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Spash, Clive L. and Schandl, Heinz

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# GROWTH, THE ENVIRONMENT AND KEYNES: REFLECTIONS ON TWO HETERODOX SCHOOLS OF THOUGHT

Clive L. Spash and Heinz Schandl

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# Growth, the Environment and Keynes: Reflections on Two Heterodox Schools of Thought

Clive L. Spash<sup>1</sup> and Heinz Schandl<sup>1</sup>

## ABSTRACT

*This paper explores the approach of Post Keynesian Economics (PKE) in comparison with ecological economics. While PKE, like all macroeconomics, has failed to address environmental problems it does have many aspects which make compatibility with ecological economics seem feasible. Ecological economics has no specific macroeconomic approach although it has strong implications for economic growth and how this should be controlled, directed and in materials terms limited. We highlight growth as the key area of difference and reflect upon how Keynes himself saw capital accumulation as a means to an end not an end in itself, regarded it as a temporary measure and also was well aware of some of its psychological and social drawbacks.*

Keywords: environment, Keynes, post keynesian, ecological economics

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<sup>1</sup> CSIRO Sustainable Ecosystems, GPO Box 284, Canberra ACT 2601, Australia  
clive.spash@csiro.au

## INTRODUCTION

Macroeconomic goals tend to have dominated economics over the last half century with little regard to the physical reality of environmental systems. Key indicators are unemployment and inflation, but primarily growth as measured by domestic product. The environmental critique of modern economic systems has long pointed out the problems with a focus on material throughput in creating waste (Georgescu-Roegen, 1971; Kneese, Ayres and d'Arge, 1970), consumption as a measure of happiness (Easterlin, 1974; Mishan, 1969) and the neglect of social implications of modern economies (Hirsch, 1977). The underlying institutional incentive to push costs onto others is built into orthodox economics (Kapp, 1978), but generally ignored. That 'successful' macroeconomic policies may create an environmental crisis has been self-evident to ecological economists but not macroeconomists or economists in general. A more heterodox approach might then offer some hope of progress and Post Keynesian Economics (PKE) looks particularly interesting in this regard.

Davidson (1981) explains the methodological approach of PKE as involving 'historical and humanistic models' which, while abstract, aim for descriptive realism. More specifically he regards three propositions as constitutive of PKE. First, the economy is a process in historical time. This emphasises the time taken for production and consumption, that knowledge is asymmetric and incomplete with the past revealed and the future hidden, and that failing to account for time in economic models makes them irrelevant. Second, uncertainty and surprises are unavoidable which makes expectations central to understanding economic decisions. Uncertainty refers to ignorance of the future and should not then be equated with risk assessment of uncertain but knowable futures. Different people have different histories and experiences and so expectations. This inherent variety adds

heterogeneity and plural perspectives to economic agents. Third, economic and political institutions play an important role in determining economic outcomes. Thus, PKE is concerned about the distribution of income as a basic struggle by individuals for control of their destinies and between various groups and social organizations.

Each of these three elements can also be found in ecological economics.<sup>2</sup> First, the importance of the economies historical path is revealed by analysis of energy and materials use over the last few hundred years and the related concept of industrial metabolism (Ayres and Simonis, 1994; Schandl and Krausmann, 2007; Schandl and Schulz, 2002). Second, concern has been expressed over the epistemology of ignorance and uncertainty (Faber, Manstetten and Proops, 1992). Spash (2002b) defines uncertainty as “strong” involving ignorance and indeterminacy as opposed to “weak” and merely being a set of potential but known probabilistic futures. This conceptualisation can be traced back to Keynes (1988 [1921]) and Knight (1921). Although in developing the concept of strong uncertainty Spash (2002b) makes more substantive use of Loasby (1976), Funtowicz and Ravetz (1990) and Wynne (1992). Third, the economy environment nexus has been described as essentially one of political economy (Brennan, 2008; O'Neill, 1993; Spash, 1995). Institutional analysis (outside game theory) is recognised as absent from orthodox economic approaches and politics ignored or hidden. Ecological economics recognises politics and institutions as key to our understanding of resource and environmental problems and the potential ways out of the current state in which we find modern economies (Martinez-Alier, 2002; Soderbaum, 1999; Spash and Villena, 1999; Vatn, 2005). However, the struggle within the political economy

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<sup>2</sup> When referring to ecological economics we maintain the meaning in European terms of a new field outside the orthodox economic tradition and which is more than merely economics and ecology combined (see Spash, 1999)

can be seen as going well beyond the PKE concern for income distribution amongst currently existing vocal humans in the body politic. In ecological economics the exploitation and treatment of others spreads to the inclusion of silent voices and how they might be represented (O'Neill, 2001), where those who are silent includes children, future generations and non-humans. This brings together environmental ethics, political science and social psychology as necessary to inform a revision of how socio-economic systems can be understood.

Thus, while ecological economics is more interdisciplinary and has a broader perspective, there appear general areas for agreement across a range of concerns expressed as falling within PKE and ecological economics. Common ground clearly arises in criticizing orthodox approaches to economics. Both see policy problems requiring new approaches and better analytical tools. There is a mutual concern that human well-being is inadequately approached as a quasi-utilitarian concept based upon individual preferences. Both express the need for a more realistic model of human psychology and of the world in which we live. In PKE there have been some notable minority interests in psychological/behavioural theories relating to consumption and market structures (eg. Earl, 1990; Earl, 2005), and there is the related work of Galbraith (1969 [1958]; 1979) which addresses itself to the political power and behaviour of the modern corporation. Orthodox economics is also believed by both research fields, but for different reasons, to exclude consideration of factors which create instability in social and economic systems.<sup>3</sup> Whether this is

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<sup>3</sup> PKE sees orthodox belief in long run stability in an unfettered market system as leading to policies which are irresponsible eg. as in the 1930s with respect to unemployment. Ecological economics sees orthodox economics as having created the myth of never ending and ever increasing production and consumption which is destroying the ecosystems which support economic and social systems.

enough common ground for a collaborative effort towards a new economics remains to be seen.

Indeed, where a divide can be clearly discerned is in terms of the objects of attention. PKE appears, at least to the 'outsider', largely a macroeconomic enterprise which has spread into methodology. PKE seems to have been primarily concerned with effective demand, unemployment, inflation, interest rates and money as a means of economic management. Ecological economics is concerned with environmental degradation, loss of species, damage to ecosystems structure and functioning, the basic limits on economic activity imposed by physical laws, the role of money in perverting environmental values and the means by which human society can operate in harmony with Nature. PKE has almost totally failed to pay attention to the environment until more recently (Holt, 2005; Mearman, 2005), and has neglected limits to growth.<sup>4</sup> Ecological economics is particularly weak on macroeconomic issues, and, indeed 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 (eg. Holling, 1986). A more heterodox macroeconomic approach sharing basic methodological concerns would therefore be a significant step forward. However, the role and meaning of macroeconomic growth is a core area where disagreement seems most likely. Although emphasising distributional concerns, PKE, like mainstream economics, assumes growth is good and more is better. Rather than questioning growth and capital accumulation the concern is for how to achieve more of the same.

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<sup>4</sup> A search of the *Journal of Post Keynesian Economics* on the ISI database reveals 1312 articles of which there is just one on an environmental topic and that relates to oligopoly in the oil industry but does attempt connections to environmental policy and sustainable development (Roncaglia, 2003).

Economic growth is then discussed, in what follows, as a topic upon which divergence between PKE and ecological economics exists and any collaboration will need to focus. In the next section we employ an historical analysis of the industrial revolution to show how dependent growth has been upon exhaustible energy sources and exploitation of other countries. A picture is painted of an internationally divisive economic system, which creates material affluence for the minority, gross inequity in resource use and fails to increase human well-being beyond some minimum level. The global environmental and social prognosis is seriously worrying and the social-ecological-economic regime one which cannot be sustained for long.<sup>5</sup> Exploring how Keynesian economics has characterised such issues reveals its inadequacies at reflecting reality.

A problem then arises as to how economists should respond. One approach is to adjust the existing theories to include aspects of the environment. Hence the concepts of natural capital, green accounting and adjusted GDP measures have arisen, in-hand with monetary valuation of non-traded entities characterised as 'goods and services'. These are attempts to make the environment part of the capitalist system without any major disruption to the theoretical approach or the fundamentals of the system itself. Capital accumulation, innovation, technology and growth remain unquestioned in a framework expanded to market trading and monetary valuation of everything from human life to carbon atoms in the atmosphere. We argue this is totally inadequate.

If PKE is to help then reflection is required upon a different type of future and how it might be achieved. Envisioning potential futures is, of course, an utopian

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<sup>5</sup> A new approach to economics offers the hope of a planned transition but lock-in to political and economic structures seems to make crisis management more likely as the need for change is denied by various vested interests protecting their power base.

exercise, but one even practical people like Keynes knew were important. The penultimate section therefore discusses his own vision of the future which adds an important perspective to his more traditional views on the role of economic growth. This also indicates some need for those following in his footsteps to reflect upon the type of society they themselves envision as desirable. We conclude with some remarks as to where all this might leave those economists amongst us striving for a fairer world in which economics as a discipline is more realistic about social problems (eg. inequity, poverty, domination of others), human psychology and environmental interactions.

## AN HISTORICAL PERSPECTIVE ON GROWTH

In this section we employ the concept of a socio-ecological regime as introduced by Siefert et al. (2006).<sup>6</sup> This links a specific mode of production, distribution and consumption with the biophysical properties of a socio-economic system and the related patterns of society-Nature interactions. The approach allows transitions in economic development over time to be understood through material and energy components.

Most of human history has been spent in agrarian societies that were unable to grow beyond a certain limit. Over 10,000 years these systems shared a number of similarities with regard to their socio-ecological characteristics. The resource base was a controlled solar energy system. Societies had to tap into flows of renewable energy mainly from biomass. As a consequence, land use, human time and the

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<sup>6</sup> A socio-ecological regime is characterized by specific institutional and governance structures, by demographical patterns, spatial patterns of land-use, infrastructure networks and technology. This approach regards key regulators as positive and negative feedbacks moulding and constraining the regime. A socio-ecological regime is always associated with a specific pattern of material and energy use (metabolic profile) and of human activity (time allocation profile). While regimes allow for incremental change, a transition process may be introduced resulting in a qualitatively different regime if a critical set of variables or characteristics transcends regime boundaries.

amount of available energy were intrinsically dependent upon one another. Land based resource utilisation was associated with decentralised systems and infrastructure. Technologies for energy conversion were limited. This imposed low mobility and confined the transport of bulk materials because of the high energy costs. Most importantly, growth and innovation were ultimately constrained by the amount of suitable land and labour available to meet a variety of energy needs (i.e. nutrition, transport and process heat).

Any surplus was distributed unequally between a rich but small ruling class and the vast majority of relatively poor peasants. Although agrarian societies had to ensure a certain level of sustainability of their main activities, a number of environmental and social problems typically occurred. These 'sustainability' problems included soil erosion and declining soil fertility, land degradation and deforestation, energy scarcity, wildlife and habitat loss, and social inequality.

Industrialisation produced a transition in the agrarian socio-metabolic regime. This occurred for the first time in the United Kingdom (UK) and was enabled by a unique combination of institutional change, population growth, improvements of land-use practices and an energy transition (Krausmann, Schandl and Siefertle, 2008; Schandl and Schulz, 2002). The energy transition involved the emergence of a new technology cluster around coal, iron ore and the steam engine (Ayres, 1990; Gruebler, 1998). Siefertle (1982; 2001) describes the large stocks of fossilised biomass as a subterranean forest which provided the energy basis of physical growth during the industrial revolution. The shift to mining of coal, instead of harvesting woodlands, was the first step in the process of decoupling energy supply from land use and the photosynthetic cycle (Krausmann, Schandl and Siefertle, 2008). Simultaneously, the coal-based industrial regime created a surge in demand

for human labour and population growth concentrated in new towns around the coalfields. Intensive coal use also produced severe and contentious environmental and health problems.

During the nineteenth century and until the middle of the twentieth century the urban-industrial centres, powered by fossil fuels and the use of non-renewable resources, co-existed with a rural matrix surprisingly untouched as an energy system by the new regime. Two centuries of British industrial development left the rural periphery essentially under the pre-industrial conditions of the agrarian regime. For some time the dual economy involved a modern industrial-urban sector trading in markets and a traditional agrarian sector based around socially structured exchange (Lutz, 1984). There was, for example, no labour market in rural areas due to various institutions bounding labour to the parish from which subsistence support was paid (see Polanyi, 1944). This co-existence of regimes restrained British industrial development because population growth driven by the urban-industrial sector could not be supported by food production in the agrarian sector. Agriculture was confined to modernisation within its traditional bounds. In 1846 repeal of the Corn Laws was a major landmark in the UK opening its markets to foreign producers by removing import tariffs, and by the early 1880s food imports surpassed domestic food production. This shift in food supply, from home production to imports, further decoupled the energy system from domestic land use and contributed to economic growth and material prosperity (Pomeranz, 2000).

The use of territories and labour from outside the UK for supplying food, and other raw materials, appears to have been novel at such a large scale. However, this was only a partial answer, the newly cultivated lands, most notably in the Midwest of America, were over exploited and gradually impoverished so that yields

had declined by the end of the 19<sup>th</sup> Century (Cunfer, 2005). The traditional agricultural constraint was only effectively surpassed as late as the 1950s after another socio-ecological transition.

Coal was replaced as the main energy carrier and a new resource-technology cluster—oil, gas, electricity, the internal combustion engine and electric motors—allowed for unprecedented levels of material throughput. This transition involved the industrialisation of agriculture and so another step in de-linking energy production and land use. The technologies (mechanisation and agrochemicals) that became available boosted agricultural yields and labour productivity. The previous rules for agricultural production—to produce at a positive return upon energy invested—profoundly changed and agriculture became a net consumer of energy due to use of fossil fuels embedded in inputs (eg. fertilisers) and for running machinery. The traditional limits to growth imposed by the agrarian regime no longer applied in developed industrial economies (Grigg, 1992).

A growth constellation emerged in the 1950's built around the welfare state, a compromise between capital and labour, introducing an era of mass production and consumption. The welfare system neutralised the relationship between unemployment and salaries. This can be seen as having eased the way for the modern industrial sector to absorb the agricultural sector with a majority of the informal agricultural workforce being integrated into the formal labour market. The modern industrial sector was supplied with both a labour force and consumers for its products. In the pre-WWII era the direct consumptive role of households and private citizens had been comparatively small. The period from 1950 to 1973 in the UK showed a rapid increase in per capita energy consumption. Relative energy prices declined markedly (Pfister, 2003; Smil, 2003) and household consumption became a

major driver of overall energy use. Previously, most of the growth in energy consumption had been determined by the size of energy intensive industries and the transportation network.

As Table 1 shows, departing from the agrarian regime and moving into an industrial regime caused a massive increase in use of energy and natural resources (by a factor of 3-5 per capita and 10-30 per hectare). Simultaneously, in accord with the laws of thermodynamics, waste and emissions (eg. sulphur dioxide, nitrous oxide, carbon dioxide, particulates) increased. Demographic change was characterised by reduced reproduction rates, increased life expectancy, urbanisation and agricultural decline. Over 250 years of transition the UK population density rose from 34 to 247 people per km<sup>2</sup>, and energy supply from 63 to 190 GJ per capita. The industrial transition introduced new resources, technologies and institutional arrangements with respect to the exploitation of finite stocks of fossil fuels and minerals, and saw a reduced relative share of biomass in overall material flows. Infrastructure was increasingly centralised and a range of energy conversion technologies allowed for high mobility and long distance transport of bulk materials.

*TABLE 1 ABOUT HERE*

While the change from an agrarian to industrial regime has been achieved in most Western economies, such transitions are still ongoing in industrially developing countries and have been surprisingly recent in many others (Schandl et al., 2008). The transition has brought Western society unprecedented levels of economic growth and material consumption across a range of socio-economic classes. However, this has been achieved at large environmental costs including pollution of water, air and land, alteration of atmospheric composition, irreversible resource depletion and biodiversity and habitat loss. Such negatives are often referred to as

temporary and/or necessary evils. Starting in the mid-1970s energy use in the UK reduced, due to deindustrialisation and efficiency gains stimulated by rising oil prices, seemingly offering the hope of a less damaging post-industrial society. However, this decline cannot be taken at face value because it conceals the shift of industrial production to other countries and the resulting energy intensive global transportation of goods. Just as land in other countries was used to supply food, in the first stage of transition, so today are energy, materials and environmental capacity. Indeed, the social and environmental cost of the material and energy intensive lifestyle of citizens in industrialised countries has long been supported by less industrially developed economies. However, those countries are now undergoing their own industrial transformation at a speed and scale never experienced before (Schandl et al., 2008). The 19<sup>th</sup> Century UK supply-side 'solution' of exploiting foreign lands through imperial enterprise fails as a general blueprint by which agricultural and resource bottlenecks can be bypassed. One person's empire is another's domination. As the industrial transition spreads this will create new global social and environmental problems and tensions over who gets to use the diminishing resource base.

## THE REALITY OF GROWTH: KEYNES AND AFTER

Keynes pretty well summarised his economic theory in one sentence when he stated:

During the nineteenth century, the growth of population and of invention, the opening-up of new lands, the state of confidence and the frequency of war over the average of (say) each decade seem to have been sufficient, taken in conjunction with the propensity to consume, to establish a schedule of the marginal efficiency of capital which allowed a reasonably satisfactory average

level of employment to be compatible with a rate of interest high enough to be psychologically acceptable to wealth-owners (Keynes, 1978 [1936]: 307).

This might be paraphrased as, economic growth requires sufficient aggregate demand (whether by war or other means) so that consumption maintains employment and prices can be fixed to allow rates of return which satisfy owners of capital. Confidence and psychology are important to the extent that they support the economic system in maintaining consumption and investment.

As an outline of the operations of a modern economy this sketch fails because there are no imperial powers striving by warfare to gain and maintain control of natural resources to supply the economy. Actually there are no environmental problems or resource constraints. Indeed Keynes (1978 [1936]: 381) in discussing war cites just two causes: (i) dictators, and similar war mongers, and (ii) economic causes specified as population growth and the competitive struggle for markets in which to sell goods, i.e. export led growth. Thus,

...if nations can learn to provide themselves with full employment by their domestic policy (and, we must add, if they can also attain equilibrium in the trend of their population), there need be no important economic forces calculated to set the interest of one country against that of its neighbours (Keynes, 1978 [1936]: 382).

Perhaps in an age of British empire questioning resource abundance, or how supply was achieved, seemed unnecessary, and Keynes was after all well embedded in the establishment (eg. civil service, Indian office, Treasury, Cambridge University, see Pressman, 2006). While PKE has added concern about social conflict, in terms of the negotiations between employers/corporations and employees/unions (Arestis,

1992: 89), there has been neglect of the industrial-military complex, as well as conflict over resources between regions and states. Today, for example, the largest per capita consumer nations can be observed fighting to maintain control over the lands supplying diminishing supplies of oil. More than this the basic picture of the economy is totally inadequate if the social and environmental impacts of ever expanding energy and materials growth are ignored. An apologia for Keynes is his primary concern for unemployed resources so that achieving a fully employed economy seemed enough of a problem without worrying too much about dealing with resource scarcity, environmental degradation or the world once full or near full employment was achieved.<sup>7</sup>

There is less excuse for PKE which has persisted in this partial and limited view of reality for half a century. For example, Arestis (1992: 102) presents a modified flow diagram which summarises the PKE economy. This repeats the failure of mainstream orthodox economic texts in having no resource base, nor any environment into which wastes must go or from which amenities might flow. A fully employed, low inflation, positive growth economy is apparently an equally desirable human society regardless of whether it entails emitting toxic waste in the water supply, pollutants in the air and depletion of the resource base, or a pristine environment with minimal non-renewable resource use. Infinite natural resources, unlimited carrying capacity and waste treatment available at no cost are the implicit 'stylised facts'.

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<sup>7</sup> Note Keynes did raise population stabilization as an issue. However, this has also failed to make a Keynesian or PKE agenda.

What makes this worse, than the same neglect by mainstream economists, is PKE's methodological claim to be based upon a realist position (most commonly associated with Lawson, 1989; Lawson, 1997). As Arestis (1992: 94-94) states:

Theories, then, should represent economic reality as accurately as possible. Post-Keynesian theory is very much based on this premise and has as its primary objective an explanation of the real world as observed.

In which case PKE scholars need to get out more and do some observing. Even some neo-classical resource economists (eg. Maler, 1974) have recognised the embedded character of the economy in an environmental system. Yet two decades later Arestis summarised the state of the art in PKE without any environmental interactions.

During the 1960's and 1970's critiques arose questioning macroeconomic growth in terms of environmental and social impacts (Hirsch, 1977; Meadows et al., 1972; Mishan, 1969). In the 1970s economists linked fundamental aspects of the physical laws of thermodynamics to economic growth models (Georgescu-Roegen, 1971; Kneese, Ayres and d'Arge, 1970). This clarified the relationship between resource consumption and waste (nothing can be created nor destroyed so all that is consumed becomes waste) and the degradation of energy (flowing from useful to useless forms under the entropy law). In an economic discipline with no concept of the environment, or capacity constraints, where efficiency is the sole operational criteria, there is no concern for the scale of the economy nor the impact of human activity on natural systems. Daly expressed this in terms of the need for a steady-

state economy (Daly, 1977), and an equivalent of the Plimsoll line for economic activity to be drawn as an indicator of excessive material throughput (Daly, 1991).<sup>8</sup>

Yet the creation of environmental problems by market economies was explicitly recognised even decades earlier than the above literature (Polanyi, 1944), and in its modern institutional form (Kapp, 1950). In particular, Kapp (1950) wrote his environmental analysis of business enterprise (covering both private and planned economies) which explained in detail how costs were passed on to others in order to create an apparent 'surplus'. In contrast to the now commonly cited 'externality theory', he did not describe these costs as 'external' because they are an integral part of the economic system and all pervasive, not one-off anomalies due to negligence. Kapp (1976) also argued for regarding economic systems as open socially and physically, for explicit recognition of value premises and acknowledging basic needs, and against the 'mechanics of self interest'. This might have been expected to strike a cord with at least those PKE theorists claiming an institutional approach. Unfortunately Hodgson seems to stand alone in both linking PKE to institutional economics (1988) and in showing awareness of Kapp and the economic history of thought which made the connection to the environment (Hodgson, 1997).

This failure is a shame because PKE would seem well placed to address the environment due to its acceptance of open systems, instability, strong uncertainty, social conflict, needs, lexicographic preferences and the importance of corporate power in controlling resources. Yet PKE appears to have been resistant to paying serious attention to environmental problems, bringing it into an unwelcome parallel

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<sup>8</sup> Space precludes entering into a discussion of steady-state economics. Suffice to say the concept of a steady-state seems to fall well within the constructs of equilibrium theory and stability rejected by both PKE, ecosystem ecologists, and many ecological economists. Daly's point on scale and his environmental concerns stand independent of his recommended solution which does at least address the need to control exponential material and energy growth.

with mainstream macroeconomics. Employment, inflation and increasing demand seem to exclude any environmental considerations and criticism of growth theory.

Let us take, hopefully not unfairly, Arestis (1992) book on PKE as our prime example.<sup>9</sup> There seems to be some tension between recognition of the writings critical of the modern affluent society, and the Keynesian promotion of full employment as the societal goal. Interestingly, the critical work on affluence by Galbraith (1969 [1958]), undoubtedly a member of the PKE community (Galbraith, 1978), gets little attention. Arestis (1992: xiii-xiv) states his aim is to clarify the limits of mainstream theory described by Galbraith but then merely makes a few references to corporate power citing none of Galbraith's major works and instead just briefly mentioning two articles.

Growth goes unquestioned apparently because there is a 'reserve army of unemployed' and the theories of imperfect competition embedded in PKE predict excess capacity and hence no scarcity of resources, or at least capital (Arestis, 1992: 97). In essence:

The conception of economics in this system is no longer the study of how scarce resources are allocated to finite needs. It is, instead, the study of how actual economic systems are able to expand their outputs over time by producing and distributing the resulting social surplus (Arestis, 1992: 90).

Post-Keynesian analysis recognises the possibility of 'insufficient demand' rather than concentrating on scarcity of resources, so that 'effective demand' assumes a central position (Arestis, 1992: 97).

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<sup>9</sup> As Davidson (1981) makes clear there are divergent PKE schools, but none of the differences he notes would seem to bear on the points made here with respect to reasons for the neglect of environmental issues.

The long-run analysis is concerned with the determination of the warranted rate of growth, and therefore the conditions required for a steady rate of expansion (Arestis, 1992: 105).

So, on this interpretation of PKE, the underlying tenets are set-up to exclude environmental issues because there are no resource constraints and the goal is an ever expanding material growth path for consumption and production.

This seems to fit well with Bruntland type 'sustainable development' which replaced the hard line of limits to growth. Sustainability as 'development' has been used to encapsulate a range of amorphous concepts in order to allow economic growth with a friendly face. Rhetorical arguments over the need for development have justified traditional industrialisation and spreading the market model while avoiding the need to seriously address key social and environmental issues. This is not to deny value in the concept of sustainability and some of the related literature (see Sneddon, Howarth and Norgaard, 2006), but progress in questioning the meaning of development (eg. Norgaard, 1994), recognising limits and transforming economics and government policy has been limited. The main concern has remained having the economic cake and eating it, or rather continually making more and bigger cakes ignoring the limited availability of ingredients and the need to handle the inevitable waste products that result from producing and consuming ever more cake. Of course who gets to eat the cake is another issue.

The basic fact is that billions of people remain materially impoverished. As the United Nations Development Program (2008: 25) notes:

There are still around 1 billion people living at the margins of survival on less than US\$1 a day, with 2.6 billion—40 percent of the world's population—living

on less than US\$2 a day. ... The 40 percent of the world's population living on less than US\$2 a day accounts for 5 percent of global income. The richest 20 percent accounts for three-quarters of world income. Income inequality is also rising within countries. Income distribution influences the rate at which economic growth translates into poverty reduction. More than 80 percent of the world's population lives in countries where income differentials are widening.

Thus, despite economic growth, there is gross inequity across and within countries; for example, 497 people rank as billionaires controlling personal fortunes amounting to 7% of world GDP.<sup>10</sup> The promise that economic growth will raise the standards of living and well-being of all is not borne out by the facts. That gross inequity fails to spill over more often into civil strife is more surprising.

Potential unrest would seem to have been averted in Western economies by the welfare state, which Keynes must be credited with having helped establish. However, as Dryzek (1992: 32) notes, there is tension within the welfare state, and something of a Keynesian policy dilemma because it both supports and criticises capitalism, eg. controlling boom-bust cycles while criticising and removing 'market incentives' in the form of unemployment and bankruptcy. Adding environmental concerns reveals further contradictions in policy goals.

To the extent that states cannot simply export or displace ecological problems, environmental conservation will be established more firmly as an additional imperative. And this establishment can only add to the contradictions of

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<sup>10</sup> This statistic is taken from the following website which cites sources for many similar and disturbing facts on global poverty and inequity, see <http://www.globalissues.org/TradeRelated/Facts.asp>, accessed 28<sup>th</sup> July 2008.

the Keynesian welfare state. There is a clear conflict with accumulation—the deleterious environmental effects of economic growth are now well understood. And to claim that one needs the fruits of growth to pay for environmental cleanup is absurd, given that all of this growth would produce negative effects on the environment, whereas only a small part of it could be siphoned off for cleanup (Dryzek, 1992: 32).

There is theoretical support for Dryzek's contention because 'sustainable' growth defined in economic terms provides no constraint on undermining ecosystems sustainability, and so can prove to be positively harmful (Common and Perrings, 1992). New forms of increasing economic production and consumption, which avoid such problems, are the hope of sustainable development and the promise of technocentric optimists.

#### NATURE AS CAPITAL, TECHNOLOGY AS SAVIOUR

The standard counter to a negative environmental prognosis is to claim technology will provide solutions, inputs (including capital) are perfectly substitutable and new forms of resources will arrive, like manna from heaven, to replace those exhausted. Our historical analysis shows why such positions arise, but also why they are fallacious. Technology-resource clusters have arisen which seemingly surpass previous constraints, but what remains are the fundamental relationships to physical laws, energy use and the environment. Economies cannot grow in the long run by exploiting finite material and energy supplies and degrading the functioning of ecosystems. A problem for PKE and ecological economics is then how to address the necessary reformulation of economics and policy.

One popular suggestion has been to treat various aspects of environmental and social systems as 'capital' in order that they should have equal footing with the more traditional man-made stuff. Everything from mountains to butterflies to the very carbon of which we are constituted is meant to be some form of 'capital' which is then to be given a price in order to be 'valued'. The aim is to squeeze everything into a capitalist framework. Numerous problems arise including treatment of non-economic environmental values, refusals to trade, respect for non-humans and protection of Nature on non-consequentialist grounds (Spash and Clayton, 1997). Raising something as obscure as the 'Cambridge capital controversy'<sup>11</sup> hardly seems worthwhile as no one using 'natural capital' seems particularly worried about measuring the immeasurable.

The aim is to impose an overarching concept of capital and apply monistic welfare measures in the form of money and GDP. For example, Ekins (1992), amongst others, has advocated the idea of capital incorporating a whole range of different concepts (i.e. environment, social institutions and organisation, human knowledge, physical man-made items) in order to achieve adjustment of standard economic growth theory. From the family to the furnace all seems to be eligible for categorisation as capital. In short, a useful environmentalist's metaphor has become a tool for 'taking Nature into account'. Next step Nature is just another asset on the corporate balance sheet and ready to be traded-off in the national income accounts, eg. increasing output of computer games, DVDs, mobile phones or whatever gismo

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<sup>11</sup> This refers to the problem of measuring diverse forms of capital in monetary terms in order to get some aggregate measure of stock. The main problem involves the circularity of defining profit and stock. Some attempt at using embodied labour to circumvent the problem was proposed. This would be of little aid for the various form of entities proposed as 'natural' capital as by definition they lack any embodied labour!

is in fashion, compensates for loss of species, habitat and ecosystems functions.<sup>12</sup> This merely results in various non-equivalent concepts being subsumed under an inappropriate title as if standard theory might then be applied to resolve all our problems.

In considering how meaningless and yet powerful is the designation of Nature as capital take a few examples. Copyrighting genes means companies are created, genetic code identified and stock value accumulated. Nothing has been invented or innovated merely rights captured in a legal system supporting private ownership and rent seeking. What might be regarded as public information is now a corporate capital asset. Alternatively, consider controlling carbon in a cycle including humans, soil, biota and much else and for which balances cannot be accurately (or perhaps even inaccurately) estimated. Create some arbitrary notion of carbon capital stock and pollution offsets, and then start trading. Pre-existing and previously planned forests suddenly have added commercial value. Firms which are shutting down old equipment suddenly get certificates of carbon offset and make money selling non-existent future emissions (for more detail see Lohmann, 2006). No more carbon has been removed from the cycle than would have occurred otherwise, but 'natural capital' has been made tangible for the economic system and the financial speculators have a new multi-billion dollar market in which to play.<sup>13</sup> Then there are species which just become items for optimal use and even optimal extinction (eg. as suggested by Swanson, 1994). After all they are just assets in the market place.

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<sup>12</sup> The concept of incommensurability is an highly relevant consideration (see Aldred, 2006; O'Neill, 1993; 1997) as well as the difference between creating harm and good (Spash, 2002a).

<sup>13</sup> On the basis of Keynes' concerns over the role of speculators in standard stock markets his opinion on this new innovation, with respect to the potential for increasing international economic instability, would have been most interesting.

Here then lies the crux of the capitalist market system and its 'solutions'. Rent is captured and costs passed along to others. Value exists in trade enforced by private property rights. In this context the environment is at best valued as an asset for use in production of something, anything, that can be captured, priced and traded. Technology, tourism or trinkets makes no difference, as long as you can sell it. This also leads to the promotion of the synthetic over the natural because rents are easier to capture eg. fish farms, genetically modified crops. The market dominates all other forms of human exchange, management and interaction.

Ludwig, Hilborn and Walters (1993) point out that large and immediate prospects of gain generate political and social power that facilitates unlimited exploitation. The rich variety of cultures and indigenous management of resources is something which has been eradicated by empire building, colonisation and corporate globalisation. Where the traditions still exist they are either ignored or regarded as inferior to modern economic systems of 'efficient' resource use. Resources are then repeatedly overexploited often to the point of collapse or extinction. However, in discussing such overexploitation, Ludwig, Hilborn and Walters (1993) fail to identify the drivers as having become more predominant in recent human history. This seems especially the case during the European settler period in the Americas, where social rules and norms on resource use were either absent or easily broken (eg. beaver rush, cattle rush, land rush, gold rush, oil rush). Yet, as natural scientist, their recommendations do not claim expert judgement will provide the solution either. Learning, or science, is unable to prevent the problem because complexity precludes standard experimental approaches (i.e. reductionism, control and replicates), especially for large-scale systems. As systems worsen the situation is masked by natural variability. Despite the history of collapses there remains no scientific

consensus on the causes of failure. Ludwig, Hilborn and Walters (1993) therefore recommend caution and more specifically attention to: human motivation, acting before scientific consensus, recognising scientists and their judgements are subject to political pressure, distrusting claims of sustainability (especially where problems of population growth and excessive resource use are ignored), and confronting uncertainty.

The inability of normal scientific method to address environmental problems is something which also has implications for how sustainable futures are perceived by economists and the role technology plays. Much faith is placed at the door of innovative science embodying knowledge in man-made capital stock to provide 'solutions'. Economists post Jevons have tended to rely on the promise of technology as the get-out clause relieving them from the need to worry about such things. For Jevons (1965 [1865]) made much of what would happen when coal was exhausted and the failure of his more dire predictions helped spur the confidence of economists and politicians in backstop technologies and signals from the price system. Today human systems are riding on a precarious wave of ever advancing technologies of which we have very little ability to predict how they may turnout.

If experiments on say a terminator gene using genetic modification are conducted partial ignorance means accidental release could be devastating. Society has become committed to a new path. Decision stakes are high but concealed. If the experiment is replicated by hundreds of laboratories social commitment increases along with indeterminacy. The danger is meant to be controlled by preventative and precautionary measures embedded in social customs expressed via scientific process. Yet the clear cut case of the laboratory experiment being a core area of low systems uncertainty and low stakes seems highly questionable.

Indeed this is more likely to be the claimed characterisation by corporations wishing to avoid safety testing and regulation who conduct research on and supply products and processes (eg. nuclear power, synthetic chemicals, genetically modified crops, nanotechnology, microwave transmission) exhibiting features of strong uncertainty.

Narrowly motivated (eg. profit/power seeking) enterprises can be expected to prefer an approach which fails to show danger as opposed to one which aims to reveal that danger. For example, a water quality bioassay can place a fish next to an outfall pipe. The fish survives so the pipe is assumed clean. However, there is a major difference between selecting the hardiest species available and placing it upstream and selecting an highly vulnerable species and placing it downstream. Hence we hear from biotech companies they have conducted hundreds of experiments and found no evidenced of harm, but were they typically minimising the chances rather than actively looking for harm? As we enter the information age with all pervasive microwave technology—with its transmission of frequencies for mobile phones and community wifi systems at ranges and with population exposure levels never tested (Anslow, 2008)—we may wonder at where the next environmental or health problem will arise. In addition, the social changes entailed by such technologies go unremarked, and are accepted as if inevitable, despite being fundamental to the way in which humans operate, communicate and interact.

Indeterminacy of knowledge is something Wynne (1992) explains as endemic in science and technology. He sees the accumulation of scientific knowledge as involving the “exogenising” of significant uncertainties which then become invisible. This builds-in ignorance as to the basic assumptions underlying theories and models. As society makes commitments (i.e. the social stakes rise) on the basis of that knowledge problems arise. Scientific knowledge is particularly blind to the

boundary conditions on the applicability of the existing framework of knowledge to new situations. As Wynne (1992: 115) elaborates:

This institutionalised exaggeration of the scope and power of scientific knowledge creates a vacuum in which should exist a vital social discourse about the conditions and boundaries of scientific knowledge in relation to moral and social knowledge.

This call for social discourse is also something found in the concept of post normal science which has been advanced within ecological economics by Funtowicz and Ravetz (1992; 1993).<sup>14</sup>

Funtowicz and Ravetz (1992; 1993) offer an insightful critique of normal science which provides guidance on alternative ways in which environmental problems might be better addressed. They combine both an analytical approach for assessing the quality of scientific information and the idea of an extended peer community including people likely to be affected. The latter is important in light of limits to knowledge being clouded by professional training and the prevalence of value conflicts over environmental issues.

Normal science is effectively regarded as bound to a limited range of cases where decision stakes and strong uncertainty are low (eg. experimentation in the laboratory). This mission driven approach is contrast with post-normal science being issue driven and applicable where stakes are high and uncertainty strong. Between these two extremes is the whole area of research consultancy. The strength of traditional science is regarded as having been due to abstraction from uncertainty in knowledge and values. While successful in the past the approach is not seen as

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<sup>14</sup> Interestingly Ravetz (1995) has also published in the *Journal of Post Keynesian Economics*.

relevant to the present environmental crisis. Here facts are uncertain, values in dispute, stakes high and decisions urgent.

New methods must be developed for making our ignorance usable. For this there must be a radical departure from the total reliance on techniques, to the exclusion of methodological, societal or ethical considerations, that has hitherto characterised traditional 'normal science' (Funtowicz and Ravetz, 1993: 743).

The conclusion is strikingly similar to that of Wynne (1992). There is a recognised need for participatory approaches to environmental, science and technology issues. How practical new methods, following a post-normal science approach, can be applied to actual policy problems is starting to become clearer (see van der Sluijs et al., 2005).

Addressing our uncertain future requires opening-up the decision space and engaging with the body politic. The conjunction of ideas from economics, ecology and science technology assessment provide a challenging agenda. In order for economics to be relevant to modern environmental and social problems requires rethinking the role of technology and science, rethinking the treatment of Nature, avoiding over simplistic categorisations (eg. Nature is capital), and showing some regard for where socio-economic systems have come from and are heading.

## FUTURITY

Where socio-economic systems are taking us seems to have fallen off the economist's agenda, along with political economy. An interesting reflection upon the future appeared by Keynes (1930) himself. He describes the world of a developed

economy one hundred years in the future. This would be a leisure society because needs have been met by general productivity increases.

The *pace* at which we can reach our destination of economic bliss will be governed by four things—our power to control population, our determination to avoid wars and civil dissensions, our willingness to entrust to science the direction of those matters which are properly the concerns of science, and the rate of accumulation as fixed by the margin between our production and our consumption; of which the last will easily look after itself, given the first three. (Keynes, 1930: 98).

The growth path was already set within the context of the modern economy and (despite the recession) Keynes was observant enough to recognise this and the on-going social-metabolic transition through which he was living. For example, he predicted the imminent industrialisation of agriculture (Keynes, 1930: 37). Only maintaining the stability and pace of change then seemed necessary for the ‘economic problem’ to be solved. This is a modernist vision of a stable society driven by faith in science and technology to improve production techniques and through compound interest to accumulate capital stock.

However, for Keynes, the ‘economic problem’ itself is not one of ever increasing material living standards or a stable growth expansion path into the never ending future. The economic problem is to remove the struggle for meeting subsistence needs; something which has a definable, if debatable, endpoint.

Now it is true that the needs of human beings may seem to be insatiable. But they fall into two classes—those needs which are absolute in the sense that we feel them whatever the situation of our fellow human beings may be, and

those which are relative in the sense that we feel them only if their satisfaction lifts us above, makes us feel superior to, our fellows. Needs of the second class, those which satisfy the desire for superiority, may indeed be insatiable; for the higher the general level, the higher still are they. But this is not so true of the absolute needs—a point may soon be reached, much sooner perhaps than all of us are aware of, when these needs are satisfied in the sense that we prefer to devote our further energies to non-economic purposes. (Keynes, 1930: 96)

Keynes is describing a very different role for economic growth than current today, i.e. a means to an end rather than a goal in itself.

Unfortunately attempting the impossible task of satisfying the relative needs he describes has become the dominant modus operandi of industrialised economies. The issue is one described by Hirsch's (1977) theory of social limits to growth, i.e. the failure of increased material living standards to satisfy human desires or increase welfare based upon positional goods. A similar line of reasoning also informs hedonic critiques of income growth (Easterlin, 1974; 1995; 2003), where the non-economic drives well-being (eg. friendship, marriage, health, meaningful employment). Productivity increases have failed to transform into Keynes vision of reduced work hours or a society devoted to "non-economic purposes".

Worse still the medicine to get to the blissful situation is to maintain capital accumulation which requires behaviour that Keynes describes as basically unethical and undesirable: greed, usury, and the desire for ever more money. Keynes wanted such behaviour to be removed on reaching the end goal. That is, on solving the economic problem:

We shall be able to rid ourselves of many of the pseudo-moral principles which have hag-ridden us for two hundred years, by which we have exalted some of the most distasteful of human qualities into the position of the highest virtues. We shall be able to afford to dare to assess the money-motive at its true value. The love of money as a possession—as distinguished from the love of money as a means to the enjoyments and realities of life—will be recognised for what it is, a somewhat disgusting morbidity, one of those semi-criminal, semi-pathological propensities which one hands over with a shudder to the specialists of mental disease. (Keynes, 1930: 97)

But beware! The time for all this is not yet. For at least another hundred years we must pretend to ourselves and to everyone that fair is foul and foul is fair; for foul is useful and fair is not. Avarice and usury and precaution must be our gods for a little longer still. For only they can lead us out of the tunnel of economic necessity into daylight. (Keynes, 1930: 97)

He is recommending the blind pursuit of future wealth, ignoring our actions “own quality or their immediate effects on our own environment” (Keynes, 1930: 97). The prescription also requires that we value the useful over the good. This unpleasant society was one through which Keynes believed we should transition in two generations.

Once the economic system reached high enough material standards to meet absolute needs Keynes foresaw the problems of a leisure society arising. He recognised the need for behavioural transition in an affluent society from work to leisure. This he described as “a fearful problem for the ordinary person” made worse “if he no longer has roots in the soil or in custom or in the beloved conventions of a traditional society”. Keynes feared affluence, in removing the drive for work as a

meaning to life, would leave no apparent idea of how “the art of life itself” should be conducted (Keynes, 1930: 97), and he noted the depressing and disastrous examples of the contemporary wealthy.

Just twenty years after Keynes (1930) penned his words Kapp (1950) published *The Social Costs of Private Enterprise*, pointing out many of the pitfalls facing modern economic systems and the society they create. Economic growth to accumulate capital as a means of getting to Keynes’ utopia seems to simultaneously destroy the possibility of ever getting there. This has as much to do with the social and psychological character of industrial consumer society as the environmental havoc it brings with it. The problem Keynes underestimated was the extent to which the system of growing material affluence would become addictive, uncontrollable, instil the negative values he recognised and yet fail to meet the goals he set out.

Keynes never foresaw the problem of reversing patterns of human behaviour created by generations of consumerism or how powerful institutions would be created to perpetuate a system which he assumed to be transitory. The ability to produce with increased efficiency leads to increases in the scale of production, not meeting the same needs with fewer inputs; a problem recognised by Jevons (1965 [1865]) and which has recently been given some new attention (this has been termed the Jevons’ paradox, see Polimeni et al., 2008). Greater production and lower prices mean greater quantities are sold. Those for whom the economic problem was actually long ago solved continue to consume ever growing quantities of energy and materials. The consumer society encourages large loans and mortgages pushed by financial institutions. People work more hours to service the loans to consume more at the behest of modern corporations. Modern material fantasy worlds, flaunting of status, self obsession with looks, aging and fashion,

mindless hours in front of the television, distraction from lack of meaning via drugs from alcohol to cocaine—these are the common pursuits of the affluent. The rise of corporate power using brand driven advertising is expressed through low product durability, fast food, supermarkets, super stores, and super convenient consumption. Support your nation's economy with larger cars with more gadgets, and ever more 'stuff' from ever changing product lines. The 21<sup>st</sup> Century motto might be 'keep the customer dissatisfied'.

This leaves a rather different 'fearful transition' to be faced now, but one which still involves addressing the economic problem at the global scale. Modern society has created no less work, failed to address inequality, has not been increasing self-reported happiness and has left the majority of humanity in poverty. Rather than leading us "out of the tunnel" we seem to have lost our way in the darkness due to the pretence that foul is fair and fair is foul.

Interestingly Keynes' musings on the leisure society strike a cord with the utopian vision of Morris (1993 [1890]). They share identification of the problems of diminishing available work and the meaning of a worthwhile life without competition and the need to struggle for survival. The difference is that Morris saw his utopia requiring a social revolution, sharing of wealth, removal of money and profit motive and a transition requiring human social, institutional and behavioural change. Keynes wanted to solve material needs using capitalism and worry about dismantling the system later. A worthy desire when many starve and suffer poverty, but, as 80 years of intervening growth have shown, growth alone achieves gains for the few not the many. Martinez-Alier (2002) notes that the poor sell cheaply so they are the most susceptible to exploitation in the market capitalist system, too often losing

control and watching the destruction of the very environmental systems upon which they have sustained themselves for generations.

The means to achieve something of what Keynes envisioned may have been within our grasp if population had been controlled, science contained and growth changed qualitatively in form and moderated in scale. Perhaps some smoother transition might have been planned to a less materially and energy intensive system of production which more equitably met basic needs. Yet, since the anti-trust movement of the early 1900s, there has been little sign of mainstream economic or political will to significantly or seriously challenge the institutions addicted to growth which prevent redistribution and degrade the environment. That these institutions create economic, social and environmental instability will become ever more apparent and a societal reaction can therefore eventually be expected, but for many (especially those suffering environmental degradation and poverty) this appears already long overdue.

How we aim for utopia seems to end-up being more important than actually getting there. For example, Keynes underestimated the potential for war to stimulate aggregate demand, boost 'business' and achieve full employment. Writing relatively shortly after WWII, Hansen (1953: 229) notes: "For most advanced democratic countries, full employment has become a settled policy more quickly than Keynes had believed possible or indeed than would have been possible except for the war and its aftermath". Avoiding the on-going waste and misery of wars and weaponry is, as they say in Australia, a 'no brainer'. Yet wars provide jobs and throughput of materials which are conveniently and quickly destroyed allowing more throughput and so a 'virtuous' cycle of growth and employment. Technology is stimulated by the

drive for ever more efficient means of destruction. Clearly not all paths are equally desirable even if they achieve a goal quickly or 'efficiently'.

That there are many paths to the same goal means making choices and that involves judgment, not blind faith in markets or growth. There are also many criteria upon which to make such choices. To advocate an economic system you acknowledge as unethical and psychologically pathological with no plan for control, remedy or escape seems at least irresponsible. The fact is that economic and social systems entail and instil in people certain values and those should be desirable values which are regarded as positive attributes for current and future generations. The values of the consumerist society are at best highly suspect and at worst self destructive.

The writings of Galbraith reflect many of the concerns raised with respect to the direction of growth and quality of modern society (see reviews by Dunn and Pressman, 2005; 2006). His description of private affluence explains the favouritism shown towards private goods and their supply and leading to public squalor and environmental degradation (Galbraith, 1969 [1958]). Excessive supply of private goods and mass consumerism is linked to corporate power as wielded through advertising and marketing. His response, to achieve the 'good society', is to limit the power of corporations which operate outside the realm of market competition and are run by a planning process controlled by professional managers (the technostructure). Contrary to economic theory the wealth of the managerial class is derived from their economic power rather than their hard work (i.e. marginal productivity). There is some irony in the rhetoric of the largest corporations with their advocacy of free market systems when they themselves are centrally planned. These organisations define public interest in their own light and are integrally linked to the military,

causing excessive spending on weapons and related systems. They have power to control prices and the resources to mould public opinion. Consumerism is then an artefact of their power used through advertising to equate happiness with purchasing private goods.

Galbraith advocated sources of countervailing power such as unions and government regulation eg. limiting the claims of the military industrial complex. Small producers in the real 'market sector' are disadvantaged and therefore need policies to correct the balance of power; their workers being liable to poverty need support eg. minimum wages. Placing the burden of response on a strong State means also improving democratic processes as government is otherwise captured by the technostructure. Individual workers and citizens have little power in the face of conspicuous consumption reinforced by advertising leading to low savings and high indebtedness. Explanations for the neglect of public goods and psychic accommodation to mass poverty combine to make Galbraithian analyses highly relevant to modern environmental problems. Despite being a PKE supporter of maintaining effective demand Galbraith did at least question what might compose national output (1969 [1958]: 128-129). Thus, while not 'environmental' in themselves (unlike Kapp), the works of Galbraith might help to provide a bridge between PKE and ecological economics.

## CONCLUSIONS

The Keynesian statement 'in the long run we are all dead' is often taken out of context to imply no need for long-term planning so that short term growth and 'full employment' can be pursued and future generations left to look after themselves. Keynes' (1971: 65) original point was a criticism of the belief in idealised long-run self-equilibrating solutions in the context of inflationary problems. Similarly, the idea

of unemployment as a temporary cyclical or sectoral phenomena can be seen as having been confounded along with Say's Law by the unemployment of the 1920s and 30s.<sup>15</sup> Just waiting for systems to correct themselves in the long-run to some imagined equilibrium was an inadequate response. Such idealised free market responses are commonly given in retort to concerns over resource depletion. Keynes response that action is required now can equally be applied to environmental sceptics' arguments that natural systems will prove self-equilibrating in the long-run eg. ozone holes will disappear, systems will adjust to human induced climate change. Rejecting the blind faith in benign equilibrating systems leads to calls for government intervention as the only obvious counter measure. Yet, how the institutions of government will control and change economic systems, and avoid substantive harm to natural ones in the process, is far from clear. Merely managing the situation fails to address the overall path upon which socio-economic systems have been set.

The dominant acceptance of a growing materialistic consumer society is what must be questioned and is brought into question by its failure to address and ability to exacerbate major social and environmental problems. Neo-liberal governments, of the type typical in Western society in recent times, then seem the least likely to respond appropriately given their proximity to the technostructure. Their institutional responses promote rather than address corporate power, and diminish rather than increase a sense of community values and respect for others. Others (human and non-human) are for the consumer just competitors in a struggle for 'goods and services', and for the firm assets to be exploited. There appears no room in the

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<sup>15</sup> Say's Law being the belief that supply creates its own demand, which was put forward by Ricardo in 1803 on the basis of his reading of French economist J. B. Say (Stewart, 1979: 26).

modern economic system for beings with feelings, direction, ability to flourish or moral standing,

Recognising the importance of issues of globalisation and global environmental change requires a broadening of the economic research perspective. It requires acknowledging that, in a biophysical sense, all economic activities are embedded in ecosystems and therefore have to respect environmental and resource use constraints. Limits to growth play no role in PKE. The approach remains very much in line with orthodox macroeconomics in the failure to take the laws of thermodynamics seriously or to include their implications in long-term growth policy.

That 'traditional' economic growth is unsustainable can be illustrated by paying attention to the historical pattern of growth in the UK over the last 250 years. The change in energy utilisation came about in two stages. First, between 1830 and 1890, the implementation of the coal, iron, steel and steam engine resource-technology cluster, enabled the UK economy to operate at almost twice the level of energy availability of other economies. Second, around the 1950s, oil, electricity and the internal combustion engine took over as the main drivers underpinning growth. Economic growth has been essentially concerned with the exploitation of finite non-renewable material and energy resources.

The UK example has been followed by many other countries resulting in remarkably similar resource use patterns, social structures and trajectories at the end of the 20<sup>th</sup> Century. During the industrial transition, a structurally coupled socio-ecological regime is established that closely links economic growth to natural resource use. Despite contemporary notions of post-industrial, service or information societies there has been no dematerialisation in terms of natural resource use. In the historic transition, industrial materials (fossil fuels, ores and

mass minerals) added to biomass materials without replacing them. The increased relative importance of the service sector in many industrial economies has actually increased natural resource flows.

Certain aspects of industrial transition have been a topic for PKE, and other economist, namely employment, salaries and mass consumption and production. The focus has been on the means by which economic prosperity could be enhanced and mass unemployment and its undesirable social and economic consequences avoided. The biophysical aspects of transition have long been neglected. Assuming unlimited substitutability and benign technological change produces a fantasy world to justify the industrial socio-ecological regime continuing in its current mode. The literature on the socio-ecological regime helps recognition of the fact that the modern industrial economy is transitory in character and a relatively recent occurrence in human history, rather than a stable long-term structure in equilibrium.

Addressing the current environmental crisis requires a new economic revolution allowing major services—such as transport and mobility, construction and housing, nutrition, water and energy use—to be organised in very different ways from today's socio-technical individualistic solutions. Such a transition would need to happen while a large part of the world is in the midst of trying to achieve the old industrial transition. It would require deliberately redirecting investment and institutional change. Lacking organisations and institutions operating at the appropriate temporal and geographic scales means globally humanity is ill-equipped to guide a sustainability transition. That governments are susceptible to capture by the technostructure makes their response equally dubious.

Proposed 'solutions' to environmental problems have included minor adjustments to GDP measures, adding some extra environmental 'goods and

services' into market pricing and widening the already troubled concept of capital. These approaches fail to address the fundamental concerns raised nor do they address key drivers of the economic system or their implications for society, human psychology or the environment. The rush to innovate and replace creates discontent while spreading the depth and scale of interventions into natural systems with unknown and unknowable consequences. An inherent characteristic of the scientific and technologically driven throughput society is the propensity to increase strong uncertainty in terms of social indeterminacy and partial ignorance. Avoiding environmental collapse points towards breaking the growth-technology-consumption complex in an intelligent way to improve society. Open social discourse has then been identified as an important part of any process whereby the role of technology and new information might be reconsidered. This can be seen as one part of the necessary challenging and questioning of the modern industrial state through increasing democracy.

A focus on growth and employment seems to miss the point of economic activity. Throughput is not an end in itself; the having and consuming of more 'stuff' does not alone increase 'happiness'. Employment can be demeaning, exploitative and self-destructive or it can be fulfilling, rewarding and give great meaning to a person's life. If economics aims to increase well-being in society then it must go beyond such bland aggregates as employment and growth. Keynes achieved great things as an economist but the socio-economic system he advocated as a temporary measure to reach economic bliss seems to have spread and made seem virtuous the "semi-criminal, semi-pathological propensities" of which he warned. A new political economy must question the reason for consumption and production activity

and the qualitative aspects of the system, not just focus on potential quantitative end goals. A new revolution in macroeconomic thought also then seems necessary.

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**Table 1. Metabolic profiles of the agrarian and industrial socio-ecological regime**

	Historical agrarian regime	Industrial regime	Growth factor
Energy use per capita [GJ/cap]	40-70	150-400	3-5
Material use per capita [t/cap]	3-6	15-25	3-5
Energy use per area [GJ/ha]	<30	<600	10-30
Material use per area [t/ha]	<2	<50	10-30
CO <sub>2</sub> emissions per capita [t/cap]	<2	8-20	4-10

Source: Krausmann et al. 2008