Envisioning a sustainable future for water

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ABSTRACT

The water sector has a major leadership role to play in addressing the global water crisis. How can it make the radical shifts in approach that are needed? This paper highlights the reality that the management of water, and the ways in which water flows are directed, reflects social relations of power, not just between human groups, but also between humankind and the non-human world. Drawing on in-depth ethnographic research with indigenous communities and other water users in river catchments around the world, it considers alternate cultural worldviews that encourage more sustainable beliefs and practices, and asks how larger societies might make imaginative use of these in contemporary and future engagements with water. In a thought experiment intended to reposition human–non-human relations, it proposes a concept of 're-imagined communities' advocating more collaborative forms of conviviality – living together – with other species. Opening the door to ideas about pan-species democracy, it calls for decision-making processes in which a wide range of expertise is brought together to exchange knowledge, with an explicit and practical remit to 'speak for' and promote the needs and interests of the non-human inhabitants of the ecosystems on which all living kinds depend.

Key words | cultural and biodiversity, human–non-human relations, interdisciplinary research, pan-species democracy, re-imagined communities, sustainable water management

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HIGHLIGHTS

- The current water crisis has arisen from assumptions that development is reliant upon growth, and from a dualistic worldview that separates culture and nature, and human and non-human worlds.
- The control and management of water reflects unequal relations of power between human groups, and between human and non-human beings. While some efforts are being made to be more inclusive of human 'stakeholders', societies continue to externalise the costs of their activities to non-human species and environments.
- There is a need for radical reform in how large societies think about and engage with non-human beings and ecosystems. Some useful examples are provided by culturally diverse ways of envisioning human–non-human relations in more holistic and egalitarian terms, which lead naturally to more sustainable beliefs, values, and practices.
- A concept of 're-imagined communities' seeks to challenge nature–culture dualism and to relocate humankind within ecosystems shared with and composed by other living kinds. It encourages a more convivial positionality that entails working with, rather than acting upon, the non-human world.

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- The paper explores ideas about pan-species democracy, in which academic, local, and other forms of knowledge and expertise are exchanged, with an explicit remit to 'speak for' and promote the needs and interests of other species and ecosystems in decision-making processes relating to water.

INTRODUCTION

What can the water sector, government, and non-government agencies, and all water users do to ensure a sustainable future for water? Over the last several decades, it has become clear that this is not where we are heading. The philosopher Ivan Illich has argued that, as long as societies remain wedded to the belief that growth is essential, the concept of 'sustainable development' is an oxymoron. Sustainability can only be achieved by setting limits: by doing it better, rather than by doing it more (Illich 1999). This is by no means impossible: throughout human history, with careful governance, some earlier societies maintained successful circular or 'steady-state' economies for long periods of time. But in humankind's more recent history societies have generally persisted in doing it more, and this pattern has accelerated. Population growth and aspirational patterns of consumption have driven ever-expanding resource and energy use, with cumulative pressure on freshwater. The removal of diverse habitats to extend intensive industrial farming continues to accelerate; 70% of the world's freshwater is currently being used for irrigation; and the World Bank calculates that to feed 10 billion people 'agricultural production will need to expand by approximately 70% by 2050'.

> *Due to population growth, urbanization, and climate change, competition for water resources is expected to increase … future demand on water by all sectors will require as much as 25 to 40% of water to be re-allocated from lower to higher productivity and employment activities, particularly in water stressed regions.*
>
> (World Bank 2020: 1)

Such unremitting demands are outstripping ecosystems' abilities to maintain reliable water flows and to replenish aquifers. Their capacities to self-regulate flows are further compromised by the loss of wetlands and forests, major changes in land use, urbanisation, and climate change. The result is increasing water and food insecurity worldwide, and an anthropogenically caused mass extinction event in which about 200 unique living species blink out of existence every 24 hours (IPBES 2019). The costs of human activities are coming back to bite us all, with high levels of air and water pollution, the loss of healthy green space, and so forth. But they are most punitively externalised to disadvantaged human communities; to non-human beings; and to environments, as illustrated by Figure 1, depicting fish deaths due to deoxygenation in the Murray–Darling Basin.

Faced with compelling evidence that this level of disruption is leading towards social and ecological collapse on a global scale, the majority of people recognise that a radical change in direction is needed. Drawing on long-term ethnographic research with diverse communities of water users and managers around the world, this article suggests some ways in which we might achieve this.

SUSTAINABLE WATER PROVISION

The water sector has a central role in societies' efforts to find more sustainable ways of engaging with freshwater

Figure 1 | Fish deaths in the Murray–Darling Basin, Australia. Photo Wikimedia Commons.

ecosystems. This role is meaningful on every scale (Liu & Ingildsen 2020: 319). While the water industry's activities are materially grounded in local, regional, and national infrastructures, water supply – and thus the basic viability of all societies – remains fundamentally dependent upon hydrological systems that, under all of the pressures noted above, are being disrupted not just locally, but at a global level.

The UN, other international organisations, national governments, and water suppliers share a common problem: that the imposition of more infrastructures to store and deliver water, and improvements in efficiency, are insufficient to deal with the social and environmental impacts of societies' large-scale patterns of growth-oriented development. The organisations responsible for water supply are therefore between a rock and a hard place. Over the last several centuries, they have become firmly positioned as a service industry, whose whole *raison d'être* is to meet people's demands for water. As these demands – for farming, industrial production, and domestic use – have grown, so too have the water industry's efforts to control and redirect the hydrological flows through the material environments that societies inhabit. Thus, the second half of the 20th century has seen the building of major irrigation schemes, with multiple channels such as the one pictured below in north Queensland's Atherton Tablelands (Figure 2). This carries water from the Tinaroo Dam that, creating a reservoir three-quarters of the size of Sydney Harbour, was built between 1953 and 1958 on the Barron River, to generate hydroelectricity and to supply over 205,000 ML of water each year to the farmers within the Mareeba-Dimbulah Irrigation Scheme.

In wealthy societies such water provision has proved profitable and, in the last half-century, shifts to the political right have brought increasing privatisation of water corporations and the commoditisation of water as a commercial 'asset' or 'environmental service'. As long as freshwater is available, these factors have favoured growth in demands for water, rather than encouraging conservation. In poorer countries, alongside efforts to strengthen economic production, there remains a strong moral imperative to provide clean water supplies and sanitation to disadvantaged rural communities who still lack such basic provision. These aims are supported by the UN's Sustainable Development Goals (SDGs).

However, whether aimed at increasing societal wealth or meeting basic human needs, goals seeking to achieve development through economic expansion frequently conflict with those aimed at environmental conservation. The question for the water industry, therefore, is how to reconcile rising demands to serve human needs with an equally urgent but contradictory imperative to reduce the levels of water abstracted from ecosystems.

For a long time, governments and water supply companies around the world have clung to the notion that the achievement of water security is a technical problem that can be solved with sufficient engineering. Water infrastructures, such as the Alqueve Dam (Figure 3), have literally concretised this way of thinking, as well as realising, through

Figure 2 | Irrigation channel, Far North Queensland. Photo Veronica Strang.

Figure 3 | The Alqueve Dam, on the Guadiana River in southern Portugal, has created Europe's largest reservoir. Photo Veronica Strang.

giant dams and reservoirs, the aspirations of Nation-States (Bichsel 2016, Strang 2016a, 2020a, Thomé *et al.* 2016). But, as the severe problems outlined above demonstrate, simply imposing more material control over water flows does not lead to sustainable solutions, and may entail what Rodgers and O'Neill describe as 'infrastructural violence' (Rodgers & O'Neill 2012). Water infrastructures are societal desires writ large: they manifest dominant beliefs and values; develop ontogenetically in accord with these; and inscribe them on the material world. Being slow to change they leave infrastructural legacies that – as the building of giant dams and irrigation schemes has demonstrated – can be burdensome for future generations.

We need to consider this problem not just as a technical issue, but in social and ethical terms. Water infrastructures both express and form relationships, between governments and other agencies, water suppliers, and different groups of water users (Bichsel 2016). This brings into focus a reality that relationships within and between societies are often highly unequal, and the gaps are widening. There has been increasing concern about the many riparian communities and traditional lifeways displaced by major infrastructural developments, and the social impacts of such displacement and disruption, particularly as they affect women and minority cultural groups (McDonald-Wilmsen & Webber 2010). The response of the UN and other international organisations has been to try to ensure that under-represented 'stakeholder groups' are included in decision-making, and to advance a vision of sustainability that 'leaves no-one behind'. These are worthy aspirations as far as they go, but they do not go far enough. Rather than challenging conventional thinking, they aim, instead, to bring 'left behind' communities into the fold, i.e. into engagements with water that remain wedded to further growth and expansion.

MISSING IN-ACTION

There is an elephant in the room in most conversations about these issues, and that elephant is about to go missing. Just as water infrastructure expresses relationships between different human groups, it also manifests the realities of relationships between human and non-human beings. There is a disconnect between discourses concentrated almost exclusively on human aspirations, and those concerned with the well-being of non-human species and the ecosystems on which all living kinds depend. It is essential, of course, to address the social and material inequalities between people, but this cannot be done successfully without addressing the much greater inequality in human–non-human relationships, and the dominant assumption, in most societies, that human needs and interests must have absolute priority.

We already know – but still strive to ignore – the reality that overriding the needs and interests of other living kinds and ecosystems is not only morally questionable but fundamentally unsustainable. Environmental organisations have been telling us for years that biodiversity is fundamental to ecosystemic health, and this is a central concern in the SDGs aimed at conserving environments. Yet contemporary discourses about sustainability remain focused on providing or maintaining reliable water and food supplies for human populations, with largely tokenistic efforts to maintain 'minimal flows' to sustain ecosystems, or to protect diverse habitats. Thus, in the last century, the clearance of forests to expand farming in Queensland has endangered nearly a thousand native plant and animal species (Figure 4; Neldner *et al.* 2017). As the devastating worldwide extinction levels noted above make clear, such practices fall a long way short of vague intentions to 'do no harm'.

Discourses about resilience tend to obscure the depth of this problem, because they are largely concerned with human capacities to adapt to changing environmental conditions. Humans are generally good at making rapid

Figure 4 | The Common Eggfly Butterfly, Cape York, Australia. Photo Veronica Strang.

adjustments, although this is more difficult for place-based communities that rely on traditional lifeways. Some non-human species (urban foxes or baboons, for example) have also made impressive adaptations to radically altered environments. But the vast majority of non-human beings are not so nimble and remain reliant upon long-term, complex, and interdependent evolutionary relationships with each other and with particular material contexts. If the freshwater flows on which they depend are redirected into human activities, and their habitats and food sources disappear, they do not just get 'left behind', they go missing. As all of them uphold the viability of ecosystems, from the familiar iconic species right down to the smallest soil microbes, each extinction increases the risk of crucial tipping points leading to collapses of local, larger, and eventually global ecosystems.

BIODIVERSITY AND NON-HUMAN RIGHTS

The reality that a major loss of biodiversity represents real risks to humankind's survival is a powerful rationale for radical changes in practice, but this is not merely a matter of instrumental self-interest. There are also fundamental ethical questions, arising from a long tradition of scholarly debate whose roots run deep into the ancient world. The ideas of early Middle-Eastern and Greek thinkers burgeoned in the Greco-Roman Classical Era, floresced in medieval Europe, and bore fruit in subsequent scholarly endeavours. Natural philosophers raised questions about the nature of the world and the place of humans (and Gods) within it. The ethical questions at the heart of these ideas remain central in philosophical debates today. What constitutes a moral relationship between humans and the non-human world? To what extent do non-human beings (and living systems) have intrinsic rights: for example rights to a share of water sufficient for their needs?

Today, these longstanding scholarly questions underpin an increasingly lively international debate about 'ecological justice' (Baxter 2005, Strang 2016b, Schläppy & Gray 2017). This highlights ethical needs to protect non-human rights to water and food sources; rights to unspoiled habitats in which their reproduction is secure; and rights not to be sacrificed to human needs and wants. Conservation groups are pushing the UN to make a Declaration affirming the Rights of Nature (Global Alliance for the Rights of Nature 2018). Spurred by the efforts of environmental lawyer Polly Higgins, legal activists are demanding that the International Court of Criminal Justice should define ecocide – the destruction of ecosystems – as an international crime (Earth Law Centre 2018). Stemming from biologist Edward Wilson's Pulitzer Prize-winning manifesto (Wilson 2016), the Half-Earth Project is campaigning for half of the world's lands and seas to be returned to non-human species to ensure that they have sufficient habitat to sustain them.

> *With science at its core and our transcendent moral obligation to the rest of life at its heart, the Half-Earth Project is working to conserve half the land and sea to safeguard the bulk of biodiversity, including ourselves.*
>
> (Half-Earth Project 2020)

These debates raise vital questions about how humans engage with other living kinds, because the accelerating figures on species extinctions around the world make most societies' conservation efforts look like fiddling while Rome burns. The challenge facing the water sector, governments, NGOs, and others involved in water policies and practices is therefore twofold. How can we reduce the countervailing developmental pressures that lead to the catastrophic overriding of non-human needs and interests; and how can we raise to a meaningful level the extent to which the needs of other living kinds are included in everyday decisions about water use and management.

CULTURAL DIVERSITY

Anthropologists maintain that cultural diversity is as important as biodiversity in sustaining social and ecological well-being. For example, a major study of diverse cultural engagements with water conducted by UNESCO (Johnston *et al.* 2012) demonstrated that traditional societies' long-term relationships with their homelands provide deep understandings of local ecosystems, and that this intimate knowledge has often supported highly sustainable lifeways. Conversely, cultural diversity is vulnerable to a loss of what Johnston and Fiske describe as 'biocultural health': 'When water that sustains life, livelihoods, and culture is threatened, the cultural stability and diversity of peoples and their environment is also threatened' (Johnston & Fiske 2014: 1).

Aboriginal Australian lifeways offer an obvious example: although their subtle use of fire management changed the landscape, and there were some costs to megafauna, their traditional practices maintained social continuity and generally robust health in the delicate ecosystems of the continent for many millennia, in contrast to the devastation caused in the two centuries since it was colonised (Strang 1997). Another classic example is provided by anthropologist Stephen Lansing's research with rice growers in Bali. He described how local priests used the ritual worship of goddesses at water temples to lead community cooperation in a sophisticated system of hydrological management that sustained irrigated rice terraces and local ecosystems for centuries, until this sensitive engagement was overridden by externally imposed developments (Lansing 2007 [1991]).

One of the major advantages of ethnographic research is that anthropologists learn, from the communities with whom we work, many different ways of thinking about human–environmental relationships. Indeed, I would say that my own theorising, while it is indebted to many academic writers, owes as much to the elders in the indigenous groups with whom I have conducted research for many years, such as Kunjen elder Alma Wason (Figure 5). In this sense, the communities which have shared their knowledge and expertise with anthropologists over the last century are truly the co-authors of our disciplinary capacities to understand different human engagements with the world.

Figure 5 | Alma Wason at Igow (Hawk Story Place) on the Mitchell River, Far North Queensland, Australia. Photo Veronica Strang.

Many indigenous communities work collaboratively with anthropologists to address issues of joint concern. Anthropologists are cultural translators: they provide bridges between diverse local beliefs and knowledges at a local level, and at a meta-discursive level they link their specific ethnographic findings with comparative questions about human behaviour. For environmental anthropologists like myself, this means bringing accounts of diverse cultural engagements with water both into academic debates and into the activities of the water sector and other groups, such as the UN, seeking to develop robust water policies and practices (Strang 2017). In recent decades, civil rights and social activism have increased indigenous people's opportunities to participate directly in national debates, and digital technologies have transformed the capacities of their representatives around the world to compare notes, and to speak in international fora.

What could the water sector learn from alternate cultural models in its efforts to move in a more sustainable direction? The relationships that indigenous societies have with their environments are as diverse as their specific cultures, beliefs, and values, but there are several cross-cutting ideas that, very broadly, they could be said to share. One is a way of composing social identities founded on a sense of belonging in place, such that many indigenous people do not feel that they can ever be fully alienated from their traditional homelands. This conceptually permanent attachment leads naturally to a long view about engaging with local environments sustainably. For example, among the Aboriginal communities with whom I work in Far North Queensland, there is a recurrent theme in local discourses, articulating responsibilities for 'caring for country' for 'future generations', and valorising low-key levels of resource use and methods of ensuring that resources can be continuously replenished. While larger and more mobile societies cannot replicate these kinds of relationships with 'homelands', this suggests that focusing on pan-human desires to belong in place has considerable potential to encourage more sustainable practices.

Central cultural tenets about 'caring for country' lead naturally to critiques of the short-termist, exploitative modes of environmental engagement imported by colonial societies, and into determined political efforts to articulate alternate ideas and values. In South America, indigenous

peoples have stressed the need to protect 'Pachamama' (Mother Earth) to the extent that, following a referendum in 2008 which gained a 64% majority, this responsibility was written into the Ecuadorian Constitution:

> *This document establishes Pachamama as a legal entity for the first time in history, stipulating the right to an integral respect for nature's existence and for the maintenance and regeneration of its life cycles, structures, functions, evolutionary processes, and restoration … This reform challenges older paradigms of progress and development, and puts the idea of harmony with Pachamama on center stage. Pachamama is no longer seen as a set of natural resources to be exploited or as a chain of natural elements that comprise the environment and must be protected. The debate goes beyond this, and it intends to establish new ways of thought and living with a claim that nature has its own rights.*
>
> (Berros 2015: 1)

More recent examples to advance alternate values include strenuous efforts by indigenous peoples, allied with environmental counter-movements, to resist the imposition of an oil pipeline at Standing Rock in Dakota (Figure 6), and to prevent the expansion of the Tar Sands Gigaproject in Northern Alberta, both of which have major implications for local waterways:

> *The cultural heritage, land, ecosystems and human health of First Nation communities … are being sacrificed for oil money in what has been termed a 'slow industrial genocide' … The Athabasca delta has been completely altered from a pristine boreal forest, clean rivers and lakes to a devastated ecosystem of deforestation, open pit mines and a watershed where fish regularly exhibit tumors and birds landing on contaminated tailings ponds die instantly.*
>
> (Indigenous Environmental Network 2020)

Figure 6 | Protests by the Dakota Sioux and conservation groups against the building of an oil pipeline at Standing Rock. Photo Wikimedia Commons.

These impassioned protests bring to the fore one of the most important elements in alternate ways of thinking: their capacity to challenge the dualism that divides Culture and Nature in Christian and scientific models of the world. This dualism, and its assertion of human and patriarchal 'dominion' over Nature, shapes ideas about human–non-human relationships in most industrialised societies. A concept of Nature as 'other' makes it possible – materially, emotionally, and imaginatively – to externalise the costs of human activities to non-human 'others' and to override their needs and interests. Challenging such anthropocentricity requires a conscious effort to question assumptions that human needs must always come first (Kopnina & Shoreman-Ouimet 2015).

Such a sharp divide between human and non-human beings rarely features in indigenous lifeworlds. Boundaries are often permeable, with living kinds sometimes shifting, via rituals and altered states, between human and non-human form. Animals, plants, and other non-human beings and things appear as ancestral totemic beings, or as supernatural deities. They may be acknowledged as persons: thus, several rivers (the 'mother' Ganges in India, the Atrato River in Colombia, and most recently the Whanganui River in New Zealand) have been declared to be persons or 'living ancestors' with their own rights and interests. In effect, within indigenous models of the world, human and non-human beings do not inhabit conceptually divided realms but are part of a single world shared by all living kinds.

A third pillar in this kind of thinking is that the non-human world is not merely a passive object upon which human societies act: it is an active partner in events. It has its own agency and capacities to demonstrate power. For indigenous communities, non-human agency is often located within sentient landscapes. In Australia, this is manifested in beliefs that waterholes will dry up with grief when the elders associated with them die; or that water bodies, personified in Rainbow Serpent form, can swallow fishers or trespassers

who transgress traditional Law. There are 'increase rituals' communicating with totemic beings within the landscape to persuade them to generate desired resources. There is an abundance of narratives describing the multiple ways in which the non-human world both asserts itself, and reciprocally supports human groups in response to their care, and these serve to encourage respect for its agentive capacities.

In a more secular context, we are well equipped to consider the material properties and behaviours of non-human elements, and how these – in the case of water – can have major impacts upon communities, via floods and drought, or by refusing to be contained or controlled by the infrastructures that human societies impose (Krause 2011). However, although we might acknowledge this agency, and employ metaphors about a punitive or beneficent 'Mother Nature', we do not generally think of the non-human world in terms of active partnership.

It is easier to understand the agency of living kinds. Anthropology has a major body of literature that focuses on human–animal relations and how societies interact with different species. This deals with processes of domestication that range from economic practices, such as raising cattle for meat, to the complex interspecies relationships represented by family pets (Serpell 1996). Building on earlier work on totemism, which observed that animals are 'good to think [with]' (Lévi-Strauss 1964), there is also work on how societies categorise and think about 'wild' animals (Marvin 2011). More recently, as the discipline has become concerned with the implications of anthropocentricity, there has been a turn towards multispecies ethnography, seeking to imagine non-human lifeworlds (Haraway 2008; Kirksey & Helmreich 2010; Tsing 2015). But mainstream thinking continues to assume human dominion over 'dumb animals', and even the most sympathetic visions of stewardship locate humankind in a hierarchical and authoritative position.

Thinking about non-human agency from a new and more egalitarian starting point is important for two reasons. First, it foregrounds the reality that power relations are always central to our relationships with other species and the material world. Second, it provides a degree of recognition that what non-human species and elements do, and how they behave, is essential to the proper functioning of ecosystems. These are intrinsically self-regulating in ways that are extremely complex. A managerialist view, that humans should direct them, expresses considerable hubris and, as we have seen, often creates more problems than it solves. In essence, when societies overpower ecosystems by imposing human direction and displacing their normal processes of self-regulation, non-human needs and interests are not met, and neither, in the longer term, are our own.

Humans doubtless have some inherent tendencies to seek to control their environments in ways that favour their own interests: this is intrinsic to all living kinds. But with capacities to be reflexive this way of thinking is not a given. If we return to indigenous Australia, for example, Aboriginal Law discourages any significant impediment of established water flows, on the basis that this is intrinsically harmful to the well-being of a shared human and non-human environment. As with place-based communities in other parts of the world, this has led to expressions of deep disquiet about the building of major dams and irrigation schemes. Contemporary societies cannot – and would probably not want to – replicate, on vastly larger scales, the traditional lifeways of small-scale indigenous societies. But we can consider the beliefs and values that keep these societies oriented towards long-term, sustainable engagements with water and other resources. We can take on board their understanding that we are not separate from but, like all living kinds, intrinsically part of local and global ecosystems. And we can recognise the dangers of a hubristic desire to replace the complex self-regulation of non-human systems with infrastructural impositions aimed primarily at meeting human interests. This gives us a fresh starting point to 'think from'.

RE-IMAGINED COMMUNITIES

Working with culturally diverse visions of the world has enabled me to articulate some ideas that I hope will assist efforts to move towards more sustainable water use. In 1991, Benedict Anderson wrote what was to become an anthropological classic (Anderson 1991). *Imagined Communities* described how we envisage the social communities that compose our lives on a variety of scales. He considered how we are located in particular kin groups; in larger ethnic or religious communities; and within collective national identities. He observed that the work we do confers membership

of institutions, associations, and professional networks. Personal or familial interests in cultural or recreational activities provide communities with whom we can identify, as does, even in more mobile societies, our physical location in rural areas, villages, urban neighbourhoods, and cities.

This led me to consider the notion of a 're-imagined community': one that locates us not only in human social networks, but also within the larger communities of the non-human beings with whom we share local and wider ecosystems. This acknowledges that they have their own complex networks of interrelationships; that many interact directly with human communities, and that all of them are affected by the activities that take place in a shared material world. This is, in effect, a thought experiment: a deliberate conceptual repositioning of humankind, not separate from and in dominion over, but located squarely within a re-imagined community of all living kinds.

In accord with the indigenous examples cited earlier, I would include in this community not just other species, large and small, but water itself, and the ecosystems that it both constitutes and supports. Water is essential to life at every scale: within individual biological organisms, including ourselves, whose bodies are wholly reliant upon constant irrigation; and within the hydrologically interconnected local, regional, and global ecosystems that we inhabit. Thus, water is, like other living kinds, in need of reciprocal ethical engagement itself, while at the same time being literally essential to the achievement of greater equality and justice between other living kinds.

The relocation of humankind within a shared world invites different kinds of thinking about the decisions we make, including those that define how we engage with water. Rather than obscuring 'non-human others' and enabling the unthinking externalisation of the costs of our activities to them, it brings the non-human material world and its inhabitants into view, and demands, or at least encourages, consideration of their needs and interests. This focus on more inclusive and active conviviality – a positive capacity to live together – has obvious application in all areas of environmental engagement, as well as in efforts to achieve more sustainable ways of engaging with water.

In carrying this thought experiment into action, there are some constructive endeavours on which we can build. Integrated Catchment Management (ICM) or Integrated Water Resource Management (IWRM) were meant to bring together and balance social and ecological needs. Anthropologists have been critical of managerial models that dominate global debates and marginalise alternate cultural perspectives, and Orlove and Caton note that many describe IWRM as a

> … *hegemonic paradigm for discussing, legitimizing, and implementing policies regarding the management of the world's water resources, subsuming within it the notion of sustainability of 1970 and 1980s development discourses … Waterworlds must be studied ethnographically, in all their components, including the often-neglected waterscapes as well as the more commonly examined watersheds and water regimes.*
>
> (Orlove & Caton 2010: 408, 411)

Nevertheless, IWRM has challenged narrower techno-managerial models and has usefully encouraged interdisciplinary and cross-sectoral collaboration. It has also influenced developments in green engineering, introducing an underlying premise of 'working with' rather than merely 'acting on' local environments.

However, the models that remain dominant in the water sector, nationally and internationally, retain a dualistic vision that there is a separate and subject domain of nature to be 'engineered'. The UN High Level Panel for Water, established in 2016 to develop some new Principles for Water to underpin the Sustainable Development Goals, tried to ensure that different voices and alternate ways of thinking were heard in their discussions (UNHLPW 2018). Subsequently – and perhaps consequently – the World Water Development Report (United Nations 2018) focused on the concept of *Nature-Based Solutions*. While this clung to a familiar vision of nature as an alternate domain requiring human management, the concept of designing solutions 'based on' nature at least dipped a toe into the water in terms of appreciating non-human agency and the need to engage with it collaboratively (Strang 2020b).

If we were to continue in this direction, relocating humankind within a shared world; respecting the agentive capacities of non-human beings and ecosystems; and recognising a moral and practical imperative to uphold their rights and interests, where would this take us? We are not

short of information: we have the social sciences to elucidate human relationships with places and environments; the arts to illuminate what these mean to us; and the natural sciences to explain the evolutionary histories, and the material properties and the behaviours of the non-human world. What we are lacking is effective structural arrangements and processes that give sufficient weight to non-human needs and interests.

If we de-anthropocentrise our thinking and accept the notion of a single 're-imagined community' of living kinds, then it becomes possible to draw on the concept of democracy to ask how non-human needs and interests might be represented in decision-making processes. Although they have some processes of communication and collective decision-making (Gagnon 2015), and although we can sometimes 'read' their signals in basic terms, non-human beings cannot speak to us. If there is to be any meaningful form of what we might call 'pan-species democracy', other species must rely on human willingness to understand and represent their interests in good faith.

Here too there are some helpful indigenous models to consider. New Zealand's capacities to bring Māori perspectives into discussions are much aided by the Treaty of Waitangi (1840), which formed the country's founding document and enshrined a commitment to bi-culturalism. As noted above, for Māori communities, rivers are 'living ancestors', *Te Awa Tupua*, whose existence is indivisible from their own (Muru-Lanning 2016). In 2017, following the successful negotiations by its associated Māori *iwi*, the Whanganui River (Figure 7) achieved legal status as a living entity (New Zealand Government 2017). The notion of a river as a living 'ancestor' is not readily encompassed in Western thought, but it is not difficult to connect with if we consider a larger temporal frame. After all, like all living beings, humans share a deep evolutionary history with the first biological organisms to have formed in the Earth's ancient oceans. And the notion of a river as a 'living entity' is surely not incompatible with a scientific concept of 'living ecosystems'.

Figure 7 | The Whanganui River, New Zealand, achieved legal status as a living entity in 2017. Photo Wikimedia Commons.

The acknowledgement of the Whanganui River as a 'living ancestor' or 'entity' had powerful symbolic and practical effects. When it was declared to have the same rights as corporate 'persons', the related legislation created a new role, *To Pou Tupua*, that charged a Māori representative with the responsibility

- to act and speak for and on behalf of *Te Awa Tupua*;
- to promote and protect the health and well-being of *Te Awa Tupua*;
- to maintain the *Te Awa Tupua* register, which is a register of hearing commissioners qualified to hear and determine applications under the Resource Management Act 1991 for resource consents (a) relating to the Whanganui River and (b) for activities in the Whanganui River catchment that affect the Whanganui River; and
- to administer a contestable trust fund established to 'support the health and well-being of *Te Awa Tupua*' (Ibid: 57).

The role of *Te Pou Tupua* rests on a Treaty-based agreement between the Crown and the local *iwi* (Māori people) and *hapū* (families). Its key responsibility is 'to be the human face and act in the name of *Te Awa Tupua*' (Te Pou Tupua 2020).

Te pou o te whakatupua

Te pou o te whakatawhito

Te pou o Ranginui e tū nei!

The celestial post

The ancient post

The pillar of universal order!

It is a role requiring 'persons of high standing, recognizing both the importance of the role and the need to interact with Ministers and other agencies, iwi and hapū, organizations and communities at a leadership level'. It was decided that it would be comprised of 'two people forming one station' (Te Pou Tupua 2020) Thus, in November 2017 Dame Tariana Turia, a former Māori Party leader, and Turama Hawira, a leading cultural advisor, were officially inaugurated, for 3 years, into the joint role of *Te Pou Tupua* at a ceremony at Ngāpuwaiwaha marae in Taumarunui.

Carrying out the responsibilities of *Te Pou Tupua* means engaging with all of the groups, including local government bodies, whose decisions might affect the river and its communities, providing a voice for the river, and speaking for its interests in all of their deliberations. It also means administering the considerable ($30 million) *Te Korotete*, a contestable fund established with the intention of supporting initiatives for the environmental enhancement of *Te Awa Tupua*. It is thus a highly active role focused on protecting and promoting the interests of the River.

The role of *Te Pou Tupua* is actively supported by *Te Karewao*, a group 'established to advise and support *Te Pou Tupua* in the exercise of its functions', which can be convened 'as required and at the request of *Te Pou Tupua*' (Te Pou Tupua 2020). Its members are appointed by local *iwi* and *hapū*, and by the relevant local authorities, and in the first instance the group included a freshwater and ecology expert; a former local Mayor; and a specialist in environmental health and social welfare.

The Whanganui River shares some ecological issues with many rivers in New Zealand. A key activity is the generation of hydroelectric power, which has placed dams in the river's upper reaches. There are sizeable towns, Whanganui and Marton, requiring domestic water supplies. There is considerable abstraction for irrigating crops, fruit orchards, and pastures during New Zealand's long dry summers. The region supports a number of industrial activities: tanning, meat production, and pulp factories making wood products from forestry, all of which require copious amounts of water and may compromise its quality. There is dairy farming, one of the country's main industries, whose impacts – in a country with sometimes extreme rainfall – can include major run-off into waterways, of slurry, and of the fertilisers used to intensify pasture growth. Both can lead to excessive weed growth, loss of oxygen in the water, and harm to fish and other aquatic species. Tourism is another major industry, raising not only issues around water use and land development, but also questions about controlling access to culturally sensitive areas, and more fundamental social and political questions about who benefits from the use of river catchment areas. Those charged with the role of *Te Pou Tupua* have to consider all of these activities, while also reminding other groups that the well-being of the river and that of the human descendants of this 'living ancestor' cannot be separated.

On the other side of the Tasman Sea, a not dissimilar role is performed by Aboriginal elders to protect a sentient cultural landscape inhabited by ancestral beings. Without a foundational Treaty between European settlers and indigenous people, it has been a long and uphill struggle to establish Native Title rights, and to ensure that Aboriginal voices are heard in debates about land and water management. However, as noted previously, the first Australians have persisted in offering alternate ways to think about and engage with water.

In 1990, an indigenous community in Kowanyama, North Queensland, initiated the establishment of one of Australia's first river catchment management groups, the Mitchell River Watershed Management Group (Strang 1997). The group is still extant, as a not-for-profit independent organisation bringing together the various communities along the river. Its stated aims are to achieve

- a balanced approach to the use of the catchment resources; and
- sustainable and integrated management of the Mitchell River catchment area (MRWMG 2020).

The Mitchell River and its tributaries cross Cape York in a watershed area of 72,000 km^2, which is larger than Tasmania and contains a series of highly diverse bioregions. Its perennial environmental issues include invasions of non-native plants and animals; land degradation caused by cattle production on delicate soil systems; chemicals from old gold mines leaching into the waterways; pressures of a rapidly expanded tourism industry; and the overfishing of waterways and marine areas.

Explicitly, the MRWMG tries to address these pressing ecological issues, but there is an important subtext. The core aim of the Aboriginal community has always been to enlighten others about indigenous beliefs and values; to protect their homelands – and particularly their sacred sites – from exploitation; and to ensure that they are fully involved in discussions and activities relating to the management of the catchment area. The elders' involvement in the MRWMG enables them to support vital social aims, such as ensuring community employment in local conservation activities. It also allows them to persevere in representing traditional beliefs and values, and promoting sustainable, reciprocal partnerships with the non-human world.

SPEAKING FOR THE RIVER

How might water users and managers in larger societies ensure that the non-human world has a 'voice' in social and environmental decision-making? Lui and Ingildsen suggest that 'to succeed requires a paradigm shift from the traditional water engineering focused management to a systems approach involving multidisciplinary research between engineering and social science, economics and ecology' (Lui & Ingildsen 2020: 319). There is similarly broad agreement across the water sector, and related government bodies and NGOs, that major social and environmental challenges require multiple disciplinary perspectives. As the director of a research institute spanning the entire disciplinary spectrum, of course I support this view. But I think we need to go further.

My first point is concerned with how we bring different kinds of knowledge together to address water issues. Multidisciplinary projects often involve people working along parallel paths that do not necessarily intersect. Like the UN trying to bring together culturally and politically diverse stakeholders, merely corralling a range of disciplinary approaches can lead to contests to dominate the proceedings, or to indecision because widely differing perspectives cannot be reconciled. In all such multi-vocal endeavours, it helps if there is a shared goal and clarity in the project's objectives, but this is not enough, in itself, to ensure a coherent outcome.

I would suggest that there is a need to shift from multi- to interdisciplinary approaches. The whole point of interdisciplinary research is that it involves a genuine exchange of knowledges, such that it produces 'more than the sum of its parts'. Success depends on an ethos of generosity in encompassing different theories and methods, and a strong commitment to equality between disciplines (Strang & McLeish 2015). Just as cross-cultural translation helps to reconcile differences between human groups, interdisciplinary research seeks to find common ground between disciplinary specialisms. It therefore requires skills in facilitating interdisciplinary conversations and collaborations, and bringing diverse approaches together to develop effective solutions to shared problems. Such skills are not easy to find, but with funding councils encouraging interdisciplinary research, and developing better ways to evaluate it, there has been considerable capacity building in this area. More is needed.

Having worked with diverse groups in many river catchments around the world, I would also underline the point that while disciplinary expertise is important, so too are indigenous and local knowledges. Indigenous groups often have comprehensive lexicons of traditional ecological knowledge (TEK), and this expertise is increasingly being shared with natural scientists. This is not without its challenges. Anthropologist Julie Cruikshank, who works with Athapaskan and Tlingit groups in the Yukon Territory, describes the complexities of such collaborations, and the ways in which different knowledges often have to compete for legitimacy (Cruikshank 2005). This matches my experience of working with Aboriginal elders in Cape York. While they have engaged increasingly with other groups in co-managing the river, and have often shared their in-depth ecological knowledge with natural scientists, the social and political inequalities between indigenous communities and wider Australian society mean that the onus of translation, or 'talking the talk' as my indigenous collaborators put it, is often a one way street (Strang 1997). The river catchment group that the community in Kowanyama initiated uses language and concepts that are largely reflective of the mindset produced by IWRM, rather than expressing indigenous worldviews.

A similar tension dogs interdisciplinary research, in which participants from generously funded, high status STEM disciplines readily assume that their concepts and modes of expression should prevail, rather than giving equal space to social theory, or to ways of thinking located

in the Arts and Humanities. There are other forms of expertise to consider as well. Local groups – farmers, fishers, recreational water users etc. – also pay very close attention to waterways and can often provide detailed information about environmental changes over time. Attempts to engage with river catchment areas in new ways should also draw upon their expertise.

Tensions between disciplinary, cultural, and sub-cultural perspectives can only be eased with a conscious commitment to equality and respect for plurality: this requires real work and, as noted above, considerable generosity. But the rewards are there: successful interdisciplinary or intercultural collaboration, based on egalitarian exchanges of knowledges, can and should lead to truly creative and transformational thinking.

Similar issues of equality arise in relation to gender. While women have often held key responsibilities for water provision historically, they rarely occupy leadership roles in contemporary water management. Ecofeminists have suggested that, in sharing subordination to male power, and bearing most of the costs of environmental degradation, women are often more sympathetic to approaches that seek egalitarian forms of collective well-being (Shiva 1993; Mellor 1997). There is a great deal more that could be said about feminism and political ecology (Nightingale 2006), but the key point here is that debates about alternate forms of knowledge should not omit the ways in which gender is also implicated in issues of access, not only to water itself, but in the political and practical processes that decide its distribution.

My second point is more radical and concerns the non-human actors in this equation. I have already noted the importance of recognising that human–non-human relations are also power relations, and the urgent need to consider non-human rights and interests. Bringing different disciplinary perspectives, local knowledges, diverse cultural perspectives, and gender issues to bear on challenges relating to water is tremendously valuable. But if this collaboration remains inside the traditional thinking 'box' of managing and acting upon the non-human world in order to fulfil human needs and desires, it will merely produce more of the same failures to achieve sustainable engagements with water.

We need new structural arrangements and modes of engagement that create a very different balance of power. We need decision-making processes in relation to water that are guided by ethical tenets supporting pan-species democracy. We need to locate, at the heart of these processes, experts who understand different species and the materialities of ecosystems, and we need to give them an explicit, practical remit to articulate non-human needs, to speak for them, and to promote their interests. We need to make similar use of local expertise and TEKs. As with interdisciplinary research projects, we need to ensure that every catchment management group is not just a cacophony of competing voices, but has shared goals and objectives, and the capacity to exchange and integrate different perspectives.

In this way, alongside the social scientists articulating the needs and interests of the different human communities in river catchments, a range of disciplinary specialists, such as biologists, soil scientists, botanists, and local experts, could 'speak for' a representative cross-section of the wild and domestic plant and animal species that inhabit and depend upon the same aquatic ecosystems; and these voices would be heard. Such an approach would be applicable to many rivers, including the one I see flowing by as I write (Figure 8).

How might such an approach be operationalized? Any genuine shift in priorities to supply non-human needs for water can run head on into fiscal and political obstacles. In countries such as Australia, where over-abstraction for irrigating crops such as cotton and wheat has devastated river catchment areas, there are interest groups doggedly determined, at all costs, to protect the economic interests

Figure 8 | The River Thames in Oxford. Photo Veronica Strang.

of agricultural and pastoral industries. Changing this reality demands a robust combination of support for farmers whose livelihoods would be affected, and much stronger leadership then has emerged thus far to protect non-human interests. But the vital paradigmatic shift that is needed requires facing up to the reality that business as usual, with the casual externalisation of costs to the environment, is no longer an option. To reframe a well-known quote about education,[1] 'if you think sustainable engagements with water are expensive, try doing without them'.

What kinds of structures and processes could support inclusive and collaborative water management in a 're-imagined community'? There are already some useful mechanisms in place. Funding Councils worldwide have been moving steadily towards providing stronger support for interdisciplinary research, in particular that which engages local groups. There is surely potential for them to fund 're-imagined communities' pilot schemes that would provide national exemplars and encourage collective shifts in this direction. The water sector could also help with fiscal support. Where there are privatised companies, a small percentage of their profits could be directed towards enabling academic, indigenous, and/or local involvement in collaborative water management. In publicly owned water sectors, domestic and commercial water charges might feasibly include a small levy for this purpose.

There are already multiple links between universities, government agencies, NGOs, and industrial partners, including water companies. So, there is plenty of scope for further creative partnerships to support the participation of experts in regional engagements with water. Conservation work has already provided vital employment for place-based indigenous communities, and as we have seen, this readily includes direct involvement in caring for rivers. Many countries have long had 'citizen science' activities to monitor water flows and quality, and this is a model that could readily involve fishers, recreational water users, and other local experts in 'speaking for the river'.

The proposed scheme needs not be expensive: although it involves a great many different actors, it does not require them to take on major and time-consuming amounts of work. Expecting all of them to be directly involved in water management is not only unrealistic but also likely to produce 'too many cooks'. What is needed is a pool of expertise, a group of people appointed to speak for the human and non-human inhabitants of river catchments and for the river itself: a kind of Senate that would appoint and guide the activities of a smaller group responsible for enacting its decisions. Such a body might be led by a Chair with a role similar to that of the *Te Pou Tupua* established to speak for the Whanganui River. With agreed goals and principles of equality and inclusion, and sensible mechanisms for collaborative discussion and decision-making – in other words robust democratic processes – there is scope to guide local and regional engagements with water towards more sustainable outcomes.

It is also worth bearing in mind that what is being proposed probably involves less rather than more 'management'. Recognising non-human needs and interests implies a shift away from intensive instrumentality towards conscious support for collective flourishing and a greater capacity to allow ecological processes to thrive without human interference. Taking care of a re-imagined community might involve the active protection of habitats and waterways, for example in regulating the use of chemicals, preventing rapacious resource extraction, replanting riparian woodlands, or reforming wetlands. But it is also likely to mean replacing heavy-handed infrastructures with softer engineering, or none at all, with very different ontogenetic outcomes. In a cultural landscape supportive of pan-species democracy, infrastructural agency would shift away from the concrete impositions of human actors, to be relocated in the non-human infrastructures that are intrinsic to ecosystems. The major work needed, really, is that necessary for a change in mindset, to question longstanding assumptions of dominion and direction, and adopt new (and sometimes very old) ways of thinking about engagement with the non-human world in terms of partnership, respect, and conviviality.

CONCLUSION

We tend to think of 'communities' as being local, but one thing the global water crisis reveals very clearly is that

[1] 'If you think education is expensive, try ignorance'. The provenance of this quote remains contested. It is sometime attributed to Derek Bok, but also to Eppie Lederer, writing as Ann Landers.

living kinds are interdependent on every scale. A model of 'speaking for' the non-human members of re-imagined communities in river catchment areas could be scaled up from the grass-roots into regional, national, and international policy-making bodies, carrying pan-species democracy into the highest levels of governance. It could equally be top-down, representing enlightened leadership at these levels. The UN could respond to longstanding requests to make a Declaration regarding the Rights of Nature. The International Court of Criminal Justice could establish ecocide as an international crime. The International Water Association could produce a manifesto to encourage all of its members to think transformatively.

Such a fundamental shift would have the potential, at all levels, to influence the design and use of infrastructures, choices about levels of water abstraction and redirection, and the legislation designed to protect human and non-human rights. Revealing the cynicism of merely aiming for 'minimal environmental flows', it would make exploitative activities transparent, bringing to the fore who is receiving the costs and benefits of all developmental activities, and discouraging the externalisation of costs to any of the participants, human, or otherwise. It would help to replace short-term exploitation with planning for long-term water security for all catchment inhabitants.

There is thus a vital opportunity for the water sector to lead the way in doing it better rather than doing it more. Re-imagining communities, and giving a voice to all living kinds, is essential if human societies are to regain any capacity to conduct relationships with the world in ways that will sustain us all in the future.

DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

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