Re-Imagined Communities: a bioethical approach to water policy

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Keywords: Bioethics, water policy, human-environmental relationships, agency, materiality, identity, community

Abstract: Focusing on water as a connective material flow, this chapter reconsiders notions of community, agency and identity from the perspective of contemporary debates on bioethics and relationality. By articulating the fluid relationships between humans, non-humans and the material world, these debates critique dominant conceptual assumptions about Nature and Culture as separate domains. Such assumptions continue to underpin water policy and management, casting ecosystems – and their dependent species – as the subjects of human action, with generally poor outcomes for their well-being. The chapter draws on actor-network theory, philosophical ideas about bioethical relations, and analyses of materiality to propose a re-imagined model of 'community' that reintegrates the human and non-human, and opens up the potential for more reciprocal – and thus more sustainable – human-environmental relationships. In doing so, it proposes a new kind of 'participatory' framework for water policy development.

Current Directions in Water Policy

There is a classic Irish joke in which a visitor, asking for directions, is told mischievously "Well, if you want to get there, I wouldn't start from here." This chapter suggests that if we hope to develop policies that enable sustainable engagements with water, we should start from an analytic perspective that is substantially different from where we are now. It considers, in particular, the legacy of long-term adherence to a dualistic vision of Culture and

Nature, and its implications for human-environmental relationships. Classically, this dualism is seen as emerging from the European Enlightenment, and there is no doubt that this greatly contributed to its dominance. But, as I have noted elsewhere, the conceptual division between Culture and Nature has longer roots, in societies' earlier shifts away from 'nature' religions in which the non-human and human enjoyed more egalitarian notions of partnership, to increasingly humanized religions separating humankind from 'the other' and adopting a hierarchically superior position of 'dominion' (Strang 2014a, see also Plumwood 1993). This dislocated position 'outside nature' has engendered notions of the non-human as both object and subject of human agency, a view further entrenched by scientific capacities to deconstruct, explain and act upon the material world (Plumwood 2002).

As a central cultural concept, a vision of Nature as 'other' permeates every form of engagement with the non-human. This includes water policy of course, making it possible, for example, to position river systems as the providers of 'ecosystem services' to human interests. Such ideas are manifested in the instrumentalist languages and practices of 'development', 'resource management' and both legal and material 'environmental regulation'. The sustainability and well-being of the non-human is thus valorized primarily in terms of the utility (or pleasure) that it provides to humans, with predictably unequal outcomes. This is not a good starting position for human-non-human relations. So what would a more effective conceptual perspective on water policy look like? And how can we get there from here?

It is useful to begin with a brief overview of the key trends that have characterized human engagements with water over time, and to note that these have undergone significant intensification over the last 500 years and most particularly in the last century, during which time they have become very obviously unsustainable. Major issues include population growth and the rapid expansion of urban areas; concomitant intensifications in agricultural land and

water use; similarly expanded uses of energy and related environmental changes (including those affecting climate and rainfall); and the accelerating enclosure and privatization of land and water. All of these may also be said to depend upon a vision of the non-human and material world as the subject of human dominion, and all have had major impacts upon the world's fresh and saltwater ecosystems.

Thus, rapidly enlarging cities worldwide have created commensurately rising demands for urban water supplies (Richter et al. 2013) as well as pushing up demands for energy, the production of which also requires extensive use of water (a key relationship which is foregrounded in a recent *World Water Development Report* (2014)). In poorer countries, population movements (and in some regions, population growth) continue to present an urgent need for improved access to clean water and sanitation. Enlarging urban areas are increasingly in competition for water with the expansion and intensification of agriculture.[1] The pressures created by agriculture are further heightened by shifts to thirsty high-value crops and dairying, and consequent demands for increased irrigation, even in arid regions such as Australia (Strang 2009, 2013a, 2014b).[2]

These rapid expansions in water use have taken place against a background of (and contribute directly to) climate change[3] and increasing variability in the movements of water and weather, with related floods, droughts, and unpredictability in freshwater flows. Overriding discourses about water 'scarcity' and 'uncontrollability' have encouraged the building of ever larger and more disruptive dams and diversions, the aim of which is to increase the 'reliable' flow of water into human activities while also controlling and managing 'excessive' flows. Material processes of capturing and redirecting freshwater are

[1] The European Commission (2012, 5) notes that 90% of the river basin management plans of its member states "indicate that agriculture is a significant pressure in the basin, including diffuse or point source pollution by organic matter, nutrients, pesticides and hydromorphological impacts.".
[2] Richter et al. (2013) observe that cities such as Adelaide and San Diego are located in river basins where 90% of the water abstracted has been allocated to agricultural water users.
[3] The Intergovernmental Panel on Climate Change (2014) observes that about half of cumulative anthropogenic emissions of carbon dioxide between 1750 and 2010 have occurred in the last 40 years.

intimately connected to an equally important political trend: the enclosure and privatization of water 'resources' previously regarded as a common good (see Bakker 2003 and in this volume, Bollier 2002, Shiva 2002, Strang 2010, 2012, 2014c). Legal reforms enabling both material and social processes of appropriation have sparked conflicts over water ownership and control in many parts of the world (Albro 2005, Altman 2004, Cherlet and Venot 2013), intersecting with broader debates about the relationship between resource ownership, governance, and democracy (Busse and Strang 2010). The enclosure of water resources has also had highly inequitable outcomes, particularly in terms of gender and with regard to (or rather with a lack of regard for) the rights of indigenous peoples (Strang 2009, 2014b, see also Wilder and Ingram, this volume; Jackson, this volume; and van Koppen, this volume). This process has intensified with the globalization of instrumental notions of water as a commodifiable resource, disseminated via development and aid networks, and through the efforts of transnational experts in 'water management'.

These patterns are being manifested in every part of the world. Intensifying water use has contributed not only to global environmental change, including glacial retreat and its long-term implications for freshwater flows, but also to a range of more immediate pressures on local and regional freshwater ecosystems (Hahn et al. 2012, Hastrup 2011). Many river basins have critically low water flows, as well as reduced capacities to cope with flood events. The recent UN *World Water Development Report* notes 'clear evidence that groundwater supplies are diminishing, with an estimated 20% of the world's aquifers being over-exploited, some massively so. Globally, the rate of groundwater abstraction is increasing by 1% to 2% per year' (2014, 27). Surface and groundwater sources continue to be degraded by industrial and agricultural pollution, and more recently by new forms of coal and gas

extraction (Howarth et al. 2011).[4] These factors, along with continued agricultural expansion into wetland areas, have meant a critical loss or degradation of habitats for multiple non-human species worldwide. The IUCN has predicted that (on top of an alarming 'spike' in extinctions to date) the next 40 years will see the loss of 41% of the world's amphibians and 25% of its mammals, as well as all of its coral reefs (which support a quarter of the world's oceanic species, and provide the livelihood of approximately 500,000 million people) (IUCN 2014).

Water policy development therefore takes place within a conflicted arena. Habituated to an instrumentalist stance, it generally prioritizes responses to pressures to increase the quantity, quality, and reliability of freshwater available to meet human needs; to contain and manage water flows; to manage rising social and political tensions around access to and control of water; and to assist economic growth. Yet there is some recognition that an approach exclusively prioritizing human interests is neither ethical nor sustainable. Policy makers are expected, simultaneously, to enact legislation to protect ecological interests, to regulate access to water (via abstraction licences) and to penalize water polluters. Both public and privatized water suppliers make at least performative attempts to encourage efficient water use through price mechanisms, technical measures, and educational programs. Further efforts are made by governmental and non-governmental agencies to promote water conservation. In reality, the relationships between different agencies often mirror the conflicts made inevitable by such incompatible interests. Economic priorities in water use may prevail, but there is rising anxiety – reflected in constant efforts to develop more effective environmental policies – about societies' inabilities to address the ecological costs externalized in the process.

[4] There are ongoing concerns that fracking may result in the pollution of groundwater (see Smith 2014, Vengosh 2014). This question continues to be controversial: Davies and others suggest that the fracking itself is generally sufficiently far removed from aquifers that there will be no immediate polluting effect, but they are unable to be as reassuring regarding the potential for abandoned wells to leak in the longer term (pers. comm.; see also Davies et al. 2014.).

Awareness of these problems is expressed in the mission statements of the national and international bodies assuming responsibility for water policy. The UK Environment Agency, for example, states that the EU Water Framework Directive (WFD)

> is a major opportunity to improve the whole water environment and promote the sustainable use of water for the benefit of people and wildlife alike. A key piece of European legislation, the Directive rewrites existing water legislation into a new overarching programme to deliver long-term protection of the water environment and improve the quality of all waters – groundwaters and surface waters – and associated wetlands. (Environment Agency UK 2014, 1)

The directive states that it provides

> a basis for ensuring the long term sustainable use of water for people, business and nature. The WFD has incorporated into a legally binding instrument the key principles of integrated river basin management bringing together economic and ecological perspectives into water management… The WFD established a programme and timetable for Member States to set up the River Basin Management Plans (RBMPs) by 2009... The key objective of the WFD is to achieve good status for all water bodies by 2015. (European Commission 2012, 1)

However, the commission's own report observes that despite its efforts to "involve stakeholders", "good status will not be reached in 2015 for a significant proportion of water bodies" and that "hydromorphological pressures, pollution and over-abstraction remain the

main pressures on the water environment". The Commission has begun infringement procedures against nine member states, and notes "a missed opportunity for the sustainable development of economic activities under a framework of real integrated water management" (2012, 5). The European Environmental Bureau, a federation of over 140 environmental citizens' organizations based in EU member states, has been even harsher in its assessment. In a 2010 report that asked if the WFD was a "toothless tiger", it noted the Commission's own admission that "The actual percentage of water bodies meeting all the WFD objectives is low, in some Member States as low as 1%". Thus the EEB expressed "serious doubts over the effectiveness of the WFD implementation to change specific and well known unsustainable water management practices" (EEB 2010, 4).

Similar admissions of inability – or unwillingness – to protect the ecological health of river systems are evident elsewhere. In Australia, for example, a Coalition Government (which closed down funding for climate change research in 2013) removed the listing of the Murray River and its wetlands as 'endangered', and decided to put on the market 10 gigaliters of the water allocations originally bought by the Federal Government for environmental protection (Arup and Swan 2014, 1).[5] As the Commonwealth Environmental Water Holder David Papps noted:

> By all accounts, conditions for a sale of temporary water allocations in the Gwydir are favorable, with strong demand for water and high prices paid for other recent sales… My decision to enter the market corresponds with the introduction of robust governance arrangements including a trade framework, operating rules, procedures and protocols. These arrangements provide the necessary reassurance that the Commonwealth will

[5] The Australian Bureau of Statistics (2011) notes that 40% of the water abstracted from the Murray-Darling Basin in 2009-10 was used to grow cotton – one of the world's thirstiest (but most profitable) crops.

> buy and sell water allocations or entitlements in a responsible, fair, equitable, transparent and accountable manner (Australian Government 2014, 1)

In the UK, recent government support for fracking and the need for energy self-sufficiency and economic recovery have come into conflict with both academic and public concerns about the potential effects of shale gas exploitation on groundwater supplies and on the landscape more generally (Vengosh et al. 2014, Davies et al. 2014). In Canada, enthusiasm for the resources available through tar sand mining has superseded environmental groups' and indigenous communities' protests about its effects on groundwater quality and local ecosystems (Frank et al. 2014). In New Zealand, despite widespread anxieties about the effects of farming practices on river systems and water quality, the government has continued to prioritize the interests of an economically central dairy industry. In 2012 it also overrode Maori protests and legal challenges to push through a plan to semi-privatize water by selling off shares in the hydro-generation companies that control major water allocations (Strang 2014b).

It is these countries, however, that export to 'the developing world' their instrumental visions of water as an economic resource, their legal reforms enclosing the commons, and their expertise in the regulation and management of water flows (Arce and Long 2000, Edelman and Haugerud 2005). Transnational water corporations regularly send senior directors to encourage and assist poorer countries in reforming their institutional arrangements for water ownership and management. The most notorious example is that of Bechtel's prominent role in Bolivia's attempts to privatize "even the rain" (Bollaín 2010; see also Albro 2005), but one might also point to apparently more benign 'aid and development' international organizations, such as WaterAid, which is the charitable arm of Water UK.[6]

[6] This is the umbrella organization for the UK's water companies.

While addressing important needs for clean drinking water and sanitation, such organizations have also carried to all corners of the globe highly instrumentalist approaches to water policy and management, as evidenced by the continued commitment to major dams in India, Latin America, and China, and their adoption of increasingly neoliberal ideologies in relation to water (see Cruz-Torres 2004, Khagram 2004, Lahiri-Dutt and Wasson 2008, Mosse 2005, Mosse and Lewis 2005).

Looking at these long-term trends and the related patterns of decision-making, it seems fair to say that, although contemporary water policies have achieved some limited ecological improvements, they are generally failing to provide a counterbalance to much weightier social, political and economic pressures within human societies. While subaltern groups and wider counter-movements continue to critique prevailing ideologies and practices, they have not persuaded governments to do more than mitigate (rather minimally) the most extreme effects of spiraling resource use, economic modes in which 'growth' is seen as intrinsically good, and continued externalization of the costs of current water use practices. In effect, we are now in a position in which aquatic ecosystems and non-human species in almost every part of the world are losing out to human demands for freshwater. How did we get here?

Conceptual Divergence

Water policy has emerged from culturally and geographically specific social and economic practices, including earlier forms of land and water use, ideologies about governance and ownership, and shifting societal relationships with the material world. There is no space here to explore the historicity and complexity of these multiple factors. However, as I implied at the outset, a particularly critical turning point in many societies' beliefs, values, and practices seems to have occurred with the historical establishment of Judaeo-Christian ideas about

human (and patriarchal) ‘dominion’ and ‘stewardship’. This introduced into human-environmental relationships a fundamental divergence: a dualistic vision of Culture and Nature, in which humankind and Culture were repositioned as being separate from and hierarchically above Nature and the non-human ‘other’ (Harrison 1999, Strang 2014a).

Early ideas about dominion were more fully affirmed by the development, particularly in Western societies, of Enlightenment-inspired visions of ‘rational’ human Culture (or at least rational *male* Culture), as opposed to irrational (and feminized) ‘Nature as subject’ (Ortner 1976, Plumwood 1993). This categorization had particular implications for water, which was cast as the ultimate manifestation of primal (female) Nature (Tvedt and Oestigaard 2010). In the more secular intellectual discourses leading up to the present, although humankind was included in a universal scientific vision of the natural world (Vivieros de Castro 2004), this unequal dualism pertained, and dominion was further enabled by scientific and technological advancements that significantly enlarged human societies’ intellectual and physical control of the material world. This shift is particularly evident in the history of water technology, which readily illustrates how the development of increasingly sophisticated ways of controlling water has been central to the emergence of more instrumentalist relationships with the environment (Strang 2014a). Increasingly, with the globalization of scientific and political discourses, culturally diverse ways of engaging with water have been displaced or overlaid by a more homogenous techno-managerial view of water, which largely assumes that water policy is primarily the remit of science and scientific practice (see Illich 1986, Linton 2010). This march towards reductive instrumentalism appears to have led to not only a categorical alienation between human and non-human beings, but also to ineluctably differential valorizations of their interests.

Dualistic concepts and values are manifested in the structural arrangement of knowledge, discourse, and practice. C.P. Snow’s well-known commentary about the schism

in the academy between the social and natural sciences (1959) drew attention to a structuration that is mirrored almost universally in the division of governmental (and non-governmental) agencies into those that deal with 'economic' or 'social' issues and the arts, and those whose task it is to protect 'Nature' and the 'environment'. Despite efforts to paper over this widening chasm with 'triple bottom lines' and 'integrated catchment management', water policies (and environmental policies more generally) inevitably reproduce this conceptual and practical division.

It is worth highlighting the critical importance of discourse in framing and thus shaping policy development. Historical notions of 'dominion' are echoed in the term 'policy' itself which is intrinsically indicative of a directive role.[7] Conversations about policy center heavily on other directive terms: 'governance', 'regulation,' and 'management'. Any graze through policy documents is a journey through ideas about 'strengthening infrastructure' and 'response strategies', and 'customers' who will support instrumental aims through 'participatory approaches to management' and 'participatory irrigation'. One of the most important influences on water policies in the last two decades has been the language – and its related values and assumptions – about the 'environmental services' or 'ecosystem services' that rivers will 'provide to' societies.

Thus, in his foreword to the *World Water Development Report 2014*, Ban Ki-moon notes that "Water and energy can drive economic growth and improvements in human health. They are enablers for poverty reduction, job creation, women's empowerment and human well-being in general" (United Nations 2014, iv). He expresses the hope that the report "will point the way towards a more integrated approach to these challenges and towards water and energy solutions that work for all the world's people" (ibid.). The premise that the environment will "work for all the world's people" (ibid.) to meet global [i.e. human]

[7] Middle English *policie,* government, civil administration; Latin *polītīa,* polity; Greek *polīteía*, citizenship, government, form of government. Random House Dictionary, © Random House, Inc. 2013.

demands for water and energy provides an underlying and largely unquestioned assumption to all of the sections of the report. And with its focus on the "water energy nexus" (United Nations 2014, 13), and improving infrastructure to "catalyse growth" (p. 48), the report perpetuates, uncritically, an ideology that growth and development are intrinsically good and that 'nature' is there to support such human prowess. Thus, UNESCO Director-General Irina Bokova's accompanying message both promotes 'sustainable development' while further removing notions of water as a common good, either for human or non-human beings:

> Energy has always been seen as 'big business' compared to water, benefitting from strategic investment, while water remains still too often perceived as a 'gift of nature', as a public good and human right… Sustainability calls on us to bridge human rights and dignity with economic and social growth, and this must start with getting right the interdependence between energy and water. (United Nations 2014, v)

Such reports undoubtedly have many worthy and practical aims, but they also communicate and enact a particular standpoint: a vision of human management of the material world and assumptions about the primacy of human interests. It is from this standpoint that it is possible to embark upon the intensely managerial approaches that characterize contemporary engagements with water and the wider material environment. And it is from these assumptions that choices are made about what is prioritized, and what is not. So, while there is no shortage of political rhetoric valorizing ecosystems, aquatic species, and other elements of water in Nature, as well as a plethora of weak and/or inadequately enforced regulations to protect them, it is clear from the outcomes that the actual value attached to non-human interests in contemporary societies falls far short of what it would take to ensure their long-term sustainability.

What kinds of paradigmatic shifts would produce realistic efforts to encompass their needs? For the 'green' and animal rights movements, and for conservationists more broadly, this is a matter of ethics: we should simply give greater value to the needs and interests of the non-human, and respect the rights of other species. This position has had some influence on water policy, most particularly in encouraging legislators to devise purportedly protective regulatory measures, but it does not provide an explicit theoretical foundation for a genuinely sustainable mode of human-environmental engagement. In general, water policy development continues to be informed by superficially integrative notions such as the 'triple bottom line', intended to reconcile social, economic and environmental interests. However, without the capacity to address more fundamental relational issues between the human and non-human, it has been unable to do more than mildly ameliorate the exploitation and degradation of aquatic ecosystems. On the basis that theory forms and is manifested in practice, it is plain that we need conceptual models that support a more genuinely integrated approach, and there have been calls for more radical reconceptualizations from a range of writers on human relations with water (see Johnston et al. 2012). I would like to suggest a related set of theoretical approaches that might provide more coherent support for water policy development.

Conceptual Redirections

In the last several decades social theory has undergone an important shift from structural forms of analysis to more fluid visions of human and non-human processes. Emerging from feminist theories and post-modern critiques of structuralism in the 1970s, theoretical analyses – in all areas of social science – have become more dynamic, more processual and more relational in their approach. Actor Network Theory (ANT) has been influential, with Latour (2005) emphasizing that the focus should be not on human and non-human actors themselves,

but on the interstitial connections between them (see also Bakker and Bridge 2006). The intricate entanglement of human and non-human/material processes is similarly foregrounded in Science and Technology studies (STS) (Law 2002, Mol 2002). One of the most important aims of this 'ontological turn' has been to introduce a new bioethic that challenges ingrained conceptual dualism and its assumptions, and provides less anthropocentric theories of human-environmental relations.

Although sometimes lacking ethnographic grounding, these approaches have proved useful in highlighting the dynamic processes through which humans, non-humans and technologies intersect. A more grounded approach is offered by work on material culture and on cultural land and waterscapes, which has similarly observed that personhood and identity are encoded in things and places, as well as in non-human species (Bender 1993, Carrithers et al. 1985 Carrithers et al. 2011, Carrithers 2000, Lambek and Strathern 1980).

It is worth detouring slightly to underline the point that such theoretical advances have benefited considerably from the exchanges of knowledge between ethnographers and indigenous societies. As I have argued previously (2006a), the highly integrative worldviews that pertain in many place-based communities have exerted an important influence upon conceptual developments in anthropology. Early critiques of Nature-Culture dualism were often inspired by ethnographic research demonstrating that many smaller, place-based societies do not frame their ways of being in the world in these terms (Descola and Palsson 1996, Ingold 2000, Moran 2006, Strang 2005, Strathern 1980).

Indigenous worldviews are not only more intellectually holistic; they also demonstrate consistently more egalitarian and reciprocal human-environmental relationships (Dove 2006). Although the efforts of 'green' groups to valorize indigenous communities as exemplars of sustainability have been criticized by right-wing writers as "romantic" (Hames 2007), this should not obscure the reality that place-based communities have regularly demonstrated

deeply affective attachments to the places in which they live and to the non-human inhabitants of those places, engendering commensurate commitment to the long-term sustainability of both. Australian Aboriginal communities are typical in this regard, their traditional relations to their homelands being characterized by inalienable connections to place; by a vision of a sentient landscape and totemic beings working in partnership with human communities; and by the strong valorization of sustainable land- and water-use practices (Strang 1997, 2009). They and other indigenous societies persist in trying to uphold these lifeways despite the tsunami of colonization and the trauma of being subsumed within larger, more instrumentalist industrialized societies (see Blaser et al. 2004).

Though large-scale societies cannot replicate indigenous lifeways or practices, such communities do provide useful examples of more integrative conceptual approaches to human-environmental relations. Thus, my own thinking in this regard has been greatly influenced by working with indigenous Australians, who, as well as adhering to sustainable practices, are informed by a worldview providing a beautifully coherent example of 'thinking with water'. This perspective allows them to consider how social and material processes, both human and non-human, are collectively encompassed in the hydro-theological movement of spirit and matter through space and time (Strang 2013b, 2015).

A Connective Flow

Researchers theorizing human relations with water have benefited particularly from the reality that water is "good to think [with]" (Lévi-Strauss 1964), enabling a clear sense of the interconnections between all participants in local, ecosystemic, and planetary processes.[8] Its

[8] I am referring here to Levi-Strauss's well-known observation that "animals are good to think", which usefully articulated the notion that humans cognitively employ the things and processes with which they are surrounded to formulate interrelated ideas and values (1964: 89). The idea of similarly 'using water to think', has some major predecessors: examples include Heraclitus' comment on the flow of time, in which he famously observed that "one cannot step in the same river twice" (535-475 BC). Henry David Thoreau observed that "Life in us is like the water in a river" (1854: 247).

material properties and behaviors are distinctive. It has a fundamental evolutionary role in enabling the development of multicellular organisms (Helmreich 2009), and it continues to irrigate the cells of all forms of organic life. It flows between them, carrying nutrients and removing waste; and it is the basis of all the chemical solutions upon which biological life depends.

The movements of water, whether on a molecular or planetary scale, demonstrate the same capacities of fluid transformation from one form to another (and back again) (Ball 2010). Thus water 'behaves' consistently in every physical environment (Strang 2005, 2015). It has been recognized throughout human history, and cross-culturally, as the substance most essential to biological 'life' and to the production and reproduction of things and persons. It has been employed with similar consistency in the human imagination: to envisage spatial and temporal concepts of flow, connection, circulation, and inter-relationships among all forms of organic life. Notions of flow are similarly central to anxieties about pollution, floods and droughts. Such concepts have readily informed scientific theories about hydrology and ecology, enabling thinking about interconnected cycles and systems.

Human cognitive processes also rely upon the transposition of conceptual models from one frame to another, in what Bourdieu called "scheme transfers" (1977). Notions of bodily health and its 'proper' flows and circulations are readily transposed to thinking about ecosystemic balances and well-being. Thus, Australian (and other) water policies aim to maintain at least a minimum of the 'environmental flows' necessary to maintain functional levels of biodiversity in aquatic ecosystems (Bunn and Arthington 2002). 'Thinking with water' similarly enables multiple metaphors about circulation and flow in social, knowledge and economic systems (Bachelard 1994, Chen et al. 2013, Lakoff and Johnson 1980, Strang 2004).

The fluid and connective properties of water have therefore been employed imaginatively to develop more holistic theories about human-environmental relationships. For example, this kind of thinking inspired Vernadsky, in the 1920s, to compose the idea that all living organisms inhabited a 'biosphere' (1986). In a more contemporary context this vision of a living planetary system translated into Lovelock's concept of Gaia which – fully expressing the hubris of modern instrumentalism – cast humankind as the brains of the operation (1987). More modestly, McMenamin and McMenamin (1994) suggested that, as all land-based organisms first emerged from the sea, and remain connected by an irrigating flow of water, they comprise a single organic 'hypersea' (see also Margulis and McMenamin 1992, Margulis and Sagan 2007). Such fluid theorizations challenge established dualistic boundaries between human and non-human beings, and – equally critically – between things and persons.

Although water illustrates the connective flows between human bodies and the social and material world most clearly, there are of course many complex flows and behavioral interactions of matter, of all kinds, in micro and macro-cosmic processes: in bodies, ecosystems, and at a planetary scale. Similarly fluid theories enabled Ingold (2007) to describe human participation in a "generative flux" of events; led Bennett (2009 and 2010) to envisage "vibrant matter"; and allowed Tsing (2004) to consider the world in terms of collisions and "friction". Whatever assumptions about human primacy prevail, non-human beings and the material world are both subjects *and* participants in the processes through which human-environmental engagements are enacted.

Alternate Agencies

Theories highlighting the reality that social and material processes are dynamically co-constitutive inevitably raise issues of agency, providing a spectrum of possibilities on the

extent to which non-human agency is acknowledged. At one end of this spectrum lie positivist assumptions of Nature-Culture dualism, in which, although non-human agency is not wholly absent (appearing for example in concepts of 'primal' nature), the non-human is largely seen as the object of human instrumentalism. At the polar opposite lie über-bioethical positions which, though useful in foregrounding the agentive capacities of the non-human, risk obscuring the major imbalances of power inherent in human societies' capacities to visit major anthropogenic effects upon all of the Earth's ecosystems. It is perhaps most useful to adopt a view of multiple and shifting forms of agency in which humans and non-humans engage dynamically, and on a variety of scales. Thus, the actions of species in small numbers or small material changes may have little impact on humans, while larger-scale events can exert considerable pressure; and human agency may be considered at individual, group, institutional, societal and pan-human levels.

There is a rich anthropological literature on the ways in which human agency is materially expressed, for example through art and material culture (e.g. Morphy 2010, Knappett and Malafouris 2008), and in relation to landscapes (Bender 1993). Such approaches also permeate research on resources and of course water, and there are key historical texts specifically linking the control of water to social and political agency and power (Wittfogel 1957, Worster 1992). Gell's observation that technological developments "prosthetically" extend human capacities to act directively (1998) is readily applied to things such as dams, pipes, channels and the other material culture through which water is redirected to serve human interests.

Acceptance that things and persons are involved in multiple processes of co-constitution returns us to the realization that this is by no means a one-way street. Non-human species and material things have agentive effects, and though this observation remains

controversial for some[9], it is gathering increasing acceptance as a form of 'agency' (see Chen et al. 2013, Coole and Frost 2010, Tilley 2007). As I have noted elsewhere (Strang 2014c), this does not imply that things have intentionality or sentience, although clearly non-human beings may be said to possess it in varying degrees. It is more an acknowledgement that the properties of things provide them with capacities to act upon the world, with the obvious example being the capacity of a waterway to cut through landscapes, irrigate wetlands and, in escaping the bounds of human control, carry away people and houses.

Some acknowledgement of non-human agency is implicit in the natural sciences, which describe the physical properties and actions of things. In relation to water policy, these understandings intersect with an important discourse about 'risk management' in which notions of 'resilience' are imputed to human groups and ecosystems alike (see Crate and Nuttall 2009). Examples of this vision abound in water policy literature (see, for example, the United Nations 2014 and IPCC 2014), and express – at least implicitly – the uncertainty and dynamism inherent in the balance of agency between humans and non-humans. However, although this perspective does go part of the way towards thinking about agency and relationality, it remains hidebound by a vision of Nature-Culture dualism in which human instrumentality is seen as a continuing attempt to manage the vagaries of 'the other' through risk-reduction strategies (such as flood defenses) and further exploitation of the non-human is justified, optimistically, by supporting ecosystemic 'resilience'.

Here, too, anthropological research with indigenous societies has provided illuminating ideas about human/non-human relations. Some influential early studies provided insights into belief systems in which people retained ideas about totemic beings, in the form of animals and other non-human species and things, as an integral part of social life (Leach 1967, Lévi-Strauss 1964). Ethnographies described societies in which totemic ancestral

[9] The major anxiety is that acknowledging the agency of the non-human constitutes a form of *faux* animism or implies intentionality (see Pels 1998), but this is avoided with a more precise definition of agency, as a capacity to act, which lies closer to its Latin root *agere*, to act or to do

beings inhabited – and composed – a sentient landscape with powerful agentive capacities to nurture local clans through the provision of resources, to withhold these from trespassers, or to punish those who flouted ancestral laws. These accounts reveal a clear vision of fundamentally reciprocal human/non-human partnerships (Strang 1997).

Such partnerships have also been elucidated through research on human-animal relations (Bulmer 1973, Edelman 2002, Serpell 1996). This work has illustrated, for example, how pets are readily regarded as persons and/or kin, and how the social lives of animals are intertwined with those of humans (Creager and Jordan 2002, Fuentes 2010, Knight 2005, Noske 1989, 1997). A related area investigating plants examines their long history of 'domestication' as well as their symbiotic relationships with humankind (Castree and Head 2008, Head and Atchison 2009). Although this work has tended to maintain a focus on human perspectives, it has also served to challenge assumed conceptual divisions between Nature and Culture.

A theoretical shift in standpoint to consider the position of subaltern elements in this equation takes such thinking further. Of particular relevance are recent theoretical developments experimenting with "interspecies ethnography" (Haraway 2008, Kirksey and Helmreich 2010). Arising directly from debates about bioethics and relationality, these represent a deliberate effort to de-anthropocentrize contemporary models of human-environmental engagement (Chen et al. 2013). Such endeavors have benefited considerably from collaborations between researchers in the 'human' and 'natural' sciences: for example, anthropologist Stefan Helmreich's work with microbiologist Ed DeLong shed useful light upon microbial-human relations (Helmreich 2009). Other anthropologists (including myself) have drawn on the work of scientists able to deconstruct the material properties of water, hydrological and geological processes, and the biological realities of non-human species (Ball 2010, Strang 2015).

By considering the social and physical processes through which non-human[10] species engage with the world and with humankind, bioethical approaches attempt to make imaginative leaps into alternate – i.e., non-human – phenomenological experiences (Hayward 2010, Lowe 2006 and 2010). As there are obvious limitations to the capacities of other species to communicate their experiences (at least to humans), this is perhaps best described as a 'thought experiment'. But it has proved useful in foregrounding the lives of 'the other' and, in so doing, challenging both the centrality and dominance of humankind in a shared lifeworld. Most importantly, it grounds at an ethnographic level the more abstract ideas promoted by Actor Network Theory and STS, and builds theoretically on the more conventional work on human-animal relations to enable fine-grained studies of the interrelated lives of human and non-human beings.

Re-imagined Communities

What I would like to propose here is taking these developments a step further, by bringing grounded 'interspecies' work together with theories concerned with material agency (e.g. Coole and Frost 2010, De Marrais et al. 2004, Tilley 2007). As noted at the outset, it is demonstrably the case that in many – possibly most – parts of the world, human water use practices have largely overridden the agentive capacities of ecosystems, and it is equally clear that most societies continue to exert increasing managerial pressure in this regard. This reality often serves to obscure the other 'half' of this relationship. What I therefore hope to draw attention to here (without making a regressive move to environmental determinism) is the material agency – the participative, co-constitutive role – of water, resources, soils, crops, vegetation, climate, weather, and topography.

[10] I am aware that some proponents of this theoretical approach prefer the term 'more-than-human'. This makes a useful ethical point in challenging the normalization of hierarchical relations implied by 'non' or 'other than', but creates a different conceptual problem in reversing the hierarchy. I am therefore employing the more familiar 'non-human' throughout this chapter.

Despite the multifarious efforts that human societies make to direct water according to their interests, water remains particularly intractable. It leaks and escapes containment; it evaporates; it erodes and undercuts technologies of impoundment. At times, it gathers sufficient force to overthrow human agency completely, dissolving boundaries and overwhelming people and their technologies of containment and control. More than any other element, it exhibits the power of the non-human and provides regular reminders of why it is cast symbolically as the primal, chaotic id of the material world (Jung 1968). On a more everyday basis, water's material properties act formatively upon all of the other things and persons through which it flows as fluid, steam, or ice. At every level, matter, organisms and environments are hydrated or dehydrated, cleansed or polluted, shaped, or dissolved by water.

Similarly formative capacities are held by all materials. Every physical element has a role in a dynamic set of processes that affect other materials as well as the lives of human and non-human species. For example, recent research has elucidated the multiple capacities of minerals and resources. Boivin (2004) discusses how the properties of minerals affect their use, as well as the meanings associated with them . Tilley (2004: 17) foregrounds the recursive nature of phenomenological experience, citing Merleau-Ponty's argument "that there is a fundamental relation of unity between the perceiver and the perceived." Harman (2009), describing the building of a tunnel, notes the necessity of understanding how rock will "behave"' (see also Boivin 2008, Harvey and Knox 2010).

The analytic approach of these authors is readily extended to consider the agentive role of soils, topography and climate. And by bringing this perspective together with those highlighting the agentive capacities of non-human species – microbes, plants and animals – this theoretical lens directs the gaze away from a vision of human Culture acting upon physical Nature. It offers instead a picture of a simultaneously social and material world

inhabited by multiple life-forms and things acting upon each other, with water flowing through and connecting them all.

Supposing, then, that we adopt a theoretical model which takes for granted that, while human activities almost invariably dominate events, the non-human species and things in every shared lifeworld have a role to play, through agentive capacities of various kinds that connect relationally not just to human activities, but to the multiple processes through which social and material systems are reproduced. What would this look like? How would it describe relationships between human and non-human species, and between things and persons? And how would it treat these as active participants in a shared, non-bifurcated system?

Superficially, such an approach might look like systems theory, and it certainly builds on the principles of such approaches (Murphy and Stoeger 2007). However, there are major differences: first, it extends the ethnographic account to give a much more nuanced and comprehensive view than is achievable through reductive modelling methods (though there is obvious potential for collaborative engagement with these). More importantly, by providing deeper insights into non-human and material realities, it offers a non-anthropocentric view of the consistent behaviors generated by their particular properties and characteristics. Through this deeper appreciation of their role, they become visible as non-human actors in the complex systems in which they participate. In this sense, they acquire 'social' identities, and, instead of merely providing a 'natural' background for a portrait of a human group and its activities, compose a fluid 're-imagined community' in which humans, non-humans, and material processes engage with each other relationally.[11]

In my own ethnographic research focusing on river catchment areas, conducted primarily in Australia and the UK, I have considered how water connects human, non-human,

[11] For those unfamiliar with this work, this is a reference to (and an extension of) Benedict Anderson's influential text 'Imagined Communities', in which he considered how human/national communities are conceptualised (1991).

and material processes of production and reproduction. Thus, in south-east Queensland, I have described how the topography, hydrology and soils of the Brisbane River valley interact with domesticated and undomesticated fauna and flora, and with the various commercial, recreational and domestic activities of the valley's human inhabitants (Strang 2006b). Similar work on the Mitchell River in north Queensland has entailed closer engagement with indigenous land and waterscapes, considering the more extreme hydrological realities of wet and dry seasons, the socially and materially disruptive effects of mining, and the increasing use of this area for recreational activities (Strang 2009). In both cases, this work links local events with wider systemic processes: climate change, national and increasingly international economic flows, and the variable mobilities and changing demographics of the human populations.

However, to carry out really fine-grained research with bioethically comprehensive 'communities' is a large task, best conducted by collaborative interdisciplinary teams. Although there have been numerous attempts to introduce greater interdisciplinarity into water policy development, these have been rather half-hearted. The most common tendency has been to try to inject social data into analytic models composed by the natural sciences. Thus we see the emergence of 'social hydrology', in which – rather than engaging with the complex theories of the social sciences – hydrologists and ecologists attempt to reinvent these in familiar reductive and thus (perceptually) more malleable terms (Di Baldassarre et al. 2013, Sivapalan et al. 2012). This involves, for example, inserting 'key variables' of human behavior into agent-based models. While this may be heuristically useful, such reduction limits the potential for the real exchange of knowledge and understanding that more in-depth interdisciplinary engagement could provide (Barnett and Di Napoli 2008, Barry and Born 2013, McLeish and Strang 2014).

Such engagement requires less compressive methodologies: ways of bringing different datasets into conjunction without condensing their meaning, so that they remain able to 'speak to' each other and artciulate their interrelationships. One might look, for example, at collaborations between anthropology and archaeology, in which usefully layered accounts of cultural and historical landscapes have been provided by GIS-based data management (Gosden 2014). There is good potential to extend these kinds of approaches to map the populations and behaviors of non-human species, plant distributions, soils, and of course, hydrological flows.

This suggests that water policy development might benefit from two key changes. First, there is a need for a much more determined shift to equal, balanced and (literally) meaningful interdisciplinary collaboration. This must move beyond mere 'talking across the divide' to real intellectual exchange between social and natural scientists. Second, this work needs to start from a different intellectual location, requiring the employment of a theoretical model that similarly reflects the multiple components of a shared human and non-human lifeworld. Openness to 're-imagining communities' could provide not only a fresh starting point for water policy, but also a developmental direction that could put the humane back into human-environmental relations before it is too late. Certainly, as diverse species continue to blink out of existence at an accelerating rate, a more inclusive approach to community is needed.

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