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SUSTAINABLE DEVELOPMENT AND ECOSYSTEM MANAGEMENT

(abbreviated version)

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SUSTAINABLE DEVELOPMENT

History, Definition and Ethical Basis

"Sustainable development" became part of our environmental language as an outcome of the June 1992 United Nations Conference on Environment and Development. This "Earth Summit", held in Rio de Janeiro and attended by representatives from over 170 countries, focused on sustainable development.

Though sustainable development entered the popular press only recently, the term and concept are not new. The idea was discussed at the United Nations Conference on Human Environment, in Stockholm, in 1972, and defined in the document, "World Conservation Strategy", published in 1980 (1).

Sustainable development is viewed by some as an oxymoron - how can development be sustainable? The concept is in fact a serious and necessary attempt to integrate development and conservation, both being essential for the present and future well being of humanity.

This is demonstrated by the definitions drafted for "development", and "conservation" for the "World Conservation Strategy" (1).

Development: "modification of the biosphere and the application of human, financial, living and non-living resources to satisfy human needs and improve the quality of human life."

Conservation: "the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations."

Though the definition of sustainable development will probably continue to undergo refinement for some time yet, several proposals have merit:

Development which meets the needs of the present without compromising the ability of future generations to meet their own needs (2);

Improving the quality of human life while living within the carrying capacity of supporting ecosystems (3);

Economic transition to an economy based on reliance on nature's "income" and not on depletion of its "capital" (4).

These definitions represent an ethical basis for sustainable development. The first of these definitions refers to our moral obligation to people living now, as well as to our responsibility to future generations. The matter of "equity for people living now who do not have equal access to natural resources, or to social and economic goods" (4), or who lack sufficient influence to avoid the externalities of other's profligate use of natural resources, should not be ignored.

Equity for the impoverished may remain a less popular slogan for sustainable development than saving the earth for our children, grandchildren, and further generations. The matter of equity for the impoverished cannot be ignored, however. In addition to the moral issue, there is a pragmatic matter. Many present environmental problems of developing nations have worldwide repercussions. Some of these cannot be resolved without alleviating poverty.

A statement defining our responsibilities to those living now that are in need, and their and our descendants, is: "development ought not be at the expense of other groups or later generations..." (3).

Environmental Principles of Sustainable Development

There are five environmental principles of sustainable development (3):

1. Conserve biological diversity;
2. Protect ecological life-support systems;
3. Use renewable resources sustainably;
4. Minimize depletion of non-renewable resources;
5. Keep within the earth's carrying capacity.

1. **"Conserve biological diversity."**

Conservation of biodiversity - at the genetic, species, and ecosystem level - is important for economic, recreational, scientific, educational, aesthetic, cultural, spiritual, artistic, religious and moral reasons (5, 6).

The earth's plants and animals provide us with valuable goods including pharmaceuticals, foods, fibers, fuels, fodder, and building materials. Wild strains of plants provide genetic material that can renew our crops - new strains of cereal crops must be produced every 10 years on average as existing strains are attacked by newly evolved pests and pathogens. Protecting biodiversity is also essential to maintaining ecosystem services, services at no cost to humanity, as explained in "Protect ecological life-support systems", below.

Natural ecosystems, often areas of exceptional beauty and tranquility, are important as regards outdoor recreation, and to provide us an opportunity for spiritual renewal.

Some believe that our fellow species on this planet, the only planet known to harbor life, having been created therefore have a right to continued existence. Others acknowledge that plants, animals and ecosystems are important components of human cultures, and believe that a world with greatly diminished biodiversity would be largely joyless. Many know that species extinctions are presently occurring at an unprecedented rate, and loss of a species is irreversible.

Threats to biodiversity from human activities include pollution, habitat destruction and fragmentation, over-exploitation of natural populations (e.g. fisheries, old-growth forests), importation of exotic species, alteration of frequency of natural episodic events (fires, floods), and global climate change (greenhouse effect, atmospheric ozone depletion).

2. **"Protect ecological life-support systems."**

These are processes that maintain the earth's ability to support life, and in doing so, provide humans with many essential services.

Ecosystem processes and services include regulation of climate, control of water flow and flooding, production of oxygen and uptake of carbon dioxide, regeneration of soils, assimilation of pollution and cleansing of air, water and soil, nutrient cycling, pollination, pest plant and insect control, and the ability of ecosystems to renew themselves.

Such processes are today threatened by the same human activities that imperil biodiversity.

3. **"Use renewable resources sustainably."**

Renewable natural resources include forests, rangelands and cultivated lands, surface and ground water, fish, wildlife, domesticated animals, and soil. Their use is sustainable only if the rate of use is within nature's ability to replenish the resource.

Overuse, misuse, pollution and other threats to ecosystems threaten the sustainability of these biological resources.

4. **"Minimize depletion of non-renewable resources."**

Natural resources necessary to our economic well-being, such as oil, coal and minerals, cannot be used sustainably as their rate of production is measured in geologic, not human time-scales. At present many of these resources are used inefficiently. They may be conserved, however, by replacing them with renewable resource substitutes - such as biologically produced ethanol for gasoline - by reuse, and recycling.

5. **"Keep within the earth's carrying capacity."**

There must be acknowledgment that there is for example a maximum rate of worldwide food production, or an upper limit to the assimilative capacity of the environment for wastes - and that increased human population, and growth in consumption of natural resources, can overwhelm these. The biosphere has finite limits.

It should be evident that compliance with these five environmental principles of sustainable development is necessary to achieve "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (2).

ECOSYSTEM MANAGEMENT

Sustainable Development and Ecosystem Management

Ecosystem management according to the principles of sustainable development is predicated on "ecosystem evaluation". Ecosystem evaluation, is similar to land capability assessment, but includes evaluation of aquatic and marine ecosystems as well. Each ecosystem type has characteristics that make it more or less suitable for a particular conservation use or development use (1).

To consider development or conservation within the geographic boundaries of an ecosystem type, it is useful to define five systems (3).

Natural systems are those where, since the industrial revolution (1750), human impact has been no greater than that of any other native species.

Modified systems are those where human impact is greater than that of other species, but these systems are not cultivated - for example, naturally regenerating forest to be used for timber production.

Cultivated systems are those where human impact is greater than that of other species, and where biological resources are cultivated - for example, farmland, sown pasture, aquaculture ponds.

Built systems are those dominated by human structures such as buildings, roads, airports, marinas, docks, dams and mines.

Degraded systems are those whose productivity and habitability have been greatly reduced - for example polluted lands or waters.

Regarding these five systems, within an ecosystem, sustainable development requires from:

- "**Natural systems**",

Conservation of biodiversity, and protection of ecological life-support systems;

- "**Modified systems**",

Sustainable production of biological resources, and protection of ecological life-support systems;

- "**Cultivated systems**",

Sustainable production of crops and livestock;

- "**Built systems**",

Development that is not incompatible with the sustainability of other systems; and,

- "**Degraded systems**",

Restoration.

Sustainable development mandates that existing or planned areas for natural, modified, cultivated, built or degraded systems, be managed to comply with the five environmental principles.

In ecosystem evaluation, that is consideration of conservation and development options for an ecosystem type, practical examples of sensible decisions would be to: preserve natural systems; reserve good cropland for crops - and put highly subsidized agricultural areas to other uses; set aside good rangeland for grazing; conserve saltmarshes and seagrass beds for fisheries and protection of marine biodiversity; and, save freshwater wetlands for flood control, water purification, and as migratory waterfowl habitat.

There are many other considerations to ecosystem evaluation, just as there are for land capability assessment. Though these are too numerous to list here, they include comparisons of alternative uses, patterns of human population growth, supply and demand for natural resources, compatibility of mixes of uses, and local, state national and international goals regarding biological resources.

SUMMARY

Sustainable development offers a conceptual model that if acted on will allow our neighbors, our children and grandchildren, to have the possibility of a standard of living and a quality of life, allowing them dignity and fulfillment.

Moving to an ethic of living sustainably is essential because it is morally right, without it, the future of humanity is bleak.

Those that are aware that environmental protection is necessary for the future of the biosphere and humanity, will find that sustainable development integrates all environmental issues, from recycling to protection of biodiversity, from alternative energy sources to human population growth, to ecosystem management.

Sustainable development also integrates development and conservation, in a human-centered framework. Thus it is very palatable to those on the development side of sustainable development.

Conservation bodies with impeccable credentials accept sustainable development as necessary. These include the International Union for Conservation of Nature and Natural Resources (World Conservation Union), the World Resources Institute, and the World Wildlife Fund.

It is also accepted by the United Nations, by President Clinton, and Florida's Governor Chiles; witness the new U.N. Commission on Sustainable Development, the Presidential Council on Sustainable Development, and the Governor's intent to appoint a Florida Commission on Sustainable Development.

Sustainable development is worthy of further investigation.

My prose cannot compete with the impassioned words of philosophers and writers, and I offer you those of Aldo Leopold.

"We end, I think, at what might be called the standard paradox of the twentieth century; our tools are better than we are, and grow better faster than we do. They suffice to crack the atom, to command the tides. But they do not suffice for the oldest task in human history: to live on a piece of land without spoiling it." (8)

We must accept a new ethic, and invent new tools.

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