

## PARASITES OR SYMBIONTS: HOMO SAPIEN LIFE ON EARTH

R.A. Hamburg, University of Hawai'i-Manoa, Department of Geography  
and The East-West Center, Program on Environment

Led largely by highly industrialized countries and a reductionist scientific approach to energy, economics, production of agricultural and material goods, and waste management, Homo sapiens have evolved into parasites preying upon the balance of the biosphere. Through failure to keep in mind the interconnectedness of all things -- a myopic focus on linear production-consumption-disposal rather than the cyclical nature of material flows -- many of the benefits of scientific progress have come at significant costs which are only now becoming widely recognized. These costs include the impacts of: increased CO<sub>2</sub> and CH<sub>4</sub> concentrations in the atmosphere; air, water and soil pollution from industrial and chemically based agricultural production; degradation of agricultural and forest soils; and generation of large quantities of residual materials for "ultimate disposal" -- the last being a biophysical impossibility.

Long-term sustainability of human life on earth requires recognition of the necessity for re-development of mutually beneficial, symbiotic interactions with the biosphere that has supported it up to this point. An integrated approach to human use of bioresources -- photosynthetic energy flows; soils, organic residues and nutrient cycles; and agri-, aqua- and sylvicultural production -- would concentrate far more on management of the cycle of return and utilization of the pathways of decomposition and renewal.

Humanity already appropriates over 40 percent of the earth's annual net primary production<sup>1</sup>. The amount of solar energy embodied in these materials is still an order of magnitude greater than humanity's total direct energy use<sup>2</sup> -- but utilization of this multifaceted energy is highly inefficient. In the long-term, the most important energy aspect of these "waste" materials may well lie in the soil-building and soil-holding contribution of humus.

An approach based on the cycle of return offers significant potential for greatly increased but benign exploitation of natural nutrient cycles and solar energy in a multitude of forms. As exemplified by many past and present agricultural activities in China, these approaches include the unification of organic residue management -- largely through anaerobic pathways -- with various terrestrial and aquatic production systems. Other biotechnologies which can be incorporated into these cyclical, symbiotic webs include solar greenhouses and many techniques of organic farming and permaculture.

Sustainability of agroecosystems for future generations of human beings -- as well as the well-being of the biosphere as a whole -- requires a recognition of the inherent deficiencies of the currently dominant, linear, neo-classical economic paradigm -- with its assumptions of infinite substitutability and infinite growth within a finite biosphere. Holistic approaches to agriculture and an economics based on ecological reality offer means for re-establishing the symbiotic relationships between humanity and the biosphere without which sustainability is implausible.

### REFERENCES

- <sup>1</sup> Vitousek, P.M., P.R. Ehrlich, A.H. Ehrlich and P.A. Matson. 1986. "Human Appropriation of the Products of Photosynthesis." BioScience, 36:6, (368-373).
  - <sup>2</sup> Dorf, R.C. 1981. The Energy Factbook. New York: McGraw-Hill Book Co.
- Key Topics: Pollution, Anaerobic digestion, Biomass, Ecological economics, Greenhouse effect, Organic recycling, Agricultural pollution, Security, Soils, Sustainability