Deliberating intergenerational environmental equity: a pragmatic, future studies approach

Matthew Cotton

Lecturer in Sustainability

Sustainability Research Institute

School of Earth and Environment

Maths/Earth and Environment Building

University of Leeds

Leeds

LS2 9JT

UK

Tel: +44 (0) 113 3436411

m.cotton@leeds.ac.uk

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Abstract

Across the applied ethics literatures are a growing number of ethical tools: decision-support methodologies that encourage multi-stakeholder deliberative engagement with the social and moral issues arising from technology assessment and environmental management processes. This article presents a novel ethical tool for deliberation on the issue of environmental justice between current and future generations over long time frames. This ethical tool combines two approaches, linking John Dewey's concept of dramatic rehearsal - an empathetic and imaginative ethical deliberation process; with the methodologies of backcasting - a type of scenario planning technique drawn from the future studies literature. The proposed hybrid 'Deweyan Backcasting' approach combines a creative process of devising multi-stakeholder visions of potentially desirable futures, with practical evaluation of the technical, social and political networks necessary to make such futures happen. It is suggested that such a model can provide a fruitful means for evaluating intergenerational environmental equity issues in long-range policy and planning.

Keywords: Intergenerational equity, environmental pragmatism, ethical tools, John Dewey, Dramatic Rehearsal, backcasting.

Introduction – the problem of intergenerational environmental equity

One of the great challenges within environmental ethics concerns how to protect future generations from harm, risk, resource depletion and pollution, and how to maintain ecological integrity over long periods of time. Ethical environmental governance involves the careful balancing of the short term, often anthropocentric interests of political actors with the needs of future citizens and non-human entities. Simply put, it is necessary in the formulation of ethically robust environmental policy, to deeply consider the future, and the social and ecological conditions that are created through current actions. For simplicity, I group these issues together under the umbrella term of intergenerational environmental equity (hereafter IEE).

The notion that political actors alive today should protect the welfare of future citizens and preserve environmental quality by reducing their impacts on natural resource use, biodiversity and the pollutants they emit, has gained prominence in light of increasing public awareness of long-term and potentially high impact environmental risks. From the development of modern agricultural, industrial and technological economies, significant contingent environmental risks have emerged in a broad range of air, land and water-borne pollutants, anthropogenic climate change, resource depletion, biodiversity loss, and the long-term management of hazardous chemical and radioactive wastes. Consequently the issue of safeguarding the natural environment for future posterity has gained increasing political significance, particularly in light of transnational commitments to a sustainable development framework that "meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (WCED, 1987).

In policy terms, assessing future generational interests tends to revolve around how to allocate capital and natural resources now whilst anticipating on a trans-generational timescale

where future harms and benefits may occur. In ethical terms, environmental policy-makers must question whether it is right to use resources to prevent potential harms in the future when more immediate benefits can be realised by utilising the same resources to alleviate current harms within society (Okrent and Pidgeon, 2000). Under conditions of scarcity and uncertainty, a balance is often struck between so-called intra-generational benefits - for example building hospitals, constructing safer roads or clean water sources, against strategies to minimise intergenerational risks such as those involved in the mitigation of anthropogenic climate change. This process of weighing up alternative courses of action encounters problems when trying to assess, firstly, the distance into the future to which our moral obligations lie (Beckerman and Pasek, 2001; Groves, 2009), secondly, how to manage uncertainty (Shrader-Frechette, 1993; Skagen Ekeli, 2004) and identify future generational interests when individual needs (or indeed future individuals themselves) cannot easily be identified (Carter, 2001; Johnson, 2003; Parfit, 1981), and thirdly, how to develop the right tools and capabilities with which to evaluate distributive outcomes across time (Norton, 2005; Page, 2007). As Barry (1997) suggests, we as a society are now accustomed to thinking about relations among contemporaries and have sophisticated apparatus for conceptualising and mitigating environmental inequality within the context of short term relations between existing political actors; what is lacking, however, are equally sophisticated apparatus to assess future generational interests and hence mitigate intergenerational inequality.

Intergenerational inequality implies a lack of reciprocity across the time frames of technological and resource use benefits that occur now to the present generation, and the contingent, long-term environmental harms that result in the future. Although many intergenerational environmental risks stemming from societal and technological advancements are now inherent and unavoidable (e.g. biodiversity loss or the managing industrial legacies of

long-lived hazardous wastes), environmental planning and risk management based upon current and future technological development and land-use change must be an ethically robust political practice.

The issues of IEE have arisen and been discussed extensively within the environmental ethics and economics literature, variably from: rights and duty-based (Elliot, 1989; Hiskes, 2005), virtue (Gaba, 1999; Sandler, 2004), justice-as-fairness (Gower, 1995), welfare utilitarianism (Schwartz, 1979), cost-benefit (Spash, 1993), non-declining capital (Solow, 1993) and discounting (Schelling, 1995; Wolf, 1996) perspectives and analyses. However, rather than weighing-up the validity of each of these normative approaches, I consider the problem instead in terms of meta-ethics and methodology. I argue for an explicitly pragmatist conception of the problem, suggesting that evaluating IEE requires a mechanism for diverse public actors to imagine and deliberate upon future peoples' interests in a democratic context, where agreements must be reached between stakeholder actors with competing moral values. Such a method must explore the technical and political challenges, social and environmental impacts, weigh up the relevant evidence and make long-term political decisions that benefit (or at least mitigate obvious harm to) the future natural environment and its inhabitants.

This pluralist, pragmatic and democratic form of ethical assessment requires some justification, and in the following section I outline some of the relevant debates in in the environmental ethics literature. Following this, I turn to John Dewey's work on ethical deliberation and then the methods of participatory 'backcasting' – a tool emerging from the future studies literature that is used by policy-makers to imagine future scenarios and to deliberate on the means to bring them about. I then draw the two together and examine how this 'ethical tool' can be applied, using a hypothetical nuclear power case study to illustrate its use in practice.

Ethical monism and environmental pragmatism

Since the late 1980s philosophical pragmatism has made a resurgence within the environmental ethics literature. The establishment of this relatively new environmental pragmatism stems from a recognition of the complex and uncertain nature of new threats that the world faces, and a sense that these threats require practical action informed by, but not substituted with philosophical deliberation (Light and Katz, 1996). This philosophical doctrine contrasts with much of the early work in the field of environmental ethics. Following Leopold (1949), White Jr. (1967), Rolston III (1975; 1981), and Routley (later known as Sylvan, 2003); those such as Taylor (1986), Westra (1998) and Callicott (1999; 2002) have advocated a reconstruction of ethical theory in holistic, and non-anthropocentric terms. The distinctly monistic, non-anthropocentric ethics of these philosophers emerged mainly in response to the dominant utilitarian and econometric valuation methodologies that reduce nature to the resources used by self-interested humans. Together they have established the foundations of a novel ethics for and of the environment, rather than simply applying one or more of the established 'off-the-rack' normative theories (deontological, utilitarian or justice-as-fairness etc.) to real-world environmental problems in a manner common to many other applied ethics disciplines.

Though much of the groundwork in environmental ethics was concerned with delineating the intrinsic from the instrumental valuing of nature, this has in turn raised criticism by advocates of value pluralism. Rather than seeking a unified metaphysical theory of environmental ethics, the value pluralists seek instead to manage the interrelated, web-like structure of both anthropocentric and non-anthropocentric values that are brought to bear by

human actors upon environmental problems (Eckersley, 2002). In general, value pluralists propose the means to navigate various economic, ethical, religious, metaphysical and aesthetic values that stem from public discourse on environmental management and to find common ground between these conflicting axiologies. To do so pluralists seek to move beyond theorising a coherent value of nature, shedding the assumptions that it requires a single form of intrinsic and non-anthropocentric value and that there is a single measure of value through which we can arrive at policy choices (O'Neill, Holland and Light, 2007). A number of such value pluralists have, to varying degrees, identified themselves as environmental pragmatists, and the writings of Light (2003), Weston (1985), Norton (1996; 2005), Minteer, (2001), Wenz (1999), Parker (1996) and Rosenthal (1994) have been influential in establishing this trend within the discipline.

Though the environmental pragmatists do not speak with a single voice, they do share a general commitment to drawing out the practical value of philosophical deliberation whilst paying attention to a broad range of heterogeneous environmental values and valuation techniques. The goals of environmental pragmatism are both philosophical and methodological. As Light (2004) suggests, philosophers of the former variety apply the theories of the classical American Pragmatists such as Dewey, Mead, Peirce and James, to modern environmental concerns, and the latter focus upon the enhancement of the political and advocacy roles of environmental philosophers and the shaping of environmental policy through persuasive argument and democratic means.

Situated within this pragmatist tradition, this article has both philosophical and methodological facets, concerned both with the application of Dewey’s ideas around ethical deliberation, and the reformulation of decision-making processes, procedures and methodologies (Norton and Steinemann, 2001) to foster arguments which are morally

motivating and politically persuasive (Light, 2002) to those engaged in long-term environmental management. I suggest that a turn to the mechanisms of public deliberation on the ethical dimensions of IEE may foster both a philosophically robust and politically persuasive assessment that would aid decision-makers in considering future generational interests and long-term environmental protection within the context of the deliberative turn (see Dryzek, 2000) in democratic decision-making over environmental matters .

John Dewey and environmental ethics

With the resurgence of pragmatism in environmental ethics, a number of philosophers (notably McDonald, 2004; Minteer, 2002; Norton, 2005; Ott, 2010) have turned to the philosopher John Dewey both to provide insights into environmental valuation and ecological justice based upon individual experience and experimentation; and in presenting the means to foster democratic institutions and mechanisms to resolve environmental problems. In this article I turn specifically to Dewey's work in the domain of meta-ethics, and show how his insights can be applied in practice to the evaluation of IEE in environmental policy.

Dewey's ethics contrasts with the dominant normative theory frameworks of deontology and utilitarianism, and also that of Callicott's non-anthropocentrism. Dewey asserts that ethics must begin *in media res,* with the lived experience, not in disembodied cerebration - deciding which action is derivable from ultimate principles (Fesmire, 2003: 28). He asserts that deciding what is right involves two inter-related processes. The first is to establish *moral empathy* - the capacity for the individual to move beyond self-centred thinking in order to imagine oneself as another person. Empathetic reasoning involves the individual seeking to comprehend another's interests, needs, beliefs and aspirations. The ethical decision-maker must

feel not just sympathy for the plight of those affected by the decision, but must imagine what it is be one of those affected. The second facet is *Dramatic Rehearsal* - the imagining of a plurality of possible futures that could be created through current actions, alongside the means to bring them about. The underlying ontology of dramatic rehearsal involves, "faith in the power of intelligence to imagine a future which is a projection of the desirable in the present and to invent the instrumentalities of its realization" (Dewey, 1917). It is a deliberative process of ethical reflection, which Dewey believed suitable for scientific, affect-laden or moral situations in which there exist competing desires and values, or elements of uncertainty. The goal is to imagine complex, 'thick' descriptions of possible futures, involving competing possible lines of action and courses of conduct, followed by a deliberative process involving imagination, creativity and emotion (Dewey, 1922). As a form of deliberation, Fesmire (1994b) articulates that:

> "Dramatic rehearsal is the hunting phase of any situation (scientific, aesthetic, or moral) involving doubt. We survey a problematic scene and forecast the consequences of alternative scenarios for thinking and acting. We do this in search of a path that will integrate competing desires and restore equilibrium to our experience."

Dewey's model of creative deliberation is dramatic in three ways: firstly, through its concern with character - with the manifestation and interaction of personalities; secondly, through its concern for plot - for creative descriptions and new narratives; and thirdly, in its suspenseful and open-ended nature (Caspary, 2000: 113-14). Dewey also emphasises how *habits* influence the process of dramatic rehearsal by marking out viable courses of action. He argues that it is the operation of habits that that holds our acts together and constitutes character. Character

allows one to integrate the possibilities of the present by using the experience of the past as we make choices. However, we do not choose our habits. The deliberations associated with empathy and dramatic rehearsal are shaped and structured by our use of shared cultural metaphors. These shared metaphors influence how we comprehend and adapt to our environment. They condition our sense of who we are, the ways in which we relate to others, and the formulation of solutions to moral problems (Collier, 2006; Johnson, 1993).

Dewey encourages reflection upon the intellectual habits through which we interrogate moral problems, because failing to do so will allow the metaphors that underpin our thinking and imagining to come to us mechanically, up to the point where we can no longer free ourselves from their influence upon us (Fesmire, 2003). It is here that moral imagination plays a role. In practice, Dewey's dramatic rehearsal represents a contextualist position in ethical evaluation; in that the 'drama' stems from the situational and contextual reflection that occurs from the agent's point of view, rather than a god's eye point of view (Lubling, 1999) - the individual draws up a scenario and 'tries on' potential courses of action from the reference of their lived experience, rather than applies a rule or moral constraint to the potential course of action. When the imagined outcome is 'felt' to cohere with the expectations of the future, the deliberative process is resolved (Dewey, 1922; Fesmire, 1994a). The moral judgements implicit in the process of dramatic rehearsal involve a delicate balance of context, evaluation, projection of moral standards and imagination. Moral empathy and imagination are intrinsically linked. Imagination is essentially an affective facilitating process that influences moral reasoning. A highly developed moral imagination allows the individual to perceive the nuances of a situation, challenge the framework or scheme in which an event, action or process is embedded and explore how it might be different. Moral imagination helps one to disengage from the particularities of a process or decision, and to evaluate the underlying mindset, hence

encouraging one to think creatively within the constraints of what is morally possible (Werhane, 2002).

By focussing upon empathy and imagination, dramatic rehearsal avows procedural rules or constraints to action. McVea (2007: 376) contends that this model contrasts with the rational, calculative models of decision-making that tend to involve the identification of alternatives, the estimation of advantages, disadvantages, costs and benefits; followed by the offsetting of these against each other in estimating which alternative is most advantageous or least harmful overall. The concept of deliberation grounded in personal experience and elaborated through moral imagination forms the core of the dramatic rehearsal process as a form of ethical reflection and evaluation. The question then becomes one of how the deliberative tenets of Dewey's reflective procedure can be practically applied to the political processes of long-range environmental governance.

The concept of ethical tools

Within the applied ethics literatures are a growing subset of specialised "ethical tools": specially formulated policy instruments used to support debates and deliberative structures for systematic engagement with ethical issues in environmental management and technology implementation (Beekman and Brom, 2007: 4). Ethical tools are, as Forsberg (2007: 456) suggests, "…judgement aids that help justify value choices without recourse to substantive theories or value systems of limited scope". They are decision-support methodologies designed to aid the choice between different courses of action, policy options or practices, based upon an evaluation of ethical criteria and a range of moral perspectives. Examples include the Ethical Grid (Seedhouse, 1998) based in the 'act deontology' normative ethical tradition, designed to

support professional practice in healthcare decision-making by considering a range of normative ethical perspectives alongside social and legal concerns. The Ethical Matrix differs in that it is grounded in 'principlism' – assessing a range of 'common sense' ethical perspectives and their interaction with a range of stakeholder actors in agricultural and environmental contexts (Cotton, 2009b; Forsberg, 2007; Kaiser and Forsberg, 2001; Mepham, 1999; Schroeder and Palmer, 2003). Similarly, the Ethical Delphi (Millar, 2007) and 'Reflective Equilibrium' workshops based upon Rawls's concept of iterative assessment of ethical judgements and normative principles (Cotton, 2009a), are both designed to support ethical assessment in policy-making through processes involving sequential rounds of dialogue between relevant policy actors and the public. This variety of available tools necessitates a toolbox of deliberative decision-support techniques, and so evaluative studies such as the BioTA project (Kaiser et al., 2004) have shown how multiple ethical tools can be implemented to aid group-based deliberative assessment of differing ethical issues arising from complex decisions. It is proposed here, that a Deweyan approach could be added to such a toolkit.

Though each of the aforementioned tools has been used in deliberative assessment of ethical issues in their respective fields of inquiry, none has been applied specifically to the issue of IEE. One significant approach to the discussion of IEE is Norton's adaptive ecosystem management structure (Norton, 2005), which shares a number of similarities with the Deweyan model presented here. Norton, drawing upon Peirce, Dewey, Carnap and Habermas, conceptualises sustainability in largely linguistic and procedural terms. He articulates an ideal speech situation in the Habermassian vein, and details the structures, mechanisms and institutions by which environmental policy debates can be negotiated whilst reducing competition between conflicting environmental values in an iterative, convergent and stepwise manner.

In relation to issues of IEE, Norton suggests a community-led environmental valuation across multiple temporal scales. He notably frames the problem through Leopold's challenge to 'think like a mountain' (Leopold, 1949), interpreted as a multi-scalar approach to imagining environmental change over time. Whereas the dominant anthropocentric, consumptive and individualist values of humans exist on short temporal scales (product cycles or election cycles), thinking like a mountain involves understanding environmental change across multiple time scales. So an economic decision may involve forecasting over 0–5 years, whereas understanding ecological dynamics and species interactions may be over a scale of 200 years, and physical, geological systems over tens of thousands, millions or billions of years. Doing so requires an imaginative and empathetic concern for ecosystem change which unfolds across different spatial and temporal scales. As Norton understands values as emerging at different scales of the system of interactions between humans and nature, these scales can be separated, thus reducing competition between them (Norton, 2005: 220).

Norton's approach has relevance to the model I outline below, as not only do I similarly base the locus of environmental values in multi-actor, community-based assessment, but also suggest that the means to achieve IEE involves building the mechanisms that allow a plurality of perspectives to emerge in the assessment and resolution of conflicting values through an imaginative and empathetic reflective process. To achieve this in practice, I propose a turn to the processes and methods of *backcasting* to provide a fruitful 'tool-based' approach for ethical evaluation by approaching the deliberation of future environmental change at different scales, through dramatic rehearsal.

Backcasting

The methodologies associated with the field of *Future Studies* are pertinent to the discussion of IEE given their focus on exploring and analysing future social, environmental and technological change. Clearly within a pragmatist framework, there is value in drawing upon the methods and practices of this field in exploring novel solutions to environmental change that will have purchase on policy and practice, given their common use in scenario building and sustainable development planning. Broadly speaking, the methods of future studies are concerned with answering one or more of three types of question:

Predictive - what is going to happen?

Explorative - what could happen?

Normative - how can a certain goal be attained?

Typically, both public and private sector organisations plan for the future predictively, using *forecasting* methods to project current economic or technology development trends forwards. These methods then identify so-called 'problem trends' which can then be 'corrected', based upon what is 'reasonable' within current standards and available knowledge and technologies (e.g. is it reasonable to implement 40% of energy from nuclear power by the year 2030?) (Dreborg, 1996). Forecasting fails as a long range planning solution in situations of high social and technological complexity, however, because predicted trends become increasingly uncertain the further into the future they are projected. It also fails when underlying trends act as barriers to implementation of social and technological change.

The concept of *backcasting* by contrast, addresses these issues of uncertainty and complexity, and explicitly deals with the normative aspects of long-range planning. Backcasting emerged from the literatures on technological forecasting in energy policy, in relation to the

concept of 'soft energy paths' (Lovins, 1976), and provided both an alternative methodology to traditional forecasting, scenario and planning methods, and also a critique upon the values inherent within forecasting approaches (Robinson, 1982). Like Dewey's ethics, it concerns how desirable futures can be imagined and attained, and the degree to which undesirable futures can be avoided or responded to. It adopts a normative stance based on implicit moral considerations, where future desired conditions are envisioned and steps are defined to attain those conditions, rather than taking steps that are merely a continuum of present methods extrapolated into the future. It is, in essence, teleological. It works backwards from a desired future endpoint to the present in order to determine the physical feasibility of that future and what policy measures would be required to reach that point (Robinson, 1982; Robinson, 1990). Dreborg (1996) asserts that backcasting methods are particularly useful in resolving highly complex problems, when there is a need for major change, when dominant trends are part of the problem, and when the scope and time-horizons are wide enough to leave room for diverse alternatives. The aim is not prediction, but to assist decision-making (especially for the long-term) under uncertainty by considering a variety of different scenarios to help in identifying the 'possibility space' of the future (Banister, Hickman and Stead, 2008). Its concepts relate to the context of discovery rather than to the context of justification, in the sense that its aims are to enable problem structuring rather than problem-solving (Dreborg, 1996). Backcasting is therefore less a specific methodology and more a paradigm of future studies, involving a variety of potential methods, including a potential *Deweyan Backcasting* approach.

In practice, backcasting methodologies have become increasingly participatory in recent years, involving and adapting multi-stakeholder design processes and methods such as scenario workshops, consensus conferences or citizens panels. This is due in part to the overlapping goals of backcasting methods and sustainable development objectives, in the sense that it is the

construction of a desirable (i.e. socially and environmentally sustainable) future that is the ultimate goal, and in both the backcasting and sustainable development literatures there is a call for tools to evaluate and construct that future. Backcasting methods have been applied in a range of environmental policy problems, examples include transportation infrastructure (Geurs and van Wee, 2004), river basin management (Tansey et al., 2002), or renewable energy technology development (Mulder and Biesiot, 1998).

Though no single methodology exists, Quist and Vergragt (2006) suggest five sequential steps commonly employed in backcasting exercises:

Strategic problem orientation;

Construction of sustainable future visions or scenarios;

Backcasting;

Elaboration, analysis and defining follow-up and (action) agenda;

Embedding of results and generating follow-up and implementation.

They then divide these stages with associated methodological tools: distinguishing *participatory* tools and methods for involving stakeholders and generating and guiding interactivity for vision and scenario construction, from *design* tools and methods to elaborate and detail systems and processes; *analytical* tools for assessment of scenarios and designs, e.g. consumer acceptance studies, environmental assessments and economic and stakeholder analyses; and *communication* tools for shaping and maintaining stakeholder networks in the implementation of the backcasted future (Quist and Vergragt, 2006). It is the category of participatory tools for future scenario construction that this article principally aims to address.

A Deweyan Backcasting approach and a nuclear power example

Participatory backcasting commonly employs normative scenarios which are then fleshed out through stakeholder dialogue to assess their feasibility and social implications. In traditional backcasting analysis, future visions are interrogated primarily using analytical tools such as cost-benefit analysis, consumer surveys or environmental assessments. These techniques are used to identify process bottlenecks, economic and policy barriers. What I suggest is that a backcasting tool can instead begin from a position of examining the shared cultural metaphors used to describe and dramatise the current and future environment, societal development and technological change. This involves a modification of the traditional techniques of brainstorming and scenario building which are commonly utilised in a multi-stakeholder context by groups of representatives from NGO, industry and community actors, by reframing the imaginative deliberation along the lines of dramatic rehearsal. This involves adapting scenario analysis techniques to build shared visions of desired futures by facilitating multi-stakeholder deliberation over past *habits*, followed by discussion of the shared cultural metaphors of technological progress and environmental management that precede the imagination of future societies at different temporal scales. In practice, this transposes Dewey's concept of deliberation as an internal reflective process on the future implications of personal actions, to a form of group deliberation, involving shared dialogue, knowledge and negotiation in the context of a broadly Habermassian deliberative democratic exchange.

IEE issues are grounded and contextualised first of all through multi-party deliberation over past decisions. In essence the goal is to consider the organisational and political actor 'habits' of the past – the entrenched roles, path-dependent technological choices and implicit

moral values that have led to the production of current and future environmental harm. The deliberation then moves sequentially to an explicit consideration of the visions of society that past decision-makers believed they would create by implementing technologies and environmental management practices that led to current environmental injustices. In practice, it is possible for stakeholders involved in backcasting participatory workshops to recreate the decision processes of others by assuming different perspectives on the possibilities open to them – those that were available to them in their context, those that reasonable agents may be assumed to believe that they had, and those that they actually believed themselves to have (Collier, 2006; Kekes, 1991).

Here I present a practical example of building new nuclear power facilities, as this illustrates the problems of the long-term planning mechanisms necessary to ensure environmental justice across generational time frames, given that both the risk bearing attributes of long-lived radioactive wastes and the ways in which nuclear power debates are increasingly framed in terms of the long-term climate risk implications of maintaining fossil fuel based electricity sources.

A Deweyan Backcasting analysis in this context would begin with an examination of the timelines of past nuclear development. In a practical stakeholder workshop context, this would involve the input of technical and historical expertise. Stakeholders including representatives of potential nuclear site communities, are presented with balanced scientific, historical and policy information in order to facilitate a grounded and contextually accurate discussion of past events. This may involve simply providing presentations and information packs with prepared materials, or could potentially be more interactive where discussants question or cross-examine experts in the manner of a citizens' jury (Armour, 1995).

In the nuclear example the discussion would then move to the technical strategies,

policies, social and moral values implicit in past decisions to implement nuclear power and an empathetic and dramatic recreation of past decisions. What is important to note, is that it is not necessary to insist upon a totally historically accurate or technically sound recreation of past decisions, the emphasis is upon creating a background context in which to discuss the implicit cultural and moral values inherent in the decisions that took place, speculating on an empathising with those decision-makers. This is in order to project how the present could have been different if other options were chosen, and how this affects equity between past generations that benefitted from nuclear power generated electricity, and current generations that are now responsible for decommissioning nuclear facilities, managing stock piles of fissile materials and safely disposing of long-lived radioactive wastes. The deliberative process is explicitly imaginative. By drawing upon knowledge of technological and environmental policy history, stakeholder actors can recreate (through role-play for example) past decisions, and through facilitated group dialogue imagine the social, political and moral context of why past decisions led to present environmental harms. Stakeholders can then use this as the basis to imagine themselves as 'future people', drawing a sense of place within a timeline of technological development and environmental degradation.

To illustrate, participants could consider, in the UK context, how in 1940's energy production was critical to rebuilding the post-war military and economic infrastructure. With the prospect of coal shortages and the political prestige derived from producing nuclear weapons, the post-war Labour government directed nuclear activities towards twin goals of weapon's manufacture and power generation, leading to the construction of nuclear reactors together with facilities for fuel production and reprocessing. The consideration of the future generational impacts of nuclear power thus begins by deliberating upon the cultural, political and socio-economic context which led to the construction of the Windscale site, which is now known as

Sellafield, and the prototype Magnox nuclear reactor called Calder Hall at Windscale in 1953, which created the UK's (and World's) first nuclear power station to provide commercially produced electricity (DTI, 2005). Then participants can reflect upon and discuss the factors that led to continued nuclear development throughout the 1950's with further Magnox stations, followed by the advanced gas-cooled reactor technology (AGR) beginning in 1964 (to succeed the earlier Magnox gas cooled stations) and the subsequent growth of commercial nuclear power generation that provided both electricity production and plutonium for weapon production (Simmons, Bickerstaff and Walls, 2007). The technological development processes consisted of Government monopoly of the nuclear industry, close ties between weapon production and civilian electricity generation that shrouded nuclear technologies in Government secrecy and the simultaneous public rhetoric of technological optimism that led to continued commercial nuclear expansion (see Blowers and Pepper, 1988). Also issues should be discussed around the continued failure to find a publicly acceptable site for a radioactive waste deep geological disposal facility, and the deepening public distrust in radioactive waste management organisations (such as the former Nuclear Industry Radioactive Waste Management Executive – Nirex) resulting from the political context of failed siting processes for the geological disposal of wastes, and how this led the UK Government to implement the Managing Radioactive Waste Safely process that involved a more participatory and stakeholder-oriented decision-making from 2001 (CoRWM, 2007; Rawles, 2004).

In this brief example, there is a rich vein of cultural and moral metaphors that shaped environmental policy processes and technological development. The development of the domestic nuclear industry had significant ramifications for international relations, hazardous waste regulation and environmental protection. It fundamentally changed the communities in which nuclear reactors were sited, creating as Blowers suggests' (1999) peripheralised

communities, dependent upon the industry which are later stigmatised as nuclear dumping grounds, causing psychological stress to those later burdened with the legacy of wastes (Gregory and Satterfield, 2002). In the dramatic rehearsal of these past decisions, multiple actor roles can be imagined from ministers and nuclear engineers to coal miners, community residents, campaigners and military officials. Issues such as early technological optimism over 'electricity too cheap to meter', the perceived social benefits of nuclear power envisaged in the 'Atoms for Peace' rhetoric of the Cold War, or the images of destruction, contamination and stigma attached to nuclear technologies following the Chernobyl Incident of 1986 are all worthy of imaginative and empathetic deliberation. These images and metaphors emerging from group deliberation serve as the foundation for a second stage which draws discussions of these competing dramatisations of past nuclear decisions forward to the present, and from there, projects them into the future.

This examination of past decisions is then drawn forward to the present and then projected into the future. Participants must consider what the options are now to current political, industrial and citizen actors and to sketch out a series of potential future visions that draw upon their imagination of past and their empathy for current generations in imagining the future society that is created under different policy conditions (e.g. ranging from 100% nuclear, contaminated nuclear wastelands to nuclear free societies or anything in between that is imagined and discussed). They then produce these different visions over different times frames.

The construction of such future scenarios can be facilitated through the use of stimuli such as charts and tables, plans, maps or drawings (O'Riordan, Wood and Shadrake, 1993), or dramatic techniques such as 'simulation', involving the acting out of future events and stakeholder responses (Wates, 2000). The purpose is to imagine and sketch the futures that they see emerging at different stages. Here, Norton's log-scale of time horizons proves useful. For

example three different levels of future visions can be imagined – across a short term, multi-election cycle (a nuclear energy vision 2020), a multi-generational scale through which the worst climate change effects are likely to occur (2220) and the geological timescale against which the half-lives of the longest-lived reactor-borne radionuclides remain dangerous (AD 1000220). In each case the participants in the dramatic rehearsal engage in sketching out visionary futures in the manner of a 'prophetic discourse'(Gustafson, 1990; Keulartz et al., 2004) in ethics; whereby participants will tend to draw either apocalyptic or utopian visions of the future. Sketching the very best and worst futures that could emerge at these different scales provides a useful starting point for deliberating the future by clarifying and delineating the desirable from the undesirable. The means to do this are established in current participatory scenario and community planning techniques, that work on presenting stylised constructions of possible future developments that can be "quite deliberately in the form of stereotypes, archetypes, optimum or doomsday situations, or other extremes" (Van den Berg and Veeneklaas, 1995). By understanding the extremes, it is possible through successive rounds of deliberation to envisage the 'future space' that each scenario creates, to discuss and imagine these futures and then select those that feel right to the individual in a contextually and emotionally coherent and dramatic manner. They must then discuss the implications of each and justify their choices within a group deliberative context.

The reaction to the morality of these future societies is highly emotive. However, that does not mean that it is simply relative. The ethical desirability of the futures that individual stakeholders may ultimately choose is based upon the empathetic and imaginative deliberation that came before. It is a form of discourse ethics. The choice of the relevant future scenario that 'feels right' to the individual must be weighed in the context of a group choice. Here we are presented with a number of options. It may be desirable to simply outline the futures that were

identified within the context of a Deweyan backcasting workshop what the alternative futures are and why they were felt by individuals to be right. This in itself is a useful input to environmental decision-making as it illustrates a pragmatically justified series of ethical scenarios that attentively explore future generational interests in a context-relevant way. In some policy contexts it may be necessary to go beyond this stage to evaluating which is most desirable either through iterative consensus building techniques based upon Habermassian principles (for example consensus conferences, see Hooft et al., 2002; Skorupinski et al., 2007), or else deciding amongst alternatives through aggregative voting. In which case multi-attribute decision analysis or other forms of multi-criteria option or objective appraisal tools may be necessary (for example Nijkamp, 1989; Stirling and Mayer, 2001). One further alternative would be to further interrogate these futures in relation to a balanced deliberation of ethical principles and 'bottom-up' stakeholder-led moral judgements in a reflective equilibrium informed process (Cotton, 2009a; Rawls, 1951), thus broadening the toolbox of participatory approaches used in ethical evaluation. In either case, the outlining of broader alternative futures is a productive input to 'opening up' (Stirling, 2005) deliberative evaluation of technology and environmental policy choices to greater deliberative democratic scrutiny and ontologically grounded ethical reflection.

The final task is then to fold the Deweyan approach into a broader backcasting analysis, by employing other forms of design process tools and stakeholder network analyses in order to construct and implement the imagined futures at different temporal scales. This involves building sufficient stakeholder and policy-actor networks to oversee the selection and implementation of the desirable futures that emerge; and to evaluate and reflect upon long-term policy outcomes as a result of the deliberative process.

Conclusions

By grounding the ethical tool based approach within a pragmatist framework, the aim is to build a pluralistic and deliberative environmental valuation of future generational interests and of long-term environmental change. By applying the proposed "Deweyan Backcasting" method to policy discussions in environmental management practice, different stakeholder groups can articulate their moral perspectives on their visions of the future environment through a process of creative deliberation. The participatory construction of future scenarios is grounded in a pragmatic, multi-scalar and contextually relevant ethical framework, one that is grounded in empathy and imaginative discourse rather than a monistic principled ideal. Whereas the scenario analyses typically used in backcasting and environmental planning involve the construction of possible futures grounded within current policy, technological and economic drivers, a Deweyan Backcasting approach presents an alternative means - beginning from a dramatic rehearsal of past environmental decisions towards the identification of multiple future visions at different temporal scales. Through deliberative democratic exchange, multiple environmental values can be expressed through differing and competing visions of the world that the participants wish to create. By examining the emotional connection that individuals have with the futures that emerge, an empathetic ethical connection emerges. By justifying each choice of desirable future at different time scales, the deliberative democratic negotiation of multiple values can emerge and be resolved through consensus building techniques or the appraisal of multiple objectives using the associated criteria analysis tools.

In the nuclear example presented, the implementation of the technology that causes long-term environmental harm and intergenerational injustice was grounded in a specific social and political context, decisions were (and are) based upon shared cultural metaphors and moral

doctrines that shape our environment to the present day. By empathetically imagining the cultural and moral context of these decisions, diverse stakeholders can reflect on past good and bad habits, project these forward in the construction of a series of new desirable futures, and then ground these visions in a dramatic rehearsal of contingent moral problems and environmental effects. By adopting this approach, the methodologies of backcasting can make the task of creating a desirable and sustainable future explicitly ethical, and present a philosophically justified range of future options to support the decisions of environmental policy makers.

References

Armour, A. 1995. 'The citizen's jury model of public participation: A critical evaluation'. in, O. Renn, T. Webler, and P.M. Wiedemann. (eds.), *Fairness and Competence in Citizen Participation: Evaluating Models for Environmental Discourse* (Dordrecht: Kluwer), pp.175-187.

Banister, D., R. Hickman, and D. Stead. 2008. 'Looking over the horizon: Visioning and backcasting', in A.H. Perrels, V. Himanen, and M. Lee-Gosselin (eds.), *Building Blocks for SustainableTtransport: Obstacles, Trends, Solutions* (Bingley: Emerald), pp. 25-54

Barry, B. 1997. 'Sustainability and intergenerational justice'. *Theoria* **45** (89): 43-65.

Beckerman, W., and J. Pasek. 2001. *Justice, posterity, and the environment*. Oxford: Oxford University Press.

Beekman, V., and F.W.A. Brom. 2007. 'Ethical tools to support systematic public deliberations about the ethical aspects of agricultural biotechnologies'. *Journal of Agricultural and*

Environmental Ethics **20**(1): 3-12.

Blowers, A. 1999. 'Nuclear waste and landscapes of risk'. *Landscape Research* **24**(3): 241-263.

Blowers, A., and D. Pepper. 1988. 'The politics of nuclear power and radioactive waste disposal: From state coercion to procedural justice?' *Political Geography Quarterly* **7** (3): 291-298.

Callicott, J.B. 1999. *Beyond the Land Ethic: More Essays in Environmental Philosophy*. Albany, New York: State University of New York Press.

—. 2002. 'The pragmatic power and promise of theoretical environmental ethics: Forging a new discourse'. *Environmental Values* **11**(1) : 3-25.

Carter, A. 2001. 'Can we harm future people?' *Environmental Values* **10**(4): 429-454.

Caspary, W.R. 2000. *Dewey on Democracy*. Ithaca, New York: Cornell University Press.

Collier, J. 2006. 'The art of moral imagination: Ethics in the practice of architecture'. *Journal of Business Ethics* **66**(2/3):307–317.

CoRWM. 2007. 'Moving forward, CorWM's proposals for implementation'. London: Commitee on Radioactive Waste Management.

Cotton, M. 2009a. 'Ethical assessment in radioactive waste management: A proposed reflective equilibrium-based deliberative approach'. *Journal of Risk Research* **12**(5):603-618.

—. 2009b. 'Evaluating the 'ethical matrix' as a radioactive waste management deliberative decision-support tool'. *Environmental Values* **18**(2):153-176.

Dewey, J. 1917. *Creative Intelligence*. New York: Henry Holt and Co.

—. 1922. *Human Nature and Conduct*. Cambridge: Cambridge University Press.

Dreborg, K.H. 1996. 'Essence of backcasting'. *Futures* **28**(9):813-828.

Dryzek, J. 2000. *Deliberative Democracy and Beyond: Liberals, Critics, Contestations*.

Oxford: Oxford University Press.

DTI. 2005. *Nuclear power generation development and the UK industry*. Department for Trade and Industry: London.

Eckersley, R. 2002. ‘Environmental pragmatism, ecocentrism, and deliberative democracy: between problem-solving and fundamental critique’, in B. Minteer and B. Manning (eds.) *Democracy and the Claims of Nature* (Lanham, MD: Rowman and Littlefield), pp. 49-69.

Elliot, R. 1989. 'The rights of future people’. *Journal of Applied Philosophy* **6**(2):159 - 170.

Fesmire, S. 2003. *John Dewey and Moral Imagination: Pragmatism in Ethics*. Bloomington IN: Indiana University Press.

Fesmire, S. A. 1994a. *Dramatic rehearsal and the moral artist: A Deweyan theory of moral understanding*. Carbondale: Southern Illinois University.

—. 1994b. 'Educating the moral artist: Dramatic rehearsal in moral education’. *Studies in Philosophy and Education* **13**(3/4):213-227.

Forsberg, E.M. 2007. 'Pluralism, the ethical matrix, and coming to conclusions’. *Journal of Agricultural and Environmental Ethics* **20**(4):455-468.

Gaba, J.M. 1999. 'Environmental ethics and our moral relationship to future generations: Future rights and present virtue ' *Columbia Journal of Environmental Law* **24**(249):249-288.

Geurs, K., and B. van Wee. 2004. 'Backcasting as a tool for sustainable transport policy making: The environmentally sustainable transport study in the netherlands’. *European Journal of Transport and Infrastructure Research* **4**(1):47-69.

Gower, B.S. 1995. ‘The environment and justice for future generations’, in D.E. Cooper and J.A. Palmer (eds.) *Just Environments: Intergenerational, International and Inter-Species Issues*, (London: Routledge), pp. 48-58.

Gregory, S., and T. Satterfield. 2002. 'Beyond perception: The experience of risk and stigma in community contexts'. *Risk Analysis* **22**(2):347-358.

Groves, C. 2009. 'Future ethics: risk, care and non-reciprocal responsibility'. *Journal of Global Ethics* **5**(1):17-31.

Gustafson, J. M. 1990. 'Moral discourse about medicine: A variety of forms'. *The Journal of Medicine and Philosophy* **15**(2):125-42.

Hiskes, R.P. 2005. 'The right to a green future: Human rights, environmentalism and intergenerational justice'. *Human Rights Quarterly* **27**(4):1346-64.

Hooft, E., A. Bergmans, K. Dervaux, and L. Vanhoof. 2002. 'Local partnerships: Achieving stakeholder consensus on low-level waste disposal?' in *Proceedings of the Waste Management Conference (WM '02)*, (Tucson, AR), pp. 1-11.

Johnson, L.E. 2003. 'Future generations and contemporary ethics'. *Environmental Values* **12** (4):471-487.

Johnson, M. 1993. *Moral Imagination: Implications of Cognitive Science for Ethics*. London: University of Chicago Press.

Kaiser, M., and E.M. Forsberg. 2001. 'Assessing fisheries - using an ethical matrix in participatory processes'. *Journal of Agricultural and Environmental Ethics* **14**(2): 191-200.

Kaiser, M., K. Millar, E-M. Forsberg, O. Baune, B. Mepham, E. Thorstensen, and S. Tomkins. 2004. 'Decision-Making Frameworks', in V. Beekman (ed.) *Evaluation of Ethical Bio-technology Assessment Tools for Agriculture and Food Production: Interim Report Ethical Bio-TA Tools*, (The Hague: Agricultural Economics Research Institute).

Kekes, J. 1991. 'Moral imagination, freedom and the humanities'. *American Philosophical*

Quarterly **28**(2):101-111.

Keulartz, J., M. Shermer, M. Korthals, and T. Swierstra. 2004. 'ethics in technological culture: A programmatic proposal for a pragmatist approach'. *Science, Technology & Human Values* **29**(1):3-29.

Leopold, A. 1949. *A Sand County Almanac and Sketches Here and There*. New York: Oxford University Press.

Light, A. 2002. 'Contemporary environmental ethics from metaethics to public philosophy'. *Metaphilosophy* **33**(4):426-449.

—. 2003. *Moral and Political Reasoning in Environmental Practice*. Boston, MA: MIT Press.

—. 2004. 'Methodological pragmatism, animal welfare, and hunting', in E. McKenna and A. Light (eds.), *Animal Pragmatism: Rethinking Human-Nonhuman Relationships*, (Bloomington: Indiana University Press), pp. 119-139.

Light, A., and E. Katz (eds.). 1996. *Environmental Pragmatism*, London: Routledge.

Lovins, A. 1976. 'Energy strategy: the road not taken?' *Foreign Affairs* (January):186-218.

Lubling, Y. 1999. 'Deliberation as dramatic rehearsal: John Dewey and the future of philosophy'. *Contemporary Philosophy* **21**(3/4):37-43.

McDonald, H.P. 2004. *John Dewey and Environmental Philosophy*. Albany, NY: State University of New York Press.

McVea, J.F. 2007. 'Constructing good decisions in ethically charged situations: The role of dramatic rehearsal'. *Journal of Business Ethics* **70**(4):375-390.

Mepham, B. 1999. 'A framework for the ethical analysis of novel foods: The ethical matrix'. *Journal of Agricultural and Environmental Ethics* **12**(2):165-176.

Millar, K., Thorstensen, E., Tomkins, S., Mepham, B., Kaiser, M. 2007. 'Developing the ethical delphi'. *Journal of Agricultural and Environmental Ethics* **20**(1):53-63.

Minteer, B.A. 2001. 'Intrinsic value for pragmatists?' *Environmental Ethics* **23**(1):57-75.

Minteer, B.A. 2002. ‘Deweyan democracy and environmental ethics’, in B.A. Minteer and B.P. Taylor (eds.) *Democracy and the Claims of Nature*, (Lanham, MD: Rowman and Littlefield), pp.33-48.

Mulder, H.A.J., and W. Biesiot. 1998. *Transition to a Sustainable Society: A Backcasting Approach to Modelling Energy and Ecology*. Cheltenham: Edward Elgar.

Nijkamp, P. 1989. ‘Multicriteria analysis: a decision support system for sustainable environmental management’, in by F. Archibugi and P. Nijkamp (eds.) *Economy and ecology: Towards sustainable development*, (London: Kluwer), pp. 203-219.

Norton, B. 1996. ‘Integration or reduction: Two approaches to environmental values’, in A. Light and E. Katz. (eds.) *Environmental Pragmatism*, (London: Routledge), pp. 47-77.

—. 2005. *Sustainability: A Philosophy of Adaptive Ecosystem Management*. Chicago: University of Chicago Press.

Norton, B.G., and A.C. Steinemann. 2001. 'Environmental values and adaptive management’. *Environmental Values* **10**(4):473-506.

O'Neill, J., A. Holland, and A. Light. 2007. *Environmental Values*. London: Routledge.

O’Riordan, T., C. Wood, and A. Shadrake. 1993. 'Landscapes for tomorrow’. *Journal of Environmental Planning and Management* **36**(2):123-147.

Okrent, D., and N. Pidgeon. 2000. 'Editorial - introduction: Dilemmas in intergenerational versus intragenerational equity and risk policy’. *Risk Analysis* **20**(6):759-776.

Ott, P. 2010. 'Value as practice and the practice of value: Dewey's value theory for environmental ethics’. *Environmental Ethics* **32**(3): 285-304

Page, A. 2007. 'Intergenerational justice of what: Welfare, resources or capabilities?'

Environmental Politics **16**(3):453 - 469.

Parfit, D. 1981. *Energy Policy and the Further Future: The Identity Problem.* Maaryland: Center for Philosophy and Public Policy, University of Maryland.

Parker, K.A. 1996. ‘Pragmatism and environmental thought’. in A. Light, Katz, E (eds.) *Environmental Pragmatism*, (London: Routledge), pp. 21-37.

Quist, J., and P. Vergragt. 2006. 'Past and future of backcasting: The shift to stakeholder participation and a proposal for a methodological framework’. *Futures* **38**(9): 1027-1045.

Rawles, K. 2004. *Ethical Issues in the Siting of Radioactive Waste Management Facilities: The Role of Local Communities*. Harwell: United Kingdom Nirex Limited.

Rawls, J. 1951. 'Outline of a decision procedure for ethics’. *The Philosophical Review* **60**(2): 177-197.

Robinson, J. 1982. 'Energy backcasting: A proposed method of policy analysis’. *Energy Policy* **10**(4):337-344.

—. 1990. 'Futures under glass: A recipe for people who hate to predict’. *Futures* 22(8): 820-842.

Rolston III, H. 1975. 'Is there an ecological ethic?' *Ethics* **85**(2):93-109.

—. 1981. 'Values in nature’. *Environmental Ethics* **3**(2):113-128.

Rosenthal, S.B. 1994. *Charles Pierce's Pragmatic Pluralism*. Albany NY: State University of New York Press.

Sandler, R. 2004. 'Towards an adequate environmental virtue ethics’. *Environmental Values* **13** (4):477-495.

Schelling, T. 1995. 'Intergenerational discounting’. *Energy Policy* **24**(4/5):395-401

Schroeder, D., and C. Palmer. 2003. 'Technology assessment and the ‘ethical matrix’’ *Poiesis*

& Praxis **1**(4):295-307.

Schwartz, T. 1979. 'Welfare judgments and future generations’. *Theory and Decision* **11**(2): 181-194.

Seedhouse, D. 1998. *Ethics: the Heart of Health Care*. Chichester: Wiley and Sons.

Shrader-Frechette, K.S. 1993. *Burying Uncertainty: Risk and the Case Against Geological Disposal of Waste*. Berkeley: University of California Press.

Simmons, P., K. Bickerstaff, and J. Walls. 2007. *CARL Country Report – United Kingdom*. Norwich: University of East Anglia.

Skagen Ekeli, K. 2004. 'Environmental risks, uncertainty and intergenerational ethics’. *Environmental Values* **13**(4):421-444.

Skorupinski, B., H. Baranzke, H.W. Ingensiep, and M. Meinhardt. 2007. 'Consensus conferences - a case study: PubliForum in Switzerland with special respect to the role of lay persons and ethics’. *Journal of Agricultural and Environmental Ethics* **20**(1):37-52.

Solow, R. 1993. ‘Sustainability: An economist's perspective’, in R. Dorfman and N. Dorfman (ed.) *Ecoonmics of the Environment: Selected Readings*, (New York: Norton), pp. 179-189 .

Spash, C.L. 1993. 'Economics, ethics, and long-term environmental damages’. *Environmental Ethics* **15**(2):117-132.

Stirling, A. 2005. ‘Opening up or closing down? Analysis, participation and power in the social appraisal of technology’, in M. Leach, Scoones, I., Wynne, B. (eds.) *Science, Citizenship and Globalisation*, (London: Zed), pp. 218-231.

Stirling, A., and S. Mayer. 2001. 'A novel approach to the appraisal of technological risk: a Multi-criteria mapping study of a genetically modified crop’. *Environment and Planning C: Government and Policy* **19**(4):529-555.

Sylvan, R. 2003. ‘Is there a need for a new environmental ethic?’ in A. Light and H. Royston III (eds.) *Environmental Ethics: An Anthology*, (Malden, MA: Blackwell), pp.47-52.

Tansey, J. , J. Carmichael, R. van Wynsberghe, and J. Robinson. 2002. 'The future is not what it used to be: participatory integrated assessment in the Georgia Basin’. *Global Environmental Change* **12**(2):97-104.

Taylor, P. 1986. *Respect for Nature*. Princeton, NJ: Princeton University Press.

Van den Berg, L.M., and F.R. Veeneklaas. 1995. ‘Scenario building: Art, craft or just a fashionable whim?’ in J.F.T. Schoute, P.A. Finke, F.R. Veeneklaas, and H.P. Wolfert (eds.) *Scenario Studies for the Rural Environment*, (Dordrecht: Kluwer), pp.11-13 .

Wates, N. 2000. *The Community Planning Handbook*. London: Earthscan.

WCED. 1987. *Brundtland Report: Our Common Future*. World Commission on Environment and Development (WCED).

Wenz, P.S. 1999. 'Pragmatism in practice: The efficiency of sustainable agriculture’. *Environmental Ethics* **21**(4):391-410.

Werhane, P.H. 2002. 'Moral imagination and systems thinking’. *Journal of Business Ethics* **38** (1/2):33-42.

Weston, A. 1985. 'Beyond intrinsic value: Pragmatism in environmental ethics’. *Environmental Ethics* **7**(4):321-39.

Westra, L.1998. *Living in Integrity: A Global Ethic to Restore a Fragmented Earth*. Lanham, MD: Rowman and Littlefield.

White, Jr. L. 1967. 'The historical roots of our ecological crisis’. *Science* **155**(3767):1203-1207.

Wolf, C. 1996. 'Markets, justice, and the interests of future generations’. *Ethics and the Environment* **1**(2):153-176.