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# **Ecological, Heterodox and Neoclassical Economics: Investigating the Differences**

**by**

**Clive L. Spash and Anthony M. Ryan**

## **Abstract**

How do ecological and heterodox economists differ, if at all, from each other and from neoclassical economists addressing environmental problems? In 2009 we probed this question by conducting an international survey across these communities, namely at conferences of the European Society for Ecological Economics, the Association of Heterodox Economists, and the European Association of Environmental and Resource Economics. The research was designed to gain insight into the extent to which ecological economics can be described as heterodox and a distinct field from orthodox environmental and resource economics. Conflicting visions of ecological economics have led to a prevalence of neoclassical articles and thought mixed in amongst more heterodox work. We introduce a novel classification of work in the field of environmental policy in order to test for the existence of differences in terms of methodological and ideological approaches. How heterodox economists understand environmental issues is also an important question to answer if there is to be more collaboration between them and ecological economists. The findings have implications for cooperation and the future direction of both ecological and heterodox economics.

## 1. Introduction

The form and conduct of human interaction with the natural environment has become a major political and economic issue in recent times. Over some fifty years, the sub-fields of resource and environmental economics have developed within a neoclassical frame to address the continuing and growing problems. The increasingly recognised inadequacies of these orthodox approaches led to the emergence of ecological economics, in the late 1980's, as a new research field which seemed to be headed in the direction of an environmental political economy (Spash 1995). Simply noting the drive for a significant change from mainstream thinking, recognised as necessary to get environmental action, might lead to the conclusion that ecological economics must be heterodox. However, the ecological economics movement has also involved the combination of natural sciences with economics and as a result a less clear rejection of mainstream methodology and ideology. Indeed, within ecological economics the socio-economists have often been in conflict with those, non-economists (e.g., some key ecologists), who decided to ally themselves with neoclassical environmental and resource economists (Röpke 2005, Spash 2011).

So, the extent to which ecological economics is actually substantively different from the mainstream remains unclear for many, especially those outside the movement. Certainly the journal *Ecological Economics* has published numerous neoclassical environmental and resource economics articles and often neglected a more radical political economy approach. Entire issues have appeared which fit comfortably within the orthodox frame (e.g., adopting mathematical models of optimising behaviour, assuming micro-economic axioms, regarding humans as self-interested utility maximisers, pricing externalities and conducting trade-offs). Also common has been the uncritical use of cost-benefit analysis, along with benefit transfer and more simplistic calculations for claiming a money value can be attached to ecosystems characterised as goods and services. Nature has been described as capital which can be

traded-off for other types of capital (e.g., human, social, man-made). Mainstream regulatory tools, such as tradable permits, also seem to be uncritically accepted by some ecological economists (e.g., Daly and Farley 2004) as if no fundamental change in economic systems were necessary. Yet, the whole idea of establishing ecological economics in the first place was due to substantive discontent with the mainstream and the failure of environmental economics to achieve its promise of a revolution in economic thought, at one time expected to be equivalent to that of Keynesian macroeconomics (see the introduction to Bohm and Kneese 1971). That forgotten promise was a challenge to and change in, not accord with, dominant neo-liberal market structures. At a time when supposed ecological economists can be found putting their names to pricing and trading biodiversity, ecosystems and greenhouse gases, whether ecological economics has anything interesting to say, outside the orthodoxy of another version of a pseudo Green capitalism, is then a reasonable question.

In this paper we probe the extent of differences between ecological and neoclassical economists and whether the former contains a serious heterodox core group. The approach employed attempts to characterise methodological and ideological positions within ecological economics and hypothesises that clear divisions should arise if there are distinctions to be drawn. We then empirically test for such divisions using a survey instrument specifically designed for the purpose.

Mearman (2011) has claimed that there is little structure to heterodox economics beyond that provided by pre-existing (or constituent) schools of thought and little agreement on core concepts or principles. He has attempted to support this conjecture with a survey of heterodox economists, but his samples are too small for strong inferences and several of his statistics lack significance. In addition, the category he refers to as ecological economics actually appears to be little more than mathematical modelling of natural systems. As will be explained in the next section, there are distinct differences in approaches to the environment

and economics even within ecological economics. These differences need to be understood in order to identify the heterodox from the orthodox.

We start Section 2 with a brief historical overview that sketches the rise of ecological economics for those unfamiliar with the movement (for more on the history of and divisions within ecological economics see Martinez-Alier 1990, Spash 1999, Spash 2011, Røpke 2004, Røpke 2005). This leads into a description of some key expected differences between ecological economists, orthodox and heterodox approaches. The section brings these ideas together with a novel characterisation of ecological economics as a movement in three potential camps. In Section 3 the survey method is described and in Section 4 the results reported from three European conferences organised by ecological, heterodox, and resource and environmental economists respectively. The sample is narrowed down to contrast heterodox with neoclassical (orthodox) groupings via respondent self classification (so avoiding the taxonomic problems encountered by Mearman 2011). In Section 5, the discussion and conclusions suggest some implications for knowledge integration to improve cooperation in developing an interdisciplinary political economy approach to the environment.

## **2. Economic thought on the environment**

Unlike other areas of economic thought ecological economics has a strong natural science element. This has impacted on how the movement has engaged with economic ideas and adds an additional dimension beyond the purely socio-economic. We start by explaining the role and influence of this aspect before turning to the relationship with orthodox and heterodox schools. We then critically discuss the engagement of different schools with environmental topics and issues. This background on the mix of approaches to the

environment and economics is brought together in Section 2.3 under a new classification framework.

### *2.1 Historical overview*

Economics has generally been a slow and reluctant field in seriously addressing environmental problems within the core of its disciplinary teachings. Despite basic concerns relating to human interactions with the environment having been reflected in classical and neoclassical thought of the 1800s, the general approach and development of economics in the 1900s sidelined resource constraints, environmental degradation and, what might be termed, general limits to ever increasing material and energy throughput. An economics literature from the early 1900s can be identified as developing concerns about conservation issues related to agriculture (e.g. soil erosion) and a theoretical approach to non-renewable resource use (i.e., optimal depletion) which is still fundamental to neoclassical resource economics (Spash 1999). However, such topics had already moved from being the concern of central figures in economic thought to specialists in agriculture and resource economics.

The resource economists of the 1950's regarded the environment as a source of materials which required some specialised management and conservation due to characteristics which differentiated them from manufactured goods (e.g., Ciriacy-Wantrup 1952). In the 1960's and 70's environmental economics appeared in the USA as a distinct sub-discipline concerned with the growing pollution problems which were becoming evident to the general public, even if previously ignored by the academic community (Kneese and Bower 1968, Bohm and Kneese 1971). The recommended economic approach employed cost-benefit analysis to calculate optimal pollution control and so led to the development of a range of methods in monetary valuation (e.g., travel cost, hedonic pricing, contingent valuation, see Hanley and Spash 1993).

The problem with traditional environmental economics was how it became nothing more than an extension of mainstream thought without having any impact on mainstream thinking. Within a decade, the promise of 'revolution' receded into preoccupation with method (i.e., mathematical formalism) over substance, and conformity to mainstream doctrines. The rise of popular political and environmental discontent in the 1960s and 70s had failed to impact on the core conduct of economics. At the same time, non-economists were openly associating environmental problems with capital accumulating socio-economic systems.

Natural scientists played a key part in the growing recognition of problems relating to interactions between the natural environment and human economy. The idea that pollutants became inert if diluted or spread widely was fundamentally revised by the realisation that ecological systems connected diverse elements of the environment through material, chemical and energy flows. Dispersal of sulphur and nitrous oxides via large chimneys, in an attempt to avoid local health impacts, created acidic deposition, an international environmental and political problem with widespread damages (Yanarella and Ihara 1985). Bio-accumulation of chemicals in the food chain brought home the fragile pinnacle upon which humanity stands (Carson 1987 [1962]). The susceptibility to human intervention of supposedly stable self-equilibrating systems led to alternative ecological approaches. Change and uncertainty became part of ecological understanding and its models rather than being treated as exogenous shocks to be externalised or neutralised (Holling 1986).

Ecological economics then appeared as an emergent property of disparate and chaotic elements in a socio-economic and politic stew, seasoned by learning from the growing scientific awareness of human-environment interactions and given a good stir by academic reflection. Yet, any pretence of a consensus on action or direction would be highly

misleading. Ecological economics combined some disparate elements of discord and gave them voice. Two strong but conflicting positions then soon appeared dominant (Spash 1999).

Ecologists of a practical or 'pragmatic' political philosophy sought to link ecology with economics. For them the type of economics was irrelevant and indeed many seemed blissfully unaware of any distinction between economic schools of thought. From this perspective environmental problems can be understood by studying natural sciences alone but the information gained needs socio-economics as a means for communicating the findings to politicians. As explained by Spash (1999), this "ecology and economics" approach sought political advancement of core messages via key natural science journals and collaboration with establishment figures. This led to a linking of models rather than a fundamental challenge to them. The methodology was inherently multi-disciplinary, despite the rhetoric of interdisciplinary or transdisciplinary thinking. Under this approach, ecologists were no more expected to question the economics than economists were expected to question the ecology.

In contrast, ecological economics also attracted a combination of older academics disenchanted with the failure of environmental economics, younger socio-economists seeking new ideas and more radical social scientists. In general, this group appears to have been looking for interdisciplinary interactions with open minded natural scientists and others. This socially oriented ecological economics grouping wanted new theory within economics not just some political realisation that the environment was as important as other economic topic areas. The point was that understanding economic systems requires understanding the Natural environment within which it is embedded, and that this fundamentally changes the way in which economics should be conducted both in theory and practice. This group formed a practical desire for policy to change the institutional arrangements whereby daily life is conducted; the aim being to address power relationships and social inequity because they are



integrally related to environmental degradation. The group might be thought of as a revolutionary and radical branch, while the aforementioned advocates of an ecology and economics approach represents an appeasing and conservative branch.

These two positions appear distinct and important for understanding ecological economics as a social and scientific movement (Spash 1999). However, there is always the danger of over simplification where dichotomies are concerned because they can conceal as much as they reveal. The complex interactions of natural scientists (e.g., ecologists, conservation biologists, physicists), social scientists (e.g., economists, political scientists, sociologist) and others (e.g., engineers, foresters), seems likely to have produced much variety. An important part of that variety is the mix of different types of economists and their worldviews. The contention of this paper is that the importance of such key groupings can be explained in terms of ideology and methodology as well as explored empirically. Clearly the socially oriented ecological economists, as described, would appear aligned with heterodox economists in a fundamental critique of mainstream economics and its view of economic systems, as has been argued elsewhere (Spash 2011). Yet, keeping in mind Mearman's (2011) critique, there is then some question on what grounds this correspondence might be drawn.

## *2.2. Heterodox vs. orthodox economics and the environment*

Heterodox economics serves as an umbrella term to cover the coming together of sometimes long standing, separate projects or traditions. This includes the Post Keynesians, critical institutionalists, feminists, Marxists, Austrians and social economists (Lawson 2006). Lee (2009: 6) has defined heterodoxy as blasphemous economists whose ideas are a rejection of and challenge to the orthodoxy. They are non-brethren and their persecution is a legitimate act in defence of the orthodoxy. They are distinguished from heretical economists who are

tolerated because they use many of the same tools and models as the orthodox, and as a result their ideas have led to theoretical advances in the orthodoxy. Such heretical economists may be lauded as part of the establishment (e.g., Nobel prize winners). They are not blasphemers because they still believe in the fundamental core ideas of the orthodoxy, they protect and defend that core and hold back from pursuing the logic of their ideas to revolutionary ends.

The rise of modern ecological economics from a discontent with mainstream economics, and in particular microeconomics, should separate it from neoclassical environmental and resource economics. This would make ecological economics equivalent to Lee's blasphemers. At the same time there are influential figures writing about ecological economics who understand little and care less about such (orthodox vs. heterodox) divisions and basically regard any economics which highlights environmental problems as a good thing (e.g., Ehrlich 2008). In as far as such individuals are non-economists they might be regarded as falling outside the heterodox/orthodox classification and so creating a novel aspect in ecological economics. Then there are those who, like Lee's heretics, question the neoclassical resource and environmental economics approach, but are reluctant to leave the comfort of the theoretical structure, social identity and secure career path that it provides them. They may also be fundamentally committed to market capitalism. These three different groupings can be further distinguished by ideological and methodological positions with respect to the environment.

Neoclassical theorists have given resource and environmental economics a technocentric optimism and ideological faith in market pricing which avoids requirements for fundamental change in human behaviour. The approach can be summarised as follows. If the economy is constrained by a lack of resources then technology must provide the solution via exploiting new substitutes and accessing new deposits. Scarcity will appear in higher prices which are expected to stimulate resource conservation and new technologies.

Resource use includes the assimilative capacity of the environment to absorb human wastes and pollutants. If the environment is excessively polluted then the belief is that technology can be developed which will clean it up. However, this is only really called for once society is rich enough to afford such a luxury as a clean and unpolluted environment. Development then requires exploitation of resources and environmental degradation in order to achieve technological advancement and capital accumulation to get back the environmental quality lost in the process of development. Humans themselves struggle with one another to meet their needs, wants and desires. This justifies the emphasis on growth of resource and energy throughput as a necessity to meet human demands. Environmental concerns are then portrayed as a modern phenomena and/or rich country preoccupation; the environment seen as a luxury good. Environmental problems are at best secondary issues relative to growth, wealth creation, capital accumulation and employment.

Despite being a pure fallacy—ignoring history and human dependence on Nature (Martinez-Alier 2002)—this characterisation, or establishment discourse, enables some common elements to be maintained across those schools of economic thought which relegate environmental issues to the sidelines. Such elements include believing that growth is an unquestioned end, economics should be preoccupied with how to achieve growth, consumption is good and increasing it raises well-being. A series of implicit environmental assumptions underlying this approach go unquestioned. Instead economic discourse concentrates upon how to achieve and maintain growth and full employment, avoid destabilising business cycles, encourage productivity and innovation, and generally conduct human affairs as divorced from physical reality and context. Ownership of the means of production, wealth and income distribution, property rights and more generally institutional arrangements can all be debated without basically questioning the interaction of the economy with the environment.

Both orthodox and heterodox economists are then observed to have ignored the fundamental role of the environment in economic affairs. The orthodox position is clear. Resource and environmental economics became the sub-disciplinary field to assuage those economic heretics with a concern for the environment. Meanwhile mainstream micro and macro economics developed theories assumed to operate independently of either the natural resource base or the assimilative capacity of the environment, and so completely marginalised environmental concerns. The heterodox position is more complicated by the different schools of which it is constituted, but generally addressing the environment has been at best a minority pursuit or totally ignored until quite recent times. However, that there is some variety in the extent to which attention has been paid to the environment is worth outlining. This is illustrated next with respect to neo-Marxists, critical institutionalists and Post Keynesians.<sup>i</sup>

Perhaps the most serious attention amongst these three schools has been within the eco-socialist literature, although this appears to be based more in sociology and political science than economics. There are a range of contributors who have been active in discussing the relationship between Marxism/socialism and the political economy of Nature, such as political scientist Ulrich Brand in Austria, sociologist Ted Benton in the UK, and in the USA sociologists James O'Connor and John Bellamy Foster and economist Paul Burkett.<sup>ii</sup> The journal *Capitalism, Nature, Socialism* is dedicated to covering research in the area of Red-Green thought and radical social ecology. On the left anarchist end of the spectrum there is the work of Murray Bookchin (1921-2006) who published a book on pollution and toxic chemicals (Herber 1962),<sup>iii</sup> the same year as Rachel Carson.

Indeed, there is a body of work across Marxist, socialist and anarchist writers addressing environmental issues which might feed into an ecological economic understanding. The incorporation of entropy via the concept of social metabolism has links

back to social idealism amongst the ecological utopians of the early 1900s (Martinez-Alier 1990). Some attempts have also been made to combine more of an eco-socialist perspective with ecological economics. For example, the edited book by Martin O'Connor (1994), later secretary of the European Society for Ecological Economics (ESEE), brought together a variety of researchers in a political ecology approach.

While, this shows a range of left wing writers have paid attention to economy-environment interactions, the core of Marxism and socialism still appears distant from, if not hostile to, environmental concerns and their socio-economic importance. Red-Green political alliances have declined in popularity since the late 1980s, perhaps due to the rise of ecological modernisation, Green capitalist and neo-liberal environmental policies. In addition, a fundamental tension between socialists and Greens concerns the relative importance given to value in humans as opposed to value in Nature and so the priority of social versus ecological objectives. Benton (1989: 52) notes the oppositional positions taken by some left wing responses to environmentalism and also the characterisation given to socialism by some environmentalists. Typical of the latter is the claim by Georgescu-Roegen (1975) that mainstream and Marxist economists alike have held to a thesis that the power of technology is without limits and Daly's (1992: 196) criticism of Marx for being committed to economic growth without limit. Burkett (2005) for one has challenged such criticisms and made the case for a more informed eco-socialist debate. Synthesising neo-Marxism and ecological economics can be seen as following-up with theory the call for a Red-Green alliance (Burkett 2006, Altvater 2007). This suggests the need for attention to the underlying eco-socialist value theory and Douai (2009) provides a contribution in that direction. There certainly seems more to unite than divide those concerned about the impacts—both societal and environmental—from the current economic system.

Institutional economics in its critical form (as opposed to neoclassical new institutionalism) has also paid some attention to environmental concerns (e.g., Galbraith 1969 [1958]). There is a line of reasoning in institutional economics going back to Veblen (1898) which links economics to an evolutionary biological approach, and there is Veblen's (1991 [1899]) work on conspicuous consumption which links well with ecological concerns over the consumer society. Kapp (e.g.1950, 1970, 1978) is foremost amongst those in the last century working with a critical institutional economic approach who developed a serious concern for the environment. Following in this line, and referencing the work of Myrdal, has been Söderbaum (e.g.2000, 1992), who has also been actively engaged with ecological economics. Then, more recently, there has been Vatn, a past President of the ESEE, who has amongst his publications a substantive volume on institutional economics and the environment (Vatn 2005).

In contrast to these two heterodox schools, the Post Keynesians have almost totally ignored environmental problems, as well as resource and energy constraints, in the tradition of maintaining capital accumulation and full employment. A search of the *Journal of Post Keynesian Economics* on the Web of Knowledge database reveals 1420 articles (as of July 2011) of which there is just one on an environmental or natural resource topic—published in 2003 relating to oligopoly in the oil industry. In recent years there has been an overdue appeal for this to change which has pointed to the potential for Post Keynesians to contribute through their emphasis on systems, uncertainty, realism and pluralism (Mearman 2007). Ecological economics is particularly weak on macroeconomic issues and, if anything, has tended to use economic equilibrium theories and concepts of capital which are inconsistent with some of its basic premises about systems functioning derived from ecology (e.g., Holling 1986). A more heterodox macroeconomic approach, sharing basic methodological concerns, would therefore be a significant step forward, and there has been some attempt to

start a dialogue between Post Keynesians and ecological economists (Holt, Pressman and Spash 2009). However, the role and meaning of macroeconomic growth is a core area where disagreement seems most likely (Spash and Schandl 2009). Although emphasising distributional concerns, Post Keynesian, like mainstream economics, assumes growth is good and more is better. Indeed, as noted, the general thrust of Post Keynesian literature remains untouched by collaborative developments and appeals for addressing the environment.

Despite the environmentally informed works and authors cited above, economist of all schools appear able, if they chose, to ignore the evidence of environmental problems and limits to growth as having anything to do with the core of their economic approaches, theories and models. This has been described as due to the treatment of environmental issues as special cases of more general theoretical constructs in mainstream economics (Spash 2011). The establishment discourse (e.g., price theory, resource allocation, efficiency) then dominates the economic debate. Indeed heterodox economists have been noted to cite orthodox work more than heterodox (Dolfsma and Leydesdorff 2008). In the USA, heterodox economics has been identified with a concentration of research activity in five areas: microeconomic theory, macroeconomic theory, labour, history of thought and industrial organisation; while nine of the top ten heterodox departments publish nothing related to the environment (Lee, Grijalva and Nowell 2010: 1366-1367). As within the economic mainstream, the environment seems to be treated as an optional extra, or specialism, rather than of fundamental importance to understanding economic systems and their operation.

Why then should ecological economists have any particular allegiance with heterodox as opposed to orthodox economics? One answer to this lies in identifying common ontological presuppositions (Lawson 2006). For example, in a comparison with Post Keynesian economics the state of the world is seen in common as involving strong

uncertainty, social indeterminacy, emergent properties and historical dynamic process (Spash and Schandl 2009). In contrast, the mainstream can be seen as treating individuals as passive agents in a static closed system with an ontology of isolated atomism. This justifies the formulation of social reality as one typified by regularities, so allowing the methodology of deductive reasoning and mathematical formalism. In contrast, ecological economics, like other heterodox traditions, accepts the transformative power of human agency with emergent properties arising from a dynamic interconnected process of multi-layered social interactions.

Mainstream economics is then identified as having watered down or changed interdisciplinary research and heterodox concepts in order to make the results fit within and conform to its own approach (Lee 2009). This can be viewed as a form of mainstream economic imperialism (as exemplified for economic psychology by Earl 2005). Modern heterodoxy is then distinguished from the mainstream by allowing theory and method to be informed by insights into social reality. As Lawson (2006: 497) states:

"The fact that heterodox economists resist the mainstream reformulation of their concepts of uncertainty, evolutionary developments, care, institutions and history, etc., reveals that heterodoxy is not so much committed to the latter categories per se, as that it insists on their possessing the ontological properties of openness, processuality and internal-relationality, etc."

In order to distinguish the heterodox from mainstream we might therefore look to the understanding and importance given to key concepts. This point is picked-up in the design of the empirical work reported in Sections 3 and 4.

### *2.3 Ecological economics as a movement in 3 camps*

Bringing the elements of the discussion so far into a more coherent frame then requires conceptualising the role of the orthodox and heterodox along with the mix of natural and



social sciences which constitute ecological economics. Building on Spash (2011) we identify three potential approaches within the ecological economics movement.

First, there is an historical root within ecological economics going back to neoclassical theory (Spash 1999). There are agricultural, environmental and resource economists all trained in the neoclassical tradition who have chosen to associate themselves with various forms of ecological economics (at least in name) while maintaining a strictly orthodox outlook. For example, Carl Göran Mäler, an environmental economist, and Partha Dasgupta, a resource economist, were both part of the rebranding of the Beijer Institute as a research centre in ecological economics. Along with other neoclassically minded economists, such as Charles Perrings, they pursue a mainstream mathematical formalism, optimisation and modelling approach. Their focus is on merging old resource economics and optimal exploitation with discussions of sustainability, resilience and environmental policy, while mostly avoiding direct valuation work and critiques of the current political economy. This branch forms what we term the new resource economists (NRE).

Second, ecological economics has an identifiable grouping of natural scientists whose primary motivation appears as aiming to achieve policy ends via their interaction with the social sciences and principally economics. At the same time social scientists may aim to do likewise via their association with natural scientists. This group may range from activists to academics. As political goal orientated individuals they are pragmatists in that they are primarily concerned with judging the success of methods by their outcome. In order to avoid confusion with the American school of philosophy called pragmatism, they are termed the new environmental pragmatists (NEP).

Third there are those seeking an heterodox approach to economics who reject the fundamental theory of neoclassical economics. They see the explanations offered by externalities and optimisation of behaviour as part of the problem not the solution. Unlike the

pragmatists they are concerned about rigour of explanation and not merely achieving policy oriented goals regardless of by which means. For example, rejection of monism leads to value pluralism and so means concepts such as 'total economic value' are rejected regardless of their political acceptability. This group aims to revolutionise economics in order to both correct the way in which the environment is addressed and also address a range of other associated societal problems (e.g. poverty, inequity, discrimination, sexism, myopia, hedonism, materialism). Taking a political economy approach, the economic system is regarded as totally infused with power relationships and embedded within social structures. Social and environmental problems are then regarded as inseparable policy issues. This group is referred to as the social ecological economists (SEE).

There is some potential for these positions to be held in a variety of combinations. Thus, some SEE might adopt aspects of pragmatism or vice versa. Indeed, Richard Howarth, editor of ecological economics, has argued in favour of a position he calls the "big tent", where we could imagine all three positions would combine (Howarth 2008). Although there seem likely to be problematic aspects to combining such diverse ideological and methodological positions, some might regard this as a form of methodological pluralism (e.g., Norgaard 1989). A series of questions then arise: whether anyone actually populates these hypothesised positions, if so how significant are they, do the groups conform to specific characteristics, do they differ as outlined, are they combined at all? These are issues probed in the empirical study.

### 3. Method

A key aspect of the preceding discussion concerns the differences and similarities between orthodox and heterodox economists in the way they perceive and address environmental problems, and the influence of these positions within ecological economics. The hypothesis

we put forward is that, despite differences in other areas, the underlying approach to the environment of the mainstream—a naive conception based on the independence of the economy from the environment, never ending growth and technological fixes—is also one found amongst many heterodox economists. Ecological economics is then potentially a distinct breakaway from this tradition which might link with other more radical heterodox approaches.

In order to address the existence of such differences, we administered a structured survey at three conferences chosen to obtain samples of ecological economists, heterodox economists and orthodox resource and environmental economists.

- European Society for Ecological Economics (ESEE), "Transformation, innovation and adaptation for sustainability: Integrating natural and social sciences." 8th International Conference, Ljubljana, Slovenia, 29 June-2nd July 2009.
- Association for Heterodox Economics (AHE), "Heterodox economics and sustainable development, 20 years on." 11th Conference, London, United Kingdom, 9-12 July, 2009.
- European Association of Environmental and Resource Economists (EAERE), 17th Annual Conference, Amsterdam, The Netherlands, 24-27 June 2009.

The survey was designed for self completion by respondents. This involved five main parts. The first was designed to classify respondents by their heterodoxy and ecological economics research grouping based on the three categories introduced in Section 2, namely NRE, NPE and SEE. The second probed for knowledge of and agreement with ten key concepts in ecological economics in order to assess core theoretical understandings and approaches. As suggested at the end of Section 2.2, this approach should aid distinguishing orthodox from

heterodox positions. Part three, which is not reported in this paper, involved respondent reaction to a set of summarised journal articles in the field. Part four, administered three environmental belief scales. Part five concluded the survey by requesting socio-demographic data.

Indication of heterodoxy was asked by a direct question but also via a request for the respondents three most often read journals. A key design feature in part one of the survey was the classification of the three ecological economics camps or groupings using expected ideological and methodological differences. Respondents were asked their closest affiliation with three summary statements of the main positions characterising each group. They were informed that “Environmental research and policy is a broad field of inquiry that encompasses a number of different theoretical approaches”. They were then presented with the three statements that were described as characterising “three broad schools of thought on how environmental issues should be addressed”. The three camps were summarised as follows:

(A) New Resource Economics

*We should base our efforts upon the basic tenets of accepted economic theory such as the axioms of consumer choice and model of the individual as a rational agent. The most important role for research is to inform policy makers as to the efficient use of scarce resources*

(B) New Environmental Pragmatism

*The natural sciences provide objective information which should be the primary basis for informing policy, but we face a communication problem. The most important role for research is to be pragmatic and employ whatever approaches are effective to inform the policy community about environmental problems and their solution.*

(C) Social Ecological Economics

*Environmental problems are complex, can be viewed from multiple perspectives and involve values which are often incompatible. The most important role for research is to understand different disciplinary perspectives and develop institutional approaches and social processes to address the interface between economics, science and policy.*

These positions were presented without the titles. In addition, respondents were informed that “some or all of these approaches can overlap”. A Venn diagram was presented that showed the three distinct approaches as well as the potential overlap. Participants were instructed to “use the Venn Diagram to indicate which BEST describes the approach or mix corresponding to YOUR research approach”. They could then indicate that they assessed their research approach to be reflected by any one of the three statements or they could indicate that their research approach reflected any combination of the statements. Thus, a respondent could chose any pairing, or all three positions or any one position. This allowed them to describe their research philosophy in seven distinct ways (i.e. NRE, NEP, SEE or a combination of these approaches).

In part two of the survey respondents were asked to rate the importance of ten key concepts for addressing environmental problems on a seven point scale. The ideas selected were: (1) steady state economy; (2) cost-benefit analysis; (3) ecological footprint; (4) incommensurability; (5) post-normal science; (6) green accounting (e.g. the index of sustainable economic welfare); (7) ecosystems as goods & services; (8) social multi-criteria analysis; (9) small group deliberation; (10) non-utilitarian ethics. The concepts were drawn from Spash (2009). Participants were asked to rate each concept on a 7-point Likert scale (1 = “not at all important; 4 = Moderately important; 7 = Extremely Important). As not all the

participants were expected to have heard of all the concepts they were also provided with the option of a “don’t know” response.

Part four of the survey was set-up to explore environmental beliefs. Three scales were based upon the findings of Milfont & Duckitt (2004), who used an exploratory analysis to simultaneously assess several previously published environmental belief scales. An additional item was added to the ecocentricism scale which otherwise only had a single item. The three environmental belief scales were:

*Technological Optimism scale (5 items):* A high score on this scale indicates that the respondent believes science and technology can solve environmental issues.

*Ecocentricism scale (2 items):* A high score on this scale indicates that the respondent believes humans should stop developing the natural environment and wilderness locations.

*Anthropocentric scale (5 items):* A high score on this scale indicated that the respondent believes that nature should be actively used to increase the welfare of human communities.

Respondents used a 5-point Likert scale (1 = strongly disagree; 3 = undecided; 5 = strongly agree) to rate the items. For a full list of the items used for each of the three scales see Appendix I.

#### 4. Results

Attendance figures are approximations given by conference organisers at the time. The ESEE and EAERE were much larger than the AHE conference. Over half the full participants attending the AHE conference completed the survey (N=44); organisers estimate 80 attending all three days while others came and went (approximately 20).<sup>iv</sup> Attendance at

the ESEE conference was estimated at about 200 delegates, which means about half (N=95) completed the survey.<sup>v</sup> Only about 10% of attendees at the EAERE conference, which was the most well-attended of the three, completed the survey (N=45).<sup>vi</sup> The reason for this low participation rate was that, unlike the other two conferences, the organisers refused to allow the survey to be advertised, handed-out or distributed, and refused to announce or let researchers announce the survey at any conference sessions or plenary talks. This was despite prior permission having been sought and given to allow the survey to be administered at the conference. The low response rate for the EAERE conference and the restriction on administration of the survey clearly mean being cautious over extrapolating the results to the general population of environmental and resource economists. They do not mitigate investigation of the between group differences of primary concern here.

The first survey question asked respondents to nominate their main research discipline. The self definition of heterodox versus neoclassical was undertaken by respondents who reported their main field as economics. As some economists may disagree with being classified as either heterodox or neoclassical, a category of 'other' was also an option. This allows a division of the sample into non-economists, and three categories of economists (heterodox, neoclassical and other). Results broken down by conference show no neoclassical economists attending the AHE conference and only a few at the ESEE. The EAERE conference sample has half neoclassical but, perhaps surprisingly, a quarter define themselves as heterodox. The ESEE sample is distinct from the other two in having a large proportion of non-economists, consistent with the history of the movement.

**Table 1 Orthodox vs. Heterodox Economists**

	Conference		
	ESEE (%)	AHE (%)	EAERE (%)
Heterodox Economists	42	80	24
Neoclassical Economists	2	0	53
Other Economists	23	18	20
Non-Economists	33	2	2
Total %	100	100	99
<u>N</u>	95	44	45

Note: may not add to 100 % due to rounding errors

### *The Role of Formal Education*

Further insight into these divisions is gained from information gathered on the training of participants. All had university education and 95-96 percent post graduate degrees. Classification of degree training by heterodoxy and conference attended is shown in Table 2. The impact of combining economics with another subject is indicated by the total absence of any neoclassical economists with such training. This implies that broadening an individual's perspective can play an important role in their breaking away from the narrow confines of neoclassical thought. At the same time being exclusively educated in economics does not seem to prevent being heterodox. Surprisingly specialised environmental economics training is a minority background for participants amongst the EAERE sample, while some of those with such education, attending the ESEE conference, regard themselves as heterodox. Contrary to expectations, none of those educated as resource or agricultural economists classify themselves as neoclassical, but rather prefer the designation of heterodox.



**Table 2 Training and Heterodoxy**

University Training		Heterodox Economist			Neoclassical Economist			Other Economists			Non-Economists			Total		
		ESEE	AHE	EAERE	ESEE	AHE	EAERE	ESEE	AHE	EAERE	ESEE	AHE	EAERE	ESEE	AHE	EAERE
Economics (straight)	N	11	17	2	-	-	17	9	1	2	2	-	-	22	18	21
	%	28	50	18	-	-	74	41	12	22	6	-	-	23	42	48
Economics (combined)	N	6	14	2	-	-	-	6	4	1	1	-	-	13	18	3
	%	15	41	18	-	-	-	27	50	11	3	-	-	14	42	7
Ecological Economics	N	5	-	1	-	-	-	5	-	-	2	-	-	12	-	1
	%	13	-	9	-	-	-	23	-	-	6	-	-	13	-	2
Environmental Economics	N	2	-	-	1	-	4	-	-	1	-	-	-	3	-	5
	%	5	-	-	50	-	17	-	-	11	-	-	-	3	-	11
Ag/Resource Economics	N	4	1	4	-	-	-	-	-	1	-	-	-	4	1	5
	%	10	3	36	-	-	-	-	-	11	-	-	-	4	2	11
Ag/Forestry	N	-	-	-	-	-	1	1	-	2	2	-	-	3	-	3
	%	-	-	-	-	-	4	4	-	22	6	-	-	3	-	7
Env Mgt/Human Geography	N	5	1	-	-	-	-	1	-	-	7	-	-	13	1	-
	%	13	3	-	-	-	-	4	-	-	23	-	-	14	2	-
Natural Science	N	2	-	1	1	-	-	-	2	-	8	-	1	11	2	2
	%	5	-	9	50	-	-	-	25	-	26	-	100	12	5	4
Engineering	N	2	-	1	-	-	1	-	-	2	4	-	-	6	-	4
	%	5	-	9	-	-	4	-	-	22	13	-	-	6	-	9
Other	N	2	1	-	-	-	-	-	1	-	5	1	-	7	3	-
	%	5	3	-	-	-	-	-	12	-	16	100	-	7	7	-
Total N		39	34	11	2		23	22	8	9	31	1	1	94	43	44
Total %		100	100	100	100		100	100	100	100	100	100	100	100	100	100

Notes:

Missing data 3 respondents

95-96% of respondents at each conference had postgraduate degrees.

Total % may not add to 100 due to rounding errors.

Other includes at ESEE 2 sociologists, 2 planners, 2 maths/statistics, 1 business; AHE 2 political scientists, 1 business.

Natural Sciences includes 4 ecologists at ESEE

The data show that those without formal university degrees in economics may still regard themselves as economists. Ecological economics appears to attract a diverse range of such people including those educated in environmental management, human geography, natural sciences and engineering. Others, trained as economists, classify themselves as non-economists and so appear to think of themselves as disassociated from the profession. Those with a straight ecological training form only a fraction of the non-economics group attending the ecological economics conference, even amongst the natural scientists (only 4 out of 11). However, responses to stating a primary research discipline revealed 17 ecologists amongst the 31 ESEE respondents in the non-economic group. So again there is divergence between training and personal disciplinary classification. In ecological economics, there is certainly the potential for skill transfer and self-redefinition over time. For example, the presence of those with engineering training may indicate adoption of the industrial ecology approach in ecological economics and/or the transference of mathematical skills to an NRE approach.

#### *Heterodox vs. Neoclassical*

Next we narrow down the comparison to focus upon contrasts and similarities between the heterodox groups of economists at the ESEE and AHE and the neoclassical group at the EAERE. The expectation was that the ESEE and AHE heterodox economists should be close in terms of methodological and ideological positions and distinct from the EAERE neoclassicals. However, such differences were not expected across the full range of tests due to the hypothesised divergence of both heterodox and orthodox economists from ecological economists on issues of growth and the environment.

Table 3 displays the demographics for the three sub-samples and reveals several demographic similarities across the groups. All sub-samples consist of a majority of males over 35 with a post-graduate education. The AHE sample has a significant non-European

minority, including Americans. The ESEE sub-sample has a quarter Eastern Europeans with the conference being held in Slovenia, and an almost total absence of non-Europeans.

**Table 3 Sub-sample Demographics**

	<b>ESEE Heterodox (%)</b>	<b>AHE Heterodox (%)</b>	<b>EAERE Neoclassical (%)</b>
Gender			
Male	73	79	61
Female	27	21	39
Postgraduate education	93	97	100
Age > 35	63	77	61
Residence			
W. Europe	73	58	87
E. Europe	25	7	0
N. America	0	16	9
S. America	2	3	0
Asia	0	7	4
Aus./NZ	0	9	0
<u>N</u>	40	35	24

### *Unifying Journals and Reading Patterns*

One way in which academic research communities can be identified is through literature held in common. Respondents were asked to list the three journals they read most often. This allows a network analysis showing the connections between journals. Network diagrams take each participant and depict their choices as a triad of connected nodes. For example, if a participant indicated that they read *Environmental Values*, *Ecological Economics* and the *Cambridge Journal of Economics* their network diagram would be as represented in Figure 1a. If another participant is then added to the diagram who indicated they read *Science*, *Nature* and the *Cambridge Journal of Economics* the new network diagram would be as represented in Figure 1b. The more people who read the same two journals the thicker the

font of the line shown in the following figures. The data relate to the samples and sub-samples being referenced and so caution is required in drawing conclusions about the community of which they are a part, but some strong associations appear representative.

An interesting aspect is then where there are key primary journals acting as hubs or nodes for communication. We define nodes as follows. If the journal was only mentioned once it was not classified as a node. A tertiary node was defined as a journal read by two or three respondents and a secondary node four to seven respondents. A primary node was a journal read by eight or more participants (a minimum of approximately 20-30% of the sample in each case). A total of 111 journals were named across the three samples; they are specified and number coded in Appendix 2.

Figure 1a. A journal network diagram for a single individual

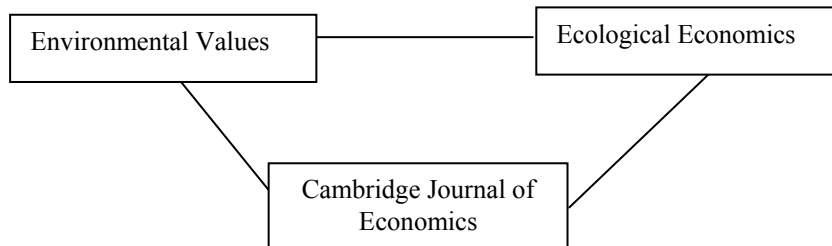


Figure 1b: A journal network diagram for two individuals

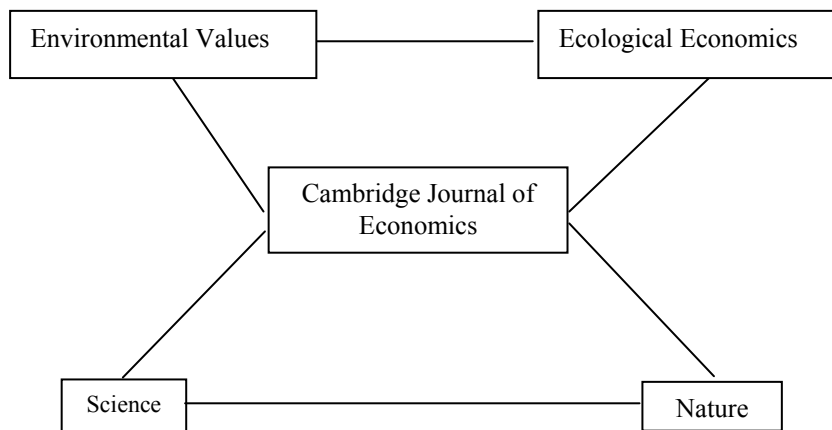
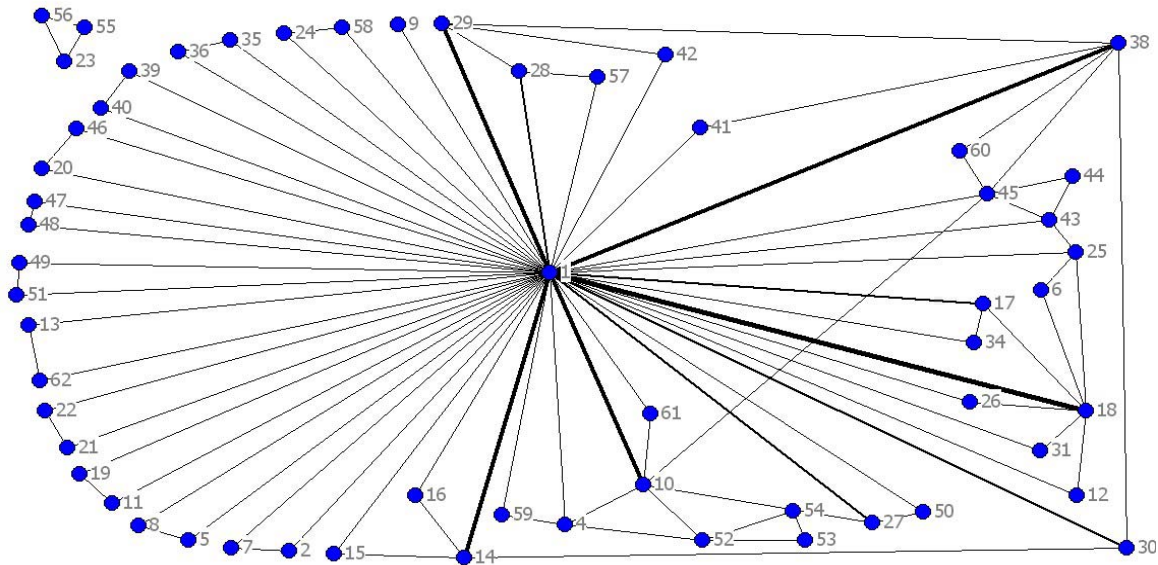


Figure 2 gives the results for the ESEE heterodox sub-sample. Comparison with data for the overall ESEE sample shows the dominant main journal connecting all others remains *Ecological Economics* (1), which was read by 85% of respondents. In comparison with the AHE and EAERE communities the role of this one journal is far more dominant in bringing together otherwise separate interests and clearly forms a unifying hub journal for the ESEE heterodox group. In that group, the 40 respondents made reference to 59 different journals, including non-economic journals. Most selected *Ecological Economics* (1) and then a unique pattern for the other two journals. This reveals both great diversity and distinct individual differentiation as to important source information. Secondary nodes such as *Environmental Values* (18), *Energy Policy* (38) and *Ecology & Society* (10) are themselves interdisciplinary and so indicate a group interest in the integration of different disciplinary bodies of knowledge. In comparison with the total ESEE sample, these heterodox ecological economists give a reduced import to the journals *Science* (9) and *Nature* (7), with the former moving from being a secondary node to no significance. Similarly, the *Journal of Industrial Ecology* (26), which is a secondary node for the total ESEE sample, is no longer significant in Figure 2. This implies neither the natural science nor industrial ecology perspectives are strongly related to the umbrella of heterodoxy for ecological economists, at least as far as ESEE attendees sampled here are concerned.

Heterodox AHE respondents are also a diverse group with 33 respondents referencing 47 journals. However, there is also distinct identifiable clustering and an economic and political focus. As Figure 3 shows, the unifying factor is the *Cambridge Journal of Economics* (52), and without this journal the community would appear to fall back into some identifiable and separate areas of research interest. Lesser nodes occur around journals associated with Post Keynesian economics, Marxism and institutional economics. These

heterodox schools have distinct journals of interest to them. The journal *Ecological Economics* (1) appears, but as a low ranking tertiary node for this community.

Figure 2: ESEE Heterodox Journal Network



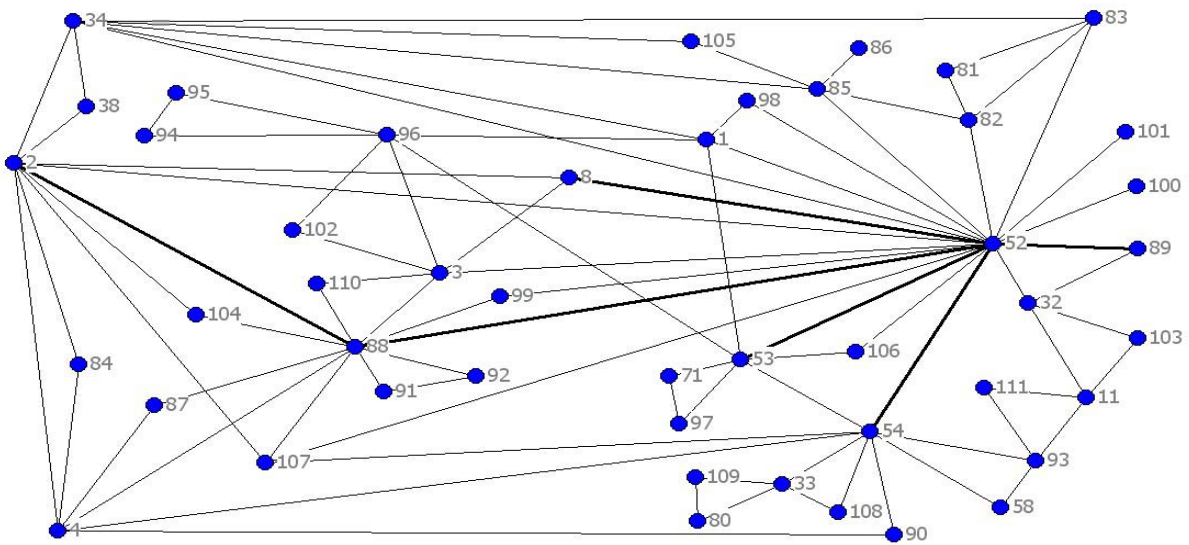
Primary node: (1) *Ecological Economics*

Other researchers have reported similar results. Cronin (2010) found that the *Cambridge Journal of Economics* (52) is the most cited of twenty top heterodox journals and a key intermediary between heterodox journals. It was also shown to cluster with the *Journal of Post Keynesian Economics* (88). The results here are consistent with these findings. The journal *Ecological Economics* appeared in Cronin (2010) as one of the top 24 journals classified as “non-heterodox/other” citing highly the top twenty heterodox journals.

Dolfsma and Leydesdorff (2008) note that if a node with a high level of “betweenness centrality” were to be deleted from a network, the network would fall apart into otherwise coherent clusters. They find the *Cambridge Journal of Economics* has an exceptionally high betweenness centrality. This is again consistent with the findings here, but also with Merman's

(2011) contention that the heterodoxy is merely a combination of separate and distinct schools.

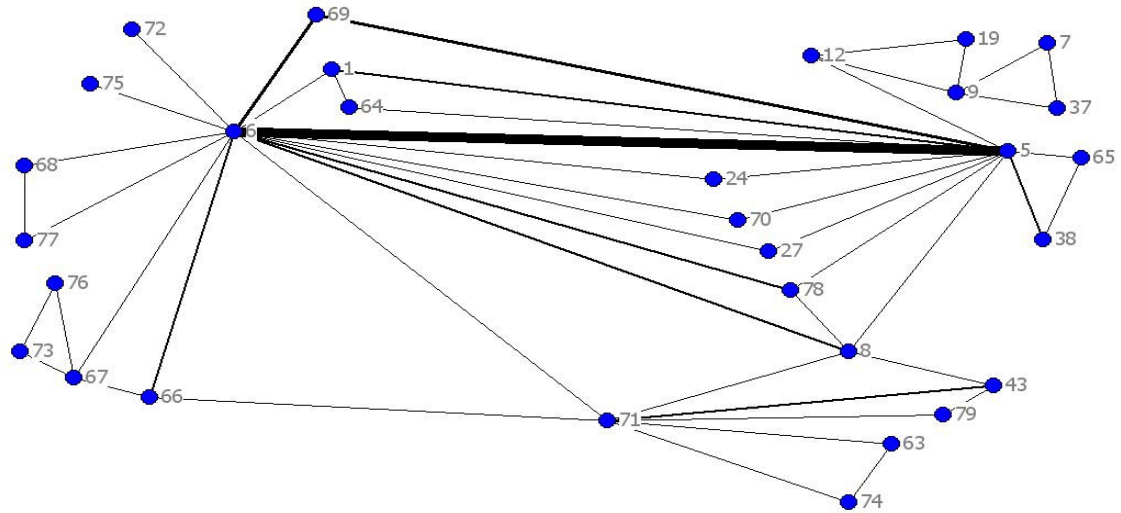
Figure 3 AHE Journal Network



Primary nodes: (52) *Cambridge Journal of Economics* (88) *Journal of Post Keynesian Economics*

EAERE neoclassical economists tend to choose the same journals as the overall EAERE group with the *Journal of Environmental Economics and Management* (JEEM) and *Environmental and Resource Economics* (ERE) coming top, see Figure 4. The 24 respondents in this sub-sample made reference to 30 journals, 54% selected ERE and 58% JEEM with 38% of the sample indicating that they read both. However, for the total EAERE sample, ERE is a secondary node, behind JEEM, and appears equal with *Ecological Economics*. This shows that the latter has established itself as an outlet for the EAERE community but is seen as far less important by the neoclassical economists. Another difference for this group, over the total EAERE sample, is the relative favour given to the *American Economic Review*.

Figure 4 EAERE Neoclassical Journal Network



Primary nodes: (5) *Environmental & Resource Economics*, (6) *Journal of Environmental Economics & Management*

Table 4 summarises the journal node results for the three communities. Despite the large number of journals (111 in total, see Appendix II), there is relatively little cross over in readings and that which does occur is often at a minimal level (i.e., amongst relatively few respondents). Only three journals appeared in all three sub-samples: *Ecological Economics* (1), *Energy Policy* (38) and the *American Economic Review* (8), but the latter two are not nodes in all three. The two heterodox groups shared ten journals, while the two environmental oriented sub-samples shared twelve journals. The lowest cross-over was between AHE heterodox and neoclassical EAERE with just four journals mentioned in common and no nodes held in common besides *Ecological Economics*. The ESEE heterodox group holds three journal nodes in common with each of the other two groups. As shown in Table 4, only *Ecological Economics* appeared as a node across all three subsamples.



**Table 4: Journal Nodes**

		ESEE Heterodox	AHE Heterodox	EAERE Neoclassical
Code	Journal			
1	Ecological Economics	1*	3	3
2	Journal of Economic Issues		2	
3	Journal of Economic Perspectives		3	
4	Journal of Economic Literature	3	3	
5	Environmental & Resource Economics			1*
6	Journal of Environmental Economics & Mgt.			1*
8	American Economic Review			3
9	Science			3
10	Ecology & Society	2		
11	World Development		3	
12	Land Economics			3
14	Intl. Journal of Sustainable Development	3		
17	Organization & Environment	3		
18	Environmental Values	2		
27	Environment & Planning C: Govt. & Policy	3		
28	Environmental Management	3		
29	Land Use Policy	3		
30	Journal of Environmental Planning & Mgt.	3		
32	Development & Change		3	
33	Journal of Development Studies		3	
34	Review of Radical Political Economics		2	
38	Energy Policy	2		3
43	Quarterly Journal of Economics	3		3
45	Journal of Evolutionary Economics	3		
52	Cambridge Journal of Economics	3	1*	
53	Journal of Economic Methodology		2	
54	Review of Social Economy		2	
63	Journal of Economic Theory			3
66	Journal of Economic Dynamics & Control			3
67	European Review of Agricultural Economics			3
69	American Journal of Agricultural Economics			3
71	Economic Journal			2
78	Journal of Public Economics			3
80	Economic & Political Weekly		3	
82	New Left Review		3	
85	Capital & Class		3	
88	Journal of Post Keynesian Economics		1*	
93	Journal of Institutional Economics		3	
96	Journal of Economic History		3	
107	Review of Political Economy		3	

Node importance: 1\* primary hub; 2 secondary node; 3 tertiary node

### *Knowledge of Key Concepts*

Key concept knowledge shows further distinct divisions between the communities and especially with respect to their perspectives on environmental issues. A striking result is the lack of knowledge and knowledge differences concerning some of the ideas. Overall the ESEE heterodox sample has the greatest understanding across all concepts and the AHE heterodox the least. For both the neoclassical and ecological economics samples 90% understand six concepts, but of the remaining ones the ESEE heterodox group has much better knowledge. The least understood concept is post-normal science with no knowledge amongst 18% of the ESEE heterodox sample, 62% of EAERE neoclassical economists and 71% of AHE heterodox. About a quarter to a third of the AHE heterodox sample lack knowledge of incommensurability, small group deliberation, ecosystems as goods and services, and social multi-criteria analysis, and one in five non utilitarian ethics. The EAERE neoclassical economists also have deficiencies in some of these areas: even more (42%) lack knowledge of incommensurability, while a third small group deliberation and a fifth social multi-criteria analysis. Full results are shown in Table 5. To the extent that post-normal science, incommensurability, small group deliberation, social multi-criteria analysis and non-utilitarian ethics are central for understanding the message of ecological economics there appear problems with communicating across the heterodox communities. At the same time the AHE sample are not a specifically environmental group of researchers, so the fact that the majority (two thirds or more) have some understanding of all concepts, except post-normal science, can be seen as an encouraging finding.

Table 5: Response statistics for the ratings of the key concepts

	No knowledge %	Mean rating	SD	Comparison of means (ANOVA)
Cost-benefit analysis				
ESEE	3	3.00 (N = 38)	1.56	F (2, 92) = 20.18**
EAERE	0	5.54 (N = 24)	1.78	
AHE	6	3.33 (N = 33)	1.90	
Steady State Economy				
ESEE	10	5.20 (N = 35)	1.51	F (2, 87) = 5.34**
EAERE	0	4.08 (N = 24)	1.69	
AHE	11	3.77 (N = 31)	2.29	
Ecosystems as goods & services				
ESEE	8	4.78 (N = 36)	1.69	F (2, 83) = 4.47*
EAERE	8	5.27 (N = 22)	1.32	
AHE	20	3.82 (N = 28)	2.14	
Green accounting				
ESEE	10	4.46 (N = 35)	1.48	F (2, 84) = 1.68
EAERE	8	4.95 (N = 22)	1.43	
AHE	14	5.13 (N = 30)	1.68	
Ecological footprint				
ESEE	5	4.35 (N= 37)	1.67	F (2, 89) = 10.60**
EAERE	4	3.52 (N = 23)	0.99	
AHE	9	5.34 (N = 32)	1.49	
Non-Utilitarian ethics				
ESEE	13	5.91 (N =34)	1.29	F (2, 82) = 26.91**
EAERE	8	3.32 (N =22)	1.59	
AHE	17	5.90 (N = 29)	1.45	
Small Group Deliberation				
ESEE	13	5.29 (N = 34)	1.29	F (2, 71) = 9.40**
EAERE	29	3.35 (N = 17)	1.73	
AHE	34	3.96 (N = 23)	1.99	
Social Multi-Criteria Analysis				
ESEE	8	5.69 (N = 36)	1.03	F (2, 79) = 6.30**
EAERE	21	4.53 (N=19)	1.61	
AHE	23	5.67 (N = 27)	1.21	
Incommensurability				
ESEE	15	5.97 (N = 33)	1.16	F (2, 67) = 0.30
EAERE	42	5.93 (N = 14)	1.07	
AHE	34	4.96 (N =23)	1.89	
Post-Normal-Science				
ESEE	18	5.84 (N = 32)	1.27	F (2, 48) = 7.77**
EAERE	62	3.11 (N = 9)	3.14	
AHE	71	4.50 (N = 10)	2.27	

\* p < 0.05; \*\* p < 0.01

Further insight is gained by analysis of the means and standard deviations using a one-way analysis of variance (ANOVA) for the rating of the concepts, as shown in Table 5. No significant difference in the rating of the importance of the concepts was found for green accounting and incommensurability. Post hoc tests were conducted on the concept ratings where the ANOVA results revealed significant differences, with the exception of the concept of post-normal science because the sample size was so small. Levene statistics revealed heterogeneous variance between the conference samples for the concepts of steady state economy and cost-benefit analysis concept ratings. Therefore the Games-Howell post hoc test was used for these two concepts. The other concepts were assessed with the least-squared difference (LSD) post hoc test. Table 6 summarises the results for these post hoc tests.

Table 6: Rating of Concept Importance

<u>ESEE&gt;AHE=EAERE</u>	<u>ESEE=AHE&gt;EAERE</u>	<u>AHE&gt;ESEE&gt;EAERE</u>	<u>ESEE=EAERE&gt;AHE</u>	<u>EAERE&gt;AHE=ESEE</u>
Steady state economy <sup>b</sup>	Non-utilitarian ethics <sup>a</sup>	Ecological footprint <sup>a</sup>	Ecosystems as goods & services <sup>a</sup>	Cost-benefit analysis <sup>b</sup>
Small group deliberation <sup>a</sup>	Social multi-criteria analysis <sup>a</sup>			

Notes:

> significantly greater than; = no significant difference

<sup>a</sup> LSD post hoc test

<sup>b</sup> Games-Howell post hoc test

The ESEE sample has a significantly higher rating for the importance of steady-state economy and group deliberation than both the EAERE and AHE samples. There is agreement between ESEE and AHE heterodox economists on rating non-utilitarian ethics and social multi-criteria analysis as more important than EAERE neoclassical economists consider these concepts. The AHE sample rate ecological footprints higher than the other

communities and ecosystems as goods and services lower. The neoclassical EAERE sample had a higher rating for the importance of cost-benefit analysis and a lower rating for non-utilitarian ethics and social multi-criteria analysis. As we move from left to right in Table 6 there is a change from non-mainstream ideas towards those acceptable within a neoclassical frame. Thus, valuing externalities can be applied to ecosystems using cost-benefit analysis and these approaches are most favoured by the EAERE neoclassical economists. On the left hand side are constraints and more political approaches involving plural values and multiple perspectives. Note that treating ecosystems as goods and services is seen as important by the ESEE heterodox sample, but apparently not using cost-benefit analysis.

### *Environmental Beliefs*

Three environmental belief scales were administered to measure commitment to technological optimism, ecocentrism and anthropocentrism. A principal components analysis with varimax rotation was able to clearly differentiate between the technological optimism scale (Cronbach's  $\alpha = 0.73$ ), the ecocentrism scale (Cronbach's  $\alpha = 0.69$ ) and the anthropocentric scale (Cronbach's  $\alpha = 0.61$ ). Each scale was divided by the number of items in the scale, so that the scores for each scale range from 1 strongly disagree to 5 strongly agree. Table 7 displays the means and standard deviations. A one-way ANOVA revealed significant differences for responses to the technological optimism and the ecocentrism scales. A Levene statistic revealed no significant differences in homogeneity of variance of the scales so the LSD post hoc test was employed to further probe for differences in the technological optimism scale scores and the ecocentrism scale scores. The anthropocentrism scale showed no differences and is therefore not analysed further.

If we take technological optimism first, a LSD post hoc test revealed that the ESEE heterodox group had a significantly lower technological optimism scale score than both the

EAERE neoclassical and AHE heterodox samples. No significant difference was found in the technological optimism score for the AHE and EAERE samples. This suggests that the ESEE heterodox economists would be less optimistic about technology solving environmental problems than the EAERE and AHE samples.

Table 7: Three environmental belief scales

		N	Mean	Std. Deviation	Comparison of means (ANOVA)
Technological Optimism Scale	EAERE - Neoclassical	24	2.82	0.76	F (2, 92) = 6.22**
	AHE – Heterodox	33	2.57	0.79	
	ESEE – Heterodox	38	2.19	0.59	
Ecocentrism Scale	ESEE – Heterodox	39	3.62	0.99	F (2, 93) = 6.97**
	AHE – Heterodox	34	3.16	0.90	
	EAERE - Neoclassical	23	2.70	0.94	
Anthropocentric Scale	EAERE - Neoclassical	23	2.70	0.72	F (2,92) = 1.07
	AHE – Heterodox	34	2.59	0.66	
	ESEE – Heterodox	38	2.46	0.56	

\*  $p < 0.05$ ; \*\*  $p < 0.01$

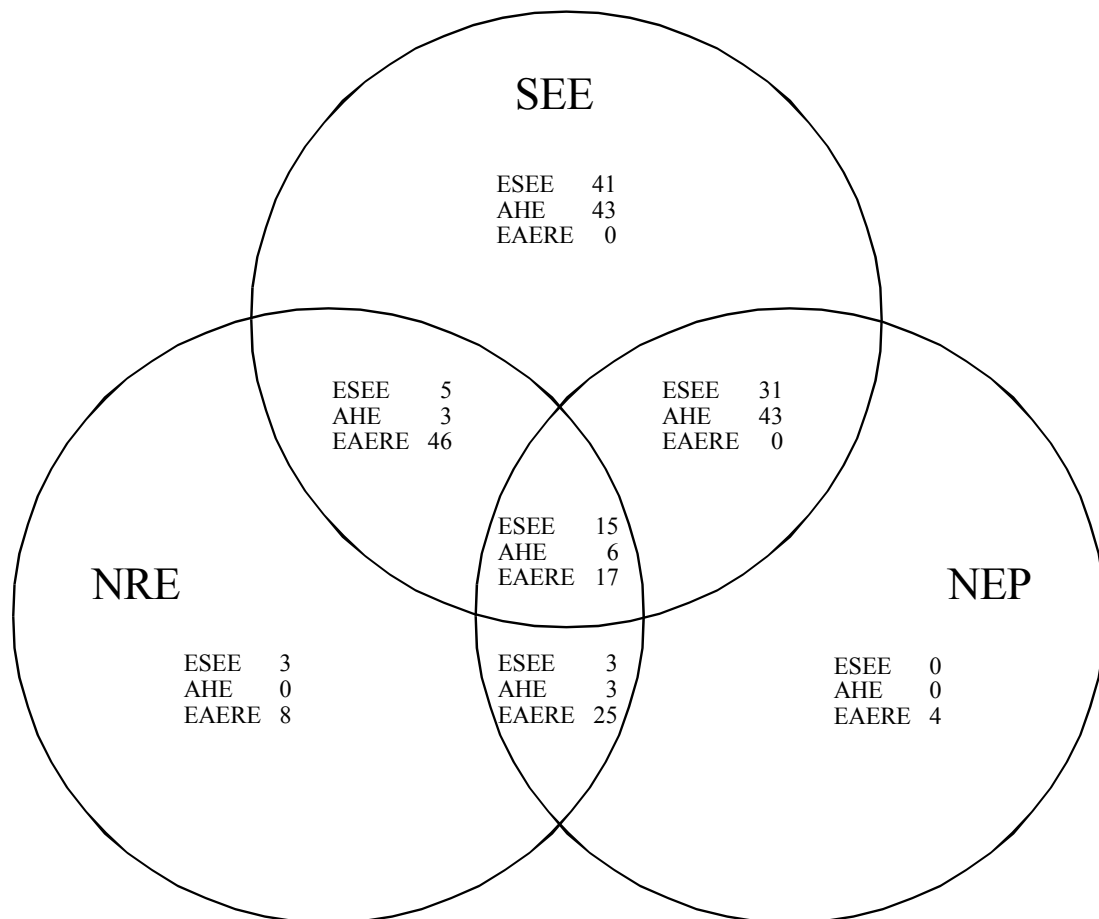
In terms of ecocentrism, a LSD post hoc test revealed that the ESEE group has significantly higher ecocentric beliefs than both the EAERE group and the AHE group. Once again there were no significant differences found between the EAERE group and the AHE group. This suggests that the samples from the EAERE and AHE conferences are more pro-development of natural environments than the ESEE sample.

### *Research Approach*

The last aspect of the survey on which we report here is the self-reported research approach. That is, the ideological and methodological positions characterised under the three categories

of NRE, NEP and SEE. The two heterodox samples from ESEE and AHE have very similar patterns of response as shown in Figure 5. The main difference being the total rejection of the pure NRE position by the AHE sample and their weaker representation in the central position (i.e., the ‘Big Tent’) in which all three approaches combine. Instead they favour SEE and SEE combined with NEP. Perhaps surprisingly the pure NEP position has no takers from amongst the ESEE or AHE samples and is only favoured by a small percentage of the EAERE neoclassical sample. At the same time all three samples show that approximately half of the respondents include NEP as an aspect of their research approach.

Figure 5: Self-Categorised Research Approach: Heterodox vs. Neoclassical



Notes:

Figures are percentages for each conference sub-sample: ESEE heterodox, AHE heterodox and EAERE neoclassical. Two percent non-response for ESEE and AHE.

The major division is then between the EAERE neoclassical sample and the two heterodox samples. The former reject a pure SEE position completely, along with SEE combined with NEP. This is a total contrast with the heterodox economists where these two classifications were majority positions held by 72% and 86% of the ESEE and AHE samples respectively. The EAERE neoclassical economists favour combining the more neoclassically consistent NRE approach with SEE, NEP or both. Thus, 63% are found agreeing with the SEE approach as part of their research position.

## **5. Discussion and Conclusions**

Many heterodox approaches are directed towards particular theoretical and/or empirical/applied issues. That they fail to address environmental issues may be seen as an issue of 'incompleteness'. In this context, a solution would be to bring together the various heterodox approaches so that they complement and integrate with the aim of making the whole better than the parts. This requires the ability of different schools to understand each other and for individuals within those schools to be able to communicate their ideas. Where there are methodological and ideological divergences, differences in world views and lack of knowledge of key concepts this will mitigate bringing together heterodox approaches. There have then been questions raised as to the coherence of heterodox economics.

Our overall conclusion is that there are distinct differences between ecological economists, heterodox and neoclassical economists sampled which imply divergent preoccupations. The conferences samples are reading different journals. There were only 4 journals that were read in common amongst the top 40 journal nodes across the three conferences. This helps explain why there may be metaphors and analogies that are not understood across the different groups. For example, the diverse reading patterns of the ESEE group would seem likely to encourage familiarity with such concepts as



incommensurability and post-normal science, and greater general readiness to learn about non-economic subjects. In contrast the narrow reading patterns of the EAERE neoclassical economists, as a community, seem likely to reinforce a narrow perception of reality.

A substantive difference between the heterodox AHE and ESEE groups was the closer contact of the later with non-economists such as (but not only) ecologists. This is likely to produce greater awareness of physical constraints and bio-physical limits to socio-economic systems. An interdisciplinary understanding of the interaction between natural and socio-economic sciences helps explain why the ESEE respondents have: (i) more pessimism about the possibility of scientific solutions, (ii) a higher ecocentrism score, and (iii) a higher rating for the importance of a steady state economy.

The network diagrams suggest divergent patterns of unification around nodes. The EAERE sample was quite distinct being unified in the reading of two core environmental economics journals, while most other journals read by this group were neoclassical. The ESEE group were unified in the reading of *Ecological Economics*, while it was also common place for these economists to read other journals that were not widely read by others within this community. This means the movement is somewhat eclectic and very diverse rather than built upon pre-existing schools of thought or groupings. The AHE group was most importantly linked via the *Cambridge Journal of Economics*. They also listed a diverse range of individual journal reading patterns but in addition a set of commonly read journals that were held in common by smaller sub-groups. The common sub-group reading patterns for AHE suggest the presence of economists from specific economic schools of thought, namely: Post Keynesian, neo-Marxist, and critical institutional/evolutionary. The importance of this key node and smaller sub-groupings pattern could be taken as support for Mearman's (2011) contention that there is little to heterodox economics as a unified field beyond the constituent

parts. However this would be to ignore the evidence on methodological and ideological positions.

As noted in Section 2 there are divergent approaches to the environment between heterodox schools. The relative presence of Post Keynesian versus eco-socialist and environmentally aware critical institutionalists would be expected to determine how far the group as a whole might adopt a SEE perspective. Yet this position comes through very strongly for the AHE sample even with the clear presence of Post Keynesians. The survey results show 92% of the ESEE sample and 95% of the AHE sample selecting a research philosophy that includes SEE. In contrast 96% of the EAERE sample selected a research philosophy that includes NRE and seems clearly interested in applying the basic tenets of mainstream theory. That heterodox research involves a focus on multiple perspectives and values is consistent with why SEE appears so strongly. That the majority of participants in both the heterodox samples classified themselves as SEE or NEP & SEE suggests that these economists are concerned about social research without using the axioms of mainstream economics or holding efficiency as a primary goal. A neoclassical approach to the environment is more concerned with applying the basic tenets of consumer choice and the rational agent model, and so consistent with NRE.

The majority of the sample of neoclassical respondents from the EAERE conference classified themselves as NRE & SEE or NRE & NEP suggesting that these researchers are focused on using the axioms of mainstream economics in order to inform and filter their understanding of other disciplines while applying methods they regard as pragmatic. This difference is further highlighted by the EAERE group rating the importance of the concept of cost-benefit analysis as being higher than the heterodox groups, while also rating the concepts of non-utilitarian ethics and social multi-criteria analysis as being lower than the heterodox groups. However, there was also a minority in the EAERE sample holding an heterodox self-

definition and those amongst the neoclassical group wishing to combine all three perspectives in the 'Big Tent'. There are also some 'Big Tent' advocates amongst the ecological economics sample, which seems likely to reflect holding to some form of methodological pluralism.

An interesting question is then how NRE ideological and methodological commitments can be maintained while holding that SEE positions are simultaneously valid? On the basis of the past interactions between mainstream and heterodox approaches a distinct possibility is domination of the field of ecological economics with key concepts being watered down or changed beyond recognition in order to conform to an implicit orthodox ontology and methodology. Yet there is still the possibility that ideas may flow in the opposite direction and result in a broadening of the horizons of neoclassical economists which breaks down their restricted world view. However, converting into fully committed alternative environmental thinkers would seem to require multidisciplinary, if not interdisciplinary, training. In this regard the finding that no neoclassical economists in the sample held combined degrees suggests neoclassical economic imperialism is a more likely outcome.

In terms of addressing economy-environment interactions from an heterodox perspective there are clear challenges. Many heterodox economist appear to lack knowledge of key concepts seen as important by ecological economists. At the same time, the more positive attitude towards traditional economic positions—technological optimism, pro-growth, pro-development—conflicts with the beliefs of ecological economists about the need for behavioural and structural change, respecting biophysical constraints and recognising limits to material consumption as a means for increasing well-being. That ecological economists are mixing natural science and other non-economic subjects seems likely to be an important contribution to their different world view, but also a further potential barrier to communication with other heterodox economists.

Incorporating Nature and our dependency upon the non-human into a theory of political economy is seen as essential by the socio-economists within ecological economics in order to create a better understanding of social and economic systems and motivate the necessary actions required to address our on-going crises. That the changes required are revolutionary in terms of the current economic systems makes alliance with radical economists from other schools seem logical. One unifying factor is clear in this study, the majority of heterodox economists sampled, including those within ecological economics, share common perspectives in terms of their world view, and this already involves a far more radical research approach than found amongst neoclassical environmental and resource economists. There then appear to be good grounds for unification through ideological and methodological commonalities in order to raise the profile of environmental and resource issues amongst heterodox economic schools of thought.

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## Appendix I: Environmental Belief Scales

### **Technological Optimism scale**

*Item 1:* Most environmental problems can be solved by applying better technologies

*Item 2:* Science and technology will eventually solve our problems with pollution,  
overpopulation and diminishing resources

*Item 3:* Humans will eventually learn enough about how nature works to be able to control it

*Item 4:* We cannot count on science and technology to solve our problems (reverse item)

### **Ecocentricism scale**

*Item 1:* Turning new unused land over to development should be stopped

*Item 2:* I oppose any removal of wilderness areas no matter how economically beneficial  
their development may be

### **Anthropocentric scale**

*Item 1:* Nature is important because of what it can contribute to the pleasure and welfare of  
humans

*Item 2:* One of the better things about recycling is that it saves money

*Item 3:* One of the most important reasons to keep lakes and rivers clean is so that people can  
have a place to enjoy water sports

*Item 4:* One of the most important reasons to conserve is to ensure a continued high standard  
of living.

## Appendix II: Journal coding for network diagrams

- 1 Ecological Economics
- 2 Journal of Economic Issues
- 3 Journal of Economic Perspectives
- 4 Journal of Economic Literature
- 5 Environment & Resource Economics
- 6 Journal of Environmental Economics & Management
- 7 Nature
- 8 American Economic Review
- 9 Science
- 10 Ecology & Society
- 11 World Development
- 12 Land Economics
- 13 Futures
- 14 International Journal of Sustainable Development
- 15 Estudos Sociedade e Agricultura
- 16 European Environment
- 17 Organization & Environment
- 18 Environmental Values
- 19 Proceedings of the National Academy of Sciences
- 20 Antipode
- 21 Real World Economics Review
- 22 Journal of Interdisciplinary Economics
- 23 Science, Technology & Human Values
- 24 Journal of Economic Behavior & Organization
- 25 Journal of Behavioural Economics
- 26 Journal of Industrial Ecology
- 27 Environment & Planning C: Government & Policy
- 28 Environmental Management
- 29 Land Use Policy
- 30 Journal of Environmental Planning & Management
- 31 Business Strategy & Environment
- 32 Development & Change
- 33 Journal of Development Studies
- 34 Review of Radical Political Economics
- 35 GAIA
- 36 Journal of Sustainable Tourism
- 37 Climate Change
- 38 Energy Policy
- 39 Ecological Economy (Chinese)
- 40 Rethinking Money
- 41 Energy & Environment
- 42 Human Ecology
- 43 Quarterly Journal of Economics
- 44 Journal of Economic Growth
- 45 Journal of Evolutionary Economics
- 46 Waste Management
- 47 Water Management
- 48 International Journal of the Commons
- 49 Journal of Rural Studies
- 50 Journal of Environmental Policy & Planning
- 51 Sociologia Ruralis
- 52 Cambridge Journal of Economics
- 53 Journal of Economic Methodology
- 54 Review of Social Economy
- 55 Storytelling, Self, Society



56	Science as Culture
57	Tourism Management
58	Socio-economics
59	German Economic Review
60	Technology & Culture
61	Biological Invasions
62	Biodiversity Conservation
63	Journal of Economic Theory
64	Environment & Development Economics
65	Energy Economics
66	Journal of Economic Dynamics & Control
67	European Review of Agricultural Economics
68	Journal of International Economics
69	American Journal of Agricultural Economics
70	Energy
71	Economic Journal
72	Natural Resource Modeling
73	Economist
74	Game & Economic Behavior
75	Marine Resource Economics
76	Economisch Statistische Berichten (Dutch)
77	Canadian Journal of Economics
78	Journal of Public Economics
79	Journal of Macroeconomics
80	Economic & Political Weekly
81	Monthly Review
82	New Left Review
83	Rethinking Marxism
84	The Economic & Labour Relations Review
85	Capital & Class
86	Radical Statistics
87	Journal of Political Economy
88	Journal of Post-Keynesian Economics
89	Population & Development Review
90	Forum of Social Economics
91	Intervention
92	Intereconomics
93	Journal of Institutional Economics
94	Desarrollo Económico Argentina
95	Realidad Económica Argentina
96	Journal of Economic History
97	History of Economic Ideas
98	Capitalism Nature Socialism
99	Meteroeconomica
100	American Journal of Economics & Sociology
101	Sociological Theory
102	Review of International Political Economy
103	International Labour Review
104	International Journal of Public Policy
105	Science & Society
106	Feminist Economics
107	Review of Political Economy
108	Economy & Society
109	Journal of Agrarian Change
110	History of Political Economy
111	IMF Staff Paper Series

## ENDNOTES

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- <sup>i</sup> The feminist economics literature also seems important and in particular its eco-feminist branch. This literature is not explicitly discussed, but we note this is deserving of attention. Several writers from this perspective have also been feeding into the eco-socialist debate e.g., British social scientist Mary Mellor, American philosopher Carolyn Merchant, Australian sociologist Ariel Salleh, and German sociologist Maria Mies.
- <sup>ii</sup> Altvater (2007) mentions David Harvey, Enrique Leff, Michael Perelman, Richard England, and Sergei Podolinsky, but also notes an active debate on Marxism and ecology in Latin America and Europe. Other eco-socialists writers are American psychologist Joel Kovel, British geographer, David Pepper, Australian political economist Stuart Rosewarne, French engineer and political activist Alain Lipietz, British philosopher John O'Neill, and French economist Bertrand Zuideau.
- <sup>iii</sup> Bookchin published this under the pseudonym Lewis Herber.
- <sup>iv</sup> Mearman (2011: 489) estimates the AHE membership at 250 in 2008, but notes considerable variability giving figures of 168 in 2006 and 258 in 2007.
- <sup>v</sup> Personal communication (28<sup>th</sup> July, 2011) from the International Society for Ecological Economics (ISEE) secretariat gave the membership for the ESEE as 548 people in 2009 and a year later 496. David Stern, an Associate Editor of the journal *Ecological Economics* states on his personal website (9<sup>th</sup> July 2011) that current membership is 3049 ISEE members with ESEE the largest block at over 700, but he gives no source for his data (<http://stochastictrend.blogspot.com/2011/07/membership-of-international-society-for.html>).
- <sup>vi</sup> The EAERE gives its membership as over 1000. Accessed 26 July 2011, (<http://www.eaere.org/overview.html>).