

Defining the Environmental Doctorate: Education for Sustainable Development

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Abstract

The *Earth Summit 2002: Johannesburg World Summit on Sustainable Development's* "Key Outcomes" highlighted education at all levels as an important means of effective implementation of sustainable development objectives. This paper argues that in the higher education sphere environmental PhD research should be pursued in the context of the increasing international focus on transition towards sustainability. With this objective in mind, it is reasoned that doctoral study of environmental problems should utilise a transdisciplinary approach that is directed towards providing advice for stakeholders.

The paper describes a methodological approach for transdisciplinary environmental research as involving integration of the specialist methods and techniques of the traditional disciplines – both sciences and social sciences – to provide research outcomes and insights for the environmental management and policy realm. Selection of the disciplinary perspectives starts with the impacts of the environmental problem. Broader contexts are then selected on the basis of relevance to the policymaking setting and stakeholders. Accordingly, it is argued that environmental PhD thesis outcomes focussing on sustainability should include policy scenarios and make recommendations on the best approach to manage or adapt to an environmental problem both in the short and long term. The experience of undertaking doctoral research with this framework should, in due course, prepare students for careers in academic or professional roles relevant to sustainable development goals.

Introduction

Currently, the research projects undertaken by environmental doctoral candidates vary on a continuum from traditional disciplinary research 'greened' at the edges, through multidisciplinary, interdisciplinary to transdisciplinary research. Arguably, the decision to use of one of these approaches for environmental doctorates, has not been an overt choice by the supervisors and students involved in the research projects to avoid other approaches but has developed from the research advisors and students own experience of research. Bosselmann (2001) comments that the problem-orientated sustainability project '...is new territory for even experienced researchers.' In the higher education sphere and in particular at the doctoral level, there is acknowledgement that sustainability issues should be researched by doctoral candidates (Jones and Meritt 1999, Bosselmann 2001, Jucker 2002, Wals and Jickling 2002). However, there has been little definition of what an environmental

doctorate encompasses. The somewhat arbitrary adoption of research methodology is not ideal for environmental PhD students. Harris and Robottom (1997) recommend in this regard:

‘It is important that students have a well considered methodological framework, including the establishment of their philosophical stances about a number of issue[s] associated with their methodology such as the nature and means of acquiring knowledge and the possible effects on their research of their political and value positions.’

This paper contributes one perspective of what the distinctive research process, approach, methodology or product that defines what an environmental PhD might be. A transdisciplinary environmental research approach is outlined here as a starting point for defining the environmental doctorate. Various contributions on environmental research (Walker 1987, Tighe and Taplin 1990, Gough 1992, Harris and Robottom 1997 and Schroll and Stærdahl 2001) have provided initial ideas for the construction of this methodological overview. Also involvement of the author in researching environmental problems and as a doctoral candidate, supervisor and examiner of environmental PhDs has influenced choice of methods.

Environmental Research Approaches

The theory and practice of environmental research in universities has been actively debated since the 1970s when environmental studies research centres were first established in universities. Critics were dismissive of environmental research’s ‘broad brush’ cross disciplinary approach arguing that, as environmental studies had no disciplinary basis, then serious doctoral research could not be pursued in the area. Environmental research adherents on the other hand struggled with the question of how best to integrate the disciplines and with the popularisation of the term ‘sustainable development’ in the Brundtland Report (WCED 1987) and its further adoption at the 1992 Rio and 2002 Johannesburg Summits, this question of how to carry out research to deal with the complexity of sustainability questions has become even more pressing and has not yet been answered adequately.

To address the nature, magnitude and extent of environmental problems, no single discipline has the breadth of focus, the methodological scope to provide adequate insight. This is merely another way of saying that the Western structure and organisation of knowledge is inadequate to the task at hand (see, for example, Merchant 1983, Fisher and Hoverman 1988, Bosselmann 2001, Tilbury 1995, and Harvey 1996). The disciplines are products of a worldview of the structure and organisation of knowledge that can be traced back some three hundred years to

Descartes, Bacon and Newton. The groundwork laid by these great philosophers of methodological inquiry stressed a mechanical, particulate, reductionist and objective approach to knowledge.

Our present environmental problems criss-cross this framework refusing to fall into the general structural lines of inquiry laid out so many centuries ago and developed and refined since that time. The organisation of knowledge derived from this method of inquiry, has been extremely successful in providing Western material ways of life, but also has been very successful in producing the environmental problems the globe now faces. Western society is epistemologically organised for materialism and economic development not for sustainability. Universities as institutions of research and teaching reflect this as well. Bosselmann (2001) comments:

‘Why is there so much expertise on development – now increasingly seen as having “unsustainable” effects – and so little expertise on sustainability? ...while the professionals may “naturally” gravitate towards development in its growth-and-demand orientation, it is alarming that the academic level also seems to gravitate towards development...As a critic and conscience of society the university has a different role to play...research (and teaching) should be development-oriented only in so far as being consistent with sustainability and long-term objectives.’

Early attempts to cross disciplinary boundaries in researching the environment were the multidisciplinary and interdisciplinary approaches. The limitations of multidisciplinary and interdisciplinary environmental research have been well examined (see, for example, Conrad 2002) as a third generation of awareness has permeated environmental research since the 1980s. This approach, referred to as transdisciplinarity, explicitly recognises the structural and epistemological shortcomings of any single discipline to tackle environmental sustainability.

However, many environmental researchers who have been attempting to adopt a transdisciplinary approach and are still struggling with its definition. Schroll and Stærdahl (2001), for example, say that ‘Transdisciplinarity draws upon a variety of disciplines for information, analysis and insight, and that means taking more negotiated sciences into the policy realm and engaging with the public’ and that environmental ‘...research is only transdisciplinary if it draws upon both natural and social sciences, as well, in some contexts, as the humanities.’

Transdisciplinary prescriptions such as this have a number of fairly radical implications. As well as continuing to alert the public about environmental problems, to critique existing policy processes and institutional structures, and to provide recommendations for reform, the agenda of environmental scholarship has been

expanded to transforming the way society views environmental problems. The agenda of social criticism imbued in the earlier multidisciplinary and interdisciplinary approaches has been replaced with an agenda of social transformation in the transdisciplinary approach (see, for example, Milbrath 1989 and Young 1990).

Approaches Adopted in Some Selected Environmental PhD Theses

In order to more closely focus on what is involved in an environmental doctorate, six PhD theses that the author participated in either supervising (Edwards 1997, Yu 1997, Braaf 1999, Banerjee 2000) or examining (Gabriel 1994, Risely 2003) during the last decade are outlined here. Aspects of the theses touched on include:

- thesis topic (environmental problem focus),
- methodological approach,
- methods adopted,
- motivations for carrying out the research,
- aspirations for the research outcomes

as stated by the doctoral candidates.

Risely's (2003) PhD thesis, *The Politics of Precaution: An Eco-Political Investigation of Agricultural Gene Technology Policy in Australia, 1992-2000* addresses Australia's gene technology policy terrain between 1992 and 2000. Risely stated her purpose was "...to provide insights for environmentalists and policy-makers, particularly those engaged in debates surrounding the principles of ecological sustainability (ESD) and green ethics, including the precautionary principle.' The methodological approach adopted was 'post-positivist' and addressed the social, political, power, ideological, and value issues underlying the policy process. Risely used a case study approach and analysed case information '...in terms of attempts to translate different knowledge systems (scientific versus eco-social).'

Banerjee's (2000) PhD thesis, *Evaluation of Policy Options to Mitigate CO₂ Emissions from Coal-Fired Power Plants: A Case Study Calcutta, India*, examined policy options for mitigation of greenhouse gas emissions from coal fired power stations in India. She used an 'action research plan' for her project together with a dual case study approach with India being '...selected as a case study of a developing country enhancing its industrial infrastructure and experiencing increasing industrial growth rates, as part of economic development to compete with the rest of the world' and 'the Calcutta region was selected as a highly populated as well as polluted region'.

Banerjee stated that her thesis research sought ‘...to contribute to reducing pollution levels of the city, partly by suggesting initiation of a specific project based on renewable energy...’.

Braaf’s (1999) PhD thesis, *Challenging Climate Impact Assessment: Vulnerability, Positionality and Power*, critiques ‘...impact assessment approaches designed to anticipate and evaluate effects of global climate change’ and explores ‘...the vulnerability of Aboriginal people in the Top End of Australia’s Northern Territory to adverse impacts of climate change for their health...’ and ‘...places the critique in a real life context.’ She stated that her research agenda arose from:

‘...concern that dominant methods of climate impact assessment do not adequately address potential impacts for vulnerable people and that they do not produce the kind of information that can be usefully implemented to prepare vulnerable communities for future change.’

Braaf utilised a single case study approach and drew on an ‘...interdisciplinary research base with experience in sociology and human geography.’ She commented that she:

‘...sought to demonstrate that climate impact assessment entrenches certain perspectives and power structures in research and planning that allow little scope for local, vulnerable communities to articulate their concerns or aspirations for the future.’

Edwards’ (1997) PhD thesis, *Climate Change, Worst-Case Analysis and Ecocolonialism in the Southwest Pacific*, explored ‘...the concept of security and threats which are likely to be faced in the twenty-first century’ and ‘...the links between environmental deterioration and security’. Edwards used a case approach and focussed on the climate change related threats to the island states of the Southwest Pacific region. Threats examined were grouped as ‘real threats’, ‘perceived threats’ and ‘policy threats’. Edwards’ aims included explaining ‘...how the threat of climate change could be manipulated by industrialised countries to extend their political and economic influence’, identification of ‘...links between the threat of climate change and ecocolonialism’ and showing ‘why Pacific islanders should try to fight climate change at a local scale.’ He adopted a holistic approach and developed a model for exploration of security threats called the ‘pyramid of holistic security’.

Yu’s (1997) PhD thesis, *International Aid and Sustainable Energy Futures in the Pacific Islands*, focuses on “...the examination of [aid] donor’s policies and practices in international assistance for renewable energy in the region.” He carried out case studies of Fiji, Kiribati, Nauru, the Cook Islands and Western Samoa. Yu stated that

his research contributed to "...providing analysis and recommendations with respect to international aid for developing sustainable energy systems in the Pacific Island region." The case studies cover "...socio-economic background, culture, environment, governmental energy policy, human resources, institutional development, international aid, and other related energy issues in the region."

Gabriel's (1994) PhD thesis, *The Political Implications of Global Warming*, evaluated '...the response of the international community to the problem of global warming up until the signing of the Framework Convention on Climate Change...in Rio de Janeiro in 1992'. Gabriel stated in the thesis 'I decided to focus on the international community's response because the enormity of this problem is so great that actions taken in one particular country will have little real bearing upon the rate at which climate warms and changes'. He used dominant environmental paradigms as the theoretical grounding for the thesis and defined '...global warming as a "systemic failure", as opposed to a technical problem with technical solutions'. A case study approach was used with the policy positions of the UK, US, Western Germany as well as the EC being discussed.

All of these doctoral candidates set out to address a particular environmental problem that had a scientific basis as well as broader ramifications, used methods and insights from the traditional disciplines and made environmental policy recommendations in their thesis conclusions. All of these used case study methods for investigation of their particular environmental problems. Three of the theses involved field research in developing nations (Edwards 1997, Yu 1997 and Banerjee 2000) and the other three involved information gathering in Australia (Gabriel 1994, Braaf 1999 and Risely 2003) but linked their work to international perspectives. Only Edwards (1997) explicitly adopted a holistic approach. Braaf (1999) referred to her research as interdisciplinary and the other candidates side-stepped definition of their disciplinary approach.

The Transdisciplinary Environmental Doctorate

Taking into account the doctoral work described above together with theoretical perspectives on environmental research (Vayda 1983, Kartawinata and Vayda 1987, Milbrath 1989, Tighe and Taplin 1990, Harris and Robottom 1997 and Schroll and Stærdahl 2001), it is suggested that transdisciplinary research for environmental PhDs could be operationalised in three research frames of reference. The frames proposed for addressing environmental sustainability questions are:

- i) holism frame;

- ii) problem delineation frame; and
- iii) policy-making frame.

i) Holism Frame

A first frame of analysis proposed for transdisciplinary environmental research involves focus on the holistic nature of the endeavour. Holism in environmental research necessitates an eclectic approach where methods and theoretical insights from all the traditional disciplines may be used. Holism however poses boundary problems for researchers. All the sources of inspiration and information place researchers in a difficult position if they do not adopt a strategy to help them discard methods and insights that are not particularly enlightening with respect to the environmental problem at hand. Walker (1987:769) suggests that '...it is possible to let the problem itself guide the selection of parameters.' However, as he acknowledges, the parameters may not be well chosen resulting in a study where the full environmental consequences are not explained. PhD researchers really need to think carefully about what they genuinely need to find out and what they really don't know about their chosen environmental problem and not to primarily tailor their research to information that is easily accessible. Another guideline, also pertinent for delineating the research boundaries, is to focus on whom and what the research is for: including the stakeholders and decision-makers, and the sustainability goals.

Decisions about which disciplinary perspectives to draw upon are not easy. Walker (1987:776) recommends the use of Vayda's (1983) *progressive contextualisation* approach developed for UNESCO's Man and the Biosphere program for the social aspects of environmental research. This approach does not have to be limited to socio-environmental research but can be used in a broader transdisciplinary environmental research approach. The initial context chosen for research should start with the source of concern or the event that raised the environmental problem to the researcher's interest. Subsequent contexts should be selected on the basis of relevance to the sustainability problem solving nature of the research and the real world policy-making aspect of the research. For example, a local campaign to stop rainforest logging in northern New South Wales at Terania Creek was the starting point in the author's doctoral research, *Wran and the Rainforests: Environmental Policymaking in New South Wales* (Taplin 1989). The progressive contextualisations in the research moved from the first context of the campaign, to a second context of focussing on the major public inquiry about the Terania Creek issue, to a third context of the New South Wales rainforest debate that surfaced from the initial trigger of the Terania Creek debate, to a fourth context of the handling of environmental policy in general in New South Wales during the Wran Government years, to a fifth

context of examining the utility of employing adversarial proceedings to assist in environmental decision-making when scientific and professional experts disagree, to a sixth context of examining the public policy-making theory for its utility in describing and contributing to environmental policy-making, to a seventh context of examining the international rainforest debate in general, to a final eighth context of synthesising the different analyses and findings arising from the different contexts and making explicit links between evidence, explanation, description and theory.

Kartawinata and Vayda (1984) described the progressive contextualisation approach as being '...the holistic premise that adequate understanding of problems can be gained only if they are seen as part of a complex of interacting causes and effects.' They recommended starting with a specific context and moving '...outwards into progressively more inclusive spatial and temporal contexts.' They said from their own research experience:

'Decisions on how large and how 'dense' the contexts observed and reported should be, were made on the basis of not only constraints on the time and tools available for research but also the degree of completeness and precision that the investigators felt to be needed for explaining the problem to themselves and policy makers...'

The progressive contextualisation approach is an important practical way of approaching transdisciplinary environmental research. By not delineating the boundaries of the research before starting the study and commencing with an initial context, a holistic approach can be facilitated. This is quite a different approach to the general Cartesian mode of rational analytical thinking adopted by conventional discipline based researchers. This different approach has to be learned. Milbrath (1989) commented in *Envisaging a Sustainable Society: Learning Our Way Out*.

So strong is the emphasis on rational linear thinking in higher education that students entering my classes experience about one month of struggle before they learn to think more integratively in holistic patterns. I repeatedly challenge them with ...'And then what?' (Milbrath 1989:271)

Such a holistic learning experience should be an integral part of an environmental PhD student's acquisition of knowledge.

ii) Problem Delineation Frame

A second frame of analysis involves problem delineation with respect to environmental sustainability. The need for a problem solving focus for transdisciplinary environmental research has been argued by Tighe and Taplin

(1990) and Schroll and Stærdahl (2001). An emphasis on practical problems is consistent with an environmental sustainability focus. However, the definition of the question, or problem, that the research involves may not always be straightforward.

The following considerations may assist in delineating a problem:

- timescale,
- social (including intergenerational and intragenerational equity),
- cultural,
- philosophic (ethical and value-based),
- environmental science,
- economic, and
- political.

Taking these considerations into account should help doctoral candidates to avoid a problem centred research focus that is solely human centred and that reaffirms, perhaps implicitly, negative human impacts on the environment. Environmental PhD researchers should be equipped with knowledge and understanding of these considerations and students who have not been exposed to these areas of learning would benefit from acquiring them via supervisor directed reading or postgraduate coursework.*

For a problem centred research focus to be useful in finding solutions to pressing real world environmental problems, there are two criteria that need to qualify this approach. These are *pragmatism* and *simplicity*. Doctoral candidates need to take these criteria into account. In Walker's (1987:768) words:

‘Methods for research and analysis should be judged and adopted on the basis of their utility and effectiveness for the tasks at hand. Unsatisfactory approaches should be freely discarded or modified.’

PhD research has a timeframe that needs to be abided by and environmental research has a timeframe because of the urgency of environmental problems.

* Students in postgraduate courses offered by the Graduate School of the Environment at Macquarie University are required to take a compulsory core subjects in environmental decision-making, environmental science and environmental attitudes (ethics and philosophy) which provide grounding for involvement in environmental research.

iii) Policy-Making Frame

A third frame of analysis for transdisciplinary environmental research involves synthesis of information for the use of the community including policy-makers. One of the more important aspects of environmental research is that it is undertaken with the aspiration that it will induce change and even if environmental policy is not altered overtly, a *social learning* process (Milbrath 1989:338-340) for those who come into contact with the research can be invoked. Harris and Robottom (1997) have said:

'We see the need for a new generation of researchers who are able to understand and communicate the nature of environmental problems and their relationship with the human contexts in which they arise, and within which they must be solved. This requires of postgraduate students cooperative endeavour in working with community representatives to identify an area of environmental concern and clarify the problem or issue, and to plan and conduct the research as a collaborative project.'

Useful methods for doctoral candidates in working with communities include action research methods (Tilbury *et al.* 2002), adaptive environmental assessment and management (AEAM) research methods (Gilmour and Walkerden 1994) and also the more traditional case study research methods (Yin 1989).

The concept that certainty is unlikely when predicting future environmental and sustainability outcomes should be acknowledged. PhD researchers should develop scenarios for policy-makers and stakeholders and recommend strategies for adequately addressing environmental problems. The scenarios developed need to be clearly outlined in terms of their potential impact on the environment and strategies should contain sufficient information regarding:

- measures needing to be taken,
- their sequence (if important),
- key organisations responsible,
- timeframe, and
- resources needed to implement actions.

Recommendations need to be explicitly linked with the findings of the research that led to such recommendations. Also it is important that they should reflect the abilities of the organisations to act; that is, recognition of legislation, resources, cultural factors, social and political circumstances or other constraints on implementing bodies needs to be made explicit. The ethical or value orientation of policy-making prescriptions should be made explicit and doctoral researchers need to keep in mind themselves, and to point out to the recipients of their policy advice, that sustainable environmental futures are intrinsic to present actions.

Some Supervision Issues

It is acknowledged that integration of information using these suggested frames of analysis is challenging and not straightforward. Importantly, a doctoral supervisor involved in advising a student using a framework such as this would need to be committed to the transdisciplinary approach. Also consideration should be given to the value of co-supervision of the thesis as the knowledge bases and perspectives of different supervisors could assist candidates. Co-supervision can present difficulties when advisors have different worldviews (Salmon 1992) and accordingly it is important that supervisors contributing to a project are committed to allow the student freedom to implement and develop their research approach. Howitt (2000) has reflected:

‘Part of the wider social role...of...graduate students is to break down the notion that there can be a mould [that they should conform to]. Indeed, one of the imperatives for young researchers is the imperative of innovation – the need to break rules, constantly reinvent, constantly push the boundaries, while always building on a critical discourse around existing understandings and knowledge.’

Also Ashibor et al. (2003) have emphasised that ‘...postgraduate supervision is a symbiotic process where balance is integral to the development of the student as a research.’ They maintain that:

‘...to foster an effective environment in the supervision of student research, there is a need to be aware in the variation of our students’ understanding of the research situation, their educational and cultural backgrounds, their expectations of the outcomes of their study.’

The role of the supervisor ideally should be to foster a collaborative student-centred PhD. Students and supervisors involved in the doctoral process can become co-learners as new transdisciplinary environmental subject-matter is explored.

Concluding Comments

The frames for transdisciplinary environmental research discussed in this paper (holism frame, problem delineation frame, policy-making frame) are proposed as a starting point for defining the environmental doctorate; they are not intended to be prescriptive. It should also be emphasised that transdisciplinary PhD environmental research has an important integrative role and its development should not be perceived as a call to abandon PhD research in the traditional disciplines that will also contribute to the resolution of environmental sustainability problems (Milbrath

1989:271; Bosselmann 2001). The contribution of transdisciplinary environmental research is to holistically integrate the specialist methods and techniques of the traditional disciplines, to address environmental problems and to assist in informing policy-makers. Milbrath has said: 'A society must learn to think integratively, holistically, if it is to be sustainable' (Milbrath 1989:271).

The PhD thesis document that is submitted for examination is the end product of the research. However, the written thesis does not fully reflect the knowledge, skills and values acquired by a student in the course of their candidature (Salmon 1992, Harris and Robottom 1997); it also does not reflect the transmission of the research to the academic community via journal publications, research seminars, presentation of conference papers, or the effect on the wider community by direct communication of results to interested stakeholders, presentations to local citizens at public meetings and even in some cases communication with the media. Also environmental doctoral graduates will make an ongoing contribution to society's sustainability learning and sustainable development goals in the professional and academic positions that they take up at the completion of their research. Their training in research and the approach they adopt is important, as future environmental PhD graduates will play significant roles in the implementation of sustainable development objectives during their careers.

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