

# Ecological Economics: A Progressive Paradigm?

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## I. INTRODUCTION

Ecological economics constitutes a major paradigm shift in mainstream economics.<sup>1</sup> Its fundamental vision of the economic system, as circumscribed by ecological limits, challenges the feasibility and desirability of the unlimited growth which underlies economic orthodoxy.<sup>2</sup> As an alternative to mainstream economics, ecological economics can appeal to progressive scholars, environmentalists, and others who mistrust mainstream economics, its treatment of environmental issues, and its approach to sustainability. The ecological economics paradigm offers a refreshing and apt perspective on the relationship between economy and ecology for progressives seeking sustainable alternatives to current patterns of economic growth and environmental degradation. But does ecological economics provide additional insights into other issues of critical concern to progressives, and does ecological economics provide a compelling critique of capitalism and vision of alternatives? If ecological economics marks a radical departure from mainstream economics, is ecological economics also a progressive paradigm?

To answer these questions, this essay introduces the ecological economics paradigm and examines its progressive underpinnings. Just as no singular description of “heterodox,” “radical,” or “progressive” economics could capture the diversity of views, methodologies, and interests of progressives working outside of the mainstream of economics, the depiction of ecological economics in this paper fails to capture the variety and nuanced views of ecological economists.<sup>3</sup> What is

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1. See, e.g., HERMAN DALY & JOHN B. COBB, JR., FOR THE COMMON GOOD 1-15 (1989). According to the official website for the International Society for Ecological Economics (ISEE), ecological economics is an emerging transdisciplinary field that integrates the ideas and work of economists, ecologists, and others to solve environmental problems and to promote sustainability. The ISEE began in 1988. The ISEE now has more than 1200 members in 60 countries and publishes a reputable peer-reviewed journal, *Ecological Economics*. There are a growing number of research institutes and graduate programs devoted to ecological economics in the U.S. and other countries. The International Society for Ecological Economics, at <http://www.ecoeco.org>.

2. See, e.g., DALY & COBB, *supra* note 1.

3. See, e.g., CHARLES SACKREY & GEOFFREY SCHNEIDER, INTRODUCTION TO POLITICAL ECONOMY 1-24 (3<sup>rd</sup> ed. Dollars and Sense, 2002); SAMUEL BOWLES, RICHARD EDWARDS & FRANK ROOSEVELT, UNDERSTANDING CAPITALISM 51-60 (2005). In economics, the term heterodox can apply to anyone who works outside of the mainstream neoclassical paradigm, regardless of their political

described is essentially the core of what defines ecological economics as distinct from the mainstream. This core is most aptly represented in the writings of ecological economics' most prolific and well-known proponent, Herman Daly. Daly is a pioneer of the ecological economics movement, author of numerous articles, books, and texts on ecological economics, and co-founder of the International Society for Ecological Economics.<sup>4</sup>

This essay explores the potential synergism between ecological economics, and progressive economists and legal scholars who are working outside of the mainstream to develop alternative perspectives on law and economics. It argues that the significance of this potential synergy is three-fold. First, progressive scholars and ecological economists challenge many of the underlying assumptions of neoclassical economics. Identifying commonalities amongst these heterodox schools is critical to their shared project of weakening neoclassical economics' hegemony and creating safe-space within the disciplines for alternative paradigms.<sup>5</sup>

Second, ecological economics provides a compelling critique of the mainstream's growth paradigm that progressives can use as a justification for global income redistribution. Ecological economists argue that economic growth is ultimately constrained by ecological limits.<sup>6</sup> Given global income disparities, it follows that redistribution may be necessary to satisfy basic needs once the limits to

inclination. This would certainly include ecological economists, but also Marxist economists from the far left of the political spectrum and Austrian economists from the far right of the political spectrum. In economics, the term radical or progressive is applied to those who adopt a critical perspective on capitalism and who explore capitalist reforms and non-capitalist alternatives. This would include Marxist economists, but also non-Marxist economists.

4. See Herman Daly, *Toward A Steady-State Economy* (1973), Herman Daly, *Steady State Economics* (1977); Daly & Cobb, *supra* note 3; *Valuing the Earth*, (Herman Daly & Kenneth N. Townsend eds., 1993); Herman Daly, *Beyond Growth* (1996); *An Introduction to Ecological Economics* (Robert Costanza et al. eds., 1997); Herman Daly, *Ecological Economics and the Ecology of Economics* (1999); Herman Daly & Joshua Farley, *Ecological Economics: Principles and Applications* (2004). For a comprehensive survey of articles on Ecological Economics, see *A Survey of Ecological Economics* (Rajaram Krishnan, Jonathan M. Harris & Neva G. Goodwin eds., 1995).

5. See, e.g., Frederick Lee, *To Be a Heterodox Economist: The Contested Landscape of American Economics in the 1960s and 1970s*, 38 J. ECON. ISSUES 3 (2004). The LatCrit literature, including the articles contained in this volume, is replete with scholarship that challenges the hegemony of neoclassical economic thought. See, e.g., LatCrit articles included in this volume by Carmen Gonzalez, Ruth Gordon, and Steve Ramirez; Charles R.P. Pouncy, *Institutional Economics and Critical Race/LatCrit Theory: The Need for a Critical "Raced" Economics*, 54 RUTGERS L. REV. 841 (2002); Carmen G. Gonzalez, *Beyond Eco-Imperialism: An Environmental Justice Critique of Free Trade*, 78 DENVER UNIV. L. REV. 979 (2001); Elizabeth M. Iglesias, *Global Markets, Racial Space, and the Role of Critical Race Theory in the Struggle for Community Control of Investments: An Institutional Class Analysis*, 45 VILL. L. REV. 1037 (2000); Sylvia R. Lazos Vargas, *Globalization or Global Subordination?: How LatCrit Links the Local to the Global and the Global to the Local*, 33 U.C. DAVIS L. REV. 1429 (2000); Chantal Thomas, *Globalization and the Reproduction of Hierarchy*, 33 U.C. DAVIS L. REV. 1451; Gil Gott, *Critical Race Globalism? Global Political Economy and the Intersections of Race, Nation and Class*, 33 U.C. DAVIS L. REV. 1503 (2000); Timothy A. Canova, *Global Finance and the International Monetary Fund's Neoliberal Agenda: The Threat to the Unemployment, Ethnic Identity, and Cultural Pluralism of Latino Communities*, 33 U.C. DAVIS L. REV. 1547 (2000); Elizabeth M. Iglesias, *Human Rights in International Economic Law*, 28 U. MIAMI INTER-AM. L. REV. 361 (1996-1997); Enrique R. Carrasco, *Opposition, Justice, Structuralism, and Particularity: Intersections between LatCrit Theory and Law and Development Studies*, 28 U. MIAMI INTER-AM. L. REV. 313 (1996-1997). Moreover, some of this literature explicitly utilizes the insights of ecological economists to challenge the mainstream growth-oriented economic model and to suggest alternative paradigms. See Gonzalez, *Beyond Eco-Imperialism*, at 1000-04.

6. See, e.g., Herman Daly, *Introduction to Essays Toward a Steady-State Economy*, in *VALUING THE EARTH*, *supra* note 4, at 34-44.

growth are reached.<sup>7</sup> If ecological economics provides a rationale for income redistribution, progressive scholars may find ecological economics, and its notion of sustainability, appealing and instrumental for gaining support for reforms they have long sought on pure equity grounds.

Finally, insights from progressive scholars can enrich ecological economists' analysis of the causes of environmental degradation. Ecological economists identify output growth and excess consumption as the engines of environmental destruction, but it is progressive economists who explicitly recognize accumulation and exploitation as capitalism's underlying tendencies.<sup>8</sup> Most ecological economists believe that sustainability can be achieved by reforming the current global economic system and, as this essay argues, they tend to either downplay or ignore the radical implications of their notion of sustainability. Progressive economists, in particular, have devoted time historically to debating the types of reforms that necessitate radical change of the economic system and can lend insights as to whether gradualist reforms can achieve the conditions necessary for ecological sustainability.

## II. COMMON GROUND

Ecological economists and progressive economists share common ground in their methodological critique of neoclassical economics. For instance, both criticize neoclassical economics for its overly mechanistic world-view and its rigid adherence to assumptions, many of which contradict historical and empirical evidence.<sup>9</sup> Both are less positivist than mainstream economists and are more inclined to consider equity and distribution in their analyses.<sup>10</sup> However, whereas progressive economists stress neoclassical economics' atomism and its reluctance to address distributive issues in their critique, ecological economists emphasize neoclassical economics' inability to view the economic system as embedded in a finite ecosystem and its steadfast support for economic growth.<sup>11</sup>

According to ecological economists, the tendency of neoclassical economics towards reductionism obscures the complex interconnectedness between ecology and economy. This renders neoclassical economics unable to recognize the ecological limits to growth and to identify the sustainable scale of economic activity.<sup>12</sup> Ecological economists offer an alternative analytical framework that fuses ecological and economic knowledge for the purpose of identifying how human needs and wants can be satisfied within the limits imposed by the earth's natural carrying

7. See, e.g., *id.*

8. See e.g., Philip Arestis & Malcolm Sawyer, *Introduction to RADICAL POLITICAL ECONOMY*, at xii- xix (Philip Arestis & Malcolm Sawyer, eds., 1994).

9. See, e.g., DALY & COBB, *supra* note 1, at 25-117; Tony Lawson, *Methodology in Economics*, in *RADICAL POLITICAL ECONOMY*, *supra* note 8 at 263-68; SACKREY & SCHNEIDER, *supra* note 3, at 2-20.

10. See, e.g., DALY & COBB, *supra* note 1, at 25-117; Lawson, *supra* note 9 at 263-68; SACKREY & SCHNEIDER, *supra* note 3 at 2-20.

11. See, e.g., DALY & COBB, *supra* note 1, at 25-117.; Lawson, *supra* note 9 at 263-68; SACKREY & SCHNEIDER, *supra* note 3, at 2-20.

12. See, e.g., DALY & FARLEY, *supra* note 4, at 23-24; DALY & COBB, *supra* note 1, at 196.

capacity. This framework incorporates a more holistic (and realistic) understanding of human behavior that eschews many of the standard assumptions of neoclassical economics. Ecological economists deny rational self interest as the sole motivator of human action, reject the presumption of insatiable human desires,<sup>13</sup> recognize only limited substitutability between manufactured and natural capital, and exhibit skepticism that technology can overcome natural limits to growth.<sup>14</sup> Ecological economists also draw an important distinction between economic growth, which they define as a quantitative increase in economic throughput, and economic development, which they view as a qualitative improvement in human well-being.<sup>15</sup> Ecological economists argue that economic throughput growth cannot be sustainable in a world characterized by ecological limits.<sup>16</sup>

Progressive scholars and ecological economists share similar concerns for the environment. Both locate the origins of the current environmental crisis firmly within the economy and seek sustainable alternatives to current modes of production and consumption. Ecological economists and progressive economists both recognize the role of vested interests in perpetuating the status quo and the incentives facing capitalist firms to externalize environmental costs.<sup>17</sup>

Unlike most ecological economists, progressive economists are more inclined to view environmental degradation as endemic to capitalism and unlikely to be completely mitigated through gradualist reforms that leave the capitalist system intact.<sup>18</sup> As evidence, some progressive economists will cite the mechanisms by which market institutions mold human preferences and relations in ways that discourage sustainable resource use.<sup>19</sup> Others will cite the role of skewed income distribution by positing that environmental degradation is unavoidable as long as the benefits from resource use and extraction accrue to wealthy elites who exercise disproportional influence in policy making, while the costs are spread amongst the disenfranchised poor and middle class.<sup>20</sup> Still, other progressive economists view environmental degradation as the inevitable manifestation of capitalism's self-destructive drive toward accumulation. According to this view, capitalism cannot be environmentally sustainable because it requires growth to sustain itself and consumerism to absorb the surplus generated.<sup>21</sup>

It is this author's opinion that what these emerging green perspectives from progressive economists lack, however, is an operational notion of sustainability. This likely frustrates many progressive environmentalists and may explain the growing popularity of ecological economics amongst progressive scholars as the only truly sustainable paradigm. However, whatever ecological economics may offer progressives in terms of sustainability, it likely disappoints on other fronts

13. See, e.g., DALY & COBB, *supra* note 1, at 85-95.

14. See, e.g., *id.* at 76-80.

15. See, e.g., *id.* at 146-58.

16. See, e.g., Herman Daly, *Sustainable Growth: An Impossibility Theorem*, in VALUING THE EARTH, *supra* note 4, at 267.

17. See, e.g., A SURVEY OF ECOLOGICAL ECONOMICS, *supra* note 4.

18. See, e.g., IS CAPITALISM SUSTAINABLE? POLITICAL ECONOMY AND THE POLITICS OF SUSTAINABILITY (Martin O'Connor ed., 1994).

19. See ROBIN HAHNEL & MICHAEL ALBERT, QUIET REVOLUTION IN WELFARE ECONOMICS 182 (1990).

20. See JAMES BOYCE, THE POLITICAL ECONOMY OF THE ENVIRONMENT 44 (2002).

21. See, e.g., IS CAPITALISM SUSTAINABLE?, *supra* note 18.

dealing more explicitly with progressive capitalist reforms.

The tendency of progressive economists is to emphasize distribution and equity, not the larger macroeconomic issue of scale that is the primary focus of ecological economics. Ecological economists define scale as the size of the economic system in relation to the ecosystem that sustains it.<sup>22</sup> While most progressives will readily admit that current modes of production, consumption, and distribution have placed us on a crash-course toward ecological destruction, they remain somewhat ambivalent about the importance of scale in defining a sustainable alternative. This leaves unanswered important questions - questions that ecological economists readily provide answers for - regarding the substitutability of natural and human-made capital, technological limits to growth, and the relative merits of “weak” versus “strong” notions of sustainability.<sup>23</sup>

For ecological economists, scale is the defining feature of a sustainable economy. Changes in the social relations of production are necessary in order to recondition economic life within sustainable limits.<sup>24</sup> For progressive economists, challenging the free market and capitalist modes of production is primary. By implication it seems, a more equitable economic system will better respect ecological limits. However, as most progressive economists will admit, capitalist reform is a necessary but not a sufficient condition for sustainability.<sup>25</sup> As evidenced by the environmental degradation of the former Soviet Union, alternatives to capitalism can be equally as injurious to the environment and quality of human life. Therefore, if progressives are to satisfactorily address the current environmental crisis, they must first clarify the necessary conditions for sustainability. This requires careful examination of the issue of scale and limits to growth raised by ecological economists.

Scale, however, is not entirely separable from the issues of equity and distribution. Limiting growth, as per the ecological economists’ prescription, could condemn the existing poor to poverty unless accompanied by global income redistribution.<sup>26</sup> Ecological economists recognize that limiting growth may require redistributing resources to satisfy basic needs, but fall short of recognizing the radical implications of this corrective. Instead, ecological economists call for substantially reforming the economic system in ways that eliminate market failures and reign in the growth of economic throughput and population, but leave the basic institutions of the economic system in place.<sup>27</sup> Whether the magnitude of income transfers that would be necessary to satisfy basic needs could actually be achieved through existing institutions is unknown, though highly improbable. To achieve the strong notion of sustainability that ecological economists advocate, more radical transformation of the global economic system may be in order.

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22. See DALY & FARLEY, *supra* note 4, at 12.

23. See, e.g., DALY & COBB, *supra* note 1, at 8-18.

24. See, e.g. *id.* at 159-75.

25. See ROBIN HAHNEL, ECONOMIC JUSTICE AND DEMOCRACY 187-214 (2004).

26. See, e.g., DALY & FARLEY, *supra* note 4, at 389.

27. See DALY, BEYOND GROWTH, *supra* note 4, at 13.

### III. SUSTAINABILITY ACCORDING TO ECOLOGICAL ECONOMICS

Ecological economics proffers a notion of sustainability that is substantially different than that of the mainstream. Ecological economists attribute this distinction to a difference in pre-analytic vision that is so stark that it constitutes a major paradigm shift.<sup>28</sup> In neoclassical economics, the economic system is viewed as distinct from the ecosystem. Nature is viewed as a source of raw materials and as a sink for human wastes, not as a limiting factor to the economy. Ecological limits, though they may constrain growth in the short run, can be overcome in the long run by human ingenuity and invention. When resources become scarce or waste products too abundant, market mechanisms will trigger more efficient resource use or the discovery of suitable alternatives. For mainstream environmental economists, environmental problems are largely the result of market failures which can be corrected using market-based mechanisms such as pollution taxes or tradable permits. Mainstream environmental economists are less concerned with the scale of the economic system per se, but more with the efficiency of its allocations.<sup>29</sup>

In contrast, ecological economists view the economic system as an open subsystem of a larger but finite ecosystem. The economic system is an open system because it exchanges raw materials and waste with the ecosystem that contains it. The ecosystem is a closed system in which the amount of matter in circulation is constant.<sup>30</sup> According to ecological economists, if one considers the economic system as an open and growing subsystem of the closed and finite ecosystem, the issue of optimal scale cannot logically be avoided.<sup>31</sup> Ecological economists reason that limits to growth imply that there are opportunity costs associated with growth; in which case, it is inevitable that the costs of growth will at some point outweigh the benefits. Mainstream analysis ignores this potential for “uneconomic growth” by essentially treating the potential for growth as unlimited.<sup>32</sup> According to ecological economists, economic approaches that abstract from this aspect of the relationship between economy and ecology, and view the economic system in isolation from nature, will fail to achieve sustainability.<sup>33</sup>

Ecological economists analyze economic activity from the perspective of a “full” world - one in which the scale of human economic activity is dangerously large relative to nature’s capacity to provide raw materials and absorb and recycle waste.<sup>34</sup> Increasing production and consumption activities beyond the earth’s carrying capacity will impair nature’s self-repairing faculties, a phenomenon already observed with respect to greenhouse gas emissions and climate change. Ecological economists, therefore, conclude that sustainability requires slowing the rise of the economy’s throughput growth.<sup>35</sup> They define throughput as the flow of natural

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28. See, e.g., *id.* at 1-15.; Daly, *supra* note 6, at 11-47.

29. See, e.g., DALY & FARLEY, *supra* note 4, at 3-5; DALY & COBB, *supra* note 1, at 51-60.

30. See DALY & FARLEY, *supra* note 4, at 15-26.

31. See *id.*

32. See *id.*

33. See *id.*

34. See *id.*

35. See *id.*

resources from the ecosystem, through the economy, and back into the ecosystem in the form of waste.<sup>36</sup>

Ecological economists rationalize limits to throughput growth by appealing to the laws of thermodynamics.<sup>37</sup> Ecological economists view economic activity as a transformation of energy and resources into the goods and services people desire. According to the second law of thermodynamics, the amount of usable energy provided by nature declines with energy use. This decline of usable energy is an increase in entropy. Accordingly, ecological economists reason that as the economic system grows, the amount of useable energy declines while entropy rises. The economy transforms the low entropy resources (high-use value) that nature provides into high entropy waste (low-use value).<sup>38</sup> As Herman Daly notes, it is impossible to power a steamship with the heat contained in the oceans or build windmills using sand or ashes. By implication, there are natural limits to growth. At some point, the increase in entropic waste from production will limit throughput growth.<sup>39</sup>

Ecological economists urge economists to recognize the implications of thermodynamics for throughput growth and to avoid the temptation of viewing technological change as a panacea for circumventing limits to throughput growth.<sup>40</sup> Human-made alternatives to natural ecosystem functions are almost always more energy intensive, although this fact is easily disguised by market prices for energy which are artificially low, due to subsidies and externalized costs.<sup>41</sup> Producing human-made substitutes for natural capital will create more entropic waste; therefore, the production of human-made substitutes is limited.<sup>42</sup> Ecological economists conclude that while technological improvement may forestall ecological catastrophe in the short run by utilizing resources more efficiently and minimizing waste, it cannot surpass natural limits to throughput growth.<sup>43</sup>

Moreover, ecological economists view human-made or manufactured capital as an imperfect substitute for natural capital.<sup>44</sup> They posit a symbiotic relationship between the two forms of capital.<sup>45</sup> For example, the amount of fish harvested each year is a function of both the number of fishing boats (manufactured capital) and the number of fish (natural capital) still remaining in the sea. Similarly, there is no economic value to saw mills without trees, no economic value to dams if sediment run-off from deforestation constricts river flows, and no economic value to inorganic fertilizers if top soil has already been eroded.<sup>46</sup>

Because ecological economists view human-made and natural capital as complements, not substitutes, they conceptualize sustainability as the preservation of

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36. See, e.g., *id.* at 6.

37. The basis for this work is Nicholas Georgescu-Roegen's classic work, *THE ENTROPY LAW AND THE ECONOMIC PROCESS* (1971).

38. See, e.g., DALY & COBB, *supra* note 1, at 11-12, 194-99.

39. See, e.g., *id.*

40. See, e.g., *id.* at 194-99; DALY, *BEYOND GROWTH*, *supra* note 4, at 76-80.

41. See, e.g., DALY & COBB, *supra* note 1, at 195.

42. *Id.* at 197.

43. See, e.g., DALY, *BEYOND GROWTH*, *supra* note 4, at 78.

44. See, e.g., *id.*

45. See, e.g., *id.*

46. See, e.g., *id.*

natural capital.<sup>47</sup> The preservation of natural capital as opposed to total capital (manufactured and natural capital) is often referred to as the “strong sustainability” criterion for sustainable development. It implies that the value of natural capital stocks should remain constant (or increase) for future generations.<sup>48</sup> In contrast, the “weak sustainability” criterion that characterizes the mainstream approach to sustainability implies that the value of the total capital stock should not decline. Future generations can inherit a degraded resource base, provided that human-made substitutes offset the decline in the value of the natural capital stock.<sup>49</sup> Both notions of sustainability imply a belief in intergenerational equity that requires that future generations inherit the capacity to achieve a level of well-being at least equivalent to our own. However, the two criteria define a different optimal scale and consumption path for the economy. Whereas throughput growth is compatible with weak sustainability, strong sustainability requires a throughput steady-state economy.<sup>50</sup>

According to ecological economists, a steady-state economy maintains a constant stock of people and physical wealth at a low rate of throughput consistent with the earth’s regenerative and absorptive capabilities.<sup>51</sup> In a steady-state economy operating at an optimal (sustainable) scale, there is no additional growth in throughput. In which case, consumption benefits must be derived from the flow of throughput without depleting capital stocks. Technological change is instrumental to enhancing the value of what is consumed in the economy without increasing throughput.<sup>52</sup>

Since throughput growth is stabilized in a steady-state economy, ecological economists favor evaluating economic progress in more qualitative terms by noting that quantitative measures such as GDP growth are not accurate indicators of human well-being or the well-being of the planet.<sup>53</sup> In an economy where institutions encourage sustainability rather than throughput growth, ecological economists expect that individuals will substitute leisure, environmental amenities, and other forms of mental, cultural, and social progress that are less throughput-intensive for consumerism and materialism.<sup>54</sup> This transition may seem revolutionary to mainstream economists who have been trained to equate growth with progress. It should, however, seem less surprising to progressives who have long associated economic growth with increased inequality, the commoditization of life, alienation, environmental degradation, and the destruction of social structures and traditional communities.

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47. See, e.g., *id.*

48. See, e.g., *id.* at 76.

49. See, e.g., *id.*

50. See, e.g., *id.* at 31, 76-80.

51. See, e.g., DALY & FARLEY, *supra* note 4 at 55.

52. See, e.g., DALY, BEYOND GROWTH, *supra* note 4, at 31-32.

53. See, e.g., DALY & COBB, *supra* note 1, at 83.

54. See, e.g., *id.* at 371-74.

## IV.

## SHOULD PROGRESSIVES ADOPT THE ECOLOGICAL ECONOMICS' NOTION OF SUSTAINABILITY?

A discernible trend in progressive scholarship for at least a half-century has been to increasingly favor economic growth as a mechanism for raising incomes for the poor. As long as economies were growing, poverty and inequality could be potentially be ameliorated without resorting to the types of zero-sum redistributions for which there has never been much political support. Ecological economics poses a serious challenge to progressive scholars in this regard, as it underscores the need for accepting limits to growth. The critical issue for progressives, then, is whether to adopt a notion of sustainability predicated on limits to growth. To answer this important question, the rationale ecological economists provide for limiting throughput growth deserves more careful attention.

Ecological economists stress first and foremost the entropy constraint. While the laws of thermodynamics cannot be debated, the relevance of their application to the economic system and sustainability can and should. Ecological economists argue that as economic throughput grows, the amount of useable energy declines while entropy rises.<sup>55</sup> Ecological economists are technically wrong when they describe the ecosystem as a closed system, bound by the entropy law, because the sun provides the earth with a practically unlimited supply of energy (low entropy). Ecological economists characterize the ecosystem as a closed system because the flow rate of arrival of solar energy to the earth is strictly limited by human ability to harness it.<sup>56</sup>

In and of itself, the entropy constraint merely explains why the potential for throughput growth is finite. It does not provide a compelling reason for reorganizing economic activity today to forestall this future inevitability. Moreover, it is unnecessary to gaze that far into the future to find evidence of the dangers of surpassing nature's limits. Evidence of a global environmental crisis abounds, but the current crisis need not be explained by the laws of thermodynamics. It reflects a failure to harvest renewable resources sustainably, conserve the use of non-renewables, and preserve critical habitats. Its origins are firmly rooted in the economic system, not in the laws of thermodynamics. Ecological limits to growth do exist as defined by the earth's carrying capacity and the scale of human demands relative to it at a point in time. Ecological economics should be credited with drawing much needed attention to the limits to growth and the dangers of exceeding the earth's regenerative and absorptive capacities. However, the emphasis of ecological economics on the entropy constraint is a red herring that obscures more immediate and insightful reasons for acknowledging those limits.

The issue is further muddled by the ambiguity which surrounds the term 'limits to growth'. Economic growth refers to an increase in output produced or an increase in the value of output produced.<sup>57</sup> Ecological economists use the entropy

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55. *See id.* at 196 (discussing how production is dependant on the entropic flow from nature)..

56. *See id.* at 194-99 (explaining that human knowledge sets the limits on exploitation of low entropy energy sources).

57. This is standard treatment of economic growth in the economics literature. Economic growth, as measured by an increase in GDP, can occur if an economy produces more goods and services

law to explain limits to throughput growth.<sup>58</sup> However, technological change can increase the value of what is produced in the economy without increasing throughput. Do limits to growth, therefore, refer only to throughput growth? Ecological economists argue no on the grounds that human knowledge is itself infinite in its potential. Unlike mainstream economists who tend to view the potential for human knowledge as unlimited, ecological economists are generally far more pessimistic. As Herman Daly explains:

Certainly it is a dangerous business to specify limits to knowledge. But it is even more dangerous to presuppose that new knowledge will contain not the discovery of new limits, but only the discovery that old limits are not really binding. It is one thing to say that knowledge will grow (no one rejects that), but it is something else to presuppose that the content of new knowledge will abolish old limits faster than it discovers new ones.<sup>59</sup>

There are many examples that demonstrate how technology circumvents certain environmental constraints only to create others.<sup>60</sup> The Green Revolution which ushered in the application of modern science to agriculture in the mid-twentieth century, nuclear power as a potential replacement for fossil fuels, and more recently, genetically modified organisms as the proposed solution to global food scarcity are all examples of technological “advances” that have created as many, if not more, environmental problems than they attempted to solve. At the same time, human ingenuity appears humbled in its response to some of the most serious environmental problems of our time – global climate change, biodiversity extinction, and fresh water scarcity.

Of course, technological change should not be held to the standard that it can never create new environmental problems. Rather, it should be evaluated according to whether it solves more problems than it creates. Technological fixes should be sought wherever and whenever possible. But given the complexity of modern environmental issues and the uncertainty and irreversibility of certain environmental changes, it requires a great act of hubris to assume that technology can substitute for all of the ecosystem functions that are presently endangered in sufficient time to sustain human well-being. In and of themselves, the confines of human knowledge and the ability to apply it soon enough to stave off environmental disaster may justify limits to growth.

Ecological economics provides yet another, more controversial rationale for limiting growth that stems from the limited substitutability between natural and human-made capital. There is both a practical and ethical dimension to this issue. The practical acknowledges the inability of humans to replicate critical ecosystem functions with human-made alternatives, given the confines of human knowledge and technology. The ethical recognizes the environment’s intrinsic value. If the environment has value apart from its direct use value to humans, intergenerational equity requires preserving existing natural capital for future generations. A human-

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and/or if the real value of goods and services produced within an economy increases.

58. See DALY, *BEYOND GROWTH*, *supra* note 4, at 31.

59. DALY & COBB, *supra* note 1, at 198.

60. See *id.* at 198.

made substitute that replicates the environment's direct use value but not its intrinsic value cannot ensure future generations a level of well-being equivalent to that of the present generation.<sup>61</sup> For this reason, ecological economics subscribes to the strong notion of sustainability. Strong sustainability requires maintaining the value of the natural capital stock constant across generations.<sup>62</sup>

With respect to renewable resources, strong sustainability requires that harvest and extraction rates not surpass nature's regenerative capacities. With respect to non-renewable resources, however, strong sustainability is more limiting. If there is limited substitutability between natural and human-made capital, any consumption of non-renewable resources today decreases the welfare of future generations.<sup>63</sup> If this criterion is strictly applied, the basic needs of too many in the present generation could go unmet. Ecological economists offer an appealing solution to this dilemma. Use only those non-renewable resources today for which good human-made substitutes are known to exist. Preserve all other non-renewable resources and redistribute income to those in greatest need.<sup>64</sup>

Therefore, strong sustainability implies the need for both intergenerational and intragenerational equity. If strong sustainability provides sufficient reason for redistributing income, progressive economists may want to adopt it as one of the goals of capitalist reform. To do so, progressive economists need only accept that there are limits to growth, at least in the short run, due to limited technological capacity and the imperfect substitutability of human-made and natural capital. Limiting the scale of economic activity in accordance with the earth's carrying capacity, regardless of the entropy constraint, is necessary to avoid environmental collapse. On this critical point, progressives and ecological economists may agree.

## V.

### THE PROGRESSIVE IMPLICATIONS OF ECOLOGICAL ECONOMICS

It is clear that ecological economists offers a notion of sustainability that is fundamentally different than that of the mainstream, which denies limits to growth based on the assumption of perfect substitutability of natural and human-made capital.<sup>65</sup> While this change in vision regarding humanity and its relationship to nature is in itself radical, its broader implications are potentially more so. Ecological economists often seem unaware that their notion of sustainability not only requires a radical change in vision, but also a radical change in economic practice along more egalitarian lines that is at odds with the current economic system. Progressives seeking to reform the current economic system in more egalitarian ways should welcome the radical implications of ecological economics.

Ecological economists advocate a steady-state economy that maintains a constant stock of people and physical wealth at a rate of throughput consistent with the earth's carrying capacity. A sustainable steady-state seemingly implies a radical

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61. See DALY, BEYOND GROWTH, *supra* note 4, at 35-36.

62. See *id.* at 76.

63. See, e.g., JONATHAN HARRIS, ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS 128-30 (2002).

64. See, e.g., DALY, BEYOND GROWTH, *supra* note 4, at 81-82, 84-85.

65. See, e.g., *id.* at 34.

departure from “business as usual” economics.<sup>66</sup> Yet, the specific policies and practices that ecological economists often propose include the following. In general, extraction rates cannot exceed regeneration rates and waste production cannot exceed nature’s assimilative capacity.<sup>67</sup> Nonrenewable resources should only be depleted at a rate equivalent to the rate of creation of renewable substitutes, to the extent that such substitutes exist. If good substitutes are not available for non-renewable resources, governments should determine which nonrenewable resource stocks can be drawn down and at what rate and auction depletion quotas for resources.<sup>68</sup> Since natural capital is the economy’s limiting factor, governments should adopt policies aimed at raising the productivity of natural capital and increasing its long run supply.<sup>69</sup> For example, taxing resource throughput could raise the price of natural capital and generate incentives to use it more productively.<sup>70</sup> Governments should invest the proceeds from the depletion of natural resources into expanding stocks of natural capital, human-made substitutes for nonrenewable resources, and cultivated natural capital (e.g., tree plantations).<sup>71</sup> Governments should abandon their standard practice of counting natural capital depreciation as national income.<sup>72</sup>

In this regard, what the ecological economists propose can be accommodated by the current economic system. Their recommendations are based on, “impeccably respectable conservative institutions: private property and the free market.”<sup>73</sup> Indeed, their recommendations for taxing natural capital use, re-investing the proceeds of natural capital into expanding natural capital stocks, and subtracting natural capital depreciation from GDP, can be found in mainstream environmental economics textbooks and in a literature predicting the emergence of a new “natural capitalism.”<sup>74</sup> These proposals are aimed at eliminating the market failures that almost all economists cite as the underlying cause of environmental problems.<sup>75</sup> However, ecological economists do differ from mainstream environmental economists who view market failures as the primary cause of environmental degradation. Ecological economists emphasize scale and distribution - the macroeconomic challenges to sustainability - and more readily admit to the pervasiveness of market failures. Ecological economists see pervasive market failure as the cause of “uneconomic” growth, i.e. growth that has exceeded sustainable limits. For ecological economists, correcting market failures is a necessary, but not

66. See, e.g., Herman Daly, *The Steady-State Economy: Toward a Political Economy of Biophysical Equilibrium and Moral Growth*, in VALUING THE EARTH, *supra* note 4, at 325-61.

67. See Herman Daly, *Five Policy Recommendations for a Sustainable Economy*, in SUSTAINABLE PLANET: SOLUTIONS FOR THE TWENTY-FIRST CENTURY (Juliet Schor & Betsy Taylor eds., 2002).

68. See, e.g., Daly, *supra* note 66, at 340-44.

69. See, e.g., DALY, BEYOND GROWTH, *supra* note 4, at 80-82.

70. See, e.g., Daly, *supra* note 66, at 341.

71. See Daly, *supra* note 67, at 215.

72. See *id.* at 210.

73. Daly, *supra* note 66, at 350.

74. See, e.g., HARRIS, *supra* note 63, at 48, 136-56, 327-32; PAUL HAWKEN, AMORY LOVINS, & L. HUNTER LOVINS, NATURAL CAPITALISM 1-21 (Little Brown & Co., 1999).

75. Market failures refer to the inability of markets to produce the socially optimal level of output at prices that reflect the true social costs of production. Market failures arise when there are external (i.e. third party) effects of consumption or production that are not taken into account by buyers and sellers. See, e.g., ROBIN HAHNEL, THE ABCS OF POLITICAL ECONOMY 71-99 (2002).

sufficient condition, for sustainability.<sup>76</sup> Sustainability requires that the scale of economic activity relative to nature's carrying capacity be addressed.<sup>77</sup>

However, rather surprisingly, ecological economists maintain faith in the market as an instrument of allocation. As Daly notes:

The alternative to capitalism and socialism that we will propose [. . .] is not intended as an alternative method for allocating resources, for on this issue we side unequivocally with capitalism. . . .we are eager to identify and correct those conditions that lead to market failure as a way of enhancing the market as our basic institution for allocating scarce resources. . .<sup>78</sup>

Ecological economics has advocated extending the realm of the market into arenas that even most neoclassical economists dare not to tread. For example, Daly has proposed stabilizing population growth by establishing birth quotas and establishing a free market in tradable birth permits.<sup>79</sup> The confidence that ecological economists bestow on markets seems both misplaced and contradictory. On the one hand, it is hard to reconcile their understanding of the role of pervasive market failures in creating environmental problems with their presumption that markets can work efficiently with respect to other goods. On the other hand, if ecological economists truly believe that market failures can be adequately corrected, they have no grounds for treating the issues of scale and allocation as separable. If all externalities can be internalized such that market prices reflect the true social costs of resource usage, including the welfare loss to future generations, markets could then be relied upon to achieve a sustainable scale. No further appeals to limits to growth are necessary.<sup>80</sup>

Ecological economists are willing to distinguish between different types of goods and services to determine which are inherently unsuitable for market allocation.<sup>81</sup> Natural resources are inherently unsuitable because the complexity of ecosystems renders it impossible to estimate the full environmental costs of their use. Market prices, even those corrected to account for external costs, will underestimate the true social costs of consuming natural resources, because they cannot be adjusted to account for the increased scale of throughput.<sup>82</sup> Ideally, what ecological economists envision is a free-enterprise economy subdivided into different spheres, where each sphere is governed by a different allocative mechanism. The sphere governed by market allocations would include private goods, for which they maintain, "The goal of efficient allocation requires the instrument of the market, at least for goods that are private (excludable and rival)."<sup>83</sup> But because the market cannot achieve distributive equity or sustainable scale, alternative social institutions

76. See DALY, BEYOND GROWTH, *supra* note 4, at 34, 45.

77. See DALY & COBB, *supra* note 1, at 142-43; DALY & FARLEY, *supra* note 4, at 5.

78. DALY & COBB, *supra* note 1, at 49.

79. See, e.g., *id.* at 244-46.

80. See, e.g. HARRIS, *supra* note 63, at 61-70 (Explaining the standard way that mainstream environmental economics determines optimal resource use over time by internalizing welfare loss to future generations).

81. See, e.g., DALY & FARLEY, *supra* note 4, at 54-56.

82. See, e.g., DALY, BEYOND GROWTH, *supra* note 4, at 34.

83. See, e.g., DALY & FARLEY, *supra* note 4, at 54-56, 363.

will be necessary to impose limits on the market.<sup>84</sup>

Progressive scholars can demonstrate a similar ambivalence with respect to markets. In economics, for example, there is a long standing debate between progressive economists who champion one or another version of market socialism, progressive economists who argue for replacing markets with some form of democratic planning, and progressive economists who envision a mixture of private and public ownership in a predominantly market economy (the so-called third-way or social democratic model).<sup>85</sup>

Ecological Economists remain ambivalent as to whether the steady-state economy they propose is inherently capitalist. As Daly notes:

Whether the steady-state economy is capitalistic or not depends on how one defines capitalism. I suggest that it is more profitable to work out the concept of steady state, of a just and sustainable society, as a third way – neither capitalistic nor socialistic but a way to which traditional capitalists and socialists are invited to contribute and within which they might find an embracing synthesis.<sup>86</sup>

However, ecological economists clearly reject centralized planning and remain committed to both market allocations and the institution of private property. As Daly states:

Our position is that centralized economic planning is inefficient, that allocations are better effected in the market than by bureaucratic planning. The role of government is to set fair conditions within which the market can operate. It is also responsible for setting the overall size (scale) of the market. The market is not the end of society and is not the right instrument through which the ends of society should be set. We favor private ownership of the means of production. We favor the widest possible participation in that ownership, including worker ownership of factories, against its concentration in a few hands.<sup>87</sup>

Ecological economists reject centralized planning based largely on the poor environmental record of the former communist countries. Ecological economists equate socialism with centralized planning, and argue that socialism, like capitalism, suffers a pre-occupation with throughput growth.<sup>88</sup> Ecological economists apparently remain skeptical of the potential for a “third way” that is neither purely capitalist nor socialist. As Daly states:

If one dislikes centralized bureaucratic decision making than one must accept the market and the profit motive, if not as a positive good than as the lesser of two evils. A third alternative (as

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84. See, e.g., *id.* at 363.

85. For a summary of this issue, See HAHNEL, *supra* note 25, at 165-215.

86. Herman Daly, *Postscript: Some Common Misunderstandings Further Issues Concerning a Steady-State Economy*, in VALUING THE EARTH, *supra* note 4, at 377.

87. DALY & COBB, *supra* note 1, at 14.

88. See, e.g., Daly, *supra* note 86, at 376.

opposed to varying mixes of the two basic ones) has not been identified.<sup>89</sup>

Progressive economists, however, have articulated visions of capitalist alternatives that potentially avoid the now well-known shortcomings of centralized planning, such as democratic planning and market socialism.<sup>90</sup> Whether these alternatives can prove to be sustainable remains to be seen. Obviously, this is an area where dialogue between progressive scholars and ecological economists could prove most fertile.

Even if ecological economists are right that sustainability can be achieved through existing institutions, the radical implications of the degree of redistribution that would be in order are difficult to deny. Sustainability is grounded in the belief that the well-being of future generations is as at least as valuable as the well-being of the present generation. Since it is inconsistent to express concern for future generations, while denying the same concern for the well-being of those alive today, ecological economists reason that intergenerational equity cannot be divorced from intragenerational equity.<sup>91</sup> Intragenerational equity is necessary for sustainability because people who are poor tend to highly discount the future and are often unable to make sacrifices today to protect resource stocks for the future. People who are rich are more likely to engage in the kind of wasteful conspicuous consumption that deprives future generations access to resources. Moreover, limiting growth can condemn the existing poor to poverty unless resources are redistributed to meet basic needs.<sup>92</sup>

If growth is eliminated as a mechanism for increasing incomes for those on the bottom, sustainability requires redistributing income from the top. Ecological economists call on the government to supersede the market's own mechanisms for distributing income and wealth to achieve more equitable distribution.<sup>93</sup> For example, ecological economists recommend the establishment of a guaranteed minimum income, funded by progressive taxes that asymptotically approach 100% at a specified maximum allowable level of income and wealth.<sup>94</sup> They encourage shifting the economy's tax base from income to consumption using mechanisms like emissions taxes, user fees, and the sale of resource depletion quotas. To ensure more equitable returns to capital, ecological economists support "broad-based" capital ownership (e.g. worker-owned cooperatives and employee shareholder ownership programs). Moreover, they favor eliminating public subsidies to extractive industries and imposing taxes on land-use equal to its social opportunity cost in order to distribute the returns to natural capital more equitably.<sup>95</sup> As Daly notes:

Ideally ownership of land and resources should be communal, since there is no cost of production to justify private ownership. . . Each citizen has as much right to the "free gifts of nature" as any

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89. DALY & COBB, *supra* note 1, at 48-49.

90. For a summary of this issue, See HAHNEL, *supra* note 25, at 165-215.

91. See DALY & FARLEY, *supra* note 4, at 389-404.

92. See *id.*

93. See, e.g., Daly, *supra* note 66, at 332.

94. See, e.g., DALY & FARLEY, *supra* note 4, at 390-403.

95. See, e.g., DALY, BEYOND GROWTH, *supra* note 4, at 31-45, 88-92; Daly, *supra* note 67, at

other citizen. By capturing for public revenue the necessary payment to nature, one serves both efficiency and equity.<sup>96</sup>

Given the magnitude of global income inequalities, the state of abject poverty that millions currently inhabit, and the ubiquitous emphasis on growth and materialism that characterizes modern societies, it is hard to envision how democratic governments can usher in the types of reforms that would meet basic needs, while at the same time, respecting ecological limits to growth, replacing private ownership of natural capital with communal ownership, and fostering new institutions to encourage less-throughput intensive consumption. Ecological economists like to pretend that such changes can be accomplished by merely “stretching and bending” fundamental institutions. As Daly and Farley state:

Even though our goal may be far from the present state of the world, the later remains our starting point. We never start from a blank slate. Present institutions must be reshaped and transformed, not abolished. This imposes a certain gradualism.<sup>97</sup>

Moreover, ecological economists repeatedly stress that their prescriptions for a steady-state economy are not inherently radical, because they are grounded in the traditional institutions of a capitalist economy - private property, market allocation, and production for profit. Even a proposal as seemingly radical as minimum and maximum income limits, ecological economists justify as necessary for preventing the market system from eroding its own requirements for competition and efficient allocation.<sup>98</sup>

Progressives have championed similar types of reforms aimed at eliminating income and wealth disparities, and they have spent more time historically thinking about the types of reforms that can be achieved within the current system and the types of reforms that require more radical institutional and systemic change. Moreover, progressive economists have debated different distributive principles, and can lend further justification to proposals for maximum and minimum incomes policies.<sup>99</sup> Progressive economists, in particular, understand well the limitations of markets, no matter how carefully regulated, and are well-versed in the pros and cons of private, communal, and state ownership. Progressive economists better appreciate the dynamics of the economic system that lead to resource exploitation than ecological economists who are more inclined to blame the problem on the way society misconstrues the relationship between the economy and nature. Ecological economists are so preoccupied with blaming neoclassical economics for perpetuating a view of the economic system as unbounded by ecological limits that they reserve most of their heavy criticism for neoclassical economics, rather than the economic system that neoclassical economics supports. While ecological economists may find it politically advantageous to appeal to gradualism and to down-play the radical implications of sustainability, self-deception almost always proves to be self-defeating in the end. The ecological economics movement must eventually incorporate more explicit capitalist critiques if it hopes

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96. Daly, *supra* note 67, at 214.

97. DALY & FARLEY, *supra* note 4, at 362.

98. *See, e.g.*, DALY & COBB, *supra* note 1, at 44-61; Daly, *supra* note 66, at 350.

99. *See, e.g.*, HAHNEL, *supra* note 25.

develop a more rigorous critique of the systemic causes of environmental degradation and a convincing blue-print for the future.

## VI. CONCLUSION

Ecological economics has grown in popularity and prominence since its inception in the 1980s. Of the many heterodox schools that challenge the basic tenets of mainstream economic thinking, ecological economics is the least self-consciously progressive. For that reason, there has been little formal dialogue between ecological economists and progressive scholars in other disciplines.

Progressive scholarship that challenges the hegemony of free-market fundamentalism and advocates for egalitarian reforms could appeal to ecological economists, particularly those ecological economists who recognize the progressive underpinnings of their paradigm. In turn, progressive scholars need to broaden their capitalist free-market critiques to include its inherent growth bias and the contradictory aims of economic growth as so narrowly conceived by increases in GDP and environmental sustainability on the other. Ecological economics provides the operational principles of sustainability that progressive scholars need to incorporate in their critique of the current economic system and their vision of alternatives.

More generally, progressives should note that public support for environmental protection has grown in recent decades while support for progressive incomes policies, welfare, and other social support programs has considerably waned.<sup>100</sup> Ecological economists who justify redistributing income for sustainability reasons may be more successful in building a core base of supporters than progressives who justify similar proposals on pure equity grounds. Furthermore, some of the most ambitious experiments in creating alternative progressive economies are rooted in the ecological economics notion of sustainability. Local currency systems, food co-ops, micro-enterprise, farmers markets, community supported agriculture, eco-villages, are just some of the many examples of a growing movement toward the creation of self-reliant, environmentally sustainable, egalitarian communities<sup>101</sup> Establishing a dialogue between ecological economists and progressive economists and progressive scholars in other disciplines will facilitate the type of cross-fertilization that is ultimately required to advance the movement for a more equitable and sustainable economy.

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100. Despite the rightward shift right in the American political landscape in recent years, surveys continue to show support for environmental protection. For a summary of recent polls of U.S. voters on matters related to the environment, see <http://www.pollingreport.com/enviro.htm> (last visited July 18, 2006).

101. See Fred Curtis, *Eco-localism and Sustainability*, 46 *ECOLOGICAL ECON.* 83, 83-102 (2003).

