FELLOW'S ADDRESS

Regional Science and Ecological Economics: The Case of Nauru

*John H. Cumberland**

I. INTRODUCTION

I want to thank John Kort, the Southern Regional Science Association (SRSA) Nominating Committee, the Executive Council, and members for the honor of being elected a Fellow of the SRSA. It is a privilege indeed to join the company of the previously elected Fellows: Walter Isard, Edgar Dunn, Bill Miernyk, Lowell Ashby, Rutledge Vining, Stuart Chapin, Charlie Leven, Bill Schaffer, Niles Hansen, Brian Berry, and Jim Hite. I feel fortunate to have known all of them in various roles as teachers, friends, and colleagues.

II. BACKGROUND

Andrew Isserman (1993) has noted opportunities to extend the analytical base of regional science, as a traditionally evolutionary, multidisciplinary field, by expanding its environmental content. It has also been suggested that this effort could be further advanced by incorporating insights from the more recently emerging field of ecological economics (Cumberland 1995). Regional science and ecological economics are complementary disciplines offering challenging opportunities for mutual enrichment, since most regions face environmental problems, and since all environmental problems are characterized by often-neglected site-specific spatial aspects.

the purpose of this paper is to illustrate that view with an example of a specific region and to consider its relevance to a wider range of emerging regional environmental issues, such as the globalization of international trade, the issue of managed regional growth, and the regional significance of the sustainability concept.

III. the CASE OF NAURU

This thesis can be illustrated by the much-neglected case of Nauru, a tiny island in the South Pacific. It has an area of only 8 square miles and a rapidly growing population of more than 10,000. Occasionally, an enterprising journalist (*The Economist* 1987) will point out that Nauru's uniquely high-quality phosphate deposits have made its small population the world's richest nation, far wealthier per capita than even the Arab oil states. At first glance, this appears to be an island paradise, enjoying vast wealth in an idyllic setting. Thus far the tribal elders seem to have managed the huge revenues responsibly, setting up large trust funds,

*Department of Economics, University of Maryland

distributing income generously, and providing public services to all citizens without charge (Trumbull 1982).

However, most observers appear to have overlooked the striking human and other real costs of this apparent economic success story. Generous dividend payments permit many on the island to have luxury automobiles, including at least one reported Lamborghini, but the only place they can be driven is around the 12-mile outer coastal fringe. Actually, in order to market the phosphate, the hinterland of the island is being bulldozed away and conveyed onto the ore ships lined up offshore (Wilson 1975). Ironically, some of the now-affluent residents can not even squeeze into their low slung sports cars. Having become too wealthy for manual labor, they have abandoned their traditional diet of fish, coconuts, and tropical crops for rich imported gourmet foods. Consequently, they are plagued by obesity, with one of the highest incidences of diabetes in the world, and with life expectancies falling sharply (*Encyclopaedia Britannica* 1998). Most food and all fresh water must be imported, since leveling the island's interior has destroyed the original watersheds and removed the topsoil. The phosphate mining has become so relentless that the few remaining reserves are expected to have become totally depleted in this year, 2000. Having literally sold off the island's life support ecosystem, its inhabitants are reported to be looking for another island to purchase and to which they can transfer their population. At last report, their search had been unsuccessful (Trumbull 1982). There are implications here that are worth considering for regional science.

IV. IS THIS REGION RELEVANT?

Is this island merely an anomaly or is it a metaphor with wider significance? From our perspective it is easy to criticize the Nauruans as having engaged in a shortsighted, irreversible monetization of their environmental heritage in order to support rampant consumerism carried to damaging excess. Unfortunately, there are numerous indicators and warning signs that these islanders are not totally unique among those engaged in selling off their ecosystems irreversibly and hoping to use the proceeds to move on to greener fields for exploitation. We need mention only the destruction of the earth's rain forests, the loss of wetlands, the overharvest of ocean fisheries, the depletion of nonrenewable resources, the erosion of agricultural topsoil, the loss of biodiversity, and the increasing evidence of greenhouse heating of the atmosphere (Costanza et al. 1997).

While these threats have not as yet advanced to the same level of damage and irreversibility as those on the island, they may be read as early warning indicators of the growing need to protect the earth's fragile ecosystems that, from the local to the global level, are the essential and indispensable support systems for all economic activity and, ultimately, for all life on earth.

Growing recognition of the limitations of neoclassical economics and of conventional growth theory, or indeed of any other single specialized discipline for coping with ecological problems of this magnitude, has led to the emergence

of ecological economics, which, as suggested earlier, can strengthen the capability of regional science for addressing these issues. A brief overview of the central concepts of ecological economics can illustrate its obvious relevance to the challenge of Nauru and to future opportunities for regional science at all levels of spatial aggregation.

V. A BRIEF VIEW OF ECOLOGICAL ECONOMICS

In his recent book on consilience, Nobel Laureate E.O. Wilson (1998) describes this concept as a guide to advancing human knowledge by seeking consistency between the known and accepted facts in one science with those in other sciences. For the last ten years, ecological economics has sought consilience between the assumptions and findings of economics and those of ecology.

In the short time available, it is possible only briefly to suggest how ecological economics diverges from the standard neoclassical economic model and points instead to some different approaches to the issues raised above. First, with its emphasis on the importance of species diversity and of species' interrelationships with the biosphere, ecological economics rejects the assumptions that human-made capital is infinitely substitutable for depletable natural capital (i.e., natural resources). Secondly, Georgescu-Roegen (1971) points out that within the earth's finite system the laws of thermodynamics make it unrealistic to accept the assumption that the biosphere can serve as an infinitely limitless sink for the high-entropy waste outputs that economic processes generate from the low-entropy resources they require as inputs. Only by ignoring the fundamental physical laws of the universe can the standard exponential economic growth paradigm continue to serve as a reliable guide for long-run public policy. Bill Miernyk (1982), in an earlier SRSA Fellowship address, drew attention to this and other aspects of the significance of Georgescu-Roegen's work for regional scientists.

By contrast, ecological economics, in attempting to put public policy on a sounder scientific footing, emphasizes sustainability rather than unlimited exponential economic growth as a more realistic guide to the future (Costanza et al. 1997). While the concept of sustainability despite many efforts has not yet been rigorously defined, and indeed may never be, it has however proven to be a useful construct that suggests three overriding principles for policy guidance: sustainable scale, equitable distribution, and economic efficiency.

VI. PRINCIPLES OF ECOLOGICAL ECONOMICS: SCALE, EQUITY, AND EFFICIENCY

The term *scale* is used in ecological economics not in the economic sense to refer to the economies of scale, but to refer to the total size and magnitude of economic activity in relation to whatever region is being considered, e.g., the island of Nauru or the total earth. Sustainable scale here is the level and density of economic activity beyond which the integrity of ecological support systems is seriously and irreversibly damaged. Therefore, the concern for appropriate,

sustainable scale springs directly from recognition of the above noted scientific principles that all economic processes ultimately depend upon the maintenance of a healthy biosphere sustained by species diversity and that no parameter, including economic growth, can expand forever in a finite environment.

Since most environmental resources (e.g., the atmosphere, the oceans, and species diversity), though they are limiting biophysical resources, are unpriced, their use is not subject to the economizing discipline of markets. Therefore, even if the standard economic goal of correcting all detrimental externalities could be achieved, continuous economic growth, even if it appeared to meet all the neoclassical requirements for efficient markets, could far exceed the scale consistent with the survival of a healthy biosphere.

Regional scientists are well aware that most urban settlements long ago far exceeded the carrying capacity of their geographic space, and now can function only because they import inputs from and export their wastes to less densely settled regions. The scale problem results from the fact that at present rates of use, we shall eventually run out of regions that are capable of continuing to supply the low-entropy nonrenewable natural resources essential for supporting economic activity and for absorbing unlimited quantities of high-entropy waste. The high rate of converting low-entropy fossil fuels into high-entropy waste, especially the growing accumulation of carbon dioxide in the atmosphere, is clearly unsustainable. The sustainable scale of economic growth cannot indefinitely exceed the ecological limits required by a healthy biosphere. The concept of sustainable scale thus needs to be reassessed for all levels of human settlement, from local to global. In this effort, regional scientists are especially well positioned to make important contributions.

Secondly, in addition to scale, ecological economics emphasizes equity in the belief that a democratic transition from the current emphasis on limitless quantitative economic growth, with its great distributional disparities, to sustainable qualitative improvement in human welfare can be achieved only if those at all socioeconomic levels are persuaded that this vision is achievable with fairness and justice among regions, among generations, and especially among classes. Without social justice and equity, the social and economic infrastructures needed for sustainability are thought not likely to be maintained (World Commission on Environment and Development 1987).

Finally, economists should be reassured to note that ecological economics fully accepts the importance of the concept of economic efficiency in the use of scarce resources for achieving these objectives, once appropriate sustainable scale has been determined and equitable policies for accomplishing it have been established. Obviously, economic market efficiency, as Isard has emphasized since his early concern with location theory, must embrace spatial dimensions, and regional science should be part of this effort towards consilience.

VII. POLICY IMPLICATIONS OF ECOLOGICAL ECONOMICS

In view of these principles of ecological economics—appropriate scale, distributional equity, and economic efficiency, with their overriding focus on sustainability—what policy guidelines can be drawn for the case of Nauru, and for regions in general?

Concerning economic efficiency, although it is still possible to find in the journal *Ecological Economics* occasional tension and hostility between economists and ecologists, the avowed purpose of its founder and first editor, Robert Costanza (1989), is to bridge the gap and advance consilience between the two disciplines. To the extent that the field of economics has now internalized natural resource economics and, more recently, environmental economics with its much stronger emphasis on the role of externalities and other market failures, ecological economics accepts the goal of economic efficiency as one, but not the exclusive, policy objective, along with sustainable scale and distributional equity.

Equity in this context should be understood to include not only interregional equity and interpersonal equity, but also intergenerational equity, with the concern for leaving future generations as well off as the present generation.

It is with respect to views on the sustainable scale of economic activity that ecological economics diverges most significantly and fundamentally from the conventional neoclassical wisdom and its policy emphasis on unbounded exponential growth. While there is as yet no consensus on a single rigorous definition of sustainability, the concept does suggest at least three simple guidelines to public policy for the long run: 1) The rate of harvest of renewable natural resources should not exceed their rate of regeneration. 2) The depletion of nonrenewable natural resources should be offset by investing in expanding the yield of renewable resources. 3) The release of waste into the environment should not exceed the region's absorptive capacity. These principles can be examined for relevance to the case of Nauru.

VIII. ECOLOGICAL ECONOMICS AND NAURU

The concepts of sustainable scale, equitable distribution, and economic efficiency do have obvious relevance to the case of Nauru. Concerning the market efficiency criterion, the phosphate mining operation has been a highly profitable marketing venture. And from the equity viewpoint, the local managers seem to be distributing these financial gains not only generously (probably too generously) among the current population, but also with efforts (of uncertain success) to provide for future generations. These achievements have led many observers to regard the island with its high per capita income as an enviable success. Only with respect to sustainable scale is the full tragedy of Nauru apparent. The islanders are irreversibly engaged in destroying the physical environmental life support system of their island. Disaster for the islanders may yet be averted only if they are able to find some suitable alternative habitat that they can manage to purchase with their trust fund. Even if they eventually succeed in this quest, which to date has

been fruitless, this escape hatch obviously is not available for very many other regions, unless the prospects for establishing on a vast scale colonies in space greatly improve.

Unfortunately, however, many other regions also are enthusiastically pursuing economic wealth by monetizing their nonrenewable resources and then hoping to move on to greener pastures. Tropical rainforest regions come to mind. This pattern was feasible as long as human settlements were limited in scale as a proportion of the total earth. However, now this process may be much more widespread than is sustainable for the long run. We should reflect on the case of Nauru as we examine development patterns in regions closer to home, and for the earth in general, as nonrenewable resources are harvested without provision for replacing them by investing in the means to increase the sustainable yield of renewable resources. The practical earthly limits to this process are obvious. For the region of the total earth, no financial trust fund, however large, can be used to purchase an alternative habitat.

There are possible implications here for all levels of regions, from global down through local, only a few of which can be mentioned here.

IX. SIGNIFICANCE FOR OTHER REGIONAL LEVELS, GLOBAL AND LOCAL

The prospect of additional Naurus' depleting their resources and looking for greener pastures to exploit suggests that the globalization of international trade, despite its promises of increased economic market efficiency, should be carefully evaluated with respect to its accompanying market failures, such as its impacts upon labor conditions, income disparities, and environmental protection. Ecological economists (especially Herman Daly 1999 and Costanza et al. 1997, pp. 156-175) are raising significant challenges to the market efficiency assumptions of traditional international trade theory on these issues. Daly's (1999) work on the effects of global free trade on the management of regional environmental resources has significant implications for the conventional wisdom that enshrines the principle of comparative advantage to the neglect of equity and environmental values.

At the other end of the spatial scale from globalization and of much greater traditional concern to regional science is the issue of regional economic development. Until quite recently, the prevailing paradigm has been that of vigorous interregional competition for economic growth and doctrinaire belief in the elusive moving target of the ever-expanding tax base. Regional scientists have made notable early contributions on this issue. For example, Walter Isard and Robert Coughlin (1957) developed a comprehensive model adding the previously neglected expanding service cost base as well as the increasing tax base that accompanies regional growth.

Regional scientists also gave early attention to the environmental impacts of regional growth and developed models for assessing the environmental impli-

cations of alternative development policies (Cumberland 1966). However, the political and economic strength of regional development establishments, where development decisions are traditionally made in the U.S., until very recently dominated most local citizens' concerns about adverse fiscal and environmental impacts of growth. The sudden emergence of local demands for managed growth or "smart growth" and the recent successes at the polls by their advocates in both political parties following decades of noninterest in the work of regional scientists on these issues is one of the more interesting regional development phenomena of our times.

However, now that these concerns about the adverse effects of regional growth have become so widespread, it is appropriate to ask what regional scientists can contribute to the analysis and understanding of the problems involved. For example, what would be the direct and indirect impacts of alternative smart-growth policies on lower income groups in both the participating and the non-participating regions? How about the effects on environmental quality? Fortunately, there is a solid basis of theoretical, analytical, and empirical regional science literature to build upon and there are challenging opportunities for applying the wide range of regional and interregional models, especially spatially disaggregated multisectoral models, developed by regional scientists for the analysis of these problems.

What public policy measures are appropriate for gaining acceptance of the changes in values and mutual sacrifices that may be necessary for achieving this transition in a democratic and equitable fashion? The addition of insights from ecological economics can add to the analytic capabilities of regional science in this regard.

It is quite early on to anticipate all of the appropriate criteria for wise regional development. However, it is reasonable to draw a distinction between traditional regional growth, with its emphasis on quantitative expansion, and regional development, with its emphasis on qualitative improvements in human welfare (Cumberland 1995, p. 175). It is also reasonable to suggest that the policy guidelines for achieving the improved quality of regional development that seeks higher levels of human welfare should be consistent with the emphasis from ecological economics on sustainable scale, equitable distribution, and economic efficiency.

X. CONCLUSION

Although in the best case scenario it may turn out to be possible for Nauru to convert its trust fund to the purchase of an alternative habitat after selling off its own life support system, no such trust fund can be purchased for the total earth with the proceeds from our current rush to deplete its biosphere. At the global scale, such a financial trust fund can not be translated into real terms.

As we continue to enjoy one of the longest sustained periods of economic prosperity in recent history and the unprecedented level of consumption it

supports, it would be prudent to consider a few questions raised by the example of Nauru: 1) Are the pollution externalities and other market failures generated by the accelerating global economic expansion being corrected at efficient rates? 2) Is the current scale of economic expansion sustainable by the environmental and ecological resource base of the earth? 3) Are the fruits of economic globalization being distributed with sufficient equity and fairness among income groups, regions, and generations to achieve political and social sustainability?

As we seek to address these questions and to meet the challenge of arresting our drift towards turning the entire earth into a global Nauru, I am confident that regional scientists with their evolutionary skills and multidisciplinary traditions will make important contributions.

XI. AFTERWORD

To end on a personal note, it comes as a particularly welcome coincidence that this event should have been scheduled for Miami Beach. Almost exactly 57 years ago this month, I was here in a different capacity. After the 1941 Japanese World War II attack on Pearl Harbor, the U.S. Army Air Corps, predecessor of the Air Force, was faced with the task of training thousands of aircrews in a very short time. Some resourceful planner had the inspiration of simply commandeering the entire resort of Miami Beach with its dozens of art deco hotels that could serve as the combined dormitories and classrooms for urgently needed pilots, navigators, radio operators, and other crew members. I happened to be assigned to quarters only twelve blocks south of here in the Ocean Grande Hotel, still at 36th and Collins Avenue, to train for service in the Pacific Theatre. Now, more than a half century later, having been the guest on Collins Avenue of both the Air Corps and the Southern Regional Science Association, I can assure you that the hospitality of the SRSA is infinitely more agreeable. Thank you again for the privilege and the honor.

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