Exploring the Potential of Polycentric Governance to Cultivate Civic Virtue for Social-Ecological Sustainability, including by Re-enchanting Human-Nature Relationships

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Abstract:

Much of humanity has become alienated from the non-human world as an enduring consequence of transformation at the IAD framework's metaconstitutional level of analysis, commencing in sixteenth century western Europe, to a 'disenchanted', anthropocentric worldview rendering this world of only instrumental value to humans. The resulting loss of affinity with the rest of Nature diminished the salience of calls for her protection, leading to a contemporary shortfall in the civic virtue ultimately required for successful collective action towards social-ecological sustainability.

This paper explores the potential of polycentric governance to reduce this shortfall, including by strengthening the contemporary salience of social-ecological sustainability by helping to 're-enchant' human relationships with the non-human world and Nature as a whole. A review and synthesis of literature affirms such potential, particularly in respect of the community-based forms of polycentric governance informed by traditional indigenous knowledge systems that Fikret Berkes identified as pivotal to sacred ecology as a re-enchanted tradition of ecological science. Such community-based forms of governance are informed by a non-anthropocentric, or community-of-beings, worldview wherein both humans and non-humans exercise agency in reciprocating each other's contributions to social-ecological sustainability.

Community-based governance for pursuing this sustainability has advantages in protecting, and engaging people with, opportunities for experiencing the non-human world on which re-enchantment depends. Efforts to realise these advantages faces formidable structural obstacles given the continuing hold of a disenchanted worldview. Overcoming these obstacles involves modest steps, each an experiment in humans practising reciprocity with the rest of Nature. Lessons gained across diverse communities filter upwards through the governance system to incrementally re-establish metaconstitutional conditions favouring human affinity with the non-human world and Nature more generally.

Contents

1. Introduction

1.1 Research problem

Despite "[h]uman actions … causing the fabric of life to unravel, posing serious risks for the quality of life of people", and widespread agreement on the urgency of changing course (Diaz, Settele et al., 2019 p. 1), "[s]ociety has been unsuccessful in transforming toward more sustainable pathways" (Chapin III, Biggs et al., 2022 p. 1907). The conventional policy approach in influencing human behaviour towards a socially preferred goal involves introducing institutions to externally motivate the desired behaviours. However, the transaction costs of relying entirely on external motivation to achieve sufficient behaviour change for social-ecological sustainability are typically excessive (Anderies & Folke, 2024), and hinder adaptive efficiency in coping with the inherent uncertainty of this endeavour (Marshall, 2020; North, 1990).

Pursuit of social-ecological sustainability is thus societally affordable only to the extent that people are not entirely selfish; i.e., they are in some degree motivated *internally* to adopt sustainable behaviours by the emotion of caring for the other beneficiaries – human and non-human – of accomplishing this goal. Transformation towards such sustainability thus involves "revitalization of human-nature relationships … Biosphere stewardship is about caring. Caring is about relations, with people and with life" (Anderies & Folke, 2024 p. 7).

This sustainability is a collective good; any actor contributing its provision cannot exclude others from sharing the resulting benefits (Olson, 1965). Hence its pursuit requires collective action. Internal motivation of individuals to contribute towards such action manifests as what analysts of collective action have called civic virtue (Frey & Jegen, 2001; Marshall, Hine et al., 2017; Marshall & Malik, 2019; Ostrom, 2000, 2005a).

The term *salience* refers to how much an actor cares about a given collective good. There is broad consensus among collective action scholars that successful provision of such a good depends on its salience to those from whom contributions are required (Poteete & Ostrom, 2004). The salience of social-ecological sustainability to most humans is diminished as an enduring consequence of the Scientific Revolution 'disenchanting' humans of an organic worldview which understood: Nature as a nurturing mother, animate, and deserving of reverence; and humans as part of, or belonging to, Nature (Merchant, 1990).

This process of disenchantment started in western Europe but spread eventually to most of humanity through colonisation, globalisation, and Westernisation more generally. In place of the organic worldview, a new, modern worldview of mechanism became established which understood: the non-human domain of Nature as inanimate, and thus amenable to prediction and control; and the cosmos as anthropocentric, with humans lacking affinity with the non-human world and valuing it only as an instrument for pursuing our own interests (Merchant, 1990). This transformation of worldview occurred at what the Institutional Analysis and Development (IAD) Framework defines as the metaconstitutional level of analysis, which "encompasses long-lasting and often subtle constraints on the forms of constitutional, collective, or operational choice processes that are considered legitimate within an existing culture …" (McGinnis, 2011 p. 173).

1.2 Focus and contribution of this paper

Through review and synthesis of germane literatures, this paper explores the potential of polycentric governance to cultivate the civic virtue needed for successful collective action towards social-ecological sustainability, including by increasing the contemporary salience of this sustainability to humans by helping to 're-enchant' human relationships with the rest of Nature. The capacity of this form of governance to strengthen civic virtue for collective action has been considered by institutional analysts including Ostrom (2000, 2005a), Marshall et al. (2017), and Marshall and Malik (2019). While these previous studies implicitly assumed contemporary disenchanted metaconstitutional conditions to be fixed and given, this paper takes a broader view to consider proposals descending from Romanticism, including from Aldo Leopold (1949) and Fikret Berkes (2008), for what amounts to some kind of re-enchantment at that level.

The present paper builds on this earlier scholarship in other ways too. It examines more broadly than previous studies what self-determination theory (SDT) (Ryan & Deci, 2017) from social psychology, which Ostrom (2000, 2005a) drew from in elucidating from an anthropocentric perspective how polycentric governance fosters civic virtue, offers for understanding how such governance might boost civic virtue for social-ecological sustainability. It draws also from cognitive and social science research on interactions between nature exposure, nature relatedness, and pro-environmental behaviour in considering the potential of polycentric governance to cultivate such civic virtue by restoring some of the human affinity with the rest of Nature displaced through disenchantment.

1.3 Structure of paper

Section 2 discusses the enchanted world and its disenchantment since the sixteenth century. Section 3 considers the Romantic response to this disenchantment, which led to calls for re-enchantment including those associated with environmentalism, Aldo Leopold's land ethic, Fikret Berkes' sacred ecology, and social-ecological scholarship (e.g., Berkes & Folke, 1998).

Section 4 explores from an anthropocentric perspective the potential of polycentric governance for social-ecological sustainability, and particularly the community-based forms of this that Berkes identified as essential to sacred ecology, to strengthen civic virtue for collective action towards such sustainability. This section includes consideration of how support from this governance for the three basic psychological needs (for autonomy, competence, and (social) relatedness) currently identified in SDT promotes civic virtue. Previous research was limited to considering how polycentric governance supports only the autonomy need.

Section 5 examines how literatures on biophilia, nature exposure and nature relatedness can inform institutional analysts in exploring the potential of re-enchanting human-Nature relationships to strengthen the salience of, and thus civic virtue for, social-ecological sustainability. Section 6 builds on this review by considering more specifically reciprocity between humans and the rest of Nature, and the how conventional, anthropocentric understanding of this reciprocity in the social-ecological tradition of institutional analysis might be reconciled with the 'community-of-beings' conception of sacred ecology. Section 7 reflects on how this reconciliation might, as proposed by Berkes (2008), be informed by insights from traditional systems of indigenous knowledge.

Section 8 explores from a sacred ecology perspective the potential of community-based polycentric governance to promote civic virtue for social-ecological sustainability by supporting people's basic psychological needs and increasing their valuing of intrinsic goals (including for affinity with the rest of Nature) relative to extrinsic (e.g., materialistic) goals. Section 9 concludes the paper.

2. Disenchantment of human relationships with the rest of Nature

2.1 An enchanted world

Humans of pre-modern western Europe, before the Scientific Revolution of the sixteenth century, perceived their world as "enchanted" or animated by spirit, and sacred (Taylor, 2011 p. 114). *Spirit* is "an animating or vital principle held to give life to physical organisms", while *sacred* means "entitled to reverence and respect" (Merriam-Webster, 2024). The boundary between the self and spiritual forces was experienced in this enchanted world as somewhat porous, such that people could be affected positively or negatively by these forces: "this was a world of 'magic'" (Taylor, 2011 p. 114).

This worldview understood self, society and cosmos as a single organism, referred to here as (capital *n*) Nature[1]. This unity derived from the Renaissance conceiving the cosmos as a living being made wholly of animate parts. Central to this organic worldview was the image of a living Earth which, like Nature generally, was identified as a nurturing mother. This identification instilled in people an affinity with Nature that established her well-being as salient to human choice and engendered internal motivation to limit activities harming the non-human world. Although activities negatively affecting this world (e.g., mining, logging, and grazing) steadily increased over the ancient and early medieval eras, the image of a nurturing Mother Nature remained effective in curtailing their intensity and scale (Merchant, 1990).

2.2 Disenchantment

In the pre-modern West, however, Nature was not only viewed as nurturing. A contrary image of her as wild and uncontrollable, responsible for violence, floods, droughts, epidemics, and chaos more generally, also prevailed. Behind the Scientific Revolution was a drive to subdue this wildness and control the non-human world held to be responsible for it. Key tenets of the organic worldview became delegitimised as it came to be displaced by the philosophy of mechanism which emerged dominant from classical physics (Merchant, 1990).

The worldview arising from this philosophy regarded humans as separate from and superior to the non-human world (to which lower-case-*n nature* conventionally came to refer), and thus as the nucleus of an anthropocentric cosmos. This world became regarded as dead in the sense of inert, passive and devoid of agency. It was thus reconceived as a predictable machine available to be controlled and dominated by human intervention in a secularised world

[1] Except for the terms *nature exposure* and *nature relatedness*, and in direct quotes where original formatting has generally been maintained, *nature* is capitalised throughout this paper to signify this understanding of the word; i.e., a composite of human and non-human existence. The word is not capitalised with these two terms (other than when starting sentences or headings) where its meaning is narrowed to the non-human world (see sub-section 2.2).

(Merchant, 1990). This worldview remains dominant in the modern, industrialized world (Böhme, Spreitzer et al., 2024).

This displacement of the image of Nature as a living, nurturing mother led to loss of human affinity with the non-human world. This world's salience to humans, and our motivation to act with sensitivity for its well-being, was thus diminished commensurate to its instrumental value for us. With the salience foregone went the internal motivation by which humans had previously transcended our instrumental interests to take the non-human world's own interests at least partly into account.

Corresponding with this ontological shift was the emergence of a new form of rationality, known as rationalism, premised on the existence of objective reality. Rationalism is concerned with gaining and applying knowledge of this presumed reality to progress mechanism's agenda of controlling the non-human world, and guide cultural and social progress (Garber, 2002). Nature was thus reduced conceptually to enable prediction of its behaviour by mechanistic (positivist) science and justify domination of the non-human world (Plumwood, 2002).

The philosopher Charles Taylor (2007 pp.135, 301) identified the separation of humans from Nature as establishing the:

> … buffered self [which, unlike the 'porous self'] is the agent who no longer fears demons, spirits, magic forces. … [W]hatever threat or other meaning they proffer doesn't 'get to' him" … Part of the self-consciousness of modern anthropocentrism is the sense of achievement of having won through to this invulnerability out of an earlier state of captivity in an enchanted world. … This buffered distance becomes part of the complex modern-European concept of 'civilization' …

Although this buffering of the self from experiences of spirit and emotion arising from exposure to the non-human world may have blocked negative emotions like fear, it also thwarted positive emotions like feeling with that world and Nature as a whole a sense of belonging. Taylor (2007 pp. 315-316, 317) observed, "in closing ourselves to the enchanted world, we have been cut off from a great source of life and meaning, which is there for us in nature. … In the effort to control our lives, or control nature, we have destroyed much that is deep and valuable in them".

3. The Romantic response

3.1 Romanticism

Romanticism arose in late eighteenth century Europe to explore ways of recovering "the magic of everyday life" (Larmore, 1996 p. 10) and the close human emotional relationship with the rest of Nature sundered by the Scientific Revolution. Most members of this movement were not opposed to science *per se*, but rather to the mechanistic version that came to dominate.

Romantics endeavoured to reinstate Nature as a matter for concern, love and protection, and reverse the loss of sensitivity to the non-human world's patterns and rhythms that they regarded as indispensable to humanity. Their strategy was "to teach people to cultivate their

power of seeing, whether through poetry, novels, painting, music or (eventually) ecological science. The emphasis on life as against dead mechanical processes in nature has its exact counterpart in the summons to awaken the life within, the power of vision, perception and receptivity …" (Hinchman & Hinchman, 2007 p. 343). Taylor (2011 p. 119) characterised this strategy as seeking "re-enchantment" of human relationships with the rest of Nature, thereby recovering within them a sense of the sacred.

3.2 Environmentalism

Romantics' critique of the mechanistic conception of Nature led them in directions that anticipated contemporary ecology in such degree that Hinchman and Hinchman (2007 p. 334) characterised their movement as environmentalism's "predecessor culture". One early environmentalist clearly influenced by Romantic ideas was Aldo Leopold who identified the supreme virtue of a naturalist as "perception" (Leopold, 1949 p. 173). This he characterised as sensitivity to events and presences in the non-human world that most humans ordinarily overlook because they are too subtle or deemed unworthy of attention.

Leopold (1991 [1933] p. 183) rejected mechanism's stance that elevating people above the rest of Nature is a defining trait of civilisation: "Civilization is not, as they often assume, the enslavement of a stable and constant earth. It is a state of mutual and interdependent cooperation between human animals, other animals, plants, and soils, which may be disrupted at any moment by the failure of any of them". The land was thus viewed, as Nature had been, as a living organism. He heralded the eventual evolution of a "land ethic", arguing, "All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts", and that they prompt individuals to cooperate in serving the interests of that community. A land ethic would "simply enlarge[…] the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land" (Leopold, 1949 pp. 203, 204, 224).

Contrary to mechanism, Leopold (1949 pp. 203-204) argued that "a land ethic changes the role of Homo sapiens from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such". This ethic would reflect a human conviction of the importance of maintaining the health of the land, which he defined as "the capacity of the land for self-renewal" (ibid. p. 221). "[A] thing is right", Leopold (1949 pp. 224-225) elaborated, "when it tends to preserve the integrity, stability and beauty of the biotic community".

In contrast to the land ethic's concern with preserving the integrity of a land community, mechanism's concern extends only to the parts of that community identified – with all the certainty that mechanistic science was assumed capable of – as instrumental for humans in 'conquering' the rest of Nature for our own purposes. For Leopold (1949 p. 204, original emphasis) this certainty was misguided, such that preserving anything less than the integrity of a land community would likely be detrimental for both its human and non-human members:

> In human history, we have learned (I hope) that the conqueror role is eventually self-defeating. Why? Because it is implicit in such a role that the conqueror knows, *ex cathedra*, just what makes the community clock tick, and just what and who is valuable, and what and who is worthless, in community life. It always turns out that he knows neither, and this is why his conquests eventually defeat themselves.

Leopold (1949 pp. 210, 214) recognised that a land ethic could not be imposed externally, and would become normalised only with "internal change in our intellectual emphasis, loyalties, affections, and convictions. … We can be ethical only in relation to something we can see, feel, understand, love, or otherwise have faith in". He "purposely presented the land ethic as a product of social evolution because nothing so important as an ethic is ever 'written'. … [It] evolve[s] in the minds of a thinking community" (Leopold, 1949 p. 225).

3.3 Sacred ecology

Leopold's concern with the internal changes required from humans to embrace a land ethic was renewed by Berkes (2008) arguing for ecological science to account for the sacred. Departure from the conventional mechanistic, and associated reductionist, approach to this science was justified, he argued, by a need to foster "more holistic approaches to ecology [that] provide a new vision of the earth as an ecosystem of interconnected relationships in which humans are part of the web of life" (Berkes, 2008 p. 253).

Berkes (2008 pp. 252-253) proposed that a turn towards the sacred be informed by the many traditional indigenous cultures for which Nature remains imbued with this attribute: "Almost universally, one encounters an ethic of nondominant, respectful human-nature relationship, a sacred ecology, as part of the belief component of traditional ecological knowledge". With echoes of Leopold's land community, Berkes (2008 p. 274) symbolised the worldview of sacred ecology as a community of beings: "This is a view of an ecosystem pulsating with life and spirit, incorporating people who belong to that land and who have a relationship of peaceful coexistence with other beings".

Traditional indigenous systems of ecosystem management associated with this worldview are, argued Berkes (2008 p. 265), "characterized by: embeddedness of knowledge in the local culture; boundedness of local knowledge in space and time; the importance of community; lack of separation between nature and culture, and between subject and object; attachment to the local environment; and a noninstrumental approach to nature". He contended that these traditional systems "inspire a new resource management science open to the participation of resource users in management, one that uses locally grounded alternatives to top-down centralised resource management. The subsidiarity principle is the general principle here …" (Berkes, 2008 p. 273).

Reciprocity among members of a community of beings, including between human and non-human members, is central to this sacred ecology. Berkes (2008 p. 274) observed that in the ethical systems of Native North Americans "there is explicit human-nature reciprocity in which animals have obligations to nourish humans in return for respect and other proper behaviour". Non-humans were thus recognised as animate and agentic, rather than passive as assumed in mechanism. Berkes highlighted in later writings how reciprocity between humans and the rest of Nature features in the ethical systems of many indigenous peoples elsewhere, noting for instance that 'healthy Country, healthy people' is a key tenet of many Australian Aboriginal peoples.

3.4 Social-ecological perspective on sustainability science

In understanding "'the land' as a place where human and natural systems interpenetrate", and its health as a capacity for self-renewal, Leopold has become regarded as a transitional figure

in the development of a social-ecological perspective on sustainability science (Berkes, 2023; Berkes, Doubleday et al., 2012; Meine, 2020 p. 32). This perspective emerged from two strands of research, within the natural and social sciences respectively, converging upon a complex adaptive systems approach to this science. The first descended from Holling's (1973) concern with ecosystem resilience, and the second from Ostrom's (1990) emphasis on institutional analysis of collective action in governing common-pool natural resources. This convergence enabled a more holistic and transdisciplinary approach to science (Schoon & Van der Leeuw, 2015).

What Leopold called the land became known from this social-ecological perspective as an ecosystem, and more specifically – since he included humans in a land community – as a social-ecological system (SES; an ecosystem occupied, used or otherwise influenced by humans) (Berkes et al., 2012). Given numerous parallels between Leopold's land health concept and resilience science, Berkes (2023 p. 1), an influential early contributor to the institutional analysis strand, argued that the former "can be reinterpreted through a resilience lens, as the health of social-ecological systems".

Noting Leopold's understanding of land health as Nature's capacity for self-renewal, Berkes et al. (2012) observed how resilience scholars view SES health similarly in terms of renewal cycles, but also in terms of dynamics of an SES that may transform it into a new stability domain. These authors also highlighted another similarity between the ideas of Leopold and resilience scholarship: the parallel between (a) Leopold's stance that "what makes the [land] community clock tick" is irreducibly uncertain, and that land health thus depends on the integrity of the biotic community, and (b) resilience science's understanding of an SES's capacity for renewal depending on its degree of biodiversity (with species redundancy affording resilience against species loss, and species diversity multiplying the options for response to novel conditions).

4. An Anthropocentric perspective on polycentric governance's potential to foster civic virtue for social-ecological sustainability

Institutional analysts embracing the social-ecological perspective (hereafter 'social-ecological institutional analysts') follow Leopold in understanding humans as part of ecosystems and Nature more generally, and also social-ecological sustainability in terms of ecosystem integrity. However, most in this tradition are yet to embrace his 'land community' stance, or the similar 'community of beings' stance of Berkes' (2008) sacred ecology, in place of an anthropocentric one, and thus to consider the significance of human affinity with the rest of Nature for civic virtue in pursuing social-ecological sustainability.

This tradition of institutional analysis has nevertheless made major contributions to understanding the potential for polycentric governance to foster civic virtue for such sustainability. These contributions are elaborated in this section by drawing more extensively from self-determination theory than has previously been the case in this tradition, particularly by moving beyond its earlier concern with only one of the three basic psychological needs currently identified within this theory (i.e., the need for autonomy). An understanding of how a non-anthropocentric, or sacred ecology, perspective could enrich social-ecological institutional analysis of polycentric governance's potential to cultivate civic virtue for social-ecological sustainability, particularly through re-enchanting human relationships with the rest of Nature, is developed over the ensuing sections of the paper.

4.1 The behavioural theory of collective action

The mechanistic, or first-generation, theory of collective action assumes all humans to be 'rational egoists'. These are wholly selfish individuals who contribute to such action only when motivated by external incentives. Zero contributions are thus predicted in the absence of such incentives (Marshall, 2005). For consistency with self-determination theory (SDT), one of the most widely researched and applied theories in the field of psychology and drawn from extensively in this paper, external incentives will hereafter be referred to as external regulations. Ryan and Deci (2017 p. 184), the founders of SDT, explained "[a] behavior is externally regulated if it is motivated by and dependent upon external reward or punishment contingencies".

The second-generation, or behavioural, theory of collective action emerged from firm evidence that the people sharing many collective action problems include not only rational egoists but also 'conditional cooperators'. The latter are internally motivated to cooperate initially and extend reciprocity thereafter. Most such problems are thus assumed to involve a mix of these types of individuals, and the behavioural theory explains how the unique context of each collective action problem affects its own mix and thereby the aggregate level of contributions (Ostrom, 2000, 2005a).

4.2 SDT understandings of basic psychological needs, and goals

4.2.1 Basic psychological needs

Ostrom (2000, 2005a) drew from SDT in developing this explanation. SDT's foundational concern is with the self, which it understands as developing though internalisation and integration of inputs from both external and internal sources. Healthy development is understood to depend on satisfaction of both physiological and psychological needs, with SDT focusing primarily on the latter (Ryan & Deci, 2017).

SDT proposes there are at least three basic psychological needs, and they are relevant across all cultures. Ryan and Deci (2017) justified this proposition on the basis that Baumeister and Leary's (1995) set of standards for identifying such needs were satisfied. Autonomy and competence were the first two of the basic needs identified, with relatedness (feelings of connection with other people) added subsequently. SDT assumes the basic psychological needs evolved biologically (Deci & Ryan, 2012).

4.2.2 Goals

Basic psychological needs are distinguished in SDT from goals. The latter are understood to arise from interaction between the needs and cultural inputs:

> … [T]here are many factors that lead people to emphasize certain life goals that may not be need fulfilling. For example, exposure to the commercial media can prompt a focus on materialism … , which provides only fleeting satisfactions and could actually detract from basic need fulfillment and, thus, well-being" (Ryan & Deci, 2000 p. 75).

Goals are differentiated in SDT as intrinsic and extrinsic. Intrinsic goals involve a focus on inherent propensities, like seeking close relationships and caring for one's community. Extrinsic goals focus on externally-valued goods like wealth, power, and social status that are not inherently valued, but are instrumental in obtaining positive regard or other benefits from others (Weinstein, Przybylski et al., 2009). SDT proposes that pursuit of intrinsic, as against extrinsic, goals better satisfies the basic psychological needs, and that when people are thwarted in satisfying these needs, especially during childhood and adolescence, they become prone to compensate by adopting extrinsic goals (Ryan & Deci, 2017).

SDT research has highlighted the negative implications for psychological needs satisfaction of social conditions across much of our planet having come to celebrate materialist and other extrinsic goals as central societal values. To the extent that these conditions steer people towards extrinsic goals at the expense of their basic needs, SDT suggests that intrinsic motivation and internalisation of external regulations (see next sub-section) will be weakened. Intrinsic motivation arises from the inherent emotional reward experienced from an activity, and relates to the sense of psychological well-being obtained from satisfying one's basic psychological needs (Ryan & Deci, 2017).

4.3 The autonomy need, polycentric governance, and civic virtue

4.3.1 Autonomy and intrinsic motivation

Ostrom (2000, 2005a) was influenced by how economists working on Motivation Crowding Theory (MCT) had applied SDT. MCT focuses primarily on SDT's basic need for autonomy, how individuals in a particular context perceive external regulations as supporting or thwarting satisfaction of this need, and how these perceptions influence their intrinsic motivation in that context (Frey & Jegen, 2001). Autonomy is a feeling of self-determination, of being the originator of one's actions. Someone experiencing autonomy is in touch with their basic psychological needs and able to act consistently with them (Ryan, Kuhl et al., 1997).

MCT proposes that external regulations tend to crowd *in* intrinsic motivation when affected individuals experience them as supporting their need for autonomy, and to crowd *out* such motivation when those regulations are experienced as thwarting that need (i.e., as controlling) (Frey & Jegen, 2001). An external regulation is thus autonomy supportive when it takes the others' perspective, encourages initiation and exploration, offers choice, and is responsive to those it affects (Deci & Ryan, 2012).

Intrinsic motivation is seen in SDT as arising from the sense of psychological wellbeing that results from satisfying an individual's basic psychological needs (Ryan & Deci, 2017). Ostrom (2000, 2005a) concluded accordingly from MCT and SDT that external regulations experienced as autonomy-supporting tend, by strengthening internalisation of social norms of reciprocity, fairness and trustworthiness from the external environment, to crowd in intrinsic motivation for individuals sharing a collective action problem to act as conditional cooperators with greater likelihood of contributing to a solution.

MCT researchers Frey and Jegen (2001 p. 604) concluded similarly from a societal perspective, while linking intrinsic motivation with civic virtue:

> Civic virtue (a particular manifestation of intrinsic motivation) is bolstered if the public laws convey the notion that citizens are to be trusted. Such trust is reflected in extensive rights and participation possibilities. … The basic notion enshrined in the constitution that citizens are on average, and in general, reasonable human beings thus generates a crowding-in effect of civic virtue. In contrast, a constitution implying a fundamental distrust of its citizens, and seeking to discipline them, tends to crowd out civic virtue and undermines the support which citizens are prepared to give towards the basic law.

4.3.2 Internalisation and integration of external influences, and autonomous motivation

Although intrinsic motivation often remains an important impetus for action, much of contemporary human behaviour is motivated, initially at least, by factors external to the self. SDT distinguishes four main types of extrinsic motivation that vary in the degree to which external regulations have become internalised to the self. Two of these types – identified regulation and integrated regulation – entail a high degree of internalisation and volition, leading SDT to group them with intrinsic motivation into a more general category called autonomous motivation (Ryan & Deci, 2019).

The high degree of internalisation associated with these two types of autonomous motivation leads a person to volitionally engage in an activity even though it is not itself emotionally rewarding. The volitional character of autonomous motivation led Marshall and Malik (2019) to associate civic virtue with this motivation category rather than with only intrinsic motivation, and this paper follows their lead.

SDT describes the process of people internalising and integrating external regulations, and also other factors external to the self, as an inherent tendency to move towards autonomous motivation where this is possible. Although this process is especially important during childhood, it remains relevant across the lifespan (Deci & Ryan, 2012). Like intrinsic motivation, this process is understood to be facilitated when people experience the external environment as supporting them to satisfy their basic psychological needs. When these needs are satisfied, enabling full development of our integrative capacities, humans are:

> not … selfish. … [T]he most integrated persons are not those that act only on their own behalf but also with others in mind. … [A]t our best, … the less parochial our integrative span, and the more of the living world we see ourselves relating to (Ryan & Deci, 2017 pp. 648, 649).

4.3.3 Polycentric governance as a pervasive source of autonomy support

SDT recognises both proximal (e.g., parent and teacher) and pervasive (e.g., mass media and governance) features of social context as potentially significant influences on the process of internalising and integrating external regulations (Ryan & Deci, 2019). Proximal contexts involve people with close interpersonal contact, and they are strongly shaped by the pervasive contexts they are embedded within.

The primary influence of a pervasive social context is typically indirect. Its values become conveyed ‘downwardly’ to people in an embedded proximal context by socialising agents like teachers. Potential also often exists for individuals and groups within a proximal setting to ‘upwardly’ influence their pervasive context, for instance by instigating cultural change

(Ryan & Deci, 2017). Included among the attributes of any pervasive context will be the subtle, long-lasting constraints on institutional choice with which the IAD framework's metaconstitutional level of analysis is concerned.

Particularly given its significance for autonomy support, social-ecological institutional analysts have identified pervasive contexts featuring polycentric governance as conducive to the internalisation and integration of external regulations from which civic virtue derives:

> Instead of relying on the state as the central, top-down substitute for all public problem solving, it is necessary to design complex, polycentric orders that involve both public governance mechanisms and private market and community institutions that complement each other. … Reliance primarily on national governments crowds out public and private problem solving at regional and local levels … (Ostrom, 2005a pp. 254-255).

Marshall, Hine and East (2017) argued that the advantages of polycentric governance for supporting people's need for autonomy, and thus for strengthening their civic virtue, arise to the extent that this governance is organised according to the principle of subsidiarity. This principle "requires that responsibility for each governance function, together with corresponding decision-making rights, be assigned to the lowest level at which it can be exercised competently" (Marshall & Lobry de Bruyn, 2020 p. 71). It enables "[t]he autonomy of individuals and their proximate governing structures [to be] maximised subject to a competency constraint" (Marshall & Lobry de Bruyn, 2022 p. 61).

Such governance equates to the "locally grounded alternatives to top-down centralised resource management" guided by the subsidiarity principle that Berkes (2008 p. 273) advocated as consistent with a sacred ecology worldview. Unlike community-*level* governance, governance of this kind is community-*based* since it "extends beyond communities to include institutional linkages and multiple levels of organization that impact and shape institutions at the local level" (Berkes, 2007 p. 15193; see also Marshall & Malik, 2019).

Empirical evidence for the claim that community-based governance can strengthen civic virtue for pro-environmental collective action came from Marshall et al. (2017) who tested relevant hypotheses deduced from SDT. The research design involved randomly assigning a sample of Australians adults to view one of two governance scenarios – government-centred or community-based – for a prospective trust fund to support regional climate change adaptation. Analysis of responses supported the hypothesis that community-based, relative to centralised, governance increases civic virtue for such adaptation. The community-based scenario yielded significantly higher levels of perceived autonomy support among the respondents; high levels of perceived autonomy support predicted higher levels of autonomous motivation; and this motivational pattern predicted significantly greater donations to the trust fund.

4.4 The competence need, polycentric governance, and civic virtue

The second of the basic psychological needs identified in SDT is competence. Deci (1975) proposed the competence need leads people to seek and master challenges that are optimal for their capacities. The emotional rewards arising from such encounters "seem to result only when there is some continual stretching of one's capacities" (Deci & Ryan, 1985 p. 27). We

turn now to consider the potential of community-based forms of polycentric governance to support this need, and thereby promote civic virtue to conditionally cooperate with external regulations introduced by such governance.

Centralised governance diminishes the opportunities for individuals to experience a sense of competence in governing their own affairs. This centralisation is legitimised by the "message contained in the policy literature … that citizens do not have the knowledge or skills needed to design appropriate institutions to overcome collective-action problems. … [This message] destroy[s] the capacity of citizens to experiment with diverse ways of coping with multiple problems and to learn from this experimentation over time" (Ostrom, 2005a p. 267).

In contrast, community-based governance offers diverse challenges across different levels of this governance by which this impoverishment of civic life might be reversed, and against which members of a group sharing a social dilemma might optimally satisfy their basic need for competence, thereby strengthening their civic virtue. This claim follows from the subsidiarity principle requiring that any task be assigned to the governance level closest to the individual where it can competently be exercised, and that tasks be reassigned periodically as competencies change (Marshall, 2011).

4.5 The relatedness need, polycentric governance, and civic virtue

The last of the basic psychological needs currently identified in SDT is for relatedness, or feelings of connection with other people (Ryan, 1995). Deci and Ryan (2012 p. 421) described these feelings as belongingness or love, and defined this need as "the need to be close to, trusting of, caring for, and cared for by others". SDT views relatedness as important for internalisation of extrinsically motivated behaviours since people mainly perform such behaviours because they are prompted, modelled or valued by others to whom they feel attached or related. Endorsement by significant others is viewed as important also for internalisation of beliefs, values, norms and social practices from the external environment (Ryan & Deci, 2017).

Sub-section 4.3 identified how community-based governance supports the autonomy need, and how support for this need strengthens internalisation of social norms of reciprocity, trustworthiness, and fairness. Since each of these norms is relatedness-enhancing, community-based governance is thus supportive of group members' relatedness with one another, as well as their autonomy and competence.

Community-based governance not only supports people in satisfying their relatedness need from local interactions. Recall Berkes' (2007) description of such governance extending beyond the local level to include linkages to multiple higher levels of organisation. Marshall and Lobry de Bruyn (2022 p. 61) elaborated, "Community-based governance … is a polycentric arrangement in which higher-level governance structures serving larger groups support or 'nest', rather than supplant or sideline, lower-level structures serving smaller groups". Nested structures can broaden relatedness beyond the local level by "mediat[ing] the trust and reciprocity needed for voluntary cooperation both upwards and downwards into the wider system" (Marshall, 2008 p. 123; 2009), particularly by "breaking into smaller steps what may otherwise be alienating social distances" (Marshall & Malik, 2019 p. 214). Community-based governance can thus allow people to feel belonging or relatedness in respect of pervasive social contexts, and even to feel "more 'at home' in society …" (Berger & Neuhaus, 1977 p. 3).

5. Human affinity with the rest of Nature, and civic virtue for social-ecological sustainability

We turn now to the first of four sections exploring how a non-anthropocentric reframing of collective action problems might advance the contribution of social-ecological institutional analysis to understanding how polycentric governance helps promote civic virtue for social-ecological sustainability. The present section focuses on the significance of experiences and relationships with the rest of Nature for supporting SDT's basic psychological needs, and thus for strengthening autonomous motivation, manifested as civic virtue, in advancing social-ecological sustainability through pro-environmental behaviours.

5.1 The biophilia hypothesis

The evolutionary biologist E.O. Wilson (1984 p. 139) hypothesised that humans, as they co-evolved with the rest of creation, developed a biologically-based, inherent human need to affiliate with the rest of Nature, its diversity, and life-like (e.g., ecological) processes. The hypothesis asserts that humans during this long co-evolution "valued nature and living diversity because of the adaptive benefits it offered us physically, emotionally, and intellectually", and that satisfying this need to affiliate with the non-human world persists as a basis for healthy human development and maturation (Kellert, 1997 p. 3).

Rather than a single tendency, biophilia is seen as "embrac[ing] … a range of human values and expressions" (Kellert, 1997 p. 4). These tendencies are understood as relatively weak biological dispositions rather than 'hard-wired' instincts. Fulfilling each tendency is seen to depend on the opportunities that society offers for relevant learning and experience, especially, but not only, during childhood and adolescence. The tendencies "tend to wither without learning, experience, and social support. The influence of society has a great effect on the content, intensity, and direction of these tendencies to affiliate with nature" (Kellert, 1997 p. 6).

A key influence of society was identified as its support or thwarting of people engaging meaningfully with the rest of Nature, given that "all expressions of biophilia depend on healthy, abundant, and attractive natural environments for their full and functional realization. … Yet increasingly we embrace a biologically impoverished, artificial, and environmentally degraded existence" (Kellert, 1997 pp. 172-173). Due to urbanisation and other consequences of modernisation, moreover, "[o]ur contact with the natural world … is slowly eroding. The biologist Robert Pyle [(1978)] refers to this condition as the 'extinction of experience'" (Kellert, 1997 p. 102).

5.2 Nature exposure and human well-being

Since the biophilia hypothesis was proposed, numerous researchers across multiple disciplines have investigated how experiences of the non-human world affect human well-being (see Bratman, Olvera-Alvarez et al., 2021; McMahan & Estes, 2015 for meta-analyses). It is now well established that such experiences are beneficial for human psychological well-being. Less is known about how the non-human world confers this benefit (Yang, Cai et al., 2022), since much of this research is atheoretical (Hurly & Walker, 2019). SDT research has contributed significantly to understanding how these benefits arise,

particularly in respect of the subjective vitality measure of psychological wellbeing. With motivation often described as involving both the direction and energy for action, SDT refers to this energy as subjective vitality (Ryan & Deci, 2019).

Accumulated consistent findings from SDT research, including that the effect of nature exposure on subjective vitality is stronger the more natural the surroundings to which people are exposed (Ryan, Weinstein et al., 2010), led to the theoretical proposition: "Other factors aside, meaningful exposure to living nature has a positive effect on subjective vitality relative to exposure to non-natural, built environments without living elements, and this relation is mediated in part by basic psychological needs" (Ryan & Deci, 2017 p. 265). Given this proposition's recognition that nature exposure supports the basic psychological needs, and SDT's earlier-mentioned (section 4.3.2) proposition that support for the basic needs facilitates internalisation and integration of external regulations, it follows that nature exposure promotes autonomous motivation, and thus civic virtue, in cooperating conditionally with such regulations.

5.3 Nature exposure's support for SDT's basic psychological needs

The ways in which human exposure to the rest of Nature supports the three basic psychological needs currently identified in SDT are now explored.

5.3.1 Nature exposure's support for the autonomy need

Passmore and Howell (2014) reasoned that natural contexts impose fewer social demands or constraints on people, thus allowing them greater autonomy. Research has identified a tendency for people to depict the rest of Nature as a place to escape from social judgement and everyday routines and find freedom to be themselves (Birch, Rishbeth et al., 2020; Moore & Van Vliet, 2022) including by expressing themselves more freely (Hartig, van den Berg et al., 2011; Kaplan, 1995).

5.3.2 Nature exposure's support for the competence need

Nature exposure's support of the competence need has been attributed to the unique opportunities the non-human world offers for people to engage with physically and mentally challenging activities and thereby exercise and develop their knowledge and skills (Di Domenico & Ryan, 2017; Landon, Woosnam et al., 2021). Kellert (1997 p. 122) observed accordingly that biophilia includes a tendency to "value nature as an arena of contest and contention. … Such experiences nurture our capacities for ingenuity, perseverance, strength, and prowess in the age-old quest to overcome challenge". Noting that natural environments tend to be less stressful than social situations, Yang et al. (2022) argued that the former endows people with more of the sense of control upon which feeling competent depends (see also Oh, Shin et al., 2020; Ryan et al., 2010).

5.3.3 Nature exposure's support for the relatedness need

Landon et al. (2021) explained support from exposure to natural landscapes for the relatedness need in terms of the social relatedness opportunities this exposure offers beyond what urban life provides. Focusing on wilderness experiences, which are often shared with significant others, and which are typically "coupled with the unique ethos that accompanies

the intimate social world of backcountry wilderness recreationists" (p. 15), they argued that such experiences are uniquely supportive of relatedness.

Nature exposure in urban settings has also been found to benefit variants of social relatedness. Social coherence (including belongingness) and local social interaction were found to be positively associated with perceived greenness of a neighbourhood (Sugiyama, Leslie et al., 2008). A positive association was found between the presence of trees and grass on common spaces in high-rise public housing and informal social contact with neighbours (Kuo, Sullivan et al., 1998; see also Rugela, Carpiano et al., 2019).

5.4 Nature relatedness: a fourth basic psychological need?

Aside from the benefits of nature exposure for human well-being in terms of subjective vitality, and for satisfying the autonomy, competence and (social) relatedness needs, there is increasing attention to the possibility that such exposure also benefits well-being by supporting an additional basic psychological need for nature relatedness. Nisbet, Zelenski and Murphy (2011 p. 304) defined this form of relatedness as "the affective, cognitive, and experiential relationship individuals have with the natural world". This relationship has for most humans been severed by what was characterised in sub-section 2.2 as the historical process of disenchantment.

Nature relatedness has also been conceived in terms of the degree to which individuals include Nature in their representation of themselves (Schultz, 2002). This conception recalls the understanding within SDT, noted in section 4.3.2, that the more fully developed are people's capacities to integrate external influences within the self, the more of the living world we tend to feel a relationship with.

Baxter and Pelletier (2019 p. 24) concluded from available evidence that nature exposure as brief as a 15 minute walk can be sufficient for eliciting a temporary feeling of nature relatedness, but "[t]he repeated exploration of a specific natural environment will generate a set of experiences and cognitive representations of the environment that will create a feeling of security and belonging with respect to that particular environment and lead to greater identification with that environment".

Based on reviews of available evidence in light of Baumeister and Leary's (1995) standards for identifying a basic psychological need, two studies (Baxter & Pelletier, 2019; Hurly & Walker, 2019) concluded that nature relatedness should be recognised within SDT as such a need. Baxter and Pelletier (2019 pp. 27-28) considered in reaching their conclusion whether nature relatedness is itself a specific need or part of a more general need to connect with something beyond oneself, and concluded from the relevant literature that it does constitute a specific need: "[T]here is something particular to natural environments with respect to replenishment of cognitive and emotional resources that is separate from social contact or physical activity, and is specific to this type of environment with respect to perceptual and experiential features and characteristics". Referring to the biophilia hypothesis and citing Baxter and Pelletier (2019), "the question of whether exposure to living nature is among our basic psychological needs" was raised for the first time by SDT's founders (Ryan & Deci, 2019 p. 136)

5.5 Nature exposure, nature relatedness, and pro-environmental behaviour

A recent systematic literature review and meta-analysis found nature exposure to be positively associated with diverse pro-environmental behaviours including conservation volunteering, green purchasing, and energy conservation. Its authors concluded that "interventions aimed at increasing personal interactions with nature may contribute, at least partly, to facilitating behaviour change that helps address various major environmental issues we face today, such as climate change, water scarcity, ecosystem degradation, and species extinction" (Soga & Gaston, 2024 p. 7). Particularly relevant to this paper's focus on social-ecological sustainability as a collective good, Zelenski, Dopko and Capaldi (2015) found from laboratory experiments involving a fishing-themed commons dilemma that participants who watched a video of the non-human world harvested more sustainably compared with those who viewed an architectural video or geometric shapes.

These authors suggested the immediate positive effect of nature exposure is on nature relatedness, with any observed increase in pro-environmental behaviour due to an increase in the latter:

> … [R]epeated experiences in nature, especially pleasant ones, may foster a more stable sense of nature relatedness, and then a desire to protect nature … A single exposure to nature will probably not permanently change a person's attitudes or behavior, and it is entirely possible that momentary feelings of connectedness with nature do not cause sustainable choices in the same way that a more stable sense of a nature related self does (Zelenski et al., 2015 p. 29; see also Zelenski & Nisbet, 2014).

Empirical support for the hypothesis that exposure to the non-human, compared with the human, world increases people's valuing of intrinsic goals relative to extrinsic goals was provided by SDT researchers Weinstein, Przybylski, and Ryan (2009). Hence it might reasonably be proposed from an SDT perspective that the contribution of nature exposure (via strengthening nature relatedness) to pro-environmental behaviour occurs through increasing people's valuing of intrinsic goals, particularly in respect of affinity with or caring for the rest of Nature, relative to extrinsic goals. The strengthening of a relationship with the non-human world resulting from this change in goal valuations would increase in turn the likelihood of people experiencing pro-environmental external regulations as supporting their need for autonomy rather than as attempting to control them, and thus of developing sufficient civic virtue to adopt the pro-environmental behaviours favoured by these regulations.

As discussed in sub-section 4.2.2, SDT proposes that people are more likely to adopt extrinsic rather than intrinsic goals when they are thwarted in satisfying their basic psychological needs. If nature relatedness is indeed one of these needs as the previous section revealed has been proposed, this proposition offers an explanation of how nature exposure strengthens people's relative valuing of intrinsic goals: nature exposure lessens the degree to which people's need for nature relatedness is thwarted, and thereby strengthens their relative valuing (and thus adoption) of such goals.

6. Reconciling social-ecological institutional analysis with sacred ecology's understanding of reciprocity between humans and the rest of Nature

6.1 Reciprocity between humans and non-humans in social-ecological institutional analysis

6.1.1 Implicit recognition of reciprocity between humans and the rest of Nature

Social-ecological institutional analysts typically understand pro-environmental behaviour in terms of human individuals contributing to collective action in sustaining common-pool *resource systems*. These contributions are understood in terms of human individuals appropriating fewer *resource units* (e.g., fish) from a natural system (e.g., fishery) and/or investing more in its provision (e.g., breeding more fish for release).

Sustaining human benefits from a natural system that arise from appropriating its resource units is thus recognised implicitly as requiring reciprocal action from humans. Although Berkes (2008) is one of few such analysts to characterise this reciprocal relationship explicitly in terms of reciprocity between humans and non-humans, none hold mechanism's view of humans having a "unidirectional relationship with nature, whereby [we] extract resources and benefit from them with few, if any, responsibilities and little, if any, accountability to sustain nature" (Ojeda, Salononja et al., 2022 p. 952).

At least implicitly, social-ecological institutional analysts recognise reciprocity between humans and non-humans in sustaining a natural system through their understanding that both groups contribute to, and benefit from, this sustainability. Humans are understood to contribute as discussed above, and to benefit from a more sustainable flow of resource units (e.g., fish). The rest of Nature is understood as contributing through her capacity for self-renewal or self-reproduction (e.g., of a fish population) (Farley, Melgar et al., 2024), and for reciprocating (e.g., by increasing harvestable fish numbers) human contributions to this capacity, and she is understood as benefiting from this self-renewal (e.g., in terms of resilience of a fish population). Benefits to humans from our contributions are affected by reciprocation from the rest of Nature, while benefits to non-humans from their contributions are affected by reciprocation from humans.

Social-ecological institutional analysts usually refer to a collective action problem in sustaining a natural system as a type of social dilemma called a commons dilemma (Ostrom, 1990). Modelling a collective action problem as a *social* dilemma implies an assumption that only humans face a dilemma in choosing whether to contribute towards collective action.

As discussed in sub-section 4.1, the behavioural theory of collective action understands success in solving a social (and thus commons) dilemma to be more likely the more that the group sharing the dilemma consists of conditional cooperators. Conditional cooperators can transform a commons dilemma, which has a single equilibrium outcome of zero contributions to sustaining the commons, into an assurance problem with two equilibrium levels of contribution: zero and 100 per cent (Ostrom, 2000). The latter, cooperative, equilibrium eventuates when they trust one another to reciprocate their contributions (Marshall, 2005). In conducive settings, reciprocity, trust and cooperation originating among some group members can spread through a virtuous-circle dynamic to others who learn of this occurring and thus become more trusting that their own contributions would be reciprocated (Marshall & Lobry de Bruyn, 2022; Ostrom, 1998).

6.1.2 Anthropocentric understanding of reciprocity between humans and the rest of Nature

Despite its major advances in understanding the behaviour of humans faced with commons dilemmas (and social dilemmas more generally), the behavioural theory of collective action retains the anthropocentrism of mechanism in considering only human choices. Non-humans remain implicitly understood as passive and inert, and their reciprocation of human contributions to sustaining the rest of Nature is consequently assumed to involve mechanistic reactions devoid of choice. Given its implication that the sum of reciprocal contributions by humans and the rest of Nature to sustaining a natural system ultimately depends only on human choices, this assumption enables the anthropocentrism of the behavioural theory to be reconciled with a social-ecological perspective.

6.2 Reciprocity between humans and the rest of Nature in sacred ecology

As discussed in section 3.3, mechanism's assumption that Nature's non-human members are invariably passive and inert, and thus without agency, is not shared by the worldview of sacred ecology with its understanding of ecosystems "pulsating with life and spirit" (Berkes, 2008 p. 274). Robin Wall Kimmerer (2013 pp. 49, 55), a botanist and enrolled member of the Citizen Potawatomi Nation (within what is now called the USA), reflected the latter worldview in describing her people's traditional understanding of the world as "full of unseen energies that animate everything". The ethnographer Deborah Bird Rose (2000 pp. 46, 56, 57, 91) found similarly that the Yarallin people (of what is now called the Victoria River District in northern Australia):

> … assume, usually on the basis of specifiable evidence, that all species (some plants may be an exception) are made up of conscious and thinking individuals who speak, fight, plan, joke, perform rituals …, according to their own Law [which originated in the Dreaming] … To disregard the Law would be to disregard the source of life and thus to allow the cosmos to fall apart. … It is implicit that all living beings have a choice in following Law. They can do what is necessary to maintain life or they can turn their backs on responsibility and, in so doing, allow destruction. … All species have … free will and choice: the burden of responsibility is shared among all living things.

This responsibility of every being includes, in Yarallin people's worldview, balancing the choices of other beings through reciprocal communication:

> A system cannot be life-enhancing if it is out of kilter. … There is here a moral obligation: to learn to understand, to pay attention, and to respond. … Just as other being's actions elicit a response from human beings, so also human actions elicit responses from other beings. People say this most explicitly: country and other species are watching us, reacting and responding (Rose, 2000 pp. 44, 228).

6.3 Reconciling social-ecological institutional analysis with sacred ecology

6.3.1 Diagnosing non-human agency

The implicit assumption of most social-ecological institutional analysts that the non-human world is passive and inert is thus a poor fit for collective action settings better characterised

by sacred ecology's assumption that non-humans have agency and exercise choice. To the extent that the latter assumption describes non-human behaviour in such settings, or at least humans in those settings believe it does, then the outcome of collective action for sustaining a natural system may differ markedly – if only because humans act according to their beliefs – from what is predicted based on the former assumption.

The thinking behind Ostrom's (2009) 'general framework for analysing the sustainability of social-ecological systems' (or 'SES framework') has value here for specifying each problem of collective action according to its unique attributes rather than on some generic basis. Particularly relevant here are the *mental models* identified in the framework as a key attribute of those *actors* (presently limited to humans) an institutional analyst deems significant for understanding *interactions* and *outcomes* within a focal SES. By directing attention to this attribute, the framework can prompt analysts to specify the unique attributes of human actors in each context in terms of beliefs regarding the agency vis-à-vis passivity of the relevant *resource system/s* and/or *resource units.*

Additional attributes could be included in the SES framework to prompt analysts to diagnose the *resource system/s* and *resource units* of focal interest in respect of their agency vis-à-vis passivity. An alternative approach, requiring greater flexibility within the framework, would provide for *resource systems* and *resource units* to be categorised as *actors* when relevant human actors believe them to have agency. The non-human actors thereby identified would, in combination with the human actors more conventionally identified in social-ecological institutional analysis, correspond with Leopold's (1949) 'land community' and Berkes' (2008) synonymous 'community of beings'. A commons dilemma modelled as shared by a community of human and non-human beings could justifiably be described as a *social-ecological* dilemma since the actors involved are not limited to the social subsystem of the focal SES; non-human actors from the broader ecosystem within the SES are also involved[2].

Such an accounting for human beliefs that non-humans have agency is antithetical to the stance of conventional, disenchanted Western science which regards such beliefs as irrational. This stance relies on a rationalist understanding of rationality that, as discussed in sub-section 2.2, became dominant as the epistemological basis for gaining the knowledge of presumed objective reality that mechanism requires to control and dominate the non-human world. This understanding is increasingly criticised as unfit for contemporary circumstances:

> I am not arguing against the practise of reason but arguing for better forms of reason that will be more, not less rational, in the current state of the world. … [T]he 'ecological' crisis is a crisis or failing of reason and culture … [W]e are entitled to conclude that rationalist rationality is irrational, in the sense that it is maladapted to the environment it depends on (Plumwood, 2002 pp. 14, 15, 18).

And similarly:

> Western science, unrestrained by taboos or spiritual values, has enabled behaviors that pose an existential threat to humans and other species. The spiritual beliefs and 'superstitions' of many Indigenous cultures have enabled them to live in harmony

[2] Some social-ecological institutional analysts including DeCaro, Chaffin et al. (2017) and Barfuss, Donges et al. (2020) have taken a different position on this, characterising a commons dilemma set within an SES context as a social-ecological dilemma despite it being shared only by human actors.

> with their ecosystems for millennia. Which approach is more rational? (Farley et al., 2024 p. 7).

Farley et al. (2024 p. 7) argued on the basis of evolutionary theory that rationalism's preoccupation with objective reality may be misguided as a basis for reasoning our way to social-ecological sustainability: "[N]atural selection does not favor beliefs based on their objective reality; it favors those that increase fitness over those that do not (Hoffman, 2019)". Plumwood (2002) advocated for seeking out higher-order forms of reason capable of enabling humans to reflect critically on rationalism and develop alternatives appropriate for navigating towards this sustainability. Kimmerer (2013 p. 346) distinguished the practice of science, as a process of revealing Nature through reasoned inquiry, from the rationalism of conventional science, and sought transformation of the latter: "I dream of a world guided by a lens of stories rooted in the revelations of science and framed with an indigenous worldview – stories in which matter and spirit are both given voice".

6.3.2 Re-enchanting social-ecological institutional analysis

Nakamura and Sato (2023 p. 128) argued "the oft-uniform view of commons as collectively managed natural resources that place humans at the center of the resource system … prevents [analysts] from seeing the agentic roles of more-than-human elements …". Berkes' (2008) call for ecological science and related fields to replace the mechanism and associated reductionism of conventional science with the holistic scientific approach of sacred ecology anticipated such a critique. Answering this call requires a transformative shift of perspective for social-ecological institutional analysis; i.e., from understanding commons dilemmas as social dilemmas shared only by human actors, to analysing them as social-ecological dilemmas shared by both human and non-human actors.

Such a shift requires such analysts to re-enchant their investigations of reciprocity and cooperation between humans sharing a commons (as social) dilemma by widening their field of vision to attend also to the dynamics of reciprocity and cooperation between humans and non-human actors sharing the commons (as social-ecological) dilemma. Given Berkes's (2008) argument that a turn towards sacred ecology be informed by learning from the traditional ecological knowledge of Indigenous peoples, we now turn to consider how such knowledge might inform social-ecological institutional analysis in accounting for non-human agency in exploring the role of polycentric governance in promoting civic virtue for social-ecological sustainability.

7. Accounting for non-human agency within social-ecological dilemmas: insights for institutional analysis from indigenous knowledge systems

7.1 Gratitude, trust, and reciprocity between humans and the rest of Nature

The foundation of human reciprocity in sustaining Nature is understood in many systems of traditional ecological knowledge to be gratitude for what are appreciated as the non-human world's gifts or blessings. Kimmerer (2013 p. 189) observed from her Potawatomi people's knowledge system that it is "our uniquely human gift to express thanks, because we have the awareness and the collective memory that the world could well be otherwise, less generous than it is". The concept of gratitude "shifts our focus from what's missing to what's there"

(Macy & Johnstone, 2012 p. 48), thus cultivating a sense of abundance and fullness (Kimmerer, 2013).

This sense of fullness resembles what Yarallin people call *punyu*, "a state of being which involves living in the fullness of life" (Rose, 2000 p. 65). The anthropologist William Stanner (2009 [1953]) associated this sense of fullness among Australian Aboriginal peoples prior to colonial devastation of their cultures with "a mood and spirit of 'assent'". Rose (2017 p. G60) argued "this beautiful assent to life … the great, expressive, demonstrative 'yes'" characterises all non-human species and can be regained by contemporary humans.

Gratitude has been characterised as "a social emotion … [that] feeds trust, because it helps us acknowledge the times we've been able to count on one another. … We're more likely to help those we feel grateful to, leading to a positive spiral of helping, gratitude, trust and cooperation" (Macy & Johnstone, 2012 pp. 45, 50). We saw in section 2.2 how mechanism legitimised in the West an image of the non-human world as violent and uncontrollable, and thus undeserving of human trust and gratitude.

Macy and Johnstone (2012) distinguished two sides of gratitude. The first involves paying attention to, and appreciating, something good that has happened. The second entails acknowledging the role of humans or the rest of Nature in bringing it about. Kimmerer (2013 pp. 344-345) observed how people in Westernised societies rarely "understand the symbiotic relationships that sustain them" and consequently tend to take for granted gifts from the rest of Nature. Also, the culture of individualism accompanying mechanism involves a "notion that we can be completely independent or self-made [which] denies the reality of our reliance on other people and on our natural world" (Macy & Johnstone, 2012 p. 50). Even when something good from the rest of Nature is noticed, consequently, it tends to be regarded as an entitlement rather than as a gift for which the non-human world deserves gratitude.

7.2 Learning how to reciprocate gifts from the rest of Nature

When people do feel gratitude for gifts from rest of Nature and want to reciprocate, doing so meaningfully requires knowledge of what the non-human world in a given setting would benefit from, as well as capacities to act accordingly. Kimmerer (2013 p. 190) argues that "one of our responsibilities as human people is to find ways to enter into reciprocity with the more-than-human world. We can do it through gratitude, through ceremony, through land stewardship, science, art, and in everyday acts of practical reverence".

In learning how we might help the rest of Nature, "[t]he land is the real teacher. … Paying attention is a form of reciprocity with the living world, receiving the gifts with open eyes and open heart" (Kimmerer, 2013 p. 222). Rose (2000 p. 90) found accordingly that "Yarralin people pay close attention to what people, country, and cosmos are 'telling' them. The point is … to note any disturbances so that problems can be corrected and order maintained".

For most Westernised people, however, mechanism and its associated reductionism have severed the relationship with the rest of Nature that enables this close attention or 'listening'. The philosopher Val Plumwood (2002 p. 189) wrote, "Attempts at serious communication between humans and other species are almost completely precluded by the arrogance and human-centredness of a culture that is convinced that other species are simpler and lesser, and only grudgingly to be admitted as communicative beings". Kimmerer (2013 pp. 336, 338) found similarly, "it is not the land that has been broken, but our relationship to it. … Restoring

land without restoring relationship is an empty exercise. It is relationship that will endure and relationship that will sustain the restored land".

7.3 Becoming naturalised to place

In looking to the land as a teacher, participants in traditional systems of indigenous knowledge are not expecting to find context-free generalisations or universal truths of the kind sought by mechanism (Berkes, 2008). Rose (2000 p. 225) found thus from the Yarallin people, "Knowledge is localised, and one of the reasons why Yarallin people feel uncomfortable in a strange environment is that they do not know what is being said [by the land] …". Plumwood (2002 pp. 231-232) argued accordingly that understanding a:

> … language of the land requires a deep acquaintance with some place, or perhaps a group of places. It also requires a capacity to relate dialogically with the more-than-human world. … But mobility rules modernity, and for most people in urban contexts both place and the more-than-human sphere are disempowered as major constituents of identity and meaning. … If in a place-centred culture social customs, etiquette, and institutions in every way nurture and recognise relationships to place, modernist culture and its institutions conversely and systematically neglect, frustrate and deny these relationships.

Kimmerer (2013 pp. 239, 340, original emphasis) was nevertheless optimistic regarding the potential for non-indigenous people to reestablish relationships of gratitude and reciprocity with the land by starting with modest steps:

> The circle of ecological compassion we feel is enlarged by direct experience of the living world, and shrunken by its lack. … In learning reciprocity [with Mother Earth], the hands can lead the heart. … Action on behalf of life transforms. Because the relationship between the self and the world is reciprocal, it is not a question of first getting enlightened or saved and *then* acting. As we work to heal the earth, the earth heals us.

This stepwise process she conceived as people "striv[ing] to become naturalized to place, to throw off the mindset of the immigrant. … [A]n immigrant culture must write its own new stories of relationship to place … tempered by the wisdom of those who were old on this land long before we came" (Kimmerer, 2013 pp. 214, 344). David Tacey (2000 p. 250) concluded similarly some years earlier for Australia, "We need to listen to the land, appreciate Aboriginal relations with the land, and move towards a new, postmodern and postcolonial enchantment. Our relation to Aboriginality must not be parasitic, but should be creative and progressive, … a co-creation of Aboriginal and migrant Australians".

8. Potential of polycentric governance to foster civic virtue for social-ecological sustainability: a sacred ecology perspective

As discussed in sub-section 4.3, governance is a part of the pervasive social context with key significance for the process characterised in SDT of humans internalising and integrating external influences to the self, and thereby experiencing autonomous motivation, manifested as civic virtue, to behave consistently with those influences. Advantages of community-based, versus centralised, forms of governance in supporting people to satisfy their basic

psychological needs, and thereby promote their civic virtue for participating in collective action for social-ecological sustainability, were identified over sub-sections 4.3-4.5 from an anthropocentric perspective. In shifting towards a sacred ecology or community-of-beings perspective, sub-section 5.3 identified the potential of nature exposure to further support these basic needs and thus further increase civic virtue for this sustainability, while sub-section 5.5 explored possibilities for nature exposure to cultivate yet more of such civic virtue by increasing people's relative valuing of intrinsic goals pertaining to nature relatedness. The focus in this section is on the potential of community-based governance for social-ecological sustainability to strengthen human exposure to the rest of Nature, and thereby increase civic virtue for such sustainability beyond what could be identified in section 4 from an anthropocentric perspective.

8.1 Community-based governance for social-ecological sustainability: advantages for nature exposure and civic virtue

Particularly when the focus of community-based governance is on social-ecological sustainability (i.e., sustaining Nature), and the collective action of concern therefore often relates to nature exposure, the advantages of such governance for increasing participation in such action signify opportunities to increase and enhance such exposure. The decision-making autonomy afforded by such governance confers it with advantages not only in designing participation opportunities with potential for nature exposure, but also in realising that potential by matching those opportunities to local people's preferences. LoTemplio, McDonnell et al. (2023 p. 251) recommended accordingly that U.S. governments:

> … Invest in the Agency of Communities to Break Down Barriers to Accessing Wellbeing in Nature. …. [A]ctivities or practices that work in one neighborhood or community may not work in another. … Therefore, investing in flexible, community-based approaches can leverage community agency to understand local needs. For example, one community may be interested in outdoor recreation but lack equipment or skillsets … Another community may decide community gardens are more important.

Several of Ostrom's (1990) institutional design principles suggest further advantages for enabling nature exposure of community-based governance for social-ecological sustainability. The autonomy enabled by such governance allows institutions for monitoring on-ground behaviours and their ecological outcomes, and for sanctioning non-cooperative behaviours, to be designed so they are performed by community members in ways involving exposure to their local non-human community and well-matched to their local culture. The fourth and fifth of the design principles are concerned with such monitoring and sanctioning, respectively, and followed from Ostrom (1990 p. 94) finding consistently that in cases with robust governance "monitoring and sanctioning are undertaken not by external authorities but by the participants themselves".

A further advantage of such governance for promoting nature exposure is indicated by two more of the institutional design principles. The third design principle follows from a finding that "the individuals who directly interact with one another and with the physical world can modify the rules over time so as to better fit them to the specific characteristics of their setting", while the second identifies a need for congruence between institutions and local conditions (Ostrom, 1990 p. 93). Ostrom (2005b p. 281) observed accordingly that people appropriating benefits from a natural system are motivated to learn how the system operates

"since the very success of their appropriation efforts depends on such knowledge". Recognition by community members of nature exposure's benefits for acquiring the place-based ecological knowledge needed to match institutions to local conditions can thus be expected to strengthen their motivations to gain such exposure. The second and third design principles thus highlight the value for motivating nature exposure of community-based governance for social-ecological sustainability granting people the autonomy they need to use the knowledge thus gained to better match institutions to their local conditions, thus better enabling them to sustain the benefits, including nature relatedness, provided by the non-human world.

These advantages of such governance for enabling nature exposure, together with the benefits of this exposure for strengthening civic virtue in practising the pro-environmental behaviours sought in such governance, are additional to those that could be identified in section 4 from an anthropocentric perspective.

8.1.1 Overcoming structural obstacles to realising these advantages

Viewed from a sacred ecology perspective, community-based governance for social-ecological sustainability offers potential to increase the salience of this sustainability to people by rekindling some of the human affinity with the rest of Nature ruptured by disenchantment and mechanism. Realising this potential by shifting towards more place-sensitive cultures nonetheless faces formidable structural obstacles from the modernist culture to which mechanism led (Plumwood, 2002), including from urbanisation (Kellert, 1997) and economic globalisation (Norberg-Hodge, 2019).

As understood through a sacred ecology perspective, such community-based governance can be regarded as a foundational step in tackling these obstacles. It allows people to start regaining the understanding of, and level of attention to, the non-human communities of local places that enables resurgence of: gratitude for their gifts; trust in their generosity; and learning how to reciprocate that generosity. As indicated in sub-section 7.3, that foundation can be built upon in modest steps, commencing with brief experiences of nature exposure and leading eventually to the enduring sense of nature relatedness associated with having become 'naturalised to place'.

Each step can be treated as an experiment to learn from in choosing how next to reciprocate gifts from the non-human world. Such lessons gained at the local level of a community-based governance system can be exchanged with neighbouring localities at relatively low transaction cost by virtue of shared governance arrangements at higher (e.g., regional) levels of the system (Ostrom, 2005b). Accumulated lessons from steps taken across a diversity of proximal contexts can thereby filter upwards through the broader system to modify those conditions at the metaconstitutional level of analysis, and elsewhere in the pervasive context, constituting structural obstacles to deepening and broadening nature relatedness across society.

8.2 Community-based governance for social-ecological sustainability: advantages for protecting and restoring venues for nature exposure

In addition to the advantages identified above for promoting people's exposure to the rest of Nature, community-based governance for social-ecological sustainability also offers advantages by way of protecting and restoring places for such exposure. The advantages of

community-based forms of governance, compared with centralised forms, in strengthening civic virtue for this sustainability were discussed in sub-sections 4.3-4.5 and 8.1. This strengthening enables more successful pursuit of such sustainability, which in turn enhances the prospects of protecting and restoring the ecosystems and other phenomena of the non-human world through which people can gain exposure to the rest of Nature.

9. Conclusion

Most humans have become alienated from the rest of Nature as an enduring consequence of the transformation at the metaconstitutional level of analysis, commencing in sixteenth century western Europe, to a disenchanted, mechanistic and anthropocentric worldview rendering her dead and of only instrumental value to humans. The resulting widespread loss of affinity with the rest of Nature weakened the salience to most humans of calls for her protection, thus contributing to a contemporary shortfall in the civic virtue ultimately required for collective action towards social-ecological sustainability.

The potential of polycentric governance to narrow this shortfall, including by strengthening the contemporary salience of this sustainability by helping to re-enchant human relationships with the non-human world and Nature as a whole, was explored in this paper. The foregoing review and synthesis of literature affirms such potential, particularly in respect of the community-based forms of polycentric governance informed by traditional indigenous knowledge systems that Fikret Berkes identified as central to sacred ecology as a re-enchanted tradition of ecological science.

Such re-enchanted forms of governance are grounded in a non-anthropocentric, or community-of-beings, worldview wherein both humans and non-humans exercise agency in reciprocating each other's contributions to social-ecological sustainability. Accounting for this worldview will be challenging for social-ecological institutional analysts maintaining the stance of positivist science that beliefs in non-human agency are invariably irrational. The form of rationality underpinning this stance is that which guided pursuit of mechanism's goal to dominate the non-human world. Openness to the possibility that alternative forms of reasoning may be more rational in guiding pursuit of social-ecological sustainability thus seems advisable.

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