Principles of Sustainability, Fundamental Questions, and Practical Principles

by **Paul Cowles 1996***

I. INTRODUCTION.

In 1980 the World Conservation Strategy gave top priority to the achievement of *sustainability* in the conservation of natural resources (IUCN 1980). The concept of sustainability of resources like forest products has been used for over 200 years (Wiersum 1995) and has grown from a focus on the continued supply of individual types of trees (e.g. sustained yield of hardwoods) to a much broader concept which seeks to ensure the survival of global ecological functions and ecosystems, human cultures, economic structures, societies, landscapes and so forth (Dixon and Fallon 1989; Wiersum 1995). Since the first widely publicized definition of this broader concept of sustainability in "Our Common Future" (i.e. sustainable development) as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987), a debate has waged over what sustainability and sustainable development really mean and how they might be achieved (McKercher 1993). This debate has been multidisciplinary, and references to sustainability can be found in many literary disciplines including, but not limited to: economics, agriculture, forestry, ecology, planning, tourism and protected area management. The debate, while often focusing on the ambiguous ways that the concept of sustainability is applied (Brown *et al.*. 1987), has done much to help frame the discussion of what is or is not sustainable (Beatley 1995a). This paper agrees with "Our Common Future" in that the basic definition or goal of sustainability is to live on this world in such a way as to ensure that we pass on to our children a world which is not merely capable of supporting life but one which is *worth* living on. The practical question of how to achieve this lofty goal remains open to discussion. …

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III. A SYNTHESIS OF THE CONCEPT OF SUSTAINABILITY FROM AN ECOSPHERE VIEW.

..."sustainable development is not a goal, not a condition likely to be attained on earth as we know it. Rather it is more like freedom or justice, a direction in which we strive"... (Lee 1993: 200)

In order to begin to develop a strategy for implementing an ecosphere approach to planning for sustainability we need to develop a common understanding of what makes up the concept of sustainability. Sustainability has been variously defined through its history. A common thread in its definition is that it is always meant to imply the maintenance of something, such as agriculture or forestry or in its later iterations development and society, over an extended period of time (Shearman 1990).The concept of sustainability has been reviewed extensively (see Brown *et* al 1987, Redclift 1987, Dixon and Fallon 1989, Daly 1990, and Beatley 1995b). The purpose of this section is to present a review of the concept of sustainability in such a way that it will be relevant to our ecosphere viewpoint and protected area management planning in East Africa. I will present information on where the idea of sustainability comes from and how it is defined, some of the ethics which underlie it, a discussion of the economics of sustainability, the relationship between carrying capacity and sustainability and eight fundamental questions that should be answered in developing a vision of the concept.

Origins and Definitions of Sustainability.

The concept of sustainability as it is used today has its roots in many different areas. The most obvious is that of sustained yield biological resource use, such as has been applied with varying degrees of success to the fields of forestry and fisheries (Brown *et al.* 1987; Dixon and Fallon 1989; Wiersum 1995). This form of sustainability seeks to maintain a constant supply of a given resource or set of resources which are of value to humans. The concept of carrying capacity, which has its beginnings in the range, wildlife, outdoor recreation and ecological sciences (Sumner 1936; Dasmann 1964; Godshalk and Parker 1975) has also been identified as being linked conceptually with sustainability (Brown, *et al.* 1987; Beatley 1995a). Like sustainability carrying capacity tries to identify limits; specifically it seeks to identify the levels of use of a resource (e.g. number of cattle that can be grazed on a given meadow) that can be maintained over a period of time. The limits to growth debate of the 1970's, which , also is considered to be a significant influence on the concept of sustainability (Redclift 1987). These varied sources of influence on the concept have greatly affected its development.

Dixon and Fallon (1989) identified 3 distinct uses of the concept of sustainability as it has developed over time. The first usage is as a purely biological concept based on maintaining the supply of a *single* resource, such as hardwoods, or specific fisheries. This is the traditional sustained yield concept which requires keeping exploitation levels below regeneration levels. The second usage of the concept is also a biological sustained yield type concept. It is a simple extension of the first which stresses the maintenance of a *group* of resources such as might be found in a particular ecological community or ecosystem. Dixon and Fallon (1989) suggest that the development of this second usage was necessary due to a recognition that focusing on just one species or resource ignores other aspects of the system in which that resource exists, resulting potentially, in use which is unsustainable. These biological concepts can be implemented, in theory, if we understand the biology of the resource or ecosystem in question. Practical application, however, is limited because these concepts ignore the

influence of social, economic (Dixon and Fallon 1989) and institutional limitations (Young 1991; Githingi and Perrings 1993), which are commonly associated with the management of natural resources. In other words they fail to recognize the integrated nature of the ecosphere. These approaches to sustainability fail to ask important questions about the cultural, social and economic systems which are integral parts of the systems we are trying to sustain.

These problems are addressed to some extent by the third usage of the concept of sustainability, identified by Dixon and Fallon (1989). This is a concept which seeks to maintain the viability of all the complex systems which support society, i.e. . This concept is embodied in the idea of sustainable development called for in the "World Conservation Strategy" (IUCN 1980) and later refined in "Our Common Future" (WCED 1987). While at first glance this extension of concern to these different systems seemed to provide an adequate framework from which to work towards sustainability, the ambiguities which result from the value laden nature of the concept were soon identified (Brown *et al.* 1987 and Dixon and Fallon 1989). The differing values of those interpreting sustainability led to differing ideas of what sustainability actually is and how it might be achieved (i.e. the economic growth vs. ecology centered paradigms of sustainability identified on page 2). There are considerable philosophical divisions over which systems should receive priority and little practical advice on how to resolve conflicts between the systems (McKercher 1993). Also important is the fact that this usage sees the social, economic and ecological systems as basically separate entities, suggesting we can understand them in isolation from each other.

Meadows *et al.* (1992: 207) provides some focus to the problem of sustainability's inherent ambiguities and this separation of systems by taking a fairly in depth system level look at what a sustainable society might be like. In their words: "a sustainable society is 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" (emphasis added). This definition picks up on the integrated nature of the components which support society and ultimately ensure sustainability. It is not just a matter of taking care of any one of the cultural, social, economic or ecological components. Since these components of the ecosphere are inextricably linked, we must ensure the resiliency of all of them together. If this is not possible then we should work to protect and strengthen at least all of them that we can have an effect on, in the hope that instability in one component might be absorbed by higher levels of stability in others. For example focusing efforts on local support for a protected area through education, agricultural development and protection of ecological functions, in a situation where little can be done about national political instability, could help ensure the areas' survival in the event of insurrection.

The Ethics of Sustainability.

> While much has been made about the problems with defining the concept, sustainability has had the effect of making us question "what is or is not sustainable." (Beatley 1995a: 339)

Nearly universal in definitions of sustainability is an ethical stance which extends our moral obligations to future generations (Dixon and Fallon 1989). This takes the form of arguments which stress that we should pass on to our children an adequate supply of natural capital which they will need to live adequately. This issue of inter-generational equity leads us to the idea that we must extend our time horizons beyond the normal 5 to 10 year planning cycle (Cocklin 1989). Beatley

(1995b) goes so far as to suggest that planning for 500 year periods should no longer be considered ludicrous. While a 500 year plan may not be realistic given the different temporal scales in which the ecological, economic, cultural and other social components of the ecosphere change, his suggestion underlines the fact that much planning takes place at too short a temporal scale.

Intra-generational equity is also an important ethic which underlies the concept of sustainability. This ethic was expressed in "Our Common Future" (WCED 1987) by the call for rapid economic growth in the lesser developed countries of the world. While this call for growth has been criticized repeatedly for being incompatible with *ecologically* sustainable development of the biosphere (Redclift 1987, Reid 1989 and Daly 1990) it does point out the inequitable distribution of resources within the present generation. It seems that the Bruntland Commission (as the authors of "Our Common Future" are commonly called) might have avoided some of this criticism by calling for rapid economic *development* rather than growth. Moving lesser developed nations to a level of development which gives them a chance to compete with developed countries, i.e. moving from agriculture dominance to industry - service dominance as suggested by Meadows *et al.* (1992), would go a long way toward resolving issues of intra-generational equity (albeit at the possible sacrifice of natural resources). Intra-generational equity need not only apply to inequities between nations but can also be an important issue *within* societies, developed or otherwise.

Within the ecosphere approach to sustainability what are the rights of people, both living and yet to be born, in terms of the life that they can expect to live? What is necessary to live well in the world? Perhaps a viable framework for answering these questions is found in the idea of sustainable *livelihoods*. Chambers (1986) described sustainable livelihoods as "a level of wealth and of stocks and flows of food and cash which provide for physical and social well-being and security against becoming poorer" (as quoted in Barbier 1987: 105). This represents the basics of what should be provided to present and future generations while ensuring the resiliency of the integrated cultural, social, economic and ecological components of the ecosphere.

Another important ethical aspect of sustainability is the way one values non-human entities in the world, be they animals or ecosystems or processes. The sustainability literature ranges from strongly anthropocentric to strongly ecocentric ethical viewpoints. Anthropocentrism views the world and its resources in terms of their value to human beings. Within this ethical framework an animal, or forest or ecological process can only have value if it is valued by humans. According to Beatley (1994) (as adapted from Hare 1987) from the anthropocentric view, entities in the world might have *instrumental* or *intrinsic* value. Instrumental values are the outputs we can get from the environment, for instance wood products from forests. Intrinsic values are also held by humans, and might be represented by aesthetic experiences such as recreating in a forest ecosystem or just knowing that it exists. Ecocentrism, on the other hand, takes the position that all things, living or non-living have *inherent* value whether they are of use to humans or not (Beatley 1994 as adapted from Hare 1987). This position would view forests as being inherently valuable because they have a right to exist on a par with human beings. Shearman (1990) and Young (1991) feel that while the ecocentric position is in many ways more defensible ethically, it is the anthropocentric arguments which will most likely be effective, given the world as it is today. The ecosphere approach to sustainability finds itself more or less in the middle of these two extremes, recognizing that human systems (economic, social or cultural) and ecological systems are integrated (and therefore interdependent) components of the larger ecosphere. Each component is required (valued) in order to ensure the resiliency of the whole.

The Economics of Sustainability

Discussions of economic theory and applications play a key part in much of the literature related to sustainability. To gain a better understanding of sustainability it will be necessary to briefly review some of the discussion which has surrounded the debate over the role and usage of economics and the related need for a shift in economic paradigms in achieving sustainability. There is a growing belief in our society that current development activities in the world which are meant to improve human conditions will prove, in the long run, to be harmful to human welfare (Redclift 1987; Shearman 1990). Daly (1991) and Rees (1995) point out that if we are going to reverse that trend we will need to change from an "expansionist paradigm," which relies on neoclassical economics, technological fixes and reductionist scientific analysis, to a "steady state" or ecological paradigm which is more holistic in its view of the world and recognizes that there are real limits to quantitative or economic growth. Neoclassical economists, working from the expansionist paradigm, view economic systems as being separate from and independent of nature. These economic systems view man-made capital as being equivalent to natural capital (Daly 1991). This is reflected in a confidence that technology will be able to replace any natural products or ecological services which may become scarce (Foy, 1990; Norgaard in d'Arge *et al.* 1991; O'Riordan 1991; Orr 1992; Rees 1995). Essentially, when faced with questions of sustainability the expansionist paradigmatic view states that we can grow our way to sustainability (Rees 1995).

To better illustrate, Norgaard (in d'Arge et al, 1991: 7) presents three "progressive beliefs" which have greatly influenced neoclassical economics and the expansionist paradigm:

1. Technological advances would solve problems of resource distribution over future generations.
2. All people of the world would eventually come to a rational understanding of the world that would end conflicts among people, cultures and nations.
3. Scientific experts could make technical decisions on behalf of the public by understanding the nature of the problems and the most appropriate solutions, thus avoiding the irrationality of politics.

Norgaard points out that none of these beliefs seem to be coming to fruition. Obviously a different conceptualization of the world and the role of humans in it is needed.

The principal problem with the neoclassical economic approach is that it does not have a way of dealing with the consumption of natural or environmental capital (renewable and non-renewable natural resources and ecological services) in such a way as to ensure the availability of those resources to future generations (Daly 1991). All forms of economic activity which draw more from the environment than they return and do not replace the loss of environmental capital are by definition unsustainable (O'Riordan 1991). While some substitutions for natural capital can occur, human made capital cannot substitute for natural capital like ecological services (such as water and carbon cycles). Daly (1990: 3) stresses that man-made and natural capital are "basically complementary" but are "only very marginally substitutable." For example: "more hammers and saws cannot substitute for lumber in building a house." While one might substitute a different material for lumber such as plastic, cement or recycled materials this merely changes either the type or amount of natural capital

which is required to create the house. Each of these changes might be beneficial in terms of ensuring sustainability but they do not replace natural capital.

The only way of determining whether or not a particular natural stock should be consumed or preserved for future generations, according to neoclassical economics, is by using an efficiency criterion for the allocation of these environmental assets (in other words allocating resources based only on cost benefit analysis) (Foy 1990). Relying solely on efficiency to make this decision suggests that there is no moral obligation to pass environmental assets on to future generations (Foy 1990), it need only be done if it is efficient from a purely utilitarian perspective (Beatley 1994). This is clearly at odds with the ethic of inter-generational equity which is integral to the Bruntland Commission's (and this paper's) definition of sustainability.

Steady State Paradigm

Alternatively, in the "steady state paradigm", Rees (1995: 347) views the economy as "an inextricably integrated, completely contained, wholly independent subsystem of the ecosphere." Given this, economic activities, rather than being analyzed separate from the biosphere, are subject to the second law of thermodynamics just as are all activities in the biosphere (Daly 1991; Rees 1995). The second law states that entropy (the amount of disorder) increases with every energy or material transformation. In this paradigm nature is the primary producer and all consumption (economic or otherwise) contributes to the overall load on the environment or the overall level of entropy in the environment. Daly (1990: 1) also suggests that we need to view the human economy as "a subsystem of a finite global ecosystem which does not grow, even though it does develop" (emphasis added). Based on this, Daly continues, "it is clear that growth of the economy cannot be sustained over long periods of time." Meadows *et al.* (1992) and Daly (1991) both stress the fact that growth refers to *quantitative* increase in size while development suggests *qualitative* improvement. Steady state economic systems, like ecological systems, are limited in the extent to which they can grow physically but are unlimited in their dynamic ability to develop in terms of complexity and diversity. From an ecosphere perspective though, an increase in the complexity and diversity of particular components (economic) are not necessarily qualitative improvements if they lead to a loss of resiliency in the other integrated components (cultural, social and ecological) of the ecosphere.

If we are to pursue sustainability as a societal goal there is a need to pass on to our children an adequate supply of natural capital, which will pay interest (renewable resources, ecological processes and services) and support them. Most solutions to the problems of how to deal with natural capital in economic systems involve some way of changing the way we value these resources. This could be as simple as changing the discount rate (Orr 1992) or as complex as Foy's (1990) recommendation that we develop safe minimum standards for the levels of environmental assets that should be protected. In other words he asks, what is the minimum environmental preservation needed to ensure the functioning of ecological processes important both socially and economically? Daly, (1990) and Pearce *et al.* (1990) also argue for and present examples of preserving minimum levels of natural stocks (capital). An obvious problem with this approach is the unrelenting growth in human population. Dixon and Fallon (1989) remind us that an increasing population base suggests that maintenance of physical stocks at current levels will result in a net loss of resources for future generations, so the goal of sustainable development must also be the enhancement of natural capital as well as placing limitations on consumption or placing limits on the population. The ecosphere approach would deal with this problem by focusing on the resiliency of the ecological components in relation to the other integrated components of the ecosphere, rather than taking a strict accounting of natural vs. human made capital. A loss of ecological resiliency, which could accompany a loss of natural stocks, would be countered by a change, or several changes, in the economic, social or

cultural components. The change(s) would be designed to increase the resiliency of the ecological components. This scenario of correcting for a loss of resiliency could be applied to any of the integrated components.

A final argument against neoclassical economics involves the uncertainty of what may happen ecologically in the near to long term future -- taking steps towards a sustainable world (i.e. valuing natural capital as suggested by environmental economists) would seem to be the most conservative path. These steps could be seen as an insurance policy against ecological disaster. Should they prove ultimately to be unnecessary then we are only out the "insurance premiums," on the other hand if they are needed they will be extremely valuable (Rees 1995; Ruckelshaus 1989).

Neoclassical economic theory does not support a sustainable ecosphere world view such as I am proposing in this paper. The basic separation and independence of the economic systems from the rest of the world which is integral to the neoclassical economic view, make it of limited use in developing an ecosphere approach to sustainability. Steady state economics on the other hand provide a world view which meshes very well with our ecosphere viewpoint. The idea that the world economy is an integrated component of a much larger overall system is inherent in steady state economics as well as our ecosphere view which contains ecological, social, cultural as well as economic components which are integrated more like cogs and gears rather than closed circular systems.

Steady state economic theory suggests that one of the major roles that protected areas and their management play in sustainability is the protection and management of natural stocks so that they might be passed on to future generations. Given the interrelated nature of the ecosphere however, simply protecting these areas from encroachment will not be enough. These areas are a part, to one degree or another, of the economic, social, cultural and of course ecological subsystems in and around the protected area. We cannot simply keep one of these cogs well oiled and healthy and expect the others to take care of themselves.

Carrying Capacity and Sustainability.

> "We cannot simply choose between a healthy economy or a healthy environment for the two are inextricably linked and, ultimately, we cannot have one without the other." (Young 1991: 32)

Rees (1995: 349) sums up one of the basic problems of achieving sustainability: "at what point does the erosion of ecosystems and the entropic 'disordering' of the ecosphere begin to interfere with its capacity for self-production?" Complex systems behavior theory suggests that ecosystems may reach invisible critical points of no return due mainly to a lag time between cause and effect (Rees 1995). In other words *cumulative* impacts to ecosystem structure can cause seemingly sudden and irreversible changes in it. This calls into question our ability to manage ecosystems sustainably (Myers 1992; Rees 1995). Rees (1995) goes on to define the problem as one of determining the carrying capacity of the biosphere and then living within those limits. Unfortunately others (e.g. Brown *et al.* 1987) have argued that the use of the carrying capacity model does not bring us any closer to a practical application of sustainability.

Brown *et al.* (1987) discuss the role of the concept of carrying capacity in sustainability. While it is important in visualizing sustainability, attempts to define carrying capacity for the world or for a complex ecological, cultural, social and economic system are problematic. This is mainly due to the complexity of understanding how these different systems interact. This same road block was encountered in the field of wilderness management (a sub-discipline of outdoor recreation) where determining the visitor carrying capacity for a particular park or wilderness area has held the interest of researchers for over 50 years (Hendee *et al.* 1990). In wilderness management it was eventually realized that the concept of carrying capacity, while its roots were in understanding the relationship of wildlife or stock use on natural habitat, also included social aspects, such as desired visitor experiences and legally defined management goals. Due to the nature of impacts recreation use could cause in wilderness (social and environmental), the process for determining the carrying capacity involved the use of human judgment and values as well as the physical sciences (Shelby and Heberlein 1986). This however does not lead to the definition of a numerical limit on the use of an area. Instead it allows us to set standards of change that are acceptable for indicators of interest to managers and those who recreate on the area. When these standards are exceeded we know that the carrying capacity is also being exceeded and management actions can be implemented to correct the problem (Stankey *et al.* 1985 and Shelby and Heberlein 1986). It would seem that the carrying capacity concept as it applies to sustainability carries the same need for a blend of the social and environmental sciences in determining the limits of *change* that will be allowed in the ecosphere.

In looking at the usefulness of the concept of carrying capacity in achieving sustainability of protected areas, we need to remember that ecosystems, as has been repeatedly pointed out, are not the only complex systems we are dealing with. Economic, cultural and social systems are also complex and may also "reach invisible critical points of no return" which could have negative impacts on the ecosystems we are trying to manage. Our ecosphere approach, therefore, needs a framework which will allow us to: (a) identify the critical elements (indicators) of the resiliency of each of the components, (b) determine how much change (standards) we will allow in each element, and (c) determine how to react (management actions) when changes are excessive.

Fundamental Questions.

While it is the view of this paper that the basic definition of sustainability is not in question (e.g. to live on this world in such a way as to ensure that we pass on to our children a world which is not merely capable of supporting life but one which is *worth* living on) operationalizing the concept remains problematic. The literature stresses fundamental questions that need to be explored in looking at the implications and ultimately the implementation of sustainability. I will present and discuss these *sustainability filter questions* from an ecosphere viewpoint. Answers to these questions should give us a better idea of what our *vision of sustainability* is for a specific context, i.e. a protected area. Building this vision is an important step towards operationalizing the concept of sustainability.

What is being sustained?

Young (1991) and Gale and Cordray (1994) both stress the importance of understanding what it is that we are sustaining. For example when we discuss sustainable protected area management are we talking about sustaining the ecology of the defined protected area, the benefits which flow from or are encompassed in the area, the management structure of the area, the jobs created by managing the area, or the tourists who visit the area? From an ecosphere perspective perhaps what we are sustaining is the overall system which includes all of the above and much more. It is also important to realize that sustaining this system does not suggest it is static. The dynamic nature of the systems we are working with suggest that what we really want to sustain is their resiliency (Githingi and Perrings 1993).

For whom are we sustaining it?

As mentioned above sustainability is a very inclusive concept, it includes both inter and intra-generational equity issues (Dixon and Fallon 1989; Shearman 1990; Young 1991). For instance, are we sustaining protected areas for the use of all people alive (intra-generational equity) and those yet to be born (inter-generational equity)? Or are they being sustained for some subset of the those two groups (e.g. scientists, tourism operators, or the economically privileged)? The ecosphere perspective would suggest the broader interpretation is more appropriate.

For how long are we sustaining it?

We need to make our time assumptions explicit. Exactly how long down the road are we looking? The answer may change many of the assumptions that underlie our implementation of sustainability. Brown *et al.* (1987) and Young (1991) both stress the importance of this question. Young (1991) discounts the response that 'forever' is our time frame since it seems unlikely that any complex system is sustainable in the same basic form forever. Different cultures and disciplines plan at different time scales. In commerce one to three year business plans are not uncommon, while natural resource management plans frequently run on ten year cycles. Some Native American cultures, on the other hand, make decisions based on the impacts to the seventh generation (Beatley 1994). The ecosphere approach requires that protected area planning be done making projections as far into the future as is practicable based on the temporal contexts of change within each of the integrated components.

Why sustain it?

Gale and Cordray (1994) asked this question in trying to understand the values attributed to different outputs which are perceived as being sustained. Traditional responses to the question of why we need

to sustain protected areas could include: to preserve biodiversity, to ensure a clean constant water supply, to provide for tourism which will supply hard currency, because we have an ethical responsibility to do so or because people like diverse natural landscapes. From an ecosphere approach however, protected areas should be sustained because of their role as part of one of the essential cogs which make up the larger system. This decision to maintain the area as an "essential cog" could be justified based on anthropocentric or ecocentric grounds.

What are the appropriate indicators of sustainability?

How will we know that our efforts to sustain protected areas are successful? We need to have measurable indicators of sustainability (Brown *et al.* 1987; Young 1991; Hailu and Runge-Metzger 1992; Gale and Cordray 1994; Beatley 1995b). We must select and measure key indicators which may include things such as: level of species diversity, the presence and relative condition of key wildlife populations, water quality (turbidity etc.), the attitudes of local people towards the protected area, the level of satisfaction of tourists, or the number of violations of protected area regulations, to name a few possible indicators. The indicators we select should be specific to each of the ecosphere components which affect the protected area and indicate the resiliency of each.

Who are the key institutional players?

Gale and Cordray (1994) used a question similar to this to determine what issues and constituencies would be likely to be involved in conflicts over how a resource allocation problem should be resolved. Based on how sustainability is defined for a protected area what are the likely social ramifications? Will the local people, political, cultural and governmental structures be supportive? Will more distant regional, national or international corporations or politics become a factor? Who is likely to be supportive of our vision of sustainability and who will resist and why? If at the outset of planning for sustainability of protected areas we recognize potential friends and foes we can adjust our activities to try and encourage the former and win over the latter.

Who is responsible for sustaining it?

While not explicitly mentioned in the literature it seems that an ecosphere approach would require knowing who is taking responsibility for seeing that sustainability is achieved. This could include government agencies, non-governmental organizations (NGO's), local communities, private volunteer organizations (PVO's), etc. For instance, is the sustainability of a protected area the sole responsibility of the government or does it include other organizations and/or the communities that live around or even in the protected area? An ecosphere approach would indicate that we should try and get as broad a commitment to implementing sustainability as is possible.

What are the consequences of our vision of sustainability?

The ecosphere approach to sustainability requires that we give equal emphasis to ensuring the resiliency of the cultural, social, economic and ecological components. This does not mean that there will not be trade-offs between these components. At different times and under different circumstances it may be necessary for one component to take priority over others. We need to be explicit in how we prioritize the components and how that prioritization might change. At the same time we need to understand the consequences of potential trade-offs (Shearman 1990). Will the results of our sustainable protected area management truly be sustainable from an ecological, cultural, social and economic perspective for the long-term? If we are trading off some aspect of these components we need to be explicit in describing the trade-off and explaining why it is justified.

Using these eight sustainability filter questions allows us to understand, explicitly, the nature of our assumptions about and values of sustainability. This understanding can be used as a basis for defining a vision of sustainability for a given situation The following section details a set of 7 principles which can be used to further develop and implement a vision of sustainability for an East African protected area.

IV. PRACTICAL PRINCIPLES OF SUSTAINABILITY FROM AN ECOSPHERE PERSPECTIVE.

The purpose of this section is to present a set of seven principles of sustainability adapted to fit within our ecosphere paradigm. They were selected and developed based on recommendations made within the sustainability literature and their logical fit with the ecosphere view. Where appropriate the principles include references to the implications for East African protected area management. These principles provide a starting point for determining the necessary components of a sustainable protected area management planning process.

1. Think long-term.

Inherent in the concept of sustainability is the use of long temporal scales (Dixon and Fallon 1989; Cocklin 1989; Young 1991). We must extend our time horizon for protected area planning to a scale which encompasses the ecological, cultural, social and economic components of the ecosphere. Temporal scale should be based on the time horizon for significant change within each of these components. These assumptions about time should be explicit in our vision of and goals for the protected area.

2. Manage protected areas as "integrated systems."

Making decisions about the use of resources on too small a scale can lead to problems with sustainability (Orians 1990). Given the nature of protected area establishment procedures in East Africa (see page 5) their boundaries rarely capture entire ecological sub-systems (Lusigi 1982 and 1994; Western 1982) and probably never completely include the cultural, social and economic components. In some cases however these components are integral to maintaining the viability of protected areas. This can be seen in the role the Maasai play in keeping agricultural encroachment from occurring around Amboseli National Park, Kenya (Western 1982; Hannah 1992). The traditional grazing system used by the Maasai ensures that wildlife are able to migrate out of the park during wet seasons. This significantly increases the wildlife carrying capacity of the Park over what would be possible if populations were restricted solely to the park (Western 1982). This points out the need to be aware of how the human and natural systems have traditionally (and in the past, at least, sustainably) interacted over the entire area in order to better understand what role our specific protected area might continue to play in those systems (Lusigi 1982; Western 1982; Zube 1992).

Managing from an ecosphere perspective suggests that an integrated system is defined by the interactions which occur between the ecological, economic, cultural and social components of that system. Inherent in an ecosphere view is the idea that humans are capable of undermining (i.e. causing the failure of) the integrated components on which they depend. For that reason management efforts will often be focused on changing human behavior. However, these changes should be implemented within a context which does not destabilize (i.e. reduce the resiliency of) the cultural, social, economic or ecological components. If actions could potentially destabilize any of these components then efforts should be made to increase their resiliency or find other actions which meet the needs of management without the destabilizing effects. For example resiliency in the economy or

agricultural production might be increased, in response to a loss of access to a protected area, by increasing diversity in the economy or introducing other means to meet agricultural needs. We need to be aware that there are real limits to the resiliency of these systems (Githingi and Perrings 1993) and we may not be aware when critical points are reached due to the delayed nature of cause and effect cycles in complex systems (Rees 1995).

At the same time that planning horizons are expanded it should be remembered that one danger of managing at too large a scale is the increased possibility of unsustainable activities due to the reduced likelihood of ethical behavior on the part of participants and the impracticality of being able to monitor progress towards sustainability (Orr 1992). It may be impractical to include every facet of every integrated system component involved, but even a partial inclusion and understanding of them are more likely to encourage sustainability than focusing solely on one aspect of the ecosphere.

3. Plan and implement in an interdisciplinary atmosphere.

Interdisciplinary planning, as opposed to multi- or uni-disciplinary planning, brings experts from different fields together to plan collaboratively, rather than separately, on a given project (Caldwell 1982). Interdisciplinary planning processes allow for a true blending of experiences and knowledge (Caldwell 1982) that is essential to the perceived need for un-fragmented planning for conservation and development, a need recognized by the World Conservation Strategy (IUCN 1980). Planning efforts are criticized repeatedly in the sustainability literature for being fragmented in their approach to the environment and development (Reid 1989; Shearman 1990; Fri 1991; Beatley 1995b). This criticism also extends to the planning and management of protected areas, which can all too often focus only on what happens within the borders of the protected area (MacKinnon *et al.* 1986; Lusigi 1994).

Some of the earliest attempts to integrate conservation and development in protected area management took place in East Africa (e.g. Amboseli National Park, Kenya and The Bururi Forest Project, Burundi) (Hannah 1992). These types of projects, in general, sought to reduce pressures on protected areas by facilitating various kinds of development projects for the surrounding population (e.g. tourism revenue sharing, agricultural development activities, etc.). While the results of many of these early Integrated Conservation Development Projects (ICDP's) were mixed they taught some valuable lessons (Talbot and Olindo 1990; Hannah 1992; Wells *et al.* 1992). Namely, that when implementing an ICDP the linkages between the social and economic benefits that will result from the development project and the needed changes in behavior to reduce pressure on the protected area need to be made explicit. In general this linkage is not well addressed in these projects (Wells *et al.* 1992; Durbin and Ralambo 1994; Ferraro and Kramer 1995). Also, most ICDP's focus on a beneficiary approach which views participants in a development effort to be passively involved in the project as opposed to actively involved in their own development. The second approach should have longer-term benefits although the time needed to implement it sometimes conflicts with conservation goals to reduce environmental degradation as soon as possible (Wells *et al.* 1992; Ferraro and Kramer 1995).

4. Monitor progress towards achieving the defined vision of sustainability.

Another critical aspect of defining sustainability is knowing how we are going to measure (monitor) it (Brown *et al.* 1987; Young 1991; Hailu and Runge-Metzger 1992; Gale and Cordray 1994; Beatley 1995b). Since there is no "single measure of general-system sustainability" (Cocklin, 1989: 348-9) we need to select a set of measures or indicators of sustainability. The selection and monitoring of ecological, cultural, social and economic indicators is well supported in the literature (Brown *et al.* 1987; Young 1991; Hailu and Runge-Metzger 1992; Beatley 1995b). One could add administrative or managerial indicators to this to emphasize, specifically, the needs of protected area management and administration. Problems of evaluation between different kinds of indicators can be solved through the use of goal setting and prioritization of the indicators to determine which ones take precedence (Cocklin, 1989).

5. Adapt the management and planning structures based on monitoring.

The need for experimentation and adaptability in planning and management is repeatedly stressed in the sustainability literature (Cocklin 1989; Reid 1989; O'Riordan 1991; Young 1991). This suggests the need for planning and management structures which are dynamic and subject to regular if not continuous revision of strategies, priorities and actions, based on the results of monitoring. Given the complex nature of the ecological, cultural, social, economic and administrative systems which are involved in protected areas management this adaptability is essential to achieving the vision of sustainability that has been defined.

6. Plan collaboratively with broad based community involvement at the local level.

This principle of sustainability requires that those most affected by management actions or those with a 'stake' in those actions (i.e. *stakeholders*) be involved in the design as well as the implementation of those actions (Reid, 1989). Given an ecosphere view of the world this could be a potentially long list, however the more inclusive the processes the more likely they are to succeed. Many works on sustainability stress the necessity of broad based involvement with communities and governments and their empowerment at the local level in order to ensure sustainability (Barbier 1987; Brown *et al.* 1987; Redclift 1987; Cocklin 1989; Reid 1989; Dixon and Fallon 1989; O'Riordan 1991; Young 1991; Clark 1994; Rees 1995). They argue that it is at the local level that changes in behavior dictated by sustainability have their best chances for success. For this reason and based on evaluations, it has been argued that projects run by locally based private volunteer organizations (PVO's) and non-governmental organizations (NGO's) tend to be more successful in achieving objectives of sustainability than large regional efforts run by cumbersome aid agencies (Reid 1989; O'Riordan, 1991). Partnerships between protected areas and these kinds of organizations should be actively pursued, especially in the implementation of ICDP's (Wells *et al.* 1992). Protected area managers must avoid implementing community involvement in a token manner, i.e. asking for input after the important decisions have been made (McCoy *et al.* 1994). This does not suggest that stakeholders should posses veto power over all decisions, or make decisions on aspects of protected area management outside their area of expertise. It does suggest a responsibility to share decision-making power in appropriate areas. We need to remember to involve bureaucrats, civil servants and

government officials among stakeholders because of their potential ability to block or enhance activities (Young 1991). The protected area manager in his or her role as planner can practice skills such as education, facilitation and mediation between stakeholders in order to promote the goals of sustainability (Rees 1995).

The role of women, disadvantaged groups and indigenous peoples should also be considered in protected area planning processes. The importance of these groups in achieving sustainability, especially in the developing world, has been receiving more and more recognition (Reid 1989; O'Riordan 1991; Young 1991; Hessing 1993). Training these groups, involving them in planning processes and making them the focus of educational efforts is the best way to ensure their support of activities which promote sustainability. For example, in Africa, most agricultural activities, fuel wood and water collection and their use is performed by women (Reid 1989, Hessing 1993). They are an important economic and social force in terms of their ability to affect the sustainability of protected areas. Likewise the roles of disadvantaged groups and indigenous peoples can be critical in ensuring the sustainability of protected areas (MacKinnon *et al.* 1986).

7. Educate leaders and citizens about sustainability and the role of protected areas in sustainability.

The concept of sustainability from an ecosphere perspective is more complex than the prevailing short term viewpoints that emerge from the traditional focus on resource extraction, commodity production or strict nature protection efforts. For people to understand the underlying reasons to shift to a more sustainable lifestyle and ultimately to be more supportive of protected area management efforts we must have comprehensive environmental education programs (Lusigi 1982). Given the expertise of protected area managers the education of local citizens in environmental and sustainability issues is a possible extension of their responsibilities. Efforts should stress the development of education programs which help people understand how they are served by pursuing the objectives of sustainability, the importance of ecological integrity and protected area management and how these are tied to the provision of *their* basic needs and rights (O'Riordan 1991). We should not wait for top down strategies, this must be a bottom up educational effort at the local level (O'Riordan 1991). We must also include local political leaders and bureaucrats in our education programs (Lusigi 1982). Beyond just a need to educate people about conservation and sustainability Fri (1991) stresses that we have a responsibility to promote the broader distribution of "knowledge resources" especially in the developing world which he sees as the chief battle ground for achieving economic well-being and environmental sustainability.

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