

## PRINCIPLES OF SUSTAINABLE DEVELOPMENT

**Lynton K. Caldwell**

*School of Public and Environmental Affairs (SPEA), Indiana University, USA*

With the assistance of Jeffrey S. Miller

**Keywords:** sustainable development, unsustainability, Ecology

### Contents

1. Introduction
  2. Background
  3. The meaning of principles
  4. Differing definitions
  5. Origin of the concept
  6. Ecology and sustainable development
  7. The changing context of sustainable development
  8. Recent efforts and their principles
  9. Underlying factors
  10. Psychological obstacles: seven “sins” of unsustainability
  11. Requisites for sustainability
  12. The present choice
- Glossary  
Bibliography  
Biographical Sketch

### Summary

Sustainable development is a term of differing definitions. Standing alone, the term is abstract and ambiguous. The meaning most often cited is that adopted by the World Commission on Environment and Development: meeting today’s true needs and opportunities without jeopardizing the integrity of the planetary life support base – the environment – and diminishing its ability to provide for needs, opportunities, and quality of life in the future. This definition may serve as a general principle, but for a guide to action its components – sustainability and development – must be given substance: what is to be sustained and what developed? Is development essentially economic or material growth, and is sustainability mostly a means to keep economic growth growing? Consequently, should development represent means toward ecologically-sustainable ends? The concept of ecological sustainability has been advanced as a restriction on economic development. It follows therefore that principles of sustainable development depend upon how the term is understood and how it is put into practice. Even so, the definition of the World Commission on Environment and Development, given the adequate definition of variable needs, provides the most reliable principle for testing the qualitative and ecological sustainability of development proposals.

## 1. Introduction

Sustainable development is a complex concept with more than one interpretation, and hence more than one set of principles. In an earlier perspective, development implied a process, its principal objective being continued economic growth. In recent years – since the mid-1960s – development has also been regarded as a strategy for improving the quality of life and the stability of the economy. Its goal has been achieving a condition, the culmination of a process. Simultaneously, there arose the concept of sustainable ecosystems, a concept which is essentially preservationist and may imply benign guided change. Thus the meanings of sustainable development have evolved over time, and its definitions vary with how its process and purpose are understood. The theme (or themes) of sustainable development has evolved from a past in which sustainability was optimistically assumed to be a concomitant of growth, the absence of which was stagnation and decline. The meaning of principles is therefore derived from particular interpretations of “development.”

## 2. Background

The concepts of sustainable development considered here emerged from a history characterized by diverse and often contradictory interpretations. The following sections address the historical emergence of ecological influences in the development process, and the prospects for development associated with the double goal of ecological and economic sustainability.

Although expressed in different ways, and often unarticulated, the goal of sustainability has historically most often been the preservation of human societies and their cultures, institutions, monuments, social orders, and landscapes. Cultural factors – behavioral, institutional, religious, and environmental – have influenced the ways in which humans understand and implement their civic and economic affairs, their relationships to other humans, their histories, and the world of nature, and hence their principles of development.

“Development” as state economic planning emerged in the seventeenth-century administration of the French finance minister Colbert, and under the Cameralists, most notably in Prussia. Antecedents of development under the names of planning, modernization, and preservation of cultural heritage gained prominence in the nineteenth and twentieth centuries, notably in continental Europe. Development as a goal of public policy, principally economically, represented a national and international objective after the Second World War. But the development concept meant different objectives in different contexts and so, as a general term, was often ambiguous in reference even as its use became more common.

There is no way to define “development” – in either domestic or international aspects – which is both simple and satisfactory. It may be described as a complex process of purposeful change in attitudes, behaviors, and institutions in human societies. The process, understood as deliberate and purposeful, implies assumptions, goals, and procedures that, because of their implications for the societal and ecological future,

should be open to critical scrutiny and evaluation. However, the purposes of development, and the criteria by which it may be evaluated – including criteria derived from scientific investigation – are culture-based and culture-bound. And they may also comprise a power-focused agenda for maintaining a political regime.

There is a large and growing volume of critical comment on economic, social, and political aspects of planned change and international technical assistance. However, this modern comment largely proceeds from a common set of assumptions regarding the relationships of man with nature, assumptions that have been dominant in Western technological society since the industrial revolution, notably the instrumental use of nature (namely, natural resources) as an economic resource

Nevertheless, there are alternative interpretations of the development process which diverge from a conventional tendency toward narrow economic considerations. Examples of broader, more inclusive, divergent ideas may be found among the French development economists and sociologists whose writings in *Economie et Humanisme* and *Tiers Monde* take a wider view of the development process than in customary Anglo-American literature. Their definition of development has incorporated issues which are more than economically-defined, and concerned with the development of the whole human person, rather than the essentially economic man.

The *Tiers Monde* philosophers – Raymond Aron, Jacques Austry, Louis-Joseph Lebret, and François Perroux – maintained that it is not the “science” of economics, nor is it necessarily economists, that are at a fault in a narrowly economic view of the more comprehensive development process. The fault lies in the more general dissociation of economics from other aspects of life, and the unequivocal elevation of material values to a dominant and definitive role in development planning.

This economic dominance in the hierarchy of values was aptly termed “economism” by Nicholas Berdyaev. He defined it as a mind-set which postulates economic values as fundamental to all others, and employs economic criteria as the primary measure of the worth of all human activities. When combined with an uncritical acceptance of innovating technology, economism has facilitated the creation of a new artificial environment incompatible with the needs of the whole man. While Berdyaev’s criticisms were not based on scientific evidence, they have seldom been contradicted by it. Similar criticisms may be found in the writings of Jacques Ellul, relating more to the dominance of technology over values.

Although many unwanted environmental changes have been taking place over many years, they have reached a threshold that has made the world aware of them. This heightened awareness is leading to an assumption that, to a large degree, humankind now has the capability and responsibility to determine and guide the future of the environment. This assumption, however, overlooks three qualifying considerations: first, that humankind will be willing to forgo some present gratifications for an uncertain future; second, that human ingenuity and technology will be used toward ecologically-sustainable consequences; and third, that nature will be a neutral bystander. A sustainable future requires reduction of the vulnerabilities to which human societies

expose themselves; and this defines a basic principle of development: that rather than increasing the risks to the life support systems of the earth, it actually reduces them, and sustains their unimpaired continuity.

If the experts are correct, the twenty-first century will be pivotal in human history, and it is likely that humans will have significant influence upon the outcome. But we are presented with a difficult choice: continuing down a path guided by an inadvertently destructive past, or learning from our mistakes and moving toward a desired future. The outcome of this choice will result either in the achievement of a proper balance between all aspects of humanity and the biosphere, or an uncertain outcome of possible hardship for humanity and a diminishing prospect for other life on earth.

If the world is to have a collective effort that is consistent with the full scope of human needs – as defined in the words of François Perroux: “de tout l’homme et de tous les hommes” – concepts and institutions must be consistent with each other, and with the broad humane ideal described by the Tiers Monde humanistic development economists and sociologists. It should be clear that the sustainability of human society depends upon the ability and willingness of humans to shift understanding away from traditional economic assumptions. If sustainability is to be truly achieved, humans must begin to order their behavior and institutions toward maintaining ecological integrity, broadly conceived, in human relationships with the earth. To this end, an informed and rational concept of sustainability needs to be widely accepted and internalized in the ethos and ethics of human society, and applied critically to concepts of growth, development, the economy, and the environment. And while this process has gained momentum as the environmental destructiveness of our narrow view has become clear, the goal of ecologically-sustainable development has yet to be institutionalized in our political and economic practices.

### **3. The Meaning of Principles**

The first meaning of “principle” in the *Oxford Reference Dictionary* is “a fundamental truth or a general law or doctrine that is used as a basis for reasoning or action.” In English usage the term denotes a fundamental proposition, but its specific meaning differs in application. Thus, in reference to invariant “laws” of physics or mathematics, principles are as precise as the concept of the phenomena to which they may refer. Sustainability principles of social institutions or of ecological relationships may be variably defined. The difficulty of deducing principles from the hyphenated concept of “sustainable-development” is compounded by the multiple meanings of both terms.

Sustainable development, whether condition or process, is not inherently confined to a particular political ideology or regime. Historical, geographic, ethnic, and economic factors are elements of the concepts behind the term, and as they vary among nations so do the characteristics of the development concept. Beneath these contingent elements, however, there are basic behavioral or psychological predispositions that are differently expressed in particular political cultures, making generalizations regarding sustainability largely abstract. For development as a concept to have purposeful meaning, its content,

and the intended outcome and means to attainment, must be identified, namely, toward what consequences is the development process actually headed?

The imprecise and diverse interpretation of what the contextually-hyphenated term “sustainable-development” means makes it difficult to draft principles that are universally applicable and useful. No set of principles, however reliable, can cover all contingencies. Arthur C. Clarke’s (1965) precepts for ecological prudence, although broadly applicable as admonitory principles, are particularly relevant to development planning. They are: do not attempt the unforeseeable; and do not commit the irrevocable.

#### **4. Differing Definitions**

The more specific concept of ecologically-sustainable development, or “ecodevelopment”, may be easily stated, although less easily defined or implemented. It can be illustrated in theoretical detail, but the ecological, cultural, and economic complexities of any actual situation are almost certain to make reality more diverse, and more difficult than might be inferred from theory.

Herein lies an underlying reason for the frequent failure of international development assistance programs to achieve hoped-for results. Standardized development doctrines adopted after the Second World War required adaptation to the circumstances in the countries receiving assistance, but the actual practice was frequently inadequate to the need. Ecological and economic values can be addressed in a variety of ways, but combining them in a coherent agenda adds geometrically to the complexity of a development program. And there are additional factors – social, legal, historical, religious, military, and demographic, for example – which further complicate comprehensive policies for development, however defined.

Sustainability implies continuity, although it requires qualifiers such as what can and should be sustained, for what length of time, level of quality, and conditions for its attainment. Still, an implication of “continuity” when applied to a process (of “development” for example) which implies change, risks becoming an oxymoron – a contradiction in concept – unless selective continuity within change is intended.

A dictionary definition of “develop” is “to make or become bigger, fuller, more elaborate or systematic.” Development implies change, whereas sustainability is commonly understood to allow for change in a homeostatic relationship, implying a steady state of continuing renewal. Sustainability joined to development might be defined as continuity of a process, not necessarily of a condition or quality. The term “sustainability” regarded as a modifier of “development” has no continuing substantive concept until the progression of “needs” from present to future is identified. In the world of today and tomorrow, “needs” may be assumed to mean more than the indispensables, namely, food, water, clothing, and shelter. Science continues to qualify, elaborate, and extend these and other human needs such as, for example, psychological needs.

Development is best identified by what is done in its name. Most often, “development”

in the socio-political context implies economic growth. Although there are attributions to physiological, cultural, or ethical “development,” the common term most frequently implies unspecified “growth” which, as has been noted, is a concept of many meanings (for example, material, qualitative, economic, exponential, intellectual, cyclical, self-renewing, malignant, and experiential). In so far as development implies – even requires – some form or forms of continuing growth, the concept of the sustainability of growth becomes relevant. For example, if all forms of growth depend upon continuous functioning of the life support systems of the natural environment – air, water, soil, and living organisms – then the concepts of growth and development require the modifier of sustainability. Since, however, the relevant parameters of life on Earth are finite, not all forms of growth are indefinitely sustainable.

In the absence of realistic achievable goals, the concept of sustainability may offer the prospect of a continuing expansion of present economic and technological systems without serious regard to ultimate limitations, such as, for example, the quality of life, the availability of natural resources, or the costs of ecosystem and institutional maintenance or restoration. The World Commission on Environment and Development (1987) declared “a sustainable society” to be “one that meets the needs of the present without compromising the ability of future generations to meet their own needs.” But who authoritatively defines needs? In 1992, Donella Meadows defined “a sustainable society” as “one that can persist over generations, one that is far-seeing enough, flexible enough, and wise enough not to undermine either its physical or its social systems of support.”

There appears, however, to be a behavioral problem arising from these and most present definitions. Each appears to conceptualize a sustainable society as having characteristics of a steady or homeostatic state. Yet each definition implies – and would seem to require – a degree of foresight, coherence, and steadiness that is not generally characteristic of advanced developing societies today.

Standing alone, unmodified, sustainability has little meaning. One must know what is to be sustained, how, when, and by whom. Sustainable development may mean sustaining a process, not a condition, yet in some contexts “sustainability” is invoked to preserve a relative status quo or steady state condition, whether it be of ancient forests, top soil, or endangered species. Using this dual definition, the concept of sustainability is thus as much preventive as developmentally-conserving.

In an ever-changing world, even under natural circumstances, sustainability may imply resistant action or the capacity for renewal rather than adaptive stasis. In apparently status quo environmental circumstances, for example, sustainability may signify preservation of ecological integrity, maintenance of systemic functions, or prevention of institutional disorder. In an economically-developing environment, sustainability may be sought to direct the course of events so that the quality of life will at least not be diminished.

In a steady state, sustainability might be less difficult to maintain than where the goal is sustaining perpetual material growth. The steady state (whatever its level of quality)

may be achievable through reactive maintenance (in other words, is homeostatic) since, as noted, linear growth on a finite earth cannot continue forever. In all life, growth is self-renewing or cyclical. Even the stars age and die, but new stars are born and the cosmos is sustained. On earth, the quality, tempo, and limitations of social change are logical components of sustainability as a condition. If quality of life is a goal, undoing the damaging effects of past development – seeking qualitative change, not necessarily material growth – may be required. Cases in point would be restoration of the integrity of river systems by the removal of large dams, and the restoration of land devastated by mineral extraction (mining).

In conventional economic development there seems to be a widespread tacit assumption that nature will be neutral, and that development will be an inevitable necessity rather than an option. Public policy for sustainability, even when corrective, is directed toward planned projects and outcomes. In a complex, dynamic world, however, the attainment of identified outcomes can seldom be certain. Contention may therefore arise over the amount and kind of action that is desirable or sustainable, for how long, at what cost, and to what probable effect.

We have identified sustainability undefined as a term of indefinite applicability, with its practical meaning requiring specificity. The principles of sustainable development as a viable, workable concept cannot be fully clarified by probing the separate meanings of sustainability and development. Joined together, each term potentially affects the meaning of the other. The operational significance that is attached to these meanings depends upon the “how” of sustainability and the “how” of development: that is, only when applied to specific processes or conditions do these words have implementable content.

Therefore, the principles of sustainable development are not analogous to the immutable laws of physics. Principles of sustainable development depend on what is being sustained and what is being developed. Axioms or equations are not appropriate models for principles of sustainable development unless phrased in language applicable to unavoidable contingencies. For example, dam construction for purposes of irrigation may not be an appropriate development project where risks of salinization of the soil, and to riverine life, and human health – such as schistosomiasis – are increased. Sustainability, then, requires an identification of causes, needs, and consequences identified in relation to environmental conditions and social behaviors. Sustainable development “in general” is not an implementable concept. Reduction to specifics is required.

## **5. Origin of the Concept**

Narrowly-focused “development” concepts grew out of the ideology of nineteenth-century industrial society. Its roots, however, extend back into the Baconian philosophy of the seventeenth century, which optimistically forecast the improvement of human society through technological innovation. The technological transformation of nature found its greatest opportunity for realization in North America, where abundance of raw materials and freedom from political and economic restraints liberated development

initiative. Too often, however, Francis Bacon's precept that, to be commanded, nature must be obeyed, was forgotten in the rush to transform wilderness into a domesticated environment, and land, minerals, and wildlife into commodities.

But "development" does not necessarily imply industrialization. Colonization of South and Central America by the non-industrialized countries of Spain and Portugal took a different course from that in North America. Land conversion to grazing and plantation agriculture (for example, *latifundia*), and the exploitation of mineral wealth through mining, were the only significant forms of material development during the colonial period. They led to economies of export and resource extraction, not to self-sustaining development.

In Western Europe and North America, the results of nineteenth-century industrial development were mixed. The earlier years of industrialization bore harshly on large sectors of society, and environments were degraded where industry flourished, as in the Midlands of England or the Ruhr Valley of Germany. Material wealth increased, however, and in time the benefits of industrialism became more widely-shared, and its worst effects less severe. Science became an increasingly important factor in industrial and technological development, not only to advance its objectives, but also subsequently to uncover its adverse effects.

Development in the form of industrialism was brought to India and Japan, and spread slowly into Russia and Eastern Europe. Governments promoted development through concessions to entrepreneurs for the development of transportation systems, especially for railroads, and for the exploitation of natural resources for industrial production. Development of energy sources in water-power, coal, petroleum, and natural gas, and growth of urbanization accompanying the factory system of production, transformed the natural environment, and greatly increased problems of housing, environmental amenities, sanitation, and health.

Viewed globally, the pattern of industrial development was uneven. By the middle of the twentieth century, large areas of the earth were heavily populated, but were technologically-undeveloped. Most of Africa and South America, China, Western Asia, and Oceania, had not undergone industrial development. One consequence was a great and growing difference in per capita monetary income, in living standards, and in technoscientific capability, between the developed nations and those described as underdeveloped, less developed, or euphemistically as "developing."

Concern over the impact of industrial development on natural resources and the environment first appeared in the conservation movement of the late nineteenth and early twentieth centuries, largely in Western countries. However, conservation was (and still is) essentially an economic – enhanced efficiency, for example – movement, and offered a corrective rather than an alternative to the existing industrial order (for example, closed-systems production instead of residuals reduction). The environmental movement proceeded on premises different from those of the conservation movement, though the two came to share some common values. Environmental-ism projected a redirection of industry from a course of resource depletion and environmental



degradation, to a self-sustaining, environment-conserving economy in which development would be consistent with, and guided by, ecological principles. The more committed “deep ecology” movement would radically modify or reject industrialism as the foundation for the environmental future.

From the 1930s through into the 1960s, development was, with few exceptions, development of natural resources with emphases on development of agriculture (especially for export) and expansion of industrial production. The environment was considered primarily in relation to public health. Ecology had no place in development strategy until the late 1960s. Commodification and monetary exchange were dominant characteristics of the economy. A common measure of economic growth was monetary return from the exploitation of natural resources, with little regard for the diminution of the natural capital in soils, forests, and minerals. The costs and losses of natural capital in these ultimately unsustainable practices were never subtracted from the calculated gross national product. The result was short-term prosperity that was not widely-shared and could not be sustained once the natural capital was exhausted.

-  
-  
-

TO ACCESS ALL THE 41 PAGES OF THIS CHAPTER,  
Visit: <http://www.eolss.net/Eolss-sampleAllChapter.aspx>

### **Bibliography**

The bulk of this work draws upon the ideas of many authors. Because of editorial limitations, references have only been included for recent works and, where necessary, older source documents necessary for the logic of the article. The interested reader is encouraged to investigate all sources cited in the original works.

AUSTRY, J. 1956. *Le Scandale du Développement*. Editions Marcel, pp. 263–97. [Article addresses paradoxes of human modification of the environment.]

CALDWELL, L. K. 1972. An Ecological Approach to International Development: Problems of Policy and Administration. In: M. FARVAR et al. (eds), *The Careless Technology: Ecology and International Development*, pp. 927–47, Garden City, New York, Natural History Press. [Outlines the need for an ecological approach to development.]

CALDWELL, L. K. 1998. The Concept of Sustainability: A Critical Approach. In: J. LEMONS et al. (eds.), *Ecological Sustain-ability and Integrity: Concepts and Approaches*, pp. 1–13. Boston and London, Kluwer Academic Publishers. [Focuses on and reinforces the conclusions of this paper.]

CALHOUN, J. C. 1962. Population Density and Social Pathology. *Scientific American*. Vol. 206, No. 2, pp. 139–48. [This research article demonstrates the self-destructive behavior of animals when confined in large numbers.]

CLARKE, A. C. 1965. *Voices From The Sky*. New York, Harper and Row. 241 pp. [Book provides Arthur Clarke’s practical guidance for the use of science and technology, but his admonitions of the

necessity for prudence in decision-making are broadly conceived to mirror the environmental message of the precautionary principle.]

CLAYTON A.; RADCLIFFE, N. 1996. *Sustainability: A Systems Approach*. Boulder, Colo., and London, Westview and Earthscan. [Book that summarizes the complexities of the present approach to development.]

DALY, H. 1990. Towards Some Operational Principles of Sustainable Development. *Ecological Economics* No. 2, pp. 1–6. [Article demonstrates requirements for specific sustainable development initiatives.]

EARTH COUNCIL. 2000. Statement of Introduction on the National Councils for Sustainable Development. National Councils for Sustainable Development web site. [Outlines present efforts by NCSDs around the world.]

ELLULL J. 1964. *The Technological Society*, trans. by J. Wilkinson. New York, A. A. Knopf. [A critical comment on the impact of technology on modern society.]

FORRESTER, J. W. 1971. Counter-intuitive Behavior of Social Systems. *Technology Review*, Vol. 73, No. 3, pp. 53–68. [An enlightening article on the complexity of social change.]

GALBRAITH, J. K. 1964. *Economic Development in Perspective*. Cambridge, Mass., Harvard University Press. 109 pp. [Early book that places economic development in a broader social and environmental context.]

GOODLAND, R. 1993. International Association of Impact Assessment (IAIA) Newsletter. Wilson. Vol. 5, No. 2. [Goodland's proposal on sustainable development.]

HARDIN, G. 1985. *Filters Against Folly*. New York, Penguin. 240 pp. [This book broadly argues for responsible prudence when making decisions using statistical modeling.]

HIRSCH, F. 1976. *Social Limits to Growth*. Cambridge, Mass., Harvard University Press. 208pp. [Book presents the possibility that there may be social, as well as environmental limits to economic growth.]

INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT. 1992. *Sourcebook on Sustainable Development*. Winnipeg, International Institute for Sustainable Development. 134 pp. [Presents some resources for sustainable development.]

INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT. 1996. *The Bellagio Principles*. Winnipeg, International Institute for Sustainable Development. [Cited March 12 2000.] [Principles for the measurement of sustainable development created at the Rockefeller Center in Bellagio, Italy.]

KING, A.; SCHNEIDER, B. 1991. *The First Global Revolution: A Report by the Council Of the Club of Rome*. New York, Pantheon Press. 259 pp. [Describes the “problématique” of mankind.]

KUTTNER, R. 1999. *Everything for Sale: The Virtue and Limits of Markets*. Chicago, University of Chicago Press. 328 pp. [An economic argument for limits to market use in solving social problems.]

LAFFERTY, W. M.; LANGHELLE, O. 1998. *Towards Sustainable Development: On the Goals of Development and the Condition of Sustainability*. New York, St. Martin's. 270 pp. [A book that explores the modern complexities of sustainable development.]

MATTHEWS, A. F. 1967. *Resources and Norms in Development Planning and International Development*. Garden City, New York, Natural History Press. [Book reflective of pre-ecological thought on development.]

MEADOWS, D. H.; MEADOWS, D. L.; RANDERS, J. 1992. *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future*. Post Mills, Vt.: Chelsea Green. 300 pp. [A report to the Club of Rome that argues for limits to growth.]

MICHAEL, D. N. 1973. *On Learning to Plan and Planning to Learn*. 2nd rev. edn. San Francisco, Jossey-Bass; Alexandria, Va., Miles River Press. [Article explores the necessary components of a learning society.]

MILBRATH, L. W. 1989. *Envisioning a Sustainable Society: Learning Our Way Out*. Albany, N.Y., State University of New York Press. [Argument for the need of social learning.]

MILBRATH, L. W. 1996. *Learning to Think Environmentally While There is Still Time*. Albany, N.Y., State University of New York Press. 135 pp. [A layman's guide to required thought change necessary for a transition to sustainability.]

MISHAN, E. S. 1967. *The Costs of Economic Growth: The Price We Pay*. New York, Praeger. 190pp. [An early book that discusses the often unseen costs to society of single-purpose economic growth.]

ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. 1999. *Three-Year Project on Sustainable Development: A Progress Report*. Paris, Public Affairs and Communication Directorate. 98 pp. [An overview of present OECD sustainable development knowledge and efforts.]

PERROUX, F. 1961. Qu'est que c'est le développement? *Etudes* Vol. 3 (January–February–March), No. 16. [A philosophical argument for the holistic approach to development.]

President's Council on Sustainable Development. 1999. *Towards A Sustainable America: Advancing Prosperity, Opportunity, and a Healthy Environment for the Twenty-first Century*. Washington, D.C., United States Government Printing Office. 98 pp. [Outlines recent US efforts on sustainable development.]

PRUGH, T.; COSTANZA, R.; DALY, H. 2000. *The Local Politics of Global Sustainability*, Washington, D.C.; Covelo, Calif., Island Press. 166 pp. [An argument for political reform to address sustainable development problems.]

RAO, P. K. 2000. *Sustainable Development: Economics and Policy*, Malden, Mass., Blackwell. 393 pp. [A modern assessment of the economic and policy dimensions of sustainable development.]

SERAGELDIN, I.; MARTIN-BROWN, J. 1999. *Culture in Sustainable Development: Investing in Cultural and Natural Endowments: Proceedings of the conference sponsored by the World Bank and UNESCO*, Washington, D.C., The World Bank. 194 pp. [An exploration of the World Bank's progress in understanding the cultural contributions and hindrances to sustainable development.]

UNITED NATIONS. 1997. *July Press Release: Earth Summit Review Ends with Few Commitments*. United Nations Department of Public Information: DPI/1916/SD. [Press release summarizes the lack of progress and international commitment toward implementation of Agenda 21 at the Rio +5 Conference.]

THOMAS, W. L., 1955. Man's Role in Changing the Face of the Earth, p. 1149

TOFFLER, A. 1970. *Future Shock*. New York, Random House. 505 pp. [A widely-read book that describes human disorientation due to fast-changing circumstances caused primarily by technological innovation.]

UDALL, S. 1963. *The Quiet Crisis*. New York, Holt, Reinhart, and Winston. 209 pp. [Early book provides a description of the environmental impact of human behavior in relationship to quickening technological, economic, and social change.]

UNESCO. 1968. *Intergovernmental Conference of Experts on the Scientific Basis for Natural Use and Conservation of the Resources of the Biosphere*, p. 9.

WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT. 1987. *Our Common Future: Report of the Commission*, Oxford, Oxford University Press. 400 pp. [The report that created a widely accepted definition of sustainable development.]

WORLD RESOURCES INSTITUTE. 1999. News release issued jointly by the United Nations Development Programme, the United Nations Environment Programme, the World Bank, and the World Resources Institute: new report reveals widespread decline in the world's ecosystems (April 17). Washington, D.C., World Resources Institute. [A sobering assessment of the status of the world's ecosystems and our dependence on them.]

### **Biographical Sketch**

**Lynton Keith Caldwell** (M.A. Harvard University, 1938; Ph.D. University of Chicago, 1943) is Arthur F. Bentley Professor Emeritus of Political Science and Emeritus Professor of Public and Environmental Affairs at Indiana University, USA. He has pursued a broad and varied agenda of scholarship and public service. His first book, *The Administrative Theories of Hamilton and Jefferson* (1944), has twice been

reprinted (1966 and 1986). Since the early 1960s his interests have been concentrated in public policy for science, technology, and the environment. He has combined academic activities with extensive involvement in public affairs, primarily at national and international levels, including assignments with the United Nations and UNESCO. He was one of the principal drafters of the United States National Environmental Policy Act of 1969. Thus, he is able to bring direct contact with the world of governmental and international affairs into his teaching, research, and published work. Caldwell has authored 12 books, in excess of 250 articles in refereed journals, and numerous reports and reviews for public and international agencies. His published work may be found in as many as nineteen different languages. Recent books include *The National Environmental Policy Act: Agenda for the Future* (1999); *International Environmental Policy* (3rd rev. edn. 1996); with Kristin Shrader-Frechette, *Policy for Land: Law and Ethics* (1993); *Between Two Worlds: Science, the Environment Movement, and Policy Choice* (1990); *Biocracy: Public Policy and the Life Sciences* (1987); *Science and the National Environmental Policy Act* (1982); and *In Defense of Earth* (1972). An anthology of his pioneering articles on *Environment as a Focus for Public Policy* (1995) was selected for the CHOICE list of Outstanding Academic Books from the American Library Association.