DEFINING SUSTAINABILITY: A CONTENT ANALYSIS COMPARISON OF DEFINITIONS FROM THE LITERATURE

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Abstract: The concept of sustainability has gained widespread use in a variety of domains ranging from engineering to economics to social science. How to precisely define the term in a way that is relevant and scientifically consistent in all these situations is a challenge that has been primarily addressed by each researcher or practitioner developing his or her own personal definition of sustainability. To determine the commonalities across the spectrum of definitions, the technique of content analysis was used to examine a set of representative definitions from the theoretical sustainability literature. The purpose of the content analysis was to systematically identify all the variables referenced in the literature as having an impact on the sustainability of a system and to develop a taxonomic representation of these variables that characterizes the concept of sustainability as reflected in the published literature. This paper describes the methodology followed in conducting the content analysis,

presents the results of the analysis, and concludes with a discussion of the outcome of the analysis and its implications for researchers and practitioners who use the term in their work.

Keywords: Sustainability, content analysis, literature, taxonomy

Background

The underlying difficulty which led to the need for this content analysis is that most authors in the sustainability literature seem to have slightly different perspectives on how to define sustainability. Even those sources which purport to present an overview of perspectives on sustainability typically develop their own, slightly unique "working definitions" of the term (e.g., Liverman et al. 1988, Pezzey 1989), with or without unique qualifiers to shape it to their own domain of interest.

The definitions within any specific domain (e.g., ecology, economics, building construction) provide an amalgam of views nearly as varied as that existing across domains. Wide variations exist in which factors or variables are seen as essential for sustainability, and what the thresholds or objectives of those variables should be in any particular context. With much of the body of sustainability literature in domains other than ecology, little, if any, attention is paid to basic scientific mechanisms of system interaction, and much of the information in so-called "applied" approaches to sustainability takes a distinctly "heuristic" or "rule-of-thumb" approach rather than an analytical approach based on sound science.

This diversity of perspective in how sustainability is defined in the literature engenders a need to systematically examine that literature to determine a valid and representative definition of sustainability which incorporates consideration of all relevant variables. Toward that end, the technique of content analysis from the field of linguistics has been applied to a variety of definitions of sustainability, resulting

in a classification of variables that summarize attributes of sustainability in the body of sustainability literature.

Content Analysis Methodology

Content analysis is a linguistic technique for "the objective, systematic and quantitative description of the manifest content of communication" (Berelson 1952, p. 18, in Krippendorff 1980). In its full form, content analysis is used to make "replicable and valid inferences from data to their context" (Krippendorff 1980, p. 21), where the data are samples of linguistic text and the context is the "surrounding conditions, antecedent, coexisting, or consequent" (ibid., p. 26). Krippendorff characterizes content analysis as an "inquiry into symbolic meaning of messages" (p. 22), and points out that messages do not generally have a single meaning as such, but are highly dependent on the perspective of the interpreter, and may vary from interpreter to interpreter.

Without entering the debate of interpretation of definitions, content analysis is used in this research as a tool to systematically process the large set of sustainability definitions from the literature and to extract the essential variables, objectives, and mechanisms proposed by each author to achieve sustainability. With this systematic examination of the literature, a taxonomic representation can be constructed to illustrate commonalities across definitions and identify any gaps or conflicts that may exist.

Krippendorff identifies three steps in processing a body of linguistic information into analyzable form:

- Unitizing
- Sampling
- Coding

After the linguistic information has been processed, various techniques exist for analyzing the data to develop inferences or generalizations of the data. Each of these steps is discussed in detail in the following subsections.

Unitizing of Samples

The first step of content analysis is to determine what is to be "observed, recorded, and thereafter considered a datum" (Krippendorff 1980, p. 57). In the case of this research, each of the discrete definitions of sustainability coined by authors in the sample of definitions (see next section) is considered a sampling unit, described by Krippendorff as "those parts of observed reality or of the stream of source language expressions that are regarded independent of each other" (ibid.). The definition of sustainability used as an example in this paper is a working definition by Liverman et al. (1988):

> [T]he indefinite survival of the human species (with a quality of life beyond mere biological survival) through the maintenance of basic life support systems (air, water, land, biota) and the existence of infrastructure and institutions which distribute and protect the components of these systems.

Sampling Strategy

Two existing compilations of sustainability definitions were used as the core sample for content analysis. These existing sets of sustainability definitions were compiled by Pezzey (1989) and DuBose (1995). Neither of these researchers claims that their compilations is exhaustive; however, both express the opinion that their sets are representative of the various perspectives on sustainability documented in the literature. A complete listing of the definitions and sources used for this content analysis is provided as an attachment to this paper.

Coding of Samples

Within each sampling unit or definition of sustainability, smaller propositional units were identified, in the following form:

Variable/Objective/Mechanism

For the purposes of this analysis, a variable is a "quantity capable of assuming any of a set of values" (AHCD 1993), in which the objective for that variable is the desired value of the set of possible values. For example, one variable from the Liverman et al. definition of sustainability (1988) is "quality of human life" (1988). The objective in this definition is "beyond mere biological survival", which is a threshold of acceptability rather than a discrete value. Mechanisms are tools, strategies, or actions which are proposed by the various authors to achieve the objective values for the variables. In the Liverman et al. definition, the mechanisms for achieving quality of human life beyond mere biological survival are "maintenance of basic life support systems" and "the existence of infrastructure and institutions which distribute and protect the components of these systems".

As shown by the Liverman et al. definition, sometimes mechanisms can yield subvariables and objectives of their own. Table 1 contains the propositional units extracted from the Liverman et al. definition of sustainability, illustrating how mechanisms can be broken down into propositional units of their own.

Table 1: Propositional Units from the Liverman et al. definition (1988)

VARIABLE	OBJECTIVE	MECHANISM
Human species	Indefinite survival	Maintenance of life support systems
Quality of human life	More than mere biological survival	
Human survival	Quality	Maintenance of life support systems
Human survival	Quality	Existence of infrastructure and institutions which distribute and protect life support systems
Air systems	Maintenance	Protection
Water systems	Maintenance	Protection
Land systems	Maintenance	Protection
Biota	Maintenance	Protection

This example shows how the subvariables of "air systems", "water systems", "land systems", and "biota" are subject to the objective of "maintenance" as a result of the necessity of maintenance of these systems to achieve the objective of indefinite survival for the variable "human species".

Hierarchical Organization of Content Outputs

The propositional units derived from the literature can be organized into four categories: Human-Related Variables, Resource-Related Variables, Ecosystem-Related Variables, and Economic-Related Variables. A complete listing of the coded propositional units derived from the sample set of sustainability definitions is shown in Tables 2 through 5, sorted into the four categories.

Each set of propositional units contains variables with varying degrees of overlap and specificity. The four categories were determined by inspection after a review of the complete list of propositional units. A hierarchy of the four categories of sustainability variables is shown in Figure 1.

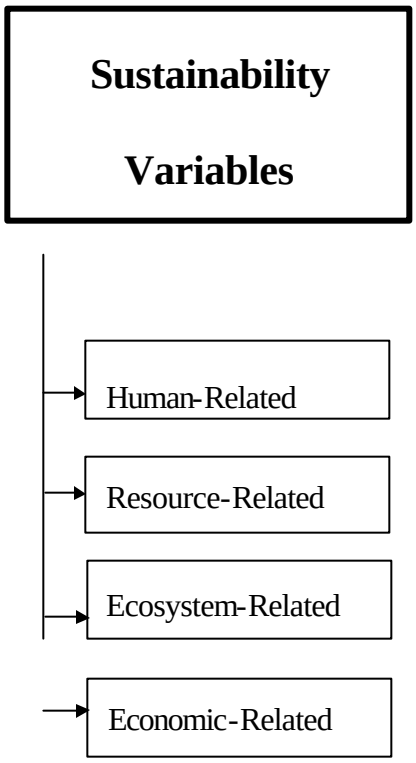

Figure 1: Four Classes of Sustainability Variables

Table 2: Propositional Units for Human-Related Variables

VARIABLES	OBJECTIVES	MECHANISMS
Humans	Progress	Development
	"Virtually all live to adulthood, once born"	
Human individuals	Flourish	
Human species	Indefinite survival	
Human survival	Quality	Maintenance of life support systems
	Quality	Existence of infrastructure & institutions which distribute & protect life support systems
Human life	Supported at specified level of well-being	Existence of supporting ecological conditions
World's people	Stable prosperity	Nurturing and safeguarding environment
Present needs (of humans)	Met	Utilization of ecosystem or species resources
Immediate human needs	Met	
Needs and aspirations of present generations	Met	Sustainable development
Societal needs and dependencies	Met	Utilization of ecosystem or species resources
	Met	Economic exchanges
Present Humans	Optimization of economic and societal benefits	
	Don't impoverish future generations	
	Satisfaction	
	Equity	Self-reliance
		Participation
Future needs (of humans)	Ability to be met	
Long-term human needs	Met	
Needs of future generations	Ability to be met	Sustainable development
Between generations	Equity	
	Social equity	
Within generations	Equity	Poverty alleviation
	Social equity	
Each generation	Equal access to the resource base	
Future humans	Maintain potential for economic and social benefits	
Future generations	Should not inherit unacceptable risks of death	Potential constraints on primary freedoms of present and future generations
	No worse off than present gens	Environmental management
	Maintain options	Conserve plant and animal species
	Respect rights	Institutions and policies
	As well off as present gens	Preserve capacity
	Don't imperil welfare	
	Well-being	Leave capacity
Future options	Preserve	[Appropriate] human conduct
Human needs	Satisfaction	Sustainable development
	Health control for all	
	Appropriate technology	

Table 2 (cont'd.): Propositional Units for Human-Related Variables

VARIABLES	OBJECTIVES	MECHANISMS
Human needs, cont'd.	Food for all	
	Self-reliance for all	
	Clean water for all	
	Shelter for all	
Human self-interest	Long term	
Human welfare	Maximize	Utilize available resources
	Steadily increase	
	Sustained	Sustained productive economic capacities
Initiatives (human actions)	People-centered	
Human time	Sustainability	Exact less
Human wealth	Sustainability	Exact less
Human maintenance	Sustainability	Exact less
Human participation	Sustainability	"Demand more, and provide opportunities"
Human cooperation	Sustainability	"Demand more, and provide opportunities"
Human civicness	Sustainability	"Demand more, and provide opportunities"
Transport		Environmental protection
Social systems	Coevolution with ecological systems	
Quality of human life	Improvement	Sustainable development
	> "mere biological survival"	
Poverty	Alleviation	"[O]verriding priority given"
	Alleviation	Sustainable economic growth
	Reduced	Providing lasting and secure livelihoods
Living standards (future)	Not impaired by current decisions	
Culture	Minimize disruption	Develop
Local Culture	Respect	Human actions
Diversity	Value	
Society	Minimize instability	
Structure of Society	Respect	Human actions
Values of the people	Respect	Human actions
Persons and Communities	Indefinitely prolonged	
	Nourished	
	Self-actualizing	
Productivity	No reduction in the long run	
Human activities	Effects remain bounded so as not to destroy ecosystems	
Problem Solutions	Sustainable and Ecoregion-specific	Incorporating cultural data

Table 3: Propositional Units for Resource-Related Variables

VARIABLES	OBJECTIVES	MECHANISMS
Energy		Env'l protection
Consumption standards	"[W]ithin the bounds of the ecological possible"	Promotion of values
	"[T]o which all can reasonably aspire"	
Living resources and source ecosystems	Meet human needs	Sustainable utilization
Environmental assets	Hold constant	
Resources	Use within availability	
	Minimize depletion	
	< managed or natural regeneration rates	Harvest
	Generation	Ecosystems
	Optimize	Sustainable use rates
	Live off dividend	
	Population well-being	Change in resource management practice
	Does not reduce future real income	Use
Natural resources	Avoid degradation	
	Meet human needs (implied)	Sustainable use over time
	Allocation	Conservation
Asset base	Maintain and improve	Can change over time
Stock Resources	Reallocate toward future	Use
	No decline	
Renewable natural resources	Non-degrading use	
Renewable resource base	Preservation	Resource use
Non-renewable mineral resources	Minimize entropy gain	Use
		Recycle
		Any use is unsustainable....
Self-exhaustible resources		Substitute with renewables
Non-renewable energy resources	Orderly societal transit'n to renewable sources	"Use at slow enough rate"
Energy	Within solar budget	All use
Natural resource base	Undeteriorating	Sustainable dev't
Natural capital stock	Constancy	Hold constant

Table 4: Propositional Units for Ecosystem-Related Variables

VARIABLES	OBJECTIVES	MECHANISMS
Agriculture	Sustained	Environmental protection
Local Conditions	Value	
Ecological systems	Human system coevolution	
Ecological means	Consumption within limits	
Ecological processes/systems	Sustained regen. capacities	
Plant and animal species	Avoid extinction or loss	Conservation
	Maintain presence	
	Self-renewal	Sustainable utilization
Biota	Diversity	Slow loss
	Maintenance	Protection
Self-organizing ecosystems	Health and integrity	Do not destroy
Genetic diversity	Preserve	
Nature	Rights respected	
Environment	Minimize degradation	Protection
	"Humans take only within self-perpetuating limits"	
	Purging of toxins	
	Improvement	Economic growth
	Health	
Land, water, soil, fuel		Demand less
Living rscs/source ecosystems	Meet human needs	Sustainable utilization
Essential ecological processes and life support systems	Maintain	
Environmental "services"		Use over indefinite time
Environmental assets	Hold constant	
Environmental quality	No degradation	
Soil and soil quality	Non-negative changes	
	No decline	
Ground /surface water quality	Non-negative changes	
Land biomass	Non-negative changes	
Water biomass	Non-negative changes	
Waste assimilation capacity of receiving environments	Non-negative changes	
Trees	No decline	
Air systems	Maintenance	Protection
Water systems	Maintenance	Protection
	No decline	
Land systems	Maintenance	Protection
Living matter	Survival	
Biosphere	Protection	Sustainable modification
Biosphere components	Persistence of all	
Food	Maintain presence	
Life on Earth	Sustainability	Nourished and perpetuated
Global environment	Avoid destruction	
	Meet human needs (implied)	Sustainable use over time
Problem Solutions	Ecoregion-specific	Incorporating ecological data
Waste	< natural or managed assimilation rates	Environment as "sink"
Global climate	Curb changes	

Table 5: Propositional Units for Economics-Related Variables

VARIABLES	OBJECTIVES	MECHANISMS
Economy	Sustainable growth	Environmental protection
	Development	Environmental protection
	Trade	Environmental protection
	Economic planning	Environmental protection
	Subject to constancy of natural capital stock	Change
	Fluctuate with social goals	
	Resilience to external shocks	
	Health	
	Supportable by physical and social environments	Growth
	Grow within limits of planet	
Economic growth	Environmentally sustainable	
Economic well-being	Reasonable, equitably distr.	Sustainable development
Economic systems	Live off dividends of resources	Management
Development	Sustainable	Political reform
		Access to knowledge/resources
		Just & equitable distribution of wealth in/between nations
		Social/structural transform.
		Resource harvest
		Waste to ecosystems
		Resource gen./waste sinks
		Worldwide political will
		Government institutions
		Economic change
		Intragenerational equity
		Help to keep poor people from destroying environment
	Greater real income	
	Better health/nutrition	
	Education	
	Resource access	
	Fairer distribution of income	
	Increases in basic freedoms	
	Grow monotonically over time	
	Self-reliant	
	Within natural rs limits	
	Cost-effective	Use fair economic criteria
	Maintain env'l quality	
	Long run productivity	
	Holistic	
Real income	Raise	Environmental quality
		Environmental inputs
	Growth without depleting capital or env'l asset stock	Policy
	Not reduced in future	
Present value	Maximized	

Figures 2 through 5 show hierarchical configurations of the variables for each class, based on the development of a dendogram for each class. A dendogram is a representation of the relationships between variables based on their degree of similarity (Krippendorff 1980). By developing a dendogram for a set of variables, one can determine the similarities between variables and develop a hierarchy showing those similarities.

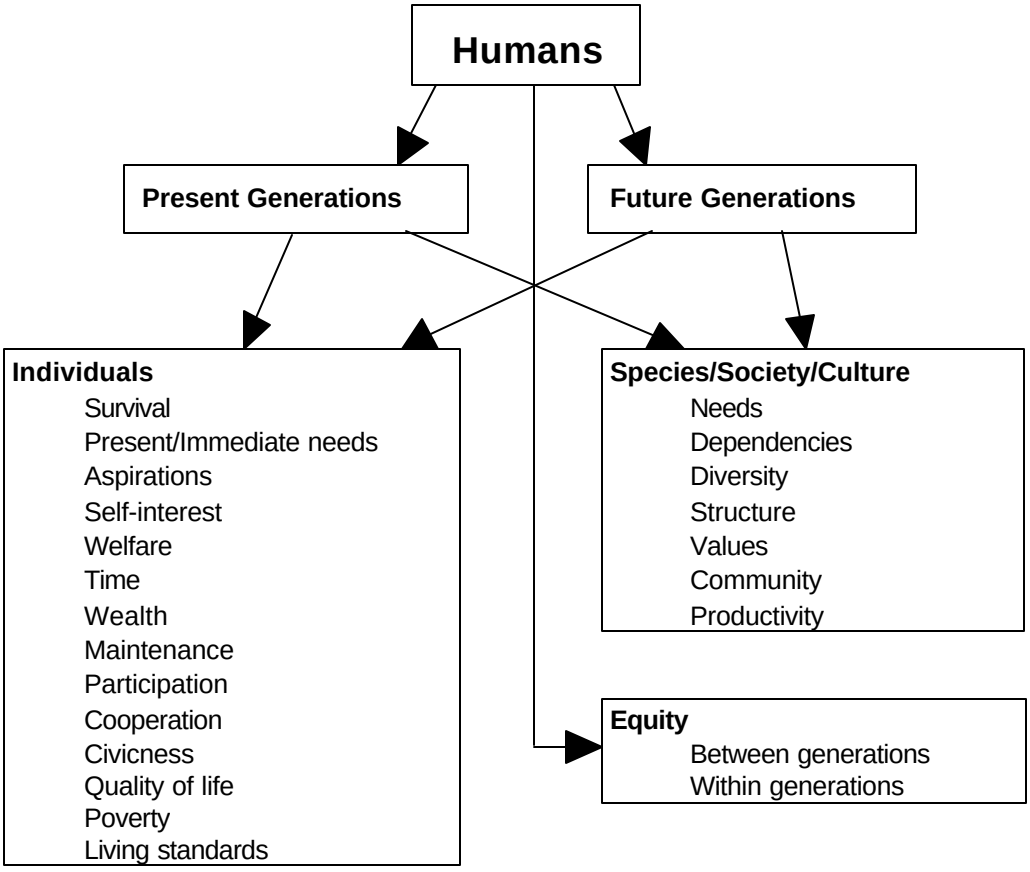

Figure 2: Hierarchical Configuration of Human-Related Variables

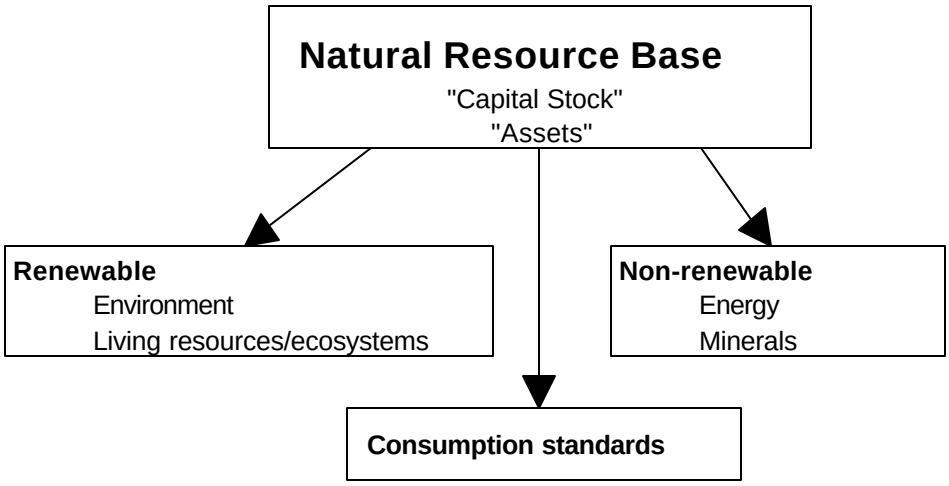

Figure 3: Hierarchical Configuration of Resource-Related Variables

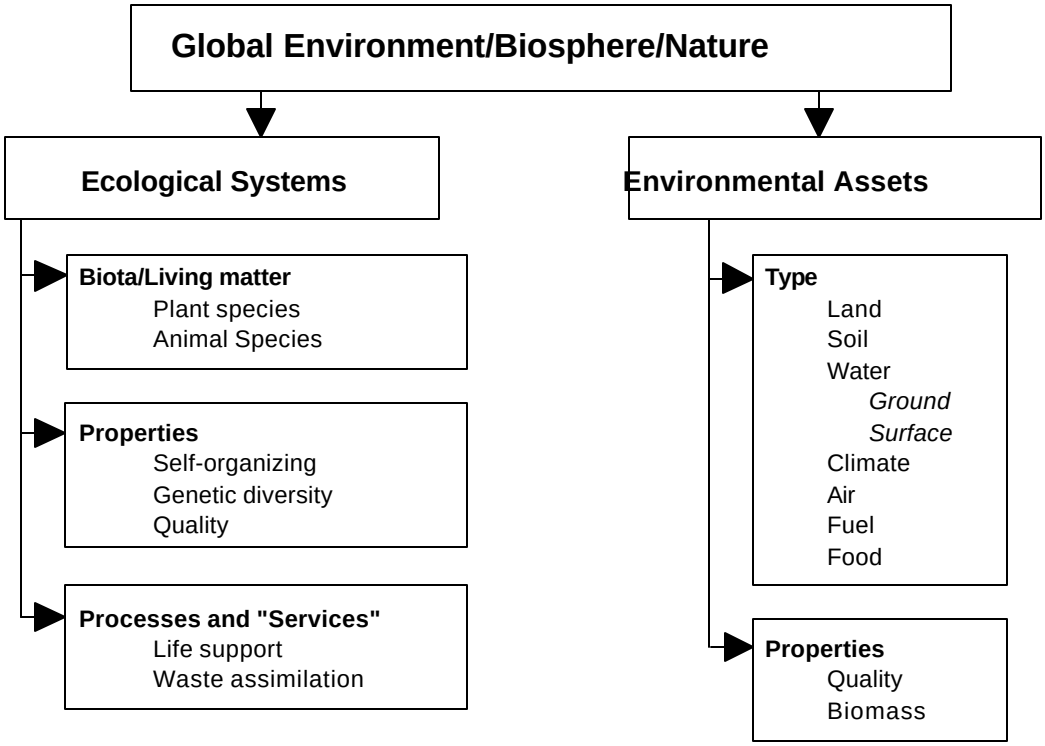

Figure 4: Hierarchical Configuration of Ecosystem-Related Variables

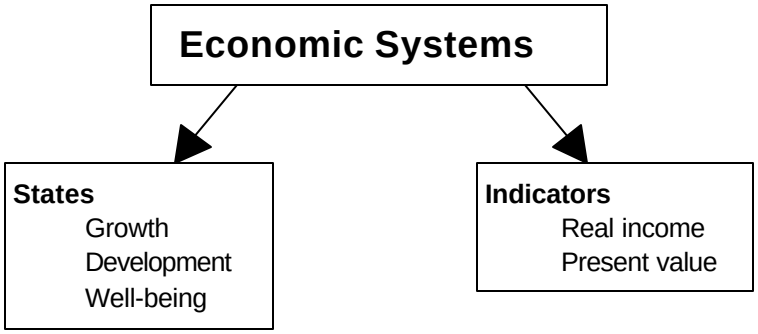

Figure 5: Hierarchical Configuration of Economic-Related Variables

By placing the variables derived from the propositional units into hierarchies, gaps in the sets of variables become more apparent. In the next section, we explore those gaps and the implications of the hierarchies for defining sustainability.

Results of Content Analysis & Discussion

The four hierarchies of variables developed using content analysis show that existing definitions of sustainability vary in their coverage of potential variables. For example, in the Resource-Related Variables hierarchy shown in Figure 3, specific classes of non-renewable resources such as "minerals" are mentioned in the literature, whereas only general types of renewable resources are covered. These gaps and variations in specificity provide an interesting topic for future research, with the hierarchies of variables presented earlier as a potential point of departure.

COMPLETE LISTING OF THE DEFINITIONS AND SOURCES USED FOR THE CONTENT ANALYSIS

Definition	Source
"We came to see that a new development path was required, one that sustained human progress not just in a few places for a few years, but for the entire planet into the distant future. Thus 'sustainable development' becomes a goal not just for the 'developing' nations but for industrial ones as well." (4)	WCED - World Commission on Environment and Development. (1987). Our Common Future. Oxford University Press, Great Britain. [Pezzey 1989].
"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs." (43)	WCED - World Commission on Environment and Development. (1987). Our Common Future. Oxford University Press, Great Britain. [Pezzey 1989].
"Living standards that go beyond the basic minimum are sustainable only if consumption standards everywhere have regard for long-term sustainability. Yet many of us live beyond the world's ecological means, for instance in our patterns of energy use. Perceived needs are socially and culturally determined, and sustainable development requires the promotion of values that encourage consumption standards that are within the bounds of the ecological possible and to which all can reasonably aspire." (44)	WCED - World Commission on Environment and Development. (1987). Our Common Future. Oxford University Press, Great Britain. [Pezzey 1989].
"Economic growth and development obviously involve changes in the physical ecosystem. Every ecosystem everywhere cannot be preserved intact." (45)	WCED - World Commission on Environment and Development. (1987). Our Common Future. Oxford University Press, Great Britain. [Pezzey 1989].
"The loss [i.e., extinction] of plant and animal species can greatly limit the options of future generations, so sustainable development requires the conservation of plant and animal species." (46)	WCED - World Commission on Environment and Development. (1987). Our Common Future. Oxford University Press, Great Britain. [Pezzey 1989].
"...satisfy the multiple criteria of sustainable growth, poverty alleviation, and sound environmental management." (10)	World Bank. (1987). Environment, growth and development. Development Committee Pamphlet 14, World Bank, Washington, D [Pezzey 1989].
"To a large degree, environmental management should be seen as a means of attaining the wider objectives of sustained economic growth and poverty alleviation."	World Bank. (1987). Environment, growth and development. Development Committee Pamphlet 14, World Bank, Washington, D, p. 18. [Pezzey 1989].
"...elevating concern about environmental matters...and developing the capacity to implement sound practices for environmental management...are [both] needed to reconcile, and, where appropriate, make tradeoffs among the objectives of growth, poverty alleviation, and sound environmental management." (28)	World Bank. (1987). Environment, growth and development. Development Committee Pamphlet 14, World Bank, Washington, D [Pezzey 1989].
"Sustainable utilization is a simple idea: we should utilize species and ecosystems at levels and in ways that allow them to go on renewing themselves for all practical purposes indefinitely." (18)	Allen, R. (1980). How to Save the World. Barnes & Noble Books, Totwa, NJ. [Based on IUCN 1980]. [Pezzey 1989].

Definition	Source
"The importance of ensuring that utilization of an ecosystem or species is sustainable varies with a society's dependence on the resource in question. For a subsistence society, sustainable utilization of most, if not all its living resources is essential. ... The greater the diversity and flexibility of the economy, the less the need to utilize certain resources sustainably but by the same token the less the excuse not to." (18)	Allen, R. (1980). How to Save the World. Barnes & Noble Books, Totwa, NJ. [Based on IUCN 1980]. [Pezzey 1989].
"...it is essential...to ensure that...people protect those parts of the biosphere that need protecting and modify the rest only in ways that it can sustain." (20)	Allen, R. (1980). How to Save the World. Barnes & Noble Books, Totwa, NJ. [Based on IUCN 1980]. [Pezzey 1989].
"sustainable development - development that is likely to achieve lasting satisfaction of human needs and improvement of the quality of human life." (23)	Allen, R. (1980). How to Save the World. Barnes & Noble Books, Totwa, NJ. [Based on IUCN 1980]. [Pezzey 1989].
"The Commission defined sustainable development as meeting the needs and aspirations of present generations without compromising the ability of future generations to meet their needs. It requires political reform, access to knowledge and resources, and a more just and equitable distribution of wealth within and between nations...."	Brundtland, G.H. (1989). "Protecting the Global Commons," Earth Ethics, Fall, 12.
"Ecologically sustainable development can then be thought of as changes in economic structure, organization and activity of an economic ecological system that are directed towards maximum welfare and which can be sustained by available resources." (271)	Braat, L., and Steetskamp, I. (1991). "Ecological-Economic Analysis for Regional Sustainable Development," in Ecological Economics, R. Costanza, ed. Columbia University Press, New York, pp. 269-288.
"Sustainable development describes a process in which the natural resource base is not allowed to deteriorate. It emphasizes the hitherto unappreciated role of environmental quality and environmental inputs in the process of raising real income and the quality of life." (8)	Pearce, D.W., Warford, J.J. (1993). World Without End. Oxford University Press, Washington, D
"In order to break its association with a limited, instrumental view of conservation and development, and in order to suggest some of the positive moral dimensions of the new social paradigm, most of our authors grope for a richer symbolic language with which to speak about the concept of sustainable development -- 'authentic integral development'..., 'ecological/holistic world view'..., 'reverential development' ..., 'ecosophical development' (Naess), 'noosphere'..., 'just, participatory ecodevelopment'..., 'communalism'..., 'desirable society'..." (10)	Engel, J.R. (1990). "Introduction: The Ethics of Sustainable Development," in The Ethics of Environment and Development, J. Engel and J.G. Engel, eds. University of Arizona Press, Tucson. 1-23.
Ignacy Sachs gave this definition in 1974: "A style of development that, in each ecoregion, calls for specific solutions to the particular problems of the region in light of cultural as well as ecological data and long-term as well as immediate needs." (186)	Hettne, B. (1990). Development Theory and the Three Worlds. John Wiley & Sons, New York.
"Sustainable economic development....In general terms, the primary objective is reducing the absolute poverty of the world's poor through providing lasting and secure livelihoods that minimize resource depletion, environmental degradation, cultural disruption, and social instability." (103)	Barbier, E.B. (1987). "The Concept of Sustainable Economic Development," Environ. Conserv., 14(2), 101-110.

Definition	Source
"Sustainable development is here defined as a pattern of social and structural economic transformations (i.e., 'development') which optimizes the economic and societal benefits available in the present, without jeopardizing the likely potential for similar benefits in the future. A primary goal of sustainable development is to achieve a reasonable (however defined) and equitably distributed level of economic well-being that can be perpetuated continually for many human generations." (36)	Goodland, R., and Ledec, G. (1987). "Neoclassical Economics and Principles of Sustainable Development," Ecological Modeling, 38, 19-46.
"...sustainable development implies using renewable natural resources in a manner which does not eliminate or degrade them, or otherwise diminish their usefulness for future generations.....Sustainable development further implies using non-renewable (exhaustible) mineral resources in a manner which does not unnecessarily preclude easy access to them by future generations..... Sustainable development also implies depleting non-renewable energy resources at a slow enough rate so as to ensure the high probability of an orderly societal transition to renewable energy sources." (37)	Goodland, R., and Ledec, G. (1987). "Neoclassical Economics and Principles of Sustainable Development," Ecological Modeling, 38, 19-46.
"Environmental protection is integral to issues such as trade, development, energy, transport, agriculture and economic planning. Therefore, environmental considerations must be taken into account in economic decision-making. ... In order to achieve sustainable development, we shall ensure the compatibility of economic growth and development with the protection of the environment. Environmental protection and related investment should contribute to economic growth..." (paragraph 37 of Paris Summit Communiqué)	Group of Seven. (1989). Communiqué from the 15th Annual Economic Summit in Paris. New York Times, 17 July 1989, p. A5. [Pezzey 1989].
"...activities should be considered that would be aimed at maintaining over time a constant effective natural resource base. This concept was proposed by Page (1977) and implies not an unchanging resource base but a set of resource reserves, technologies, and policy controls that maintain or expand the production possibilities of future generations." (337)	Howe, W. (1979). Natural Resource Economics - Issues, Analysis and Policy. John Wiley & Sons, New York, NY. [Pezzey 1989].
"In simple terms [sustainable development] argues for (a) development subject to a set of constraints which set resource harvest rates at levels no higher than managed or natural regeneration rates; and (b) use of the environment as a 'waste sink' on the basis that waste disposal rates should not exceed rates of (natural or managed) assimilation by the counterpart ecosystem." (58)	Pearce, D. (1988). "Optimal Prices for Sustainable Development," in Economics, Growth, and Sustainable Environments, D. Collard, D. Pearce, and D. Ulph, eds. St. Martin's Press, New York. [Pezzey 1989].
"A major challenge in the coming decades is to learn how long-term, large-scale interactions between environment and development can be better managed to increase the prospects for ecologically sustainable improvements in human well-being." (5)	Clark, W. and Munn, R.E. (1986). Sustainable Development of the Biosphere. Cambridge University Press, Cambridge, UK. [Pezzey 1989].
"[The] sustainable society is one that lives within the self-perpetuating limits of its environment. That society...is not a 'no-growth' society. ... It is, rather, a society that recognizes the limits of growth...[and] looks for alternative ways of growing." (1)	Coomer, J. (1979). "The nature of the quest for a sustainable society." In Coomer, J., ed. Quest for a Sustainable Society. Pergamon Press, New York. [Pezzey 1989].

Definition	Source
"Socially sensitive interpretations of sustainable development emphasize the opportunity for a return to community values, local control over resources, community-based development and other forms of decentralized government..." (22)	Rees, W.E. (1990). "The Ecology of Sustainable Development," The Ecologist, 20(1), 18-23.
"...in order for a course of action to be sustainable it should be compatible with the local culture by respecting the structure of the society and values of the people..." (114) - p.7 in DuBose 1994	Dower, N. (1992). "Sustainability and the Right to Development," in International Justice and the Third World, Attfield, R., and Wilkins, B., eds. Routledge Publishing, New York. [DuBose 1994]
"But there are also some basic requirements to reach ... a situation [of sustainable development]. First of all, there should be a worldwide political will to attain a sustainable development. One cannot expect this will to exist in a world of poverty, so that sustainable development requires an equity oriented policy." (88)	Nijkamp, P. and Soeteman, F. (1988). "Ecologically sustainable economic development: key issues for strategic environmental management." International Journal of Social Economics, 15(3/4), 88-102. [Pezzey 1989].
"If sustainable development is to be achieved, we will have to devise institutions, at all levels of government, to reallocate the use of stock resources towards the future, curb the pace and disruption of global climatic changes, reverse the accumulation of toxins in the environment and slow the loss of biological diversity. These are the key resource and environmental issues that must be addressed." (608)	Norgaard, R.B. (1988). "Sustainable development: a coevolutionary view." Futures, 20(6), December, 606-620. [Pezzey 1989].
"Until the use of hydrocarbons, development was a process of social system and ecosystem coevolution that favoured human welfare. ...Obviously this coevolutionary process did not result in sustainable development for all societies. Many suffered, some were overtaken by others and the welfare of the survivors did not steadily increase. But at least those societies which historically met their demise did not take the global environment with them." (617)	Norgaard, R.B. (1988). "Sustainable development: a coevolutionary view." Futures, 20(6), December, 606-620. [Pezzey 1989].
"In simple terms [sustainable development] argues for (a) development subject to a set of constraints which set resource harvest rates at levels no higher than managed or natural regeneration rates; and (b) use of the environment as a 'waste sink' on the basis that waste disposal rates should not exceed rates of (natural or managed) assimilation by the counterpart ecosystems. ... ... There are self-exhaustible resources, so that 'sustainabilitists' tend to think in terms of a resource set encompassing substitution between renewables and exhaustibles. Equally self-evident is the implicit assumption that sustainability is a 'good thing' - that is optimizing within sustainable use rates is a desirable objective. On these terms, sustainability could imply use of environmental services over very long time periods and, in theory, indefinitely." (58)	Pearce, D.W. (1988). "Optimal prices for sustainable development." in Collard, D., Pearce, D., and Ulph, D., eds. Economics, Growth and Sustainable Environments. St. Martin's Press, New York. [Pezzey 1989].

Definition	Source
"Sustainable development is categorized by economic change subject to 'constancy of the natural capital stock' - the stock of environmental assets is held constant while the economy is allowed whatever social goals are deemed appropriate. Such a rule, which has its own difficulties, accommodates the main concerns of the advocates of sustainability - equity between generations, equity within a generation, economic resilience to external shocks, and uncertainty about the functions and values of natural environments in social systems. It may also accommodate some of the concerns of the 'deep ecology' movement by respecting rights in nature." (598)	Pearce, D.W. (1988). "Economics, equity and sustainable development." Futures, 20(6), December, 598-605. [Pezzey 1989].
"We take development to be a vector of desirable social objectives, and elements might include: - increases in real income per capita - improvements in health and nutritional status - educational achievement - access to resources - a 'fairer' distribution of income - increases in basic freedoms. ...Sustainable development is then a situation in which the development vector increases monotonically over time." (4)	Pearce, D.W., Barbier, E., and Markandya, A. (1988). Sustainable development and cost benefit analysis. LEEC Paper 88-03, IIED/UCL London Environmental Economics Centre, 3 Endsleigh St., London WC1. [Pezzey 1989].
"We summarize the necessary conditions [for sustainable development] as 'constancy of the natural capital stock'. More strictly, the requirement is for non-negative changes in the stock of natural resources such as soil and soil quality, ground and surface water and their quality, land biomass, water biomass and the waste assimilation capacity of receiving environments." (6)	Pearce, D.W., Barbier, E., and Markandya, A. (1988). Sustainable development and cost benefit analysis. LEEC Paper 88-03, IIED/UCL London Environmental Economics Centre, 3 Endsleigh St., London WC1. [Pezzey 1989].
"Over the last decade or so international attention has increasingly become focused on the problem of ensuring that modern development on this planet takes place at a pace which the earth's environment can sustain. ... Economic growth is a necessary precondition for environmental improvement but it is possible and necessary to plan for economic growth which is environmentally sustainable."	Ridley, N. (1989). Policies against Pollution: The Conservative Record - and Principles. Centre for Policy Studies, London. [Pezzey 1989].
"...the health of the economy and the health of our environment are totally dependent upon each other. The [British] Government espouses the concept of sustainable economic development. Stable prosperity can be achieved throughout the world provided the environment is nurtured and safeguarded."	Thatcher, M. (1988). Speech at 1988 Royal Society Dinner (September). [Pezzey 1989].

Definition	Source
"In broad terms the concept of sustainable development encompasses: (1) help for the very poor because they are left with no option other than to destroy their environment; (2) the idea of self-reliant development, within natural resource constraints; (3) the idea of cost-effective development using different economic criteria to the traditional approach; that is to say development should not degrade environmental quality, nor should it reduce productivity in the long run; (4) the great issues of health control, appropriate technologies, food, self-reliance, clean water, and shelter for all; (5) the notion that people-centred initiatives are needed; human beings, in other words, are the resources in the concept." (98)	Tolba, (1987). Citation unknown. [Pezzey 1989].
"The current state of scientific knowledge ... leads inexorably to the conclusion that anyone driven by either long-term self-interest, or concern for poverty, or concern for intergenerational equity should be willing to support the operational objectives of sustainable development." (p. 17, paraphrasing Repetto 1986)	Lele, S.M. (1990). "Sustainable Development: A Critical Review," World Development, forthcoming. [Pezzey 1989].
"The precise meaning of terms such as 'sustainable resource usage', sustainable growth' and 'sustainable development' has so far proved elusive." (5)	Turner, R.K. (1988). "Sustainability, resource conservation and pollution control: an overview." In Turner, R.K., ed. Sustainable Environmental Management: Principles and Practice. Belhaven Press, London. [Pezzey 1989].
"The World Conservation Strategy...gave considerable prominence to the sustainability concept, although its precise meaning and practical applications were not presented in a detailed and operational form." (576)	Turner, R.K. (1988). "Sustainable global futures - common interest, interdependency, complexity and global possibilities." Futures 19(5), 574-582. [Pezzey 1989].
"Two principles of 500-year planning: Principle 1: Future generations should not inherit, from present generations, unacceptable risks of death owing to environmental or other preventable catastrophes. Principle 2: Future, as well as present, generations may inherit constraints on their primary freedoms as sacrifices for enjoying the conditions of Principle 1."	Tonn, B.E. (1989, forthcoming). [Pezzey 1989].
"The sustainability criterion suggests that, at a minimum, future generations should be left no worse off than current generations." (33)	Tietenberg, T.H. (1984). Environmental and Natural Resource Economics. Scott, Foresman & Co., Glenview, IL. [Pezzey 1989].
"Conservation has three basic objectives: (1) To maintain essential ecological processes and life support systems. (2) To preserve genetic diversity. (3) To ensure that the utilization of living resources and the ecosystems in which they are found, is sustainable." (4)	Talbot, L.M. (1984). "The World Conservation Strategy." In Thibodeau, F.R. and Field, H.H., Sustaining Tomorrow - A Strategy for World Conservation and Development. University Press of New England. [Pezzey 1989].
"...a society that invests in reproducible capital the competitive rents on its current extraction of exhaustible resources, will enjoy a consumption stream constant in time. ...this result can be interpreted as saying that an appropriately defined stock of capital - including the initial endowment of resources - is being maintained intact, and that consumption can be interpreted as the interest on that patrimony." (141)	Solow, R.M. (1986). "On the intergenerational allocation of natural resources." Scandinavian Journal of Economics, 88(1), 141-149. [Pezzey 1989].

Definition	Source
"...the main text [of WCED 1987] combines views that have often been regarded as hard to reconcile. Traditional objectives of economic growth are believed to be compatible with sustainability. In fact, the position taken by the Commission is that a high level of GNP growth will facilitate the transition towards sustainability." (20)	Soderbaum, P. (1988). "Sustainable development - a challenge to our world views and ideas of economics." In Stockhold Group for Studies on Natural Resource Management, Perspectives of Sustainable Development: Some Critical Issues Related to the Brundtland Report. SGN, Stockholm. [Pezzey 1989].
"[Sustainable growth] means economic growth that can be supported by physical and social environments in the foreseeable future. An ideal sustainable society would be one in which all energy would be derived from current solar income and all non-renewable resources would be recycled." (10f)	Pirages, D. (1977). "A social design for sustainable growth." in Pirages, D., ed. The Sustainable Society - Implications for Limited Growth. Praeger, New York. [Pezzey 1989].
"The core of the idea of sustainability, then, is the concept that current decisions should not impair the prospects for maintaining or improving future living standards. ... This implies that our economic systems should be managed so that we live off the dividend of our resources, maintaining and improving the asset base. This principle also has much in common with the ideal concept of income that accountants seek to determine: the greatest amount that can be consumed in the current period without reducing prospects for consumption in the future." (10)	Repetto, R. (1985). The Global Possible - Resources, Development and the New Century. Yale University Press, New Haven. [Pezzey 1989].
"All economic growth in the future must be sustainable: that is to say, it must operate within and not beyond the finite limits of the planet." (120)	Porritt, J. (1984). Seeing Green - The Politics of Ecology Explained. Basil Blackwell, Oxford. [Pezzey 1989].
"The sustainability criterion requires that the conditions necessary for equal access to the resource base be met for each generation." (13)	Pearce, D.W. (1987). "Foundations of an ecological economics." Ecological Modeling 38, 9-18. [Pezzey 1989].
"The key concept [regarding natural resource degradation in developing countries] is 'sustainability'. Changes in resource management practice toward sustainable resource use could at least contribute to the preservation of the renewable resource base and hence to the direct well-being of the population and to the future of the macroeconomy." (102)	Pearce, D.W. (1988). "The sustainable use of natural resources in developing countries." in Turner, R.K., ed., Sustainable Environmental Management: Principles and Practice. Belhaven Press, London. [Pezzey 1989].
"We developed our own simple, anthropocentric working definition by which we mean sustainability to be the indefinite survival of the human species (with a quality of life beyond mere biological survival) through the maintenance of basic life support systems (air, water, land, biota) and the existence of infrastructure and institutions which distribute and protect the components of these systems." (133)	Liverman, D.M., Hanson, M.E., Brown, B.J., and Merideth, R.W., Jr. (1988). "Global Sustainability: Toward Measurement." Environmental Management, 12(2), 133-143.
"It may only be a matter of time before the metaphor of sustainability becomes so abused as to be meaningless, certainly as a device to straddle the ideological conflicts that pervade contemporary environmentalism." (29)	O'Riordan, T. (1988). "The politics of sustainability." In Turner, R.K., ed. Sustainable Environmental Management: Principles and Practice. Belhaven Press, London. [Pezzey 1989].
"Sustainability is a much broader phenomenon [than sustainable development], embracing ethical norms pertaining to the survival of living matter, to the rights of future generations and to institutions responsible for ensuring that such rights are fully taken into account in policies and actions." (30)	O'Riordan, T. (1988). "The politics of sustainability." In Turner, R.K., ed. Sustainable Environmental Management: Principles and Practice. Belhaven Press, London. [Pezzey 1989].

Definition	Source
"...much of the desertification literature also suggests that desertification is nonoptimal from both the producer's and society's perspective. Sustainable use is generally put forward as the optimal strategy. [Morey then shows how sustainable land use may or may not be optimal.]" (551)	Morey, E.R. (1985)."Desertification from an economic perspective." Ricerche Economiche, 39(4), 550-560. [Pezzey 1989].
"The basic idea [of sustainability] is simple in the context of natural resources (excluding exhaustibles) and environments: the use made of these inputs to the development process should be sustainable through time. ....If we now apply the idea to resources, sustainability ought to mean that a given stock of resources - trees, soil quality, water and so on - should not decline." (9-10)	Markandya, A. and Pearce, D.W. (1988). "Natural environments and the social rate of discount." Project Appraisal, 3(1), 2-12. [Pezzey 1989].
"In the narrowest sense, global sustainability means the indefinite survival of the human species across all the regions of the world. A broader sense of the meaning specifies that virtually all humans, once born, live to adulthood and that their lives have quality beyond mere biological survival. Finally the broadest sense of global sustainability includes the persistence of all components of the biosphere, even those with no apparent benefit to humanity." (717)	Brown, B.J., et al. (1987). "Global sustainability: toward definition." Environmental Management, 11(6), 713-719. [Pezzey 1989].
"...in a pedagogical sense sustainability requires that all processes operate only at their steady state, renewable level, which might then suggest a return to a regulated caveman culture." (323)	Burness, H.S. and Cummings, R.G. (1986). "Thermodynamic and economic concepts as related to resource-use policies: reply." Land Economics, 62(3), 323-324. [Pezzey 1989].
"'Sustainable', by definition, means not only indefinitely prolonged, but nourishing for the self-actualizing of persons and communities. The word 'development' need not be restricted to economic activity, much less to the kind of economic activity that now dominates the world, but can mean the evolution, unfolding, growth, and fulfillment of any and all aspects of life. Thus 'sustainable development', in the broadest sense, may be defined as the kind of human activity that nourishes and perpetuates the historical fulfillment of the whole community of life on earth." (10)	Engel, J.R. (1990). "Introduction: The Ethics of Sustainable Development," in The Ethics of Environment and Development, J. Engel and J.G. Engel, eds. University of Arizona Press, Tucson. 1-23.
"This chapter will address these two opposing meanings of 'sustainability' and their respective development paradigms. It will differentiate between sustainability as a narrow economic ideal and sustainability as an ethical ideal, between sustainability of privileges and sustainability of life on Earth." (28)	Kothari, R. (1990). "Environment, Technology, and Ethics," in The Ethics of Environment and Development, J. Engel and J.G. Engel, eds. University of Arizona Press, Tucson. 27-35.
"[I]t is an obligation to conduct ourselves so that we leave to the future the option or the capacity to be as well off as we are. It is not clear to me that one can be more precise than that. Sustainability is an injunction not to satisfy ourselves by impoverishing our successors...There is no specific object that the goal of sustainability, the obligation of sustainability, requires that we leave untouched." (181)	Solow, R.M. (1993). "Sustainability: An Economist's Perspective," in Economics of the Environment: Selected Readings. R. Dorfman and N.S. Dorfman, eds. W.W. Norton & Company, New York, 179-187.

Definition	Source
"While other attributes such as color or temperature can be ascribed to isolated objects, this is not the case with sustainability. It is somewhat of a misnomer to say that a technology in and of itself is sustainable. This is not to say that therefore nothing is sustainable or that sustainability can not occur -- it is simply that our way of speaking of sustainability is imprecise and misleading. Sustainability does not describe a quality that resides within the confines of an individual technology or practice but refers instead to the nature of the relationship between the technology and its context." (14)	DuBose, J.R. (1994). Sustainability as an Inherently Contextual Concept: Some Lessons from Agricultural Development. Unpublished M.S. Thesis, School of Public Policy, Georgia Institute of Technology, Atlanta, GA.
"Even the narrow notion of physical sustainability implies a concern for social equity between generations, a concern that must logically be extended to equity within each generation." (43)	WCED - World Commission on Environment and Development. (1987). Our Common Future. Oxford University Press, Great Britain. [Pezzey 1989].
"The core of the idea of sustainability, then, is the concept that current decisions should not impair the prospects for maintaining or improving future living standards....This implies that our economic systems should be managed so that we live off the dividend of our resources, maintaining and improving the asset base....This does not mean that sustainable development demands the preservation of the current stock of natural resources or any particular mix of human, physical, and natural assets." (10)	Repetto, R. (1985). The Global Possible - Resources, Development, and the New Century. Yale University Press, New Haven, CT. [Pezzey 1989].
"The sustainable community, as the architect planner Sim Van der Ryn suggests, 'exacts less of its inhabitants in time, wealth, and maintenance, and demands less of its environment in land, water, soil, and fuel.' I would add that it also demands more of its inhabitants in terms of participation, cooperation, and civicness, and provides more opportunities for these as well." (2)	Veiderman, S. (1993). "The Economics and Economy of Sustainability; Five Capitals and Three Pillars." presented at the Delaware Estuary Program Conference on "Preserving Our Future", November 30, 1993, Philadelphia, PA.
"Sustainability is a relationship between dynamic human economic systems and larger, dynamic, but normally slower-changing ecological systems, such that human life can continue indefinitely, human individuals can flourish, and human cultures can develop--but also a relationship in which the effects of human activities remain within bounds so as not to destroy the health and integrity of self-organizing systems that provide the environmental context for these activities." (25)	Norton, B.G. (1992). "A New Paradigm for Environmental Management," in Ecosystem Health: New Goals for Environmental Management, R. Costanza, B.G. Norton, and B.D. Haskell, eds. Island Press, Washington, DC, 23-41.
"Sustainability within the economic paradigm is sustainability of human welfare through the sustenance of the productive capacities of the economy; sustainability in the ecological paradigm makes essential reference to crucial productive capacities of ecological processes and systems."	Norton, B.G. (1996). "Evaluating Ecosystem States: Two Competing Paradigms," Ecological Economics.
"The market does not distinguish an ecologically sustainable scale of matter-energy throughput from an unsustainable scale, just as it does not distinguish between ethically just and unjust distributions of income. Sustainability, like justice, is a value not achievable by purely individualistic market processes." (320)	Daly, H.E. (1986). "Thermodynamic and economic concepts as related to resource-use policies: comment." Land Economics, 62(3). 319-322. [Pezzey 1989].

Definition	Source
"By 'growth' I mean quantitative increase in the scale of the physical dimensions of the economy; ... By 'development' I mean the qualitative improvement in the structure, design and composition of physical stocks and flows, that result from greater knowledge, both of technique and of purpose." (323)	Daly, H.E. (1987). "The economic growth debate: what some economists have learned but many have not." Journal of Environment and Economics Management, 14(4), 323-336. [Pezzey 1989].
"... 'growth' is if you get just an increasing number of the same type of mail coaches. And if you pass from traveling in mail coaches to traveling by railway, that is 'development'." (294)	Georgescu-Roegen, N. (1988). "About economic growth - a variation on a theme by David Hilbert." Economics and Development of Cultural Change. 36(3) Supplement, S291-S307. [Pezzey 1989].
"[S]ustainability is by default taken to mean 'the existence of the ecological conditions necessary to support human life at a specified level of well-being through future generations, what I call 'ecological sustainability'."	Lele, S.M. (1990). "Sustainable Development: A Critical Review," World Development, forthcoming. [Pezzey 1989].
"In principle, such an optimal [sustainable growth] policy would seek to maintain an 'acceptable' rate of growth in per-capita real incomes without depleting the national capital asset stock or the natural environmental asset stock." (12)	Turner, R.K. (1988). "Sustainability, resource conservation and pollution control: an overview." In Turner, R.K., ed. Sustainable Environmental Management: Principles and Practice. Belhaven Press, London. [Pezzey 1989].
"It makes no sense to talk about the sustainable use of a non-renewable resource (even with substantial recycling effort and reuse rates). Any positive rate of exploitation will eventually lead to exhaustion of the finite stock." (13)	Turner, R.K. (1988). "Sustainability, resource conservation and pollution control: an overview." In Turner, R.K., ed. Sustainable Environmental Management: Principles and Practice. Belhaven Press, London. [Pezzey 1989].
"...in this [sustainable development] mode...conservation becomes the sole basis for defining a criterion with which to judge the desirability of alternative allocations of natural resources." (21)	Turner, R.K. (1988). "Sustainability, resource conservation and pollution control: an overview." In Turner, R.K., ed. Sustainable Environmental Management: Principles and Practice. Belhaven Press, London. [Pezzey 1989].
"Rather than eliminating the [positive] discount rate, the present-value criterion should be complemented by other criteria, such as sustainability. ....For example, we might choose to maximise present value subject to the constraint that future generations are not made worse off." (432)	Tietenberg, T.H. (1984). Environmental and Natural Resource Economics. Scott, Foresman & Co., Glenview, IL. [Pezzey 1989].
"This does not mean that sustainable development demands the preservation of the current stock of natural resources or any particular mix of human, physical and natural assets. As development proceeds, the composition of the underlying asset base changes." (10)	Repetto, R. (1985). The Global Possible - Resources, Development and the New Century. Yale University Press, New Haven. [Pezzey 1989].
"There is broad agreement that pursuing policies that imperil the welfare of future generations, who are unrepresented in any political or economic forum, is unfair." (11)	Repetto, R. (1985). The Global Possible - Resources, Development and the New Century. Yale University Press, New Haven. [Pezzey 1989].
"...sustainability might be redefined in terms of a requirement that the use of resources today should not reduce real incomes in the future..." (11)	Markandya, A. and Pearce, D.W. (1988). "Natural environments and the social rate of discount." Project Appraisal, 3(1), 2-12. [Pezzey 1989].
"One can identify four primary criteria for sustainable development when it is conceived as an ethical ideal: a holistic view of development; equity based on the autonomy and self-reliance of diverse entities instead of on a structure of dependence founded on aid and transfer of technology with a view to 'catching up'; an emphasis on participation; and an accent on the importance of local conditions and the value of diversity." (34)	Kothari, R. (1990). "Environment, Technology, and Ethics," in The Ethics of Environment and Development, J. Engel and J.G. Engel, eds. University of Arizona Press, Tucson. 27-35.

Definition	Source
"[Sustainability] can be accomplished by leaving adequate resources, be they natural or manmade....[G]oods and services can be substituted for one another...what we are obligated to leave behind is a generalized capacity to create well-being, not any particular thing or any particular natural resource."	Solow, R.M. (1993). "Sustainability: An Economist's Perspective," in Economics of the Environment: Selected Readings. R. Dorfman and N.S. Dorfman, eds. W.W. Norton & Company, New York, 179-187.
"...you are almost forced logically to think about equity not between periods of time but equity right now..." (185)	Solow, R.M. (1993). "Sustainability: An Economist's Perspective," in Economics of the Environment: Selected Readings. R. Dorfman and N.S. Dorfman, eds. W.W. Norton & Company, New York, 179-187.
"[S]ustainability is a vague concept. It is intrinsically inexact. It is not something that can be measured out in coffee spoons. It is not something that you could be numerically accurate about." (187)	Solow, R.M. (1993). "Sustainability: An Economist's Perspective," in Economics of the Environment: Selected Readings. R. Dorfman and N.S. Dorfman, eds. W.W. Norton & Company, New York, 179-187.
"No one element can by itself indicate sustainability; it is the nexus of relations between elements working in harmony that indicates sustainability -- like an equation for which an answer cannot be derived from one variable alone but requires the interaction of the variables for solution." (15)	DuBose, J.R. (1994). Sustainability as an Inherently Contextual Concept: Some Lessons from Agricultural Development. Unpublished M.S. Thesis, School of Public Policy, Georgia Institute of Technology, Atlanta, GA.
"Like an equation in which the terms are multiplied by one another, many different values can be assigned to the variables while still yielding the same answer. Sustainability does not require a specific configuration of these variables (culture, environment and society) -- there are numerous and perhaps limitless possible ways in which they could interact sustainably. This is not to deny that there are perhaps some non-negotiable elements that would have to be present in any imaginable sustainability scenario such as air, water, food, and maybe even specific animal species. Even while recognizing that there are some essential elements in the equation the possible permutations are many."	DuBose, J.R. (1994). Sustainability as an Inherently Contextual Concept: Some Lessons from Agricultural Development. Unpublished M.S. Thesis, School of Public Policy, Georgia Institute of Technology, Atlanta, GA.
"Sustainability, I argue, is a community's control and prudent use of capital -- all forms of capital: natural capital, human capital, human-created capital, social capital, and cultural capital -- to ensure, to the degree possible, that present and future generations can attain a high degree of economic security and achieve democracy while maintaining the integrity of the ecological systems upon which all life and all production depends."	Veiderman, S. (1993). "The Economics and Economy of Sustainability; Five Capitals and Three Pillars." presented at the Delaware Estuary Program Conference on "Preserving Our Future", November 30, 1993, Philadelphia, PA.

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