

Sustainability through a new economic paradigm for the 21st century

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The problem facing humanity

Is humanity a victim of its own success? In less than a century we have seen huge growth in human population, advances in food and energy production, gains in wealth and knowledge, and advances in technological prowess. The engine for these changes is the cumulative economic activity of individuals, businesses and countries. However, the benefits of this economic engine are increasingly overshadowed by the costs and consequences of how we have chosen to run our economies. Climate change, declining oil reserves, stratospheric ozone depletion, fresh water shortages, species extinction, toxic contamination of the biosphere, soil fertility losses, land conversion, and ecosystem collapse threaten our current and future quality of life and possibly our survival as a species. The magnitude of these problems is amply documented in reports from the Millennium Ecosystem Assessment (<http://www.millenniumassessment.org/en/index.aspx>) and the International Panel on Climate Change (<http://www.ipcc.ch>). There can be no doubt that human economic activity has produced major impacts at a planetary scale and that our current course is clearly unsustainable. In addition, increased production and consumption are providing less and less benefit for the wealthy, while a quarter of humanity remains in desperate poverty. Poorer countries are being disproportionately affected by climate change, toxic waste and other problems, leading to the specter of massive population migrations and conflicts over scarce resources. These vast, systemic problems require a systemic solution at a global scale. Here we argue that a transformation of our economic theories, policies and institutions can provide that solution.

Does our economic system really cause these problems and why?

Yes, economic activity, as currently practiced, drives virtually all environmental problems. Fossil fuel burning causes global warming. Logging causes deforestation. Industrial production causes land, air and water pollution. Why? Our current economic theories were developed in the 19th and early to mid 20th centuries to convert natural resources into manufactured goods, at a time when those resources seemed unlimited and goods were in short supply. Today, these theories are dangerously out of touch with our current and future reality. They reflect neither our scientific understanding of the earth's biological and geophysical systems, nor what is most valuable to us in our health, families, communities and economy. Among the problems with economics as it is practiced are:

1. The sphere of human economic activity is considered as separate from the natural world. The goal of economic theory is to increase physical output indefinitely. This is fundamentally incompatible with the planet's finite resources and systems.
2. Current theory focuses on the conversion of natural resources into goods and services. Costs that arise from the waste and pollution generated from these processes, and by the rapid obsolescence and disposal of the goods, are ignored and considered as "externalities". The costs of the externalities are not borne by the manufacturers, but rather passed to others – often to future generations.
3. Current theory actually discounts benefits and costs to future generations. The maximization of "net present value" is the predominant criterion for economic decision-making. This biases all decisions towards harvesting benefits in the present and pushing costs into the future – again fundamentally unsustainable.
4. Commonly held human values are not a part of economic theory. Current economics assumes that the more an individual consumes, the happier that person becomes. Unfortunately, we now know that increased economic output is not a surrogate for increased human wellbeing. Universal concern for the welfare of our children and grandchildren is incompatible with the current economic practice of discounting costs to future generations.
5. Economic theory is not grounded in scientific knowledge or concepts. This problem becomes critical when the output from human economic activity becomes sufficiently large to alter the functioning of planetary systems such as the ozone layer, the carbon cycle and oceanic temperature regulation. Market mechanisms have no ability to recognize when irreversible, species-endangering damage has been done to these planetary systems.

How did we arrive at our current economic theories and practices?

Until the Great Depression, economics at the scale of businesses and markets, microeconomics, was the prevailing branch of economics. There were no goals or measures regarding national production, unemployment or inflation. At that time economic growth was not generally limited by the availability of natural resources, but rather by the technology, knowledge and manpower to extract and make use of the resources. The economics of the time proved

not only incapable of resolving the crisis of the Great Depression, but actually deepened it, revealing the inadequacy of microeconomic analysis for national scale economic problems. These events led to the creation of macroeconomics, specifically designed to solve this national scale economic crisis. Macroeconomics incorporated new goals (full employment), measures (inflation), policies (banking regulation) and institutions (Securities and Exchange Commission), and was ultimately successful in bringing the nation out of the depression.

Macroeconomics adopted the dominant goal of increasing Gross Domestic Product (GDP), but has no reference to global environmental problems, science, or human values. The international institutions created at the end of World War II to stabilize the global economy, such as the World Bank, International Monetary Fund and World Trade Organization, use national scale analysis and lack a global vision. The World Bank sees no contradiction in simultaneously managing carbon trading while funding coal-fired power plants. Without a global and science-based framework, these institutions have pursued policies that actually worsen global problems.

How can our economic system be upgraded to reflect today's realities? Earth-economics: a new paradigm

There are several critical deficiencies that can be remedied by the creation of a new economic theory, which we call earth-economics, to complement micro- and macro-economics and to deal specifically with current problems:

1. Match the scale of the theory or the institution to the scale of the problem. Just as microeconomics was of no use to solve national-scale problems in the Great Depression, macroeconomics is unable to solve global problems. An earth-scale economic theory is needed.
2. Incorporate the best available scientific knowledge. Earth-economic theories and institutions are designed to incorporate scientific knowledge about the workings and interactions of natural systems, and between natural systems and human activities. Earth-economics takes account of the critical limits to the functioning of our planet, such as the need to cap atmospheric carbon dioxide levels, maintain ozone levels, maintain topsoil etc.
3. Broaden the definition of capital or goods and services. Earth-economics goes beyond built capital (stuff that humans make) to incorporate *natural capital* (our natural endowment, geology, topography, climate, ecosystems, water, nutrient and chemical cycling that is provided by nature and which contributes to our economy and quality of life), *social capital* (our families, friends, languages, communication, trust, social groupings, laws and societal structures) and *human capital* (our own bodies, health, personal experiences, education, talents, skills and interests). The goal of earth-economics is the development and/or preservation of all four capitals to maximize human wellbeing. Importantly, it is possible to calculate the financial value of some natural capital in the form of *ecosystem services*. However, ecosystem services differ from built capital in fundamental ways. Ecosystem services (for example flood protection provided by coastal wetlands) are self-maintaining and increase their value over time. Ecosystems provide value continually into the indefinite future, whereas built capital depreciates rapidly. Valuation of ecosystem services can be used as a part of economic decision-making, although some ecosystem services (like the ozone layer) are priceless because they cannot be replaced by any amount of money or human goods and services.
4. Incorporate fundamental human values. Earth-economics takes account of values like fairness, respect for future generations, and justice. These values are used to design and build institutions, policies and measures.

Simply put, as during the Depression, our current economic theories are far too narrowly and removed from reality to provide solutions and policies that will ensure a sustainable future. Earth-economics seeks to describe our assets, the four capitals, and to design policies, measures and institutions to preserve and grow these assets in accordance with fundamental human values and a sustainable future. Four goals are important:

1. *Ecological sustainability*: a set of physical, dimensional limits of the economy to ensure it is biophysically sustainable. This defines paramount physical rules within which the economy must function. The physical size of the economy must be compatible with the ecological and biophysical systems upon which it depends.
2. *Social justice*: paramount social rules based on our values, vision of justice and legal tradition. Just as the original inalienable rights of life, liberty and the pursuit of happiness have been expanded to include freedom from slavery, voting rights and civil rights, earth-economics envisions other rights and freedoms such as the right to an unpolluted body, rights to preservation of global commons assets like clean air and water, and the right to a global minimum wage.
3. *Economic efficiency*: markets allocate efficiently when certain conditions are met. Economic transformation requires greater real "economic efficiency." Externalities have been long recognized as distorting markets and creating great inefficiencies. If a third party, outside the producer/seller and buyer/consumer, shoulders costs (such as asthma from air pollution) that are not included in the price of the product, this is an "externality". Externalities

can be corrected by placing a tax or charge equal to the damage caused, if it is possible to calculate the damage. Alternatively a precautionary approach can be used to prevent damage to the third party.

4. *Good governance*: transparent, accountable public and private institutions with checks and balances that can act at the scale, and within the realm, of their remit. Institutions must be of a scale commensurate with the scale of their mission and provisioned with the authority, resources and tools to get the job done. The institutions must be able to act independently from the influence of special interests and politics.

How can earth-economic ideas be applied to create a policy matrix for global and local issues?

Earth-economics provides a more accurate description of our society and our planet than does current conventional economics. Earth-economics makes possible the achievement of economic transformation by construction of new policy matrices for individual sectors of our society (agriculture, climate, energy, health, tax policy etc) within the context of the overarching ecological, social, economic and governance goals. A policy matrix constructs and integrates individual policies from individual sectors so that they are mutually supportive of each other and of the “big picture” goals. A systems approach is used to analyze the scientific information relevant to policies and to guide decision-making. Illustrative policy matrices are included within the accompanying longer document. Importantly, this kind of policy matrix analysis can be applied on a global level or a local level – as long as the scale of the analysis matches the scale of the problem. For example, problems pertaining to the Puget Sound basin can be analyzed at the scale of the appropriate ecosystem – the Puget Sound watershed – rather than the piecemeal approach now used (local governments, flood districts, storm water districts, shellfish districts, utilities, park districts etc).

Summary

Many people recognize the profound challenges that human society faces. These challenges are driven by economic decisions. Efforts to protect and preserve our natural heritage and improve our quality of life are largely piecemeal – protecting one geographic area or one endangered species at a time, fighting pollution one toxic chemical at a time, or advocating progressive policies one at a time. Such a piecemeal approach will never produce the results that are needed in the timeframe that they are needed. Instead, we should recognize the root cause of our problems as the sum of human economic activities. Only a systemic transformation of our outdated economic theories, practices and institutions can lead to the broad improvements that are necessary to face our problems. We can develop an earth-economics that meets our needs by incorporating fundamental human values, broadening the definition of capital to include natural, social and human capitals, including the best available scientific knowledge, and matching the scale of our analysis and institutions to the scale of the problems. Earth-economics adds an earth-scale economic analysis, and unifies economic policies across scales and sectors. Many of the solutions to our problems already exist in some jurisdiction, in the discipline of ecological economics, or in academic, sector or advocacy circles. However, the ideas are too often held in specialist silos. An earth-economics framework is intended to create sufficient unity across parties and sectors to build necessary alliances and support bold, successful, transformational leadership. No one person or organization can bring about such a profound transformation. It will take a large-scale collaboration to promote, refine and apply the ideas discussed here. For the sake of our children and their descendants, it is the task of our generation to transform our relationships with each other and with the planet, and to develop a sustainable society.