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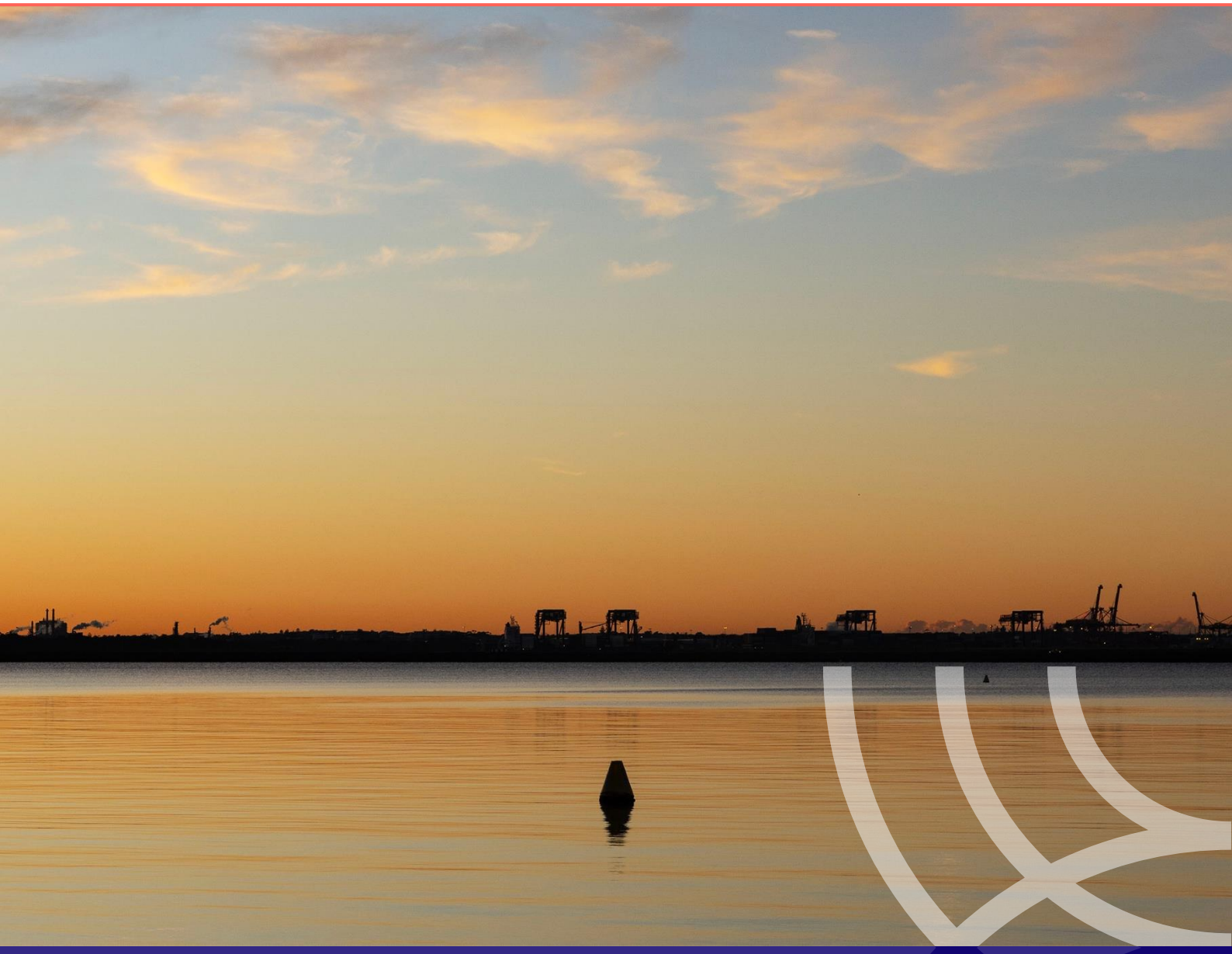

Restoring coastal ecosystems and culture through Traditional Ecological Knowledge

Dr Mitchell Gibbs, Matilda Goslett, Bryce Liddell, Professor Pauline Ross, and Dr Laura Parker

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Acknowledgment of Country

The Australian Public Policy Institute acknowledges the Gadigal people of the Eora Nation and the Ngunnawal people upon whose ancestral lands our Institute stands.

We pay respect to Elders both past and present, acknowledging them as the traditional custodians of knowledge for these lands. We celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of Australia.

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Authorship

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Executive summary

As environmental degradation continues to accelerate, meaningful change requires more than isolated conservation interventions; it demands systemic transformation that simultaneously benefits ecosystems, communities, science, and culture. Extensive evidence demonstrates that Indigenous land and sea management practices are among the most effective approaches for sustaining biodiversity, ecosystem resilience, and cultural continuity. Yet a persistent structural gap remains between this evidence and its translation into contemporary conservation and resource management policy. Indigenous knowledges are frequently acknowledged in principle but remain marginalised in governance, decision-making and resource allocation. This research seeks to redress that imbalance by establishing mechanisms for genuine co-governance, partnership and knowledge integration.

Grounded in principles of self-determination, relational accountability and care for Country, this study addresses ongoing inequities in environmental decision-making to restore Indigenous authority in caring for land and sea Country.[1] Three interrelated policy areas are identified as offering opportunities for action: enhanced Indigenous engagement and partnership, protection of Indigenous Cultural and Intellectual Property, and incorporation of Traditional Ecological Knowledge in environmental management.

These opportunities are informed by a case study analysis of the Gamay Rangers (Botany Bay), whose work demonstrates the value of local knowledge, cultural continuity and place-based stewardship. The case study highlights persistent governance barriers and ecological risks arising from exclusionary policies and inadequate consultation.

Findings indicate that Indigenous peoples continue to face exclusion from environmental governance frameworks that prioritise Western ecological science and economic values over cultural, spiritual and community-based relationships with Country.[2]

To address these barriers and improve outcomes of conservation and environmental restoration practices, the proposed policy agenda will contribute to:

1. **Building trust** between Indigenous communities and government institutions.
2. **Strengthening biodiversity outcomes** through culturally-informed restoration and management.
3. **Enabling Indigenous peoples to fulfil their cultural rights and responsibilities** to care for Country in ways that align with both tradition and contemporary science.

Ultimately, this paper calls for a paradigm shift from consultation to co-governance, from tokenistic inclusion to sovereign participation and from extractive environmental management to relational care for Country. This will create a platform for the New South Wales (NSW) Government's reconciliation obligations by centring Indigenous leadership and knowledge in environmental governance, moving towards a more just, resilient and sustainable future for both people and the natural world.

Policy opportunities – at a glance

1 **Enhance Aboriginal engagement and partnerships**

Establishing protocols or mechanisms to create meaningful relationships with Indigenous communities will increase Indigenous participation in all facets of biodiversity governance, from project conception through decision-making, implementation and delivery phases. This could be implemented through state government authorities and departments, such as the Department of Primary Industries and Regional Development and the Department of Climate Change, Environment, Energy and Water, as well as local government councils.

2 **Prioritise and protect Indigenous values and Indigenous Cultural and Intellectual Property**

Environmental governance should be grounded in place-based Indigenous knowledges, ensuring they remain context-specific and safeguarded through Indigenous values and Indigenous Cultural and Intellectual Property protocols, so they are neither misrepresented nor applied beyond the Country to which they belong. Achieving this requires formalising the role of local Indigenous community members in environmental restoration, recognising their cultural authority and vital contributions as custodians of place.

3 **Incorporate Traditional Ecological Knowledge for environmental management**

A clear mechanism for incorporating Traditional Ecological Knowledge into sustainable development and land-use planning is essential for strengthening Indigenous-led biocultural conservation. Such a mechanism should remove barriers to cultural practices, including activities like Indigenous rock carving, and expand support for Indigenous-led initiatives. Embedding Traditional Ecological Knowledge within education systems helps to challenge colonial structures that have limited broader recognition of Indigenous knowledge. Central to this approach is Indigenous self-determination, recognising Indigenous peoples as the primary stewards whose governance systems and knowledge are fundamental to effective and equitable conservation.

Contextualising Indigenous positioning

Amidst the escalation of climate change and ecosystem collapse, the role of Traditional Ecological Knowledge has become increasingly recognised in informing effective land and sea Country management. However, there is currently no systemic integration of Indigenous knowledges into coastal management/restoration, nor is there a requirement for Indigenous consultation for marine environmental policy. This is surprising given the importance of the health of the environment and the understanding that Traditional Ecological Knowledge offers tens of thousands of years of invaluable insights and knowledge that will contribute to scientific research, particularly regarding habitat dependencies, ecological linkages among habitats, environmental adaptation and historical ecosystem conditions and changes.

The fragmented nature of marine restoration in different levels of government (at the local and state level) and the use of industry partners (such as, The Nature Conservancy) creates the idea that "someone else will do it", potentially leaving Indigenous Knowledges and practices consistently "falling through the cracks".

Reinstating traditional land and sea Country responsibilities and meaningfully integrating Traditional Ecological Knowledge into mainstream environmental governance are fundamental to developing a more holistic understanding of Australian ecology. These actions can support the sustainable use of natural resources, enhance ecological restoration efforts and strengthen ecosystem resilience strategies that are both ecologically robust and culturally grounded. This policy document underscores the importance of cultivating genuine, respectful and enduring relationships with Indigenous communities, recognising that such relationships are critical to the success, legitimacy and long-term sustainability of restoration and environmental management initiatives. Central to this approach is the prioritisation of place-based Indigenous knowledge from the relevant Traditional Custodians, ensuring that local ecological, cultural and relational understandings meaningfully inform decision-making processes.

Additionally, this document advocates for the establishment of clear, culturally-appropriate mechanisms and protocols for incorporating Traditional Ecological Knowledge into environmental projects in ways that respect Indigenous Cultural and Intellectual Property rights and community-determined governance. Embedding these mechanisms within industry and government environmental management frameworks is essential for developing practices that are not only more effective and inclusive, but that also uphold environmental integrity, support the continuity of Indigenous culture and promote broader social wellbeing.

This policy document aims to highlight the importance of creating meaningful relationships with Indigenous communities and how this will impact the outcomes of restoration projects. Reinstating traditional landownership responsibilities and integrating Traditional Ecological Knowledge into mainstream processes is a vital component of building a more holistic understanding of Australian ecology, along with the benefits to culture and environment mentioned earlier. It prioritises the incorporation of place-based Traditional Ecological Knowledge for the benefit of the local environment and, more generally, provides a mechanism for incorporating this knowledge within projects in accordance with cultural protocols. Understanding and embedding these mechanisms/protocols within environmental management for industry and government is critical for developing effective and inclusive practices for the benefit of the environment, Indigenous culture and social wellbeing.

Since Indigenous occupation of the continent over 60,000 years ago, Indigenous land and sea Country practices have heavily influenced the Australian environment, resulting in ecosystems that evolved alongside and as a direct result of human habitation.

Traditionally, land management methods were uniquely aligned with the distinct customs, stories and language of Country. "Country", in an Indigenous understanding, refers to the deep awareness and appreciation of the interconnectedness and interdependence of all living and non-living things, positioning all beings and non-beings, the ordinary and the sacred, the spiritual and the physical, as equal parts of a whole.

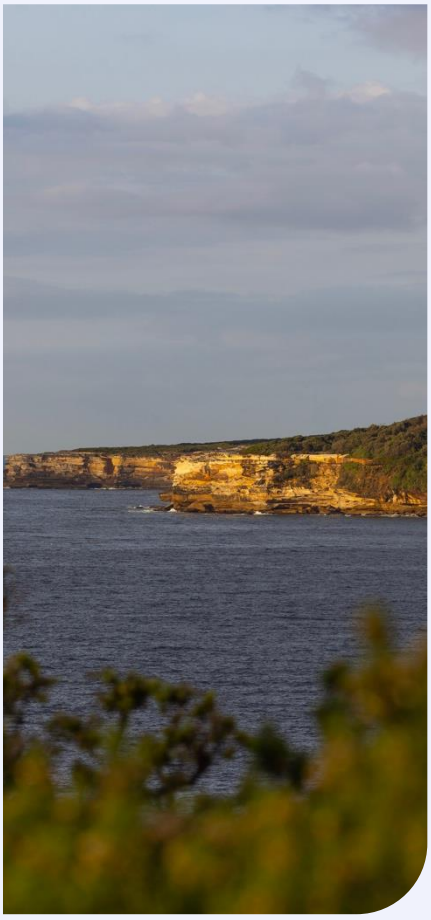
At the core of Indigenous philosophy are relationships with Country, kin and totems, which collectively form the foundation of moral life. These relationships embed ethical responsibilities within interconnected networks of mutual obligation, guiding individual choices and identities toward principles of reciprocity, respect and balance. This relational and ethical framework remains largely absent from contemporary restoration practices, which often prioritise technical or managerial outcomes over reciprocal responsibilities to Country.

Creation stories (also referred to as Dreamtime, Dreaming and Indigenous Lore), passed down orally, describe the interwoven history of the geographical, biological and ethnographic landscapes of Australia. With all Australian waters and lands storied and tied to the specific language, dreamtime, and knowledge of Country, the protection of tangible heritage (rock art, shell middens) and intangible heritage (Cultural Fire, knowledge sharing) became a defining ethic for Indigenous communities.

Unified under this philosophy, a continuous practice of responsible and sustainable land management evolved from slow, transformative and iterative learning cycles built on generational observations of the environment. Unlike Eurocentric understandings of land management, “Caring for Country” is less extractive and more about working with land to coexist and maintain the natural state of the ecosystem.

Following the arrival of British colonists in 1770, the violent subjugation of the Indigenous population and the subsequent eradication of their cultural heritages, languages and traditions profoundly affected Country. The prohibition of Indigenous cultural practices, which tended to stabilise the environment, has caused degradation to the natural environment.

> “The knowledge that the elders had within our communities was just so vast... their management didn't come across as actual management... we just did what we had to do to look after the country... When we knew that it was sick, we burnt it to make it feel better... it's really simple... It was just knowing and being able to connect to the land and knowing when it needed repairing.[3]



Effects of Colonisation on Ecosystems

A clear example of the consequences of prohibiting cultural burning can be seen in the transformation of Australian forest landscapes. Cultural burning – practices that vary regionally but can involve lighting small, controlled areas and carefully managing flames according to wind conditions (known as cool burns) – serves to reduce fuel loads while promoting plant growth and ecosystem health. Without these practices, forests have become denser and have encroached upon adjacent grasslands, significantly increasing the risk and intensity of bushfires.[4] This mismanagement has led to many severe bushfire events in recent history, most notably, the extreme bushfires of 2019-2020. For 9 months, uncontrolled bushfires devastated 240,000 square kilometres of Australian landscape, killing over 450 people and causing an estimated loss of over a billion animal lives.[5]

Indigenous bushfire management practices have proven highly effective in mitigating late-season, large-scale and destructive bushfire events, contributing to a significant shift in public and policy attitudes following the catastrophic 2019–2020 fire season.[6] The value of these traditional practices in environmental management and hazard reduction has since been increasingly recognised at both state and federal levels. In NSW, this recognition has been formalised through the introduction of a Cultural Fire Management Policy, which enables the integration of Indigenous fire practices into mainstream land management frameworks.

While policy has adapted to accommodate the risk of bushfires in terrestrial environments, we have yet to see similar levels of understanding and policy implementation in coastal environments. Mismanagement and harmful practices have continued to disrupt and destroy marine ecosystems.

A stark example of this historical disruption is the practice known as “skinning,” in which British schooners would anchor on exposed mudflats at low tide while settlers raked nearby oyster beds until they were completely depleted. Oyster reefs, some extending as deep as eight metres, were systematically excavated, with the extracted shells burned to produce lime for mortar used in the construction of Sydney’s buildings and roads.[7] This extractive practice (along with other human-induced ecological degradation) continued until more than 99 per cent of Sydney Rock Oyster reefs and over 92 per cent of Flat Oyster reefs had been destroyed/excavated, fundamentally altering coastal ecosystem dynamics. The removal of these reefs reduced habitat complexity, diminished food availability, weakened natural coastal protection and eliminated a critical source of natural water filtration provided by oysters as filter feeders.[8]

This history of large-scale extraction and ecological degradation stands in sharp contrast to Indigenous fishing practices, which have traditionally integrated both harvesting and cultivation to sustain marine ecosystems over time. Whereas colonial approaches treated oyster reefs as expendable resources to be removed, Indigenous knowledges emphasised ongoing care, regeneration and reciprocal relationships with Country. Despite this, the cultivation aspect of Indigenous marine stewardship has historically been overlooked in coastal restoration and management, which have instead prioritised extractive or technocratic approaches over relational, place-based ecological practices.

> Feeling the loss of those mullet, not being able to come to shores and do that net fishing and then having government come in and... telling us that we couldn't do it. Like putting policies, procedures, legislations and acts in to prevent us from even going and doing the things that we've been doing for thousands of years... it takes away everything. It takes away connection, spiritual connection. It was to break the black person.
> And the community.

The Australian Bureau of Meteorology has recognised the need to incorporate Indigenous weather knowledge. This includes Dharawal seasonal descriptions for the Sydney area, onto its website, as it is seen to offer a more appropriate framework for interpreting Australian environmental data than the traditional four-season model.

> A lot of people think our ocean's just our ocean, that we're saltwater people, so it doesn't include our freshwater lakes and stuff, but it does... it's all connected-- you ruin one environment, it just cascades down to the next environment, and it has an impact on that.

Other than contributing to Australia's long-term economic security and sustainable development, co-producing a unifying foundation for environmental monitoring also supports a more comprehensive and culturally-inclusive custodianship that recognises and celebrates Indigenous expertise and value systems. Connecting Indigenous communities to government provides a mechanism for identifying priorities that may differ from Eurocentric ideals, holding governments accountable and scrutinising the implementation (or non-implementation) of policies and programs that are crucial for developing meaningful relationships for the betterment of the environment and Indigenous community whose lives are intertwined.

> It's one thing basically leading to the next. We will find ourselves in that situation one day, where we basically have nothing. Most of our traditional food is gone. Hopefully today we can at least look at trying to get it back or getting some of it back... we still survive, yet we survive with less and less of our traditional foods and stuff that have been taken away. I've eaten beans that you can't get now and my grandkids will never have the chance. The change has been really drastic.

Historically, Indigenous policy in Australia has oscillated between varying governmental approaches, including "decolonising" strategies that emphasise self-determination, economically driven models of "practical reconciliation" and symbolic commitments such as the formal apology and Closing the Gap targets. However, in the absence of meaningful relationships and, thereby, meaningful progress towards Indigenous sovereignty, policy interventions in Indigenous affairs – including those related to environmental and coastal management – have remained firmly embedded within deficit-based and paternalistic frameworks. Rather than enabling Indigenous leadership in the stewardship of Country, these approaches have often reproduced dependency and reinforced colonial power relations within natural resource governance. Efforts to seek Indigenous input into policymaking, including in coastal planning and restoration, have similarly been critiqued as "ritual calls to action" characterised by limited Indigenous participation, inadequate resourcing and a lack of real decision-making authority.

In contemporary coastal management, Indigenous voices continue to be marginalised through colonial governance structures, tokenistic consultation processes and initiatives that privilege Western scientific and managerial values over Indigenous Knowledges and practices. This marginalisation is further exacerbated when community perspectives on marine and coastal environments are misrepresented or filtered through non-Indigenous intermediaries, or through select Indigenous representatives positioned as symbols of inclusivity while ultimately reinforcing Eurocentric agendas. As a result, Indigenous relationships to sea Country, including long-standing practices of care, cultivation and reciprocal stewardship, remain constrained rather than centred in coastal management, restoration and decision-making frameworks.

In this research, we recorded knowledge and perspectives gathered from representatives of an Indigenous community, the Gamay Rangers and La Perouse Indigenous community, to identify the issues currently inhibiting reconnection to cultural heritage. The findings from this case study have been used to inform opportunities for policy change to meaningfully and symbiotically unify Indigenous and Western knowledge systems to support environmental regeneration.

CASE STUDY

Gamay Rangers

The Gamay Rangers of the La Perouse Local Aboriginal Land Council are an Indigenous-led land and sea management group operating across Gamay (Botany Bay), integrating deep cultural knowledge with contemporary science to restore Country, protect marine and coastal ecosystems and enhance community wellbeing.

Their work is grounded in cultural authority, supported by strong community legitimacy and strategically aligned with state and national government priorities in marine conservation, Indigenous co-management and community engagement.

This makes them an ideal partner for a policy-focused case study, offering a powerful model for effective, place-based governance and transformative environmental outcomes.

Yarning circle methodology

A yarning circle is a traditional Indigenous cultural practice used across many Aboriginal and Torres Strait Islander communities in Australia. It is a communal, conversational space where people come together to share stories, knowledge and experiences in an environment built on respect, deep listening and equality.

The term "yarning" refers to a way of communicating that goes beyond casual conversation — it is about building connection, understanding and relationships. When held in a circle, it symbolises unity and inclusivity, with everyone sitting at the same level, without hierarchy or judgment. This process has a few principles of respect that will help build a meaningful relationship with those one wants to collaborate with.

Yarning circles are a deeply rooted cultural practice for sharing knowledge between Elders and community members. When building relationships with Indigenous communities, it is essential to approach these interactions with respect. Adopting a yarning circle methodology demonstrates this respect by aligning with Indigenous ways of sharing knowledge, and recognising that knowledge is collective, evolving and built through the contributions of all participants rather than held by any single individual. More common principles of respect that should be incorporated by government, and more broadly by industry and academia, when building a relationship with an Indigenous community are as follows:

Principles of respect in building collaboration

1 Time

Building meaningful relationships, engaging in dialogue, and making collective decisions with Aboriginal and Torres Strait Islander people requires time, patience and ongoing commitment. Genuine engagement is neither transactional nor rushed. It involves allowing time for yarning, deep listening, consulting elders and community members and honouring cultural protocols. Highlighting that relationships and processes are valued as much as the outcomes.

In this project, relationships with the Gamay Rangers were pre-existing. Genuine collaborations with the La Perouse Indigenous community formed the basis for this project.

2 Place

Understanding where yarning circles should occur is important, as place plays a significant role in creating a safe and respectful environment for participants and knowledge sharing. Respecting place means acknowledging that Country is not merely a physical location, but a living entity that connects people, ancestors, stories and knowledge systems. In practice, respecting "place" means engaging with communities in ways that honour local protocols, languages and custodianship (place-based knowledges). It requires understanding that each place has its own governance structures, cultural responsibilities and histories that must be acknowledged and followed.

Selecting an accessible, comfortable and culturally-appropriate space for yarning circle participants is essential to fostering meaningful engagement and enabling, where appropriate, on-Country demonstrations of practice.

3 People

Understanding the number of people within a yarning circle is important to allow those who participate to be, and feel like, they have been properly heard and respected for their knowledge. Genuine engagement with local communities will inform how many people should be present and who they might be.

4 Acknowledgement

Recognition of Traditional Owners and Custodians in decisions that affect their lands and waters, and ensuring their voices guide all place-based work, builds respect. It acknowledges the time their communities have cared for that land, sea and sky Country and the knowledge they possess about that place.

5 Indigenous Values and Indigenous Cultural and Intellectual Property

The identification of knowledge and who it belongs to is a continuing area of concern for Indigenous communities. Building protocols around the ownership and usage of the knowledge shared by community members highlights respect for their knowledge, where it has come from, the community and place.

Three primary findings emerged as major themes from community yarning circles:

- The importance of forming a meaningful relationship for **engagement and partnership** with the Indigenous community for coastal governance.
- The impact of **incorporating Indigenous values and Indigenous Cultural and Intellectual Protocol** by understanding the importance of place-based knowledges for the Indigenous community and environment.
- The impact of **Traditional Ecological Knowledge** on the environment and its incorporation into modern restoration practices.

Engagement and partnership

> “You can go up the Cooks River today, and if you're swimming that river, I’ll give you a million dollars. I would never swim in it. I'd never eat anything that came out of it. And they say they're cleaning it up. I’m saying the only way you’ll clean it up is to block it off and fill it in with concrete.

The cultural and ecological significance of habitat restoration on the identity of the Gamay people can be understood through the framework of “social-ecological traps”; a situation in which “feedback between social and ecological systems leads toward an undesirable state that may be difficult or impossible to reverse”.[9]

From an Indigenous perspective, a social-ecological trap describes how anthropologically caused ecosystem collapse severs cultural practices, ruptures the continuation of culture and reinforces the policies of assimilation into the settler state. In Gamay, severe pollution from surrounding factories, boat ports, shipping terminals and airport (e.g. heavy metals, crude oil, toxic chemicals and sewage) has contaminated connecting waterways, causing severe eutrophication and putrefaction of many water and food sources.

> “We had a lot of... Oil spills...It wasn't uncommon... black, thick oil on the beach. After a while, they didn’t even bother to clean it up... Towards the end... the mullet was actually getting oilier. You could see it when you slit them open.
>
> “Apart from the crude... there'll be other chemicals and substances that come with it. Botany was a big, factory suburb... I used to work at Orica [a chemicals manufacturing facility at the Botany Industrial Park], and they lost something like twenty-two thousand tons of mercury over the years... We used to clean up the mercury.. [it] was just everywhere... And that eventually found it’s way in the waterways... I think, that’s where our pollution problem started...Millpond Road is the most polluted beach in Australia because of the heavy metals....That was the first settlers early water, Millpond. Now when you drive past it just stinks... They've contained it and it's just grown with moss and sludge and it stinks.

The overfishing and contamination from local industries continue to impact marine life. Within a single lifetime, traditional foods like pipis, lobsters, bimbalas, oysters and mussels have become inedible and, in some cases, are approaching local extinction. Reliant on foods harvested from the bay, surrounding Indigenous communities are at risk of experiencing a social-ecological trap (loss of traditional fishing), without having produced any industrial pollution or engaged in harmful fishing practices that have contributed to ecosystem collapse.

Despite this unique vulnerability, mitigation and adaptation responses are rarely acknowledged or implemented, reflecting a persistent misalignment between official assessments produced by regulatory authorities and the lived realities of local communities. For instance, the Kamay Ferry Wharves Environmental Impact Statement (2019–2020) reported that 93 per cent of Botany Bay and lower Georges River swimming sites were graded as "good," indicating "generally good microbial water quality" and that waters were considered suitable for swimming most of the time. However, this official characterisation stands in stark contrast to the experiences of Indigenous community members, who routinely describe the Cooks River, Georges River and Gamay (Botany Bay) as having persistently poor water quality, marked by unpleasant odour and significant turbidity throughout much of the year. This divergence highlights a fundamental gap between regulatory water quality metrics and Indigenous environmental observations, suggesting that formal assessment processes insufficiently account for community knowledge and may rely on selectively chosen data rather than a comprehensive representation of environmental conditions.

Despite governments and environmental non-governmental organisations publicly acknowledging the value of Traditional Ecological Knowledge, there has been a continued failure to appropriately regulate chemicals leaching into the waterways and soil. This has severely compromised the health and wellbeing of knowledge holders, hindering intergenerational transfer and therefore risks the loss and fragmentation of Indigenous knowledge.[10]

In conjunction with colonial disruptions such as the separation of families from their ancestral lands, the breaking of community connections, the prohibition of cultural practices and the impact of urban development, it is the systemic lack of Indigenous participation, communication, negotiation and compromise that has so greatly damaged trust between Indigenous peoples, government, industry and scientists.

With the health of natural ecosystems and Indigenous cultural heritage dependent on meaningful co-management partnerships among these stakeholders, facilitating Indigenous autonomy over decision-making and land care is a critical component of effective policy reform that delivers improved outcomes. This involves building long-term, reciprocal relationships to improve the government's interactions with the environment and to understand how this may affect the Indigenous communities who live in these environments.

Recognition of the importance of building meaningful relationships, engaging in dialogue and making collective decisions with Indigenous peoples requires time, patience and ongoing commitment. Engagement and creating meaningful connections should be an ongoing and, importantly, foundational part of a project, giving the time to form meaningful relationships and build trust. This approach will foster more inclusion and sharing from a community perspective, giving greater depth of knowledge shared and avoiding engagement being perceived as transactional or as a one-off event. This approach recognises that relationships and processes are valued equally to outcomes.

Traditional Ecological Knowledge

The Gamay Rangers have played a key role in safeguarding special sites such as middens, protecting marine mammals and restoring ocean ecosystems to bring back scarce shellfish species like crabs, lobster and abalone that have declined over the past three decades. Indigenous perspectives, values, and conservation priorities differ from conventional wildlife management agencies and remain unacknowledged in restorative practice and policy.

Bureaucratic challenges, such as lacking appropriate credentials, have greatly limited their ability to carry on ancestral practices or manage culturally significant species. This was recently demonstrated following a beaching event in 2025 of the community's spiritual ancestor, the Burri Burri (Humpback Whale) at Bundeena Beach. Currently, stringent rules around environmental biohazards and the interference of culturally significant Indigenous sites prevent the Rangers from ceremonial disposal of the Burri Burri remains. Regardless of unceded ownership of those Indigenous sacred sites, these regulations meant the Burri Burri body was disposed of in a landfill rather than allowed to decay naturally, be buried in sand dunes, or even be pushed back out to sea as dictated by tradition.

Similarly, despite having the ancestral rights, knowledge and skills to maintain culturally significant artifacts such as rock carvings, without the appropriate certifications, the Rangers have not been allowed to re-etch the engravings. Consequently, many of the images, and the knowledge and ceremony surrounding them, have faded or disappeared.

> We have community members that want to keep culture going but can't because permits and legislation doesn't allow... We have family members who should be able to re-carve their cultural heritage but aren't able to because of legislation... we've got a whale engraving down here that's disappeared now. Our most significant spirit ancestor. Yes we've got a stencil, yes we've got a satellite image but it's not the same and it's because we've been battling bureaucracy for several decades. ...it was important that people could see it because there was ceremony around it... a whale ceremony. It's gone. I wouldn't even know what that whale ceremony is because in my time it hasn't happened. And the more these engravings fade, that's what'll happen. Things just fade away. Confusion.
>
> "I remember a few of the oldies coming up to me in the 80's saying "We gotta re-etch this. Why aren't you telling your National Parks, people, that we shouldn't have to go through all this bullshit?." We should have the right to come down here and do whatever we want. There should be a level of acknowledgment, and trust and respect that we know what we're doing, we know what it is, we know what needs to be done."
>
> "This is what's happening with bureaucracy- basically erasing a lot of our culture. I mean we can tell them in stories but we still want to be able to physically go out and look at that. Culture is more than a story- it's the 5 senses all coming in... tasting, seeing, hearing, feeling, smelling... it's practice. They're all things that connect us... geography, family, an engraving, a special place- they're all layers of connection for us. If we lose them, there's a broken connection there. They're all links in a chain. We break a link in a chain, where do we go from there?"

Even in collaborative projects with universities and marine institutes that investigate ecological problems like sea urchin barrens and work on seagrass habitats, difficulties in acquiring permits and approvals greatly limit meaningful change. For example, Project Restore, a multihabitat restoration project led by the Sydney Institute of Marine Science, funded by the NSW Environmental Trust as part of the Seabirds to Seascapes Program, has been significantly delayed in implementing the different repair interventions across Sydney Harbour due to the complexities of obtaining approvals for restoration. These complexities mainly stem from inefficiencies in the NSW's planning instruments, with restoration works following similar approval processes to coastal development works, as well as the landowners' perception of restoration as a high-risk activity, influencing the approval process and the uptake of the interventions.

Formally integrating Indigenous knowledge systems into environmental policies requires acknowledgment of their validity and efficacy alongside Western science. Integration of Indigenous knowledge and Western science can lead to more adaptive, place-based solutions that are culturally appropriate and resilient, moving away from universalist, top-down approaches. Genuine integration includes ensuring that Indigenous representative bodies can self-organise and regulate according to their own needs, wants and values without government regulation or intervention, and that Indigenous people are leading projects in alignment with these community values and traditions.

> “Because they're working for their community and they're not working for other people, so... It's always going to be real, and it's always going to be straight up. It's not going to be politicised, or wrapped up in legislations or anything like that. And I think we need that, because a lot of people...[think] we need white people to run these things. We really don't, we just need to be able to set up the table for... government to come to community.”
> “My family have always had that saying... " “You have to give it away to keep it.”... You had to give your stories away to keep them going. You had to give your knowledge away to keep the knowledge going. You had to give away the skills around, you know, deep sea diving or fishing or hunting or gathering-- like it was all a part of giving it away, so that it goes to that next generation... if you're going to gatekeep that knowledge and that information, then it would have gone extinct hundreds of years ago.

The welcoming of visitors and the sharing of the world's longest continuous environmental education system by Traditional Owners carries both a profound cultural obligation and an inherent right for all Australians to learn the joy of place, alongside the responsibility to care for it. Indigenous peoples have sustained and adapted complex systems of land and sea management over tens of thousands of years, developing place-based knowledges that maintain ecological balance, biodiversity and resilience. Learning from Indigenous custodians is therefore essential not only to understand local environments, but also to inform more responsive and sustainable approaches to contemporary environmental challenges.

Indigenous resurgence and engaged environmental stewardship depend on the meaningful recognition of Indigenous knowledges in contemporary contexts, allowing culture to persist as a living, adaptive practice that evolves alongside technological and scientific advancement, rather than being reduced to tokenistic representations of a supposedly static or "primitive" past. Celebrating Indigenous ways of knowing, being and doing thus requires liberating Traditional Ecological Knowledge from paternalistic, Eurocentric interpretations that revere ancient practices without recognising their ongoing validity, innovation and applicability within modern environmental governance. This also necessitates dismantling entrenched binaries — such as nature and culture, or people and environment — to enable genuinely integrated knowledge systems that are capable of supporting holistic, Indigenous-led environmental management.

> Sittin' around talking- that's all about the cultural practice, and it gets lost in translation because they just see a modern boat and a modern net...We get those comments, commercial fisheries get those comments-- people saying "oh, how is it modern fishing?". But come have a fish with us. Listen. Even the subtleties of knowing how to read the surface of the water, or underwater movement. Is it mullet or is it Whiting? Salmon? That's all part of the cultural practice, it's not all about just catching it in a net mate.

Indigenous values and Indigenous Cultural and Intellectual Property

Western science is largely characterised by a positivist, materialist approach, often using reductionist, mechanistic and quantitative methods that are widely accepted and applied in biodiversity conservation, regardless of context or location. In contrast, Australian Indigenous knowledge systems are context-specific. They are dependent on physically seeing, feeling and voicing the correlations, changes and interactions that occur between the abiotic (non-living components of an environment) and biotic (living components of the environment) features of the land. This holistic understanding of relationships and changes within natural systems makes Indigenous knowledge holders exceptionally skilled at quickly and easily identifying declines in ecosystem health, the root causes and, importantly, high-impact solutions. This can lead to meaningful practices – combining Indigenous and Western knowledges – to benefit the environment and be incorporated into policy to benefit social, cultural and economic health of the area more broadly.

> The bottom used to be quite soft... now it's a lot harder... it's more compacted. Yeah, especially along Foreshore Road, cause your feet used to sink in. And it was a greyish sort of sand. Yeah, different colour."
>
> "The reintroduction of marine animals like Gropers... Brim... all of those type of fish... We're literally not seeing them here, because... there's no camouflage for the fish... there's no food for the crustaceans... weed restoration... I think that's one of the key things that we should be doing because... everything will evolve from that. If the sea grass is there, everything will start coming back.

For example, in the Gamay area, due to dredging and changes in wave dynamics due to man-made structures on shorelines, Indigenous community members feel an increased compaction of the seafloor that they believe has prevented seagrass from rooting in the sediment where seagrass meadows were previously. This has destabilised the benthic environment (the area at the bottom of a body of water), forming a positive feedback loop in which the sand is further compacted without seagrass to buffer wave energy. Although Western-led restorative projects in the Gamay area have reintroduced large marine animals, such as gropers and brim, to regulate the ecosystem, populations have not been sustained without the habitat and food provided by seagrass.

> “The biggest change I've seen in my lifetime that impacted my father and my grandfather was when they built that wall. Because the mullet are a seasonal fish... They came in on that side of the bay and... used to follow the beaches around. But when they built... the break wall out there, the mullet would swim around all the other bays. And as soon as they’d get to the break wall they’d swim straight out. So it virtually... cut the amount of fish our people could catch in half.”

Indigenous knowledge is deeply rooted in emotional and relational engagement with the environment and is transmitted across generations through practices such as storytelling, ceremony and art. In contrast, Western scientific approaches have often framed the environment as a usable and effectively limitless resource, shaping research priorities and funding allocations based on perceived economic or scientific value. As a result, environmental and industrial projects frequently overlook or fail to account for changes in species populations, migration patterns, life cycles and broader ecological processes — particularly those involving unstudied or locally significant species.

From the Cooks River, the migration pattern of mullet fish has travelled seasonally along the north-eastern edge of the bay, passing through each beach before reaching the South Pacific Ocean. As this migration journey is taught to younger mullet generations by sexually mature adult fish, Indigenous fishing practices ensure that only older mullet fish, who have passed the age of reproduction, can be caught in specialised traps or targeted net fishing. This ensures that the fish population and behaviour persist for future generations.

In recent years, this pattern of migration has been interrupted through the addition of man-made walls and structures such as Port Botany, Port Botany West and the Sydney Airport runway, which have significantly shifted the coastline and migration pattern. Indigenous community members have reported watching around 50 per cent of the mullet stock swim straight out to sea, rather than travelling into Yarra Bay and Congee.

> They had a model... of the bay, over at the airport ...and a map of the bottom of the bay, what it looked like and all this... they reckoned they knew the intake and the water movements and everything... [they said], "it will do this, it will do that" and nothing...” They didn’t have a clue, the exact opposite happened.” “I asked about the waves -- what about the ricochet?—[they said] “oh, there will be no ricochet! Because the force of the wave will go into the break wall the way it’s designed, and that'll break it down.” [laughter]... that's what they said, that the design and the material they used would break the waves, they would dissipate.”

The construction of a breakwall has not only limited the community from a traditional food source but also changed historical pathways of sediment flux and wave direction. Despite the reassurance that the design and engineering of the wall, and the use of predictive morphodynamic beach models, would prevent any major problems from occurring, the severe erosion caused by dredging and wave energy ricocheting off the structure required hundreds of tons of sand to be delivered on trucks to rebuild the Brighton-Le-Sands Beach front.

Warnings and concerns voiced by the Gamay Rangers and Indigenous community about the impacts of ongoing erosion along the western shore and accretion on the eastern shore of the bay have remained largely unaddressed. This is of particular concern as the damage to benthic habitats caused by physical alterations to the seafloor has displaced or eliminated the communities of organisms that live within them, disrupting the food web and the ecological balance of the bay. Sediment resuspension also releases trapped contaminants, including mercury and oil refinery pollutants, into the water column. Once suspended, these contaminants can spread to new areas, become more bioavailable to aquatic organisms and potentially increase exposure risks for wildlife and humans. Increased solid suspension can reduce light penetration, affecting photosynthetic organisms, such as seagrass and overall water quality. Recovery of these habitats can be a slow process, sometimes taking years or even decades, depending on the severity and scale of the damage.

These impacts underscore the limitations of conventional management frameworks and the need to meaningfully embed Indigenous custodial knowledge within place-based environmental governance. All Australian waters and land are storied and tied to specific place-based knowledge. The integration of Traditional Ecological Knowledge and expertise of traditional landowners within formal management processes must recognise this and align with the nations, cultures and identities of individual Indigenous communities that existed before European administration. Countries, divided according to independent but interconnected geographical features and sacred sites, necessitate the establishment of tailored, separate and localised consultation protocols that allow all thoughts, concerns, ideas, knowledge and skills to be heard and acted upon in an honest and open manner.

Indigenous knowledge is neither generic nor transferable; it is intrinsically grounded in place, language, kinship and generations of lived experience. Acknowledging this locational integrity is fundamental to ethical and effective environmental governance. For this reason, place-based Indigenous knowledges must be embedded within routine environmental and operational practices, ensuring that all activities are guided by the Traditional Custodians of the specific Country on which they occur. Upholding Indigenous Cultural and Intellectual Property protocols is essential to prevent the misuse or misappropriation of knowledge across different locations. Consequently, the development of nation-specific policies and restoration protocols, led by Indigenous communities, should be prioritised. When Indigenous and Western sciences are respectfully and purposefully integrated, they enable more adaptive, culturally grounded and resilient approaches to environmental management and restoration.

A policy agenda for NSW

Legislative and policy reform must actively empower Indigenous-led biocultural conservation across public lands. Embedding Traditional Ecological Knowledge within environmentally sustainable development frameworks and strategic land-use planning will ensure that Indigenous knowledge systems inform ecological assessments, conservation strategies and development controls at every level of decision-making.

This requires revising and adapting existing policies and guidelines that currently restrict or overlook cultural practices and replacing them with frameworks that reflect and facilitate the aspirations of Indigenous communities. Access to funding could also be expanded to support Indigenous-led conservation initiatives, enabling communities to restore Country and maintain cultural governance on their own terms.

Integrating Traditional Ecological Knowledge into mainstream education and training systems is also essential to dismantle colonial structures that constrain Western understandings of Indigenous environmental knowledge. Reducing this colonial load means embedding Indigenous perspectives across sectors and ensuring that environmental management is guided by the principles of Indigenous self-determination.

Ultimately, this approach recognises Indigenous peoples as the primary environmental stewards of their lands and waters, whose sovereignty, governance systems and place-based knowledge must form the foundation of contemporary conservation and resource management policy.

The following policy opportunities aim to establish an underlying framework to administer the protection, access and benefit-sharing regimes for Traditional Ecological Knowledge. The three main community concerns are as follows:

1. **Building trust between Indigenous communities and government institutions**
2. **Strengthening biodiversity outcomes through culturally-informed restoration and management; and**
3. **Enabling Indigenous peoples to fulfil their cultural rights and responsibilities to care for Country in ways that align with both tradition and contemporary science**

Finally, all the above points will be expanded on below and serve to advance the NSW Government's obligations for reconciliation, sustainability and environmental management.

1 Enhance Aboriginal engagement and partnerships

As shown above, incorporating a mechanism for building meaningful relationships with Indigenous communities is an important aspect of restoration. Governments at all levels could establish formal mechanisms for Aboriginal participation in biodiversity governance, including advisory, decision-making, implementation and delivery phases. This would involve:

- Establishing dedicated committees within biodiversity management boards that can voice community values, needs and concerns.
- Ensuring identified positions for Aboriginal representation on relevant statutory committees where currently no designated Aboriginal members exist (e.g. NSW Threatened Species Scientific Committee).
- Clarifying the roles and responsibilities of Aboriginal regional representative bodies (such as Local Aboriginal Land Councils, Native Title organisations, Elders groups, etc.) and peak body structures, shifting the discourse from competition to complementary work.
- Establishing an effective and meaningful relationship with the Indigenous community by which colonial bodies of authority (i.e. State government departments such as the Department of Primary Industries and Regional Development and Department of Climate Change Environment, Energy and Water, local councils, scientific bodies such as the state Environmental Protection Agencies [EPA], and industry partners for the area [in this case, Orica]) can respectfully communicate and collaborate. This includes:
    - Consulting with community about potential environmental changes e.g. the addition of infrastructure (i.e. hot water outlets) and restoration practices.
    - Warning community of potential pollutant risks and/or hazards.
    - Notifying authorities/industry of community concerns. Issues raised must be recorded, addressed, and discussed with community and relevant parties, and follow-up steps and progress must be communicated regularly.
    - Improving transparency around chemical testing and species tracking.
    - Nurturing trust and reciprocity between non-Indigenous and Indigenous communities.
- Co-designing an emergency response plan specific to the risks and potential dangers threatening community. This includes:
    - Elevating precautionary measures to prioritise community concerns (e.g. waste management practices).
    - Creating an “Immediate contact plan” (by government officials) with a representative community organisation or body (such as Land Councils) as soon as potential risks or hazards are flagged in the environment.
    - Contacting affected communities during and after emergency responses.
    - Regularly updating community of incident progress, changes to strategy, involved parties and stakeholders, new information. etc.

2 Prioritise and protect Indigenous values and Cultural and Intellectual Property

Legal safeguards for Indigenous Cultural and Intellectual Property related to biodiversity and conservation knowledge could be further strengthened to support positive environmental outcomes. This is to prevent misuse or appropriation and acts to respect Aboriginal ownership of cultural information embedded in conservation practices. This could involve:

- Revising, reforming and adapting already established policies, for example the NSW Local Land Services Act (2013), Biodiversity Conservation Act (2016), Crown Land Management (2016) Land Management (Native Vegetation) Code (2018) and State Environmental Planning Policy (Biodiversity Conservation) (2021) to explicitly prioritise Aboriginal cultural values in conservation decision-making processes and better facilitate place-based Traditional Ecological Knowledge.
- Developing nation-specific Indigenous values and Indigenous Cultural and Intellectual Property contracts and protocols.
- Recognising culturally significant species and ecosystems not only by Western scientific criteria but also through Aboriginal cultural importance and Traditional Ecological Knowledge. This includes:
    - Establishing protocols for the status and risks threatening bioculturally significant species and ecosystem of concern (Indigenous community members are often already doing this but do not have the means to present the data).
    - Assessing sources of pollution impacting ecosystems to develop effective and site-specific methods of redirecting and appropriately disposing of pollution. For example, criminalising and/or heavily fining the dumping of oil and chemicals into coastal areas (the fine must greatly outweigh the cost of properly disposing of chemical waste).
    - Regularly evaluating mitigation strategies, safety measures and restoration projects to ensure effectiveness and allow for continuous improvement.

3 Incorporate Traditional Ecological Knowledge for environmental management

Aboriginal Traditional Ecological Knowledge could be more effectively and comprehensively incorporated into environmentally sustainable development practices and land use planning to ensure that Aboriginal knowledge systems inform ecological assessments, conservation strategies and development controls. This could include:

- Revising, reforming and adapting policies and guidelines that hinder, restrict or change cultural practices to better reflect and facilitate the needs of community. One such example is the protection of culturally important rock carvings. These sites are “protected” by national parks, but this inhibits the Indigenous community from re-carving them as a cultural practice.
- Incorporating Traditional Ecological Knowledge into mainstream education systems to address the colonial structures that preface limited understandings of Indigenous culture and issues, thereby reducing the colonial load burdening Aboriginal people.
- Enabling legislative support for Aboriginal-led biocultural conservation projects on private and public lands by expanding eligibility and access to funding through programs such as the Biodiversity Conservation Trust's Cultural Biodiversity Conservation Offer. This supports the restoration and protection of culturally significant species and habitats.
- Improving and developing pathways for acquiring the necessary permits for cultural practices that are flexible, fit for purpose and recognise the leadership of Aboriginal people and the cultural knowledge and expertise applied.

Potential outcomes and conclusion

Indigenous culture is predicated on being part of, and holding responsibilities within, community and Country. However, as a consequence of forced colonial displacement, Indigenous Australians have been systematically excluded from caring for Country, which is driven by lore, practices and governance systems. This disruption has undermined Indigenous environmental stewardship, limiting the application of long-established land and sea management practices that maintain ecological balance, biodiversity and ecosystem resilience.

Reinstating traditional responsibilities, such as harvesting, cultivating, burning and caring for Country, restores Indigenous authority and accountability within ecosystems, enabling the renewal of place-based ecological knowledge and practices refined over millennia. These responsibilities support environmental wellbeing by sustaining species populations, strengthening habitat connectivity and reinforcing reciprocal relationships between people and Country. Future policy frameworks must recognise the ongoing and relational nature of Indigenous peoples' connections to the settler state, extending beyond environmental management agreements to address colonial structures that continue to privilege Western ecological frameworks while marginalising Indigenous environmental knowledge systems.

The expectation that Indigenous peoples compensate for institutional knowledge gaps in environmental governance constitutes an ongoing colonial burden and must be addressed through sustained commitment from non-Indigenous institutions to engage with, learn from, and apply Indigenous conservation principles within everyday practice and across formal and informal education systems. Beyond improved community engagement and shared custodianship, joint management frameworks enable a fundamental shift away from anthropocentric environmental management toward an earth-centred ecological consciousness in which humans are understood as part of a larger, interconnected living system.

This perspective, embedded within many Indigenous cultures, promotes policy approaches that prioritise ecological health and reciprocal relationships with Country, with the capacity to inform and reshape global dialogues on sustainability, climate change and biodiversity conservation. Accordingly, policy reforms that centre trust-building and meaningful partnerships with Indigenous communities can enable genuine, reciprocal ecological knowledge exchange and strengthen the capacity of ecosystems to adapt to environmental change. Recognising and embedding place-based knowledges foregrounds the critical role of Indigenous communities in protecting species, restoring habitats and maintaining ecosystem integrity, while advancing NSW's reconciliation and sustainability frameworks. Integrating Indigenous knowledges and Indigenous-led governance into environmental management enhances the health of ecosystems and Country, while upholding cultural rights and responsibilities and aligning traditional and contemporary science within Indigenous-led restoration practice.

Annex A | Experts consulted

- **Assen Timbury**
  La Perouse Indigenous Community Elder/knowledge holder, member of the La Perouse Aboriginal Community Cultural Fishing Group
- **Barry Cooley**
  La Perouse Indigenous Community Elder/knowledge holder, member of the La Perouse Aboriginal Community Cultural Fishing Group
- **Barry Ella**
  La Perouse Indigenous Community Elder/knowledge holder, member of the LaPerouse Aboriginal Community Cultural Fishing Group
- **Dolly Brown**
  La Perouse Indigenous Community Elder/knowledge holder
- **Harley Lester**
  La Perouse Indigenous Community knowledge holder, member of the La Perouse Aboriginal Community Cultural Fishing Group
- **Latoya Brown**
  La Perouse Indigenous Community knowledge holder
- **Margaret Brown**
  La Perouse Indigenous Community Elder/knowledge holder
- **Michael Cooley**
  La Perouse Indigenous Community Elder/knowledge holder, member of the La Perouse Aboriginal Community Cultural Fishing Group
- **Michael Walker**
  La Perouse Indigenous Community Elder/knowledge holder, member of the La Perouse Aboriginal Community Cultural Fishing Group
- **Robert Cooley**
  La Perouse Indigenous Community Elder/knowledge holder, Senior Ranger of the Gamay Rangers, member of the La Perouse Aboriginal Community Cultural Fishing Group
- **Robert Russel**
  La Perouse Indigenous Community Elder/knowledge holder, Ranger of the Gamay Rangers, member of the La Perouse Aboriginal Community Cultural Fishing Group
- **Rodney Ella**
  La Perouse Indigenous Community Elder/knowledge holder, member of the La Perouse Aboriginal Community Cultural Fishing Group

Endnotes

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