on Climate Change (IPCC) AR6 report on 'Impacts, Adaptation and Vulnerability' for the first time features Indigenous knowledges alongside Western scientific research, using information from multiple local-scale case studies across the world, including the Countries of Kamilaroi, Waanyi and Kalkadoon, and the Meriam Nation in Australia (Schipper *et al.* 2022).

Building connections among First Peoples and scientists generated significant learning. Key Indigenous capability mentored and supported non-Indigenous colleagues in their understanding of world views, cultural values and the empathetic nature First Peoples have one to another. The Indigenous-led Steering Committee maintained the position that Aboriginal and Torres Strait Island people's comprehension of weaving cultural governance into the scientific community and machinery of nation-state governments is achievable and is a testimony of respect to their Elders, past and present.

The cascading consequences diagram and the two-way timelines developed at the Gathering highlighted how such visualisations both provide a richer picture that amplifies Indigenous contributions (Tengö *et al.* 2017; Zurba *et al.* 2019). Overall, the NFPGCC ensured success through parallel lenses of Western and First Peoples' knowledge to engage at a deeper level of trust, respect and action. The concept of seeing through diverse knowledge lenses is not for the faint-hearted, and often produced frustration in robust discussions in the journey to learn, trust and support decisions.

Several risks were also encountered during the Gathering, including intergroup tensions about priorities, frustration at the technical complexity and inaccessibility of science, and rejection of the worth of Western science in some instances. For people enculturated into their own knowledge and value systems, science can appear abstract, depoliticised and divorced from the everyday lived experience of First Peoples. Additionally, Country is a critical part of connections for First Peoples and the hosting of the Gathering in a hotel owing to COVID restrictions (as opposed to on Country) triggered strong negative reactions among some participants. When First Nations people are on Country, Country speaks to them and the complex responsibilities and relations between each other and Country are made tangible (Bakawa Country *et al.* 2015). The team, like others working in knowledge co-production, were required to constantly recognise risks as they emerged, to reposition their activities to navigate tensions and opportunities (Chambers *et al.* 2022). The concerns expressed by both scientists and First Peoples about one another's roles and contributions indicate more investment is needed in specific activities to build trust and consolidate the benefits of working together.

Australian Government investment through the NESP Phase 2 is a significant step forward. This positive response reinforces the overall strategy of the Gathering to elevate First Nations agendas and present these for response from governments. Importantly, the NESP protects ICIP in accordance with the United Nations Declaration on the Rights of Indigenous People (UNDRIP), Article 31 ICIP, through a contract clause. The NESP supports Indigenous Facilitators in four Hubs – Resilient Landscapes, Sustainable Communities and Waste, Marine and Coastal, and Climate Systems. These relationships in turn support culturally informed research plans with and between First Peoples and the NESP hubs.

The goal of delivering practical outcomes for community, for example for Torres Strait Islander communities whose homes are being engulfed by rising seas, requires additional activities. Indigenous-led adaptation planning, with opportunities for communities and scientists to work together and support locally strategic climate change responses embedded in Traditional Owner narratives, has proved successful in building trust and practical outcomes, as highlighted at the 2018 Gathering (Lyons *et al.* 2020; Hale *et al.* 2022). Drawing on these lessons from the Gatherings about the strengths of Indigenous-led co-design, the Australian Government is currently supporting a First Nations-led response through the Torres Strait and Northern Region Climate Resilience Centre (Department of Climate Change, Energy, the Environment and Water 2025). NESP is also building practical outcomes from the Gatherings, and has invested in a National First Peoples Platform on Climate Change comprising participants from all Australian States and Territories, Torres Strait Islands as a unique region, a youth participant and an emerging partner (Climate Systems Hub 2022).

Aboriginal and Torres Strait Island people have consistently advocated for their voice to be heard in the political and socio-economic systems of Western cultures. Climate

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scientists are gradually learning ancient knowledge of an ancient land from the descendants of Australia's ancient people. In the Australian science sector, there is a need to fully open the door to the place of Traditional knowledge at the table of climate and environmental management through respectful partnership practices. Respect, recognition and protection of ICIP and free, prior and informed consent are the primary framework for scientific research and policy design with First Nations People. The journey is a young one, and the way forward requires courage, innovation and collective wisdom, to work together to support People and Country in climate change and adaptation.

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Data availability. The data that support this study cannot be publicly shared owing to ethical or privacy reasons and may be shared on reasonable request to the corresponding author, if appropriate. A preprint version of this article in Morgan-Bulled *et al.* (2023).

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