Polycentric self-governance and Indigenous knowledge

Dr Shann Turnbull, Prof Natalie P. Stoianoff & Prof Anne Poelina

Vincent and Elinor Ostrom defined polycentricity as a complex form of governance with multiple, semi-autonomous centres of decision making. Australian researchers Dr Shann Turnbull, Prof Natalie Stoianoff and Prof Anne Poelina explore how the polycentric self-governance of Australian Indigenous societies can inform modern governance and safeguard the wellbeing of humanity and natural ecosystems.

Introduction

This article's main aim is to discuss research exploring how the self-governing practices found in Indigenous societies, biota and modern organisations can be embedded into the constitutions of legal entities to protect and share the well-being of humanity, biota and the planet. It highlights the potential for organisations to become a locally controlled common pool resource (CPR)[1] that protects local bioregions. Ultimately, it outlines how turning upside-down the top-down exploitive power structures of society can enrich democracy through stakeholder self-governance[2] that protects and nurtures the community, biota, and the environment.[3]

---

1. Ostrom, 2009b
2. Turnbull, 1994, 2000a
3. Turnbull, 2023

We are particularly interested in local culturally determined self-governance for Australian Indigenous communities and how the traditional practices of Indigenous people and communities can be adapted to fill a modern knowledge gap.[4] This article proposes that all citizens need to work together to reinstate and reinvent the self-governing processes that respect a wide variety of individuals, their totems, moieties, skin, clans, tribes, with local communities, geology, landforms, water resources, sub-regions, and the bioregional components of our planet Earth, described as Gaia (the Earth goddess, from whom the world was born, bringing calm to an otherwise chaotic universe). Polycentric self-governance (PSG) through all these levels could bypass existing political arrangements, rendering markets and the state redundant, as suggested by Ostrom (2009b).[5] We aim to understand Indigenous Australians' ideas of self-governance to call for a total reset of modern institutions in the face of emerging existential risks to humanity and our planet.

Polycentric Governance and First Law

Ostrom's design principles were established for CPRs that did not possess property rights. Her Nobel Prize citation stated: "It was long unanimously held among economists that natural resources that their users collectively used would be over-exploited and destroyed in the long-term" (Nobel Prize Facts 2009)[6] Hardin (1968) describes this concept as the "tragedy of the commons".[7] Ostrom identified eight design principles for CPR management, as outlined in Table 1.[8]

TABLE 1: Ostrom's Design Principles for CPR Management

1. Clearly defining the group boundaries (and effective exclusion of external un-entitled parties) and the contents of the common pool resource (CPR).

2. The appropriation and provision of common resources that are adapted to local conditions.

3. Collective-choice arrangements that allow most resource appropriators to participate in the decision-making process.

4. Effective monitoring by monitors who are part of or accountable to the appropriators.

5. A scale of graduated sanctions for resource appropriators who violate community rules.

6. Mechanisms of conflict resolution that are cheap and of easy access.

7. Self-determination of the community recognised by higher-level authorities.

8. In the case of larger CPRs, an organisation in the form of multiple layers of nested enterprises, with small local CPRs at the base level.

These principles have since been modified and expanded to include several additional variables believed to affect the success of self-organised governance systems, including effective communication, internal trust and reciprocity, and the nature of the resource system.[9] Further modified by Wilson *et al.* (2013) (Table 2),[10] the number of issues raised makes it essential that their implementation is subject to continuous testing and review for each specific situation.

---

4. Turnbull and Poelina, 2022; Unuigbe, 2023
5. Ostrom, 2009b
6. Nobel Prize Facts 2009. https://www.nobelprize.org/prizes/economic-sciences/2009/ostrom/facts/
7. Hardin, 1968
8. Ostrom, 1990
9. Poteete and Ostrom, 2010
10. Wilson *et al.*, 2013

TABLE 2: Modified Ostrom's Design Principles for CPR Management[11]

1.	User boundaries: Clear and locally understood boundaries exist between legitimate users and nonusers.
	Resource boundaries: clear boundaries that separate a specific common-pool resource from a larger social-ecological system.
2.	Congruence with local conditions: appropriation and provision rules are congruent with local social and environmental conditions.
	Appropriation and provision: appropriation rules are congruent with provision rules; the distribution of costs is proportional to the distribution of benefits.
3.	Collective-choice arrangements: most individuals affected by a resource regime are authorised to participate in making and modifying its rules.
4.	Monitoring users: individuals who are accountable to or who are the users monitor the appropriation and provision levels of the users.
	Monitoring the resource: individuals who are accountable to or who are the users monitor the condition of the resource.
5.	Graduated sanctions: sanctions for rule violations start very low but become more robust if a user repeatedly violates a rule.
6.	Conflict-resolution mechanisms: rapid, low-cost local arenas exist to resolve conflicts among users or officials.
7.	Minimal recognition of rights: the rights of local users to make their own rules are recognised by the Government.
8.	Nested enterprises: when a common-pool resource is closely connected to a larger social-ecological system, governance activities are organised in multiple nested layers.

Ostrom and her co-researchers developed a comprehensive social-ecological systems (SES) framework, encompassing the evolving theory of common-pool resources and collective self-governance.[12] Here, we consider this in the context of Australia's First Nations Peoples to develop insights into how to protect, nurture and exchange unique local resources with other global localities.

The framework incorporates all voices from each location in a way that is consistent with what would be described today as stakeholder feedback or a Second Track.[13] It conceptualises how voices from each location are needed to protect and nurture the wellbeing of local flora and fauna and meet the concerns of constituent language groups responsible for nurturing their respective bioregions. This framework could be formalised as a body that encourages voices for all – Indigenous or otherwise – at each multi-bioregional level. It would aim to safeguard a rich diversity of self-governing local communities as envisaged by Turnbull (1980)[14] and provide a bottom-up means to encourage support and dissent through each level of governance up to a global level. Research on wellbeing frameworks has been led in recent times by the work of the Organisation for

---

11. Wilson *et al.*, 2013
12. Ostrom, 2009
13. Fritz, 2019, 2021
14. Turnbull, 1980, pp. 109–147

Economic Co-operation and Development (OECD, 2020) with the Australian Government conducting its own investigations on measuring wellbeing (Australian Government 2022). For an analysis of well-being frameworks and their suitability for Australia's First Nations Peoples see Sangha *et al* (2023).

First Law owneeship

Place is significant for PSG from an Indigenous perspective. Indigenous Australians consider themselves interconnected with Country.[15] Indigenous Australians see themselves as being of the land,[16] with which comes the obligations of an ownee[17] under their First Law[18] to care for their environment. The words 'custodian' or 'steward' of land are inadequate, given the non-negotiable intimate relationship of Indigenous People being of the land. These words also imply an inadequate and incomplete agency that overlooks the origin of Indigenous Australians, their obligations to their ancestors who created them and their environment, and how they relate to each other and to visitors to Country.

Indigenous Australians have sustained themselves for at least 65,000 years. Their environment has been subject to major variations over time and by location; hence, the eight design principles identified by Ostrom[19] are consistent with the traditional practices of Australia's First Nations Peoples; they are also subject to their First Law having been determined by the form and geology of their Country and its fauna and flora.

Knowing the language – know the land

Before colonisation, there were around one million First Nations Peoples in Australia in a land area comparable to Europe or the US.[20] While all First Nations Peoples shared a common Dreamtime creation story, it was spoken in hundreds of languages and dialects and knowing a homeland meant knowing its language.[21] This also meant that it was usual for some First Nations Peoples to be multilingual.

For humanity, sustainability is possible in entirely different environments, but location matters according to how each region is endowed with resources and how each region of the planet is governed. Managing these resources in a way that is sustainable, humanity must be governed by nature as practised by Indigenous Australians according to their First Law.[22] This requires modern societies to turn upside down their dominant top-down power structures to create what Campbell (2022) describes as a Total Reset.[23] Turnbull (2002a) describes it as an ecological architecture and ecological governance because it mimics the architecture of biota.[24]

Governance grounded by and for bioregions

Each bioregion has its unique features, so humanity in each region needs to behave and govern its regions differently. As Indigenous languages are lost,[25] so is our knowledge of how to care for Country. To update our knowledge and reinvent ways to protect and nurture each unique region of Australia, we have no alternative but to devise

---

15. Country is capitalised as it is respected as a living entity and in a deep relationship with Indigenous Australians, see RiverOfLife *et al.*, 2020a, 2020b, 2021; Nursey-Bray *et al.*, 2020
16. Turnbull, 1980, p. 56
17. Turnbull, 1980, pp. 163, 164; Turnbull, 1986
18. Redvers *et al.*, 2020
19. Ostrom, 2009b
20. Gough, 2011
21. Turnbull and Poelina, 2022, p. 27
22. Campbell, 2022, Guthrie *et al.*, 2022, Turnbull and Poelina, 2022, Turnbull, 2014c, 2023, Guthrie and Turnbull, 2019
23. Campbell, 2022
24. Turnbull, 2002a; Turnbull and Myers, 2017
25. See https://www.commonground.org.au/article/indigenous-languages-avoiding-a-silent-future#:~:text=250%20First%20Languages%20were%20spoken,First%20Languages%20are%20still%20spoken.

synthetic governing relationships between humans and their bioregion by (a) custom designing the governance architecture at each location and (b) educating governance architects to custom design governing relationships.

We recommend that incorporated bodies work as agents of change to achieve a total reset. The advantage of introducing incorporated bodies is that they can be custom-designed to become grounded in the local environment. Over time, their involvement could be phased out as citizens become committed to sustainable behaviour like First Nations Peoples.

System science reasons considered below support the need for a total reset. For Indigenous Australians, this would involve self-determination as espoused by the *United Nations Declaration on the Rights of Indigenous Peoples 2007* and more recently in the *Indigenous Voice Co-design Process – Final Report to the Australian Government July 2021*.[26] However, there have been numerous recommendations for Indigenous self-determination, including reports dating back to 1980, such as the *Economic Development of Aboriginal Communities in the Northern Territory*[27] and, more recently, the *Empowered Communities: Empowered Peoples Design Report*.[28]

The most recent Australian proposal seeks only a Voice to Parliament and the executive Government. This proposal will be put to the Australian people at a referendum on 14 October 2023. The National Indigenous Australian Agency's recommendation for a Voice to Parliament and the executive Government is intended to encompass

the ability of "[l]ocal and regional Voices [to] provide advice to all levels of government to influence policy and programs, and advise the non-government sector and business".[29] The NIAA recommends a plurality of voices because the Voice to Parliament and the executive should not be construed literally as a single voice. This misconception has prompted Indigenous leaders of the No Campaign to argue against the referendum proposal because "A single voice cannot speak for Indigenous Australians".[30] The NIAA recommendations recognise that obtaining different voices is essential to govern separate locations according to their characteristics if a total reset is to be achieved. Hence the need "for a system-wide approach where the 2 parts of the Indigenous Voice – Local & Regional Voices and the National Voice – complement and support each other to ensure the best outcomes".[31]

A new way to govern[32]

The "question … how exactly the Voice process will collect the input of local and regional Voices and transfer them to federal parliament"[33] cannot be answered in the context of traditional forms of democratic Government that perpetuate dictatorships of the majority. Instead, a total reset based on polycentric self-governance (PSG) can foster inclusive participation of many voices. It requires introducing a bottom-up stakeholder form of ecological governance described below.[34]

Bottom-up governance introduces a multiplicity of what Fritz (2019) describes as a second track.[35] This fulfils the monitoring role Ostrom (2009b) identified as a requirement for achieving

26. NIAA, 2021
27. Turnbull, 1980, p. 3
28. Empowered Communities, 2015
29. Allam, 2022
30. https://thewest.com.au/opinion/warren-mundine-indigenous-australia-cannot-be-spoken-for-by-a-single-voice-c-8096954
31. NIAA 2021, p. 214
32. Turnbull, 2002a
33. Thorburn *et al.*, 2023 citing Larkin, 2021
34. Christakis, 2014; Turnbull, 1994, 2000a, 2002a, 2014a, 2020a, 2020b
35. Fritz, 2019

self-governance without markets or state.[36] The Garuwanga Project provides a valuable example of a bottom-up or grassroots approach to governance in the context of establishing a competent authority to protect Indigenous knowledge.[37] The tiered approach espoused by the Garuwanga Project recognises the importance of local and regional competent authorities as the key decision makers, with the national competent authority providing a reporting and supporting role.[38]

PSG allows many local voices to aggregate with kindred minority interests upward through all higher levels to a global perspective. It promotes local self-sufficient, self-governing circular economies with micro-democratic organisational structures promoting equity and self-reliance, like traditional Indigenous societies. To create higher levels, the federation of lower levels of organisations follows the principle of subsidiary function (PSF). PSF states that no higher-level organisation should undertake any activity that can be better achieved at a lower level.[39]

An outline of how Australian minority voices can be heard from different neighbourhoods up through to various levels to be recognised and aggregated with others to a global level, according to the principle of PSF, is indicated in Table 3.

TABLE 3: Australian architecture of polycentric self-governance (PSG)[40]

The Australian component of Earth and water-centred bottom-up governance by Gaia		
Level	**Localities**	**Organisational Form**
6	Global	Global federations of PSG incorporated organisations by types of 5 host climate regions and other attributes.
5	Shared water basins	Incorporated and unincorporated PSG associations were federating lower levels within climate types and 13 water basins.
4	Bioregions	89 incorporated and unincorporated PSG associations federating 419 sub-regions.
3	Sub-regions Suburbs/towns	419 incorporated and unincorporated lower-level PSG entities.
2	*Language groups/Tribes*	*Unincorporated*, Incorporated, Corporate, and non-profit PSGs.
1	Neighbourhoods *Clans/ moiety/Skin/Totems*	*Unincorporated*, Incorporated Associations, Non-profit corps. Locally controlled investor-stakeholder endowment corporations continuously re-birthing providing a universal dividend to all citizens as achieved in Alaska.[41]

---

36. Ostrom, 2009b

37. Stoianoff *et al.*, 2022

38. Stoianoff *et al.*, 2022, see in particular Chapter 7, section 7.1.3

39. Pius XI, 1931; Schumacher, 1973, p. 204; Pirson and Turnbull, 2017; Turnbull, and Guthrie, 2019

40. This table draws on Campbell, 2022 by reversing centralized top-down governance institutions while not involving political structures, consistent with PSG existing without "markets or state" Ostrom, 2009b

41. https://pfd.alaska.gov/payments/tax-information#:~:text=The%202022%20Permanent%20Fund%20Dividend,Identification%20number%20 is%2092%2D6001185.

The principles of Ostrom (2009a) underpins Table 3.[42] Ostrom's field research was not concerned with the higher level of coordinating organisations or how minority voices could be recognised and aggregated with others through higher levels, as shown in Table 3. This is important to provide an Indigenous Voice whether or not the proposal to change the Australian constitution is accepted.

In seeking to manage climate change, Ostrom (2009a) proposed a polycentric approach at various levels with active local oversight of local, regional, and national stakeholders. Ostrom noted that:

> **Building a strong commitment to find ways of reducing individual emissions is an important element for coping with this problem, and having others also take responsibility can be more effectively undertaken in small- to medium-scale governance units that are linked together through information networks and monitoring at all levels.**[43]

Voices also need to be shared to promote trade, investment and safeguards on crucial scarce global resources. Indigenous Australians exchanged items across a territory as large as the US or Europe.[44]

The organisational scope of this article is limited to the foundational first two levels in Table 3, which includes Indigenous practices highlighted in **bold italics**. Suggestions for global arrangements were presented in the first Global Brain Workshop.[45] The territorial scope of this article is limited to Australia.

Polycentric Self-Governance Literature and Examples

Frameworks for considering micro self-sufficiency and self-governance in contemporary society that also follow the PSF are presented in various studies.[46] A literature review of self-governance is presented in the Appendix of Turnbull (2022b).[47] A vision of a total reset is provided by Turnbull (2018),[48] with details in Table 1 of Turnbull (2015).[49]

Ostrom (1993, 1998a, b, 2009b)[50] and colleagues Wilson *et al.* (2013)[51] have considered the contributions already made by Indigenous societies worldwide in filling the modern knowledge gap. As the first political scientist to win a Nobel prize in economics, Ostrom described the self-governing design rules as polycentric governance. This is a political scientist's description of what has been described as a compound board,[52] distributed decision-making,[53] or what others refer to as network governance.[54] This article applies Ostrom's revised design rules to transform incorporated entities into a CPR that benefits all stakeholders.

Barkin and Napoletano (2023) documented how traditional Indigenous practices can be adapted to promote local self-sufficiency and self-management for around a third of the population of Mexico.[55] This was because of civil war settled

---

42. Ostrom, 2009a.
43. Ostrom 2009a, Abstract.to Policy Research Working Paper 5095
44. https://blog.qm.qld.gov.au/2012/05/16/indigenous-science-australia-had-ancient-trade-routes-too-2/
45. http://pespmc1.vub.ac.be/Conf/GB-0.html
46. Morehouse, 1997; Turnbull, 1980, pp. 109-147; Barkin, 2022; Turnbull and Myers, 2017; Lucio and Barkin, 2022
47. Turnbull, 2022b
48. Turnbull, 2018
49. Turnbull, 2015, p. 18
50. Ostrom, 1993, 1998a, b, 2009b
51. Wilson *et al.*, 2013
52. Turnbull, 2000b, p. 27
53. Kelso *et al.*, 2013
54. Craven *et al.*, 1996; Nohira and Eccles, 1992; Pirson and Turnbull, 2011, 2012, 2015, 2017; Turnbull, 2000a, 2002a, 2014c, 2020a, 2020b, 2022a; Turnbull and Pirson, 2012, 2019
55. Barkin and Napoletano, 2023

by negotiations between the Government and the Zapatista National Liberation Army (EZLN) in 1996. The Mexican Constitution was amended to make the country a multicultural nation with autonomous regional Indigenous governments. As Mexico had a population of around 129 million in 2022, around 43 million Mexicans have adopted traditional practices. This significantly exceeds the total population of Australia of 26 million. The land area of Mexico is only a quarter of the size of Australia. In Mexico, there are 68 Indigenous languages with 364 variants.

Modern significant business examples of PSG are the stakeholder-controlled Visa Inc. in the US,[56] The John Lewis Partnership in the UK,[57] and the Mondragón[58] cooperative system in Spain.[59] They have proved their competitiveness and resilience by surviving business cycles for over half a century. They have also shown that no changes in private law are required. Many civic organisations have survived and thrived with PSG promoting engagement with their members. Professional associations and Rotary clubs are examples. The following section explains why.

Methodology

A science of governance was established by introducing bytes as the unit of analysis.[60] Bytes describe data. Data is physically represented by patterns in matter or energy that make a difference. No changes in the social constructs of information, knowledge and wisdom can arise without the transaction of bytes.[61] Transaction Byte Analysis (TBA) provides an instrumental

basis for evaluating, comparing, and designing human organisations independently of the level of technology that may be employed.[62] Any transaction of bytes involves perturbations in energy and matter. Minimising bytes economise energy and matter to minimise the energy or matter required to sustain biota and organisations.

TBA creates a methodology that subsumes and extends the science of cybernetics. Instead of being limited to "the control and communication in the animal and the machine",[63] TBA becomes the science of control, communication and decision-making within and between any biota and devices. TBA explains why nature uses DNA to store and reproduce life's complexity. DNA creates a process for amplifying the creation and regulation of complexity by *indirect* means.[64] To simplify and amplify complexity, we introduce our innovation of using incorporated organisations as *indirect* agents for introducing a total reset.

Our brains reveal the cost of resources in transacting data: "The brain makes up only 2 percent of our body weight, but it consumes 20 percent of the oxygen we breathe and 20 percent of the energy we consume'.[65] Our brains reduce data overload by introducing distributed decision making. This removes the need for a Chief Executive Officer neuron.[66] TBA explains why polycentric decision-making networks in our brains or polycentric governed organisations obtain competitive advantages in data processing. It also improves resilience by introducing redundancy in data processing capabilities. TBA also explains why management scholarship focused on leadership

---

56. Hock, 1999

57. Turnbull, 2000b, pp. 190-198

58. Mondragón is nested network of, 200 multi-stakeholder owned and controlled cooperatives that were founded in, 1957 around the Spanish town of Mondragon that now has over 80,000 members.

59. Turnbull, 1995, 2000b, pp. 199-225; Whyte and Whyte, 1988

60. Turnbull, 2000b, p. 83

61. Turnbull, 2005

62. Turnbull, 2005

63. Wiener, 1948

64. Ashby, 1956, p. 265

65. NLM, 2007

66. Kurzweil, 1999, p. 89

is dysfunctional in mimicking nature. All biota, by necessity, must become self-governing to survive their creation in dynamic, unknowable, complex environments until they can reproduce. A defining feature of distributed decision-making in biota is that each decentralised decision-making centre can act independently of others. Hence, this is known as ecological governance, distinguishing it from hybrid networks that lack autonomy or become a component of a command-and-control hierarchy. Ecological governance replaces regulators with empowered stakeholders to protect themselves. This occurs in nature. In modern society, it means, in effect, "privatising" regulation.[67] A related defining feature of ecological governance is that different control centres exhibit contrary ~ commentary Yin ~ Yang like behaviour now described as "Tensegrity". This is demonstrated in human behaviour. We can be competitive ~ cooperative, trusting ~ suspicious, selfish ~ altruistic, etc. In this way, Tensegrity introduces checks and balances to promote self-regulation.

Such contrary ~ complementary behaviour exists in the physical world. Fuller (1961) coined Tensegrity by combining Tension and Integrity to describe physical structures created by combining materials with contrary ~ complementary characteristics like geodesic domes.[68] Schumacher (1973) and Ostrom (2009) described Tensegrity with different words.[69] Schumacher used the word antimony, while Ostrom described a context of competing stakeholders cooperating. Meanwhile, Hock (1999) combined the words "chaos" and "order" to create the word chaordic.[70] Hock

founded the credit card organisation VISA Inc. in 1970. It adopted PSG, with Hock (1999) explaining that the organisation possessed: "multiple boards of directors within a single entity, none of which can be considered superior or inferior as each has irrevocable authority and autonomy over a geographical or functional area ... No part knew the whole and the whole does not know all the parts, and none had any need to" because they were self-governing.[71] In this way, both complexity and data overload in executives were reduced.

Tensegrity creates the greatest strength in biological and physical structures with the least materials.[72] In social systems, Tensegrity can be used to increase the reliability of communications, control and decision-making while minimising the energy and matter required within the system.[73]

Analysis

Choice of legal entities

Five types of possibly relevant Australian legal structures are set out in Table 4.[74] This table was constructed for the Garuwanga Project, which focused on identifying the most appropriate legal structures for a competent authority to administer a legal regime tasked with protecting Indigenous knowledge in Australia to benefit Indigenous Australians.[75] For parsimony, the table omits the Australian innovation of No-Liability (NL) corporations[76] and incorporated limited liability partnerships available in each state jurisdiction.[77] Following Australian law, all options assume unitary top-down control and thereby do not provide for PSG without modification.

67. Turnbull, 2008b, 2019, 2021

68. Fuller, 1961

69. Turnbull, 2020b

70. Hock, 1999

71. Hock, 1999, p. 191

72. Ingber, 1998, p. 32, Muresan, 2014

73. Turnbull, 2000b, p. 134, 2022b

74. Stoianoff *et al.*, 2022

75. Stoianoff *et al.*, 2022

76. https://asic.gov.au/about-asic/contact-us/complaints-about-companies-organisations-or-people/using-limited-no-liability-or-proprietary-in-a-name/

77. https://business.gov.au/planning/business-structures-and-types/business-structures/partnership#:~:text=Incorporated%20Limited%20
    Partnership%20ILP%20%2D,general%20partner%20with%20unlimited%20liability.

TABLE 4: Potentially relevant Australian incorporated entities.[78]

	Proprietary Company	Public Company limited by Shares	Public Company limited by Guarantee	Incorporated Association	Registered Co-operative	CATSI Corporation
Management structure	Board of Directors 1+ directors	Board of Directors 3+ directors 1 secretary	Board of Directors 3–12 directors 1 secretary	Management committee in most states 3+ committee members	Board of directors 3+ directors	Board of Directors 3–12 directors
Area of operation	Australia wide	Australia wide	Australia-wide	State of registration	Australia wide	Australia wide
Administration	ASIC	ASIC	ASIC	Fair Trading	Fair Trading	ORIC (3)
Legislation	*Corporations Act 2001 (Cth)*	*Corporations Act 2001* (Cth)	*Corporations Act 2001* (Cth)	*Associations Incorporation Act 2009* (NSW) or equivalent in other States	*Co-Operatives National Law* (**CNL**) (Uniform State-based legislation).	*Corporations (Aboriginal and Torres Strait Islanders) Act 2006* (Cth) + regulations
Members	1 + No more than 50 non-employee shareholders	1 +	1 +	5 +	5+	5 + 51% must be indigenous
Limitation on trading	Nil	Nil	Nil	Depends on Fair Trading policy	Nil	Nil
Personal offers of shares/equity	Yes	Yes	No	No.	Co-op with share capital only (individuals taking up shares must become "active" members)	No
Public offers of shares/equity	Yes – subject to maximum	Yes	No	No	Yes, but difficult	No
Charity registration and tax concessions	Rarely granted.	Rarely granted.	Needs appropriate purpose and provisions in Constitution	Needs appropriate purpose and provisions in Constitution.	Co-ops without shares with appropriate purpose and provisions in Constitution.	Needs appropriate purpose and visions in Constitution

78. Indigenous Knowledge Forum, 2018, Table 3, p. 17

An especially egregious option is the far-right column-headed CATSI corporation. This refers to the Corporations (Aboriginal and Torres Strait Islander) Act 2006 (Cth). It replaced the Aboriginal Councils and Associations Act 1976 (Cth). Section 69.35 of the Act allows the Registrar to change an Aboriginal and Torres Strait Islander corporation's constitution in certain circumstances. While those circumstances relate to dealing with actions contrary to the interests of the members as a whole or oppressive to one or more members, this indicates the failings of the CATSI regime to achieve self-determination for a CATSI corporation's members by requiring an external power to rectify internal conduct.

Private corporations in the first column, cooperatives in the fifth column and CATSI corporation are not likely to be relevant to becoming a CPR because they each deny the interests of stakeholder citizens in ways that can be more simply overcome with public companies in the second and third columns and incorporated associations in the fourth column.

NL corporations were created to facilitate funding high-risk mining ventures in the middle of the 19th century. This purpose is no longer acceptable in the 21st century, which needs to recycle non-replaceable minerals. This law should be amended to be fit for funding technology that can sustain people and the planet eternally. State and Territory laws create incorporated associations, so their operations are limited to their jurisdictions.[79] There are limitations on trading imposed on incorporated associations, which are created for the benefit of the membership collectively, not for individual benefit. Accordingly, an incorporated association needs to specify the objects of the association and cannot trade to secure pecuniary gain for its members. The one exception to

this prohibition to operate for the pecuniary benefit of its members is the Northern Territory incorporated trading association. Like cooperatives, it is practical to create incorporated associations without a lawyer. However, to introduce PSG, custom-designed constitutions are required that introduce the novelties outlined below. Few lawyers, governance experts or businesspeople would be familiar with the innovations of PSG. This leaves the way open for any interested persons from any culture to develop the art and practices of becoming a self-governance architect.

Selection and association of legal forms

A review of Indigenous language groups and bioregions reveals that quite a few cross state borders. However, the use of incorporated associations is restricted to individual state jurisdictions. A CATSI corporation is not so limited, nor are corporations or unincorporated organisations or associations. This means that organisations in level 1 of Table 3 could, in practice, take on one of three forms: (1) unincorporated association, (2) incorporated association, or (3) a corporation. A mix of entities could populate level 2 of Table 3. Several organisations in level 3 of Table 3 would be limited to 419 sub-bioregions. Criteria for introducing PSG into the three types of organisations in levels 1 and 2 are suggested below. They include non-profit social PSG organisations and business enterprises in the form of locally owned and controlled ecological endowment firms. Ecological endowment firms promote sustainable circular local economies with a universal well-being dividend to reduce the size and cost of Government.[80]

However, it should be noted that, while an unincorporated association has the capacity for registration as a charity under the *Australian Charities and Not-for-profits Commission Act*

79. Associations Incorporation Act 1991 (ACT); Associations Incorporation Act 2009 (NSW) and Associations Incorporation Regulation 2022 (NSW); Associations Act 2003 (NT); Associations Incorporation Act 1981 (QLD); Associations Incorporation Act 1985 (SA); Associations Incorporation Act 1964 (TAS); Associations Incorporation Reform Act 2012 (Victoria); Associations Incorporation Act 2015 (WA).
80. Turnbull, 2022a

2012, the association is not a separate legal entity from the members. As a result, each member has limited liability for the association's debts and defaults to the level of their subscription, since the unincorporated association cannot enter into contracts in its own name, or own land, or employ people, or sue or be sued: B*radley Egg Farm v Clifford* [1943] 2 All E.R 378, 378; *Carlton Cricket & Football Social Club v Joseph* [1970] VR 487, 499. Rather, the association's committee members stand in as the 'surrogate for the association' and become personally liable under such contracts or breaches: Fletcher (1979); see also *Peckham v Moore* [1975] 1 NSWLR 353. This is an important consideration when determining choice of legal structure.

While the scope of this article is limited to levels 1 and 2 of Table 3, the need to consider bioregions and water basins is included to highlight how humanity is dependent on bottom-up governance by Gaia. There are 13 major water basins in Australia.[81] Four water basins are larger than one million square kilometres. Notably, the largest basin in central Australia, does not discharge into any ocean, only the Great Artesian basin. The smallest of the four largest basins is the Murray-Darling system, which includes the town of Brewarrina on the Barwon River. At least six Aboriginal communities competing for access to fish collaborated in maintaining and utilising fish traps at this location from the last Ice Age. The traps could be the oldest known human construction. They are also the oldest known example of PSG of CPR.

Design Criteria for PSG Architecture

Ostrom design principles for unincorporated organisations

The dual role of communicating upward and downward contrary viewpoints is illustrated through nature – for example, the cell structure of trees. As the seasons change, Tensegrity allows the flows of energy and material up and down the tree to change as best required for its survival in its ecosystem.[82] Ingber (1998) identified that the contrary behaviour of cells arises from the mechanics of how single cells in trees (or of any other biota) can change their activities according to physical stresses. Our social systems need to mimic this self-regulatory and self-governing process in nature.[83]

The ability of an individual minority to be heard in contemporary, traditional Indigenous society was demonstrated on Groote Eylandt in 1977. This was reported in the 1980 Australian Government report, *Economic Development of Aboriginal Communities in the Northern Territory*.[84] At the Annual General Meeting of the Groote Eylandt Aboriginal Trust Fund Inc., in attendance were over 100 Aboriginal people, with only one individual who was not. The minority member, Gerry Blitner, had pitched for funds to acquire a vehicle to provide the first taxi service on Groote Eylandt. This was approved on the condition that it was a loan to be repaid rather than a grant because it was a business. Unlike most company directors, Blitner voted against the motion for receiving the loan because of his conflict of interest! Conflicting viewpoints between different clans and the non-clan members arose. All viewpoints were treated with respect, discussed, negotiated and resolved. PSG was illustrated at the most basic group level. Resolving tensions created by conflicting viewpoints also illustrates how Tensegrity creates integrity in decision-making.

Local unincorporated and incorporated PSG organisations will need second and higher levels of PSGs to give direct voices to their constituent stakeholders up to and down from a global level created by PSF.

---

81. https://en.wikipedia.org/wiki/List_of_drainage_basins_of_Australia
82. Wohlleben, 2016
83. Ingber, 1998
84. Turnbull, 1980, p. 14

As part of the analysis of legal structures undertaken in the Garuwanga Project referred to above, it was necessary to identify criteria for evaluating the various options available to form a competent authority that the Australian federal or state governments did not control. To this end, the Garuwanga Project embarked upon the development of governance principles that would assist in such an evaluation:

> ... the processes, structures and institutions (formal and informal) through which a group, community or society makes decisions, distributes and exercises authority and power, determines strategic goals, organises corporate, group and individual behaviour, develops rules and assigns responsibility.[85]

In exploring governance principles, the Garuwanga Project considered the Indigenous Governance Toolkit developed by the Australian Indigenous Governance Institute, which explained that Indigenous governance is a networked form of governance focused on the concept of effective or legitimate governance as distinct from good governance.[86] Some common Indigenous principles of governance were identified by the Centre for Aboriginal Economic Policy Research at ANU, including networked governance models, nodal networks and gendered realms of leadership, governance systems arising out of locally dispersed regionalism and 'bottom-up' federalism, subsidiarity and mutual responsibility as the bases for clarification and distribution of roles, powers and decision making across social groups and

networks, cultural geographies of governance, and an emphasis on internal relationships and shared connections as the foundation for determining the 'self' in self-governance, group membership and representation.[87] However, to inform the identification of appropriate legal structures for the competent authority, the Garuwanga Project developed its own governance principles and applied them to various legal structures before coming to its conclusions. Those principles are outlined in both the Discussion Paper[88] and the Final Report[89] of the Garuwanga Project and demonstrate the value of PSG.

Reformatting Ostrom's PSG design principles for incorporated entities

Incorporated entities may create property rights. These were not envisaged in Ostrom's design principles established for CPRs. A reformatting of Ostrom design principles is required to introduce the idea of an incorporated entity becoming a CPR, with all corporate stakeholders participating in the control architecture of CPRs,[90] the natural laws of system science that recognise the biological processes for achieving self-regulation and self-governance,[91] the concept of Tensegrity[92] not required in the context of Ostrom's field studies that inherently involved competition with cooperation for access to CPRs,[93] and a size limitation in the number of individuals.[94]

To introduce Tensegrity, each individual or group needs to (a) share at least one agreed type of common interest and (b) become subject to challenge by other individuals and

85. Dodson and Smith, 2003, p. 1
86. Stoianoff *et al.*, 2022, p. 63
87. Hunt *et al.*, 2008, p. 21
88. Indigenous Knowledge Forum, 2018, pp. 33-35
89. Stoianoff et al, 2022, pp. 64-65
90. Turnbull, 2000a, 2020b, 2022a
91. Turnbull, 2002b, 2008a
92. Schumacher (1973) used the word "antimony" while Hock (1999) coined the word "Chaord" by combining the words "Chaos" and "Order". Without using the word "Tensegrity" Mathews (1996) described its paradoxical characteristics as a defining characteristic of Holons and Holarchies.
93. Turnbull, 2022b
94. see Turnbull, 1973, 1975, 2000a, 2002a, 2014a, b; Whyte and Whyte, 1988, p. 259

groups with other types of shared common interests. Each agreed type of common interest, individual or group, must possess internal decision-making processes to provide contrary ~ supplementary challenge ~ support for common interests.[95] Mathews described autonomous entities that possessed paradoxical contrary ~ complementary behaviours like centralisation ~ decentralisation, bottom-up ~ top-down, autonomous ~ integrated, order ~ ambiguity, and behaviours as holons.[96] He described networks of holons as a holarchy that likewise possessed a similar behaviour but he did not use the word "Tensegrity".

TABLE 5: Reformatted design principles for incorporated CPRs

1.	Stakeholder boundaries	Stakeholders of each CPR define a requisite variety[97] of common interest groups (Holons). The holon may be a single individual with at least one common interest with CPR. However, this is on condition that a requisite variety of alternative contrary ~ complementary individuals or groups/holons are also recognised.
2.	Stakeholder decision making	Is autonomous within each group according to local social and environmental conditions. This includes the power to modify their own rules of decision-making consistent with the PSF but subject to negotiation with external interests who, in turn, need to be made aware of and recognise the autonomously determined rules.
3.	Monitoring	Various stakeholders need to become responsible for monitoring how the CPR affects them, the environment and other stakeholders that may become a concern to them.
4.	Sanctions	Each group will negotiate graduated sanctions for intergroup rule violators within and with other groups.
5.	Dispute resolution	Groups to establish accessible, low-cost means for dispute resolution within the group and between groups. The Garuwanga Project describes an Australian Indigenous example.
6.	Governing scale	Groups with at least one commonality form nested tiers from the lowest level up to the entire interconnected system.
7.	Governing complexity	Groups of groups become separate decision-making entities in a hierarchy of holons on the condition that there is a "requisite variety" (Ashby 1962: 206) of other such group collectives with a requisite variety of contrary ~ complementary interests.
8.	Systemic governance	Group collectives follow each of the design principles for individuals or groups.
9.	Size limitation	When a group size grows beyond the human scale, it divides into two independent groups, one becoming the supplier or a customer of the other to reproduce Tensegrity in the next higher level of the holarchy.

---

95. Mathews, 1996, p. 41

96. A Holon is an autonomous unit of a complex system like a human in an organisation that has dual characteristics such as being a whole, and also a part, while possessing dual interdependent paradoxical behaviour described as "Tensegrity".

97. Ashby 1962, p 206.

By mimicking the architecture of nature, ecological governance removes 20 "toxic problems of hierarchies".[98] This also establishes a basis to govern *complexity* to achieve RDP-7 by introducing PSG to reinforce the efficacy of the other RDPs. The size limitation of RDP-9 can be achieved as illustrated in the stakeholder-governed cooperatives of Mondragón. To keep to human scale, they would follow the process of an amoeba that divides into two. With Mondragón enterprises, this process involved one firm becoming the supplier or customer of the other.[99] The new firms would then establish a second-level entity to manage a group of entities. Mondragón extended *systemic governance* (RDP-8) from a second to a third level by federating groups into a Mondragón Corporación Cooperativa (MCC).[100] The MCC General Meeting provides direct feedback from minority voices from its stakeholders.

Polycentric governance allows the voices of minority stakeholders to become united with similar common interest minorities at higher levels to a global level. This has practical significance, as in the case of the Arabana people.[101] Many Arabana people, whose homelands are in the Lake Eyre basin of South Australia, were recruited to work on establishing the railway from Adelaide to Alice Springs in the Northern Territory. Polycentric governance would allow the minority voices of Arabana people in South Australia to be reunited from second and third-level incorporated PSG entities or corporations. While corporate entities could be used at any level, they become essential to federate common interests across state borders that could arise from level three upwards in Table 1.

Both incorporated associations and corporations can stifle adaption to changing environmental conditions and demographics. To encourage

continuous adaption and "learning by doing", it is proposed that the life of incorporated bodies be limited to force cyclic re-birthing. In this way, incorporated bodies can more closely follow the processes found in living bodies to discover successful adaptations. This creates an efficient way to build a locally owned and controlled circular economy to promote long-term sustainability.

Separating powers also allows different skill sets, knowledge and interests to be more appropriately allocated. As well as systemically providing inclusive voices, removing conflicts of interest and simplifying complexity, diverse views are achieved to counter groupthink.[102] The board of governors would generally be limited to three individuals, one retiring each year. Re-election could be permitted after two years to provide power-sharing opportunities and continuously establish fresh relationships and diversity. Gender change could likewise be required for each election to facilitate equality, new relationships and diversity. This would be subject to cultural laws in the case of Indigenous-incorporated associations or corporations.

The role of a board of governors is as guardians of the integrity and inclusivity of the association or corporation and to manage conflicts of interest. They would take on the role of an audit committee, whether an external one was appointed. Governors would nominate and control any auditors or other advisors desired by the management committee/directors or members. Governors would not nominate management committee members/directors but, with a unanimous vote, could disqualify nominees who introduced operating conflicts and were subject to traditional avoidance relationships.[103] Governors would have the power to veto any remuneration

---

98. see Table 3 of Turnbull and Poelina, 2022, p. 26
99. Turnbull, 1994
100. Turnbull, 1994; Turnbull and Poelina, 2022, p. 28
101. Nursey-Bray *et al.*, 2020
102. Fink, 2018
103. Turnbull, 1980, p. 164

or benefits bestowed to any association or corporate member. Members could overturn any such veto by calling a meeting of all members.

The committee of management/directors would be required to establish boards of external stakeholders such as suppliers, employees, contractors, customers, agents and host communities on such terms and conditions as approved by the board of governors. Members of the association/corporation could also establish multiple advisory boards representing various sub-groups of members as may be approved by the governors or members. Minutes of all advisory boards would be publicly available unless the governors approved otherwise. General meetings of members would be convened by the governors, with the chair being nominated at the general meeting unless a council of stakeholder boards exist to nominate the chair who is not conflicted.

The meeting of members would decide the number of members of the management committee or board and would ordinarily be between five and seven members. Members would be allowed to nominate alternates as may be accepted by the board of governors. Accumulative voting would be used to elect management committee members/directors to encourage the representatives of minority voices. Accumulative voting provides each constituent member as many votes as vacancies to be filled on the management committee/board. Each constituent can accumulate two or more votes for anyone and more individuals to frustrate the dictatorships of a majority. Governors may introduce the need for only men to nominate and elect women and only women to nominate and elect men.

A detailed description may be desired on the public record to provide a rich multiplicity of stakeholder voices to promote comprehensive self-governance. Indigenous constituents could include gender,

totems, skin, moiety, clan, tribal, owneeship and language affiliations with unique capabilities or status as a youth, a parent or grandparent. This would facilitate the establishment of common interest voices, allow them to be aggregated through higher-level organisations, and allow traditional avoidance relationships to become recognised. In culturally mixed communities, work experience, trade and professional qualifications and marital status could provide a basis for establishing diverse types of stakeholder common interest voices.

Concluding remarks

This article has identified how Australian Indigenous knowledge and practices can be protected and shared by becoming embedded into organisational entities. To achieve this aim, we have described how Ostrom's revised design principles can be reformatted into corporate constitutions to mimic an ecological form of governance practised by Indigenous Australians. In this way, our article establishes a research and practice agenda for designing contextually specific forms of ecologically governed entities and testing their efficacy.

Our contribution to knowledge is in identifying how the self-governing practices of Indigenous Australians are consistent with the laws of nature. This means that the science of governance[104] can be applied to reinvent and adapt the lost wisdom of Indigenous Australians. Specifically, we identified how the design of self-governing corporate constitutions needs to introduce Tensegrity and the law of requisite variety.

We also introduced the innovation of how polycentric governed corporate entities can be transformed into a CPR. In this way, corporations can become agents to counter climate change and the degradation of the environment, including biodiversity, locally on a global basis.

---

104. Turnbull, 2008a

An immediate political contribution of our article is to show how polycentric entities can be used to avoid the dictatorship of the majority. We identified the need to change the current approach of suggesting that there is only one voice to many. This is required to match the rich diversity of Australian bioregions and how they require protection and nurturing in different ways.

In doing so, we call for a Total Reset of modern institutions if humanity is to survive and thrive in the face of emerging existential risks. Our contribution is to outline the required operational practices and provide an agenda for research and implementation.

References

Allam, L. (2022), 'How would an Indigenous voice work and what are people saying about it?', *The Guardian*, 28 August. https://www.theguardian.com/australia-news/2022/aug/28/how-would-an-indigenous-voice-work-and-what-are-people-saying-about-it

Ashby, W.R. (1956). *An introduction to cybernetics*. Wiley, London, https://archive.org/details/introductiontocy00ashb/page/n7/mode/2up?view=theater

Australian Government (2022), Budget Statement 4 – Measuring What Matters. The Australian Government, https://treasury.gov.au/consultation/measuring-whatmatters-2022

Barkin, D. (2022), 'Shaping a communitarian ethos in an era of ecological crisis', *Frontiers in Sustainability*, https://www.frontiersin.org/articles/10.3389/frsus.2022.944252/full

Barkin, D. and Napoletano, B. (2023), 'The communitarian revolutionary subject and the possibilities of system change', *Monthly Review*, 74(10), 52–64, https://monthlyreview.org/2023/03/01/the-communitarian-revolutionary-subject-and-the-possibilities-of-system-change/

Campbell, G. (2022), *Total reset: Realigning with our timeless holistic blueprint for living*, Total Reset, Dunsborough Western Australia

Christakis, A.N. (2014), 'An epic learning journey: From the club of Rome to dialogic design science and demosophia', in Metcalf, G. (ed.), *Social systems and design*, Springer, Japan, https://www.academia.edu/11859672/An_Epic_Learning_Journey

Craven, D.W., Piercy, N.F. and Shipp, S.H. (1996), 'New organisational forms for competing in highly dynamic environments: The network paradigm', *British Journal of Management*, 7, 203–218

Dodson, M. and Smith, D. (2003), *Governance for sustainable development: Strategic issues and principles for Indigenous Australian communities*, ANU Press, Canberra

Empowered Communities (2015), *Empowered communities: Empowered peoples design report*, https://empoweredcommunities.org.au/wp-content/uploads/2018/04/EC-Report.pdf

Fink, L. (2018), Larry Fink's letter to CEOs, https://www.blackrock.com/corporate/investor-relations/2018-larry-fink-ceo-letter

Fletcher, K. (1979), Unincorporated Associations and Contract: The Development of Committee Liability and the Unresolved Issues, *University of Queensland Law Journal*, 11(1), p. 53, http://classic.austlii.edu.au/au/journals/UQLawJl/1979/5.pdf

Fritz, P. (2019). 'Second track to success', *Journal of Behavioural Economics and Social Systems*, 1(1), 11–28, https://journals.aau.dk/index.php/BESS/issue/view/395/193

Fritz, P. (2021). 'The neuroscience of the second track', *Journal of Behavioural Economics and Social Systems*, 2(1), 33- 51, https://journals.aau.dk/index.php/BESS/article/view/6775/5876

Fuller, R.B. (1961), 'Tensegrity', *Portfolio and Art News Annual*, 1(4), 112–127, 144, 148

Gough, M. (2011), 'Prehistoric Australian Aboriginal populations were growing', *Cosmos Magazine*, May 11

Guthrie, J., Dumay, J., Belizzon, A. & Martin-Sardesai, A. (2020), 'Another way: The intersections of First Nations' peoples ways of thinking of governance, accounting, and accountability', *Journal of Behavioural Economics and Social Systems*, 4(1), 37–49

Hardin, G. (1968), The tragedy of the commons, *science*, 162, 1243–1248

Hock, D. (1999), *Birth of the chaordic age*, Berrett-Koehler Publishers, San Francisco

Hunt, J., Smith, D., Garling, S. and Sanders, W. (2008), *Contested governance: Culture, power and institutions in Indigenous Australia*, ANU Press, Canberra

Indigenous Knowledge Forum (2018), Garuwanga: Forming a Competent Authority to protect Indigenous knowledge – Discussion Paper, UTS, April 2018, 33–35

Ingber, D.E. (1998), 'The architecture of life', *Scientific American*, January, 30-39

Kelso, J.A.S., Dumas, G. and Tognoli, E. (2013), 'Outline of a general theory of behavior and brain coordination'. *Neural News*, 37, 120–131

Kurzweil, R. (1999), *The age of spiritual machines: When computers exceed human intelligence*, Viking, New York

Larkin, D. (2021), 'Membership models for an Indigenous Voice: What does representation mean for First Nations Indigenous Law?' https://www.indigconlaw.org/home/membership-models-for-an-indigenous-voice-what-does-representation-mean-for-first-nations

Lucio, C. and Barkin, D. (2022), 'Postcolonial and Anti-Systemic Resistance by Indigenous Movements in Mexico,' *Journal of World-Systems Research* 28, no. 2: 293–31

Mathews, J. (1996), 'Holonic organisational architectures', *Human Systems Management*, 15(1), 15–54, https://researchers.mq.edu.au/en/publications/holonic-organisational-architectures

Morehouse, W. (1997), *Building sustainable communities: Tools and concepts for self-reliant economic change*, Bootstrap Press of the Intermediate Technology Development Group of North America Inc., New York, NY.

Muresan, A. (2014), *Modelling tensegrity systems via energy minimisation*, master's Thesis, School of computing, Ontario, Canada: Queen's University, http://research.cs.queensu.ca/~blostein/AdrianMuresanThesisAug2014.pdf

NIAA (2021), *Indigenous voice co-design process: Final report to the Australian Government*, July 12, National Indigenous Australians Agency, https://apo.org.au/node/316024

NLM (2007), 'Information about the Brain – Introduction', National Library of Medicine, https://www.ncbi.nlm.nih.gov/books/NBK20367/

Nohira, N. and Eccles, R.G. (1992), *Networks and organisations: Structure, forms, and action*, Harvard University Press, Cambridge MA

Nursey-Bray, M., Palmer, R., Stuart, A., Arbon, V. and Rigney, L.I. (2020), 'Scale, colonisation and adapting to climate change: Insights from the Arabana people, South Australia', *Geoforum*, 114, 138–150, https://www.sciencedirect.com/science/article/pii/S0016718520301408#b0040

Organisation for Economic Co-operation and Development (OECD), 2020. How's Life? *2020: Measuring Well-being*, OECD Publishing, Paris, https://doi.org/10.1787/9870c393-en

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge University Press. pp. 90, 91–102

Ostrom, E. (1993), 'Self-governance, the informal public economy, and the tragedy of the commons', in P. L. Berger (ed.), *Institutions of democracy and development*, ICS Press, San Francisco
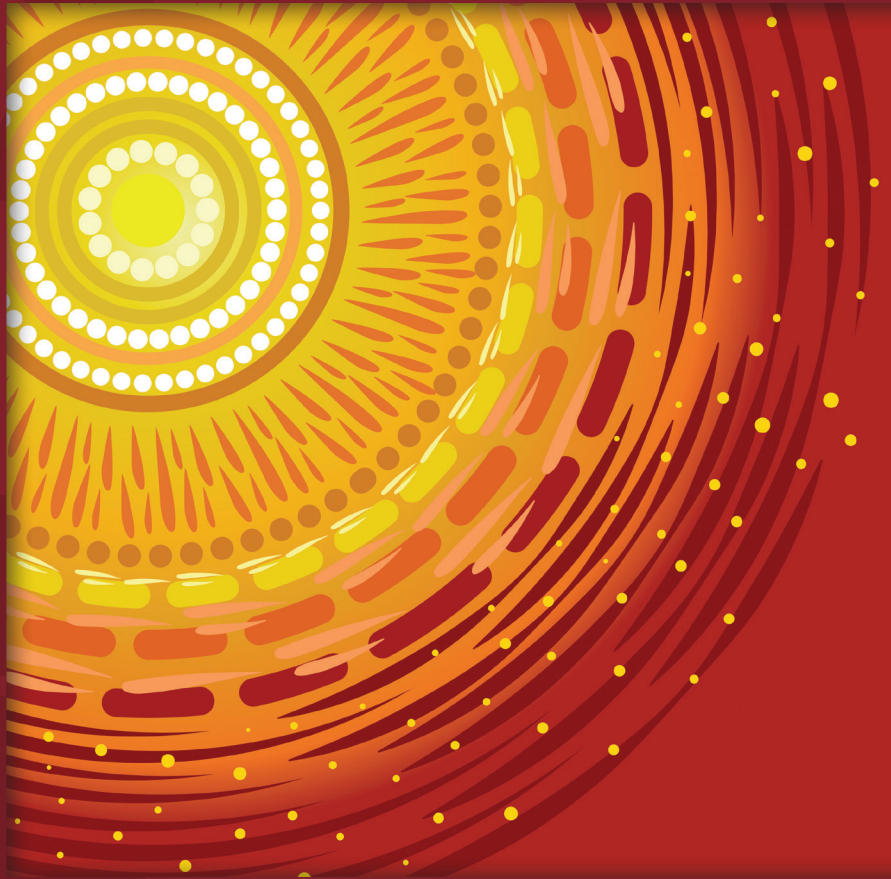
Ostrom, E. (1998a), 'Scales, polycentricity and incentives: Designing complexity to govern complexity', in: L. D. Guruswamy and J. A. McNeely (eds), *protection of global biodiversity: Converging strategies*, Duke University Press, Durham NC

Ostrom, E. (1998b), 'Self-governance of common-pool resources', in P. Newman (ed.), *The new Palgrave dictionary of economics and the law*, Stockton Press, NY, Vol. 3.

Ostrom, E. (2009), 'A general framework for analysing sustainability of social-ecological systems', *science*, 325 (5939), 419–422

Ostrom, E. (2009a), *A polycentric approach for coping with climate change*, The World Bank, Development Economics, Washington, DC. http://hdl.handle.net/10535/5357

Ostrom, E. (2009b), *Beyond markets and states: Polycentric governance of complex economic systems*, Prize lecture, December 8, https://www.nobelprize.org/uploads/2018/06/ostrom-lecture-slides.pdf

Pirson, M. and Turnbull, S. (2011), 'Towards more humanistic governance: Network governance structures' *The Journal of Business Ethics*, 99(1), 101–114

Pirson, M. and Turnbull, S. (2012), 'A new approach to fix broken governance', *ISEI Insight* 13, 28–35

Pirson, M. and Turnbull, S. (2015), 'The future of corporate governance: Network governance – A lesson from the financial crisis', *Human Systems Management*, 34 (2015), 81–89

Pirson, M. and Turnbull, S. (2017), 'Decentralised governance structures are able to handle CSR induced complexity better', *Business and Society*, pp. 1–31

Pius XI (1931), *Encyclical letter on social reconstruction*, The Vatican, Rome

Poteete, J. and Ostrom, E. (2010). *Working together: Collective action, the commons, and multiple methods in practice*, Princeton University Press, Princeton

Redvers, N., Poelina, A. Schultz, C., Kobei, D.M., Githaiga, C., Perdrisat, M., Prince, D. and Blondin B. (2020), 'Indigenous natural and First Law in planetary health', *Challenges*, 11(2), 29, DOI: 10.3390/challe11020029

RiverOfLife M., Poelina, A., Alexandra, J. and Samnakay, N. (2020a). *A conservation and management plan for the National Heritage listed Fitzroy River Catchment Estate (No. 1).*, Nulungu Research Institute, Broome. Available at https://researchonline.nd.edu.au/nulungu_research/4/

RiverOfLife, M., Poelina, A., Bagnall, D. and Lim, M. (2020b), 'Recognising the Martuwarra's first law right to life as a living ancestral being', *Transnational Environmental Law*, 9(3), 541–568. doi:10.1017/S2047102520000163

RiverOfLife, M., Taylor, K. S. and Poelina, A. (2021). Living waters, law first: Nyikina and Mangala water governance in the Kimberley, Western Australia', *Australasian Journal of Water Resources*, 1-17. doi:10.1080/13241583.2021.1880538

Sangha, K.K., Dinky, Y., Costanza, R. and Poelina, A. (In Review). 'A comprehensive analysis of wellbeing frameworks and their suitability for Indigenous peoples in Australia'. Submitted to the *International Journal of Well-being* (August 2023)

Schumacher, E.F. (1973), *Small if beautiful: A study of economics if people mattered*, Blond & Briggs, London

Stoianoff, N., Davis, M., Andrews, G., Bodkin, F., Marshall, V., Poelina, A., Perdrisat, I., Marshall, P., Bodkin-Andrews, G., Wright, E., Morse, B., Collings, N., Mowbray, A., Cahill, A., Geissler, M., Martin, F., George, A. and Robinson, D. (2022), *Garuwanga: Forming a Competent Authority to protect Indigenous knowledge – Final Report*, Indigenous Knowledge Forum, https://www.indigenousknowledgeforum.org/_files/ugd/c8bc39_e55cc4be2c8b45e3aa55d81f0bc0bb0f.pdf

Thorburn, K., Ross, J. and Kinane, S. (2023), 'People in the Kimberley have spent decades asking for basics like water and homes. Will the voice make their calls more compelling?' *The Conservation*, April 13, https://theconversation.com/people-in-the-kimberley-have-spent-decades-asking-for-basics-like-water-and-homes-will-the-voice-make-their-calls-more-compelling-202606

Turnbull, S. (1973), 'Time limited corporations', *ABACUS*, 9(1), 28–43

Turnbull, S. (1975), 'Democratising the wealth of nations', Company Directors' Association of Australia: Sydney, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1146062

Turnbull, S. (1980), *Economic development of Aboriginal communities in the Northern Territory*, Australian Government Publishing Service, Canberra

Turnbull, S. (1986), 'When land owns people', *Et cetera: A Review of General Semantics, International Society for General Semantics*, 43(4), 389–392

Turnbull, S. (1994), 'Stakeholder democracy: Redesigning the governance of firms and bureaucracies', *Journal of Socioeconomics*, 23(3), 321–360

Turnbull, S. (1995), 'Innovations in corporate governance: The Mondragon experience', *Corporate Governance: An International Review*, 3(3), 167–180

Turnbull, S. (2000a), 'Stakeholder governance: A cybernetic and property rights analysis, in R. I'. Tricker, (ed.), *Corporate governance: The history of management thought*, pp. 401–413, Ashgate Publishing, London

Turnbull, S. (2000b), *The governance of firms controlled by more than one board: Theory development and examples,* Doctoral dissertation, Macquarie Graduate School of Management,

Sydney, Australia, https://papers.ssrn.com/abstract_id=858244

Turnbull, S. (2002a). *A new way to govern: Organisations and society after Enron*, New Economics Foundation, London

Turnbull, S. (2002b), 'The science of corporate governance', *Corporate Governance: An International Review*, 10(4), 256–272

Turnbull, S. (2005), 'The use of bytes to analyse complex organisations' in K. Richardon (ed.), *Managing the complex: Philosophy, theory and applications*, pp. 137–151, Information Age Publishing Inc. Connecticut

Turnbull, S. (2008a), 'The science of governance: A blind spot of risk managers and corporate governance reform', *Journal of Risk Management in Financial Institutions* 1(4), 360–368

Turnbull, S. (2008b), 'The theory and practice of government de-regulation', in J. Choi and S. Dow-Anvari (eds) *International Finance Review: Institutional approach to global corporate governance*, 9, 117–139, http://ssrn.com/abstract=1008453

Turnbull, S. (2014a), 'A proposal for self-governing corporations', in P. Blond (ed.), *The virtue of enterprise: Responsible business for a new economy*, 52–54, January, ResPublica, London, http://www.respublica.org.uk/wp-content/uploads/2014/01/jae_The-Virtue-of-Enterprise.pdf.

Turnbull, S. (2014b), *Designing resilient organisations: With operating advantages for public, private, non-profit and government entities and their stakeholders*, Lambert Academic Publishing, Saarbrucken, Germany

Turnbull, S. (2014c), 'How might network governance found in nature protect nature?' *Journal of European Law*, 11(2), 98–102

Turnbull, S. (2015), 'Sustaining society with ecological capitalism', *Human Systems Management*, 34, 17–32

Turnbull, S. (2018), 'A vision for an eco-centric society and how to get there', *The Ecological Citizen*, 2018, 1(2), 141–142

Turnbull, S. (2019), 'Causes and solutions for misconduct in financial services industry', *Law and Financial Markets Review*, 13(2-3), 99–113

Turnbull, S. (2020a), 'The case for radical reform of corporate governance: A narration', *Corporate Governance Insight*, 2(2), 4–30

Turnbull, S. (2020b). 'Do we need ''A new model of corporate governance?''' paper presented to 6th World Interdisciplinary Network for Institutional Research (WINIR) online September 8, 2022, session S5.6 – Corporate & Sectoral Governance: https://papers.ssrn.com/abstract_id=3735205

Turnbull, S. (2021), 'Privatising regulation to enrich democracy', *Long Finance*, February 18, https://www.longfinance.net/publications/professional-articles/privatising-regulation-enrich-democracy/

Turnbull, S. (2022a), 'A new way to govern for eternity based on system science', *Journal of Behavioural Economics and Social Systems*, 4(1), 81–106

Turnbull, S. (2022b), 'How cybernetics explains tensegrity and its advantages for society', *Journal of Behavioural Economics and Social Systems*, 4(2), 71–92

Turnbull, S. (2023), *Avoiding extinction by transforming society*, presentation to Nanoscience & Technology 12th Annual Congress, Sapporo, Japan, February 8-10, https://10times.com/e13r-h1xd-1kz7

Turnbull, S. and Guthrie, J. (2019), 'Simplifying the management of complexity: As achieved by nature', *The Journal of Behavioural Economics and Social Systems*, 1(1), 51–73

Turnbull, S. and Myers, K. (2017), *Shaping global cooperation with ecological governance*, submitted September 29th to ''Global Challenge Prize 2017 – A New Shape: Remodelling global cooperation'', https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3103450

Turnbull, S. and Pirson, M. (2012), 'Could the 2008 US financial crisis been avoided with network governance?' *International Journal of Disclosure and Governance*, 9(1), 1–27

Turnbull, S. and Pirson, M. (2019), 'The future of management: network governance', *The European Financial Review*, May 1, pp. 45–50

Turnbull, S. and Poelina, A. (2022), 'How Indigenous wisdom can protect humanity', *Journal of Behavioural Economics and Social Systems*, 4(1), 10–36

Unuigbe, N. (2023), 'What can we learn from indigenous ecological knowledge?', *The Ecological Citizen*, 6(2), 1–5

Wilson, D.S., Ostrom, E. and Cox, M.E. (2013), 'Generalising the core design principles for the efficiency of groups', *Journal of Economic Behaviour & Organization*, 90, June, S21–S32

Wohillieben, P. (2016), *The hidden life of trees: What they feel, how they communicate – Discoveries from a secret world*, (Trans. Jane Billinghurst) Greystone Books, Berkely/Vancouver

Whyte, W. F. and Whyte, K. K. (1988), *Making Mondragon: The growth and dynamics of the worker cooperative complex*, ILR Press, New York

Wiener, N. (1948), *Cybernetics: Or control and communications in the animal, machine*, John Wiley & Sons, New York

JOURNAL OF BEHAVIOURAL ECONOMICS AND SOCIAL SYSTEMS

gap**1** | **TCG**