

COMMENTARY

FORUM: THE ECOLOGICAL FOOTPRINT

Commentary on the utility of the ecological footprint  
concept

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This journal has done much to popularize (if that is quite the right word) the ecological footprint (EF) concept introduced by Rees (1992) and elaborated by Rees and Wackernagel (1994), Wackernagel and Rees (1995, 1996, 1997), Rees and Wackernagel (1999) among others. It is not necessary to recapitulate the fundamental ideas involved, except the one that is most troublesome, namely, the assumed equivalence of energy flows from all sources into corresponding areas of biologically productive land. I return to that later. However, a recent Ecological Economics Forum (April 1999), and especially the invited paper therein (van den Bergh and Verbruggen, 1999), raised some important issues. I comment hereafter mainly on the problems noted by van den Bergh and Verbruggen (vdB&V). I agree with their conclusion that while the EF concept has some value as an indicator of current global unsustainability, it is too aggregated (and too limited in other respects) to be an adequate guide for policy purposes at the national level.

The fact that energy accounts for over one-half of the footprint for most developed countries

(Wackernagel and Rees, 1996) has been emphasized by vdB&V. The underlying equivalence factors used in that calculation function as implicit weights for aggregation as well as conversion. These conversion factors are derived from physical and biological considerations that are openly acknowledged, but which do not correspond at all to either long-term technological potential or current 'social' weights for inputs (i.e. market prices). These weight-factors "reflect neither relative scarcity changes over time nor variation over space ... a fixed rate of substitution is supposed between different categories of environmental pressure. Worse even, some categories receive identical weight, even is it is clear that their environmental impacts are very distinct" (van den Bergh and Verbruggen, 1999, p. 64).

As applied to the energy use issue, in particular, the EF procedure, as currently implemented, calculates the productive land requirements for energy consumption in terms of the land required to absorb the carbon (i.e. carbon dioxide) from burning fossil fuels. The hidden implication, which is not sufficiently clearly spelled out by the EF proponents, is that in a sustainable world energy would be obtained from fossil fuels but the latter would be burned — in any given country

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— in just such quantities as to permit the resulting carbon dioxide emissions to be absorbed by vegetation within the country.

Stated thus, the idea is absurd not only in purely economic terms, but also in environmental terms. In the first place, there are other ways to absorb carbon dioxide. Already there are serious proposals to sequester the gas from large power plants, compress it and pump it into oil or gas fields to replace the fuel that has been extracted, and incidentally increase the pressure of the fuel that remains. Conversely, the carbon dioxide could be liquefied and pumped into the deep ocean where it would dissolve under pressure and remain out of circulation for hundreds or thousands of years. In the second place, there are other ways to generate useful energy without producing carbon dioxide, ranging from nuclear electricity to windmills, tides, water power and photovoltaic (PV) electricity or even PV hydrogen (by electrolysis of water). To be sure, the latter is far from economic feasibility at present. However, technology marches on, and it will march faster if it is stimulated by scarcities, carbon taxes, or regulatory constraints on the use of carbon fuels.

Third, the exclusive focus on carbon dioxide is topical but not necessarily justified. Methane, an important greenhouse gas, is neglected. Sulfur and nitrogen emissions from fossil fuel consumption may have important ecological consequences, including the possibility of eutrophication, which are neglected by the EF scheme.

Finally, the self-sufficiency scenario neglects the possibility of trading emission rights or ‘joint implementation’. Indeed, one of the related criticisms of EF by vdB&V is that there is also an unjustified implication that no country should have an EF ‘deficit’. This suggests that trade is somehow ecologically unfriendly. On the contrary, as vdB&V point out, trade makes it possible for EF deficit areas to increase their carrying capacity by exchanging one kind of ecological service (which might be in oversupply) for another which is locally inadequate. Why not? In short, as economists have pointed out since Smith and Ricardo, trade can increase the welfare of all (although in the real world, it does not necessarily do so).

This observation leads directly to another weakness of the EF scheme, at least as currently implemented. By focusing on productive land, it omits any role for the oceans. Yet, not only do the oceans produce food — and they could produce much more in a more rational international management regime — but they also provide a number of important environmental services. Not the least of these services is their role as carbon sinks. To be sure, the ocean is a common property resource, not controlled by any single nation. But it is not unreasonable to imagine a sort of virtual eco-trade between the land and the sea (with the atmosphere as one of the intermediaries). In effect, each country, even the land-locked ones, can reasonably utilize the ocean as a carbon sink as well as for other purposes. Again, this role could be enhanced by a better international management system.

In conclusion, there is no reason whatever to believe that the EF of any individual country, as now calculated, is ‘too big’. In the first place, the method of calculation postulates a sustainability scenario that is unrealistic, which fails to reflect many technological possibilities, and which ignores the role of oceans — which cover most of the earth’s surface. In the second place, it implies that ecological autarky is desirable, hence that trade is undesirable, which is almost certainly not the case. On the contrary, there is no a priori reason why the Netherlands should not import animal feeds from far away, and export pork and dairy products. If the human race as a whole is consuming too much meat, that is a different question altogether and one that is unrelated to the question of where it should be produced. Nor is there any reason why the Netherlands should not buy emissions permits from a less industrialized country.

What, if anything useful, does the EF tell us? Fundamentally, it is just another way of saying some things that we already knew. One is that virtually no country is currently autarkic in ecological terms. But then there is no reason why it should be. Another is that the main reason for EF deficits arises from consumption of fossil fuels. If

energy were obtained from a noncarbon source, the EFs would drop automatically and substantially. At the global level, it can be argued that the world is ecologically out of balance, hence unsustainable, due to excessive carbon emissions from fossil fuel consumption. Again, we knew this already.

What the EF does not provide, however, is a meaningful rank-ordering of countries. Still less does it have any value for policy evaluation or planning purposes.

## References

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