Weaving Knowledges for a More Sustainable and Fair Circular Economy:

A Framework for Respectful and Collaborative Indigenous Research in Australia

by Laura Vecoli
MSc Industrial Ecology

TU Delft - Leiden University
October 2023

Weaving knowledges for a more sustainable and fair circular economy: A framework for respectful and collaborative Indigenous research in Australia

by: Laura Vecoli

In partial fulfilment of the requirements for the degree
of Master of Science in Industrial Ecology
at Leiden University and Delft University of Technology

First supervisor:	Dr. Udo Pesch
Second supervisor:	Dr. Jenny Lieu
Additional support:	Dr. Anthony Halog
Project Duration:	February 2023 - October 2023

This thesis and the supplementary information are available at http://repository.tudelft.nl.

Cover Image: Own design

TU Delft Delft University of Technology

Universiteit Leiden The Netherlands

Disclaimer:

This thesis respects and acknowledges the rich and diverse cultures and knowledge systems of Aboriginal and Torres Strait Islander peoples, the First Nations of Australia. I am committed to promoting cultural sensitivity, and any reference to Indigenous heritage is made with deep respect. Despite precautions to use correct language and terminologies, the contents or wording of this thesis may cause offense. I sincerely apologize if any offense is caused, as my intent is to promote respectful research practices and foster cultural understanding from my perspective.

Acknowledgements

First and foremost, I wish to acknowledge the Turrbal and Yuggera people, traditional custodians of Meanjin (Brisbane), where my research took place. I also acknowledge all Aboriginal people, and pay respect to their sacred knowledges, stories, and their ever present Dreaming. It is an honor to have had an introductory outlook into the rich tapestry of Aboriginal knowledge systems. I am particularly grateful for the generosity of the Indigenous participants of my research, who helped me navigate Aboriginal culture and knowledge systems, and who taught me so much beyond the scope of my research. If one of you is reading this – thank you, this research could not have happened without your help.

My gratitude goes out to Dr. Anthony Halog, the first person to support my crazy dream to conduct my thesis research in Australia. Thanks to him, I could enroll as a visiting research student at the University of Queensland and begin my research on-site. I also want to say thank you to my supervisors Dr. Udo Pesch and Dr. Jenny Lieu, for allowing me to do this atypical research for industrial ecology, and for giving me so much flexibility in my work. Your mentorship has provided me with the opportunity to develop as both a researcher and a person.

It goes without saying that this thesis has been a collective effort, and there are many more people that directly or indirectly inspired me and contributed to this work. Special thanks to Maurizio and Rosalia, for introducing me to other researchers in Australia and making me feel at home with your lovely Italian Sunday lunches.

I am so grateful to my family, for supporting me no matter what, encouraging me to follow my dreams, and reminding me of the important things in life. Vi voglio bene!

I wish to thank my wonderful friends, old and new; even though I was far away in Australia, I was never alone. Special shout out to Hannah and India for taking the time to proofread my work.

Lastly, thank you Kevin, for always cheering me on and standing right by me, even from a distance. Thank you for giving me advice when I needed it, and for encouraging me through the difficult times.

I feel so lucky to have had such lovely friends and family with me on this journey, so I say again: thank you!

Table of Contents

List of Definitions

- **Aboriginal and Torres Strait Islanders**: the first peoples of Australia, that within the Australian continent before British colonization for circa 60,000 years (Clarkson et al., 2017).

- **Mob**: A colloquial term used to identify a group of Aboriginal people associated with a particular place or Country. It is used to connect and identify who an Aboriginal person is and where they are from. "Mob" can represent a family group, clan group, or wider Aboriginal community group (Ipswich City Council, 2016).

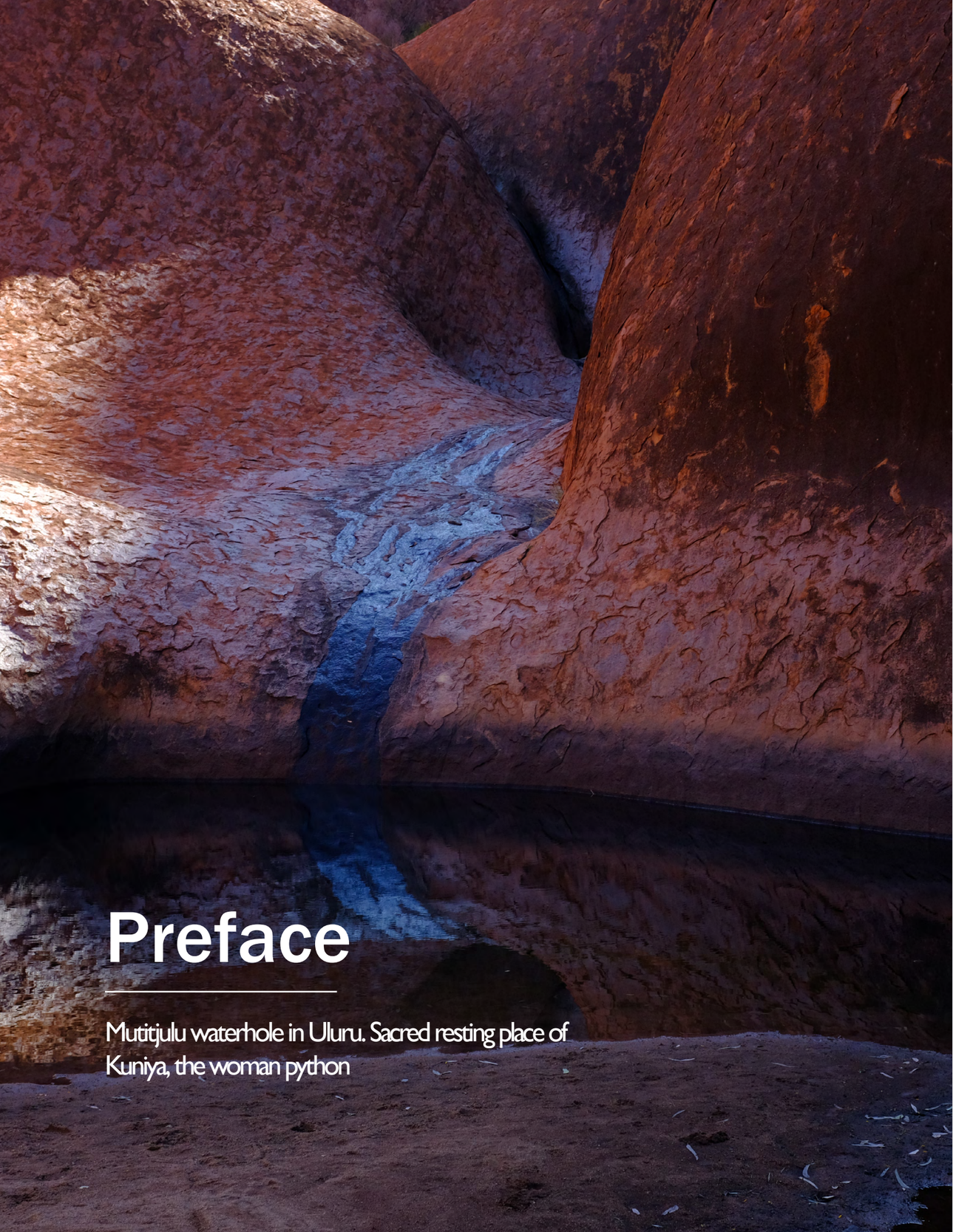
- **Yarning**: In Aboriginal English, "to have a yarn" means to have a conversation or discussion (Shay, 2021). Yarning implies the weaving together of different stories to articulate new understandings and create new relationships (Bessarab & Ng'andu, 2010).

- **Worldview**: A worldview is "a collection of attitudes, values, stories and expectations about the world around us, which inform our every thought and action"(Gray, 2011). It can be expressed in different ways, such as in ethics, religion, philosophy, scientific beliefs and so on (Gray, 2011).

- **Country:** In Aboriginal English, Country does not just refer to the land itself but also the "people, animals, plants, Dreamings, and underground, earth, soils minerals and waters, surface water, air. There is sea country and land country; in some areas people talk about sky country" (Dudgeon & Bray, 2019, p.4).

- **Dreaming**: The Dreaming is a complex concept in Aboriginal cosmology that is centered around the idea of timelessness. It is a source of knowledge and wisdom that has been passed down through generations via storytelling, song, dance, and art. It is not, however, a relic of the past, and is continuously unfolding (Hume, 2000).

- **Circular Economy**: A model of production and consumption that "eliminates waste and pollution, is regenerative by design, and aims to circulate products and materials at their highest utility and value" (EMF, 2023).



Preface

Mutitjulu waterhole in Uluru. Sacred resting place of Kuniya, the woman python

For many Aboriginal communities, water – a rare occurrence in the dry and arid climate of Australia – often holds sacred meaning (Mountford & Roberts, 1965). In the traditional land of the Yolngu people, known today as Caledon Bay, is a mangrove lagoon in which saltwater and freshwater join to form a union of spiritual importance.

The two streams, one from the sea, and the other from inland, meet to create a foam that represents 'Ganma': a metaphor for the unveiling of truth and the attainment of deeper understanding that is only possible in the encounter of differences (Watson & Chambers, 1989). In the same spirit, this thesis explores the foam that results from the confluence of Indigenous and Western ways of knowing, in the effort to seek a deeper and more pluralistic understandings of sustainability concepts.

The process of knowledge-sharing, however, takes time, and this thesis only scratches the surface of Aboriginal worldviews and knowledge systems. The information relayed in this work was derived from literature, field observations, and discussions with Indigenous academics; however, it does not include the perspectives of the Elders who are the designated knowledge keepers and who uphold the traditional Laws and principles in the strictest sense. This thesis is a first attempt at Ganma, and is an invitation for further Indigenous-led research into this realm. With this in mind, I am happy to present my work, which I have dedicated myself to over the course of five months in Australia.

1. Introduction

Meanjin (Brsbane), view from Kangaroo Point

Australia is often viewed as a "new" country with little history or culture with respects to Europe; however, it has cradled human civilizations for much longer than the so-called Old World. Aboriginal people first arrived in Australia at least 65 thousand years ago, as part of the first wave of migration outside of Africa by modern human beings (Clarkson et al., 2017; Flannery, 1995). To put this into perspective, 25,000-15,000 years ago the Netherlands was a barren land covered by Scandinavian ice sheets (Britannica, T. Editors of Encyclopaedia, 2018). This ranks Aboriginal and Torres Strait Islander peoples as the oldest continuous living cultures in the world (Tobler et al., 2017).

There is a wealth of culture and intergenerational knowledge in Australia that, unfortunately, has been systematically undermined and eliminated since the colonization of the country in 1788. This is not to say that Aboriginal and Torres Strait Islander knowledge has ceased to exist. Indigenous Australians have maintained rich repertoires of knowledge encoded in the oral storytelling tradition and collective memory. However, Indigenous knowledge in Australia and abroad is still largely excluded from political, academic, or scientific matters, often relegated to peripheral 'ways of knowing' or myth (Querejazu, 2016). The missing voices of Indigenous knowledge producers in academia and socio-political discourses point to the marginalization and devaluation of their legitimate contributions. This is a form of epistemic injustice which perpetuates patterns of Western intellectual supremacy and social inequality (Fricker, 2007). Not only that, but the exclusion of Indigenous knowledge is also arguably a loss for the world at large, particularly in the advent of climate change.

Indigenous people in Australia have lived in tandem with nature for generations, guided by certain worldviews and practices that have allowed them to create reciprocal and resilient relationships with their environments. Aboriginal people consider nature as a source of knowledge and spirituality, and children learn from a young age that animals and plants can teach valuable lessons for how to live in the world, for instance through balanced dynamics of giving and taking (Poelina et al., 2022). In contrast, Western civilization is inclined towards an anthropocentric perspective, often viewing nature as a resource to be exploited for economic and technological advancement (Querejazu, 2016; Wachsmuth, 2012). The current fixation on economic growth and the linear "take, make, waste" models of consumption are exerting enormous pressure on our planet's life support systems. As the effects of anthropogenic forcings on the climate are becoming increasingly more apparent, industrial nations are issuing new policies and targets to remain within the Earth's planetary boundaries. One such effort is the transition towards a circular economy (CE).

As defined by the Ellen MacArthur Foundation, a circular economy is one that eliminates waste and pollution, is regenerative by design, and aims to circulate products and materials at their highest utility and value (EMF, 2022). It is viewed as a promising economic model to achieve progress decoupled from environmental degradation. However, there are still many technological and conceptual challenges in the pursuit of a CE (Siderius & Zink, 2022). Meanwhile, Indigenous peoples of Australia have implemented aspects of circularity for millennia. One example constitutes the use of firestick farming techniques, or controlled burning, which

enhance nutrient cycling and soil regeneration (Flannery, 1995)[1]. Despite this, there is a lack of engagement with Indigenous knowledge in engineering, climate change strategies, and policymaking, and a research void regarding Indigenous ontologies and the circular economy. This was evidenced by a literature exploration on the Google Scholar search engine, which resulted on a call for papers by the Emerald Group Research Journal to "explore not only the meanings of CE from an Indigenous knowledge perspective but also explore how certain Indigenous epistemologies on this subject matter dovetail with this already burgeoning idea" (Marotti de Mello et al., 2022).

Figure 1. Ancient rock paintings in Uluru, own picture

1.1. Research justification and goals

Australia is endowed with extensive, multigenerational, empirical knowledge from the world's oldest civilization which has lived and thrived in native land without destroying it for millennia. The Indigenous approach to circularity entails radical ontological differences from Western knowledge systems, which are worth exploring to achieve more pluralistic and rich understandings of sustainability and circularity. This thesis aims to engage with Australian Aboriginal knowledge to include Indigenous perspectives in global academic discourses about sustainable development and the circular economy. The analysis is not limited to the context of Australia, but rather explores how globalized concepts like the CE intersect with localized knowledges. This exercise may reveal implicit assumptions and biases within the CE, and also offers the opportunity to re-imagine what an economy can look like when it is rooted in different worldviews.

[1] Fire burning practices were illegalized by the Australian settler state, however, they are now increasingly recognized for the role they can play in wildfire prevention and mitigation. As such, traditional burning is now gaining advocacy in government policy and programs (Maclean et al., 2023).

However, it is not sufficient to merely learn from Indigenous worldviews, *how* this is achieved is also critical. Engaging with Indigenous knowledges in academia is a complex and politically challenging task (Brigg, 2016). Not only is Indigenous knowledge difficult to reconcile with Western knowledge systems, Indigenous peoples have often been paced in subordinate positions towards researchers, and rarely reaped the benefits of research projects (Tuhiwai Smith, 2012). In recent years, Indigenous scholars have been developing methodological guidelines for conducting decolonial research (Bessarab & Ng'andu, 2010; Martin & Mirraboopa, 2003; Tuhiwai Smith, 2012). This emerging literature could help inform how to achieve respectful and collaborative research with Indigenous peoples.

As such, the research outcomes for this thesis are two-fold. Firstly, the question of how to conduct respectful research with Indigenous peoples will be explored. This research outcome is concerned with methodology and research practices that respect the integrity and autonomy of Indigenous people and knowledges, and aims to provide a pathway for knowledge exchange and collaboration. Secondly, it explores Australian Aboriginal perspectives on circularity, to articulate new understandings of the concept for Western scholars. As such, this thesis does not prescribe technical solutions for social change, but rather broadens the conceptual scope of circularity to help think about the circular economy more creatively.

With these goals in mind, the research questions this research will explore are:

RQ 1: How can Indigenous Australian knowledges inspire alternative designs for the circular economy?

1.1. How do we value Indigenous knowledges and respectfully engage with Indigenous communities for academic research on sustainability?

1.2. What are Indigenous knowledge systems, worldviews, or principles?

1.3. How could Indigenous worldviews inspire circular economy principles?

To answer these questions, I spent 5 months as a visiting research student at the University of Queensland (UQ) in Brisbane, Australia. I was registered at the School of Earth and Environmental Sciences under the sponsorship of Dr. Anthony Halog, an industrial ecologist, who invited me to research at UQ. There, I had library access to books and online resources about Indigenous knowledge that I did not have in the Netherlands through the TUDelft online or physical library access, and was also able to get into contact with Indigenous staff from various Schools and departments, to help me answer my research questions.

1.2. Research Contributions to Industrial Ecology

Industrial ecology (IE) is an emerging scientific discipline that aims to contribute to sustainable development by providing tools and methods that reduce materials extraction, consumption, and waste in industrial or urban systems (Ayres & Ayres, 1996). The circular economy (CE) is a related concept and a potent tool in IE's repertoire to mitigate the exorbitant amounts of pollution produced globally. In my career as an industrial ecology Master student, I have learned and practiced a variety of (mostly quantitative) methods to analyze complex systems and create solutions that advance sustainability. However, throughout my studies, I noticed that theories and principles for sustainability and the CE largely stem from a few – and largely Western, academic – knowledge producers. Indeed, the genealogy of the CE is predominantly European, with predecessors including industrial ecology and concepts such as "cradle to cradle" and biomimicry (Ayres & Ayres, 1996; Calisto Friant et al., 2020). Still to this day, Europe is the primary contributor to knowledge production on the CE, with approximately 51% of publications worldwide originating from the continent (Hachaichi & Bourdin, 2023).

To my knowledge, this thesis is the first to explore IE concepts like the circular economy outside of a Western ontological perspective, within an academic education setting. The idea for this project emerged after I had enrolled in an elective course at Wageningen University called Anthropology and Development, which gave me an inkling that there are many more perspectives and knowledges that are not considered in our IE education. How can we claim to analyze "complex systems", or pride ourselves in applying a "systems thinking" perspective , if the only systems we are considering are Western/European systems?

The contribution of this thesis to IE is a diversification and pluralization of knowledge streams. By broadening the horizon of scientific and engineering sciences, not only may we advance the decolonization of academic institutions, but also possibly attain more effective and inclusive solutions for the transition towards sustainability (which consider non-Western knowledge systems). A lack of diversity within the field of IE is problematic, because it risks to produce policies and technological innovations which promote certain ways of living that, although they aim at improving sustainability, would favor a European/ "Modern" perspective over others. This perpetuates a "one-world world" ontology in which only one (European) way of living and being is considered valid and desirable (Law, 2015). This reproduces patterns of imperialism, colonialism and paternalism (Escobar, 2018). By including more Indigenous voices, while respecting their autonomy and not seeking to 'integrate' them into Western ways of knowing, the field of IE can learn to make space for other 'worlds' and ways of knowing, and thus become a more pluriversal and fair discipline.

Lastly, it is difficult to formulate transformative solutions for sustainability whilst remaining within the prevailing Western paradigm. Complex systems theory shows that systems are the sources of their own problems, through mechanisms like feedback loops, default options, and misplaced incentives (Meadows, 2008). As such, it follows that unsustainability is a problem rooted in the internal structure of industrial society. By engaging in voluntary knowledge exchanges between two very different ontological stances, it becomes possible to expand the collective imaginary and potentially achieve a more radical transition towards sustainability.

1.3. Research Contributions to the Indigenous Community

In my conversations with Indigenous respondents, I was asked many times the question, "how are you going to give back to us?". Whenever I was asked this question, I felt a tinge of guilt and self-defensiveness, and responded by trying to prove to my respondents all the different ways that my research could (indirectly) contribute to the Australian Indigenous community. Looking back on this a few months later, I realized that the self-defensiveness was a reaction to me wanting to protect not only my research, but the idea I had of myself, as someone who wanted to do meaningful and 'just' research.

It was only in the very final stages of my research project, that I understood that the honest answer to this question is, I cannot truly give back. I cannot give back in any significant way, at least not within the scope of a master's thesis project, in which I am only given one semester to complete my work, and in which I am bound to institutional standards which make it considerably more difficult for me to deliver relevant outcomes for the community (this is better explained in Section 4, Roadmap to Indigenist Research). This does not change the fact that I want to give back. I intend to carry the valuable knowledges and learnings I have been gifted with through the many encounters of this research experience in future endeavors that might, eventually, contribute more greatly to Indigenous communities, or any other communities that happen to fall outside of the prevailing Western mainstream.

Thus, this thesis is primarily meant for students in industrial ecology and other sciences (in a Western academic context), to learn how to engage with Indigenous peoples in a respectful and collaborative way. Particularly, the Methodological Roadmap in Section 4 is meant as an inspirational tool for researchers to achieve cross-cultural scientific research that is respectful, reciprocal, relevant and collaborative. I hope that by reading about my own personal learning journey, future (Western) researchers can be inspired and better informed to contribute to more decolonial work that challenges the academic and scientific exploitation of Indigenous peoples, of their intellectual properties, and traditional lands.

1.4. Positionality Statement

In my first draft, it was very hard for me to reflect on my positionality. I did not know how my identities could potentially impact my research aims, methods and outcomes. I resorted to listing adjectives about myself: white, female, European, educated. Although this broadly positioned me as a relatively privileged individual, it lacked criticality in terms of my individuality and personal role in the research.

Months later, the influence I exerted on this research had gradually become clearer the more I worked on the project and interacted with different people. Particularly, my interactions with Indigenous academics revealed ingrained hegemonic practices I did not know I possessed, which I then 'learned to unlearn' in an iterative process (see Section 4, Roadmap to Indigenist Research for more elaboration). Ironically, the practice of writing a positionality statement itself is governed by Western academic conventions. Instead of locating oneself on a spectrum of privilege as a starting point of reflexivity, Aboriginal scholars emphasize the importance of transparently conveying one's personal information and "cultural location", so that "connection can be made on political, cultural and social grounds and relations established" (Martin & Mirraboopa, 2003). For this reason, I introduce myself here as Martin and Mirraboopa (2003) suggest, taking inspiration from their own self-introduction in their article.

My name is Laura Vecoli. I am the oldest of two daughters in the family of Marco and Simona Vecoli. Both my parents come from the Lucca region of Tuscany, Italy; a place that I didn't grow up in, due to my family's choice to live abroad. I was therefore raised in different countries across Europe and the Middle East, and when I was 18, I decided to move to the Netherlands on my own to pursue university education. After completing my Bachelors in Liberal Arts and Sciences at the Erasmus University College in Rotterdam, I started a Master's in Industrial Ecology in 2021. By qualification, I am an industrial ecologist in the making, with a multidisciplinary knowledge background thanks to my liberal arts education. In February 2023, I was invited to write my thesis at the University of Queensland on Indigenous knowledge and the circular economy. This is what has brought me to spend five months in Australia to learn about Indigenous culture, history, and knowledge, in relation to the circular economy.

In providing these details, I transparently show my relations, so that Indigenous and other readers know where I come from, both physically and ontologically (Martin & Mirraboopa, 2003). I introduce myself as a person, and not as an objective, distant researcher. All I can describe in this thesis is my own personal journey; I cannot pretend to know Indigenous knowledge nor speak on behalf of Indigenous peoples. My training and education in Western institutions have instilled in me certain biases and ways of looking at the world, which likely limit my understanding of Indigenous knowledge systems. It is for this reason that I am writing in the first person, to better convey that this is an interpretative work that cannot be alienated from my personal involvement.

Sharing my own personal history, identity, and motives offered the opportunity for the participants of my research (and now for my readers) to establish differences and commonalities with me, to determine whether they wanted to engage with me or not. It is the first step towards potentially building relationships of trust, which are so important in Indigenous research (Archibald, 2008). In many ways, however, my positionality as a white European woman educated in a Western context posed challenges (more on this in Section 4).

To the best of my ability, I have tried to maintain the authenticity and validity of the knowledge enclosed here by foregrounding Aboriginal voices and authorship on the topic. Still, the knowledge included in this thesis incurred a subconscious screening process, based on my cognitive biases and limitations as a non-Indigenous person that filtered what I have heard, read, seen, and subsequently retained and written about. Additionally, the Indigenous knowledge collected here was screened (this time intentionally) based on what I considered to be "relevant" for my research objective. As such, this thesis does not provide a neutral, comprehensive account of Indigenous knowledge, but rather selects snippets of knowledge that the participants of my research and I thought could contribute to answering my research question.

1.5. Thesis Structure

The structure of the paper is as follows. The following chapter will provide a brief historical backdrop of Indigenous Australia starting from colonization to ground the research into the local context. Next, the methodological approach of this research will be explained, followed by a roadmap of my personal experience striving to achieve respectful and collaborative research with Indigenous peoples in Australia. This roadmap is intended as a guide that may help other students and researchers who wish to undertake a similar endeavor. Then, the basics of Indigenous knowledge systems will be explored to build an understanding of the main Indigenous principles and values that could inform the rethinking of circular economy designs/frameworks. A description of the mainstream circular economy model by the EMF is provided, followed by my interpretation for what a circular economy based on Indigenous principles and value might instead prioritize. To give a more concrete example of what an Indigenous-inspired circular economy represents, a case study about spinifex grass applies my model into practice. Finally, the discussion reflects on the importance of doing respectful and collaborative research with Indigenous peoples, and answers the main question. The epilogue reflects on the relevance of this topic, and suggests avenues for future research.

This thesis is not structured as a linear narrative, and covers a variety of different topics ranging from history, to research methodologies, and circular economy concepts. Although each chapter could be read as a stand-alone essay, together they contribute to building an understanding of Indigenous knowledges systems, and answering the main research question. I therefore invite you to follow me along this journey to learn about Australian Indigenous knowledge systems, the circular economy, and how to engage in respectful cross-cultural knowledge exchanges.

2. Historical Context

Kata Tjuta at sunrise, sacred initiation site

This chapter provides information about Indigenous Australia's historical and contemporary context. Initially, I had begun reading about Aboriginal and Torres Strait Islander history for my own familiarization, as part of my preparation to become more culturally "ready" to receive knowledge in my upcoming interviews (Archibald, 2008). I soon realized, however, how relevant history is to understand the emergence and meanings of Aboriginal worldviews, knowledges, and practices. Like Tuhiwai Smith said, "to hold alternative histories is to hold alternative knowledges" (Tuhiwai Smith, 2012). Not only that, I found that most white Australians are ignorant about the history of colonization and its repercussions for Indigenous communities today, which is also confirmed by qualitative studies on this subject (see Taylor & Habibis, 2020). Therefore, I decided to include a brief timeline of Indigenous colonial history as an integral part of this thesis, not only to better understand the context of Aboriginal knowledge systems, but also to counter historical erasure, amplify Indigenous voices, and raise awareness about the ongoing injustices perpetrated against the Indigenous peoples of Australia.

The following historical account begins with the colonization of Australia, and foregrounds Indigenous narratives, to decolonize the past and build a place-based understanding of Aboriginal knowledge. In this historical backdrop, inevitably many things are left out. History functions like a microscope, it magnifies a subject so that it becomes easier to see (von Zinnenburg Carroll, 2014). However, it may bring the subject of study out of context and show only a partial view. In this historical backdrop, Indigenous Australians are portrayed as resisters to ongoing racialization and colonialism. Indigenous peoples of Australia have not merely 'survived' colonization, but have reinvented themselves through it, by grappling and negotiating between tradition and modernity, and continuously showing resistance to the colonial project (Maddison, 2019; McGregor, 1997).

The information presented here is derived from available published literature, as well as materials provided by the UQ Reconciliation Action Plan Network (video and written sources). The validity of the contents has additionally been cross-checked by Indigenous respondents in two different rounds of feedback. Still, there might be inaccuracies given the limited amount of established literature. The subject of "Aboriginal history" materialized only as of the 1970s, and it remains largely incomplete because until 2007, the efforts made by historians to develop and retrace Indigenous history was discredited and discouraged by the then conservative government (Muecke, 2011). The impact of this is felt to this day. In the Uluru Statement from the Heart of 2017 (see sub-chapter "An Ongoing Battle"), a call for a Makarrata Commission was pleaded to the government to supervise a process of truth-telling about Indigenous history (Makarrata is a word of the Yolngu people, meaning two parties coming together after a struggle, healing divisions of the past) (Zerafa-Payne, 2023). Due to the limited number of Indigenous historical sources in academic journals, this historical overview is a patchwork of different sources, ranging from books (both fiction and non-fiction), to academic articles, poetry, and museum visits. I selected, whenever possible, texts and stories written or told by Indigenous peoples, to promote Indigenous authorship.

"(By contradiction, I mean) is how the world moves: not like an arrow, but a boomerang. (Beware of those who speak of the spiral of history; they are preparing a boomerang. Keep a steel helmet handy). I know; I have been boomeranged across my head so many times that I now can see the darkness of lightness."

– Ralph Ellison, Invisible Man.

2.1. Colonial Australia

Indigenous people in Australia are the oldest continuing living culture in the world, with a history that goes back tens of thousands of years, or "since time immemorial" (Tobler et al., 2017). Indigenous collective memory as well as scientific evidence point to the fact that the first Indigenous peoples arrived in the Australasian continent 50 to 65,000 years ago (Clarkson et al., 2017). I only start recounting Indigenous history from the moment Australia was colonized, because this recent part of Australian history remains largely one-sided and Indigenous narratives are typically not foregrounded. Therefore, I seek to contribute to the decolonization of the past 200 years by focusing on Indigenous experiences and perspectives on colonial history.

As the quote from Ralph Ellison suggests, events from the past can greatly influence the trajectories of our societies. The brutal colonization of Australia continues to impact the lives of Indigenous people, who, as will be shown in this section, still face systemic disparities and adversities. While changing trajectories can be difficult, learning about colonial history and addressing past injustices is the first step towards healing colonial wounds, and preventing the boomerang from returning to impact current and future generations.

British Arrival

Although the British weren't the first Europeans to discover Australia[2], the arrival of the British differs from previous encounters in that it eventually led to settlement and colonization (Martins, 2022). In April 20, 1770, James Cook first discovered the east coast of Australia, and 9 days later harbored to Botany Bay, New South Wales, thus becoming the first European to set foot on the east coast of the Australian continent (British Library Board, 2023). James Cook meticulously recorded his travels, and as he continued to sail north of Botany Bay, he proceeded to map out and rename the ancestral lands of the Indigenous Australian people, ignoring the fact that these territories were already richly woven with Dreamings and Songlines (see Section 5, Introduction to Aboriginal Worldviews, for an explanation of these terms).

[2] The Dutch East India Company navigator Willem Janszoon first landed there in 1606 in an expedition to explore and identify trade opportunities. While there is some evidence that the Portuguese sailed to Australia first, the expedition by Willem Janszoon is the first recorded landfall in Australia by Europeans (Martins, 2022)

James Cook eventually reached an island in the Torres Strait which he renamed Possession Island. It is there that in August 22, 1770, he claimed the east coast of Australia for Britain, which he renamed New South Whales (British Library Board, 2023).

The colonization of the Australian continent by the British was formally recognized in 1788, as admiral Arthur Phillip established the first permanent penal colony in Sydney under the command of the British Royal Navy (Britannica, T. Editors of Encyclopaedia, 2023b). This was made legally possible by drawing on the claim of "terra nullius", denominating Australia as an empty, virgin land in which civilization would be brought (Australian Museum, 2021). The doctrine of terra nullius ignored the 60,000 and plus years of Indigenous presence in the continent, and was used as a justification for the dispossession of Indigenous peoples from their lands and the assertion of European ownership and sovereignty (Moreton-Robinson, 2015).

Frontier Violence

From the moment the British invaded Australia, they encountered active resistance from the Aboriginal custodians of the land (McGregor, 1997). Massacres became a defining strategy to eradicate that resistance, thus leading to a drastic decline in Indigenous population (van Neerven, 2020). Still to this day, Indigenous people are not passive victims to the Australian colonial project, and continue to resist domination and control (McGregor, 1997). Emphasizing that Indigenous Australians have been and continue to be resisters of colonialism rather than 'survivors' contributes to decolonizing history, because until very recently, there was a mainstream denial that there was any Indigenous resistance to invasion (Muecke, 2011).

Missions and Reserves

The Indigenous people who survived the frontier conflict were forcibly removed from their land and separated from their families, to be sent to missions or reserves set up the by government (van Neerven, 2020). The missions were known for their brutality, and people would be punished for speaking their language or practicing their culture (Pilkington, 1996). Dispossessed and humiliated, Indigenous peoples across the continent were prevented from performing the rituals crucial to their culture and ways of being. Although cultural practices and rituals were to some degree maintained in secret, the missions contributed to drastic intergenerational loss of knowledge (Pilkington, 1996).

Despite their relocation into colonial institutions, Aboriginal people resisted to efforts by the settlers to "civilize" them (McGregor, 1997). Their resistance, misinterpreted by the settlers as an innate inability to keep up with the pace of progress, was taken as a sign of the inevitable extinction of the Aboriginal race. Also known as the Doomed Race theory, most settlers were certain of the fact that Aboriginal people were on their way to extinction (McGregor, 1997). The most widely shared belief, especially amongst humanitarians, was that the best that could be done for the Aboriginals was to protect them from injustice and the vices of civilization, or "smooth the dying man's pillow" (McGregor, 1997). These beliefs gave way to a paternalistic attitude towards Indigenous people, assuming that they do not know what is best for them. Arguably, paternalism is still prevalent today in the way that government continues to monitor and control the freedoms of Indigenous peoples through policing and management of income for Indigenous welfare recipients (Dee, 2013).

Protection Era

From the end of the 19th century, under state and territory laws such as the Aboriginals Preservation and Protection Act of 1939, so-called Protectors and Protection Boards segregated and controlled large parts of the Indigenous population (van Neerven, 2020). While the overt purpose of such an act was to "protect", government effectively acquired a source of cheap labor by displacing Aboriginal peoples throughout the state for over 50 years (Aird, 2001). Aboriginal workers were not allowed to manage their own money, and as a consequence many were exploited and never received any retribution (Cooms, 2015). The millions of dollars that have been withheld from their rightful owners has contributed to the intergenerational poverty of Indigenous people in Australia today. A parliament report released in December 2006 called "Unfinished Business: Indigenous Stolen Wages" recognized that many Indigenous Australians were denied wages and forced to work in conditions akin to slavery (Standing Committee on Legal on Constitutional Affairs, 2006). The report recommended that a national inquiry be conducted to better quantify the extent of the stolen wages, and that litigation be used as an alternative to payment schemes.

Some of the mandates that the 1939 Act imposed include: the exclusion from state elections, the illegalization of alcohol use and possession, the restriction of movement, the denial of land rights, and curtailed access to the judicial system (van Neerven, 2020). The 1939 act also continued to give relevant authorities the power to resettle by force, remove children without proof of neglect, forbit marriage without approval, censor mail, compel reserve residents to work for low wages (or no wages), and seize property without consent (van Neerven, 2020).

Assimilation Era

In 1937, the Commonwealth Government held a national conference stating that Aboriginal people 'not of full blood' should be absorbed and assimilated into the wider population. In other words, 'half castes' were to be 'bred out' while 'full bloods' were expected to die out (AIATSIS, 2023c). This invigorated the White Australia Policy, which advocated for a racially homogenous Australia through protection and assimilation policies. The White Australia Policy was introduced in 1901, and was formerly known as the Immigration Restriction Act. The policy was designed to "minimize the migration of all non-whites, predominantly non-European"; however, the Indigenous locals were also targeted (National Museum of Australia, 2023). With the goal of assimilation, the Protection Acts sought to isolate 'full blood' Aboriginal and Torres Strait Islander peoples on missions and reserves, while 'half castes' were to be eventually 'absorbed' into wider Australian society (AIATSIS, 2023c). As a consequence, families with children of lighter complexion lived in constant fear of their children being taken away to white foster homes or reserves (Beckett, 1994).

Stolen Generations

A key part of the assimilation policy was the forcible removal of Aboriginal and Torres Strait Islander children from their families and their placement into white institutions or foster homes. The Aboriginal Preservation and Protection Act of 1939 gave the authorities the power to resettle Aboriginals by force, and remove their children without proof of neglect. Known as the Stolen Generations, many of these children never saw their families again (van Neerven, 2020). They were expected to work as domestic servants and manual labor from a very young age, and were often subject to physical, psychological and sexual abuse (The Common Ground, 2022).

These policies were implemented between approximately 1905 and 1967, but continued illegally into the 1970s (van Neerven, 2020). Even today, the removal of Aboriginal children from their homes continues at abnormally high rates, with Aboriginal children 10 times more likely to be in the child protection system compared with white Australian children (van Neerven, 2020). The bureaucratic terror and daily oppressions that persisted through the 70s often compelled Aboriginal people to repress their Aboriginality (Beckett, 1994).

The Stolen Generations were denied their family, culture and past, and the cruel implications of these policies have rippled out to later generations. The *Bringing Them Home* report published in 1997 recognized that the forced removal of children amounted to a breach of human rights, including the right to family, culture, and self-determination (Australian Human Rights and Equal Opportunity Commission, 1997). Following this report, on the 13th of February 2008, then prime minister Kevin Rudd issued a formal apology to the Stolen Generations (AIATSIS, 2023b). Thereafter, National Sorry Day is observed every year on May 26th.

"Forbidden from speaking
our unwritten language

Shifted into tin huts and
given mission blankets

We made a living
shearing but the town
doors were closed

White flour, sugar, teas
is not what we chose

Our story is that thing

That lotta my people forgot

Now it's all grog,
drugs and cops
And my mob movin;
around a lot

Where that respect gone?
I'm black but I look white
Where that respect gone?"

– Excerpt of lyrics "State of the Heart" by the teen singing group, Deni mob

2.2. Reconciliation Australia

Modern Conditions

Currently, only 3% of Australian population is Indigenous (Australian Bureau of Statistics, 2022). In the 200 years of Australian settlement, Aboriginal and Torres Strait Islander peoples have lost much of their respective cultures, knowledges, and even appearances due to genocide and forced assimilation (Aird, 2001). Nevertheless, many different Indigenous groups across Australia remain, each with their own distinct cultures, customs, languages and traditional Laws (AIATSIS, 2023a). The exact number of Aboriginal groups or "mobs" as they are sometimes called, is not known, however it is close to 500 (Maddison, 2019).

As of 2016, around 120 Aboriginal and Torres Strait Islander languages are spoken in Australia, although only 13 are still considered strong (AIATSIS, 2023d). Prior to British arrival, there were around 250 distinct languages and 600 dialects across Indigenous Australia (AIATSIS, 2023d).

Figures 2 and 3 show a map by Horton (1996) which represents an approximation of the locations of larger groups of Indigenous people. There are some variations in the way that some language or group names are spelt, and the borders between groups are purposely represented as slightly blurred to account for the fact that there are no strict land borders in Indigenous culture (AIATSIS, 2023a).

Today, two thirds of Aboriginal and Torres Strait Islanders live in regional or remote areas of Australia (Australian Human Rights Commission, 2014). While some Indigenous people chose to live on pastoral stations or rural towns in order to be closer to Country (the meaning of Country in Aboriginal English is further explored in Section 6), another reason cities were avoided is because they were hostile places riddled with discrimination and police violence (Aird, 2001). Between 1990 and 1995, Indigenous people were 17.3 times more likely to be arrested than non-Indigenous people, and were 16.5 times more likely to die in custody (Australian Human Rights Commission, 1996). While updated data is missing, Indigenous people today continue to have disproportionate rates of incarceration and death compared to the rest of the nation, as expressed in the Uluru Statement (Hurst, 2021). As part of its 'Closing the Gap' campaign, the Australian government spends billions of dollars each year on policies to improve Indigenous welfare. Some scholars argue that these investments have yet to yield significant results, although there have been improvements in certain areas (Denny-Smith & Loosemore, 2020).

A minority of people live in remote areas also known as "the Outback"[3], often in poverty and conflict-ridden conditions (Memmott, 2011). These communities are neglected by the government, who in some cases fails to provide them with basic necessities such as clean drinking water, which reportedly is contaminated in nearly a quarter of remote Aboriginal communities in Western Australia (OAG, 2021). Remote Indigenous communities also face food insecurity and malnutrition (Hudson,

[3] The Outback is an arid, vast and remote part of inland Australia, usually sparsely populated (Britannica, T. Editors of Encyclopaedia, 2023a).

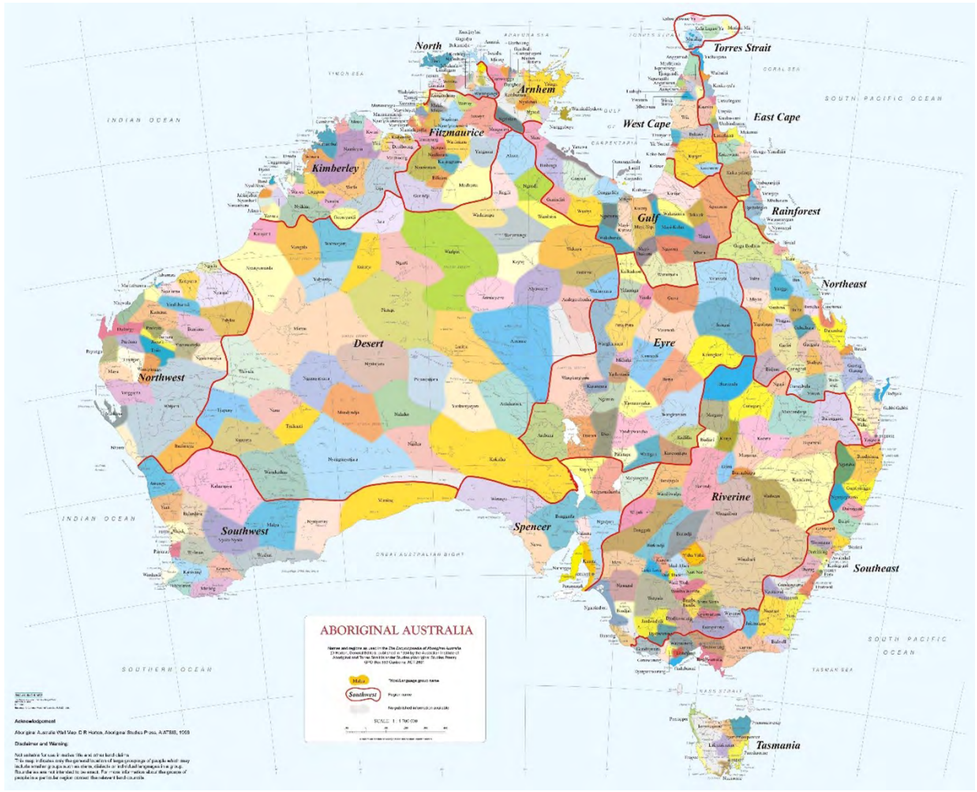


Figure 2. Map of Aboriginal Australia by Horton (1996). Retrieved from AIATSIS (2023)

Figure 3. Close up of traditional owners of the Brisbane area

2009; McKay & Godrich, 2021; Sherriff et al., 2022). Many Indigenous communities rely on Western food systems due the loss of knowledge about traditional food sources, and where to locate them (Sherriff et al., 2022). Government-run food stores known as "Outback Stores" markup retail prices up to 4 times what they cost in urban cities – recently, the price of fresh milk has inflated up to $8 for 2 liters (Fitzgerald, 2022). Therefore, while these stores were meant to facilitate access to fresh foods in the Outback, most people cannot afford them and rely instead on fast foods. This has led to a health crisis, with abnormally high incidences of diabetes, obesity, and cardiovascular diseases among Indigenous communities (Hudson, 2009).

An Ongoing Battle

Native Title rights for Indigenous Australians have only been recognized since 1992, and to this day, Australia is the only Commonwealth that does not have a treaty, or a formal agreement, with its Indigenous peoples (Allam, 2022). While the Australian Commonwealth advocates for better relations between non-Indigenous and Indigenous Australians, reconciliation remains an unfinished business.

In 2017, the Uluru Statement from the Heart was pronounced by Aboriginal and Torres Strait Islander delegates to expose to the wider public the structural injustices that continue to affect Indigenous people today, and to plead government for sovereignty and self-determination (Uluru Statement Working Group, 2023). Unfortunately, the reforms were rejected by then Prime Minister Malcolm Turnbull without parliamentary debate, despite public support (Fredericks & Bradfield, 2021). The following excerpt is derived from the Uluru Statement and illustrates the modern condition of Indigenous Australians:

This year, as of 2023, a referendum took place regarding an Indigenous "Voice to Parliament" enshrined in the Constitution (Allam, 2023). The Voice is intended to establish an Aboriginal advisory body to Parliament. It is meant to give Indigenous people a say in their own affairs, in an effort to enhance Indigenous wellbeing and representational justice (Allam, 2023). Unintuitively, based on my own conversations with only a few Indigenous peoples on this matter, their responses to this are not altogether favorable. This speaks to the pervasive distrust of government amongst Australian Indigenous peoples.

On October 14th, a couple of weeks before the end of my thesis project, it had been announced that the vast majority of the Australian population voted against the Voice referendum. This is a sad news, that indicates the "tacit approval of a status quo that is widely considered to have failed [Indigenous Australians] for two centuries" (Whiteman, 2023).

Excerpt from the Uluru Statement: "

"Proportionally, we are the most incarcerated people on the planet. We are not an innately criminal people. Our children are aliened from their families at unprecedented rates. This cannot be because we have no love for them. And our youth languish in detention in obscene numbers. They should be our hope for the future.

These dimensions of our crisis tell plainly the structural nature of our problem. This is the torment of our powerlessness.

We seek constitutional reforms to empower our people and take a rightful place in our own country. When we have power over our destiny our children will flourish. They will walk in two worlds and their culture will be a gift to their country.

We call for the establishment of a First Nations Voice enshrined in the Constitution."

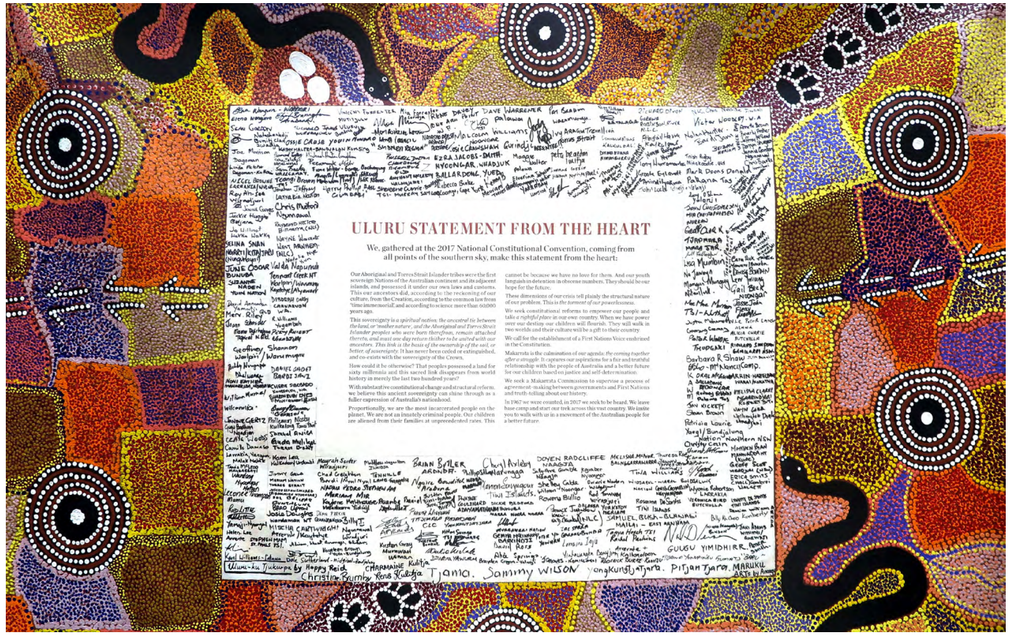


Figure 4. The original statement, signed by 250 Aboriginal and Torres Strait Islander delegates

Figure 5. Collage of newspaper headlines and official Instragam posts of Vote Yes and Vote No campaigns

2.3. Concluding Remarks

This historical backdrop has briefly covered the colonial history of Australia, and has sketched a picture of life in Australia today for Indigenous peoples. This informs the context in which my interactions with Aboriginal people took place; a context where the colonial wounds of the Aboriginal and Torres Strait Islander people are still fresh. Like in the quoted paragraph in the opening of this chapter, history is like a boomerang, and in this case it is not simply "in the past" but continues to affect lives today, as highlighted by the *Bringing Them Home* report. Consequently, there is a mistrust of foreign researchers and governmental interventions, with justifiable cause. For this reason, it is necessary to remain cognizant and sensitive to Aboriginal people's needs, priorities, and demands, especially when it comes to conducting research in their lands. Doing research with Indigenous peoples in a "cunning post-settler state" (Kowal, 2015) is not easy and demands dedication form the researcher to form relationships of trust by continuously showing genuine intentions, and giving back to the community as the first priority. The special considerations and protocols for conducting Indigenous research are more thoroughly explained in Section 4, Roadmap to Indigenist Research.

Figure 6. Portrait of Lenny (Timer) Miller by Vernon Ah Kee. Own picture, taken during museum visit (QGOMA, Brisbane)

"When you look at their gaze, you can see persistence and endurance. They're not about sadness, they're not even about frustration, They're about endurance. Like all of us blackfellas, it's about picking up and... not going away. We're still here."
-- Vernon Ah Kee

3. Methodology

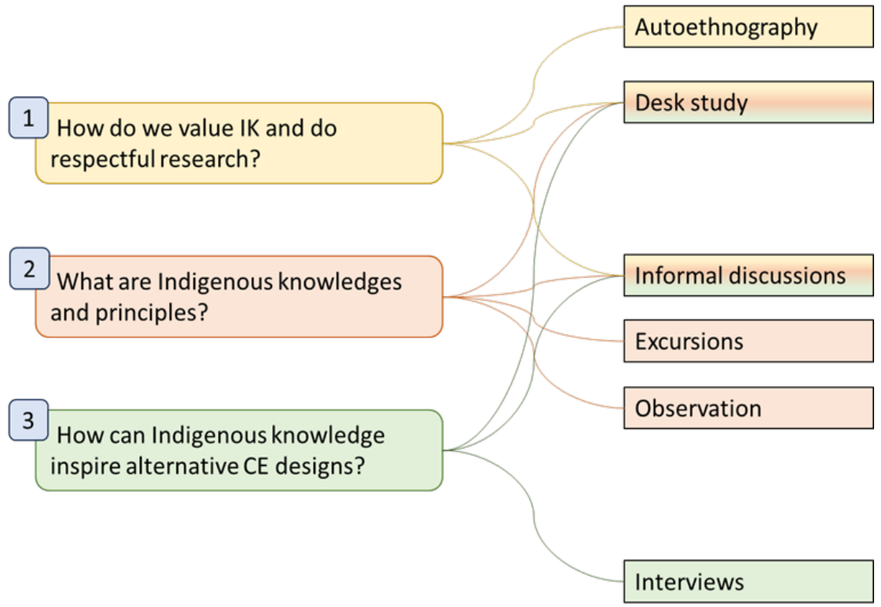
State Library of Queensland, Brisbane city

3.1. Research design

Given the lack of literature on the intersection between Indigenous and Western knowledges of sustainability and the circular economy, this thesis is exploratory and interpretative. Additionally, since this research deals with alternative knowledge systems, it does not presume any universally true premises. Rather, it adopts the view that multiple realities exist, lived by different peoples in different ways. This is a stance derived from the concept of the "pluriverse", which is described as a design practice that aspires to the creation of a "world where many worlds fit"(Escobar, 2018). This research aligns with the pluriverse ideology by asserting that multiple diverse and interrelated worlds exist, whose realities and ways of being are all equally valid and true.

Therefore, an inductive research approach is most appropriate, where broader understandings of Indigenous perspectives and designs for a CE can be synthesized, based on a collection of on-site observations, interviews, and desk studies. This research aims to show that valid and culturally relevant research can be achieved without necessarily relying on dominant ways of knowing or quantitative study.

This dissertation sets out to partially fill a knowledge gap in industrial ecology research methods and circular economy concepts by exploring 1) how can academics engage respectfully with Indigenous peoples and knowledges 2) what are Indigenous knowledge systems, worldviews, and principles, and 3) how these principles can inspire designs for the CE. The first question deals with appropriate research methods for Indigenous research, and the second and third questions concern ontologies and epistemologies, and the intersection of two different worldviews. Therefore, different approaches were necessary to explore all aspects of the research goal.



Finding the right methodology has been a process of trial and error, and was vastly informed by my own personal experiences attempting to do respectful and appropriate research in this domain. Applying conventional industrial ecology methods was not appropriate, thus diverse methodologies were used, so as to enhance the depth and richness of data collection and analysis (see Table 1).

3.2. Definition of Indigenist Research Methods

In my interactions with Indigenous peoples, I employed methods and principles from Indigenist research that has been formulated and developed in Australia by Aboriginal scholars. These are yarning interviews, Dadirri, and Ganma. Indigenist research originates from critical theory (West et al., 2012), and has been taken up by Aboriginal scholars in the goal of "liberating people from domination, powerlessness, and oppression"(Rigney, 2006). Indigenous people have been an over-researched group by non-Indigenous academics, often in a subordinate relations which reproduce patterns of imperialism and colonialism (Rigney, 2006; Tuhiwai Smith, 2012). Not only that, the knowledge derived from research conducted in Indigenous communities has often been weaponized against them, abused for capitalist exploitation, or utilized to justify governmental intervention (Saltmere, pers. com., 2023). Indigenist research methods rebalance the power asymmetries by giving people control over the research outcomes, and ensuring that the benefits outweigh the risks. Indigenist methods are more compatible with Indigenous experiences, interests, and aspirations (West et al., 2012), and are better suited to develop an understanding of Aboriginal knowledge than Western scientific research methods are able to achieve (Rigney, 2006).

There is no one way of doing Indigenist research, because it is not focused on methodological convention so much as moral integrity ("doing it right"). Indigenist research is first and foremost guided by respect, reciprocity, and relationality (pers. com., 2023). The interconnections between the researcher and the participants, communities, places and objects must be valued and acknowledged as a central part of the research methodology (Martin & Mirraboopa, 2003). The following paragraphs briefly describe the main ideas behind yarning, Dadirri and Ganma. These methods are compatible with the storytelling tradition of knowledge sharing, and allowed me to engage with Indigenous peoples in more culturally appropriate ways.

Yarning

Yarning is a culturally sensitive alternative to standard interviews, articulated by and for Indigenous Australians (Shay, 2021). As a methodological tool, "yarning [is] employed not only to collect information during the research interview but to establish a relationship with Indigenous participants prior to gathering their stories through storytelling" (Bessarab & Ng'andu, 2010, p.37). To have a yarn means to have informal and relaxed discussions through which both the researcher and the participant share stories relevant to the research study. It is a method of knowledge exchange that respects and emulates the oral tradition of Indigenous cultures, and legitimizes the power of story as a vehicle for knowledge creation (Shay, 2021).

Table 1. Overview of study methods and their outcomes

Method		Outcome
Autoethnography	Journaling	**Documentation** of personal observations and experiences, of challenges and successes. This resulted in the Methodological Roadmap for Indigenous research
	Critical reflexivity	**Identification and questioning** of deeply held assumptions, power dynamics, and positionality. Process of "learning and unlearning" to **transform researcher's own knowledge and perspective**, and offer space to decolonize the research method (Coburn & Gormally, 2017; Martin & Mirraboopa, 2003)
Desk study	Library search (TU Delft and UQ library access) Internet search (scientific articles, books, children's books, poetry, tourism pamphlets, news articles)	Understanding of local **historical and social context**, learning about Indigenist research methods **Case study** of spinifex, to illustrate how Indigenous CE principles may be applied
Informal discussions	Conversations with informal informants	**Sharing and learning** from knowledge that mainly exists within the storytelling tradition
Observation	Museum visits, excursions, conferences, participation in activism	First-hand **exposure to local culture** and environmental context, exposure to emerging research and relevant topics
Interviews	Yarning Dadirri Ganma	Indigenist **research methods that are culturally compatible**. Formulated by Aboriginal scholars, they can accurately grasp the essence of Indigenous Knowledge while respecting cultural protocols Insights into **Indigenous CE principles**

Figure 7. Yarning steps for scientific research (adapted from Bessarab and Ng'andu, 2010)

Despite its narrative nature, yarning is a structured process with protocols for data analysis and collection (Barlo et al., 2020). The yarning process follows different steps, with each step fulfilling a different purpose. For the purposes of this research, the following yarning steps were included: social yarning, research topic yarning, and collaborative yarning (Bessarab & Ng'andu, 2010).

Social yarning involves informal conversation before the actual "research yarn". Its main purpose is to develop trust and build a relationship. In my case, this typically involved meeting the participant at a café, exchanging introductions, and casually discussing my research topic, without any voice or video recordings. I did however take some notes on paper. Researchers should consider this into their research plan; it requires more time than a typical interview .

After this step, the research yarn can take place. This can take a form similar to a relaxed semi-structured interview, in which topics related to the research are discussed. Collaborative yarning is a subtype of research yarning in which two or more people share and discuss ideas, often leading to new discoveries and understandings. As such, it then influences the research topic yarning in an iterative process (Bessarab & Ng'andu, 2010).

Yarning process

Data collection:

1. Everything is a learning opportunity: not just words, but intonation, body language, emotion, and the researcher's own interjections/written reflections
2. Also include generic information about the participants as it can determine authority and authenticity of the information being provided

Data analysis:

1. If recording is not allowed: ask the participant if they are comfortable with you taking notes. Journaling can, in this case, be a valuable medium for recording but also processing the interaction through critical reflection.
2. If recording is allowed: Transcribe the recordings and give the opportunity for each participant to edit their yarns (add or withdraw content)
3. Read transcripts and find repeating or important themes
4. During the analysis and discussion of the results, the data must always be contextualized
5. Take time to think and make meaning
6. Consult again with participants to verify the relevance of the themes
7. Provide an additional reporting method that is relevant to Indigenous communities. This can be an infographic, presentation, and the like.

Dadirri

Dadirri is a way of life for many Indigenous people in Australia, that can also be incorporated into research methodology to promote cultural sensibility. The word Dadirri derives from the language of the Ngangikurungkurr people of Daly River in Northern Territory, Australia. In their language, dadirri "means inner, deep listening and quiet, still awareness" (West et al., 2012). Not easily translated in the English language, its definition is similar to contemplation. Although Dadirri is a word from the language of the Ngangikurungkurr river people, equivalent concepts are found across different Indigenous groups in Australia (West et al., 2012).

Enacting Dadirri in research practice means recognizing the role of both the researcher and the participants as equal partners in the creation of knowledge. Reflexivity is an important aspect of this, since Dadirri requires "listening to and observing the self as well as, and in relationship with, others" (West et al., 2012). To practice Dadirri means truly listening to the speech and emotions of the self and others without simultaneously thinking about a reply to follow up. In many Indigenous communities, it is customary for long pauses or silences to occur after a speech. This not only shows respect to the speaker, but also allows the listener to formulate a thoughtful and deliberate response (Archibald, 2008). In a research context, Dadirri implies a meditative and narrative process of writing and analyzing (West et al., 2012).

It is important to try not to interrupt the conversation, even if it appears to go off-topic. Bessarab and Ng'andu (2010) remarked that after transcribing the yarning interviews, they often found that seemingly 'tangential' yarns were actually highly pertinent to the research topic upon further contemplation. They advise to not be too constrained by the research question or by academic jargon, in order to be able to pick up on what the participants are really saying. The rigor in yarning is to engage in Dadirri to let stories flow without interruption, allowing time for pauses and silences (Bessarab & Ng'andu, 2010).

Ganma (knowledge sharing)

In the foreword, I made reference to Ganma, a Yolngu metaphor for the confluence of difference streams, which lead to the uncovering of truth and deeper understanding (H. Watson & Chambers, 1989). I reapply it here as a research tool to highlight the fact that Indigenous knowledge "is not just another information set from which data can be extracted to plug into scientific frameworks" (Nakata, 2007).

The confluence of Western and Indigenous knowledges is not meant to result in the absorption of one knowledge system into the other. Like Ganma, their union should produce something new, with characteristics of both knowledges still present. Indigenous people also call this "weaving a new Dreaming" (pers. com., 2023), and is an example of how Aboriginal and Western peoples and knowledges can collaborate while maintaining their separate identities (Sharmil et al., 2021). The knowledge that emerges from this exchange is co-owned and shared. Achieving this in practice can be difficult, and my own thesis is not a perfect example of it. Still, the principle of Ganma has been the guiding compass for my research approach.

3.3. Target Participants

The target participants for the yarning interviews were Indigenous academics at the University of Queensland (UQ). These interviews were meant to specifically inquire into how Indigenous knowledge could inspire alternative designs for the CE. Participants were initially found on the UQ staff directory, and were contacted by email. Another call for participants was advertised through the Aboriginal and Torres Strait Islander Studies (ATSIS) unit at UQ. From there, other participants were found through snowballing, based on previous participants' recommendations. Ultimately, although several yarns took place, I was not able to record or transcribe interviews due to hesitation from the participants to be interviewed in a more formal setting. I had conducted one recorded interview which I later transcribed, but the participant eventually withdrew their consent to participate, so I could not include the quotes in the final manuscript. This low turnout was caused by delays incurred by the HREC application process, my lack of strong relationships with participants due to too little time spent in Australia, and factors beyond my control considering a context where Indigenous people are often an over-researched group burdened by legacies of extractive and colonial research practices (Tuhiwai Smith, 2012). As a result, informal yarns or conversations with Indigenous people at the UQ campus and beyond more greatly contributed to answering the research question. To protect the anonymity of the respondents, information gathered through informal conversations is cited in this paper as personal communications (in the format: *pers. com., year of communication*). Regardless of the type of interview (informal or recorded), concepts of Dadirri and Ganma underpinned all my interactions.

3.4. Relationality in Research

Indigenist research methods are relational, in that they highlight the decisive role of people, places, and objects in providing information for the research (Tynan, 2021). Indeed, this thesis is the outcome of all the interactions I have had with multiple people, places, and things I have haphazardly encountered during my time in Australia. Figure 8 shows a map that depicts how literature and information was relayed back to me. The information and knowledges portrayed in this manuscript can be considered a result of a "relational literature review", which is not limited to Google Scholar or other online search engines, but rather takes place in real places and real relationships (Tynan & Bishop, 2022).

The map in Figure 8 is personal to me, and as such there are aspects to this method that are not necessarily replicable; this is the predicament of relational research (Tynan & Bishop, 2022). In reality, all scientific research is necessarily relational since it is contingent on personal interactions and feedback rounds; however, relational research makes these connection explicit and foregrounds them as essential to the research outcomes (Brigg, 2016). I have included this map, which I made up myself, as a way to transparently describe my positionality and relationality in this research, and encourage future researchers to do the same.

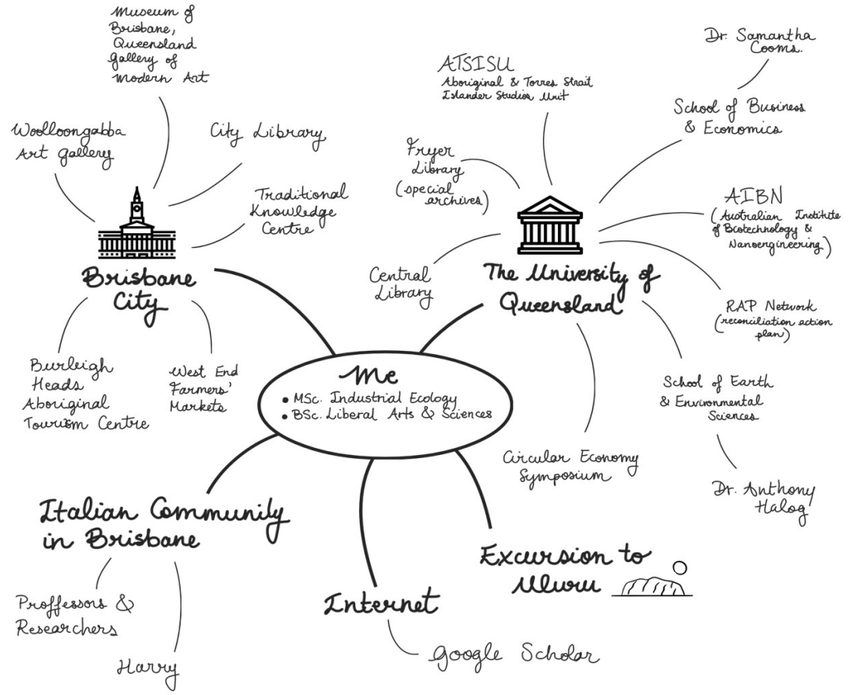


Figure 8. Diagram of a relational literature review. This map is personal to me. For instance, my nationality as an Italian person granted me access to a network of expats who were able to connect me to knowledgeable people for my research.

Learning and applying these methods was not a straightforward process. The following section presents a Methodological Roadmap that I designed, explaining how I approached my research from the very start, and the learning curves that occurred in the process. This roadmap is one important result of my study, and provides the answer to the first research sub-question investigating how to conduct research with Indigenous peoples in a way that is culturally appropriate and respectful.

4. Roadmap to Indigenist Research

Sunrise in the Yulara Outback

METHODOLOGICAL ROADMAP

FIND A LOCAL MENTOR

Seek guidance from a community member to help establish connections and navigate through cultural protocols and expectations

CRITICALLY REFLECT ON PERSONAL BIASES

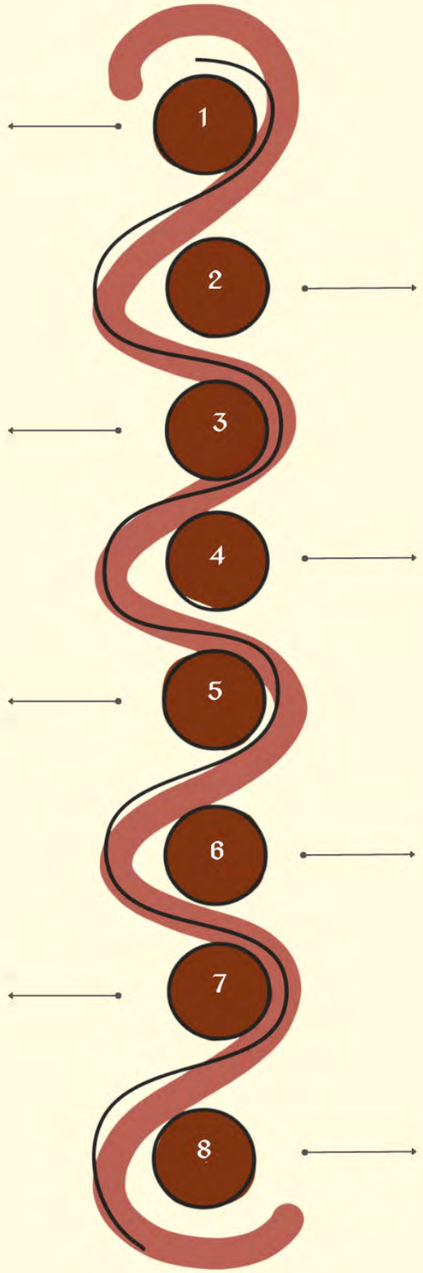
Reflect on potential cultural differences to gain insights into personal assumptions and biases, to determine positionality, and transparently report on these

PRACTICE INDIGENIST RESEARCH METHODS

Choose methods that are compatible with Indigenous interests, which rebalance power asymmetries, and are suited to accurately understand Indigenous Knowledge

OBTAIN ETHICS CLEARANCE

Inquire into local regulations for human research, and submit the ethics applications well in advance



GAIN CULTURAL COMPETENCE

Immerse in local culture to develop an understanding of Indigenous frameworks, and to be able to respect local practices

REVIEW THE RESEARCH DESIGN

Re-evaluate the research design based on the enhanced understanding of positionality and local culture. Ideally, it should be co-designed with the participants., and based on a relationship of trust and respect

SELECT THE RIGHT PARTICIPANTS

Find participants who can be engaged with in a culturally appropriate manner (working with Elders or more traditional communities might not be possible), and consider linguistic barriers

CONTINOUSLY ADAPT AND REVIEW

Remain flexible to unexpected changes, and make space for continuous learning. This type of research might require more time than usual

4.1. Introduction to Roadmap

This roadmap is meant to inform future students on how to conduct research with Indigenous people based on my own mistakes and successes in this pursuit. Australia is still very much at grips with the question of how to do ethical research with Indigenous peoples in a way that is collaborative and reciprocal (pers. com., 2023). At the time of writing, only the state of Queensland enacts domestic legislation (known as the Biodiscovery Act) that protects the intellectual property and interests of Indigenous peoples in scientific research, and this has only been in place since 2004[4]. Therefore, the first research sub-question, "*How do we value Indigenous knowledges and respectfully engage with Indigenous communities for academic research on sustainability?*", is a very relevant question to explore.

The roadmap follows a stepwise process for conducting respectful cross-cultural research, that others may follow and build upon. These steps, however, do not necessarily unfold in a linear pattern, as Indigenist research often entails an iterative process of learning and re-learning. The roadmap and the order of the steps reflect my own research process, but I would recommend students to start with Step 3 ("Critically reflect on personal biases") and 2 ("Gain cultural competence") to be as prepared as possible before interacting with any members of the Indigenous community. In practice, however, it just so happens that most cultural learning and self-reflection occur during interactions with participants. Therefore, while it is important to do preparatory work, be ready to acknowledge that little can impart as much knowledge as real-life interactions.

I hope that my own journey can be informative for other researchers, so that they may better anticipate the challenges and opportunities ahead. Considering the growing enthusiasm from students at the TU Delft to participate in sustainable development projects abroad in underserved communities, I believe this roadmap is a valuable tool and contribution to promote decolonial research practices. The following section takes an autobiographical tone in which I share my personal experiences, which were documented in handwritten journal entries throughout the duration of the project.

[4] This act emerged from legal pressures that Indigenous protesters deployed against the university of Queensland's opportunistic use of Indigenous knowledge in the past, particularly with malpractices relating to the spinifex project (see Section 9) (pers. com., 2023).

While Australia is a signatory of the Convention on Biological Diversity (CBD), the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), and it has enacted the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), among others, it does not have domestic nationwide legislation that comprehensively protects the intellectual rights of Indigenous peoples (AHRC, 2008). Therefore, much more needs to be done to protect Indigenous intellectual property and traditional knowledge from corporations and organizations, especially considering the fact that the EPBC Act does not specifically address Indigenous intellectual property rights, and the UNDRIP is not legally binding (AHRC, 2008).

1. Find a local Mentor

As an outsider to Aboriginal culture, I found it essential to seek guidance from someone who had extensive knowledge and experience within the Indigenous community, or ideally someone who was a member of the community itself. In my case, I was fortunate to find an Indigenous academic at the University of Queensland, who helped me navigate through Australian Indigenous culture, establish connections with community members, and, most importantly, ensured the validity and integrity of my work as I was writing. Additionally, my mentor (who requested to remain anonymous) helped me identify important Indigenous principles, and often gave me constructive feedback and comprehensive reading lists.

My relationship with my mentor, however, also presented some unexpected challenges. Our dialogue was hampered by fundamental differences in the way we understood our relationship and the ways in which academia created barriers between us. My lack of awareness of certain cultural and academic protocols when doing Indigenist research eventually compromised my mentorship.

In hindsight, my relationship with my mentor was perhaps the greatest teacher when it came to understanding the colonial dynamics still at play within academia. Given the complex relationship between Indigenous communities and white researchers, I am not surprised at the caution and sensitivities that were uncovered in the process of writing a Master's thesis on this topic. One key lesson I learned is that our current academic frameworks are extractive, and new methodologies and approaches are needed in order to have academia support and uplift traditionally marginalized and exploited communities.

2. Gain Cultural Competence

Considering the fact that I had no prior knowledge of Aboriginal culture upon my arrival in Australia, it was important to dedicate enough time for a full cultural immersion at the beginning of my research, in order to build the capacities to understand Indigenous knowledge systems. Originally, I had planned one month fully dedicated to gaining cultural competence. This was very naïve, because gaining cultural competence is a lengthy and sometimes sensitive process (where you might make unintentional mistakes) that never stops for as long as you are involved in the study.

Something that I learned only at the end of the research project, for instance, was the sensitivity around utilizing Aboriginal art symbols in my thesis. Originally, I had included diagrams with Aboriginal-inspired art symbols, but ultimately had to remove them due to concerns over cultural appropriation. This was another important learning curve, which taught me that despite my knowledge of the symbols and their meanings (acquired through art workshop such as in Figure X), and my intention to use them respectfully and accurately, there were still too many

Figure 10. Learning dot painting technique from a local Anangu woman

tensions around the use of these symbols for academia. The question of cultural appropriation is a loaded one, and it can be difficult to delineate when something becomes appropriation. I had to remind myself that these symbols hold sacred meaning, and that it is not my place to use them to refer to circular economy designs. An interesting observation that was shared with me by an academic who is experienced in Indigenous research made me realize that one can do Indigenous research, without necessarily "becoming" Indigenous. That is, mimicking Indigeneity does not make a study about Indigenous knowledges any more valid – perhaps it does quite the opposite, since it might ignore certain cultural protocols.

While I was in Australia, my research was delayed by several months due to long waiting times for HREC approval (see Step 7). This turned out to be a blessing in disguise, as it gave me more time to learn about Aboriginal cultures, and forced me to seek more literature and cultural experiences, such as guided tours and museum visits. This preparation work paved the way for more meaningful interactions in my conversations and interviews with Indigenous peoples later on. As Tuhiwai Smith (2012) writes in her book, researchers "need to develop a cultural competence that allows them to move outside of their own cultural frameworks and understand the ways in which Indigenous peoples see and interpret the world". Being culturally competent is the precondition to be able to understand, respect, and effectively engage with the particular worldviews and knowledges of a specific community. It allows the researcher to engage with Indigenous knowledge in Indigenous terms,

without circling back to a mainstream Western vantage point (Brigg, 2016). I want to emphasize that the burden of learning about another culture, and how to interact with one another must be on us as researchers, and it is not the duty of our participants to accommodate us and help us understand them. The difficult work of learning and unlearning mental frameworks is on us.

Learning about Aboriginal Australia also helped me avoid falling into tropes of romanticization of Indigenous cultures, by learning both about the good and the bad that exists within them. Romanticization can be harmful because it reproduces incorrect stereotypes of "noble savages" that lock Indigenous peoples in the past, keeping them marginalized and in subordinate relations (Koot, 2022). Immersing into the local culture helps break stereotypes and appreciate the complexity and nuances of the local environment.

Some of the Indigenous people I conversed with were surprised that I was so curious to learn about Indigenous knowledge and that I was making an effort to find resources and activities related to Indigenous cultures. Most are accustomed to the fact that White Australians do not get involved in Indigenous affairs. Others were more reserved and defensive in their interactions with me, and I had to show cultural competence to reassure them and consistently justify my intentions. I would advise future researchers to dedicate enough time reading and learning about the history and culture of their participants. It is important to know what the most sensitive topics of discussion are, and how to diplomatically deal with adverse reactions. It is important to know that your presence may not always be welcome, even though your intentions might be genuine. Respect boundaries, and find people who are willing to share their culture with you; and in turn, share a bit of yours.

3. Critically Reflect on Personal Biases

Critically reflecting on one's positionality offers the space to decolonize the research method by unearthing potential biases and prejudices that the researcher may have (Martin & Mirraboopa, 2003). My cultural immersion (by way of reading, touring, and casually discussing with people) helped me gain awareness into my own positionality, but also revealed to me the influence of Western academic conventions and biases in the formulation of my research goals, methods and processes. For instance, the practice of positioning oneself as "the researcher" is considered arrogant from an Indigenous point of view, where traditionally the knowledge keepers determine what one learns, how, and when (Tynan & Bishop, 2022). The institutionally-appointed authority to scope and formulate research questions empowers the researcher as sovereign, and assumes that the world is a knowable entity; whereas in Australian Indigenous knowledge systems, it is accepted that not everybody can know everything about anything (Brigg, 2016; West et al., 2012).

Some Western knowledge practices and expectations were institutional, and therefore unavoidable. A consequence of being a Master's student is the expectation of

completing my degree within a strict timeframe, which does not necessarily match with Indigenous timescales for learning or building relationships. The mismatch performs a form of epistemic exclusion, since it leaves out knowledge that can only be exchanged once strong relationships are built over time (Shay, 2021). Additionally, I was expected to have an approved research proposal and a well-defined research question prior to the beginning of my field research in Australia. This prevented me from developing a research question together with the Indigenous participants, thus limiting the extent to which I could truly do "collaborative" and relevant research for the local Indigenous communities. Where certain institutional expectations cannot be changed, being transparent about the completeness and validity of the research is important.

For future research, I would recommend students to work with other researchers who already have established relationships with Indigenous communities, so that they do not have to build relationships from scratch. Otherwise, if students already know that they want to conduct Indigenist research, ideally they should consider building relationships with Indigenous communities in their first year of their study program. Starting the relationship-building process well ahead of time might give enough margins to collaboratively define a research question, and consequently produce work that is more reciprocal.

4. Review the research design

Once I understood the colonial legacy of conventional Western research practices and the influence of my positionality in this research, it became necessary to review the research design accordingly. For instance, learning about Indigenous cultural protocols for knowledge sharing humbled the way I approached the research process. While I was still the "author" of this thesis and was responsible for conducting the research and seeking out knowledge, I chose to reposition myself as a "learner" rather than a "researcher". As a learner, I had to let go of some control over the research process, keeping it open-ended to make space for collaboratively-determined goals. The flexibility of the research design not only gave more agency to the participants of my research (thus promoting decolonial research practices), but remained adaptable to my own learning process and to unexpected changes that appeared along the way.

More specifically, I identified three principles that should guide the research design, based on my own experience and on conversations I had with professionals working with Indigenous peoples in Australia. As is typical of Indigenous wisdom, these principles do not prescribe a checklist of specific criteria or measurable indicators to fulfil. Rather, they provide a moral compass for how to approach a research project from beginning to end. These principles are the following:

1. Build relationships of trust

Cultural knowledge is not just shared with anyone, it must be earned (Yunkaporta, 2019). Researchers must take the time to establish relationships of trust with Indigenous participants. Simply, there can be no knowledge exchange without first having established trust (pers. com., 2023). Trust is generally established by showing your intention of doing research that is reciprocal; that you are not solely motivated by personal gain but that you have also considered how you will contribute to the Indigenous community. In my own case, I showed reciprocity in the given time by striving to represent the knowledge I have gained in an accurate and respectful way. I have also sought Indigenous scholarship and literature as the preferred sources for this thesis to promote Indigenous authorship and visibility on research databases. However, as I explained in the introduction, it was difficult for me to produce work that was truly relevant for the Australian Indigenous community. This undoubtedly caused posed barriers for me to establish relationships of trusts with the involved respondents.

Earning trust sometimes entails fulfilling certain obligations towards our Indigenous research partners (Parsons et al., 2016). At the beginning of the research participants demanded additional ethics clearance before engaging with them (see Step 7). It was my responsibility to listen to their requests and follow through my commitment to do the research correctly so that they could trust me, even though that meant incurring delays in the research process. This points to an additional challenge: sometimes, obligations to the participants conflict with the expectations and time frames of academic institutions. My thesis journey looked different than that of my peers; and required flexibility from both myself and my supervisors.

2. Co-design everything

The entirety of the research process should be co-designed from the start, in order to recognize and accommodate Indigenous interests. In this context, co-design entails Indigenous leadership and inclusive partnerships, among other things (see Butler et al., 2022). Collaborative research practices help minimize power inequalities and marginalization of Indigenous peoples, by giving them space to make their own decisions and assume ownership over the research process and results. Co-designing sounds simple, but it sits in direct opposition to academic culture in which individual achievements are primarily celebrated (Tynan & Bishop, 2022; pers. com., 2023). While there are many disciplines that work hard to promote social justice (sociology, cultural psychology, Indigenous studies, etc.), academic aspirations typically lend to individual pursuits. It is important, particularly within the STEM field, for researchers to acknowledge that in projects involving Indigenous peoples, outcomes and benefits must be for the collective and not the self.

3. Show respect

The final principle, which ties into both relationships-building and co-design, is respect. To show respect means to work together as equal human beings, and to value each other's values, opinions, and preferences (pers. com., 2023). Importantly, it means to not impose oneself or one's worldview over others, and to comply with local practices (Akama et al., 2019). In my research, I showed respect by educating myself on Indigenist methodologies and applying these, as well as by adhering to the different temporalities of Indigenous research to the best of my abilities. I showed respect through a willingness to question my own assumptions and beliefs about what it means to do rigorous research. A strong research project is built on mutual respect; these reciprocal relations, however, often take time to establish.

5. Practice Indigenist Research Methods

My new research design, or research approach, compelled me to reassess my methods for collecting and interpreting data. Finding the right methodology for this project has been an an iterative process of trial and error. In my original research proposal, I had planned on carrying out a systematic literature review, along with a Causal Loop Diagram (CLD) illustrating how Indigenous knowledge could be integrated into a circular economy. I later became aware that a systematic literature review was inappropriate because of the lack of academic articles on Indigenous knowledge on online databases. This would have led to an incomplete and highly limited collection of Indigenous knowledge which is mostly archived in the oral storytelling tradition. Additionally, a CLD is not the best fit for the qualitative, highly contextual and holistic nature of Indigenous knowledge (the CLD, by breaking systems down to its main elements, tends to be reductionistic).

I was initially reluctant to let go of this research plan; as an industrial ecology student, I felt I had to satisfy certain methodological conventions, in part driven by fear of not meeting requirements for graduation. One challenge in this research project was to adopt a methodology that respected cultural protocols and integrity, while also being acceptable to the rigorous standards of the scientific method by which I will be evaluated. With the help of my Indigenous mentor at UQ, I was made aware of the necessity to apply Indigenist research methods in my thesis. This is because Western research methods are not consistent with Indigenous values, and persist the imposition of a Western research practice over non-Western "subjects" (Barlo et al., 2020; Brigg, 2016).

Indigenist research methods, centered on storywork and relational learning, challenged my own assumptions about what it means to do rigorous academic work. Learning these methods also forced me out of my Western knowledge system, from which I was observing Indigenous knowledge. I had to learn to become "open and vulnerable to alternative ways of being and knowing, and to know relationally rather than (wholly) as a sovereign"(Brigg, 2016). The methods I selected, Yarning, Dadirri and Ganma (introduced in Section 3), are place-based methods specific to Australia, and researchers should seek out methodologies that are relevant to their own particular contexts.

6. Select the Right Participants

The target participants of this research were Indigenous academics at the University of Queensland. Initially, I intended to interview Elders, who are the appointed knowledge keepers of the Aboriginal community. However, it was made clear to me that, being in Queensland for only 5 months, I could not conduct non-extractive, respectful research with the Elders in such a short time frame. Traditionally, knowledge from Elders is shared gradually, and only when the Elders judge the student to be ready and worthy to be the recipient of knowledge (Archibald, 2008). This necessitates a long-term, reciprocal and continuous student-teacher relationship, something that I could not achieve within the scope of a Master's thesis.

Nevertheless, working with academics had its advantages. Accustomed to operating in both Western and Aboriginal worlds, they could better convey cultural knowledge in a way that might be understood by me, as an outsider. Additionally, this imposed fewer cultural and linguistic barriers to overcome, and reduced the negative ramifications of a faux-pas. Narrowing the pool of participants down to academics at UQ was also more practical given my location on campus. It is important to emphasize, however, that Indigenous academics are not Elders, and therefore are not knowledge holders and do not have cultural authority. Although they do have Aboriginal cultural insights and knowledge, they do not speak for their traditional communities.

7. Obtain Ethics Clearance

In Australia, many Aboriginal and Torres Strait Islander people have a deep distrust for Western academics and research, due to exploitative and disrespectful practices in the past (Sharmil et al., 2021). Tuhiwai Smith (2012), a Māori scholar and author, writes "the word 'research' is probably one of the dirtiest words in the indigenous world's vocabulary"(p.1). This posed a challenge for me, a European student with no prior existing relationships with the local Indigenous community. My preparatory efforts to gain cultural knowledge helped me earn some trust; however, in order to do this research ethically and establish confidence, I ultimately had to obtain additional ethics clearance.

As other researchers before me have pointed out, engaging with Indigenous knowledge in the academy is a complex and politically challenging task (Brigg, 2016). I myself encountered obstacles with attaining ethical clearances, leading to considerable delays in the research process. Ethics approval was first obtained from TU Delft's Human Research Ethics Committee (HREC), prior to my arrival in Australia. However, because of the high level of ethics clearance needed in Australia for research with Aboriginal and Torres Strait Islander peoples, the participants of my research demanded additional ethical measures as a guarantee. I therefore had to undergo the HREC process at the University of Queensland, which entailed a long and sometimes frustrating process that lasted 4 months. Future students who would

like to do research in this area should be aware that local clearances (although not mandatory in our home universities) are often needed for research with Indigenous peoples, and therefore should begin the application process well in advance.

Ultimately, this research project obtained HREC approval by TU Delft and UQ, and also abides to the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) 'Code of Ethics' guidelines. Moreover, to ensure a culturally appropriate research process, this research was periodically supervised by an Indigenous academic at UQ (who requested to remain anonymous). The final draft of the thesis was additionally sent back to main respondents, to cross-check the validity and accuracy of the written content, and this way show respect for my respondents and the knowledge they had shared with me. Extensive feedback was received, which was subsequently integrated into the final version of the thesis. The results of the thesis has been made available at TU Delft's thesis repository, and the Methodological Roadmap has been shared with the Decolonial Research Group at the faculty of Technology, Policy and Management. In this way, the Roadmap is more easily accessible to professors and tutors, who may use it as an educational tool for students who want to engage with Indigenous people.

8. Continuously Adapt and Review the Research Method

In doing this research, I experienced a very steep learning curve and I continuously learned new aspects of Aboriginal culture throughout the entirety of the project. This meant that I had to repeatedly go back to my initial plan and methods to refine them and to reflect what I had learned along the way. As new information emerges and perspectives change, methodologies and goals must be reassessed to ensure accuracy and relevance. Additionally, there were many unexpected changes and obstacles, such as delays by the HREC board and unwillingness by some participants to continue with the research. I never fully knew how my report would look like until the very end. For this reason, it is important to adopt a flexible approach and to consider that more time might be needed than in other types of research.

4.2. Final Reflections

My motivation for pursuing this topic came from my belief that this was interesting research that mattered. I had a conviction that learning from Indigenous knowledge could help solve environmental problems while also promoting social justice, by including marginalized voices in the knowledge production of concepts like the circular economy. I wanted to bring awareness to Indigenous knowledge and the ways in which it could contribute to the scientific fields of sustainability, such as industrial ecology. Despite all of these ideals, when it came to actually *doing* the research, I was confronted with the disturbing fact that my research was not necessarily welcome by everyone.

My main challenge in this research project was dealing with the harsh reality that my research was sometimes perceived as extractive by some of the participants. Despite my best efforts, for reasons out of my control, I had failed to truly build a strong relationship of trust with my mentor and interviewees. This has been very distressing for me, because I was highly emotionally invested in this project and genuinely wanted to do it right.

This research indeed came out at great personal cost, because I was hopelessly frustrated by the fact that, ultimately, I was not able to work against the tide and truly engage in decolonial research. It was also discouraging to see that despite doing my outmost to accommodate the requests of the participants, such as attaining additional HREC clearance, I was still not able to follow through most of my interviews. The extractive legacies of university institutions, my positionality as a white educated European woman, and the fresh colonial wounds of Aboriginal Australians, tangled me and the participants of my research in relations that prevented us from working freely with each other.

Nevertheless, this experience allowed me to grow as a person, and helped me better understand the changes that need to happen to mend past injustices, so that we may move forward in unison. I still believe in the importance of cross-cultural exchanges of knowledge, in collaborative work for sustainable futures, and in strengthening sameness across difference. There is a lot of hard work ahead, and one starting point may be with this roadmap. My past education had left me wholly unprepared for the research I set out to do; no methods courses ever mentioned decolonial research methods, or cross cultural research methods. I learned everything through trial and error and self-study of literature, and in this roadmap I pass on all the hard-earned knowledge I have gained in the hope that other students coming after me may do better. This roadmap is purely based on my own experience, and it is not exhaustive nor comprehensive. The steps do not necessarily unfold in a linear way, but they provide a starting point and aspiration for how to do respectful and collaborative research with Indigenous people.

Despite the challenges, coming to Australia was indispensable for my thesis research, because I was able to learn so much about decolonial research practices, Indigenous knowledge, and even about myself, than I would ever have been able to by staying in the Netherlands. Particularly with regards to Aboriginal Knowledge, there are so few written sources of information available, that conducting this research from a distance would have been a difficult undertaking. My presence in Australia allowed me to experience snippets of Aboriginal culture first hand, and helped me gain awareness into my own positionality in this research and in broader social contexts. On a different note, I do have to disclose the fact that this research abroad incurred a financial cost which was mostly covered by myself (although a small scholarship was obtained). This is also a factor to keep in mind for students who want to organize their own research abroad.

The following pages delve into the rich world of Indigenous knowledge systems, answering the second research sub-question, *What are Indigenous knowledge systems, worldviews, or principles?*

5. Introduction to Aboriginal Worldviews

Uluru at sunset

Indigenous cultures and knowledges have suffered a great loss due to colonization. However, these cultures persist as vibrant and powerful components of Aboriginal identity today. This section explores the rich tapestry of the Aboriginal worldview, to outline some its most foundational elements. The aspects of Aboriginal worldview explored here are the Dreaming, Songlines, and artworks that carry spiritual and intellectual significance. This introduction to Aboriginal worldviews is a simplification, and for instance does not touch upon Aboriginal languages, which carry knowledge within their grammatical structures and vocabularies. Regardless, building a general understanding of the Aboriginal worldview fosters cultural competence, allowing for more meaningful and respectful cross-cultural knowledge exchanges that transcend surface-level interactions. In my research, having some knowledge about Dreamings and Songlines proved to be very helpful in my discussions with Indigenous peoples, to be able to correctly interpret and understand their insights. Cultural learning can therefore be one way for researchers and individuals to deeply engage with a culture from the same mindset, without circling back to a Western point of view (Brigg, 2016).

For this chapter, I have relied on Dreaming stories I could find, mainly in children's picture books, on excursions to museums and art galleries, and documentaries. The book *Songlines: The Power and Promise* by Neale and Lynne, has been extremely helpful in attaining a better understanding of this complex topic.

5.1. The Dreaming

Aboriginal cosmology is centered around what is known in English as the Dreaming[5] , which refers to the creation of the universe, but also to a continual, atemporal reality (Hume, 2000). Aboriginal people believe that before the Dreaming, Australia was a flat and sterile continent. Then, one day, large ancestral beings emerged from the Earth, who began to shape and populate the continent, thus marking the beginning of the Dreaming (Courage and Beauty, 2022-2023). Their behaviors, good and bad, provide the foundational stories that tell people how to live (Hume, 2000). For this reason the Dreaming may also be referred to as "the Law" by some Aboriginal people (Muecke, 2011).

In everything the ancestors touched, they left their essence, imbuing the landscape with meaning and significance. During initiation rites, apprentices pilgrimage to the sacred sites and become identified with certain Dreaming stories or features of the land (Hume, 2000). The sacred stories of the Dreaming are passed down through storytelling, song and ritual, and these are considered the medium through which the land can speak (Kwaymullina, 2005).

Because the Dreaming is an expression of Country and its ancestral beings, the Dreaming is immutable and its essence cannot be altered by humans. Indigenous Australians call white laws "weak" because, unlike the Dreaming laws, they keep being changed (Muecke,

[5] Sometimes the term "Dreamtime" is also used, however this is unrecommended because it implies a moment in the past, whereas the Dreaming is continuously unfolding.

2011). The Dreaming is absolute and exists beyond (before and after) human intervention. Aboriginal Elders are the designated knowledge keepers and are responsible for maintaining Dreaming stories and wisdoms. This is how knowledge, cultural values, and traditions are passed on accurately to younger generations. Nevertheless, Dreaming stories do superficially vary from one storyteller to the next (Neale & Lynne, 2020).

The Dreaming is not simply a historical record of times past; it is an eternal and continuing process. It grows and adopts new phenomena into its ancient indexes. For instance, new technologies such as smartphones are also entering the Dreaming and carry their own stories and protagonists.

While some people refer to the Dreaming as timeless (even the word for time itself does not exist in Aboriginal languages), circular is a more accurate term (Yunkaporta, 2019). Like most other Indigenous societies in the world, Aboriginal Australians view time as cyclical, not linear. This means that whereas in a linear fashion, time progresses in an irreversible chain of events, cyclical time is in "perpetual repetition, corresponding to the diurnal and seasonal rhythms of the natural world, and the past therefore is infinitely repeatable" (Farriss, 1987). The non-linearity of time can be difficult to understand for people who are socialized in cultures that view time as an irreversible linear progression. It helps to acknowledge that the perception of time as linear is a cultural phenomenon, most likely influenced by the development of writing, which (unlike the oral tradition) organizes thoughts and records in a linear and unidirectional way, and Christian theology, which recounts the story of mankind beginning with the Genesis and ending with the Fall (Falvey, 2005). However, there's not much evidence that points towards the linearity of time. Einstein proved that time is not absolute, but relative. In nature, seasons pass in a cyclical regularity. History, as we can attest, repeats itself.

The Dreaming, therefore, follows a cyclical pattern. However, it has an added layer of complexity: in the Dreaming, past and present -- and by extension, the future -- are overlapping. As such, the Dreaming is at once a parallel universe (containing all historical events or stories), and present reality. To help us think through this, I borrow an analogy from outer space. Consider that time and space are the same, and infinite. If they were to collapse into a black hole, in that moment, the past, present and future all collapse into a single point. They become the same, and time loses its significance. Similarly, in my interpretation and understanding, the Dreaming, when enacted through song or ceremony, calls or collapses everything into the present moment. In this way, history runs parallel to the present.

To conclude, the Dreaming is more than the collective memory of Aboriginal and Torres Strait Islander people. It contains the memory of Country and all its knowledge since time immemorial, but also extends its reach to ongoing life and realities. It exists as an absolute, beyond human intervention. Although human beings are key parts of the Dreaming as custodians of ceremonies and texts, the Dreaming itself is not centered on them (Muecke, 2011). Still, the Dreaming forms the basis for all Aboriginal knowledge and laws, through its teachings of timeless connections between land, human beings, and all other physical and metaphysical entities (Hume, 2000).

5.2. Songlines

Songlines, Neale and Lynne explain, "refer to a knowledge system – a way of retaining and transmitting knowledge – that is archived or held in the land" (2020). In this system, physical tracks across Country are linked to specific stories and knowledge, turning the land into an archive of knowledge. The use of songs to "call up" Country is perhaps the most ancient form of indexing (Neale & Lynne, 2020). While some songlines are confined to tribal or local boundaries, others travel the entire continent. Together, they comprise of a network of lines crisscrossing the continent along distributed nodes of concentrated knowledge (see Figure 11) (Neale & Lynne, 2020). This way of understanding Country as an interconnected and metaphysical entity is very different from the rectilinear convention of Western geographical mapping, punctuated by state lines, grid patterns, borders, and never considering knowledge trails (see Figures 11 and 12).

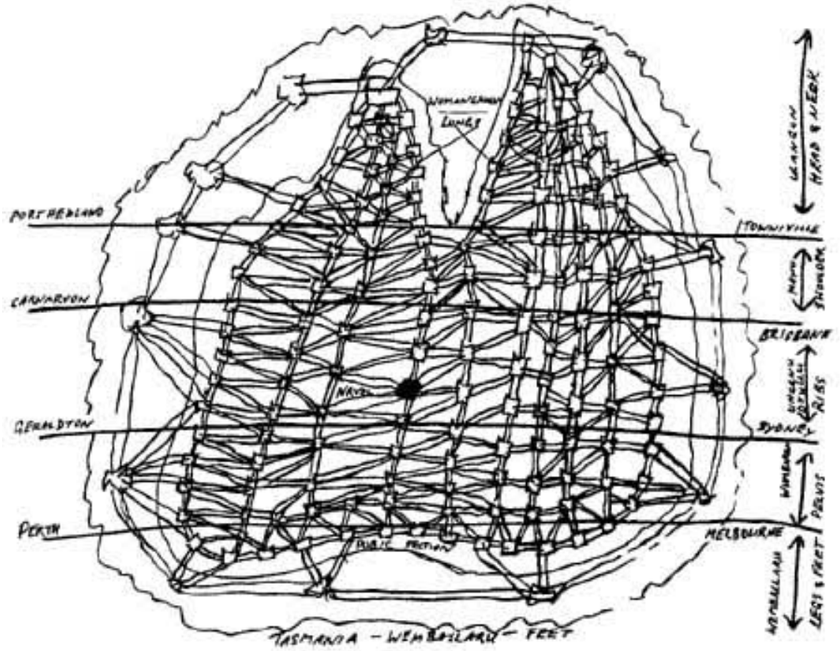


Figure 11. "Corpus Australis", a representation of Australia by David Mowaljarlai, a traditional Elder of the Ngarinyin people in Western Australia (1992). The squares represent stories: the lines linking each story are lines of communication between tribes. Thus Australia is not a land mass but a "story mass"

Today, some of these trails are formalized into Aboriginal Heritage Trails. For instance, the Lurujarri Heritage Trail is a 90km walk, spread out over nine days and guided by the Goolaraboolooo group (Goolaraboolooo, 2019). Tourists join this guided trek offered once or twice a year, and this is a beautiful example of cross-cultural knowledge transfer that has mutually beneficial outcomes. White Australians experience the knowledge and vitality of Country, while the traditional custodians are able to maintain and reconnect with their sacred trails. As such, Aboriginal Heritage Trails are not only touristic or leisure activities. They are practices that maintain natural heritage sites and keep Aboriginal knowledge alive (Muecke & Eadie, 2020). To provide a practical example of how these trails have been beneficial, Landscape Architecture students from RMIT University in Melbourne have been participating in the Lurujarri walk since the nineties as part of their coursework. These yearly excursions have helped reform and indigenize the students' curriculum, and have educated the students about Indigenous knowledge and practices. When the Western Australia government and Woodside Energy were set to industrialize the Kimberly region (where the Lurujarri trail is located) and accelerate the extraction of fossil fuels, many of the students were among those who came back to fight against the project (Muecke & Eadie, 2020).

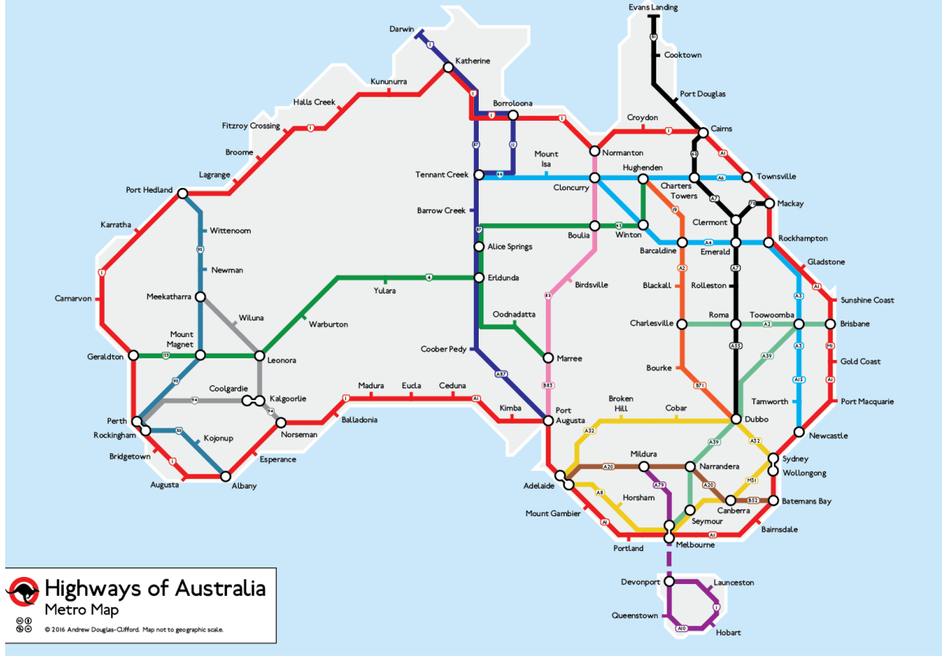


Figure 12. Conventional Western style of mapping. The nodes indicate main cities, and the lines indicate roads for travelling in between them.

Along the heritage trails are special sites or features of the landscape which contain stories and knowledge. Features of the landscape serve as cues for people to remember Dreamings. What makes this way of encoding and decoding knowledge so special is that it is necessarily local and embedded, and it ensures that "culture remains the active space through which knowledge is transferred rather than objectified" (Muecke & Eadie, 2020). Knowledge in songlines does not presume the same universalizing ambitions as modern disciplines of Science, Economics, History, etc.; it rather demands a "relationship of mind and body to Country" and "a process of attunement over the time taken to walk" (Muecke & Eadie, 2020). This is not to say that Aboriginal knowledge does not have some absolutisms and universalisms – it does – however, it recognizes their situatedness first (Brigg, 2016).

Restriction of Access

Not everyone, however, is permitted to know the stories and the knowledges they enclose. Maintaining "secret and sacred" business has been one mechanism though which Indigenous Australians have been able to protect core aspects of their cultures from colonial interference (Muecke, 2011). For instance, the sound of the bull roarer is associated with secret men's initiation ceremonies for the Anangu people. It is for this reason that Anangu people do not want bullroarer objects sold to tourists, and women (of any culture) are not allowed to touch them (Australia National Parks, 2012). Neale and Lynne (2020) describe Aboriginal protocols for knowledge sharing:

> "Some of the stories are open to all, but many are not: rather, there are many layers of the same story, each with varying levels of access. Stories are either "open" or "closed": a story in the National Museum of Australia or in a book is an open story, which the custodians call the schoolkids' version. Beyond this version, the deeper layers of a closed story will only ever be known by a select few. Further access to deeper knowledge is not democratic but gendered, age-graded, and continually negotiated. By keeping knowledge secret from those not yet ready to receive and protect it, Elders can ensure that every repetition of the story is correct."

This quoted paragraph shows that the nature of Aboriginal knowledge, like the Country from which it emerges, is cyclical – one person will encounter the same knowledge many times throughout life, each time with added layers of meaning (Neale & Lynne, 2020). Knowing from the land is also a deeply personal endeavor; it requires placing the self as an intimate part of the environment, and building knowledge from personal experience with Country and all its inhabitants. Knowledge needs to be earned by showing dedication to learning, and respect for the Laws (Yunkaporta, 2019). Therefore, it is important to acknowledge that the knowledge that was shared with me for this research is merely entry level or elementary knowledge.

Songlines are what allowed Aboriginal people to memorize immeasurable amounts of information, without the need of a writing system (Neale & Lynne, 2020). This system of memory encoding is today formally known as memory of loci, or colloquially known as the "memory palace", and is practiced by memory champions worldwide. Neuroscience shows that the brain is particularly good at associating memory with images, places, routes, and the associated experiences (Moser et al., 2008). For Indigenous peoples, however, Songlines are not just a trick to enhance memorization. They provide a framework for relating people to the land, and to show that this relationship is inalienable, or, in Aboriginal terms, Law (Neale & Lynne, 2020).

5.3. Artwork

Aside from the predominantly oral tradition, Aboriginal people do have a way to inscribe their knowledge, and that is through art. Australian Indigenous art is not just aesthetic, but conveys intellectual knowledge and was used as a form of mnemonic device. Aboriginal art typically provides a map of the land from a bird's eye view, however, this map is not cartographic, and "to consider a piece of Indigenous art as simply a map would be so superficial as to lose most of the intent behind it" (Neale & Lynne, 2020). It may have multiples scales and orientations, painted by a group of different artists at once. In addition to mapping a landscape, it always makes reference to the way the landscape is to be understood based on the teachings of the Dreaming.

The painting in Figure 13 was completed by eight senior Martu women of Western Australia, representing a hunting ground in the Parnngurr area (Rey, 2016). Each woman drew parts of Country to which they had cultural authority. In Aboriginal Law, only certain people (the Elders) have the authority to speak for the land, and the authority only extends as far as that person's tribal territory. Therefore, no single person can speak for all (Yunkaporta, 2019). Although each person can only map out their own territorial land, together a comprehensive map can be created, bringing together different tribal knowledges and teachings (Rey, 2016). This resulted in an epic 3x5m painting that withholds detailed information about the land and how to live in it, encoded in specific iconography and symbolism. Figure 14 illustrates explicitly some of the information contained in the Yarrkalpa in an accessible way. For instance, it represents Nuyrnma as a freshly burnt country and as a good place for hunting goanna (Neale & Lynne, 2020).

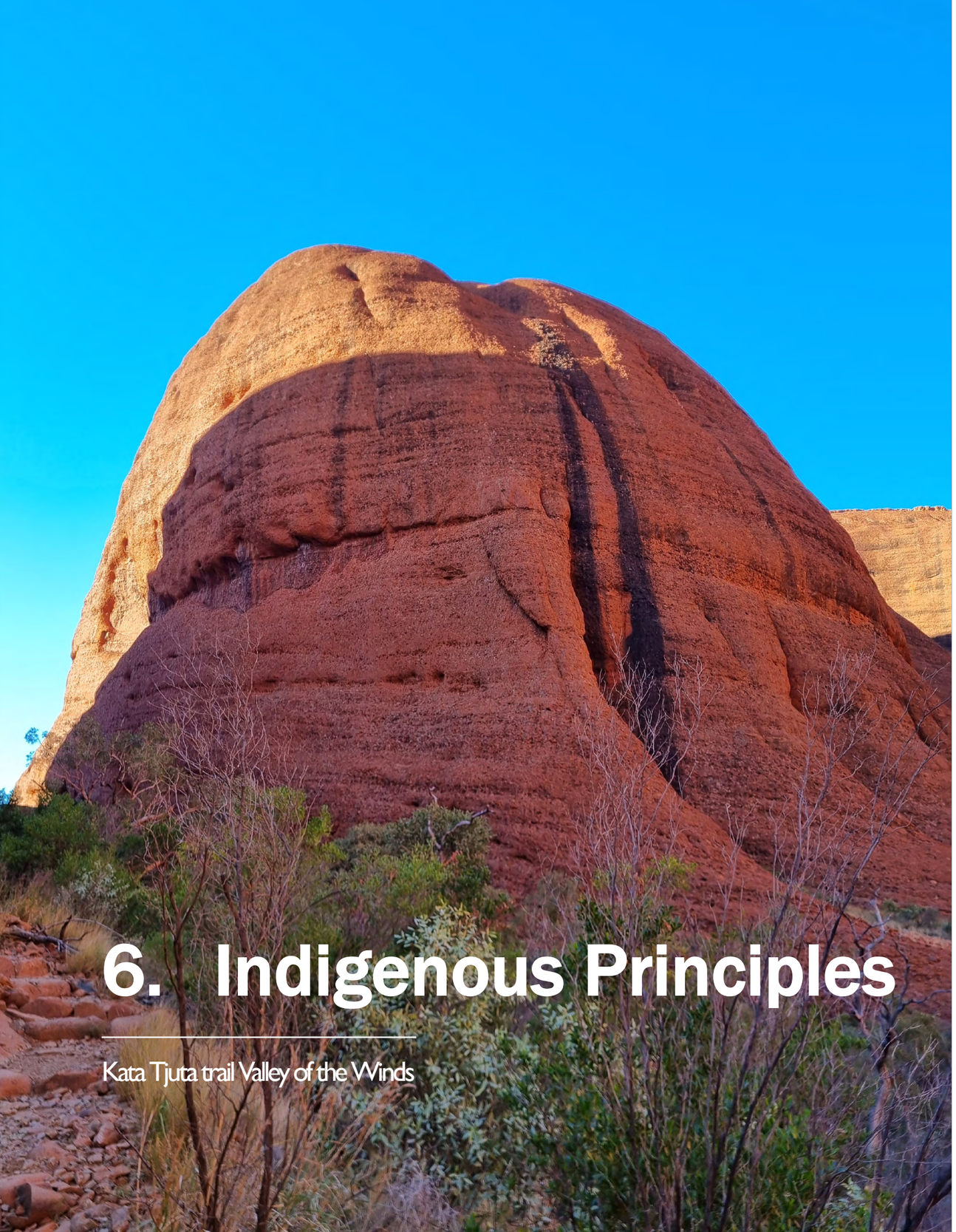
Today, much Aboriginal art is secular and sold to tourists as a source of income. While some view this as a regrettable change, it rather points out that beyond simply 'surviving', Aboriginal art and culture is adapting through time. One common problem nowadays is that the authenticity of Aboriginal artists and their respective works is often questioned, because it does not conform to stereotypes critics and viewers have of Aboriginal art (L. Taylor, 1999). This fails to recognize the inherently dynamic and diverse forms of Aboriginal culture and artistic expressions. Through their paintings and performances, the Indigenous people of Australia continue to transform themselves and adapt to new contexts (Neale & Lynne, 2020).

Figure 13. *Yarrkalpa – Hunting Ground (2014). Acrylic on linen / synthetic polymer paint on linen. Retrieved from Neale and Lynn (2020).*

5.4. Conclusion

Despite the years of colonial violence, Aboriginal cultures and worldviews persist in all their complexity and richness. Many Aboriginal people today revive their culture, knowledge and traditions through self-teaching, in a laborious scavenging of archives and recollection of childhood stories. Dreaming stories, songlines, and artworks stand in for the missing history of Aboriginal and Torres Strait Islanders, which has been tentatively erased by settler society (von Zinnenburg Carroll, 2014). Artwork today is a particularly influential medium for the assertion of Indigenous culture in Australia, and provides an outlook for future-building and Indigenous collective continuance, which Whyte (2018) argues is crucial to reinstate justice. There is more to the Aboriginal worldview than I have been able to convey in this short introduction, and its exploration is a never ending process of learning. Developing a basic understanding of Australian Indigenous worldview helped me engage in more meaningful conversations with Indigenous peoples, and build a strong foundation to be able to learn about more specific Indigenous principles, explained in the next chapter.

Figure 14. *Translation of the symbolism of the Yarrkalpa painting. Retrieved from Neale and Lynn (2020)*



6. Indigenous Principles

Kata Tjuta trail Valley of the Winds

Based on my extensive readings, observations, and thanks to the guidance of Indigenous academics at the University of Queensland, I have recognized five important building blocks of Australian Indigenous worldview, and have outlined them below. These principles are Country, relationality, reciprocity, kinship and respect, and altogether they form the basis of my interpretation of an Indigenous-inspired circular economy. These are not my ideas, and are principles that have been espoused by Indigenous peoples in other writings. However, I bring them together here to support the backbone of my analysis. When reading about the concepts, it becomes evident that they are all interrelated and they sometimes appear to be interchangeable. However, each concept uniquely contributes to a deeper comprehension of Indigenous ontology and is indispensable in its own right. Presented below is a coherent sequence wherein each concept builds upon the previous one.

6.1. Country

The most logical place to begin the discussion of Aboriginal knowledges and principles is Country, because all of the following principles are grounded “down to Earth”; down to the Country from which they emerge. For Aboriginal people, everything – knowledge, stories, and human existence – begins and ends with Country. Country in Aboriginal English is both a common noun and a proper noun, meaning that people talk about Country in the same way that they would talk about a person (Dudgeon & Bray, 2019). Country does not just refer to the land itself but also the “people, animals, plants, Dreamings, and underground, earth, soils minerals and waters, surface water, air. There is sea country and land country; in some areas people talk about sky country” (Dudgeon & Bray, 2019, p.4). For this reason, I apply a capitalized spelling of the word “country”, to denote its different meaning.

Ancestors from the Dreaming (giant mythical beings) once treaded the land and inscribed stories and knowledge in features of the landscape wherever they went, for their descendants to safeguard and learn from. After millennia of human presence on Country, the land has grown ever richer with knowledge and wisdom. As previously explained, this knowledge is indexed in the form of Songlines (physical tracks along Country) and Dreamings. Country and Dreaming, therefore, are intimately linked, and Country can be understood as a physical expression of the continuous unfolding of the Dreaming. The Dreaming is not bound by linear time, and in the same way, Country is everywhere and everywhen (Neale & Lynne, 2020). Ancient wisdoms and knowledges are brought back through song, dance, and ritual, and in this way Country is kept alive so that it may speak to those who are ready to listen (Neale & Lynne, 2020; Wooltorton et al., 2017). Country is the original teacher, and learning from it requires deep listening (Dadirri), observation, and accumulated experiential learning (Wooltorton et al., 2017). The knowledge acquired from Country is inherently rooted in a nuanced and intimate understanding of the land and the flora, fauna, and spirits that inhabit it. To some extent, this relational and superlocal way of knowing aligns with the emerging narrative that sustainable development can only be achieved upon the consideration of local social, economic, and environmental contexts. Ignoring local

contexts often leads to climate change mitigations measures that fail to provide relief and instead generate unintended negative consequences. This is known as maladaptation, which the new IPCC report shows is becoming an influential obstacle to sustainable development (IPCC, 2023).

6.2. Relationality

Relationality is at the core of Indigenous ontology and informs behavioral conduct in everyday life. Indigenous people believe that everything and everyone are related (Tynan, 2021). Cree scholar Shawn Wilson (2016) writes that "relationships are reality, and reality is relationships. As Indigenous people, we 'are' our relationships with other people" (p. 313). Although he speaks from a Native American perspective, this also resonates in the context of Indigenous Australia.

As such, the basis for knowing and experiencing the world centers not on entities themselves, but on the relations between them (Tynan, 2021). For instance, in Aboriginal astronomy, the spaces between stars are not empty voids, but are significant parts of a larger interconnected celestial ecosystem (Yunkaporta, 2019). The focus on the spaces between celestial bodies contrasts with Western astronomy, which focuses instead on individual stars and constellations. This relational approach to astronomy (also known as "dark astronomy") is but one example of the way in which Indigenous ontology shapes Indigenous ways of knowing (see Figure 15).

Another example of how relational worldview translates in practice is illustrated in the following example, adapted from Tynan (2012):

- *How are a mountain and river similar?*
  A. They are both found in nature
  B. The river flows down from the mountain

The first answer is more common to a Western worldview in which entities are classified into categories (mountains and rivers belong to nature). The second answer is typical of a relational or process-based worldview in which entities are known based on how they relate to one another (a river flows through a mountain) (Edwards et al., 2013).

In my own experience, I have found that Indigenous people first and foremost wanted to know who I was and where I came from; whereas white Australian or generally "Western" participants primarily asked what I studied and at which university. The question "where are you from?" ultimately functioned to determine my positioning in relation to my inquirer. Differences and commonalities between two people are thus determined, with the particular goal to strengthen sameness across difference (Martin & Mirraboopa, 2003; Tynan, 2021).

It is interesting to mention that the concept of relationality has recently gained traction across various fields in academia. However, it carries a different nuance in meaning. The academic use of relationality

Figure 15. The Emu is the most famous dark constellation in Aboriginal astronomy. Retrieved from: (Fuller et al., 2014)

typically involves "an iterative process of drawing interconnections between two or more discrete categories and phenomena that may not necessarily be binaries" (Yeung, 2005). Thus, relationality in academia marks a departure from Cartesian binary understandings of the world to foster a greater insight and appreciation for complex systems. The emergence of "inter-", "multi-", and "trans-" disciplinary fields is just one evidence of the growing influence of relationality, which criticizes the specialization and subdivision of disciplines as reductionistic and poorly equipped to deal with modern challenges (Prior et al., 2018).

However, despite its intent to divert from the mechanistic and reductionist legacies of Cartesian dualisms, the use of relationality in academia has been criticized for continuing to employ reductionist language and analytical methods. For instance, the breaking down of complex systems into small parts for analysis (which, for instance, is the convention in system dynamics modelling) undermines the holistic essence of relationality. To some degree, I have also adopted reductionist methods by breaking down complex Indigenous worldviews into five main principles. This highlights the influence of the education I received in the way I approach problem solving and analysis, and I invite you to think critically about the extent to which I manage to portray the holistic nature of Indigenous worldviews.

Other conceptualizations of relationality in Western academia oversimply the complexities between actors, for instance by adopting linear models of cause and effect which neither capture emergent properties, nor the intricate "wicked" interactions of genuine relational dynamics (Törnberg, 2017). Additionally, the tendency to frame the individual as the primary unit of analysis is anthropocentric, and undermines the collective or non-human roles of actors in a system

(Kopnina et al., 2018). The Indigenous perspective on relationality emphasizes a more holistic perspective, and values relationships as integral components of existence, rather than as tools for analysis or means to an end (pers. com., 2023).
Still, reductionism is not necessarily a "bad" or incorrect way of analyzing. Breaking down complexity has has value in engendering better (and more accessible) understandings of difficult concepts, systems, or other phenomena. However, it is important to acknowledge that there is always some loss incurred by taking a reductionist approach.

While both reductionist and relativist approaches are valuable and legitimate, I emphasize in this section that the Indigenous notion of relationality carries different implications which can perhaps provide a different way to deal with complexity. Comparing the Indigenous understanding of relationality with Western academic notions of the term helps bring into contrast the differences, offering the potential to improve the conceptual strength validity of relationality in academia.

6.3. Kinship

As previously explained, relationality is the web that connects humans to each other and to Country (Tynan, 2021). These relationships are bound by responsibilities, which are enshrined in the kinship system. A kinship system determines obligations between people, their human and non-human kin, and place (Dudgeon & Bray, 2019; Wooltorton et al., 2017). This creates enduring, non-negotiable relationships that "carry consequence" (Paulson, 2019; Rose et al., 2003).

Australian Aboriginal kinship governs social interaction in traditional Aboriginal culture (Russell & Cohn, 2012). The kinship system is complex, and it is beyond the scope of this paper to outline its intricate categorizations. However, typically, people are divided into 'skins', which group people into twos, four, six or eight depending on the mob (Russell & Cohn, 2012). Skin groups are typically determined by the skin of a person's parents, but they also follow certain orders. For instance, skins are assigned in a re-occurring pattern, typically repeated every three to four generations (depending on the local tradition), exemplifying the cyclical perspective that permeates Aboriginal worldview: a grandmother and her grandkid may share the same skin, because they are closest to each other in the cycle of life (pers. com., 2023). This shows that relations are not only made between elements, but also across time (H. Watson & Chambers, 1989).

Kinship systems are universal, meaning that everybody is assigned a skin name (Russell & Cohn, 2012). When a stranger comes into a traditional Aboriginal community, they must be located within the genealogical order. A common genealogy can be established not only through biological descent, but also through cultural or historical descent (Russell & Cohn, 2012). As such, a non-Indigenous person will be given a skin (a type of classification) based on the group they have most interacted with, and will be taught who their brothers and sisters are (Cowlishaw, 1999). On the other hand, an Indigenous person who is already located within a system of kinship, will have their system translated into the system of the host. No new connections have to be made, because all Aboriginal people are already connected to one another through a series of intermediate relations. Using the kinship system, the relations between all elements (human and more-than-human) of the world can be known (Watson & Chambers, 1989).
The kinship system has practical functions in everyday life. For instance, it designates potential marriage partners, parcels of lands for which individuals are responsible for, or the different roles a person should assume (H. Watson & Chambers, 1989). Most interesting for matters of environmental conservation, kinship also assigns different totems to each person. If a person's totem is a sea turtle, then it is their duty to know everything about that species, including its Dreaming (pers. com., 2023). The totem becomes their teacher, thanks to the different Creation stories, and is considered family. Thanks to the totem system, people learn from a young age how a non-human being can teach them how to learn, hear, and feel (Poelina et al., 2022). In a quote extracted from Watson and Chambers (1989), a Gumatj man says, "I see a crocodile as an animal that is part of me and I belong to him, he belongs to me. […] In my group of people, and the forefathers, we have always treated crocodile in a way that it is part of a family." Each person is responsible for their totem's wellbeing, and therefore they are forbidden from eating that animal (Muecke & Eadie, 2020). As such, totemism helps maintain balance in the ecosystem and prevents species extinction (Rose et al., 2003). This provides a valuable lesson that may also extend to Western contexts; that to know our kin is to come to love and cherish them (Suzuki & Knudtson, 1992).

6.4. Reciprocity

Reciprocity is about giving back, but it is more than transactional exchanges, or creating "win-win" scenarios. Rather, reciprocity is about valuing and respecting relationships (pers. com., 2023). It is not equivalent to today's Modern economic exchanges, because reciprocity has an emotive component. In fact, in the Aboriginal tradition, trading land would be as absurd as trading love or relations of love (Wooltorton et al., 2017).

Reciprocity is borne out of the recognition that the obligations set out by the kinship system must flow both ways for the system to work: Country must provide its inhabitants with resources, but in return, the animals, people, plants, and spirits must also give back. There is a comfort in knowing that Country always provides; that it is not an unresponsive land but rather "animate, energetic, and interactive in a reciprocal way" (Wooltorton et al., 2017). Reciprocity is the practice that has maintained the balance that sustains life on Earth. This balance, however, has been compromised due to ramping consumerism and ecological debt of modern human beings.

Reciprocity informs a custodial ethic towards the land, and by extension towards all its inhabitants, resulting in a system of "mutual life-giving" (Rose et al., 2003). An illustrative example of this is the partnership that Quandamookan men once established with dolphins (in what is known today as Moreton Island, off the coast of Brisbane). Quandamook is the name of the main creator spirit of the island, a sea spirit that manifests as a dolphin. As such, Quandamooka literally means 'the place of the creator spirits Quandamook) (pers. com., 2023). Quandamookan fishermen had formed mutually benefitting relations in which dolphins would help them gather fish, which they could then more easily spear. In return, the dolphins would be fed the biggest or most palatable catch (pers. com., 2023). Unfortunately, the century-old friendship with dolphins no longer exists due to colonial interference.

Quandamookan land custodians firmly believe that such relationships could be restored, with time and consistent reciprocity (pers. com., 2023). The example of dolphins in Quandamooka is not a unique, isolated phenomenon. In different parts of Sea Country, fishermen once collaborated with orcas and even seals (Brown, 2014).

6.5. Respect

Respect is not an unfamiliar concept to Western culture. However, it carries a peculiar meaning in the Indigenous worldview. For Australian Indigenous peoples, respect is most of all about honoring the relationships and obligations established through the kinship system. Respect is based on the ancestral understanding that we all stand for a short time in a world that lived long before us and will live for others long after we have passed. Therefore, we may not assume a godlike authority over the land, over other species, or even over the ancestors (Yunkaporta, 2019). Respect is about showing care, reciprocity, and staying humble knowing that our view of the world is always incomplete (Akama et al., 2019). The following excerpt, taken from an exhibition at Brisbane's Traditional Knowledge Centre, illustrates this point (italics are added for emphasis):

Upon creating the world, the Rainbow Serpent taught all living creatures, rocks, tress, and waterholes, to respect each other, *for they are all children of the same creation*. Noticing the greedy behavior of human beings, she taught them to stay within their own tribes and their own lands, so that everyone could live in peace and abundance. Those who would hunt in a land without permission, would be punished. Before she went back to sleep, beneath the surface of the Earth, the Rainbow Serpent reminded the woman and man that *if they did not fulfill their responsibilities*, and if they abused the Earth instead of caring for it, then she might have to emerge again and create a new world, in which woman and man would have no place.

From the perspective of this story, respect is about humility, and relinquishing the narcistic idea that man is a superior species that has dominion over everything (Yunkaporta, 2019). Recognizing that all beings "are part of the same Creation" compels us to respect all human and non-human kin as equals.

I had the chance to meet a person that showed me what these principles mean in real life. Below is an anecdote borrowed from my journal, that describe the first time I met Harry, a man from New Zealand with Indigenous ancestry who is now highly regarded among Aboriginal peoples in more remote communities, and is accepted as one of their own.

After a long train ride across the Glass House Mountains, I arrived to Eudlo to meet with Harry. He came to pick me up and invited me over to his property, an old banana plantation which he extraordinarily turned into a rainforest over the course of only 40 years. Harry is the kind of person you might hear about in town folklore but rarely get to meet; he seems to have lived a thousand different lives, each one more fascinating than the last. Hopping into his rusty Jeep, he drove me across his estate, which can be better described as a food forest, considering that there are approximately 115 different plants growing edible fruits and vegetables. I asked him how he single handedly grows all these plants as an 84 year old. He told me that it is very easy; the plants tell him what they need, and they do not need all that much. He does not irrigate, fertilize, or plough the ground. Sometimes, he will play the guitar for them. Even the plants that are in perpetual shade grow tall and make fruits; I myself witnessed the medicinal plum trees that were flourishing in the shadiest corners of the orchard. It was hard for me to understand how this system could work. Much later, I realized that his orchard, made up of intercropped plants, wildly growing in an unstructured way, was the epitome of a complex system. These are the very systems that we study in industrial ecology; self-organizing systems that sustain and regenerate themselves without the need of external control or a hierarchical structure. His role in the system initially was to help restore it, through an intimate knowledge and feeling for the land and local traditional plants (through a relational ontology, that I previously discussed). Now, he assumes the role of a custodian, becoming one of the many actors in this complex system, each fulfilling their roles and respecting one another. There is no narcissism, no dominion over; and the system thrives in balance.

Figure 16. Visiting Harry's orchard by Jeep in Eudlo

This experience showed me how a person can learn to become part of the system without assuming dominion over it. By placing the self as part of the environment, rather than as separate from it, Harry assumes a larger, more interconnected role as autonomous yet interdependent agents of the complex system. Thanks to his custodial ethic, Harry helped rewild a monoculture into a vibrant self-sufficient food forest. The kilos of fruits that he reaps from his orchard are then donated to a food bank for Indigenous peoples, further

illustrating the principle of reciprocity in practice. It also points to an important belief: that nature needs human intervention. To Aboriginal people, fenced off "conservation parks" are considered wastelands, because they have been deprived of nurturing (pers. com., 2023). Human beings play an important role as custodians of nature; and the maintenance of natural ecosystems requires human intervention.

6.6. Conclusion

This section has outlined the principles of Country, relationality, kinship, reciprocity, and respect. Altogether, these principles makeup (part of) the Law by which Aboriginal people live, or aspire to live (Dudgeon & Bray, 2019). This is not an exhaustive list, and it is partly a product of my interpretation, although I have cross-checked its validity through feedback rounds with Indigenous academics at UQ. Gaining awareness of these principles and developing an understanding of them helped me better understand the conversations and interviews I had with Indigenous individuals, and provided me with a lens through which to interpret Indigenous knowledge. These five principles later became the building blocks through which I designed an Indigenous-inspired circular economy in Section 8.

It is important to remember that all these principles are interlinked, and derive from Country. In my discussions with Harry, he shared with me the slogan of a healing center for Indigenous peoples in which he worked. The words of the slogan read:

PRINCIPLES FOR GOOD LIVING:

1. How do your actions affect the environment?

2. How do you actions affect your community?

3. How do your actions affect you?
(it is all the same)

I realize now, that this slogan is just a different way to interpret and combine the five principles I have outlined. It positions the land first (Country), highlights the impact of people's actions (linking to the idea or reciprocity and respect), and recognized that peoples, land and its inhabitants are all connected (relationality and kinship). No matter which terms are used, they all convey the same basic ideas.

7. Introducing the Circular Economy

View of Brisbane centre from city botanical gardens

Until this point, the previous chapters have discussed Indigenous history, contemporary issues, knowledge systems, and principles. In order to answer the final research sub-question, *RQ1.3 "How could Indigenous worldviews inspire circular economy principles?"*, I take a small detour to recenter the discussion to the circular economy. This chapter goes into more detail on the conventional model of the circular economy, to then have a basis of comparison with my interpretation of an Indigenous-inspired circular economy.

As the effects of anthropogenic forcings on the climate are becoming increasingly apparent, the circular economy (thereafter CE) has gained momentum as an alternative model to achieve progress decoupled from environmental degradation. By proposing a system which closes the input and output flows of the economy, the CE is expected to solve scarcity problems as well as climate change, without undermining economic growth (Wiebe et al., 2019). For the purposes of this paper, the CE is defined as an economy that eliminates waste and pollution, is regenerative by design, and aims to circulate products and materials at their highest utility and value (EMF, 2023).

7.1. Context and genealogy

The premises of the CE are informed by a variety of concepts such as ecological economics, industrial ecology, cradle-to-cradle design, biomimicry, and natural capitalism, among others (Korhonen et al., 2018). These are scientific or semi-scientific disciplines which are largely technocratic, and therefore approach environmental problems with technical solutions (Wachsmuth, 2012). The lack of social indicators, in fact, has been portrayed as a potential blind spot for the CE (Hachaichi & Bourdin, 2023). Close relatives of the CE are also concepts of 'green growth', 'sustainable growth'[6] and 'sustainable development'[7] formulated in the 1990s and 2000s, all of which are "wedded to the neo-classical and conventional economics' trust in the efficiency of markets"(Corvellec et al., 2022). These predecessors of the CE (and perhaps the CE itself) have been casted by environmentalists as outcomes of capitalism's ability to co-opt 'almost everything', including environmental movements, thus derogating their potential for real transformative change (Bookchin, 1994). Knowledge production on the CE is predominantly European, with the EU detaining 51% of global publications on the CE, although China is also picking up speed (Hachaichi & Bourdin, 2023). The majority of carbon emissions are generated by the wealthy world via industrialization (Desmet & Rossi-Hansberg, 2021), so perhaps it is not a surprise that the CE is a core issue in Europe, and increasingly popular in China.

The CE also offers potential benefits, such as reduced extraction of raw materials, increased employment opportunities, and the development of synergies between industries (Wiebe et al., 2019). Today, with its logics of dematerialization, the CE

[6] Green or sustainable growth mean "fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies" (OECD, 2018).

[7] Sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987)

aligns with the European political agenda to decrease reliance on foreign countries for raw materials and resources (Kovacic et al., 2019). The economic incentives of "going circular" have made the CE an attractive choice amongst contemporary policymakers, businesses, and foundations. Indeed, advocates of the CE suggest that circular business models, by making better use of resources, are more profitable than traditional models (Howard et al., 2019). For this reason, most research on the CE has been advanced by the business or policy sectors. The Ellen Macarthur Foundation (EMF) has been particularly influential in popularizing the CE at the European stage, and its articulations of the concept are analyzed here (Kovacic et al., 2019).

7.2. The EMF Model

The EMF describes the CE as comprised of biological and technological cycles, each with their own metabolism (see Figure 17). The biological cycle delineates a looping pathway for materials that can biodegrade and safely return to the Earth, such as food wastes and material scraps like cotton or wood (EMF). This cycle suggests how these wastes can be used productively to restore the environment, for instance by composting or cascading by-products into other uses (for instance, leather made out of tomato peels). It promotes regenerative farming practices like agroecology, and anaerobic digestion to produce biogas as a form of recovered energy (EMF).

In the technological cycle, resource use is maximized through the "R's Framework" of reuse, repair, remanufacture, and ultimately, recycle. Ideally, resources should be circulated in these phases for as long as possible, to retain the highest possible value and quality. Here, the term "value" is understood as potential revenue generated from byproducts or emissions which would otherwise be considered waste (EMF, 2023; Howard et al., 2019). "Tighter" loops, such as reuse, are preferred because they demand less energy to circulate, and have higher value than recycled products. Consistent with the goal of value retention, landfill disposal and waste combustion for energy are last-resort options in this system (Korhonen et al., 2018). The application of R's framework is contingent on product designs that ensure repairability, ease of disassembly, and recyclability; and therefore necessitates compatible business models and strategies (Gheewala & Silalertruksa, 2021).

In its ambition to 'future-proof' the economy, the CE relies on renewable sources of energy to power itself, and seeks to avoid fossil fuels (Korhonen et al., 2018). Interestingly, the literature on CE for the most part does not elaborate on water recycling strategies, which is surprising in a

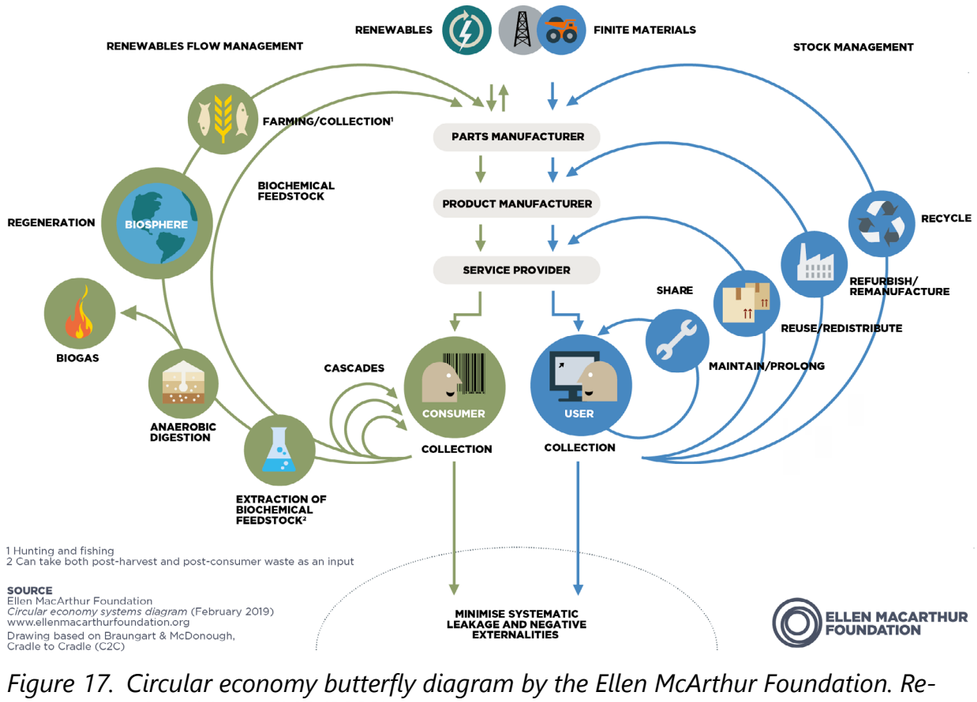


Figure 17. Circular economy butterfly diagram by the Ellen McArthur Foundation. Retrieved from EMF (2023)

context of global water scarcity (Hachaichi & Bourdin, 2023; Korhonen et al., 2018). Beyond these broad characteristics, the CE remains vague and its venues for operationalization change from sector to sector. In fact, it is this very vagueness that makes the CE attractive, because companies or governments can suit the concept to their goals and priorities (Corvellec et al., 2022)

At a product or company level, CE principles are straightforward and achievable through different strategies such as utilizing circular inputs (i.e. bio-based or recyclable input); extending product use; and shifting to selling services rather than products (Cui, 2021). There are many examples of circular business models such as service-product systems which incentivize principles of reuse, repair and remanufacture. For instance, sharing platforms for personal mobility such as city e-scooters are becoming a popular option in cities to replace car ownership. However, a "circular economy" implies a greater scope than simply optimizing individual business practices. An economy encompasses all interactions between all agents, and as such requires a systems perspective (Kirchherr et al., 2017). It is at this macro scale that the CE premises are examined in this paper.

7.3. CE principles, assumptions and goals

Building on the description of the CE above, and based on a review of current literature, the main principles of the CE are summarized here (ranked in no specific order). Firstly, a CE is targeted to be "restorative by design" (EMF, 2023). This means that the CE aims at not only reducing waste and pollution, but also at repairing previous damage through innovation and better product design (Kovacic et al., 2019). Secondly, the CE aims to decouple economic activities from environmental damage. This is achieved by maximizing resource productivity, and increasing efficiencies along the supply and production chains. Finally, a core principle is value retention, achieved business models and product designs which increase longevity or facilitate repair (Howard et al., 2019).

The main goals of a CE are reducing the dependency on raw materials as the main inputs into production processes, reusing wastes, and reducing GHG emissions through greater reliance on renewable energy sources (Hachaichi & Bourdin, 2023).

The implicit principles and goals reveal the following assumptions:

Table 2. Summary of CE goals, principles, and assumptions

Goals (adapted from EMF, 2023)	**Principles** (adapted from Howard et al., 2019)	**Assumptions** (self-interpretation)
Eliminate waste and pollution, regenerative by design	Restorative design	Techno-optimism. The CE relies on: • Renewable energy technologies • Improved product designs • More efficient technologies • Carbon sequestering
Reduced dependency on raw materials	Material use efficiency	Sustainability problem is a materials problem
Sustainable economic growth	Economic decoupling	Desirability of economic growth
Circulate products and materials at their highest utility and value	Value retention	View of nature as capital

7.4. Critiques of the CE

As previously discussed, one of the main goals of the CE is to restore ecological systems. The way that it seeks to achieve this is by increasing the circulation of technological objects within the economy, so that less natural raw materials are needed, and nature has more time to regenerate itself. Additionally, the CE tries to emulate ecological patterns of regeneration and self-sufficiency by re-imagining wastes as valuable feedstocks which can be indefinitely recycled. These propositions of the CE are significant because, for the first time since neo-classical economics, "externalities" such as wastes and emissions are taken into consideration as flows that need to be circularized (Kovacic et al., 2019). As such, it suggests an awareness that natural resources are not limitless, and that linear models of consumption are untenable in the long-term.

However, the CE model is still based on a rationality of linear economic growth. This is a goal that contradicts the aim of restoring the Earth. Simply put, in order to be restorative, a CE would need to respect natural reproduction rates (Korhonen et al., 2018). This means that an economy would need to adhere to the natural rates of waste decomposition and resource replenishment, either by slowing down economic activity, or decoupling it from environmental strain (Calisto Friant et al., 2020). It is worth noting that the option of slowing economic activity, is a position of privilege that only industrialized economies may afford (Kallis et al., 2012). Yet to date, most industrial nations still fetishize economic growth (Kallis et al., 2012). As it currently stands, the CE, uncompromising on growth, relies on technological innovation to increase efficiency and 'hijack' natural constraints (limited resources, slow regeneration) so that growth may be achieved without incurring further environmental damage (Kovacic et al., 2019). Alternative economic models such as Doughnut economics[8], degrowth[9], and steady state[10] can better address concerns of environmental exploitation, and are compatible with the baseline model of the CE (Charonis, 2021). However, in itself, the CE is primarily concerned with the efficient use of resources and minimization of waste, and does not directly consider a slowing down of economic activities as a means to establish societal wellbeing within planetary boundaries.

The assumption that economic growth can be decoupled from environmental degradation is questioned by an increasing number of scholars and economists

[8] Doughnut economics is a visual framework for sustainable development that combines the concept of planetary boundaries with the concept of social boundaries (Raworth, 2012).

[9] Degrowth is a planned reduction of energy and resource use designed to bring the economy back into balance with the living world in a way that reduces inequality and improves human well-being. degrowth is primarily focused on high-income nations, who are the greatest consumers and who have the resources to afford degrowth (Hickel, 2021).

[10] A steady-state economy aims for stable population and stable consumption of energy and materials at sustainable levels. It imagines a scenario where the growth rate of the economy is constant or zero, which can be achieved when the level of capital is equal to the level of depreciation (CASSE, 2023).

(Kovacic et al., 2019). A recent empirical review of existing literature concluded that "not only is there no empirical evidence supporting the existence of a decoupling of economic growth from environmental pressures on anywhere near the scale needed to deal with environmental breakdown, but also, and perhaps more importantly, such decoupling appears unlikely to happen in the future" (Parrique et al., 2019). However, a different study shows that in a CE scenario, a 10% decrease in global material extraction could be achieved. Yet, it remains unclear if that would indeed be enough on a planetary scale to offset the effects of climate change (Wiebe et al., 2019).

Ironically, while the CE takes inspiration from the self-sustaining and regenerating characteristics of nature, it arguably still positions it as something to be overcome with the help of technology. The persisting Cartesian dichotomy between Nature and Culture is made obvious in the butterfly diagram's distinction between biological and technological cycles of the economy, as shown in Figure 17. In the EMF diagram of the CE, nature remains a source for raw materials, and a destination for wastes. Culture, on the other hand, is where nature is processed and metabolized into economically valuable goods and services (Wachsmuth, 2012). It is interesting to point out that the man-made objects circulating through the CE's technological cycles are not purely products of society. Technical objects are made with natural resources which have been manipulated in a lab; they are hybrids of nature and artifice, and as such they "are not only carriers of human projects and values, they are also integral parts of natural cycles" (Bensaude-Vincent, 2018).

As a result of the nature and culture dichotomy, it is unclear how materials in the technological cycle can re-enter the biological cycle. The EMF states that the biological cycle mainly concerns consumable products such as food, and only some materials from the technological cycle, such as wood and cotton, can re-enter the biosphere (EMF, 2023). Still, it is the main assumption of the CE that technological objects should be left to circulate within the technosphere, through processes of recycling, product development, etc. The illusion of a nature culture divide invigorates the idea that both can function somewhat independently from each other (hence the belief in the plausibility of economic decoupling). However, the R's framework that governs the technological cycle overlooks the fact that there are thermodynamic limitations to circularity. Materials cannot be infinitely recycled, and energy is altogether unrecyclable (Howard et al., 2019; Kovacic et al., 2019). The laws of nature still govern the technological cycle; however, the CE seems to assume that the constraints of physics can be overcome with technological progress (Corvellec et al., 2022).

Many proponents of the circular economy recognize the importance of considering the holistic and systemic aspects of resource management, including the interconnectedness of economic activities with the natural world (Iacovidou et al., 2021). However, the CE remains largely mechanistic and reductionistic in the ways that it analyzes economic systems by breaking them down, for instance separating between Technological and Biological cycles, and further deconstructing products and supply chains into their basic elements (materials, components, processes). Breaking down complex systems into smaller parts overlooks global systemic effects or emergent properties,

the nuances of local socioeconomic contexts, as well as the complex relationships between ecosystems and human-made systems (Iacovidou et al., 2021).

7.5. Conclusion

In conclusion, while the circular economy (CE) presents a promising framework for sustainability, there are certain conceptual limitations to its full realization, particularly in terms of its approach to economic growth, its treatment of socio-natural systems as separate entities, and its mechanistic interpretation of complex systems (Iacovidou et al., 2021; Wachsmuth, 2012). These limitations are in part legacies of the origins of the CE, rooted in orthodox economics theory, narratives of 'green growth', and Western European cultural and political landscapes (Hachaichi & Bourdin, 2023; Kovacic et al., 2019).

As a consequence, the CE proposes an economic system that is not genuinely aligned with natural reproduction rates, and does not consider the complex codependent interactions between human-made and natural systems. The question of how technological objects can then re-enter the biological sphere is also not elaborated. CE principles will achieve resource efficiency, reduced extraction of raw materials, and progress towards dematerialization (Wiebe et al., 2019). However, the materials-focus of the CE ignores the social aspects of an economy, thus limiting its transformational impact (Calisto Friant et al., 2020).

8. Indigenous-inspired Circular Economy

Harvesting wild bush tomatoes with local guides

While circularity is a Western concept that does not exist in Indigenous language, I adopt the term "Indigenous-inspired circular economy" (IICE) to loosely describe the set of Indigenous principles and worldviews that generally fit the concept of circularity as understood in a sustainability context. Utilizing English words inevitably centers Western worldviews, arguably obscuring true understanding of Indigenous concepts (Yunkaporta, 2019). However, I utilize the term "Indigenous-inspired circular economy" as a common denominator or lingua franca to provide a starting point for engaging with Indigenous knowledge and drawing comparisons with the mainstream model of the circular economy (CE).

My interpretation of an Indigenous-inspired CE (IICE) is entirely based on my personal understanding of Indigenous knowledge and culture, gained over 5 months of field work and a combination of formal and informal yarning interviews in Australia. The working definition I have developed for an IICE describes an economy that prioritizes the regeneration of both nature and culture, by advancing environmental goals as well as intergenerational justice. An Indigenous-inspired CE emphasizes cultural continuity as an important aspect to consider, beyond material cycling and value retention.

My intention in this chapter is to exercise "Ganma" and explore what ideas can emerge at the confluence of Indigenous and Western knowledge systems. The IICE model is meant to respect and celebrate the Indigenous worldviews and knowledge systems from which it draws from. To the best of my abilities, I have ensured validity and accuracy by reviewing the results with Indigenous respondents. The IICE provides an alternative to the traditional Western circular economy models, but most of all, it is an experiment of respectful and reciprocal cross-cultural knowledge sharing, which I hope can serve as inspiration for fellow students and for future research in this domain.

8.1. Context and genealogy

The knowledge encompassed in Aboriginal cultures is the result of 50-60,000 years of intimate understandings of nature and coadaptation with Australian ecosystems (Flannery, 1995). Certain aspects of Aboriginal ways of life that can be considered 'circular' are the result of years of observation and attunement with nature (Edwards et al., 2013). For instance, the observation of naturally occurring bush fires in Australia has led to the understanding that small controlled fires are beneficial for the land, by decreasing the occurrence of large destructive wildfires, and helping to recycle nutrients in virtually dead soils (Flannery, 1995). Aboriginal fire burning practices are therefore 'circular' because they increase the cycling of nutrients in unproductive soil, enabling growth of new shoots and restoring desert landscapes (Kohen, 1993; Steffensen, 2020).

"Circularity" from an Indigenous perspective is therefore always rooted in place-based understandings of nature, and is motivated by the obligation of human beings to fulfill their roles as custodians of the land. The context of an Indigenous-inspired CE is always situated in Country, and its genealogy traces back to ancestral presence in the continent.

8.2. The Indigenous-inspired model

Based on my personal interpretation of Indigenous practices and ways of life, an IICE economy should first and foremost be centered around the people – benefiting local communities, protecting cultural heritage, generating employment, and providing safe and clean environments for all to live in. The yarning interviews revealed the importance of relationships, community and reciprocal exchanges of knowledge for a circular economy. In this sense, true circularity is achieved not only through the "looping" of materials, but also through the reciprocal giving and taking of knowledge.

The backbone of the IICE model is supported by the 5 Indigenous principles outlined in Section 6. These principles – Country, relationality, kinship reciprocity, and respect – make up the Law upon which a circular economy can emerge. Over time, as an outcome to living according to the Law, a regenerative economy is established. Materials are cycled, knowledge is passed on, and life is regenerated indefinitely. In this model, circularity is not pursued for the sake of circularity; it is achieved as an outcome of pursuing an upright life as laid by the cosmic Law.

8.3. Principles, assumptions, and goals

The main goals of an IICE are underpinned by the 5 Indigenous principles of Country, relationality, kinship, reciprocity and respect. Each principle carries its own assumptions and implications. For this model of the CE, I maintained some of the core goals of the EMF model of circularity (i.e., eliminate waste and pollution, regenerative by design) because these are what characterize a circular economy; other goals are unique to an IICE.

Goal #1. Eliminate waste and pollution, promote cultural continuity.
I have combined the goals of waste elimination and cultural continuity together, to reflect the fact that both are equally important, and are not necessarily mutually exclusive. As reflected by the principle of relationality, in Indigenous culture there is no distinction between nature and culture: everything and everyone in the world is interconnected. To give an example of how eliminating waste and pollution may also contribute to cultural continuity, Indigenous communities in the Torres Strait use plastic waste from ghost nets in the ocean to create artwork that tells traditional stories. By fishing out this harmful waste that pollutes waters and traps marine life and birds, they help preserve the environment; and by using the material in traditional artworks, they help pass on their culture to the next generations (The Australian Museum, 2020).

The interconnection of nature and culture is further evidenced by the weaving of knowledge into landscapes in the form of Songlines, and by the Dreaming stories about animals, plants, and spiritual ancestors that teach people how to live. The role of nature in maintaining vibrant human cultures is not limited to Indigenous populations. In Europe and other parts of the world, we appreciate the fact that certain natural sites are particularly important to our culture, often formally acknowledged as UNESCO World Heritage Sites.

The main point here is that eliminating waste helps preserve nature, which in turn preserves culture. An IICE not only considers how we may preserve nature, but also how human knowledges and cultures may be preserved too. It is also interesting to consider how waste has become part of human culture, and how it could play its own role in carrying human histories. Ultimately, the goal to "eliminate waste, pollution, and promote cultural continuity" reminds us of the interconnection between nature and culture, and prompts us to consider how tackling environmental pollution may also help human cultures thrive.

Goal #2. Autonomous regard.
This goal is derived from an Aboriginal concept popularized by Morgan Brigg and Kombumerri scholar Mary Graham (2021). Autonomous regard is a modern manifestation of kinship, because it defines the rules for relating to one another. Autonomous regard recognizes that all beings on Earth are interconnected and mutually dependent. However, it also guards "one's autonomy with attending to the interests of others in the pursuit of long-term interdependent security". By recognizing personal agency as well as interrelatedness, autonomous regard "moderates the responsibilities that come with ordered entanglement" (Brigg & Graham, 2021).

To provide a concrete example, coral reefs have developed symbiotic relationships where coral organisms provide habitat for photosynthetic algae, while in return the algae provides coral with nutrients. In turn, the reef houses an enormous amount of fishes and other organisms found in the sea (Flannery, 1995). Like coral reef ecosystems, a circular economy should promote symbiotic yet autonomous relationships that ensure collaborative survival.

While the CE model by the EMF tries to minimize dependence on the Earth (which is a good thing, considering material scarcity), the IICE emphasizes the interdependence on nature and its human and non-human beings for life on Earth, and the responsibilities that each have for one another. This entails a greater sense of personal responsibility for climate change than is typically warranted in industrial ecology, where it is often assumed that the greatest environmental impact occurs at industry level.

Goal #3. Intergenerational justice.
Intergenerational justice is achieved when each generation does its fair share to enable members of succeeding generations, both inside and outside its borders, to satisfy their needs, to avoid serious harm and to have the opportunity to enjoy things of value (Thompson, 2009). Thanks to the Indigenous circular perspective on time, there is a greater awareness that justice is not bound by time, and that our actions today impact the future generations but also interfere with the legacy of our ancestors (Edwards et al., 2013). There is also an awareness that justice does not only concern human beings, but further extends to all other forms of life (Eichler, 2023).

At its core, this goal is about being a good ancestor (pers. com., 2023). Based on

this definition, the principles of respect and reciprocity are the guiding compass for achieving intergenerational justice, by demanding a consideration of past and future ancestors in our daily actions and behaviors.

Particularly, the principle of respect underscores the Indigenous belief that no one is "greater or less than", and that our needs and wants of today should not compromise the needs of future generations (Yunkaporta, 2019). For Indigenous peoples, respect is also shown by letting each form of life "live in a way that does not prevent any other life form from overreaching its purpose" (Edwards et al., 2013). This reflects the ideal of intergenerational justice that each individual in each generation should have the opportunity for self-actualization.

Goal #4. Sustainable growth through bioeconomy.

Traditional Aboriginal engineering practices are akin to the bioeconomy in that they create tools and technologies from bio-based materials that can safely return to the biosphere. This reflects the belief that everything that comes from Country, must return to Country, and similarly, that "this Country, this Earth, will not be sustained by ways that have nothing of Earth in them"(Kwaymullina, 2005). Aboriginal people see themselves as an extension of Country, and therefore do not have a construct of "society" as separate from the environment (Edwards et al., 2013). The tools and technologies they create, never truly become separated into a "technological cycle", as in the EMF CE. Country contains the blueprints for life (Kwaymullina, 2005), and here it is the guiding principle for building a sustainable and regenerative bioeconomy.

Aboriginal engineering is different from Western engineering in the ways that Aboriginal people take great care not to interfere with the original purpose of a plant/animal/rock preordained by nature. Traditionally, Indigenous people created tools and technologies from plants, rocks, or animal parts in ways that only minimally changed their original purpose, shape, or properties. This derives from an intimate understanding of the local flora and fauna, and also from the understanding that human beings do not have authority over other beings on Country.

For instance, traditional boomerangs were made by simply sanding tree branches that are already shaped in the ideal proportions for a boomerang (this was communicated to me by an Aboriginal guide on a cultural walk at Burleigh Heads). Another impressive example is the Budj Bim eel trap system in Lake Condah that is recognized as a UNESCO World Heritage site and once provided year-round supply of fish for the local Gunditjmara people. A complex aquaculture system was constructed by making use of volcanic formations in the lake, which were converted into traps, weirs, dams and channels (Watson, 2020).

What we can learn from the Aboriginal engineering practices is that living in harmony and abundance in an environment requires deep and intimate understanding of it (Flannery, 1995). It supports the now widely accepted idea that sustainability efforts should be localized, and it promotes the creation of an

economic system that is based on biophysical realities (unlike the Western illusions of biophysical transcendence) (Hagens, 2020). This is not to say that an IICE would be against technological development; however, in my interpretation it aspires to an economy where materials and products are either derived from Country, or whose functionalities and life cycles are inspired from Country (parallels with the field of biomimetics could be interesting to explore here), and can always safely return to the biosphere and respect the integrity of the land.

Figure 18. Figure 2: Eel trap used by Gunditjmara people in the Budj Bim aquaculture system. Retrieved from: deadlystory.com

Goal #5. Regenerative by design.

This goal is ultimately what a CE is meant to achieve. Arguably, an economy centered around the principle of reciprocity will always be in balance, because whatever is taken must always be given back. Additionally, an economy that is grounded on Country implicitly creates a system that is life-giving. A Country-based economy entails the balancing of resource limits and constraints to ensure the health of ecosystems (Calisto Friant et al., 2020). It also entails a different temporality, which is attuned to local timescapes and which considers the longtermism of "Country-time" (Tynan, 2021).

Aboriginal conceptions of time are more holistic and process-based than is typical in Western cultures (Edwards et al., 2013). They follow the circular patterns of Country, and follow different markers than the ticking of a clock, where "the right time" for something is a function of other "somethings". For instance, the right time for burning Country may be marked by the accumulation of seaweeds on the shore of a specific beach, which indicates that favorable winds are blowing (pers. com., 2023). Such hyperawareness of time, told and revealed by more-than-human agencies (Tsing, 2005), could potentially promote the development of sustainable

technologies which match the regenerative pace of nature. An IICE might be compatible with concepts of a steady-state, degrowth, or "slow" economy, and this could be an interesting subject to further explore.

Additionally, the long-term perspective that is encouraged by a cyclical understanding of time ("your actions of today will affect several generations into the future") could also promote the development of solutions that go beyond "quick fixes", to longer-term high impact solutions such as system redesign. As previously described, a CE is typically conceptualized as a combination of reduce, reuse, and recycle activities (Kirchherr et al., 2017). These strategies provide immediate relief to the system; however, they do not necessarily catalyze the systemic shift needed to achieve long-term sustainability, because they not demand radical change from our governance systems or institutions (Kirchherr et al., 2017).

It is also interesting to note that simply reframing time as circular might already be an influential nudge to promote environmental behavior. Studies have shown that a cyclical conception of time promotes a greater sense of personal responsibility for environmental impact (Xu et al., 2023). Individuals with a cyclical perspective tend to include the environment in their perception of self more than individuals with a linear temporal perspective, leading to higher pro-environmental behavior (Xu et al., 2023). Another study has shown that an integrated view of the past, present and future inspired greater corporate social responsibility, more collaboration, and greater breadth of mitigation solutions for climate change (Slawinski & Bansal, 2012). This may be because a cyclical view of time emphasizes that everything is interconnected and part of a larger cycle. Thinking about the cyclicity of time might then be an easy and actionable way to encourage regenerative designs in a circular economy.

Table 3. Summary of Indigenous-inspired CE goals, principles, and assumptions

Goals	**Principles**	**Assumptions**
Eliminate waste and pollution, promote cultural continuity	Relationality	Foreground importance of relationships in circularity (Circularity extends to both the cycling of materials and knowledge)
Regenerative by design	Reciprocity	Give back what you take with as little damage as possible (this is also connected to intergenerational justice)
Intergenerational justice	Respect, Reciprocity (everyone is equal, and everyone has roles and agencies which must be respected)	Be a good ancestor to the future and past generations
Sustainable growth through bioeconomy	Country	Nature as mother ('creator') and teacher Autopoiesis (life creates life)
Autonomous regard	Kinship (obligatory relationships)	Collaborative survival, Right to self-sovereignty

8.4. Limitations

A potential limitation of this Indigenous-inspired CE model is that it may not be well-equipped to deal with non-recyclable materials, which are still prevalent and needed in today's modern society. While the transition towards the bioeconomy is underway, it is still important to have systems that can deal with toxic or man-made objects.

Another limitation is the lack of tools and measures to assess whether the intended goals have been reached. The IICE is guided by ancient wisdom or the Law. Many statements of "Indigenous wisdom such as 'we are all related', 'respect the land' and 'never take more than you need' are simple, direct moral instructions from which complex social, economic, cultural and environmental processes unfold" (Edwards et al., 2013). However, the lack of specific targets or roadmaps can make the practical application of a CE more difficult or ambiguous to practitioners who are less familiar with Indigenous principles.

Additionally, although this thesis aimed to make Indigenous concepts more accessible to Western academics, some understanding of Indigenous worldview is still required to make sense of the IICE. Therefore, there are some barriers to accessibility.

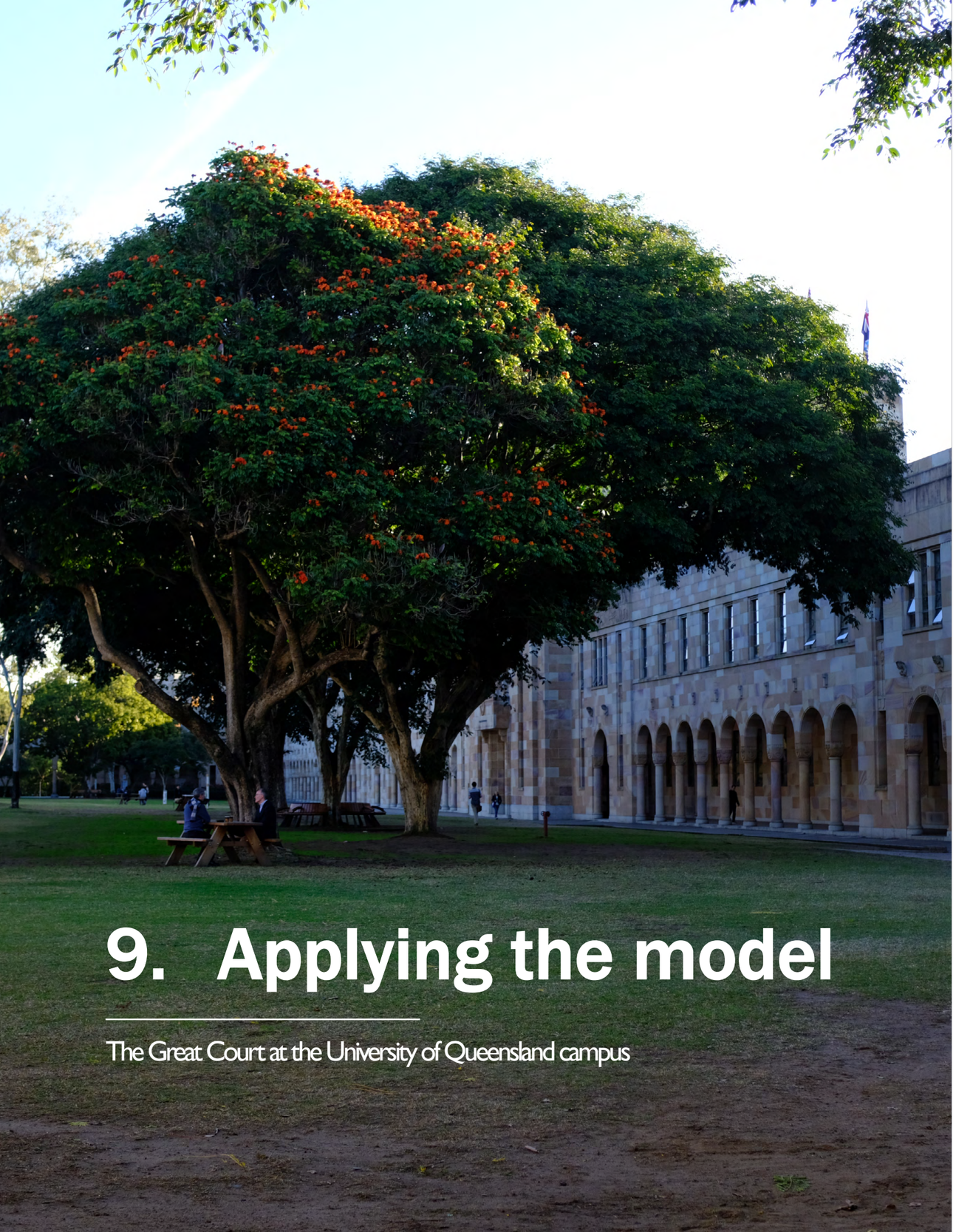
Finally, this model is based on my own interpretation of a very limited amount of resources on Indigenous knowledge, including one transcribed interview. This rendering of an Indigenous-inspired CE could be much more elaborated and developed, ideally by Aboriginal scholars and writers.

My IICE model does not prescribe solutions, however, it may be that the "how" to achieve a circular economy might not be the most important question to ask. Indigenous people are guided by "big picture wisdom" and a custodial responsibility towards the environment (Edwards et al., 2013). If you do the "right thing" as determined by the principles and Laws that make up Indigenous knowledge systems, and if you respect autonomous regard and behave as part of the ecosystem, without interfering on the agencies of other organisms and plants, then the "how" reveals itself. This is what my acquaintance with Harry, the 80 year-old retiree who grew hundreds of vegetables in his orchard, taught me. As I kept asking him "how can you grow so much?", he became frustrated with me, and he responded that he simply listens to the plants speak. Perhaps, then, we can learn to not seek more knowledge, but rather grow wiser and become more attuned to the unseen natural order of things, to help us behave more sustainably (Edwards et al., 2013; Falvey, 2005).

8.5. Conclusion

Currently, society and its ethical, cultural, spiritual, and custodial values have been placed outside of the economic system (Shiva et al., 2015). Indigenous knowledge systems can help us think about re-integrating society and its values into the economy, so as to create a system that is rooted in cultural and ecological wisdom (Edwards et al., 2013). The qualitative model of a circular economy suggested here is informed by the principles of Country, relationality, reciprocity, kinship and respect. Together, these principles act as a moral compass to guide the behaviors and attitudes needed to achieve circularity. The Indigenous-inspired CE is different from the EMF in that it assumes complete interdependence across social and ecological environments. Additionally, it seeks to achieve intergenerational justice as part of its goals to eliminate waste, pollution, and promote cultural continuity.

This construct of a CE inspired from Indigenous principles is insightful, because it is based on radically different ontologies from the EMF model of the CE. However, it is also interesting to see how this model may be applied in practice. The following chapter provides an example of how the IICE model aligns with real life situations, and explicitly shows how Indigenous principles can enable sustainable and socially fair projects and, by extension, futures. The example also brings back into focus the relevance of engaging in respectful research practices with Indigenous peoples. As such, the following section recombines the two main aspects of this thesis: conducting respectful research, and Indigenous perspectives on the CE, showing how they converge and become relevant in real life.



9. Applying the model

The Great Court at the University of Queensland campus

In this section, I apply the Indigenous-Inspired Circular Economy (IICE) model to a real-life situation, to better understand how it may be usefully implemented in future sustainability or circular economy projects, and how it can advance both environmental and social justice goals. The example I use here concerns a research project launched by a team of researchers at the University of Queensland in 2007, analyzing the potential of spinifex grass for industrial applications. The research project saw some controversy, but ultimately developed into an Indigenous-led initiative that delivers innovative products which support the transition to a circular bioeconomy, and that brings economic opportunities for remote Indigenous communities in Australia.

The information that follows was almost exclusively obtained from informal interviews and conversations I was lucky to have with the main stakeholders involved in current and past spinifex research projects. I first met with Prof. Alan Rowan, project manager at the Australian Institute for Biotechnology and Nanoengineering (AIBN) who is in charge of the current research team on spinifex. The AIBN is an influential research institute that pioneers in biotechnology in Australia and globally. Alan later introduced me to Colin Saltmere, who was involved in the spinifex research from its inception in 2007. I also talked by phone with anthropologist Prof. Paul Memmott, a well-known scholar in Australia, who was the lead researcher of the initial spinifex project.

Throughout my time in Australia, many people would refer to "the spinifex project" as an example of what not to do when researching with Indigenous peoples. This refers to the early beginnings of the project, which were highly controversial due to exploitative practices from some of the researchers involved. The spinifex project has since been relaunched and has become a good example of respectful research with Indigenous communities. This section therefore brings back into focus the importance of engaging in respectful research practices with Indigenous peoples, and how this is the precondition for collaboratively building more sustainable and fair futures in Indigenous land. Thus, this section unites the two main aspects of this thesis – respectful research practices and Indigenous-inspired frameworks for the circular economy – to show how one is the precondition for the other.

9.1. Launch of spinifex research and early discoveries

Spinifex (also known as "porcupine grass") is a grass endemic to Australia that grows in abundance across the Outback. It has adapted to the hot, arid, and low nutrient environment of Australia, allowing it to cover between 26% and 40% of the continental landmass (Memmott et al., 2017). For tens of thousands of years, Aboriginal people have made use of its tough fibers as an insulating and water-repelling construction material, and have extracted its resin to mend cracks in wooden tools, or for use as a waterproofing agent in canoes. Spinifex also has medicinal uses to treat sores and itchy skin, and has traditionally been used in inhalation vapors for coughs, colds or respiratory infections (Memmott et al., 2017).

From 2007 until 2012, an interdisciplinary team of researchers led by anthropologist Paul Memmott and Colin Saltmere, a respected Aboriginal leader, set out to Camooweal to learn about traditional ecological knowledge of spinifex, and identify potential industrial applications of the grass that could revitalize the local economy (Memmott et al., 2017). Camooweal is a small, remote town of a few hundred people, up to 980km away from the nearest city Alice Springs. Unemployment rates are above average, and the spinifex research was intended to catalyzing new industries and employment opportunities for the local Indjalandji-Dhidhanu residents (pers. com., 2023). The research aspired to be a leading example of multidisciplinary, ethical cross-cultural research with Indigenous stakeholders. The prestigious Australian Research Council (ARC) grant was awarded to support the collaboration between Aboriginal traditional knowledge and Western scientific expertise (pers. com., 2023).

Unfortunately, the research process did not unfold in the intended manner. One of the researchers in the team made a pivotal discovery that showed the remarkable potential of spinifex for applications in nanoengineering. Upon making the discovery, the researcher secretly filed patents to claim ownership and royalties of spinifex and the emerging technologies (pers. com., 2023). This broke the agreement of shared ownership and benefits of the research with the traditional owners of the land in which the project was taking place. Because no laws were in place to protect the use and dissemination of traditional ecological knowledge, the Indigenous stakeholders were unable to fight for their intellectual property rights.

Problem and Consequences

The singular action of the researcher severely damaged the trusting relationships that had been meticulously built with the local Indjalandji-Dhidhanu people over several years, and ran counter to the original altruistic aim of the research project. The failure to protect Indigenous intellectual property and entitlements points to the persisting colonial nature of Australian governmental and academic institutions. The power asymmetry between the university and the Indigenous community enabled the extraction and exploitation of Indigenous knowledge to the benefit of the settler.

The lack of trust, collaborative work, and respect, which have all been previously discussed as important aspects for conducting research with Indigenous people, compounded into the disintegration of the research team, and the abrupt ending of the spinifex project.

9.2. Project relaunch

Thankfully, the research did not end here. A new Indigenous-led initiative has since been launched, resulting in positive outcomes for the local Indigenous community and for the environment. When hearing about this new initiative, I could see how it reflected in many ways the different Indigenous principles of Country, relationality, kinship, reciprocity and respect. In the following paragraphs, I will show how the new spinifex research initiative reflects many of the goals and principles of an Indigenous-inspired CE, to affirm that the model does indeed reflect real-life situations. This may indicate the potential of the IICE model for applications in future sustainability projects.

- **Restoring respect and reciprocity**

  Following the collapse of the initial research project, Colin Saltmere founded Myuma Group, which is owned and managed by himself. The Myuma Group includes the corporation Bulugudu Ltd., which is the first Indigenous-owned biotechnology corporation in Australia, to research into commercial uses of spinifex nanofibers (AIBN, 2023).

  The Myuma Group was critical in reforming the Queensland Biodiscovery Act of 2020 (originally passed in 2004), which introduced protections for the use of traditional ecological knowledge in biodiscovery (AIBN, 2023). This act is the first one of its kind in all of Australia, and mandates that traditional knowledge for biodiscovery may only be used under an agreement with the custodians of the knowledge (Queensland Biodiscovery Act, 2020). Additionally, it mandates that Indigenous permission and informed consent must be acquired before conducting research on native biological material. This protection applies to material collected from anywhere in Queensland. Lastly, the Act requires that the benefits of biodiscovery be fairly distributed (Queensland Biodiscovery Act, 2020). Since then, the University of Queensland and Bulugudu Ltd. have signed an agreement to recognize the knowledge of the local Indigenous land custodians, to ensure an equal splitting of royalties emerging from patented technologies, and to give Bulugudu Ltd. the right to veto commercialization (Renault, 2015).

  This reform formalized the Indigenous principles of respect and reciprocity into legal obligations. From here onwards, IPs must be developed together, and companies must be owned at least 55% by Indigenous shareholders (pers. com., 2023). This Act contributes to intergenerational justice by protecting ancient Indigenous knowledge and safeguarding it for future generations. It moves a step closer towards the decolonization of institutions, and begins to level the power imbalances between Indigenous and non-Indigenous people.

Practicing kinship

With the new legal framework in place, Colin Saltmere established a new team and partnership with the University of Queensland, to study spinifex and its commercial opportunities. Bulugudu Ltd. partnered with UQ's Australian Institute for Bioengineering and Nanotechnology (AIBN) to investigate the properties and potential uses of spinifex nanofibers. A new facility, the Long Pocket Research Centre, has been built at the University of Queensland's campus with the capacities to produce large quantities of spinifex cellulose nanofibers for commercial purposes (AIBN, 2017). Still, the small town of Camooweal remains the epicenter of the research, where a new bioprocessing plant has been constructed, and a training enterprise provides vocational courses for up to 80 Indigenous people (pers. com., 2023).

These developments recognize that participation from both Indigenous and Western researchers is needed to advance research on spinifex. The partnerships distribute responsibilities and obligations between Indigenous knowledge keepers and Western scientists, so that they may successfully work together. This example illustrates a concrete way of practicing kinship through the principles of autonomous regard, where genuine partnerships are formed, while still preserving the rights to autonomy and self-determination.

Learning from Country (Sustainable growth through bioeconomy)

Where everything comes from Country and must return to Country, there is no place for wastage and pollution. An Indigenous circular economy, based on a knowledge of Country where complex systems are maintained in balance and synergy, promotes growth through the bioeconomy. For instance, bioengineered spinifex contributes to a circular (bio)economy through the production of bio-based materials that can safely return to biosphere and minimize waste.

Thanks to the combined forces of Western technological tools and Indigenous traditional knowledge, it has been found that spinifex nanofibers are remarkably strong, thin and flexible, making it a versatile and reliable biomaterial (Memmott et al., 2017). Multiple applications across numerous markets have been found for spinifex cellulose fibers, such as in the production of ultrathin condoms, biodegradable medical textiles, and sustainable lightweight construction materials (AIBN, 2022a). Currently, a commercial trial is being negotiated with VISY, a paper recycling company, where spinifex cellulose nanofibers could be utilized to produce cardboard material that is much stronger. Other projects include cellophane made out of spinifex gel which can biodegrade, reducing plastic waste and pollution (pers. com., 2023).

Spinifex fibers have also been bioengineered into protective membranes to produce drought-resistant seeds. This technology could contribute to food security in remote Outback communities, whose arid climate makes it difficult to grow food locally (pers. com., 2023). Modified spinifex hydrogel materials can also be used as dermal fillers, providing a fully plant based, renewable and sustainable alternative to hyaluronic acid or collagen (AIBN, 2022b). Biomedical use of spinifex for has already been tested and is available in select locations (pers. com., 2023).

Today, bioengineered spinifex is Australia's first and most advanced nanocellulose technology, in an emerging global nanocellulose market (AIBN, 2017). The research at AIBN in collaboration with Bulugudu Ltd. promises to revolutionize the technology behind everyday products while creating employment for remote Australia cite. This is an example of how traditional ecological knowledge can achieve sustainable growth through bioeconomy.

Relationality and building relationships

This thesis has highlighted multiple times the importance of relationships in the Indigenous worldview, and they are also an important precondition to achieve an economy that is truly circular. Such an economy must give back not only to nature, but also to the people, animals, and things that inhabit the Earth.

The spinifex project has helped support local communities through employment and business opportunities. Today, Camooweal is an economically active community of Aboriginal people, who work primarily in construction, harvesting or refining. There are systems in place to help workers hold down a job, and support networks against drug and alcohol abuse (pers. com., 2023). Spin out companies have emerged from the spinifex research, such as Trioda Wilingi (a company that produces medical gels for osteoarthritis derived from spinifex resin), which is co-owned by Indigenous stakeholders (AIBN, 2023).

Another way that the spinifex research project has strengthened relationships with the Indigenous community is by motivating the construction of a National Indigenous Science Translation Centre at UQ, expected to open in 2026 (pers. com., 2023). This will be an innovation hub to support and develop Indigenous ideas and start-ups, and will also be a place where ancient Indigenous knowledge remains owned by traditional knowledge keepers. The center would promote intergenerational justice and cultural continuity by providing a space for safekeeping and ensuring Indigenous sovereignty over their own knowledge.

The emergence of bio-based and sustainably sourced products made out of spinifex also mend the exploitative relationship to nature to one that is regenerative and interdependent. Bioengineered spinifex products can safely return to the biosphere, closing the gap between the circular economy's "biological cycles" and "technological cycles", and moving towards a more integrated model of circularity.

9.3. Conclusion

Spinifex, which covers hectares of “valueless” land in remote Australia, offers opportunities to valorize the land and create new industries and employment for Indigenous peoples. The initial project failed because of exploitative practices, which compromised the intended social and environmental outcomes. With the new Indigenous-led approach, traditional knowledge and modern scientific advancements were successfully combined to generate cutting-edge research and bio-based technologies. The products emerging out of spinifex materials now contribute to the transition towards a circular (bio)economy, while also benefiting local communities. The example has shown the importance of respectful and collaborative research practices for the development of successful projects that also benefit Indigenous communities. It also illustrated how the Indigenous principles of Country, relationality, reciprocity, kinship and respect can be applied in a modern context to guide circular economy initiatives. To some extent, this confirms that the Indigenous-inspired CE model reflects real-life situations, and is not merely an abstract theoretical model. Additionally, the alignment of the model with real events points to the potential of the model to be used and implemented in the future, in order to achieve circular economy outcomes that are also socially fair.

10. Discussion and Conclusion

Field of Light art installation in Uluru National Park

In answering the research question *"How can Indigenous Australian knowledges inspire alternative designs for the circular economy?"*, I conducted an extensive five-month field study in Australia, where I immersed myself in Aboriginal worldviews, intricate knowledge systems, and diverse cultures. I learned to navigate the challenging terrain of decolonial research, which brought into question my own assumptions, academic conventions, and perceptions of self. This endeavor has yielded three main research outcomes that serve as valuable contributions to the broader scholarly discourse on decolonial research and the circular economy.

Firstly, I produced a Roadmap to Indigenous research, which outlines steps for partaking in cross-cultural knowledge exchanges in a way that is respectful, relevant, and collaborative. This roadmap addresses the first sub-question *"How do we value Indigenous knowledges and respectfully engage with Indigenous communities for academic research on sustainability"*, and promotes decolonial research practices that advance the autonomy, self-determination, and intellectual rights of Indigenous people. As such, this thesis contributes to the growing body of literature on decolonial research practices, particularly Indigenous research practices, pioneered by Barlo et al., (2020), Bessarab and Ng'andu (2010), Martin and Mirraboopa (2003), Nakata (2007), Shay (2021), Tuhiwai Smith (2012), and Tynan and Bishop (2022). The roadmap is meant as a tool and inspirational guide that can be used by students who are interested in decolonial Indigenous research.

Secondly, as part of my immersion in Aboriginal knowledge systems, and thanks to the help of the Indigenous participants of my research, I identified five important Indigenous principles to help me answer the second sub-question, *"What are Indigenous knowledge systems, worldviews, or principles?"*. Altogether, these principles constitute (part of) the foundations to Indigenous ontology, and are namely: Country, relationality, reciprocity, kinship and respect. Aboriginal worldviews and knowledge systems are very rich and complex, and there are very few interpretative sources available for outsiders to be able to understand them (Fricker, 2007). My description of these principles, based on my own process of learning and understanding, offer an introductory level of insight for individuals who may not be already familiar with Indigenous knowledge, enabling them to engage more readily and respectfully with this body of knowledge.

Thirdly, based on these five principles, I was able to tackle the final sub-question *"How could Indigenous worldviews inspire circular economy principles?"*, and formulated a design for an Indigenous-inspired circular economy (IICE). To my knowledge, there is currently no published literature that presents Indigenous perspectives on circularity, likely due to the marginalization of Indigenous knowledges, and the difficulty of engaging with such knowledges for Western researchers. My interpretation of an Indigenous-inspired CE, rooted in Indigenous knowledge and principles, recenters the ethical, spiritual, and custodial values of society into the economic system. In this way, it bridges the gap between society and culture which currently divides the CE, and promotes a more holistic approach to circularity. It also brings into light the implicit assumptions and ontologies that underly CE models, and broadens the theoretical and creative scope of what a circular economy might include.

10.1. Implications and recommendations

As you have followed me along this text, I hope to have shown that meaningful alternatives to sustainable futures are possible, and they already exist. In this thesis, I have not "discovered" anything new, but rather have built an understanding of knowledges from the world's oldest living cultures, which have been marginalized and suppressed since colonization. Engaging with alternative knowledge systems is not an easy undertaking, not only because of the laborious work of "learning and unlearning" that must take place in order to see through the eyes of a different worldview, but also because of the political and social challenges that this entails. I have highlighted in my work the high personal and emotional cost of pursuing this topic. Pushing the limits of our colonial educational system to try to engage with Indigenous knowledge (or other non-Western knowledge) in the terms of Indigenous people, is not an easy undertaking. In this type of research, issues of marginalization, power asymmetries, discrimination and colonization are very real and heartfelt, and at times self-confronting.

Still, I believe it is necessary and meaningful work, which builds momentum towards decolonial research practices that contributes to the creation of more pluriversal worlds. I bring back here the term "pluriversal" from the work of Escobar, which I previously alluded to in Section 3. The pluriverse recognizes the coexistence of multiple realities constructed through different local experiences, and challenges the dominant Western idea of a single, universal, and homogeneous reality (Escobar, 2018).

I believe it is important for industrial ecologists to gain an awareness of the diversity of knowledges that exists in the world to ensure that we do not impose a "one-world world" with our aspirations to a sustainable future (Law, 2015). The tools, policies, and models we design reflect certain values and assumptions that enable certain ways of life above others, even though they are well-intended and aimed at sustainable development (Escobar, 2018). For instance, the circular economy can change the political, physical, and even social environments in which people live, by introducing sharing economies which requires new infrastructures, behaviors, and institutional frameworks. Currently, the concept of the CE itself is largely formulated by European knowledge producers, and therefore mainly reflects European idealizations of sustainable sociotechnological futures. (Hachaichi & Bourdin, 2023; Kovacic et al., 2019). It does not reflect, for instance, the local needs, priorities, and aspirations of Indigenous Australia.

How might we enable a plethora of (sustainable) futures, without subsuming one another? How can we learn and do research in a way that is not extractive? These are relevant questions that, I believe, should be asked more often in the classroom. They are also valuable topics to explore for future research , that would not only contribute to enriching the global body of literature, but also to advancing social justice by enabling more "pluriversal" worlds.

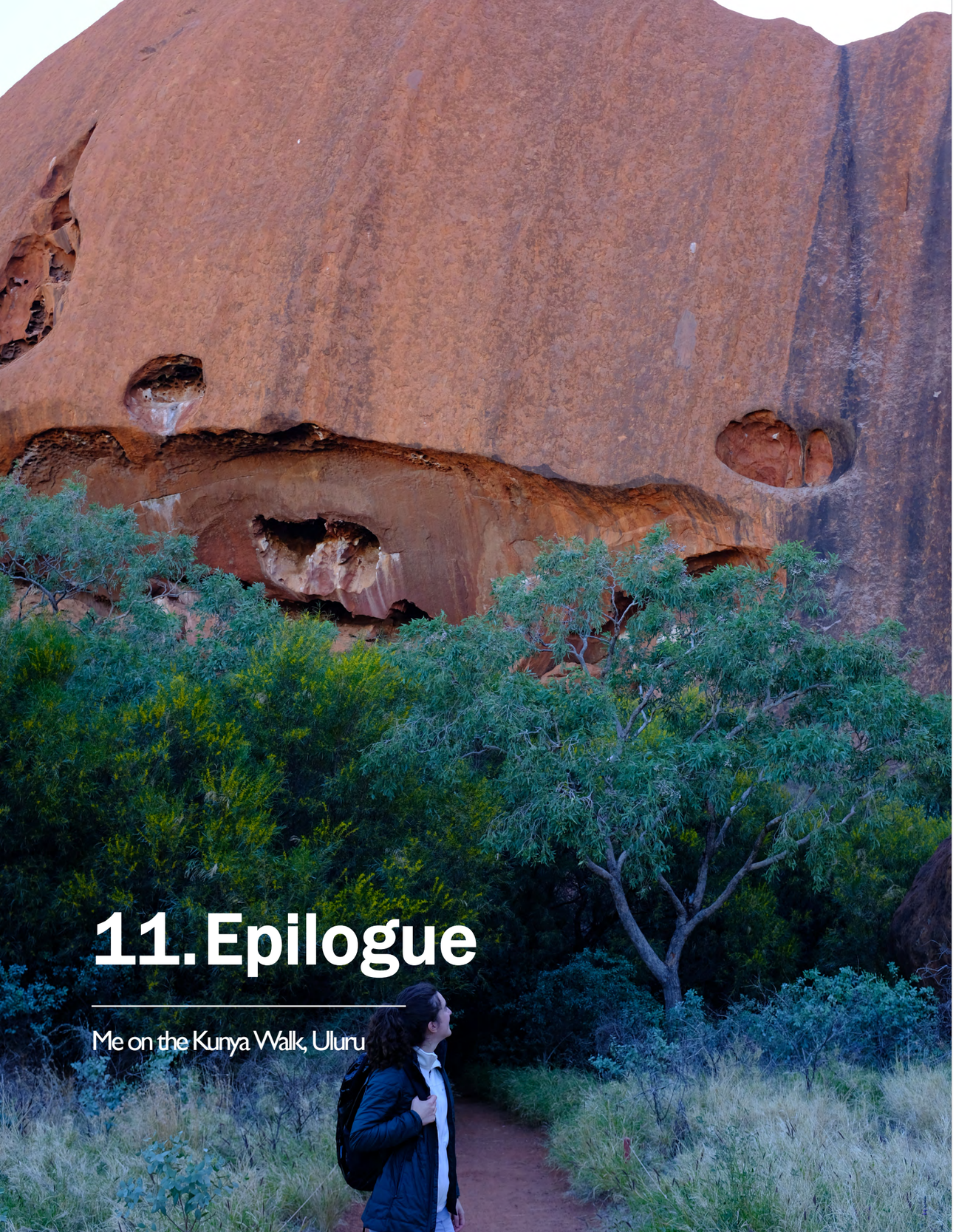
Including missing voices is important, because knowledge produced locally creates global impacts that affects the realities of even those whose voices are excluded (Escobar, 2018).

I also propose to push for the decolonization of our academic institutions, by teaching and learning about decolonial research methods. In my own learning journey researching with Indigenous people, I have uncovered many implicit assumptions not only in the prevalent EMF model of the circular economy, but also in the very ways that we set out to do research as Western academics. The research designs, methodologies, and expectations we have are incompatible with non-Western knowledge systems, preventing us from engaging with them. This perpetuates the epistemic exclusion of non-mainstream knowledges, and by extension excludes non-Western visions for the future, replacing them with a Western mono-vision and interpretation of 'sustainable development'. This is a form of social injustice, because it denies communities the agency to determine for themselves their own trajectory that aligns with their values and priorities.

My methodological Roadmap for Indigenous Research can be used as a starting point to conduct decolonial research that contributes to the creation of more pluriversal worlds. The different steps such as gaining cultural competence, practicing critical self-reflection, learning Indigenist research methods, etc., all contribute to making space for different worlds to exist in their own terms and thus reflect the principles of the pluriverse.

10.2. Study Limitations

While I strived to make my work process collaborative and reciprocal, I encountered challenges in genuinely achieving this. Ideally, co-development should occur at every stage of the research process. While I facilitated several rounds of feedback with Indigenous respondents, I first came into this research with a pre-established research question and project proposal (due to institutional expectations from the university). As such, the research is not 'truly' collaborative since the RQ was formulated by myself only. Given the fact that I formulated the scope of my project before I truly understood Australian Indigenous ways of life, priorities, and aspirations, I was limited in the ways that I could produce directly relevant work for them. Bearing these limitations in mind, I hope this thesis can help fellow students to be more aware of the considerations this type of research requires, so that eventually we can be better equipped to engage in respectful, relevant, and collaborative research with Indigenous communities.



11. Epilogue

Me on the Kunya Walk, Uluru

In times of environmental, social, and economic uncertainty, it has become critical to develop and apply new solutions to enhance the resilience and sustainability of man-made systems. However, as my journey through this thesis has illuminated, these solutions must be approached with an awareness of their underlying assumptions and a commitment to inclusivity. Only by respectfully engaging with different knowledge systems can we hope to maintain a safe operating space for humanity on our planet Earth, and co-create pluriversal futures that fulfill the aspirations of all people.

With the completion of this thesis, I have shown the ability to independently plan, conduct and evaluate in-depth research within an interdisciplinary context; a key learning outcome of my master's program. I have combined various methods and engaged in cross-cultural knowledge exchanges to contribute to the further development and validation of circular economy theories, which is pertinent to industrial ecology. I have gone beyond the conventions of industrial ecology to learn and apply, to the best of my abilities, decolonial and Indigenist methods for a more respectful and ethical research process. By doing this research, I have gained thorough knowledge of various conceptualizations and definitions of the circular economy, but also gained an awareness of the importance of collaboration for sustainable development.

This research has been highly personal, shaped by encounters with different peoples and places. It is an extensive gathering of multiple perspectives and experiences, but it is not in any way exhaustive, and much more remains to be written about this topic. For future research, it would be interesting to further explore how the Indigenous-inspired CE model might compare with existing concepts such as Buen Vivir and Ubuntu. Perhaps, these concepts can also inspire new ideas about circularity, sustainability, and pluriversal designs. Indigenous-led research projects would be a particularly valuable contribution to this field.

Preliminary results of this thesis were shared in a poster presentation at the ISIE 2023 conference in Leiden, and attracted much traction and attention from participants. This points to the potential of this topic to spark new ideas and discussions, and reveals that there is great interest in this subject matter in the industrial ecology community, particularly around the question of how to achieve respectful research. Moving forwards, I invite future students and researchers to question their personal and academic assumptions, challenge existing frameworks, and actively engage with diverse ways of knowing. I hope that the information enclosed in this thesis has value for those who seek to go beyond simple narratives, and have the courage to engage with the messy entanglements of colonialism, discrimination, climate change, and academia.

I also hope that in the near future, we can be better educated about respectful and collaborative research practices, especially for students in engineering and the natural sciences. As I have come to learn, true social and environmental resilience emerges from the weaving together of various knowledges, and mutual respect. Only by acknowledging historical and contemporary power dynamics, and by fostering genuine partnerships built on trust, may we create futures that are more sustainable and fair.

12. References

AHRC. (2008). Chapter 7: The Protection of Indigenous Knowledge's (Native Title Report). Australia Human Rights Commission. https://humanrights.gov.au/sites/default/files/content/social_justice/nt_report/ntreport08/pdf/chap7.pdf

AIATSIS. (2023a). Map of Indigenous Australia. https://aiatsis.gov.au/explore/map-indigenous-australia

AIATSIS. (2023b). The Stolen Generations. Australian Institute of Aboriginal and Torres Strait Islander Studies; Australian Institute of Aboriginal and Torres Strait Islander Studies. https://aiatsis.gov.au/explore/stolen-generations

AIATSIS. (2023c, June 13). To Remove and Protect. Australian Institute of Aboriginal and Torres Strait Islander Studies. https://aiatsis.gov.au/collection/featured-collections/remove-and-protect

AIATSIS. (2023d, July 4). Living languages. Australian Institute of Aboriginal and Torres Strait Islander Studies. https://aiatsis.gov.au/explore/living-languages

AIBN. (2017, April 26). Long Pocket Spinifex Nanocellulose Downstream Pilot Facility. The University of Queensland Australia. https://aibn.uq.edu.au/project/long-pocket-spinifex-nanocellulose-downstream-pilot-facility

AIBN. (2022a, November 29). Spinifex Materials for Advanced Industrial applications. The University of Queensland Australia. https://aibn.uq.edu.au/project/spinifex-materials-advanced-industrial-applications-0

AIBN. (2022b, November 29). Spinifex Materials for Biomedical applications. The University of Queensland Australia. https://aibn.uq.edu.au/project/spinifex-materials-biomedical-applications

AIBN. (2023, February 21). AIBN congratulates new Indigenous spin out company. The University of Queensland Australia. https://aibn.uq.edu.au/article/2023/02/aibn-congratulates-new-indigenous-spin-out-company

Aird, M. (2001). Brisbane Blacks.

Akama, Y., Hagen, P., & Whaanga-Schollum, D. (2019). Problematizing Replicable Design to Practice Respectful, Reciprocal, and Relational Co-designing with Indigenous People. Design and Culture, 11(1), 59–84. https://doi.org/10.1080/17547075.2019.1571306

Albeck-Ripka, L. (2021, January 26). Day of Celebration or Mourning? Australia Grapples With Its National Holiday. The New York Times. https://www.nytimes.com/2021/01/26/world/australia/invasion-day.html

Allam, L. (2022, August 20). What is an Indigenous treaty and how would it work in Australia? The Guardian. https://www.theguardian.com/australia-news/2022/aug/21/what-is-an-indigenous-treaty-and-how-would-it-work-in-australia

Allam, L. (2023, September 4). What is the Indigenous voice to parliament, how would it work, and what happens next? The Guardian. https://www.theguardian.com/australia-news/2023/sep/04/what-is-the-indigenous-voice-to-parliament-australia-what-does-it-mean-explained-referendum-campaign

Archibald, J. (2008). Indigenous Storywork: Educating the Heart, Mind, Body and Spirit. UBC Press.

Australia National Parks. (2012). Uluru-Kata Tjuta National Park Knowledge Handbook. https://parksaustralia.gov.au/uluru/pub/handbook.pdf

Australian Bureau of Statistics. (2022, July 1). Australia: Aboriginal and Torres Strait Islander Population Summary. https://www.abs.gov.au/articles/australia-aboriginal-and-torres-strait-islander-population-summary

Australian Human Rights and Equal Opportunity Commission. (1997). Bringing them home: Report of the National Inquiry into the Separation of Aboriginal and Torres Strait Islander Children from Their Families. https://humanrights.gov.au/our-work/bringing-them-home-report-1997

Australian Human Rights Commission. (1996). Indigenous Deaths in Custody: Report Summary. https://humanrights.gov.au/our-work/indigenous-deaths-custody-report-summary

Australian Human Rights Commission. (2014). Face the facts: Aboriginal and Torres Strait Islander Peoples. Australian Human Rights Commission. https://humanrights.gov.au/our-work/education/face-facts-aboriginal-and-torres-strait-islander-peoples

Australian Museum. (2021, September 9). Terra nullius. The Australian Museum. https://australian.museum/learn/first-nations/unsettled/recognising-invasions/terra-nullius/australian.museum/learn/first-nations/unsettled/recognising-invasions/terra-nullius/

Ayres, R. U., & Ayres, L. W. (1996). Industrial Ecology. Books. https://ideas.repec.org//b/elg/eebook/915.html

Barlo, S., Boyd, W. (Bill) E., Pelizzon, A., & Wilson, S. (2020). Yarning as Protected Space: Principles and Protocols. AlterNative: An International Journal of Indigenous Peoples, 16(2), 90–98. https://doi.org/10.1177/1177180120917480

Beckett, J. (1994). Aboriginal Histories, Aboriginal Myths: An Introduction. Oceania, 65(2), 97–115. https://doi.org/10.1002/j.1834-4461.1994.tb02493.x

Bensaude-Vincent, B. (2018). Of Times and Things. Technology and Durability. In French Philosophy of Technology (pp. 279–298). https://www.researchgate.net/publication/325410266_Of_Times_and_Things_Technology_and_Durability

Bessarab, D., & Ng'andu, B. (2010). Yarning About Yarning as a Legitimate Method in Indigenous Research. International Journal of Critical Indigenous Studies, 3(1), Article 1. https://doi.org/10.5204/ijcis.v3i1.57

Bookchin, M. (1994). Which way for the ecology movement? AK Press.

Brigg, M. (2016). Engaging Indigenous Knowledges: From Sovereign to Relational Knowers. The Australian Journal of Indigenous Education, 45(2), 152–158. https://doi.org/10.1017/jie.2016.5

Brigg, M., & Graham, M. (2021, July 27). The relevance of Aboriginal political concepts: Autonomous regard. ABC Religion & Ethics. https://www.abc.net.au/religion/aboriginal-political-concepts-autonomous-regard/13472098

Britannica, T. Editors of Encyclopaedia. (2018, May 27). Scandinavian Ice Sheet. Encyclopedia Britannica. https://www.britannica.com/place/Scandinavian-Ice-Sheet

Britannica, T. Editors of Encyclopaedia. (2023a, September 13). Outback. Encyclopedia Britannica. https://www.britannica.com/place/Outback

Britannica, T. Editors of Encyclopaedia. (2023b, October 7). Arthur Phillip. Encyclopedia Britannica. https://www.britannica.com/biography/Arthur-Phillip

British Library Board. (2023). Timeline of Cook's voyages. The British Library; The British Library. https://www.bl.uk/the-voyages-of-captain-james-cook/timeline

Brown, B. (2014, July 4). The Aboriginal whalers of Eden. Australian Broadcasting Corporation. https://www.abc.net.au/local/audio/2013/10/29/3879462.htm

Brundtland, G. H. (1987). Our Common Future: Report of the World Commission on Environment and Development (UN Document A/42/427). United Nations. http://www.un-documents.net/ocf-ov.htm

Butler, T., Gall, A., Garvey, G., Ngampromwongse, K., Hector, D., Turnbull, S., Lucas, K., Nehill, C., Boltong, A., Keefe, D., & Anderson, K. (2022). A Comprehensive Review of Optimal Approaches to Co-Design in Health with First Nations Australians. International Journal of Environmental Research and Public Health, 19(23), Article 23. https://doi.org/10.3390/ijerph192316166

Calisto Friant, M., Vermeulen, W. J. V., & Salomone, R. (2020). A typology of circular economy discourses: Navigating the diverse visions of a contested paradigm. Resources, Conservation and Recycling, 161, 104917. https://doi.org/10.1016/j.resconrec.2020.104917

CASSE. (2023). Definition of Steady State Economy. Center for the Advancement of the Steady State Economy. https://steadystate.org/discover/definition-of-steady-state-economy/

Charonis, G.-K. (2021). Degrowth, Steady State and Circular Economies: Alternative Discourses to Economic Growth. Society Register, 5(3), Article 3. https://doi.org/10.14746/sr.2021.5.3.05

Clarkson, C., Jacobs, Z., Marwick, B., Fullagar, R., Wallis, L., Smith, M., Roberts, R. G., Hayes, E., Lowe, K., Carah, X., Florin, S. A., McNeil, J., Cox, D., Arnold, L. J., Hua, Q., Huntley, J., Brand, H. E. A., Manne, T., Fairbairn, A., … Pardoe, C. (2017). Human occupation of northern Australia by 65,000 years ago. Nature, 547(7663), Article 7663. https://doi.org/10.1038/nature22968

Coburn, A., & Gormally, S. (2017). Critical Reflexivity. Counterpoints, 483, 111–126. JSTOR.

Cooms, V. (2015). The Queensland government's protection policy and exploitation of Aboriginal labour. The Queensland Journal of Labour History, 20, 43–48.

Corvellec, H., Stowell, A. F., & Johansson, N. (2022). Critiques of the circular economy. Journal of Industrial Ecology, 26(2), 421–432. https://doi.org/10.1111/jiec.13187

Courage and Beauty [Exhibition]. 2022-2032. Queensland Gallery of Modern Art. Brisbane, Qld, Australia.

Cowlishaw, G. (1999). Rednecks, Eggheads and Blackfellas A Study of Racial Power and Intimacy in Australia. Allen & Unwin.

Cui, M. (2021). Key Concepts and Terminology. In L. Liu & S. Ramakrishna (Eds.), An Introduction to Circular Economy (pp. 17–34). Springer. https://doi.org/10.1007/978-981-15-8510-4_2

Dee, M. (2013). Welfare Surveillance, Income Management and New Paternalism in Australia. Surveillance & Society, 11(3), 272–286. https://doi.org/10.24908/ss.v11i3.4540

Denny-Smith, G., & Loosemore, M. (2020, February 12). Why we aren't closing the gap: A failure to account for 'cultural counterfactuals'. The Conversation. http://theconversation.com/why-we-arent-closing-the-gap-a-failure-to-account-for-cultural-counterfactuals-129076

Desmet, K., & Rossi-Hansberg, E. (2021). The Economic Impact of Climate Change over Time and Space. NBER, 4. https://www.nber.org/reporter/2021number4/economic-impact-climate-change-over-time-and-space

Dudgeon, P., & Bray, A. (2019). Indigenous Relationality: Women, Kinship and the Law. Genealogy, 3(2), Article 2. https://doi.org/10.3390/genealogy3020023

Edwards, M., Biloslavo, R., Kwaymullina, B., & Kwaymullina, A. (2013). Big picture wisdom: Metatheorising ancient, scientific and indigenous wisdom perspectives for global environmental leadership. Journal of Spirituality, Leadership, and Management, 7(1). https://doi.org/10.15183/slm2013.07.1113

Eichler, J. (2023). Subjects of Intergenerational Justice: Indigenous Philosophy, the Environment and Relationships by Christine J. Winter. Abingdon: Routledge, 2022. Human Rights Review, 24(2), 313–315. https://doi.org/10.1007/s12142-023-00695-3

EMF. (2023). Circular economy introduction. Ellen MacArthur Foundation. https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview

Escobar, A. (2018). Designs for the pluriverse: Radical interdependence, autonomy, and the making of worlds. Duke University Press. http://www.dawsonera.com/depp/reader/protected/external/AbstractView/S9780822371816

Falvey, J. L. (2005). Religion and Agriculture: Sustainability in Christianity and Buddhism / Lindsay Falvey. Institute for International Development Ltd.

Farriss, N. M. (1987). Remembering the Future, Anticipating the Past: History, Time, and Cosmology among the Maya of Yucatan. Comparative Studies in Society and History, 29(3), 566–593. JSTOR.

Fitzgerald, R. (2022, June 24). Remote Northern Territory store 'has no choice' but to charge $74 for instant coffee, $8 for 2L milk. ABC News. https://www.abc.net.au/news/2022-06-25/food-prices-in-remote-northern-territory-communities-skyrocket/101160112

Flannery, T. F. (Tim F., 1956-. (1995). The future eaters: An ecological history of the Australasian lands and people / Timothy Fridtjof Flannery. Reed Books.

Fredericks, B., & Bradfield, A. (2021). More than a Thought Bubble... The Uluru Statement from The Heart and Indigenous Voice to Parliament. M/C Journal, 24(1). https://doi.org/10.5204/mcj.2738

Fricker, M. (2007). Introduction. In M. Fricker (Ed.), Epistemic Injustice: Power and the Ethics of Knowing (pp. 1–8). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198237907.003.0001

Fuller, R., Anderson, M., Norris, R., & Trudgett, M. (2014). The Emu Sky Knowledge of the Kamilaroi and Euahlayi Peoples. Journal of Astronomical History and Heritage, 17. https://doi.org/10.3724/SPJ.1440-2807.2014.02.04

Gheewala, S. H., & Silalertruksa, T. (2021). Life Cycle Thinking in a Circular Economy. In L. Liu & S. Ramakrishna (Eds.), An Introduction to Circular Economy (pp. 35–53). Springer. https://doi.org/10.1007/978-981-15-8510-4_3

Goolarabooloo. (2019). Lurujarri Heritage Trail. Goolarabooloo.Org. http://www.goolarabooloo.org.au/lurujarri.html

Gray, A. J. (2011). Worldviews. International Psychiatry, 8(3), 58–60.

Hachaichi, M., & Bourdin, S. (2023). Wheels Within Wheels: Mapping the Genealogy of circular Economy using Machine Learning. Circular Economy and Sustainability. https://doi.org/10.1007/s43615-023-00260-7

Hagens, N. J. (2020). Economics for the future – Beyond the superorganism. Ecological Economics, 169, 106520. https://doi.org/10.1016/j.ecolecon.2019.106520

Hickel, J. (2021). What does degrowth mean? A few points of clarification. Globalizations, 18(7), 1105–1111. https://doi.org/10.1080/14747731.2020.1812222

Howard, M., Hopkinson, P., & Miemczyk, J. (2019). The regenerative supply chain: A framework for developing circular economy indicators. International Journal of Production Research, 57(23), 7300–7318. https://doi.org/10.1080/00207543.2018.1524166

Hudson, S. (2009). Healthy Stores, Healthy Communities: The Impact of Outback Stores on Remote Indigenous Australians. The Center for Independent Studies, 122.

Hume, L. (2000). The Dreaming in Contemporary Aboriginal Australia. In Indigenous Religions: A Comparison (pp. 125–138). Cassell. https://espace.library.uq.edu.au/view/UQ:146294

Hurst, D. (2021, January 18). UN countries challenge Australia's Indigenous incarceration record in human rights review. The Guardian. https://www.theguardian.com/australia-news/2021/jan/19/un-countries-challenge-australias-indigenous-incarceration-record-in-human-rights-review

Iacovidou, E., Hahladakis, J. N., & Purnell, P. (2021). A systems thinking approach to understanding the challenges of achieving the circular economy. Environmental Science and Pollution Research, 28(19), 24785–24806. https://doi.org/10.1007/s11356-020-11725-9

Ipswich City Council. (2016). Appropriate Terminology, Indigenous Australian Peoples. Ipswich City Council. https://www.ipswich.qld.gov.au/__data/assets/pdf_file/0008/10043/appropriate_indigenous_terminoloy.pdf

Kallis, G., Kerschner, C., & Martinez-Alier, J. (2012). The economics of degrowth. Ecological Economics, 84, 172–180. https://doi.org/10.1016/j.ecolecon.2012.08.017

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the Circular Economy: An Analysis of 114 Definitions (SSRN Scholarly Paper 3037579). https://doi.org/10.2139/ssrn.3037579

Kohen, J. (1993, October 1). The Impact of Fire: An Historical Perspective. Association of Societies for Growing Australian Plants. SGAP 17th Biennal Seminar, Sydney. https://www.anpsa.org.au/APOL3/sep96-1.html

Koot, S. (2022, March 22). Tourism and authenticity [Lecture].

Kopnina, H., Washington, H., Taylor, B., & J Piccolo, J. (2018). Anthropocentrism: More than Just a Misunderstood Problem. Journal of Agricultural and Environmental Ethics, 31(1), 109–127. https://doi.org/10.1007/s10806-018-9711-1

Korhonen, J., Honkasalo, A., & Seppälä, J. (2018). Circular Economy: The Concept and its Limitations. Ecological Economics, 143, 37–46. https://doi.org/10.1016/j.ecolecon.2017.06.041

Kovacic, Z., Strand, R., & Völker, T. (2019). The Circular Economy in Europe: Critical Perspectives on Policies and Imaginaries. Routledge. https://doi.org/10.4324/9780429061028

Kowal, E. (2015). Welcome to Country: Acknowledgement, Belonging and White Anti-racism. Cultural Studies Review, 21(2), Article 2. https://doi.org/10.5130/csr.v21i2.4280

Kwaymullina, A. (2005). Seeing the Light: Aboriginal Law, Learning and Sustainable Living in Country" [2005] IndigLawB 27; (2005) 6(11) Indigenous Law Bulletin 12. Indigenous Law Bulletin, 6(11), 12–15.

Law, J. (2015). What's wrong with a one-world world? Distinktion: Journal of Social Theory, 16(1), 126–139. https://doi.org/10.1080/1600910X.2015.1020066

Maclean, K., Hankins, D. L., Christianson, A. C., Oliveras, I., Bilbao, B. A., Costello, O., Langer, E. R., & Robinson, C. J. (2023). Revitalising Indigenous cultural fire practice: Benefits and partnerships. Trends in Ecology & Evolution, 38(10), 899–902. https://doi.org/10.1016/j.tree.2023.07.001

Maddison, S. (2019). The Colonial Fantasy: Why White Australia Can't Solve Black Problems. Allen & Unwin. http://ebookcentral.proquest.com/lib/uql/detail.action?docID=5734468

Marotti de Mello, A., Mdiniso, J., Ndlovu, M., & Donkor, F. K. (2022). Editorial: Call for papers – indigenous epistemologies and circular economy: critical reflections from the periphery. Revista de Gestão, 29(4), 318–320. https://doi.org/10.1108/REGE-10-2022-194

Martin, K., & Mirraboopa, B. (2003). Ways of knowing, being and doing: A theoretical framework and methods for indigenous and indigenist re-search. Journal of Australian Studies, 27(76), 203–214. https://doi.org/10.1080/14443050309387838

Martins, K. (2022, January 26). The Dutch Discovery of Australia. World History Encyclopedia. https://www.worldhistory.org/article/1933/the-dutch-discovery-of-australia/

McGregor, R. (1997). Imagined Destinies: Aboriginal Australians and the doomed race theory, 1880-1939. Melbourne University Press. https://researchonline.jcu.edu.au/12109/

McKay, F. H., & Godrich, S. L. (2021). Interventions to address food insecurity among Aboriginal and Torres Strait Islander people: A rapid review. Applied Physiology, Nutrition, and Metabolism = Physiologie Appliquee, Nutrition Et Metabolisme, 46(12), 1448–1458. https://doi.org/10.1139/apnm-2020-1075

Meadows, D. H. (2008). Thinking in systems: A primer (D. Wright, Ed.). Chelsea Green Publishing. http://catdir.loc.gov/catdir/toc/ecip0825/2008035211.html

Memmott, P. (2011). Violence in Indigenous communities: Full report. Crime Prevention Branch, Attorney-General's Department. https://webarchive.nla.gov.au/awa/20050719160636/http://www.ag.gov.au/agd/www/rwpattach.nsf/viewasattachmentPersonal/5210C36F7DE2A926CA256B-4300022F10/$file/violenceindigenous.pdf

Memmott, P., Martin, D., & Amiralian, N. (2017). 9—Nanotechnology and the Dreamtime knowledge of spinifex grass. In C. Baillie & R. Jayasinghe (Eds.), Green Composites (Second Edition) (pp. 181–198). Woodhead Publishing. https://doi.org/10.1016/B978-0-08-100783-9.00008-3

Moreton-Robinson, A. (2015). The White Possessive: Property, Power, and Indigenous Sovereignty. University of Minnesota Press. https://www.jstor.org/stable/10.5749/j.ctt155jmpf

Moser, E. I., Kropff, E., & Moser, M.-B. (2008). Place Cells, Grid Cells, and the Brain's Spatial Representation System. Annual Review of Neuroscience, 31(1), 69–89. https://doi.org/10.1146/annurev.neuro.31.061307.090723

Muecke, S. (2011). Australian Indigenous Philosophy. Comparative Literature and Culture, 13(2), 1–7. https://doi.org/10.7771/1481-4374.1741

Muecke, S., & Eadie, J. (2020). Ways of life: Knowledge transfer and Aboriginal heritage trails. Educational Philosophy and Theory, 52, 1–13. https://doi.org/10.1080/00131857.2020.1752185

Nakata, M. N. (2007). Disciplining the savages: Savaging the disciplines. Aboriginal Studies Press.

National Museum of Australia. (2023, May 16). National Museum of Australia—White Australia policy. National Museum of Australia; National Museum of Australia; c=AU; o=Commonwealth of Australia; ou=National Museum of Australia. https://www.nma.gov.au/defining-moments/resources/white-australia-policy

Neale, M., & Lynne, K. (2020). Songlines: The Power and Promise. Thames & Hudson Aust.

OAG. (2021). Delivering Essential Services to Remote Aboriginal Communities – Follow-up (25: 2020-21). https://audit.wa.gov.au/reports-and-publications/reports/delivering-essential-services-to-remote-aboriginal-communities-follow-up/

OECD. (2018). What is green growth and how can it help deliver sustainable development? OECD: Better Policies for Better Lives. https://www.oecd.org/greengrowth/whatisgreengrowthandhow-canithelpdeliversustainabledevelopment.htm

Parrique, T., Barth, J., Briens, F., Spangenberg, J., & Kraus-Polk, A. (2019). Decoupling Debunked. Evidence and arguments against green growth as a sole strategy for sustainability. A study edited by the European Environment Bureau EEB.

Parsons, M., Fisher, K., & Nalau, J. (2016). Alternative approaches to co-design: Insights from indigenous/academic research collaborations. Current Opinion in Environmental Sustainability, 20, 99–105. https://doi.org/10.1016/j.cosust.2016.07.001

Paulson, S. (2019, December 6). Making Kin: An Interview with Donna Haraway. Los Angeles Review of Books. https://lareviewofbooks.org/article/making-kin-an-interview-with-donna-haraway/

Pilkington, D. (1996). Follow the Rabbit-Proof Fence. University of Queensland Press.

Poelina, A., Wooltorton, S., Blaise, M., Aniere, C., Horwitz, P., White, P., & Muecke, S. (2022). Regeneration time: Ancient wisdom for planetary wellbeing. Australian Journal of Environmental Education, 38, 1–18. https://doi.org/10.1017/aee.2021.34

Prior, J., Cusack, C. M., & Capon, A. (2018). The Role of Pliability and Transversality Within Trans/Disciplinarity: Opening University Research and Learning to Planetary Health. In D. Fam, L. Neuhauser, & P. Gibbs (Eds.), Transdisciplinary Theory, Practice and Education: The Art of Collaborative Research and Collective Learning (pp. 57–71). Springer International Publishing. https://doi.org/10.1007/978-3-319-93743-4_5

Queensland Biodiscovery Act. (2020). Biodiscovery Act 2004—Queensland Legislation—Queensland Government. Queensland Government. https://www.legislation.qld.gov.au/view/whole/html/inforce/current/act-2004-019

Querejazu, A. (2016). Encountering the Pluriverse: Looking for Alternatives in Other Worlds. Revista Brasileira de Política Internacional, 59. https://doi.org/10.1590/0034-7329201600207

Raworth, K. (2012). A Safe and Just Space for Humanity. Oxfam. https://www-cdn.oxfam.org/s3fs-public/file_attachments/dp-a-safe-and-just-space-for-humanity-130212-en_5.pdf

Renault, H. (2015, April 29). Indigenous community signs landmark agreement with University of Queensland to develop spinifex 'nanofibre' industry. ABC News Australia. https://www.abc.net.au/news/rural/2015-04-29/spinifex-discoveries-drive-industry/6429716

Rey, U. (2016). Women's Business: Cross-cultural Collaborations in Remote Indigenous Art Centres. Australian and New Zealand Journal of Art, 16(1), 39–54. https://doi.org/10.1080/14434318.2016.1172550

Rigney, L.-I. (2006). Indigenist Research and Aboriginal Australia. In Indigenous Peoples' Wisdom and Power. Routledge.

Rose, D., James, D., & Watson, C. (2003). Indigenous kinship with the Natural World in New South Wales. NSW National Parks and Wildlife Service. https://www.academia.edu/21533921/Indigenous_Kinship_with_the_Natural_World_in_New_South_Wales

Russell, J., & Cohn, R. (2012). Australian Aboriginal Kinship. LENNEX Corp.

Sharmil, H., Kelly, J., Bowden, M., Galletly, C., Cairney, I., Wilson, C., Hahn, L., Liu, D., Elliot, P., Else, J., Warrior, T., Wanganeen, T., Twaylor, R., Wanganeen, F., Madrid, J., Warner, L., Brown, M., & de Crespigny, C. (2021). Participatory Action Research-Dadirri-Ganma, using Yarning: Methodology co-design with Aboriginal community members. International Journal for Equity in Health, 20(1), 160. https://doi.org/10.1186/s12939-021-01493-4

Shay, M. (2021). Extending the yarning yarn: Collaborative Yarning Methodology for ethical Indigenist education research. The Australian Journal of Indigenous Education, 50(1), 62–70. https://doi.org/10.1017/jie.2018.25

Sherriff, S., Kalucy, D., Tong, A., Naqvi, N., Nixon, J., Eades, S., Ingram, T., Slater, K., Dickson, M., Lee, A., & Muthayya, S. (2022). Murradambirra Dhangaang (make food secure): Aboriginal community and stakeholder perspectives on food insecurity in urban and regional Australia. BMC Public Health, 22(1), 1066. https://doi.org/10.1186/s12889-022-13202-z

Shiva, V., Lockhart, C., & Shroff, R. (2015). Terra Viva Manifesto. https://seedfreedom.info/wp-content/uploads/2015/05/Terra-Viva_Manifesto-English.pdf

Siderius, T., & Zink, T. (2022). Markets and the Future of the Circular Economy. Circular Economy and Sustainability. https://doi.org/10.1007/s43615-022-00196-4

Slawinski, N., & Bansal, P. (2012). A Matter of Time: The Temporal Perspectives of Organizational Responses to Climate Change. Organization Studies, 33(11), 1537–1563. https://doi.org/10.1177/0170840612463319

Standing Committee on Legal on Constitutional Affairs. (2006). Unfinished business: Indigenous stolen wages (Australia; Text 412). Senate Standing Committee on Legal and Constitutional Affairs. https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Legal_and_Constitutional_Affairs/Completed_inquiries/2004-07/stolen_wages/report/index

Steffensen, V. (2020). Fire Country: How Indigenous Fire Management Could Help Save Australia. Hardie Grant Travel.

Suzuki, D., & Knudtson, P. (1992). Wisdom of the Elders (1st ed.). Bantam.

Taylor, L. (1999). Painting the land story. National Museum of Australia.

Taylor, P. S., & Habibis, D. (2020). Widening the gap: White ignorance, race relations and the consequences for Aboriginal people in Australia. Australian Journal of Social Issues, 55(3), 354–371. https://doi.org/10.1002/ajs4.106

The Australian Museum. (2020, May 26). Ghost net art. The Australian Museum. https://australian.museum/learn/cultures/atsi-collection/ghost-net-art/australian.museum/learn/cultures/atsi-collection/ghost-net-art/

The Common Ground. (2022, October 25). The Stolen Generations | Common Ground. Commonground.Org. https://www.commonground.org.au/article/the-stolen-generations

Tobler, R., Rohrlach, A., Soubrier, J., Bover, P., Llamas, B., Tuke, J., Bean, N., Abdullah-Highfold, A., Agius, S., O'Donoghue, A., O'Loughlin, I., Sutton, P., Zilio, F., Walshe, K., Williams, A. N., Turney, C. S. M., Williams, M., Richards, S. M., Mitchell, R. J., … Cooper, A. (2017). Aboriginal mitogenomes reveal 50,000 years of regionalism in Australia. Nature, 544(7649), Article 7649. https://doi.org/10.1038/nature21416

Törnberg, A. (2017). The Wicked Nature of Social Systems – A Complexity Approach to Sociology. https://gupea.ub.gu.se/handle/2077/51507

Tsing, A. L. (2005). Friction: An ethnography of global connection. Princeton University Press. https://search.library.wisc.edu/catalog/999975449702121

Tuhiwai Smith, L. (2012). Decolonizing methodologies: Research and indigenous peoples (2nd ed.). Zed Books ; University of Otago Press.

Tynan, L. (2021). What is relationality? Indigenous knowledges, practices and responsibilities with kin. Cultural Geographies, 28(4), 597–610. https://doi.org/10.1177/14744740211029287

Tynan, L., & Bishop, M. (2022). Decolonizing the Literature Review: A Relational Approach. Qualitative Inquiry. https://doi.org/10.1177/10778004221101594

Uluru Statement Working Group. (2023). The Statement. Uluru Statement from the Heart. https://ulurustatement.org/the-statement/view-the-statement/

van Neerven, E. (2020). Homeland Calling: Words from a new generation of Aboriginal and Torres Strait Islander voices. Desert Pea Media. https://www.booktopia.com.au/homeland-calling-desert-pea-media/book/9781741176926.html

von Zinnenburg Carroll, K. (2014). Art in the Time of Colony. Ashgate Publishing Limited. https://www.routledge.com/Art-in-the-Time-of-Colony/Carroll/p/book/9781138247734

Wachsmuth, D. (2012). Three Ecologies: Urban Metabolism and the Society-Nature Opposition. The Sociological Quarterly, 53, 506–523. https://doi.org/10.2307/41679734

Watson, H., & Chambers, D. W. (1989). Singing the land, signing the land: A portfolio of exhibits. Deakin University Press.

Watson, J. (2020). Lo-TEK : design by radical indigenism (D. Wade, Ed.). Taschen. https://www.worldcat.org/title/lo-tek-design-by-radical-indigenism/oclc/1130119634

West, R., Stewart, L., Foster, K., & Usher, K. (2012). Through a Critical Lens: Indigenist Research and the Dadirri Method. Qualitative Health Research, 22(11), 1582–1590. https://doi.org/10.1177/1049732312457596

Whiteman, H. (2023, October 14). Australians vote No in referendum that promised change for First Nations people but couldn't deliver. CNN. https://www.cnn.com/2023/10/14/australia/australia-referendum-results-intl-hnk/index.html

Whyte, K. (2018). Settler Colonialism, Ecology, and Environmental Injustice. Environment and Society, 9, 125–144.

Wiebe, K. S., Harsdorff, M., Montt, G., Simas, M. S., & Wood, R. (2019). Global Circular Economy Scenario in a Multiregional Input–Output Framework. Environmental Science & Technology, 53(11), 6362–6373. https://doi.org/10.1021/acs.est.9b01208

Wilson, S. (2016). Using Indigenist Research to Shape Our Future. In Decolonizing Social Work. Routledge.

Wooltorton, S., Collard, L., & Horwitz, P. (2017). The land still speaks: Ni, Katitj!: An introduction. Philosophy Activism Nature, 13, 57–67. https://doi.org/10.3316/informit.368273434953785

Xu, L., Zhao, S., Cotte, J., & Cui, N. (2023). Cyclical Time Is Greener: The Impact of Temporal Perspective on Pro-Environmental Behavior. Journal of Consumer Research, ucad016. https://doi.org/10.1093/jcr/ucad016

Yeung, H. W. (2005). Rethinking Relational Economic Geography. Transactions of the Institute of British Geographers, 30(1), 37–51.

Yunkaporta, T. (2019). Sand Talk: How Indigenous Thinking Can Save the World. The Text Publishing Company.

Zerafa-Payne, E. (2023). What is a Makarrata Commission? Queensland Teachers' Journal, 128(4). https://www.qtu.asn.au/makarrata-commission

26/06/2023, Brisbane, Australia