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Biodiversity and Sustainable Development

Research Exercise 31.499

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Introduction

Introduction

Economic development has had an increasingly detrimental effect on the environment. The current level of environmental impact by humans has been unprecedented for a single species in the history of the earth. In recent years there has been an increased realisation of the detrimental impact of our actions. Along with this realisation there has been an improvement in the understanding of the fundamental importance of the environment to the human society.

The aim of this thesis is to examine the possibility of sustainable development, a concept which has arisen out of this increased awareness of the dynamic interconnectedness of the environment and development. A more environmentally destructive development path will reduce the quality of the environment not just for today but in the future. This thesis will endeavour to show that, if we are to achieve sustainability, we need to change our attitude towards the environment.

To do this I will look at two broad perspectives of what is meant by sustainable development: technocentric and ecocentric (O'Riordan 1981:1). Their primary difference is in their attitude towards the environment. This thesis will highlight the technocentric perspective as it has become the dominant development throughout the globe. It will primarily focus on critiquing technocentrism, demonstrating how this approach has resulted in widespread environmental degredation. In looking at the technocentric and ecocentric perspectives I shall attempt to show the significant role that knowledge systems can have in shaping the attitudes of a society.

In order to highlight the need for a change in attitude, and the role that knowledge systems play, I will focus on biological diversity. Biological diversity, or biodiversity, is defined by the United Nations Environmental Programs (UNEP) Global Biodiversity Assessment as "the total diversity and variability of living things and of the systems of which they are a part" (UNEP 1995:9).

Biodiversity is of specific relevance to the sustainable development debate because our continued existence and prosperity is dependant on the natural world. The natural world, which is composed of biodiversity, provides us with biological resources and essential ecological functions, such as nutrient and hydrological cycles. Each ecosystem or species which is lost reduces biological resources and threatens the continuation of these ecological functions.

Human decisions have replaced evolutionary pressures as the prime cause of species' extinctions. Our alteration of habitats, introduction of exotic species and over-exploitation of species, have resulted in extinction becoming primarily a socioeconomic phenomenon. The loss of species exemplifies the unsustainability of our current development. As the high rate of species extinctions is a symptom which illustrates the environmental damage of our current practices.

Biodiversity as a term has only come into prominence in the last few decades, with an awareness of the crisis level of species extinctions. In 1988 it was estimated that the rate of human caused species extinction was up to 40,000 times the natural background rate (Myers 1988:28). Wolf (1987:11) estimated that as much as a fifth of the species present in the mid-1980s could become extinct by the year 2000.

Throughout the history of life on this planet species have become extinct because of changes in their competitive environment. These changes often result from the evolution of a new species. In this situation extinctions occur due to intense selection pressure from competitors and predators. Those species which become extinct are no longer competitive in the altered environment. This background rate of extinction has generally been well below the rate of speciation, or species evolution. Lost species are normally replaced by one or more species resulting in an accumulation of biodiversity.

Because humans are the predominant cause of the current extinction crisis, there is a fundamental difference between extinctions today and those which have resulted from environmental selection. It has been argued by Holmes Rolston III (1985:72) that these differences make them as morally distinctive as death by natural causes is from murder. The current rate of extinction is higher than the rate of speciation, thus we are on a downward spiral, every extinction accelerating the rate at which biodiversity is being lost. Human caused extinctions are not part of the evolutionary process. Rather they are diametrically opposed to it, preventing the continued evolution of entire families of species.

The recogition of the current extinction crises combined with a global realisation of the importance of biodiversity culminated in the 1992 International Convention on Biological Diversity. This was one of the primary achievements of the United Nations Conference on Environment and Development in Rio de Janeiro, and was eventually ratified by almost 120 countries. But why was there a separate convention on biodiversity when species extinctions could have been incorporated with other environmental issues?

The driving forces behind the creation of the Convention on Biodiversity were the concerns of developed, industrialised countries. Their primary interests lay in the preservation of species and ecosystems, preventing the loss of benefits which they receive from their continued existence. Industrialised countries are likely to receive most of the future benefits from scientific advances utilising genetic resources, which predominantly exist in developing countries.

Most of the world's species are believed to exist in tropical, less developed countries. It has been estimated that between 50 and 90 percent of species live in tropical rainforests (Hamilton 1993:6). In many cases the integrity and viability of these ecosystems have been maintained despite centuries on continued human habitation. These habitats are often the ones which are under the most immediate threat of deforestation. The motivations for deforestation vary, timber exportation and conversion to grazing land

being common. Almost universally these habitats are altered in order to promote short term human economic development.

Many of the substantial benefits which society gains from biodiversity incur in areas and countries outside the region where the species or ecosystem exists. The distribution of these benefits often differs widely from those who are responsible for conservation or whose decisions often result in extinction. In many situations the decisions which have the most detrimental impact are made by those who are removed from the direct impacts of their actions.

This thesis shows that the issues surrounding biodiversity are central to the concept of sustainable development. Begining by examining two alternative approaches to achieving sustainable development. The first approach is technocentric development, which advocates a continuation of current development practices with modification to incorporate the environment. It will compare this approach with ecocentric development which argues that unless society adopts a more ecological basis we will not be able to achieve sustainable development. This chapter will place particular attention on the knowledge systems on which these differing development models are based.

In chapter two it will examine the technocentric model, proposing that it inherently fails to provide adequate conservation. It will demonstrate the inadequacies and failures of a market approach which has resulted in widespread extinctions. Next it will propose that the technocentric knowledge system economics is an inappropriate basis for environmental analysis. Then it will look closely at the economic approach to valuing biodiversity in order to illustrate its unsuitability. In doing so it will highlight the importance of biodiversity to humans, showing why it is vital that it is conserved, irrespective of our attitude towards the environment.

Chapter three will examine some of the problems with an individual species approach. This approach has been the most commonly utilised with the technocentric model. These problems occur especially with regard to ecosystem services and the limitations of applying an approach with an individual species focus in a dynamic interconnected environment.

Chapter four will examine the interventionist approach to remedying, or at least addressing, the problem of extinctions which is necessary under a technocentric model. This approach has been the establishment of wilderness enclaves primarily in the form of national parks. Investigating the history of the national park model, which was primarily developed more recreation rather than conservation. It will also investigate the global appropriateness of this Western interventionist model, especially given its belief in the incompatibility of people and nature.

Chapter five will look at the detrimental effects that national parks and other protected areas can have on local people. The support of local people is important for successful conservation. Attempts to gain local support have attempted to incorporate local needs

within protected areas. However these attempts still impose a technocentric approach to conservation. They have generally failed to recognise local people's human rights or involve them in planning and decision making. Finally, it will look at some examples which have involved local participation. These projects have attempted to utilise local knowledge, controls and decision making while aspiring to meet the needs of national and international conservation.

CHAPTER 1

SUSTAINABLE DEVELOPMENT:

TWO APPROACHES

Introduction

The purpose of this chapter is to examine sustainable development. Sustainable development has a wide range of definitions which encompass the connection between development and the environment. Sustainable development is in danger of becoming a catch phrase amongst both developers and environmentalists, incorporating many environmental perspectives. In looking at sustainable development this chapter will highlight equity, an issue which this author believes should be encompassed within sustainable development but is often overlooked within some approaches. Rather than trying to define sustainable development, a term that has many different meanings to many different people, this chapter will focus on two approaches towards sustainable development.

The two broad approaches towards sustainable development examined are technocentric and ecocentric. They differ fundamentally in their outlook towards nature and the degree of change they believe is necessary to current social organisation for development to be sustainable.

Adherents of the technocentric approach believe that reforms to the current system will be sufficient to achieve sustainable development. It advocates a continuation of scientifically based modernisation. Believing that human devised scientific and economic systems will be able to manage and control the environment.

This chapter will argue that these reforms will not be sufficient and that larger, more wholesale changes are needed. It will put forward the proposition that the knowledge systems on which the technocentric system is based will not provide an adequate basis for sustainable development. In attempting to dominate and control nature these knowledge systems have tended to focus on components rather than taking a more harmonious holistic viewpoint.

Even though technocentric development may have increased the prosperity of developed countries, this chapter will suggest some reasons why it may not be applicable to developing countries today. It will question the feasibility of attaining the level of technological innovation which will be required to offset the detrimental environmental impacts of continued development, such as biodiversity decline.

It will also questioning why the technocentric approach has found it necessary to differentiate biodiversity from the environment when considering the current extinction crisis.

Ecocentric development will be presented as a possible alternative approach to achieving sustainable development. Instead of modifying the current social structures ecocentrists argue that there needs to be a fundamental change to current development attitudes. Whereas technocentric development has had a socioeconomic base for decision making, ecocentric development advocates a change to an ecological basis. Where technocentric

development emphasises our ability to manipulate and control nature, the humbler ecocentric approach advocates changing societies behaviour to reflect ecological principles and environmental limits.

The ecocentric approach recognises the legitimacy of knowledge systems other than Western science and economics. Followers of ecocentric approach believe that these alternative knowledge systems, which often evolved in response to the local ecosystem, may be less likely to cause environmental degradation because they do not seek to dominate nature.

Many people who are involved in subsistence economies have been dependant on the local environment for the satisfaction of all of their needs for generations. They have a vested interest in conserving biodiversity and the environment so as to ensure their continued survival.

Sustainability

Sustainable development has become the catch phrase that encompasses the connection between development and the environment. The environmental effects of development and the development process have received considerably more attention as people have become more aware of their interdependent relationship. Environmental quality, clean air and pure water represent a vital component of human welfare and an improvement in human welfare should be the basis of development.

Yet sustainable and sustainability are terms which have ecological origins, emerging in the context of renewable resource management: "Ecological sustainability emphasises the constraints and opportunities that nature presents to human activities" (Lele 1991:609). The focus of ecological sustainability is on biophysical laws that determine the effect human activities are having on the environment.

Intergenerational Equity

This thesis assumes development has a strong equity component, as development should be concerned with improving the welfare of those who are in the most need. In endeavouring to sustain development there needs to be an adequate consideration of the impacts of our actions on future generations. With a focus on intergenerational equity, the Bruntland Report (World Commission on Environment and Development) provides the most common currently popular definition of sustainable development:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development 1987:43).

This widely quoted definition, while not without its problems, does highlight the importance of how we allocate resources between now and the future. "Problems of

allocation in time, between present and future generations, are central to the discourse surrounding sustainability" (Redclift 1994:21).

Biodiversity is of particularly relevance to the Bruntland definition of sustainable development and the issue of intergenerational equity. Our allocation of resources has been a major contributing factor in species extinctions and each extinction reduces the options for future generations.

Intragenerational Equity

Sustainable development is also concerned with the equitable distribution within the current generation. Environmental degradation such as the effects of pollution, often inflict the most suffering on those who are the poorest in society. There are estimated to be a billion people who lack access to clean water and 1.7 billion who lack access to adequate sanitation in developing countries. This has been a leading contributory factor resulting in major health problems for some of the world's poorest people.

Enriching and sustaining the environment and ecological services can be powerfully redistributive, often enhancing the well-being of the poorest in society. Many people within the less developed countries are engaged in subsistence economies, dependent on their local environment for the satisfaction of all of their needs. They bear the brunt of any local environmental degradation. Their costs are extremely high, because they often lack alternative ways to satisfy their basic needs. For those who have accumulated wealth, particularly those within developed countries, there are ready alternatives, they can buy their way out of local environmental problems (The World Bank 1992:31).

There is no doubt that humans are causing considerable environmental degradation. However, those who are most affected almost always differ from those who are the most responsible. The poor are often blamed for environmental destruction. In many situations, while they are the agents of destruction they are not the root cause:

> European agriculture depends on upon massive imports of soya animal feed from South America. Not only is forest being directly cleared to grow soya beans but, outside the forest, large-scale mechanised export cultivation is replacing more traditional peasant farming methods. The displaced farmers are amongst those seeking other land, often in the Amazon region. (Counsell, Juniper and Le Marchant 1992:34).

Social Organisation

Because of the interaction between humans and nature there is also a definite social aspect to sustainability. Social sustainability is defined by Edward Barbier as "the ability to maintain desired social values, traditions, institutions, cultures, or other social characteristics" (quoted in Lele 1991:610). The structures of society and the way in which people interact have been a fundamental cause of environmental degradation.

Differing socioeconomic structures have differing environmental effects; the way in which society is organised, the underlying attitudes, principles and ideologies play crucial roles in the pattern and extent of environmental degradation. There are many diverse societal organisational structures which have evolved, adapting and responding to distinctive environments. The manner in which these societies have adapted has had varying effects on the level of environmental degradation and economic development of these societies.

Social organisation has a fundamental role in determining the means of production and the distribution of output. Comparing industrialised with subsistence economies we can see how they have widely different environmental effects, especially with regard to biodiversity.

In today's industrialised societies production relies on linear, interconnected technological chains and distribution is determined by purchasing power. Production is conditional on the continued supply of external inputs. For example, in industrialised agriculture, where the impacts on the environment are often the most direct and obvious, production is dependent on introduced fertilisers, pesticides, herbicides and the regular infusion of new genes. The objective is the continual maximisation of profits through increased production. Industrialised agriculture achieves this with the utilisation of a series of genetically identical monocultures. These uniform systems have been widely applied throughout the globe, reducing biodiversity within agricultural systems.

Conversely, within subsistence economies external inputs are limited and production is reliant on cyclic, self-provisioning systems. There are multiple objectives, reflecting the many needs of a subsistence society. Production is considerably less specialised. Because of the need to produce a variety of goods and services locally the community is reliant on a diverse array of species. Distribution is considerably more equitable, as people produce the majority of their own needs. Subsistence agriculture conserves and often promotes biodiversity because of the reliance on a variety of species to meet diverse needs, both now and in the future (Shiva 1993:61).

Need For Change

If we are to attempt to achieve anything approaching sustainability there is a need to change the currently dominant social structure. The degree of social change necessary is a major area of debate. Two differing viewpoints are technocentric and ecocentric development, which will be discussed below. This classification for differentiation is based on Timothy O'Riordan's (1981:1) "two major strands in western environmentalist thinking" (Jackson 1993:651). As a basis for sustainable development they represent the central foundations for their ideological viewpoints towards the environment: "The two perspectives differ not just in their attitudes to nature but also in their morality that tempers action" (O'Riordan 1981:1).

Technocentric Development

Technocentric development advocates that we continue predominantly on the current development path, believing that we will be able to make changes or reforms which will prevent environmental degradation. By continuing to develop largely on the same path we will be vulnerable to many of the same problems which caused widespread environmental degradation under the present system. This thesis will question whether these modifications will be sufficient. This examination of technocentric development will look at some of its underlying principles, particularly the knowledge system on which it is based, to demonstrate why it has caused environmental degradation. It will also raise some issues which the technocentric approach has failed to adequately consider if it is to be applicable to developing countries, such as resource limits and the role of colonies in development.

The foundation of technocentric development lies in a belief in the superiority of human devised social and political systems to manage the environment. Technocentric development assumes anthropocentrism, defined by Robyn Eckersley as:

> the belief that there is a morally relevant dividing line between humankind and the rest of nature, that humankind is the only principle source of value and meaning in the world, and that nonhuman nature is there for no other purpose than to serve humankind (Eckersley 1992:51).

Technocentric ideology is based on a belief that the betterment of human society will be achieved through scientific research, which will be able to manipulate and control physical, biological and social processes:

> Progress, efficiency, rationality, and control - these form the ideology of technocentrism that downplays the sense of wonder, reverence, and moral obligation that are hallmarks of the ecocentric mode (O'Riordan 1981:11).

Scientific Modernisation

Technocentric development has been founded on scientifically based modernisation. This modernisation has utilised science in an attempt to control and dominate nature, removing humans from their ecological basis. Modernisation is a highly subjective term, which proposes that development has occurred in the West and the Third World should aspire to achieve such a model of development.

As a doctrine, technocentrism does not challenge the Western mode of development. Modernisation is seen as indisputable. It is believed that detrimental social and environmental impacts will be rectified by minor alterations in existing social structures or through technological innovation. In this context sustainable development becomes sustaining development, maximising the length of time that technocentric development can be sustained.

In order to attempt this process of modernisation, it was necessary for developing countries to adopt the environmentally exploitative habits of the West. The technocentric

model was adopted by most newly independent nations in the post colonial era in their quest for economic and social development. Within South East Asia this has been the favoured process of development irrespective of the state's political ideology:

> In a sense, this process merely reiterates a pattern of development that was first elaborated on a grand scale under colonial rule. However, the post colonial quest to "modernize" ... has intensified the pressure on the natural resource base. Whether capitalist or socialist, "outward looking" or "inward looking", democratic or authoritarian, states in South East Asia have shared a similar vision of development predicated on industrial development and intensive natural resource exploitation (Bryant 1995:95).

Western Knowledge Systems

What, then, are the reasons for the general acceptance of modernisation in the Third World? Ecofeminists such as Vandana Shiva suggest an answer: "Contemporary development activity in the Third World superimposes the scientific and economic paradigms created by western, gender-based ideology on communities in other cultures" (Shiva 1988:xvii). Science and economics are portrayed as universal knowledge systems which are devoid of any value judgements. However they represent the structural dichotomies within Western patriarchal society which seek to dominate women and nature:

> Science has been produced by a particular sub-set of the human race, that is, almost entirely by white, middle class males. For the founding fathers of modern science, the reliance on language of gender was explicit; they sought a philosophy that deserved to be called 'masculine', that could be distinguished from its ineffective predecessors by its 'virile' powers, its capacity to bind Nature to man's service and make her his slave (Keller quoted in Shiva 1988:15).

Western science, like all knowledge systems, reflects the culture in which it was created. The scientific revolution of the fifteenth and sixteenth centuries was developed by white, upper class, Western males. They saw nature as female, but instead of a nurturing Mother Nature, with scientific rationalism man had come of age. Nature was now seen as inert and manipulatable, a subordinate female to be tamed by 'rational' man. The subordinate female imagery within language is rife, with the wilderness being tamed, mastered, subdued and sometimes even raped: virgin territory laid prone, waiting to be conquered.

In failing to recognise their foundings in Western ideologies these knowledge systems have been able to replace other systems of knowledge and knowing through the proposition that they make no value judgements. This positioning as being above value judgement, itself makes the judgement that all other systems are of less value. This myth of objectivity has allowed for the almost universal application of Western scientific and economic techniques.

Reductionism

This mechanistic, reductionist view of nature promotes the need to dominate. Science and economics are reductionist. They reduce complex systems through fragmentation,

perceiving basic, uniform, mechanistic constituents. Because of this universal base, the systems are believed to be applicable in all situations.

> To control nature, modern science disassembled it (Bacon's *dissecare naturam*), denied Nature value, purpose or meaning. Galileo reduced Nature to matter and motion, while Hobbes made a machine even of the mind (Foley 1988:121).

The scientific approach fragments knowledge into narrow disciplines. In doing so it limits the perception of linkages with respect to relational properties and relational impacts (Shiva 1991:21) This approach permits knowledge of part of a system to be substituted for comprehensive knowing. This approach can gives priority and value to selective components of complex systems, while leaving other components without value. This has led to specialists, who may have substantial knowledge about components, being projected as experts on the entirety of complex systems.

An example of this belief in a specialists ability to solve a exceedingly complex problem, was the awarding of the 1970 Nobel Peace Prize. Norman Borlang, a plant geneticist, received the award for his part in developing the "green revolution". This example demonstrates the misplaced optimism in science's ability to solve the world's problems. The monocultures of wheat and rice which Borlang developed were very effective in a selective component: increasing yields. Borlang was not given the Nobel prize for science; his "green revolution" was mistakenly believed to be able to end world hunger, providing prosperity and bringing peace to developing countries.

> "Green Revolution" is the name given to this science based transformation of Third World agriculture and the Indian Punjab was its most celebrated success. Paradoxically after two decades of the Green Revolution, Punjab is neither a land of prosperity, nor peace. It is a region riddled with discontent and violence. Instead of abundance, Punjab has been riddled with diseased soils, pest-infested crops, water-logged desserts and indebted and discontented farmers (Shiva 1989:1).

This example also demonstrates the mistaken belief in the universal applicability of a solely scientific approach. The reductionist scientific approach to ending world hunger concentrated solely on increasing yields. It failed to consider that the green revolution required more intensive use of local natural resources as well as a reliance on extensive external inputs. In transforming agriculture the green revolution also restructured agrarian society. These changes did not occur in a vacuum, they changed the distribution of power and altered the local environment.

> While treating nature and politics as dispensable elements in agricultural transformation, the Green Revolution created major changes in natural ecosystems and agrarian structures. New relationships between science and agriculture defined new links between the state and cultivators, between international interests and local communities, and within agrarian societies (Shiva 1989:19).

Economics

Our allocation of the world's resources is the fundamental cause of current environmental degradation. With the global dominance of technocentric development, resource

allocation decisions have become increasingly reliant on economic evaluation. Economic resource allocation techniques, like benefit cost analysis, are also supposedly rational and value free and thus universally applicable. However, these techniques reflect the values associated with the system within which they were created.

Neo-classical economics fails to recognise that its microeconomic basis is founded on a specific view of human nature and social relations. It fails to take into consideration the differing culturally determined nature of roles within different cultures. "The rational, individual calculator beloved of economics sits uneasily in cultures other than those who helped to develop the paradigm in the first place" (Redclift 1994:29).

The neo-classical economic model which has been the dominant school of economic thought in the later half of the twentieth century exemplifies reductionism. This model is characterised by an examination of microeconomic equilibriums. In order to examine macroeconomic events, the neo-classical economic approach is often accomplished through an aggregation of these microeconomic relationships.

Economics serves to allocate resources amongst conflicting human needs. This has led to criticisms about classical utilitarianism, the basis for much of economic theory. A classical utilatarianist approach views economics as a science of material welfare, limited to considering human choices for material goods. "Economics is primarily concerned with theorising on the bargain hunting activities of the purchaser." (Schumacher quoted in O'Riordan 1981:17) These 'purchases' are not differentiated between those which are manufactured by humans for the purpose of consumption, and those which are provided by nature, often free of charge.

The more modern view of economics has expanded to consider a wider range of human desires for commodities. However, many of these non material desires are external to the scope of the market; the benefits or costs are not directly borne by producers or consumers. Costs which are not incurred by participants in the market are not adequately considered by the market mechanism.

The 'individualistic' viewpoint of the market generally seeks goals on the basis of private costs and benefits, only considering the associated social and environmental costs if they can be identified and attributed. The reduction of a system to a single function, private profits, has provided a knowledge system which allows and legitimises continued resource depletion:

> Only those properties of a resource system which generate profits through exploitation and extraction are taken into account; properties which stabilise ecological processes but are commercially non-profit generating are ignored and eventually destroyed" (Mies and Shiva 1993:24).

The Conversion Process

Continued resource utilisation, which has often resulted in resource depletion, has been the foundation for technocentric development. This resource based development is based on the substitution or conversion of resources to those which are of greater value to the individual decision maker. This decision is based on the function of the resource which is of particular value to the decision maker, regardless of other properties which may be beneficial to the environment and society.

One area which has seen widespread conversion of biological resources is agriculture. Humans have favoured species which are more productive and of greater anthropocentric value. While the diversity of other species may have diminished, the diversity of domesticated plants and animals was greatly enhanced. An extensive agricultural biodiversity 'evolved' before modernisation and an increasingly globalised economy. "The world before the industrial revolution can be envisioned as a mosaic coevolving social and ecological systems" (Norgard 1988:206).

Farmers had differing approaches to agriculture, influenced by their varying cultures and microenvironments. Millions of farmers in these differing social and ecological systems selected the best seeds for storing and replanting, promoting global diversity amongst cultivated plants.

> the patchwork of cultivation sown by man [sic] unleashed an explosion of literally inestimable numbers of new races of cultivated plants and their relatives. The inhabited earth was the stage for 10,000 years for an unrepeatable plant breeding experiment of enormous dimensions (Bennett quoted in Shiva 1989:33).

With the advent of globalisation and the acceptance of the green revolution and other Western technologies the conversion process was accelerated, increasing the unification of the agricultural environment.

> The global adoption of Western knowledge and technologies has set disparate cultures on convergent paths. And the environment has not been immune to this globally unifying process. ... Global markets, global values, global social organisations, and global technologies have resulted in global criteria for environmental fitness. Diversity of all kinds has been lost (Norgaard 1988:208).

Often these conversions are beneficial for human societies. For example, conversion of forests to agriculture often can greatly increase agricultural productivity. However, this conversion process does not make a distinction about the type of the resource, and often fails to consider the long term implications. Conversion is generally limited to only one direction because of the often irreversible nature of environmental degradation: "Trying to reconstruct nature with building-blocks made of capital is a Sisyphean task" (The Ecologist 1993:101).

Naturally existing biological 'resources' are converted into other resources more highly valued by human societies, often with little regard for the reversibility or sustainability of such practices. While it is the rate of conversion which is of immediate concern, the conversion process itself may not be sustainable in the longer term. Continuing conversion, even at a significantly slower rate which fails to adequately consider

ecological processes, will lead to a continuation of environmental degradation and a retarding of general well being:

> Economic development involves methodically substituting the technosphere - or the surrogate world of human artefacts - for the biosphere - or the *real* world of living things - from which the former derives its resources and to which it consigns its ever more voluminous and toxic waste products. In other words, economic development, to which our society is totally committed, inevitability means ecological degradation and economic contraction. The two are inseparable - they are but different sides of the same coin (Goldsmith 1988:118).

This conversion process occurs because the economic system is based on human preferences. It substitutes the natural world for the 'technosphere' because economic development is entrenched in continual capital accumulation. While technocentric development advocates modifying the economic system, these modifications may not be sufficient to achieve sustainability. There is still a firm entrenchment in this basis of capital accumulation. Shiva (1992:191) refers to this basis which is prevalent in the technocentric approach to 'sustainable development' as the 'primacy of capital'.

> 'Sustainable development' ... protects the primacy of capital. It is still assumed that capital is the basis of all activity. The preservation of the primacy of capital creates a dualism between 'conservation' and 'development'.

Overconsumption

The technocentric socioeconomic system has depleted the environment in return for capital accumulation. The irreversibility of the conversion process is accentuated because modernisation has been exported around the globe, often as the only appropriate means of development. With the interconnected nature of the global economy it has allowed wealthier developed countries to export the environmental degradation they have caused through overconsumption. While the environmental effects of population growth are a global problem, "the environmental impact of 2.6 million new born Americans each year far exceeds that of the 34 million new Indians and Chinese" (Berntsen 1996:11).

Not only has this exportation of environmental degradation been permitted, but it has become institutionalised. Overconsumption has been encouraged and is second nature to people from developed countries, who have ready access to resources from around the globe. Britain, the largest importer of tropical timber within the EC member states in 1990, imported over 2,500,000 cubic metres (Counsell et. al. 1992:39). The overconsumption of other tropical products may also result in deforestation:

> Through its consumption of various tropical commodities, Britain is a major importer of deforestation. Products ranging from coffee to tapioca, iron ore and rubber may all derive from areas which have been stripped of their rainforest cover (Counsell et. al. 1992:34).

Because overconsumption is removed from the effect of the degradation it is not readily identified as the cause. As opposed to a proximate cause, overconsumption is an underlying reason for environmental degradation. The effects are often only obvious on

the other side of the world. The developed country overconsumers are removed from the impacts of their actions and they can continue their overconsumption because they can draw on resources from many environments.

The question remains why, in countries where the detrimental environmental effects of an unsustainable rate of biological conversion are obvious, do they often continue to strip their natural and biological resources? The producers of biological products may be closer to the impacts of their harvesting but often they have little motivation or opportunity to change their practices. Many harvesting operations are controlled by businesses, whose primary motivation is the maximisation of profits rather than conservation.

Often developing countries have little choice but to continue exporting natural resources. They are forced to in order to generate foreign exchange to finance their vast foreign debt:

> The debt owed by the poor countries to private banks, international financial institutions and rich country governments now [1992] stands at a crippling US$1,300 billion. The resultant outflow of resources has placed monstrous economic burden on developing countries; including those with tropical rainforests. Debt has been identified as a major force behind the poverty of many ordinary people in the Third World, the distortion of sustainable development and damage to the environment (Counsell et. al. 1992:10).

The technocentric model promotes overconsumption by developed countries which is largely reliant on utilising the outflow of resources from developing countries. As a model for global development technocentrism does not sufficiently consider environmental limitations, or the role developing countries have in the development of industrialised countries.

Limitations to Modernisation

Given the earth's finite resources, the sustainability of a continuous growth based on material consumption has been called into question. The 1972 United Nations Conference on the Human Environment has been commonly identified as a key event highlighting the emergence of concern about industrialisation's impact on the environment:

> The primary motivation behind the UN's decision to hold an environmental conference in 1972 came from the developed world, and the initial focus was on the environmental problems of industrialisation (Adams 1990:37).

Our material intensive development which promotes the pursuit of economic growth has resulted in widespread environmental degradation, because of its seeming ignorance or apathy about resource limitations. The increased global acceptance of this model has exhausted large amounts of the world's resources. The effects of technocentric development include a rate of extinction which is several thousand times the natural rate, a decline unmatched since the extinction of the dinosaurs (Ryan 1992:6). It has also resulted in a level of pollution which threatens to radically alter the global climate.

"Global environmental degradation is perhaps the most blatant challenge to modernity" (Norgaard 1994:12).

Environmental degradation has not only placed doubt on the continued viability of economic growth for developed countries but on the environmental impact technocentric modernisation is likely to have for developing countries. If developing countries were to achieve development via this same material intensive development path, they are likely to require a comparable amount of resources and have a similarly detrimental environmental impact.

Similarly, advocates of modernisation have ignored the role that the colonies have had in providing the resources which aided and promoted continued prosperity of developed countries. Mahatma Gandhi in 1947 realised this crucial role the colonies have had on Britain's development.

> It took Britain half the resources of the planet to achieve its prosperity. If [India] an entire nation of 300 million took to similar economic exploitation, it would strip the world bare like locusts (quoted in Wilson 1994).

A continuation of modernisation on the same material intensive path, even at moderate levels of growth, will require considerable levels of technological innovation.

Technological Utopians

Technological utopians believe that a combination of technological progress and economic growth are essential to solving environmental problems. This optimistic viewpoint sees economic growth as a way of permanently reducing scarcity through continued capital accumulation. Economic growth is similarly seen to increase the level of scientific knowledge and result in a faster rate of technological progress. This optimism about the benefits and desirability of economic growth has been the dominant economic thought for the past century (Tisdell 1990:2).

This optimistic belief is shared by global development organisations such as the World Bank. Andrew Steer (1992:18) the Staff Director for the 1992 World Development Report, Development and the Environment argues that:

> the belief that greater economic activity inevitably hurts the environment is based on static assumptions about technology, tastes and environmental investment. In reality, however the relationships .. are continually changing.

However, irrespective of how much technological progress there is we will be unable to recreate biodiversity lost as a result of biological conversion.

Technocentric development has the dual role of being both responsible for the loss of biodiversity and successfully distancing humans from nature. It has been so successful that people in developed countries more readily associate poverty with environmental

destruction, rather than overconsumption. This distancing is promoted by taking a reductionist approach, focusing on the loss of biodiversity rather than our detrimental impact on the environment. The technocentric approach does not believe that the biodiversity crisis need result in a major change in the way society is structured. This could be because the technocentric knowledge system focuses more on components, rather than taking a more holistic approach.

Why Biodiversity is Differentiated From The Environment?

An example of this component approach is that with widespread environmental degradation there has been a recent focus on biodiversity loss. Biodiversity is differentiated from other terms that are used to describe the environment, especially in the context of the impact of development. Unlike nature or the wilderness, biodiversity is not an encompassing term. It focuses on the variability of life, whether at an ecosystem, species or genetic level.

As a term, it highlights the prevalent Western scientific approach towards the environment. This taxonomic approach is based around scientific identification and classification of biologically distinct entities. An improvement in knowledge of component species is thought to result in an improved level of knowledge of the ecosystem. With an increased level of scientific knowledge it is believed that we will be better able to manage and control the environment and when we have this control we will be able to solve the problem of extinctions.

As a term biodiversity downplays its dynamic, interactive nature of the environment. Instead it refers to a quantifiable, additive category for the variety of genes or the number of species. "Species diversity ... has been variously estimated to be between 5 and 50 million or more, though only about 1.4 million have actually been described [by Western scientists]" (McNeely, Miller, Reid and Mittermeier 1990:17). The reduction of nature to a number promotes an inert and lifeless view of the environment. This distances species from other species within the same ecosystem, downplaying the interconnectedness which exists within nature.

If humans can successfully downplay this innate interconnectedness, responsibility for nature's destruction is increasingly distanced from our actions. If we can successfully remove ourselves as the cause of the problem, the problem becomes ecological rather than socioeconomic. If the problem is seen as ecological, treatment of the problem will only attempt to reverse the symptoms rather than treat the underlying cause.

Ecocentric Development

The technocentric approach to sustainable development focuses on continual economic growth and a belief in our ability to control the environment. An ecocentric approach argues that the pursuit of economic growth has caused substantial environmental degradation, and it is paradoxical to suggest it will also be the cure. Exponents of the

ecocentric viewpoint, such as Shiva (1992:188), argue that there is a fundamental difference between achieving sustainable development and endeavouring to sustain growth.

Ecocentric development differs from technocentric development by focusing on an ecological rather than a economic basis. "It provides a *natural morality* - a set of rules for man's [sic] behaviour based upon limits and obligations imposed by natural ecosystems" (O'Riordan 1981:11). It attempts to avoid anthropocentric ideology; proponents of ecocentrism do not believe there is a morally relevant division between humans and nature, viewing humans as part of nature and subject to its laws.

In direct contrast with technological utopians, ecocentrists believe there needs to be a radical, fundamental change in conventional development attitudes. Ecocentrists share a pessimistic view about the future of the earth, unless we adopt a humbler approach which is more harmonious with ecological processes.

Ecocentrism is not in itself anti-science and technology, but it is opposed to the conviction that Western science is the only valid knowledge system and does argue for low impact technology. In fact, Western science has provided some empirical support in undermining the technocentric view that there is a morally relevant division between humanity and the rest of nature:

> It is indeed ironic that while an ecocentric orientation is often wrongly criticised for resting on an "anti-science," mystical idealization of nature, many proponents of ecocentrism are quick to point out that the philosophical premises of ecocentrism are actually *more* consistent with modern science than the premises of anthropocentrism, which posit humans as either separate from and above the rest of nature (Eckersley 1992:51).

Ecocentrism seeks to avoid the hierarchies and structure dichotomies which have been associated with Western philosophies and knowledge systems since the classical Greek philosophers. Ecocentrism has a bioethical foundation, believing all beings are of equal intrinsic value, as an integral part of nature, independent of any human perspective.

Ecocentrists believe that in order to achieve a more permanent, stable society it is necessary to change societal behaviour to reflect ecological principles such as homeostasis and diversity. Ecocentrists propose that behaviour patterns which have evolved in response to the local ecosystem may more appropriately reflect ecological principles, such as the promotion of diversity.

Ecosystem People

Traditional societies relied solely on their local ecosystems for survival. If these societies were to continue exploitative practices, violating the local ecological rules their ecosystems would be continually degraded, to a point where they would no longer support the society. Their methods "are based on the view that the environment is the

source of life for future generations and should therefore not be pillaged for short-term gain and long-term loss." (Clay 1988:69)

This does not mean that they did not manage and exploit their ecosystem, rather they did so in relative stability. Where there was agriculture, methods were developed which prevented land degradation and maintained the integrity of ecosystem processes. An example is the shifting cultivation of rainforest cultivation of rainforest people which has been sustainable despite the inherently infertile rainforest soils.

> For generations forest peoples have been able to exploit their environment in ways which are sustainable, bring no long-term damage to the forest and protect soils from erosion and declining fertility (Park 1992:47).

Raymond Dasmann (1988:304) defines communities who are dependant on and have a relatively harmonious, symbiotic relationship with their local ecosystem as 'eco-system people'. He contrasts their sustainable practices with 'biosphere people' who draw their support from the entire globe. Biosphere people are part of the global market, drawing resources from where they can most cheaply or efficiently be harvested, for example tea from Sri Lanka, coffee form Brazil or lamb from New Zealand.

Dasmann (1988:305) believes this difference in resource base results in a different attitude to the environment. Because ecosystem people are integrated with their ecosystem they are far less likely to degrade an environment on which they are wholly dependant. Detrimental exploitation of their ecosystem could have devastating effects on the lives and livelihoods of ecosystem people.

On the other hand biosphere people lack this dependence, they are removed from the environment, reliant on socioeconomic structures rather than a particular ecosystem. They can detrimentally exploit an ecosystem because their purchasing power allows them to readily acquire resources from alternative ecosystems. This purchasing power combined with a lack of dependence permits biosphere people to export local production shortfalls, sometimes resulting in famines in poor countries. Consequently biosphere people can plunder many ecosystems, causing widespread environmental degradation, a practice that would be unthinkable to people reliant on a single ecosystem.

Ecosystem people's knowledge systems, while focused on only particular ecosystems, tend to be more holistic than Western reductionism. Their societies generally see themselves as part of nature and their evolving knowledge systems often reflect this interdependence. Not only has their culture been modelled on nature, but it has been integrated with the particular ecosystem(s). There are an immense variety of knowledge systems which have been constructed by societies to explain, understand and adapt to the diverse environments in which the systems were developed. This adaptation of human communities had resulted in people inhabiting environments as diverse as the arctic tundra and the tropical rainforest.

> The environment itself is local; nature diversifies to make niches, enmeshing each locale in its own intricate web. In so far as this holds, enduring human adaptions must also ultimately be quite local (O'Connor quoted in The Ecologist 1993:16).

There are numerous examples of the complexity, variety and validity of ecosystem peoples' knowledge of their environment; this knowledge is often demonstrated in their agricultural practices. The Hanunoo swidden cultivators of the Philippines provide an example of these systematic approaches to knowledge:

> At the lowest level, mutually exclusive named categories of specific plant types number over 1,600. ... More than 90% of these specific plant types are of particular significance in terms of food provision, medicine, ritual, and general technology. More than 430 are cultigens, most of which are swidden-growth. Partly as a result of this great interest in plant domestication and detailed knowledge of minute vegetative differences, native categories outnumber by more than 400 types, the taxonomic species into which the same local flora is grouped by systematic botanists (Conklin 1957:44).

While there is a diverse array of ecosystem people, coming from a wide range of countries, backgrounds and cultures, it is possible to make some generalisations. The original structure of these communities was typified by limited forms of private ownership; land is generally 'owned' in common, along with many other resources. This is one of the reasons for a relatively equitable sharing of wealth. Values, traditions and rules have evolved out of necessity to meet the specifics of the ecosystem and ensure community survival:

> For instance, foraging peoples usually value sharing, reciprocity, hard work and even temper; individuals who wish to hoard, to be lazy, to dominate others, to isolate themselves or be quick to argue and fight face ridicule, misfortune and social isolation (Beauclerk, Narby and Townsend 1988:5).

Communal organisations may appear egalitarian, however this is more out of necessity rather than any notion of equality. When people share a reliance on an ecosystem for all of their needs there is an interdependence among members of the community. Everyone within the ecosystem shares a stake in minimising their own and the community's risk. Thus, there is a realisation that no one elses survival should be put at risk by other members of the community.

Historically ecosystem peoples communities have been the dominant social organisation. These primal hunter/gatherer societies were typified by ecocentric, earth and nature based religions, and knowledge systems based on humility and reverence towards nature.

> Given that the vast majority of humans who have lived on earth over the millennia have been hunter/gatherers, it is clear that ecocentrism has been the dominant human religious/philosophical perspective through time (Sessions 1991:109).

These religions/philosophies played fundamental roles in underpinning and determining primal values and ordering primal societies. An ecocentric value system formed a sound ethical foundation for these societies interactions with nature.

Ecosystem and Species Preservation

Ecosystems necessarily contain a wide variety of species, each of which plays an important role in the ecosystem's continual operation. "The functioning of the ecosystem is dependant upon the presence of a suitable combination of species each of which performs a task within the total system" (Dasmann, Milton, Freeman 1973:29). These complex, dynamic interrelationships amongst species and between species and the environment, collectively result in the provision of ecological functions. These ecological functions, such as nutrient and hydrological cycling, play an integral part in maintaining the viability of the ecosystem, including providing vital ecosystem services for ecosystem people.

Ecosystem people are dependent on their local environment for the satisfaction of all their needs. From their ecosystem they derive their diverse requirements: essentials such as food, fodder, energy and medicines (Damodaran 1992:419). This dependence results in a fundamental incentive for ecosystem people to conserve the local biological diversity, both for its individual applications, as well as part of the functioning ecosystem.

Because of the diverse array of ecosystems, a social system based on communities of ecosystem people would provide a foundation for the conservation of biological diversity at an individual ecosystem level. If this is to become a practical method for widespread conservation, society must readapt to the local environment and relearn how to live within the limits of the surrounding ecosystem.

However these traditional knowledge systems and behaviour patterns have often been replaced by Western reductionist systems, especially during the period of European colonisation. The colonial attitude towards local people and local knowledge was often derogatory. David Hume considered the local people involved in traditional agriculture to be unskilled and lazy: "A habit of indolence naturally prevails. The greater part of the land lies uncultivated. What is cultivated, yields not its utmost for want of skill and assiduity in the farmers" (Hume quoted in Schultz 1965:26).

The European colonisers failed to realise the validity of traditional agriculture and conservation. Instead of seeking to dominate nature, converting it intensive agriculture, these societies generally sought to live as part of nature.

An example of this attitude was demonstrated by the British colonisers in India. The views of the British, who failed to acknowledge and recognise the importance of conservation and the legitimacy of existing social structures were typified by Buchanan, a naturalist employed by the East India Company, who believed the sacred groves were "a "contrivance" to prevent British rulers from laying a claim to what was now its rightful property" (quoted in Gadgil 1992:266).

The British only recognised private and public ownership. Cultivated lands were considered to be privately owned, while other communal land which was vitally

important to local communities and recognised as of considerable value to Britain was therefore acquired by the state.

> By the mid-19th century, on a further realisation that wastelands contained tree growth and plant wealth of immense value to British industries back home, the colonial state embarked on a massive programme of appropriation of large tracts of common lands by constituting/reserving them as state forests (Damodoran 1992:421).

This defamatory attitude represented a cultural bias as to what was meant by poverty. To Western societies, who were focused on capital-accumulating modernisation, subsistence economies were seen as inferior and traditional.

This attitude towards those who have not fully embraced the technocentric model is still prevalent today. The fundamental premise of mainstream sustainable development thinking is the cause and effect relationship between poverty and environmental degradation. This has been especially demonstrated in the Western approach to conservation, which has commonly displaced local people from protected areas.

This arbitrarily imposition has failed to distinguish between those 'poor' who are heavily reliant on local ecosystems, and those living in absolute poverty. While those living in absolutely poverty have little choice but to degrade the environment in order to survive. Most that the West would consider poor have access to enough resources to satisfy their subsistence needs without degrading the environment. According to Alan Durning of the Worldwatch Institute, there are one billion people "living unsustainably at or below subsistence levels and three billion who live sustainably at a scale below or equal to their systems carrying capacity (and 1.25 billion unsustainable overconsumers)" (quoted in Broad 1994:813).

While the successful disbursement of human communities throughout the planet has proved societies adaptability to nature, the ability to continually adapt nature to society is severely questionable. Many indigenous societies have realised the necessity of living in harmony with the immutable laws of nature:

> Indigenous peoples throughout the world are now breaking their traditional silence to warn us of the consequences of ignoring natural law, and to offer their help. The Kogi tribe of Colombia, who have maintained absolute isolation for hundreds of years, have come forward to warn us the earth is in danger ... that unless we stop violating natural law, the world that contains and sustains us is coming to an end (Strong 1995:23).

Much of the indigenous ecosystem knowledge has been lost, but humanity has previously proved its adaptability and the global ecological crisis provides a powerful incentive:

> The global ecological crisis is the ultimate challenge to societies ability to learn. The choice is stark: either we lean our way out or the quality of life on this planet will deteriorate past any point of restoration (Finger and Verlaan 1995:503).

However it may not necessarily be the actual practices of traditional societies which are vital for sustainability, rather the principles and ideology of these societies which will result in change in our attitude to the environment:

> To the extent that traditional societies such as hunter-gatherers lived sustainably ... they have much to teach us. However, it is not their specific skills we need ... so much as the principles behind the ways of life in such societies. ... they will include an appreciation of limits, an acknowledgement of ecological necessities, a willingness to share resources, and a recognition that we are not the owners of the Earth to do with as we like it (Gunn 1994:34).

Conclusion

There are many views towards the interrelationship between development and the environment which are encapsulated within sustainable development. The two broad perspectives that this chapter has focused on emphasise the importance of our attitude towards nature. Our attitude towards the environment is important as it shapes our ideology and environmental practices.

Ecocentrism promotes an ecological basis for decision making, recognising ecological limits and environmental constraints. Ecocentrism recognises the validity of knowledge systems other than reductionist Western systems. It places particular emphasis on ecosystem peoples' knowledge systems, which were developed within and are attuned to the local environment. Because ecosystem people commonly see themselves as part of the environment, these knowledge systems often reflect this interdependence. Proponents of the ecocentric approach believe that if we see ourselves as part of and dependent on nature we will be less likely to degrade the environment. Proponents believe that development based on this approach, which is still held by many subsistence communities, would be a more appropriate basis for sustainable development.

While the ecocentric viewpoint considers humans to be part of nature, the technocentric places humans above nature, in a position to manage and control the environment. Its adherents believe that through improved scientific understanding we will be able to solve any environmental problem. Either these problems will have technological solutions or they will be social problems, which can be solved through economic or political means (Ehrenfeld 1978:17).

Technocentric development promotes the improvement of society through scientifically based modernisation. These knowledge systems on which technocentric development is based are more reductionist than the relatively holistic ecocentric approaches. This reductionist approach has failed to consider the wide range of values which are associated with the environment, resulting in environmental degradation. The technocentric approach advocates further application and modification of existing systems which will correct its failings. However, it is questionable whether an intensifying in the application of the same systems which were responsible for environmental degradation will result in a cure.

CHAPTER 2

THE ECONOMIC VALUATION

OF BIODIVERSITY

Introduction

The technocentric model has increasingly become the dominant global mode of development. However this approach has failed to ensure sufficient conservation. The technocentric approach utilises a market based approach which views the environment as a collection of biological resources. The purpose of this chapter is to demonstrate that, in relying on market allocation and economic valuation for biological resources, there is an inherent failure within the technocentric system to provide sufficient environmental conservation.

This chapter will begin by examining the importance of the conservation of species as an integral part of sustainable development, highlighting the importance of biodiversity in providing goods and services which are essential to our way of life.

It will then examine how our resource allocation decisions, particularly our allocation of biological resources, are the principal factors causing species extinctions. Within the market approach biological resources are distributed on the basis of our individual preferences. It will argue that while resulting in an optimal resource allocation for the individual, this will not result in the optimum situation for society or conservation. This is because the market price fails to incorporate social and environmental costs associated with a reduction of biological resources. Despite the importance of conservation the market treats biological resources in the same manner as other resources.

The technocentric approach advocates the incorporation of non-market economic values in the resource price to improve the sustainability of the market allocation of biological resources. This chapter will endeavour to show that an economic approach which focuses on valuing environmental components, particularly species, is unlikely to ensure sufficient conservation.

This chapter will conclude by arguing that, in utilising a piecemeal approach to value biodiversity, we are legitimising the process which is wiping it out. By giving species a dollar value we are stating how much compensation we require to justify its extinction.

The Importance of Conserving Biodiversity

Biodiversity is particularly pertinent to the issues surrounding sustainable development because of the irreversible nature of species extinctions. Every species represents an irreplaceable successful adaption to a series of distinctive environmental problems. This reduction in the diversity of life has significant implications on current and future development. The extinction of a species is often symptomatic of environmentally detrimental development practices.

Humans receive many benefits from biodiversity. On an individual species basis, humanity is heavily reliant on certain species in important areas such as agriculture, fisheries, forestry and providing medicines. While not every species is of significant

direct value to society, we are unaware of what species may be of value in the future. The loss of biodiversity reduces options for future development, diminishing the pool of biological resources which will be available to be utilised.

Our ways of life, even our existence is dependant on the continued functioning of both natural and managed systems. These systems provide vital ecological services such as maintaining nutrient and hydrological cycling and climate regulation. Each of these systems are comprised from varyingly complex interdependent interrelationships between species. Individual species often play a vital role in the continued functioning of those systems. The loss of species or systems can represent an irrevocable change the provision of these critical ecological services.

Resource Allocation

Through continued technocentric development we have placed ourselves in a position where we decide how to allocate the world's resources. These decisions have often altered environments, radically changing the conditions in which species evolved. The choices we make in allocating the world's resources now determines the rate of biodiversity loss.

When resources are scarce the options for their use becomes limited. Within the market resources are allocated on the basis of individual human preferences, within the constraints of individual endowments.

These human preferences are supposed to represent a rational use of individual endowments for the utilisation of scarce resources for individual benefit. This assumes that the individual is in the best position to determine what is the appropriate allocation of their endowments. This will result in an optimum allocation of resources for the individual.

The market allocates resources on the basis of an aggregation of these individual decisions. For this to achieve a socially or environmentally optimum result either two assumptions must hold, or the market price must represent the true environmental and social cost.

These two assumptions are that the individual must have perfect knowledge of the environmental and societal impact of their decisions and they must be willing to act altruistically on this information. Within the market the information available to the consumer is limited to the purchase price. Even if more information was available the consumer is assumed to act rationally, in their own self interest in order to maximise personal benefits:

> The buyer is essentially a bargain hunter; he is not concerned with the origin of the goods or the conditions under which they have been produced. His sole concern is to obtain the best value for money (Schumacher 1993:29).

Even if people always acted altruistically these assumptions would not hold because of a lack of perfect knowledge. The rational, individual calculator's knowledge about purchasing decisions is often limited to the price. The bargain hunting activities of the purchaser mean that for an optimal resource allocation, the cost to the individual purchaser must accurately reflect the true environmental and social cost.

Market Failure and Biodiversity

As a means of allocating biological resources markets are limited in their effectiveness in conserving biodiversity. The market price of a biological resource is derived from the amount supplied to the market and the demand for its use. A market approach inevitably fails to generate sufficient conservation or environmental protection. Because environmental degradation is only directly acknowledged and quantified when it diminishes our ability to utilise natural resources.

> Probably the most tangible effects of any ecological disruption caused by biodiversity loss would be on the various ecological resources that are extracted and exploited by humans, such as fish, fuelwood, agricultural products and meat (Barbier, Burgess and Folke 1994:31).

Environments are only identified as being degraded in extreme cases, or when there is an obvious cause and effect relationship between our action and ecological deterioration. Degradation is often only acknowledged after the event, not at the time it was incurred. Because the market system is generally reactionary it fails to make a marginal distinction between a level of use which is sustainable and a level which is ecologically damaging. Natural systems have complex interrelationships and feedback mechanisms which can not be incorporated within the scope of an human preference based economic model.

Because of the market system's generally reactionary nature, the long term effects of environmental degradation are insufficiently considered. Examples of this long term failing include where there is a delay between cause and perceived effect or when the detrimental effects are long lasting or permanent.

A case which provides both of these long term failings is the threshold level below which it is believed a species is doomed to extinction. It is believed there is a minimum number of individuals required to ensure the species continued viability. At a level below this threshold a species is doomed, but it may take time for the species to become extinct.

Similarly within the market approach there are no immediate safeguards to ensure the conservation of enough species so the ecosystem will continue to function. Furthermore it may not ensure the maintenance of sufficient numbers and combinations of functioning ecosystems necessary to maintain global welfare:

> In other words, we cannot be sure of how close we are to the critical level of biodiversity conservation for maintaining global welfare and existence, nor what that critical level might be. For all we know, we may be at that threshold already, or will be driven to it inevitably, given current economic and demographic trends (Barbier et. al. 1994:18).

Irreversibility

The aspect which limits the effectiveness of market allocative mechanism in conserving biodiversity is the irreversibility of extinction. In allocating resources on the basis of demand for use the market treats biological resources in the same way as any other resources. The environment is seen "as a form of natural capital, analogous in some ways to physical or financial capital assets" (Winpenny 1991:2). In doing so it fails to realise that unlike other resources each unit of biodiversity is irreplaceable.

In allocating biodiversity it considers it biological capital and treats it in the same manner as other forms of capital investment. These capital investment decisions reflect a social time preference, placing a higher value on benefits which are received sooner rather than later. The greater the social time preference the quicker the rate of biological resource conversion. Treating biological resources identically to human constructed capital means that it may be economically efficient to exploit a resource to extinction. Colin Clark (1973:951) found that in maximising the present value of a biological resource the owner would harvest them until they were extinct if "the discount (or time preference) rate sufficiently exceeds the maximum reproductive potential of the population."

This raises the issue of intergenerational equity as it is impossible for future generations to have their say in either the rate of conversion or what combination of biological and human constructed resources they would prefer to be retained:

> In the absence of any knowledge of future preference patterns and technological possibilities it is impossible to know what substitutions would permit the same level of welfare to be obtained from different combinations of assets. More trees and fewer insects? More machines and fewer fish? (Beckerman 1992:492).

Knowledge

This uncertainty over the preferences of future generations is compounded by our uncertainty over the true value of biological resources. Our knowledge of many aspects of biodiversity is very limited. The taxonomic approach of Western science, which focuses on identifying and categorising, has only catalogued approximately 1.75 million species (Hammond 1995:117). This does not even approach the total estimated number, even to the nearest order of magnitude.

While this lack of species identification illustrates the superficial level of current biological understanding, it represents only the merest fragment of what more we have to learn from nature. It cannot be said that we possess comprehensive knowledge about any one of the millions of species. Every species is valuable as it represents the culmination of millions of unrepeatable years of evolution, presenting us a unique opportunity to increase our knowledge of the biological world.

This uncertainty effects the valuation of biological resources because we are presently unable to determine with any accuracy what biological resources may be of value in the future:

> Biota as a whole is continually providing us with new ways to improve our biological lot, and that species that may be unimportant in our current assessment of what may be directly useful maybe important tomorrow (Lovejoy 1986:17).

Not only will an increase in knowledge provide us with new uses for biological resources but the increase in knowledge will itself be of value. Each species which is lost represents a vast amount of unattainable knowledge. Not only will improvements in knowledge aid conservation efforts by improving our environmental understanding but it may also increase our awareness of the calamity of extinction. If instead of a diminishing number we can identify what species are becoming extinct and the wonders of nature which are associated with them, the tragedy of extinction will manifest itself.

Ecosystem Interconnectedness

We posses a similar superficial knowledge about the complex interrelationships which occur within ecosystems. These interrelationships occur both amongst different species and between species and the environment. These interconnections are of varying importance and intensity. Often a species will be completely dependant on an other. Following the extinction of a particular species, other species which share interactions or dependant relationships will be threatened.

Functioning ecosystems provide ecological services such as climate regulation and nutrient and hydrological cycling. The continued functioning of these ecosystems is vital because these services support our existence. However our knowledge of the importance of species and interspecies dynamics in the continual provision of these essential services is very limited.

> Ecologists still have insufficient knowledge of the role of particular species, or groups of species, over time, in the generation of ecological functions. In particular, further research is required to investigate critical thresholds of diversity and the conditions or time scales over which diversity is particularly important (Barbier et. al. 1994:26).

Public Good

Ecosystem services and other benefits from biodiversity are received throughout society. Biodiversity is a public good, if a species exists the benefits are shared throughout society. While it is possible to exclude people from the benefits derived from particular uses of biological resources, many benefits, particularly ecosystem services, are public. They are shared by those within a large area, often throughout the entire world. Since it is virtually impossible to be excluded from these benefits there is little incentive for the individual to conserve. They can ride freely on the conservation efforts of others.

The benefits which are provide for society are difficult to measure, they are often intangible or unperceived. The benefits from the conversion of biological resources are often privatised. While the costs incurred in the conversion process are widely dispersed throughout society.

> Those who benefit from exploiting a forest, wetland, or coral reef seldom pay the full social or economic costs of their exploitation; instead these costs (to be paid now or in the future) are transferred to society as a whole ... (McNeely 1988:11).

The bias towards the harvesting of biological resources is enhanced by the increased certainty of the material returns from exploitation, compared to the often vague, inexplicit values associated with conservation. The returns gained from exploitation are generally immediate, tangible and easier to attain.

Economic Valuation

This is probably the major reason why a market system leads to so much biodiversity being lost. The market value of biological resources rarely reflects the complete range of values associated with their conservation. With the technocentric resource-based economy becoming the dominant development model it may be necessary to illustrate the value of biodiversity, in order to prevent its conversion to resources which are believed to be of higher value:

> In order to compete for the attention of government decision-makers in today's world, policies regarding biological diversity first need to demonstrate in economic terms the value of biological resources to a country's social and economic development (McNeely et. al. 1990:25).

This view assumes that the reason why developing countries have failed to adequately conserve the environment is because decision makers have not realised its full economic value. This view does not consider the economic and political realities which face many developing countries. Governments may be primarily concerned with the generation of foreign exchange or representing the interests of the elite who benefit out of exploiting the environment for private gain.

> Economic values do not influence decision-makers who are more interested in the immediate financial values of converting and exploiting biodiversity in response to market opportunities (Alcorn 1991:320).

Problems With An Economic Approach

In attempting to analyse and quantify values associated with biodiversity an economic approach may not give sufficient weight to conservation. Economics is a knowledge system which was developed to study human behaviour with respect to our production distribution and consumption of wealth (Bannock, Baxter and Davis 1992:130). As a knowledge system which was designed to explain social interactions it is questionable whether it will be an appropriate basis for environmental analysis. Economics is founded on human preferences, it implicitly assumes that they are above reproach and directly

relevant to the solution of any problem: "Nothing is more basic, in a mainstream neo-classical economic model, than preferences" (Randall 1986:81).

Since economics is reliant for analysis only on our production and consumption preferences, the judgement it produces provides only a fragment of the total issue. "Out of the large number of aspects which in real life have to be seen and judged together before a decision can be take, economics provides only one - whether a things yields money profit *to those who undertake it* or not" (Schumacher 1993:28).

The economic system provides the decision maker with information which is relevant to her assumed primary concern, the maximisation of personal profit. Because of this individualistic, profit maximising approach the economic system will not necessarily ensure that the decisions made will be beneficial for society as a whole.

The benefits from biodiversity which accrue to society are predominantly ecosystem services which are associated with the continued ecological functioning. Despite this the economic value society places on biological resources may differ widely from the importance of their ecological roles:

> In a resource-based economy of the modern type, the value of a natural product or a natural amenity is abstracted from its ecological role in nature and becomes part of an entirely separate system with a different focus, the system based on human demand (Ehrenfeld 1972:10).

In order to achieve sustainable development the technocentric approach believes that modifications are required to the current socioeconomic system. Technocentrists believe that the major change which is needed to achieve sustainable development is the modification of the market resource price to incorporate all individual preferences for biological resources.

> From the conventional economic perspective, the sustainability issue has at its core the phenomenon of market failure and its correction via 'proper' resource pricing. What is required is an intertemporally efficient allocation of environmental resources through price corrections based on individual preference value (Turner and Pearce 1993:182).

These price corrections would be based on the value we have for environmental or biological resources. This would incorporate the individual preferences for the wide range of values associated with biological resources. These would include preferences for conservation as well as the demand for the use of biological resources.

> According to conventional economic theory, the value of all environmental assets is measured by the preferences of individuals for the conservation of these assets (Turner and Pearce 1993:182).

Because most of these individual preferences for biological resources are external to the market they have to be incorporated within the price to allow the market to allocate biological resources. However for them to be incorporated they need to be accurately valued and quantified. Many non-market values which are associated with biological resources do not lend themselves to easy measurement.

An accurate economic valuation of biological resources, which considers all possible human preferences, may not be enough to ensure sufficient conservation. The burden of proof has become levelled on the environment. For a species being a functioning part of the natural world is not sufficient; to ensure survival it needs to justify its existence in economic terms.

This has increasingly dichotomised nature, where its value must be demonstrated or its destruction becomes legitimised. This has particularly been the case in benefit cost analysis, an economic technique which is commonly used to press non-economic values into an economic framework. For biodiversity this piecemeal approach relies on methodological techniques to assign quantitative valuations to individual species:

> When applied to questions of species preservation, The BCA [Benefit Cost Analysis] approach assesses the value of an individual species and, if several species are involved, sums the relative individual assessments. With this approach it is assumed that any value the species has relates to particular, specifiable ways in which it is useful or in which it is enjoyed (Norton 1987:30).

In attempting to assign a value to nature Western science and economics have reduced it to its constituent parts. Biodiversity refers to the variety of genes, species and ecosystems rather than the entirety of the natural world. The term biodiversity is commonly used as "an umbrella term for the degree of nature's variety" (McNeely et. al. 1990:17). This numerically categorises biodiversity as an arithmetic composite of biological resources: a subtractable commodity to be converted or traded in our bid for technocentric development.

While science is becoming increasingly aware of the interdependence of nature's components, including humans' dependence on nature, it believes there are complicated mechanistic models which can explain this interconnectedness within and between ecosystems. Because of this basically mechanistic model there is a tendency to

> investigate effects on the environment only with regard to certain parts of nature, a selected species for example, and to neglect the existing biochemical and energetic processes within ecosystems. Consequently "one cannot see the wood for the trees" (Bosselmann 1995:18).

The Valuation of the Individual Species

This tendency is illustrated by the recent focus on biodiversity and has been reflected in government policy. "The United States Endangered Species Act (ESA) and the Convention on International Trade in Endangered Species (CITES) are major global biodiversity protection statutes that focus primarily on the species category" (Meffe and Carroll 1994:66).

This focus, combined with the approach where every species has to justify its existence in terms of economic importance, has meant attempts at valuing nature have been predominantly concerned with individual wild species. To obtain the value of an ecosystem this methodology relies on summing the ecosystem's components.

> The prevalent notion on the topic of valuing biological diversity ... is such that valuation is accomplished by estimating the benefits stemming from the sum total of an ecosystem's biological resources (Aylward and Barbier 1992:47).

A variety of methods and approaches have needed to be utilised to attempt to quantify the wide range of values associated with individual species or biological resources. While they may consider a wider range of values than in a BCA approach, as an individual species-based approach it still fails to adequately consider the benefits gained from an ecosystem as a whole, particularly ecosystem services.

In the economic quantification the values associated with biodiversity are often divided (or reduced) into a variety of different components. A method utilised by Randall (1986:84) and McNeely (1988:15) separates values into 'direct' and 'indirect' values:

Direct Values	Indirect Values
Consumptive Use	Nonconsumptive Use
Productive Use	Option
	Quasi-Option
	Existence

Direct Values

These values are received directly from biological resources, entering directly into human socioeconomic systems. Direct values represent the value of biodiversity when it goes through the *conversion process* and is both on current and expected future use. Direct values are extractive, the products which are of human value are extracted from nature. Within the economic system value is based on use, there is no differentiation at the margin between whether the resource is being harvested at an environmentally sustainable level or whether it is causing environmental damage.

These values are easier to identify and quantify than indirect values because they are directly valued by those who harvest the resource. Thus these are the values which are most readily identified and associated with biodiversity. Direct values are often differentiated on the basis of whether their consumption passes through the market.

Consumptive Use Value

McNeely et. al. (1998:28) defines the values which are *consumed* directly, those which do not pass through the market as consumptive use values. Within developing countries a considerable contribution is made by 'wild' resources at both a local and a national level. There are many reasons why this value is difficult to quantify and its total worth may be underestimated. Much of this contribution is consumed by the harvester or passes

through informal markets. Direct consumption occurs mainly in rural areas which are often widely dispersed.

Consumptive use is integral to traditional societies where people are reliant on the local ecosystem for satisfaction of many of their needs. Wild resources can play an important part in their diet in the form of game or wild vegetables and spices. They are also widely used as fodder for domesticated animals.

Biological resources also provide essential components for traditional medicines, playing an essential role in the well being of most of the worlds population: "About four fifths of the people in developing countries still rely on traditional medicines for health care" (Reid and Miller 1989:28).

Biological resources are also vitally important as a source of energy with about a third of the world's population dependent on firewood for fuel:

> More than 1,200 million cubic metres of wood are used annually by developing countries for fuel. Virtually all of this wood is from wild trees and shrubs, only a negligible proportion currently coming from plantations (Prescott-Allen and Prescott-Allen 1982:34).

Productive Use Value

Productive use value is obtained from 'wild' biological resources which are commercially harvested, those which are effectively *produced* by nature for sale in the market. Because of this market transaction, productive use values are easier to quantify and are the only values from biological resources which are recorded in national accounts. Hence they are more likely to attract the attention of government decision makers because they are both easily quantified and this value is measured in national accounts.

However our dependence on wild resources for productive use may not be fully recorded in national accounts. The value of the output is calculated at the harvest or production end, measuring the benefits received by the harvester. The value is considerably higher to the consumer at the retail end, once mark-up and additional expenses such as transport, processing and packaging are added. These industries would not exist without the productive use of the biological resource.

The contribution to society made by the productive use of wild resources is significant. Within national accounts of developed countries the value which is derived from wild resources can be considerable. In analysing the contribution of wild species of plants and animals to the United States economy Robert and Christine Prescott-Allen estimated that the combined contribution to GDP of wild harvested resources averaged $87 billion per year over the period 1976 to 1980 (cited in McNeely et. al. 1990:30). This represents 4.5 percent of their GDP which is attributable to wild resources. Within developing countries their percentage contribution is usually much higher.

Problems With Direct Value

Direct values are identifiable by the harvester, being the benefits gained by the individual in consumptive use or the market price received by the producer in productive use. These immediate, tangible values fail to represent accurately the wider array of values which are associated with biological resources.

The categorisation of direct value is based on economic classifications and has been criticised for having a derogatory attitude towards those engaged in subsistence living. This classification is accused of predetermining who are the villains and who will be the saviours in nature conservation (Shiva 1993:86).

"Productive" Use?

This economic classification is based on the conventional market, with producers who produce goods increasing the supply to the market, whereas consumers purchase goods, reducing the quantity available. While this approach may be appropriate when analysing the allocation of human constructed goods, it is an unsuitable framework for an analysis of conservation. The normal connotation associated with producers is in the producing of a product for the market they increase the well-being of a society. However this is not always the case when wild resources are converted. This occurs because use values are not the sole values which are associated with nature.

The diversity of nature is a product of millions of years of unrepeatable evolution. Nature can be converted to marketable goods with the costs to the harvester often only the costs of extraction. They are now directly valued by society, resources for which there is a market. Within an economic system which is primarily concerned with market allocations of resources, the market becomes the end, being the place where resources obtain value. The harvester or producer values the resource on the basis of current and likely future individual benefits, regardless of social values.

While 'wild' biological resources are renewable, they are also destructible, particularly when habitats are threatened or biological resources are overexploited. The low costs associated with the harvesting of nature does not represent the values which are associated with its conservation, encouraging over-exploitation in the pursuit of increased profits.

> When the natural system being harvested appears to be limitless, or has a very low price placed on it ... then the system is easily subject to over-exploitation. Such over-exploitation is often in the interest of the individual seeking to maximise profits (McNeely 1992:17).

As a basis for allocation the market represents an aggregate of individual human preferences for biological products. It fails to consider other associated values, including the value to non-market users, hence the market favours exploitation. Those who harvest biological resources, converting them to biological products for the market are often the consumers or exploiters of nature.

"Consumptive" Use?

Those who consume what they harvest are physically closer to the local environment, often possessing particular location-specific knowledge of the impact of their harvest. Their circumstances mean they are in a much better position to assess other values associated with biological resources than consumers who are reliant solely on the market price.

The economic classification for valuation of biodiversity views the market as the determinant of value. The role rural poor have in conserving and improving biological resources for their own consumption is not recorded. For the rural poor who directly consume biological resources there are no markets. Irrespective of how long these people have been living in relative harmony with their environment, within this economic classification they are only recognised as consumers. Hence the biological resources on which they are reliant on are not given a market value and they are not measured in national accounts.

A market based classification further imposes the market as the appropriate means of allocation for biological resources. Irrespective of who or what is causing the destruction of biodiversity, through the arbitrary imposition of a Western market ideology the developed countries of the North have suddenly become nature's saviours:

> If the Third World poor, who derive their livelihoods directly from nature, only 'consume', and the trading and commercial interests are the only 'producers', it follows quite naturally that the Third World is responsible for the destruction of its biological wealth, and the North alone has the capacity to conserve it (Shiva 1993:86).

Indirect Value of Species

While direct values represent the value of biological resources to an individual or corporate entity, indirect values tend reflect benefits which accrue to society. Many indirect values are provided by an ecosystem as a whole, but a component approach focuses on those than can be attributed to individual species.

Nonconsumptive Use Values

These values are derived from benefits which do not consume or cause a reduction in biological resources. While most are benefits provided by ecosystems, species specific benefits can be gained from activities such as bird watching, or other forms of ecotourism where values can be ascribed to specific species.

A major nonconsumptive value which can be attained from biodiversity is from improvements in knowledge. Our knowledge of species can normally be increased without causing any reduction in the resource. Here we are not concerned with the improvements in use which will come from increased knowledge (c.f. quasi option value). Rather the value of improving the level of knowledge associated with the study of

the individual species. Attempts to quantify the value of knowledge are exceeding difficult and trying to assign the value to an individual species is even more so.

Option Values

There is considerable uncertainty in attempting to value the benefits which are likely to be attained from a species future use. In the light of this uncertainty, option values represent the additional amount over and above the expected future use value someone is willing to pay to secure the option for use in the future.

These values are accentuated by the irreplaceability which is associated with species extinction. Even though a species may not be currently used, it may be in the future. It's loss represents an irreversible reduction in production possibilities which are associated with a diminishing pool of biological resources.

Thus preserving species can be seen as a form of insurance, leaving us with greater resources to meet future needs. "Option value is a means of assigning value to risk aversion in the face of uncertainty" (McNeely et. al 1990:33).

Option values are associated with guaranteeing future access to a species or biological resource for currently known uses. Thus the option value of a species is derived from its possible use values. However they are much more difficult to quantify than use values, which are apparent to the user and can theoretically be aggregated. In attempting to value alternative uses for a species any estimate will suffer the same uncertainties as a species which has not been examined for use.

Quasi-Option Values

As our knowledge increases we will have more options and opportunities to utilise biological resources. The value associated with the preservation of these as yet unknown options for future uses is known as Quasi-Option Value.

Quantifying quasi-option values is very difficult because assigning values to future discoveries can at best be only speculative. Not only may species previously which were unknown or seen as unimportant become valuable but it is possible to find better uses for species currently commercially utilised. Because of the inevitable changes in our use of biological resources not only are quasi-option values almost impossible to accurately estimate, but doubts are placed about whether current commercial use values will necessarily be accurate or relevant for the future.

> Thus to the extent that dollar amounts assigned option and quasi-option values are less accurate than actual commercial values, these very same inaccuracies apply to dollar amounts assigned species with current commercial uses (Norton 1987:40).

Despite the uncertainty surrounding what species will be of future value estimates are being made. These are often linked to the likely direction of scientific discovery, which is

guided by recent innovations. This has particularly been the case for the conservation of wild relatives of species which are currently important in commercialised agriculture.

> The International Board for Plant Genetic Resources (IBPGR) has identified numerous species whose wild relatives are prime candidates for *in situ* [on site] conservation. These include relatives of ground nut, oil palm, banana, rubber, coffee, cocoa, members of the onion family, citrus fruits, mango, cherries, apples, pears, and many forage species (Reid and Miller 1989:61).

This represents an example of commercialised conservation, where the likely future value of the wild relatives are believed sufficient to justify conservation. Here conservation is clearly linked to their value to the biotechnological industry. These wild varieties are likely to provide the genetic resources which would be utilised by the biotechnological industry to continue and improve production in commercial agriculture.

The IBPGR

The IBPGR was created in order to collect and conserve genetic resources. It is involved in both in situ conservation and ex situ or off site preservation such as in gene banks and seed storage facilities. In ex situ preservation the IBPGR has transferred many genetic resources which are native to the developing South to the gene banks of the wealthy industrialised North.

> While most genetic diversity lies in the South, of the 127 base collections of IBPGR, 81 are in the industrialised countries, and 29 are in the CGIAR (Consultative Group on International Agricultural Research) system which is controlled by the governments and corporations of the industrialised countries in the North. Only 17 are in the national collections of Third World countries (Shiva 1993:80).

Existence Value

While many species are likely to be of practical use to humans in future, the probability that a particular species is going to be of direct value is often very low. However people often value species when they have no intention of ever using or even seeing them. This value is derived simply from knowing that a species exists and is completely independent of the prospects for future use.

All species may have an existence value, though it may differ depending on the relative public appeal of the species. The aesthetically pleasing, highly symbolic giant panda is likely to have a much higher existence value than a rare species of spider. Existence value is not limited to rare species. However because of their limited supply at the marginal or individual level it is likely to posses a much greater existence value. Because scarcity results in an increased value, conservation organisations often utilise flagship species, those which are rare and charismatic, to gain the public support necessary for habitat protection and fund raising.

Because existence value is calculated independently from use, it is derived from some form of human altruism. This altruistic value may represent a belief that others should be

in a situation where they can gain the satisfaction of knowing that a species exists, either today or as a bequest for future generations. It may also be founded on the belief that species have an intrinsic value, having a value in of themselves irrespective of human beliefs.

Commodification of Nature

Demonstrating that parts of nature have value may not be sufficient to ensure their conservation. By assigning values to nature there is a reinforcement of the belief that tangible monetary benefits are the most important factors in a decision, legitimising the conversion process by reducing nature to a dollar amount:

> By assigning value to diversity we merely legitimise the process that is wiping it out, the process that says, "The first thing that matters in any important decision is the tangible magnitude of the dollar costs and benefits ..." (Ehrenfeld 1988:213).

This economic approach means that the burden of proof has moved onto the species (or the conservationist), to demonstrate its value. Each species must posses sufficient qualities to exist both in the natural world as well as our socioeconomic system.

> ... the humanistic world accepts the conservation of Nature only piecemeal and at a price: there must be a *logical, practical* reason for saving each and every part of the natural world that we wish to preserve. And the dilemma arises on the increasingly frequent occasions when we encounter a threatened part of Nature but can find no rational reason for keeping it (Ehrenfeld 1978:177).

If we accept that economic valuation should be the basis for conservation, then we have also accepted that our socioeconomic system holds the solution to the extinction crisis. We have assumed that we can know the economic value of every species, both now and in the future and that this value is the only important quality that the species possesses. However this assumption, which approaches omniscience, is paradoxically combined with a failure to recognise the root cause of extinction:

> In the long run, basing our conservation strategy on the economic value of diversity will only make things worse, because it keeps us from coping with the root cause of the loss of diversity. It makes us accept as givens the technological/socioeconomic premises that make the biological impoverishment of the world inevitable (Ehrenfeld 1978:214).

Conclusion

In utilising the market to allocate resources continued technocentric development has resulted in environmental degradation and the loss of species. The market values the environment as a collection of biological resources, treating them in the same manner as other resources. The resource is priced by the market on the basis of the quantity supplied and the demand for its use. This market allocation has resulted in environmental degradation because of its failure to realise the importance of conservation.

Within the technocentric approach attempts to incorporate the value of conservation have attempted to amalgamate all of the individual preferences for biological resources. These attempts to measure the complete range of individual preferences for biological resources have used an economic approach. As a knowledge system economics was developed to explain social interactions. It examines the environment on the basis of individual preferences for use and conservation. This is an inappropriate basis for environmental evaluation because we are only analysing one aspect of its value. This perspective fails to value adequately the environment because it does not sufficiently consider benefits which accrue to society rather than the individual.

The reductionism of this method is further enhanced by the piecemeal approach utilised to give an economic value to nature. This approach reduces the environment to its component species for analysis. These attempts at quantifying the values associated with biodiversity are further reduced into various direct and indirect values.

Direct use values are highlighted, being those which we receive from harvesting biodiversity for human use. Categorisation of direct use is based on economic classification of whether the product passes through the market. This categorisation represents a technocentric bias in favour of a market allocation of biological resources. "Consumptive Users" consume what they harvest, being in close proximity to the impacts of their actions they are in a better position to asses other, indirect values which are associated with conservation.

"Productive Use Values" being those which were produced for the market, are the most readily identifiable as being associated with the species within the technocentric system. In passing through the market they receive a market valuation and are incorporated within national accounts. This value is thus of primary importance to harvesters and governments, so much so that other values associate with biodiversity are often not be sufficiently considered. Market consumers are distanced from the impact of their purchases, their information is limited to the price alone. Because this price is unlikely to fully represent the value associated with the resource it encourages overconsumption.

Indirect values can be received from a species without resulting in a reduction in their numbers. These include use values which are nonconsumptive and values associated with preserving options for future use. An improvement in biological knowledge is another important value which we can gain from a species so long as it remains in existence. Improvements in knowledge will also allow us more options and opportunities in our utilisation of biodiversity. Species also posses an intrinsic existence value, independent of any prospects for use.

It is often difficult to quantify and assign indirect values to a particular species. These values do not lend themselves readily to an reductionalist, economic, individual species approach. Many indirect values are provided by a combination of species working together in a functioning ecosystem. These values, particularly ecosystem services, are

not adequately considered by an individual species approach. The value of the environment is considerably greater than the sum of its parts.

However in attempting to value identified or selected components, such as species, we are legitimising the conversion process. In quantifying the dollar value of a species we are accepting the processes which lead to it's extinction, so long a we receive sufficient economic compensation. This approach assumes that all that matters in decision making process is dollar values and that biodiversity is a resource to be traded so long as there is sufficient economic incentive.

CHAPTER 3

THE INDIVIDUAL SPECIES APPROACH

Introduction

The individual species approach within the technocentric system extends beyond valuation to conservation. This chapter will endeavour to show that conservation programmes need to change from an individual species approach to focus more on the conservation of ecosystems. Beginning by examining the flagship species approach where conservation programmes have revolved around charismatic species such as the bald eagle, tiger or locally the kakapo, these approaches have had successes in conserving both targeted species as well as other species which share the same habitat.

However this chapter intends to show that this approach successfully conserves entire ecosystems only because it coincides with the conservation of the targeted species. An individual species approach, even one targeting the most important species, may not ensure the ecosystem's continued functioning.

This chapter will conclude by examining why this reductionist individual species method is inappropriate when approaching the environment. An ecosystem approach is a more appropriate basis for both conservation and valuation because environments are complex, dynamic and interconnected. This change in approach and attitude is necessary within the technocentric system because the environment, and ecosystem services in particular, have largely been taken for granted.

Species Conservation and Habitat Protection

The individual species approach towards conservation, which intervenes to attempt to save specific species from extinction, has had some notable successes. Within the USA under the legislative protection of the Endangered Species Act (ESA), species previously threatened, such as the Bald Eagle have increased in numbers. Other species, like the American alligator, have had their population increase to such an extent that they no longer require ESA protection.

Within the ESA legislation, protection extends to the habitat of the endangered species. This protection extends only to the critical habitat, which is sufficient only for localised, short term survival, but it does demonstrate the fundamental importance of habitat protection in the conservation of species. However if an individual species based approach is to be successful in the long term a larger area than the critical habitat, at least the entire supporting ecosystem needs to be conserved.

> A species is what it is, inseparable from the environmental niche into which it fits. Particular species may not be essential in the sense that the ecosystem can survive the loss of an individual species without adverse effect. But habitats are important to species, and an endangered species typically means an endangered habitat (Rolston 1994:31).

While many individual species may not be essential for the continued functioning of their ecosystem, a change in the population or the extinction of a species may be a manifestation or an indication of problems within the ecosystem.

Selectivity of Human Caused Extinction

The extinction crisis is primarily a result of human actions. Our introduction of foreign species has led to many extinctions, principally on islands. However Veirmeij (1986:34) concluded "that habitat fragmentation and human hunting are the most important causes of current extinctions."

When a species is chronically over harvested or hunted to extinction the effect on the surviving ecosystem will depend on its role and the extent of its interactions with other species. However when habitats become fragmented certain types of species are more likely to be vulnerable. In reviewing habitat fragmentation Terborgh and Winter (1980:127-128) concluded that a key factor which increases the likelihood of extinction is population density. In investigating species of birds which have disappeared from Sao Paulo woodlots they found that those most susceptible to extinction are either specialised on patchily distributed habitats or were constitutively rare.

Constitutively rare species, irrespective of their location exist in low population densities because they require large individual ranges. These animals are typified by a large body size, and their susceptibility is exaggerated because their small populations are less capable of rapid recovery.

Flagship Species

Individual species conservation has often been focused around charismatic, flagship species, which have tended to be large vertebrate animals, generally birds or mammals. These species tend to be highly visible, effective both at attracting the attention and the sympathy of the public. As such they have been utilised to raise public awareness for conservation, particularly in developed countries.

Because flagship species are often large vertebrate animals they tend to be those most susceptible to extinction when habitats are fragmented. They are often higher trophic species which are near the top of the food web. These constitutively rare large vertebrates usually require large ranges. Efforts to conserve flagship species require the protection of large areas of natural habitats. Under the umbrella of this large area many other species, requiring smaller habitats are also conserved.

In these situations a flagship species approach may be effective, focusing protection on those species which give the first indication of problems in ecosystem functioning. Thus it is possible, but far from certain, that a promptly applied flagship species approach could conserve an ecosystem before major irreversible damage is incurred. However a flagship species approach is not the most appropriate basis for the widespread conservation of biodiversity. Not all species which are currently under threat of extinction are even known, let alone the focus of conservation programmes.

These species which are under threat, even when not flagships for conservation programmes, tend to be those we find the most interesting and useful. Because over hunting and habitat fragmentation often cause major shocks in complex, highly developed ecosystems, they threaten biotically competent species. These species have successfully evolved in response to intense selection from predators and competitors, thus they represent an unreplaceable, successful combination of solutions to a continual series of complex biological problems. The more biotically competent a species, the more interesting and complicated the successful solutions are likely to be. Any of these solutions could be utilised by humans, as the problems faced by many species often similar to those humans face today.

> Most of the natural substances which have yielded useful medicines evolved as chemical defence mechanisms against predation. The humpback whale has solved the problem, which humans share, of long-range underwater communication. Current research is designed to understand and perhaps apply those solutions to the human problem (Norton 1986:126).

Keystone Species

Species based conservation approaches are most likely to be effective in conserving ecosystems when the target species plays a crucial role in the maintenance of their ecosystem. Not all species will be vitally important to the continued viability of an ecosystem, certain keystone species will be of disproportionate importance. However because we posses only a limited knowledge of the significance of species in the functioning of ecosystems we simply do not know what the effect select extinctions will have on other species.

> The disappearance of a species represents more than merely the loss of a biological entity; it also heralds a change in the selectional environment of the surviving species. This change can effect many species if the extinct species interacted with many of its neighbours. Surprisingly, this topic has received little attention from biologists (Vermeij 1986:40).

Barro Colorado Island

One area where the effect of the loss of species has received significant attention from biologists is Barro Colorado Island (BCI). This human constructed island was made with the creation of the Panama Canal in the second decade of the twentieth century. Because it presented an ideal opportunity to investigate the effects of controlled habitat fragmentation it "came under the close scrutiny of some of the best naturalists of the day" (Terborgh 1992:206).

The island did not have sufficient area to support viable populations of many of the higher trophic predators, such as jaguars and pumas. Following the localised extinction of these species there was a superabundance of many of their prey species. These included the seed and seedling predators agouti and paca, who in their increased numbers are believed to be suppressing the recruitment of certain species of tree to BCI. Scientists have found that Dipteryx panamensis and Gustavia superba, two large seeded climax

trees, are up to ten times more likely to survive on adjacent mainland peninsulas (Terborgh 1992:210).

Since BCI's creation there has also been an increase in the population of lower trophic level predators, apparently because of the absence of their higher trophic counterparts. For example the coutimundi, a predator of birds eggs, nestlings and other small vertebrates, has experienced a considerable increase in population. Subsequently it is expected that there will be an increased predation of birds. Experimental evidence would tend to support this reasoning, artificial nests were found to be disturbed more than 15 times more on BCI compared to similar mainland sites (Terborgh 1992:209).

The role higher trophic level predators have in regulating the population size of their prey species may be exacerbated within a rainforest environment. Emmons, in studying the faecal remains from the top three terrestrial predators in the Peruvian Amazon (jaguar, puma and ocelot), found that prey species occurred in frequencies which almost exactly matched their numbers in the environment (cited in Terborgh 1992:208). It was assumed that terrestrial predators tended to be opportunistic hunters, prowling through their territories attacking whatever prey they found, within the dense cover of a rainforest there would appear to be little opportunity to be selective in their prey.

Higher Trophic Predators

Within the rainforest predators tend to kill whatever prey species are the most common. Assuming they have a similar role in other ecosystems, these predators may act as a control on prey populations, switching species in relation to their numbers. Because high trophic level predators are believed to have a stabilising effect on population levels of prey species, they appear to aid in avoiding competitive exclusion amongst those species in lower trophic levels. Thus higher trophic predators seem to be amongst those species whose conservation is most vital for ecosystem stability. Unfortunately not only are they amongst those species most likely to be effected by habitat fragmentation, but they may be uniformly lost from all fragmented habitats where they lack sufficient range. A continuation of habitat fragmentation could lead to their extinction resulting in an irreversible decline of all levels of diversity within the rainforest.

Other Keystone Species

Another keystone species within a rainforest environment at the other end of the food web was identified by Terborgh (cited in Meffe and Carroll 1994:210). Irrespective of how many species have evolved and coexist within the rainforest, numbers are limited by the amount of food available during lean periods. Within the Cocha Cashu area of the Peruvian Amazon "only about 1 per cent of the 2000 tree species in the area fruit during the lean period, and these are essential to sustain the frugivorous animals" (Whitmore 1990:64). Some species of palms and figs, such as the strangler fig provide 'famine foods' and are thus vitally important to the maintenance of biodiversity.

Problems With The Keystone Approach

In many ecosystems it may be difficult to identify those which are the keystone species. Our lack of knowledge about ecological processes is a constraint. Ecosystems are dynamic and complex not lending themselves to a reductionist species by species approach. Often keystone species may also be flagship species, instances where this is the case may be coincidental, greatly increasing the chances that a flagship based approach will conserve intact ecosystems. While a species-based approach may be effective in conserving some ecosystems, it will be an insufficient basis for conservation efforts because of the vast number of species.

However the conservation of keystone species is necessary but not sufficient for the successful conservation of an ecosystem. The loss or change in the number of a few non-keystone species may have a greater ecosystem effect than a similar change in a keystone specie.

Because of the dynamic nature of ecosystems a species based approach may be inappropriate for long term conservation. Those species with disproportionately large roles today, may not be essential in the future as an ecosystem evolves and responds to change. In a constantly changing environment an ecosystem's continued survival is dependant on its resilience, its ability to recover from shocks and perturbations. A species not normally important in maintaining the ecosystems viability may become vital in the wake of an environmental change. With increased diversity there are a multitude of interactions which can regulate ecological disturbances and a greater pool of species from which one or more can mitigate shocks, hence there is increased ecosystem stability.

Ecosystem Approach

The inappropriateness of a species-based system of conservation and valuation is perhaps best highlighted by the integral role functioning ecosystems have in providing ecological services. These ecological services include the photosynthetic fixation of solar energy, the maintenance of hydrological and nutrient cycling, the creation of soils and their protection from erosion, and micro and macro climate regulation. These ecological services are indispensable for life as we know it.

An ecosystem approach is a more appropriate basis for estimating the true value of biodiversity because it is better suited to measuring the benefits society receives from ecological services. Not only do these services permit our survival, they also allow the continued survival of our way of life. There has been an increasing realisation of the role biodiversity has in the provision of these services, which previously have been taken for granted. "Economists are increasingly recognizing that these environmental functions, or 'ecosystem services', support and protect economic activity and thus have an economic value" (Aylward and Barbier 1992:34).

Our socioeconomic system is very much dependant on the functioning of ecosystems. These systems are interconnected, but not interdependent, increased economic activity has tended to have an increasingly detrimental effect on biodiversity.

> Biodiversity and biological resources are fundamental to the functioning and resilience of ecosystems, which in turn supply essential ecological services and resources to support the production and consumption activities of the economic system, and, ultimately, human welfare and existence. However, these economic activities of production and consumption also lead to biodiversity loss, directly through over-exploitation of biological resources, and indirectly through habitat modification or destruction (Barbier et. al 1994:19).

The benefits that society gains from ecological services are considerable. They are generally provided free of charge, by biological resources. Often they have not been previously scarce and are thus not perceived as something which has to be paid for by society, even if the cost is foregoing conversion. Because economics is largely concerned with the allocation of scarce resources, it has rarely valued ecosystem services which are often perceived as part of the natural scheme of things.

Methods of Calculation

Various methods to attempt calculation of ecosystem services have been utilised. Meadows provides an example of a possible approach which could make us appreciate the value of services which we take for granted. This approach estimates the cost of providing the same service manually or through technology, which is currently provided by the ecosystem.

> How would you like the job of pollinating trillions of apple blossoms some sunny afternoon in May? It's conceivably maybe that you could invent a machine to do it, but inconceivable that at the machine could work as elegantly and cheaply as the honey bee, much less make honey on the side (Quoted in Meffe and Caroll 1994:33).

The attempts at quantifying the benefits provided by ecosystem functions, while only estimates of their total worth have shown that the value to humans is considerable. The difficulties in quantifying the value of ecosystem functions is exacerbated by the scale of some of the ecological systems. Systems are often extremely large, such as the global carbon cycle, and while its value in regulating climate is immense, its size makes valuation a daunting task.

The Inappropriateness of a Species Approach in a Changing Ecosystem

An individual species-based valuation approach is not the most appropriate for quantifying and allocating the value of a functioning ecosystem. While there is an overwhelming importance in maintaining the functioning of ecosystem services, it is nearly impossible to attribute the value of these nonconsumptive uses to a selected species. Even when current keystone species are identified, how much of a complex ecosystem's value should be attributed to species which are important today?

> Ecologists cannot furnish economists with the information necessary to distribute these benefits among species, even if the value of the ecosystem service could be accurately measured and quantified. Further, species contribute to ecosystems in ecological and evolutionary ways that have no direct or immediate, and certainly no measurable effect on human benefits. But these contributions are essential to the long-term health of systems and even to the future of the human species. While it is often the case that decisions must be made without full information, the present case is so extreme as to call into question the value of assigning quantified values at all (Norton 1987:41).

Ecosystems are dynamic and their species composition changes over time. Often the composition of species will change in response to shocks, but there is also a general tendency for the diversity of species within an ecosystem to be self-augmenting or increase with time. The dynamic nature of ecosystems means that species not directly important to an ecosystems functioning today may be of vital importance in the future. These species can be viewed as a form of biological insurance, increasing the likelihood of an ecosystems continued functioning in the wake of a shock or a change in environment.

Self Augmentation

The tendency for the diversity of ecosystems to be self augmenting, results from the larger pool of species which can compete for available ecological niches. While this may aid in the recovery from shocks, it is the organisation and interconnectedness which is slowly accumulated within an ecosystem which provides more niche opportunities. Diversity is necessary for ecosystem complexity, but it is not sufficient, it requires a considerable period of time for the formation of the interconnected structure of interdependencies. Thus diversity begets diversity, as diversity is necessary for developing the complex ecosystem structure, and structure promotes niche opportunities for speciation (Norton 1986:115).

However this interconnectedness within ecosystems can also exacerbate extinctions, if an ecosystem continues without the occasional perturbation there is a greater possibility that an ecosystem can become over-connected. In this situation a major shock or the extinction of a species can cause massive, widespread destruction because of the increased degree of interdependence between species (Barbier et. al. 1994:25).

The Downward Spiral

It is this dynamic interdependence between species which promotes evolution, but it can also cause a flow-on effect associated with species extinction. When a species becomes extinct, other species which are dependent on it, or interact with it, are threatened. If we were in a situation where speciation was increasing, the loss of a species would merely slow the rate of increase. However we are currently experiencing an era where species are becoming extinct at a rate far greater than the rate of speciation. Additional extinctions are accelerating this extinction rate exacerbating a downward spiral. Thus the impact of human-caused extinctions are accentuated, intensifying the detrimental effect of extinctions.

Managed Systems

Overconnected ecosystems can become vulnerable to major shocks. However these diverse systems are generally more resilient, especially to less severe perturbations, than highly managed systems with fewer species. In the past few thousand years humans have converted diverse natural ecosystems to less diverse managed systems of greater economic value. These agricultural and silvicultural systems have fewer interactions between species which could dampen or counteract disturbances. This lack of species interactions within controlled systems results in fewer opportunities for self regulation. Disturbances within part of the system are transferred, often amplified to other parts of the system. "Biodiversity is a way to hedge bets against uncertainty, even in managed systems" (Baskin 1994:658).

The more complex and interdependent an ecosystem the more interactions there are between species in many different levels. Not only are managed systems with their reduced diversity more vulnerable to shocks but in lacking the beneficial symbiotic interrelationships between species they require a greater amount of external inputs.

Conclusion

The interventionist individual species approach to conservation has not been without its successes. In protecting the habitat of the targeted species many others are conserved. However this individualistic approach is not the most appropriate for the widespread conservation of many species. It is simply impossible to apply individual conservation programmes for all species which are endangered. We are not even aware of most of the millions of species which are under threat, yet alone in a position to apply individual conservation programmes.

Even if an individual species based conservation approach was to target keystone species, those which are most integral to the continual functioning of the ecosystem, it would not ensure ecosystem conservation. Our lack of knowledge of ecological processes limits the identification of keystone species within many ecosystems. Even where keystone species are identified, the application of this reductionist single species approach may be unsuitable for long term conservation. Ecosystems are dynamic and complex ecosystems, the combined effect of changes in a number of other species may have a greater detrimental effect than the keystone species.

One of the most important factors that causes a species to become endangered is habitat fragmentation. Since a species is inseparable from its habitat, a threatened species commonly indicates a habitat which is under threat. Unfortunately when a habitat becomes fragmented it appears to cause the loss of the same types of species. Thus a system based on conserving fragmented habitats may fail to conserve species that require wide ranges. These species require a large area of habitat to be conserved and for their long term survival, it will often be necessary to conserve their entire ecosystem.

A conservation approach which focuses more on habitats and ecosystems, rather than individual species will be better suited to the maintenance of ecosystem services as well as conserving species. With the expanding global dominance of Western socioeconomic systems, the requirement for economic justifications of conservation will increase. In this environment it will become extremely important that ecosystems are valued correctly.

> Endangered species conservation must be ecosystem-orientated. It is not preservation of *species* that we wish, but the preservation of *species in the system.* It is not merely *what* they are, but *where* they are that we must value correctly (Rolston 1994:31).

CHAPTER 4

NATIONAL PARKS AND RESERVES

Introduction

This chapter will focus attention on the legislative protection which is required within the technocentric system in order to protect nature from conversion. Protected areas have represented the predominant technocentric approach to habitat protection during the last hundred years. National parks represent the epitome of this preservationist approach, which originated to secure the pristine qualities of an untouched wilderness rather than conservation.

This chapter will question why the preservationist national park approach has become the dominant form of in situ conservation. As part of the technocentric system the national park ideal has been exported around the globe. National parks were originated by an affluent culture to preserve fragments of untouched wilderness for hunting and recreational use. This is despite its attempts to preserve an untouched wilderness in places where there has been relatively sustainable human interaction with local ecosystems for generations. The continued popularity of national parks over other protected areas appears to be the result of tourism, funding or national prestige rather than conservation or sustainable development.

Global Awareness

There has been an increased global awareness of the need to conserve functioning ecosystems. Chapter three highlighted the importance of focusing efforts on in situ (on site) conservation of ecosystems, rather than on individual species. Habitat protection conserves not just one, but all species which comprise an ecosystem. The conservation of ecosystems is necessary to ensure both the long term protection of species and the continued provision of ecological services.

Protected Areas

Habitat protection for the past century has often involved the setting aside of wilderness areas in the form of national parks and other reserves, so much so that national parks and reserves have become globally the most significant method of biodiversity conservation. "National parks and reserves represent the single most important method of conserving biological diversity worldwide" (Brandon and Wells 1992:557).

Despite national parks' and reserves importance in being the foremost method for in situ species preservation, the high rate of extinction has called into question the continued viability of this approach. National parks and reserves are commonly fragments of wilderness, often islands in a sea of intensely managed landscapes. As a method of conservation one area where they may fail is to ensure the survival of certain types of species. Those especially susceptible are migratory species and large animals, particularly higher trophic predators.

Fragmented habitats can also accentuate the susceptibility of many species to climactic and other ecosystem changes. Before habitats were fragmented species susceptible to change could continue to exist in areas other than where environmental damage occurred. Many species would be able to escape from localised environmental destruction are unable to because their habitats are enveloped by intensive agriculture. "The biodiversity crisis is challenging the fundamental logic of pristine wilderness set-asides surrounded by intensely managed multiple-use lands" (Grumbine 1994:229).

Parks and Reserves

There are numerous different types of reserves, which vary in the use which is allowed within the protected area. Parks differ from reserves in that they allow only scientific, educational and recreational use of the areas resources. Other categories of reserve can allow for restricted use of resources depending on the objective of the reserve.

Parks and reserves represent an inability of Western society to live in harmony with the environment. Without legislative protection the technocentric system would continue to exploit biological resources beyond what is socially optimal. National parks are the epitome of a Western legislative approach to nature preservation, restricting all non-recreational uses. They are required because of the failure of the technocentric socioeconomic system to adequately conserve the environment. "We would not need national parks if we did not have such an exploitative relationship with nature" (McNeely 1988b:239).

National parks have been challenged as encouraging, reinforcing or reflecting a Western societal separation between people and nature. This dichotomy within the technocentric model views human society to be inherently antagonistic towards nature and must be removed to ensure successful wilderness conservation.

> People are seen as radically separated from nature, wilderness areas are considered to be pristine enclaves of nature untainted by human handiwork, and they are believed to be to be operating in harmonious balance with the natural landscape they are embedded within (Grumbine:1994:28).

This dualism between people and nature provides a rationale which legitimises the human exploitation of natural resources in combination with the preservation of pristine enclaves in an undeveloped state.

Conservation Vs Preservation

It is possible for the environment to be conserved without locking it away in an untouched state. Conservation differs from preservation in that it allows natural resources to be utilised in a sustainable fashion, while maintaining functioning of ecosystems safeguarding the continued viability of the environment. The Western separation of people from nature has failed to recognise that throughout history humans have manipulated their environment to suit their own needs. As a result of this manipulation there are very few environments that have not been altered in some way by human action.

> Simmons (1974) has shown that the proportion of 'unused land' (virgin land, or land which has totally unaltered by man) [sic] has been reduced to a very small figure - probably less than 1% of the total land surface of this planet (Jones 1987:150).

Inappropriate Exportation of the National Park Idea

As part of the technocentric model the national park preservation priority has been inappropriately applied in many developing countries. These applications have not sufficiently considered that other options for conservation which may be more suited to the situation. One reason why national parks may not be appropriate is their belief in the incompatibility of people and nature. They have been applied in areas where local people derive their existence directly from their local environment. This has often created conflict between the park and local people, which has limited the effectiveness of the national park.

The national park idea comes from the technocentric model which evolved within Western culture. The Western managerial approach towards the environment differs from other environmental viewpoints. Yet national parks have generally been applied without consideration of cultural differences.

> The problems are not just ones of management, but of ethics; if conservation is part and parcel with culture, can it be right to take a conservation concept which is itself closely allied with a particular type of culture and promote (or acquiesce in) its dissemination, in unmodified form, around the world? Nevertheless, that is what happened with the national park ideal (Harmon 1987:150).

Today the national park approach, rather than reserves or other forms of protected areas, is the most important method of conservation around the globe. are reliant on the environment. A major reason is the legacy of Western nineteenth century ideology has remained powerful in the post colonial era.

> "National Park," nevertheless, is still the most used protected area designation in the world - a fact due in large measure to the preponderant influence the conventional national park idea has had on international protected-area conservation (Harmon 1987:148).

Historically

National parks were created within a Western socioeconomic system, originating in a uniquely North American situation. The first national parks were established where technocentric development had successfully created an affluent immigrant society. It had done so while still retaining large but diminishing amounts of land which had remained undeveloped by the dominant Western culture, particularly Western USA and Northern Canada. The belief that wilderness should be set aside as a pristine enclave, originated in a society that had never used and was sufficiently wealthy that it need never use all of its environment.

Technocentric development had been so successful in North America that it had given the immigrants a sense of control and dominance over the New World. In separating humans from the environment technocentric development had increased the pleasure associated with experiencing an untouched landscape. George Caitlin (quoted in Nash 1970:729), who gave birth to the national park idea believed "the further we become separated from that pristine wildness and beauty, the more pleasure does the mind of the enlightened man feel in recurring to those scenes."

While in 19th century North America the untouched wilderness was gradually disappearing, natural resources were believed to be inexhaustible. It was the pristine aspect of an untouched wilderness which was endangered, establishing the preservation priority within the national park idea.

> Ironically the very process which destroys wilderness stimulates its appreciation. Canada has too much wilderness left for widespread appreciation to exist. America took the lead [though it was closely followed by Canada] in parks and preservation because its wilderness was exhausted sooner (Nash 1970:728).

The primary motivation behind national park development was not the conservation of functioning ecosystems. Protection for Yellowstone, the world's first national park (1872) was primarily created to ensure its continued availability as a recreational area or pleasure ground. "The prime function of Yellowstone was that of recreation; the spectacular scenic value of the area was already attracting many visitors in the s and this trend had continued to this day" (Jones 1987:115).

American national park development was primarily motivated by recreational needs and legislation was provided to protect areas so that they could be available for the enjoyment of the public. In Europe royalty and other elite had often held private reserves of wilderness. In keeping with the European immigrants democratic ideology national parks were to be held publicly for all to enjoy.

While the colonists of the New World rebelled against aristocracy, they retained much of their European ideology. The belief in the need to separate humans from nature remained. National parks were protected from all forms of non-recreational direct use, ensuring availability for current and future recreation. These legislative and physical barriers extended to the indigenous Shoshone. The Shoshone were viewed as "sneaking red devils" and were either evicted from the park area or killed (Runte in Kothari et. al. 1995:189).

The American model for national park preservation has been exported to other countries. It's success has lead to other countries adopting similar approaches in order to preserve nature, commonly for the purpose of recreation. However many of these countries, especially in Europe, lacked the large tracts of undeveloped land to preserve. Their desire to have their own national parks often led to the incorporation of resident populations within the park's boundaries.

> The ten existing National Parks [in England and Wales] are extensive areas designated between 1950 and 1955 for their scenic beauty and their potential for open air recreation. They do not correspond to national parks ... but rather to ... Protected Landscape ... (Foster, Phillips and Steele 1984:431).

However in most situations, particularly in developing countries, their have been little consideration of the possibility of coexistence. The national park model has been applied unaltered, retaining its emphasis on recreation and the belief in the incompatibility of people and nature. "Park planning concepts introduced in the United States in the 19th century have served as models for development of protect area networks worldwide" (Brandon and Wells 1992:558).

The "Great White Hunter'

The attitude towards nature preservation approaching the end of the 19th century was often based around hunting. Perhaps the best example is provided by USA President Theodore Roosevelt, an avid hunter and collector of trophies, who was a 'pioneer statesman of the [conservation] movement' (Fitter cited in Adams 1990:18).

The "great white hunter" was most prominent in the colonial establishment of African game reserves in the late nineteenth century. These game reserves were the basis for many of Africa's national parks. For example the 1892 Sabie Game Reserve in Transvaal would later become the Kruger National Park and in Kenya much of the game reserve established in 1899 would become the Ambolesi National Park (Adams 1990:18). They were set up to protect the large mammals which were the trophies for hunting expeditions. These charismatic flagship species had captured the imagination of Westerners and would become the focus of international tourism.

These game reserves/parks failed to consider local peoples rights or needs, commonly seeing local people to be the problem. Hingston (cited in Adams 1990:18) provides us with an example of the colonial attitude towards African people and the detrimental environmental effects of their hunting, in comparison to the colonial 'sportsman'.

> The sportsman does not obliterate wild life. True, he kills. But seldom is the killing wholesale or indiscriminate. What the sportsman wants is a good trophy, almost invariably a male trophy, and the getting of that usually satisfies him. ... The position is not the same with the native hunter. He cares nothing about species or trophies or sex, nor does he hunt for the fun of the thing. What the native wants is as many animals as possible for the purpose of meat or barter.

The 'sportsman' was not separated from the 'native' in that he killed, he was different because he killed 'for the fun of the thing', whereas the native killed out of necessity. Many precolonial African societies hunted in order to provide protein to supplement their basically carbohydrate diet (MacKenzie 1987:42).

The imperialist hunting ethos was combined with a colonial viewpoint which saw Africa as some form of Eden. Africa was perceived to be wild and untamed, in direct contrast to

the domesticated landscapes of Europe. The African people were also seen as part of this uncivilised wilderness, evolutionarily distanced from the imperialist sportsman.

> For Theodore Roosevelt, part of the excitement of Africa was that it brought the hunter face to face with the Palaeolithic past, with his remote evolutionary ancestors, with a raw wildness unimaginable in the civilised world (MacKenzie 1987:53).

Colonialism had allowed Europeans the opportunity to impose their preconceived image of Africa as an untouched natural landscape. There appeared little consideration but the great white hunters about their right of access, however conservation of these game reserves/parks grew out of their need to restrict access by others. The technological superiority of the Europeans gave them the means to control and limit access by indigenous peoples to national parks.

Motives for Recent National Parks

The national park ideal was to preserve wilderness areas in an unaltered state. Often land which is now a national park was left relatively unaltered by humans because of severe physical restrictions which inhibited use. These areas with severe restrictions, such as those at high altitudes, which experience intense cold and an extreme lack of water, are amongst the most inhospitable and biologically impoverished landscapes.

The national parks method of conservation has only been applied for just over a century, many biologically significant areas had already been converted to agriculture or other uses deemed more productive to humans. Thus national parks have often been created in areas which have relatively low direct economic value.

One possible reason why tropical rainforests have, until recent years, escaped major deforestation is their biodiversity. An area with a small number of many different species of trees is less valuable to harvest that an area with a large number of the same type of tree. "The rarity of big stands of single valuable timber species has been a factor militating again long-term economic management of tropical rainforests" (Dasmann et. al. 1973:43).

There has also been a reluctance to protect areas which are likely to be of direct economic value, especially those which could be commercially harvested. These areas of direct economic value are generally the most accessible, either within the range of rural populations or permit commercial access.

> Globally, high altitude habitats have received a disproportionate share of protective efforts, while others of greater biological significance (such as lowland forests, wetlands, and most aquatic ecosystems) have been neglected (Ryan 1992:17).

Tourism and National Park Creation

While there has been a reluctance for legislators to apply protected area status because of the belief that they retard economic development, there are situations where the creation of national parks can actively promote economic development. National park creation has often been advocated in order to promote tourism, historically they were primarily developed for recreational use. In the 1960s, spurred on by the success of Kenyan wildlife safaris, neighbouring Ethiopia investigated into the creation of national parks with a focus on tourism as much as on wildlife conservation.

> The Awash Valley was not outstandingly rich in wildlife but it was close enough to Addis Ababa (about 200km to the east), and accessible enough, for its development as a tourist attraction to be feasible short-term project (Turton 1987:172).

Conservation, in this context has often been viewed as having the potential to satisfy both economic development and conservation objectives. Increased tourism can promote economic growth and be a valuable source of income for cash strapped less developed countries.

Tourism can be income generating, this income could provide for or offset some the cost of national park creation. This can also counter some of the opportunity costs which may be associated with not converting the park.

A tourism focus on national park development can be beneficial for various sectors of both the local and international community. Governments can benefit as tourism revenue can bring in valuable foreign exchange, improve economic growth and increase government revenue.

> Governments are sometimes more ready to allocate budgets for parks than for other conservation areas such as nature reserves in the belief that parks mean tourism and therefore dollars for Treasury (Blower 1984:723).

The preservation priority of national and international conservation agencies is served as long as tourism is a nonconsumptive use of the national park environment. These agencies often utilise the likely tourism benefits to offset the belief that conservation retards economic development.

A national park or reserve will attract tourists because of the area's recreational possibilities, which are largely dependant on maintaining its natural beauty. However in many situations tourism can have a detrimental effect on the quality of the environment which attracted the tourist in the first place. With increased tourism meaning increased income, financial pressure may be put on the park to increase tourist numbers beyond its carrying capacity.

The tourism focus of national parks often exacerbates social inequalities, the primary beneficiaries park development are foreign tourists. With increasing financial pressure on parks and an awareness of limits in sustainable tourist numbers, park access is likely to become increasingly restricted and expensive. Tourists are able to gain access to

protected areas which are restricted to local people. These inequalities are not just exacerbated locally but globally, as park development has commonly provided little which is beneficial, and can often marginalise the rural poor.

> It is not the rural poor who will gain most from the designation of national parks, but the rich consumer of the industrialised North with leisure and wealth to be a tourist in the Third World (Adams 1990:200).

The people within developing countries are not the main beneficiaries of their national parks. Despite this national parks have commonly been developed within developing countries in the post colonial era. The reason is unlikely to be solely the influence developed countries have in exporting modernisation and their preservation priority.

Demonstration Effect

The national park ideal has been as much imported as exported. Harmon (1987:151) believes legislators within developing countries who are responsible for the designation of national parks are attracted by the status of their own Yellowstone. He believes the spread of national parks can largely be attributed to the demonstration effect the success of developed country national parks has had on the governments of developing countries. This is accentuated by the possibility of attracting financial support for park development. "Parks are fashionable and ... are sometimes more successful at attracting financial support than other less publicized categories of protected areas" (Blower 1984:723).

Conclusion

National parks represent the most important global method of conservation. However, there needs to be a fundamental change in what was historically a Western preservation ethic. National parks were invented to preserve wilderness for those who could afford the luxury of using the protected area for recreation. The national park ideology has been exported to developing countries without sufficient consideration of other conservation options. While often introduced by developing country governments, national parks perpetuate global inequalities. Park development has commonly had detrimental impacts on local people, the primary direct beneficiaries being rich foreign tourists.

This desire to preserve the environments in an untouched form is based on the technocentric belief that humans are inherently antagonistic towards and need to be separated from nature. In the global application of the national park there has been a general failing to recognise that other cultures do not share this ideology. This Western model has often been developed without sufficiently considering local conditions or the needs of local people. The application of this is approach has often clashed with local people, who have a different cultural perspective.

CHAPTER 5

PROTECTED AREAS

AND LOCAL PEOPLE

Introduction

The imposition of national parks and other protected areas has often had detrimental effects on the lives of local people. This chapter will begin by examining how Western conservation has been imposed without due consideration of local conservation practices or its impact on local people. Parks and reserves have generally resulted in a reduction in the availability of resources and have often displaced local communities from their traditional lands. This Western approach to conservation represents an alien imposition into their way of life, which has all to often failed to realise the integral role local people currently have and can have in future conservation.

Next this chapter will highlight the role of outside experts and park planners have had in the development of national parks and reserves in developing countries. These 'experts' come with their own assumptions about conservation and commonly fail to fully comprehend local living and conservation practices. In examining cases protected areas we can see cases where park planners have failed to even consider local people.

Then this chapter will highlight the vital role local support has in the success of any conservation strategy. The realisation of the need for local support has led to a move towards integrating the economic development of local people in integrated conservation development projects.

Finally it will investigate these integrated conservation development projects. It will endeavour to show that while they have shared some of the revenues generated by the protected area, this approach has largely been imposed on local people. It has failed to have local people participate in park planning and decision making. This is despite the unique local knowledge and a history of successful environmental management that local people may posses.

Local People and Externally Imposed Conservation

National parks and Western conservation in general, are often seen by local people as alien impositions into their way of life. Local people are those who reside or utilise the area which lies within the proposed or existing protected area. A wide variety of communities have been affected by the imposition of national parks. These communities differ in their method of development, which affects their level and the location of their environmental degradation.

Those committed to technocentric development can draw on resources from around the globe and the impacts from their overconsumption are widely dispersed. This allows them to live within a protected area or in close proximity to a national park, in relative harmony with the local environment. The global market allows biosphere people (Dasmann 1988:304) ready access to external resources. Japan has 5.4% of its land area in national parks (Sutherland and Britton 1980:7) and still retains over 20% of its original

forest cover, "but its citizens' affluent lifestyle is maintained only by massive imports of timber and food" (Gunn 1994:31).

In many circumstances, particularly in developing countries those effected by the creation of protected areas are closer to Dasmann's (1988:304) ecosystem people. These people despite drawing most if not all of their needs from local resources have maintained a relatively harmonious, symbiotic relationship with the local environment for generations. It is ironic that despite having maintained the area in a condition that outsiders deem worthy of protection, these same outsiders believe that a change to a Western conservation approach is necessary. National parks and reserves impose their own preservation priorities which often reflect the interests of national or international conservation agencies, not the local community. As the leader of the Tambon from the Lampoon District in Thailand demonstrates:

> This is our community forest that was just put inside the new national park. No one consulted us! We protected this forest before the roads were put in. We set up a roadblock on the new road to stop illegal logging. We caught the district police chief and arrested him for logging (quoted in Alcorn 1990:317).

Local people value and will often defend and fight for their right to manage biodiversity. The technocentric approach to conservation, reflected by most international conservation agencies, is primarily focused on the preservation of biodiversity. This priority has often created a barrier which prevents access to previously utilised lands by local people. Where parks have legislated protection and physical guarding to prevent harvesting and/or hunting a siege mentality can develop between the park and the local population.

> The park or reserve effectively becomes a "castle", with the "enemy" out there and the "good guys" inside. By definition, a state of siege is generated. And castles virtually never survive a siege (Janzen 1992:31).

Outside "Experts"

From the outset local people are often ostracised and it is rare for them to participate in the development of protected areas. As a foreign method of protection national parks and reserves are usually established on the basis of advice from outside experts. Rarely are a local community's practices or knowledge considered because even despite their years of accumulated knowledge they lack Western formal training.

> The assumption has always been that wildlife conservation is the prerogative of naturalists, trained ecologists and foresters, and that modern biological science is the only discipline needed to carry it out (Kothari, Suri and Singh 1995:190).

Often these outside experts only stay within the area for a short period of time, limiting their opportunities to gain a full understanding of local culture and knowledge. This can often result in a biased viewpoint of the detrimental effects of traditional utilised practices. Which can lead to "experts" advocating further outside intrusions into the local

way of life. "Repeatedly such expert missions identify the current actions of local people as a threat to the survival of some feature of conservation interest" (Adams 1990:184).

Barriers which prevent access by outsiders to local communities are considerable, including lack of contact, problems with language, the experts professionalism and prestige, as well as sheer prejudice. In many situations "the knowledge of any group of rural people is accessible to outsiders only through learning from rural people themselves" (Chambers 1983:84).

While it is difficult for these outside "experts" to fully comprehend local peoples knowledge, these experts often failed to even consider that this knowledge could be of use in conservation. This is despite accumulated knowledge and an underlying attitude which had maintained their environment for many generations.

> Seldom were the tribal people who lived on the land consulted, even though they had cared for the wild plants and animals an had basically maintained the land in a wilderness condition deemed suitable for a nature reserve for many centuries (Dasmann 1991:10).

'Experts' are often provided by international conservation agencies, who have had a growing involvement in the funding and development of national parks in developing countries. These experts usually possess the same preservation priorities as their organisations.

Outside experts bring their own assumptions, particularly about what is most appropriate method of conservation. They often view their job is to encourage a transition from traditional practices to the modern, protected area conservation. They generally come with an assumption of the success of the technocentric approach towards development and conservation which they are familiar with. This conviction was demonstrated during the 1992 United Nations Conference on Environment and Development (UNCED):

> Many UNCED delegates and conservationists ... view local control over land, forests, streams and rivers as a recipe for environmental destruction. The only way to secure the environment is to put a fence around it, police it and give it economic value through development (The Ecologist 1993:12).

The experts commonly fail to consider the global socioeconomic picture. In which developed countries can draw on the natural resources of developing countries in order to support their overconsumption. Thus allowing them to maintain their own national parks in an untouched state.

Cultural Differences

There are often large cultural differences between externally imposed conservation and local people. Within the Mursi culture there is a special status for cattle.

> Cattle, for the Mursi, are almost part of human society. Both men and women are named after them; they are, through bridewealth, the crucial means of establishing family units and they are a

> dependant on human beings for their survival as human beings are dependant on them (Turton 1987:181).

The Mursi categorise other animals as 'aha dusoin' - things of the bush. While on occasion they may kill aha dusoin, it is only to gain useful products or to protect their cattle, otherwise they are kept at arm's length from Mursi society.

The Western cultural perspective differs from the Mursi. The technocentric approach sees itself as being above nature, in a position to dominate and control it. It endeavours to bring nature under its will either through exploitation or conservation. For the Mursi, the concept of protecting wild animals is alien. This approach obliterates the difference between two fundamentally opposed categories, cattle and aha dusoin. The designation of the national park has imposed the western dichotomy between people and nature, as opposed to the Mursi who live and see themselves as part of nature.

Displacement of Local People

The displacement of local people has often been advocated by national park creation. "The official definition of a national park includes words to the effect that they are not materially altered by human exploitation and occupation." (McNeely 1988b:239) The exclusion of local people is often taken arbitrarily, based on ideology, rather than any physical evidence. In displacing local people national parks have taken control away from those who have substantial, irreplaceable, locally specific knowledge and a history of environmental conservation.

They have violated their basic human rights, evicting them from lands which they have occupied for generations. National parks and reserves have historically and often still fail to adequately include the interests of those who are most concerned and reliant on the local environment.

> Indeed, there is increasing recognition that a protection strategy which alienates local communities, besides being unjust and disrespectful of peoples fundamental human rights is detrimental to wildlife conservation. (Alcorn 1991:320)

The Mursi and The Omo National Park

The creation of the Omo National Park in South Western Ethiopia provides an example of such disempowerment. The Mursi were reliant on lands within the national park for cultivation and cattle herding. It was believed by the outside experts, the 'Park Planning Team' that the resettlement of the Mursi be a fundamental prerequisite for a successful national park (Turton 1987:180).

The Park Planning Team believed the Lower Omo Valley to be 'wilderness': they have attempted to impose the Western dichotomy between people, in this case the Mursi, and nature. "According to Stephenson and Mizuno [the Park Planning Team] it is Ethiopia's 'most unspoilt wilderness' which has 'retained its primeval character from ages past'

(1978:1-2)" (Turton 1987:179). They failed to recognise that the Mursi are part of the environment and their activities have modified local ecosystems without causing major environmental degradation. Centuries of Mursi burning and cattle grazing have resulted in the open grass plains to the west of the Omo river and the wooded grasslands to the east (Turton 1987:180).

Impact of National Parks on Local People

Local people often bear the greatest costs associated with the development of national parks and reserves. These externally imposed conservation systems result in a reduction in the availability of resources to local people. The reduced resources available to local people outside the parks boundaries face increased pressure. This can lead to resource degradation outside the protected area, promoting a "siege mentality" as local people attempt to gain access to abundant park resources.

> Local people often view parks and reserves as restricting their income and access to needed resources. The contrast between limited resources *outside* the park and abundant resources *inside* the park becomes marked as the pressure on their resource base intensifies. Not surprisingly, local people are willing to risk fines and imprisonment if they are caught breaking the park regulations in order to satisfy a variety of needs (Brandon and Wells 1992:558).

Parks and reserves can cause conflict with local people because of their success in the conservation of potentially destructive or dangerous species. These animals are often those seen by national and international conservation agencies as flagship species, these include elephants, wild boar, bears, leopards, lions and tigers. These species are charismatic and have a high level of international visibility, but they are also large, requiring large ranges. With increased numbers they may encroach onto neighbouring human settlements, destroying crops and property, and attacking livestock and villagers.

> Between 1979 and 1984, the Sunderbans National Park (and Tiger Reserve) reported 192 cases of human being injured or killed by animals. Crop damage by wild boar and bluebull is so widespread that some [Indian] states have declared the animals vermin or ordered their elimination (Kothari et. al. 1995:188).

Another example where national parks have had a marked detrimental effect on local people is the Gonarezhou National Park. This park was created in South Eastern Zimbabwe (then Rhodesia) in 1966. Much of this area was inhabited by Shangaan who were evicted in keeping with the national park ideal.

Previously the Shangaan had traditionally utilised some agriculture but were primarily reliant on hunting and large scale fish drives. Now they were forced to rely primarily on agriculture in an area which was prone to drought and subject to raids on crops by wild animals, especially elephants (Peterson 1991:103).

Shangaan resentment towards the national park was manifested mainly through poaching. This was not only a practical means of gaining needed food, but their way of fighting the recent loss of their traditional homeland. Poaching intensified when, despite land

redistribution being a central issue in the independence struggle, the newly independent government failed to return park land to the Shangaan.

> Government justification for not returning the land was the national need for the foreign exchange earnings from tourists who visited the park. This created additional incentive to poach wildlife in the park. The Shangaans felt that without wild animals there would be no tourists and therefore no need for a park (Peterson 1991:103).

In many cases in it is understandable why local villagers are opposed, often violently, to national parks. Other forms of direct protest have included deliberately setting parks alight. Disputes with park officials have been relatively common and physical clashes have occurred with park officials within India have occurred in at least 47 protected areas (Kothari et. al. 1995:192). National parks have often alienated the local community, this can result in a conflict of interests between the park and surrounding people, this conflict calls into question whether this is the most appropriate method of nature conservation.

Local Involvement

National parks do not exist in isolation. To be successful they must have the support of local people not just within but surrounding the national park. Many of those who live outside the boundaries are often directly reliant on the national park. It is vital for the parks continued viability that the people surrounding the park recognise and support the park's existence.

Integrated Conservation-Development Projects (ICDPs)

In recognition of the need to gain the support of local people there have been efforts to link conservation with the social and economic development of local people. ICDPs represent a progression in conservation methodology endeavouring to accommodate the needs of local people. "These projects attempt to ensure the conservation of biological diversity by reconciling the management of protected areas with the social and economic needs of local people" (Wells, Brandon and Hannah 1992:ix). As well as being project beneficiaries, local people have limited access to directly utilise protected area resources and are often employed within the project. Their local knowledge making them very effective in positions such as managers, guides and advisors.

Unfortunately ICDPs suffer from an externally imposed conservation priority onto which participation has attempted to be grafted. ICDPs evolved out of the realisation that without local support parks are generally unsuccessful in protecting the environment. Necessity is the primary motive for incorporating local people, rather than a belief in the rights or ability of local people to manage their environment. Within the ICDP rhetoric there was a recognition of the need for local "participation in decisionmaking, in problem identification, in project design and implementation, and in project monitoring and evaluation" (Wells et. al. 1992:63). However when it came to practice:

> Few of the projects specified what they meant by local participation, and most have treated local people as passive beneficiaries rather than as active collaborators (Wells et. al. 1992:x).

Local participation is more than a few project jobs or sharing in the revenues which are associated with the protected area. If protected areas are to receive support from as well as benefit the local community there is a need to better understand local grassroots level activities and concerns.

> True popular participation goes much beyond the mere provision of labour and other inputs into projects initiated from outside the community: it involves decisions being taken and plans being formulated on the local level (Vivian 1992:53).

Local People Most Affected by Local Environmental Degradation

Local people bear the greatest cost of local environmental damage. Most affected are those who are reliant for all their needs on their surrounding ecosystem. Without external resources to draw on, local environmental degradation can threaten their continued survival. In addition these communities within or adjacent to protected or proposed protected areas have commonly lacked any form of political power. "The people in these areas are often extremely poor, with limited access to government services and no political power" (Brandon and Wells 1992:558).

These people, particularly indigenous communities, have close cultural ties to the local environment. For indigenous communities a reduction in diversity not only reduces their options, but can often lead to a permanent loss in knowledge and culture which was associated with the lost species. This is intensely magnified when the community is displaced or the entire ecosystem is destroyed, because of the often highly localized interdependence between culture, knowledge and the environment.

Indigenous Control of Conservation

Indigenous people will normally want to maintain control over local resources. In situations where traditional practices and social structures are functioning effectively, a continuation of local control will provide a sound basis for conservation. In order for indigenous control to be effective their homelands, like national parks, need to be protected from the encroachment of technocentric development. In endeavouring to achieve this protection the indigenous people of the Amazon are seeking legal titles to land they have occupied for centuries. As the Coordinating Body for Indigenous Peoples Organisation state without legal protection their land is vulnerable to private exploitation and the whims of cash strapped national governments:

> Our experience, especially during the past hundred years, has taught us that when politicians and developers take charge of our Amazon, they are capable of destroying it because of their shortsightedness, their ignorance and their greed (Quoted in Mowrey 1990).

In order to prevent the loss of their lands and other abuses of their human rights indigenous peoples have become increasingly politically organised at both the village and

national level. These organisations have had to confront both external exploiters and 'outside expert' conservationists who have often been opposed to the presence of indigenous peoples. Clay (1991:249) believes that one of the most important issues in the survival of indigenous societies and the conservation of fragile environments will be "the ability of indigenous peoples to organize themselves both to work with those who would support them and against those who would eliminate them."

Similar but not Identical Priorities

Rather than taking opposing sides it may be mutually beneficial for indigenous peoples and human rights organisations to work with conservation organisations. There are many similarities between the priorities of external conservationists and local people. Both wish to conserve, if not preserve the diversity and the continued ecological integrity of the region. Both groups also share a common enemy, the relentless expansion of technocentric development. Kothari et. al. (1995:192) argues it is essential that these groups collaborate if they are to protect India's biodiversity:

> Many popular movements are working together to break down the artificial divide between conservation and human rights, arguing that one without the other is meaningless and that alliances between conservation groups and social activists are essential if India's cultural and biological diversity is to survive the juggernaut of economic liberalisation (Kothari et. al. 1995:192).

However external conservation priorities may not be met through control by ecosystem people who lack a global perspective. Widespread conservation of biodiversity will require a co-ordinated effort across landscapes rather a few localised environments. Local people manipulate the environment to suit their own needs. Endangered and or endemic species which are of great marginal existence value to conservationists are unlikely to be treated differently than other species within the ecosystem. Secondary forests lack the diversity which is associated with primary forests. Multiple land use by ecosystem people could be seen by conservationists as an effective compromise when preservation is unrealistic or unattainable.

Not all local people will be engaged in strictly sustainable living. Many of those who are reliant on the environment may have exploitative practices. Particularly in the case indigenous people there is often a romanticism about the impact of their practices. They are judged by a different standard than we judge ourselves. When their social structures are functioning indigenous people coexist relatively sustainably with the environment, in any event their practices are likely to have less global environmental impact than those in developed countries.

Often traditional practices may breakdown or prove to be ineffective. Increases in population or material needs can put increasing pressure on a land base which is often diminishing. Changing technologies and external pressures can result in environmental degradation before local practices can adapt. An example of a traditional activity which often fails to keep pace with population increases is shifting cultivation, which is only sustainable in association with relatively low population densities.

Often contact with the dominant culture can result in 'cultural amnesia' (Beauclerk et. al. 1988:37). With younger generation suppressing their culture, viewing it as irrelevant or illegitimate when compared to the successful Western culture. This can irrevocably brake the fragile chains through which oral traditions are past down through the generations.

National park legislation has also been used to protect an environment which is under threat rather than preserve an untouched wilderness. In this situation the threat can be because traditional practices can not adjust quickly enough to keep pace with an environment which is often rapidly changing. In these situations traditional practices may well be correctly identified by outside "experts" as unsustainable and detrimental to the environment. However this may not reduce tension associated with what locals correctly view as an alien imposition on their way of life.

When given control over their resources, and the opportunity to exploit them, they may harvest or convert them. Many ecosystem people may be financially impoverished and they may not opt for traditional environmentally sustainable practices. "Will Indians (or any other residents for that matter) come to the same conclusion - that is, that long term benefits outweigh short-term needs?" (Clay 1988:63).

Evolution in Thinking

There has been growing awareness of both the rights of indigenous and other local people and their ability to live in relative harmony with the environment. Indigenous people are often an integral part of the local environment, and securing their tenure and participation in protected areas can be vital in ensuring conservation. Management of local resources can often be based on traditional subsistence systems, while still meeting the desires of external conservation agencies. Sources of external income are likely to be important and changes will be required in order to manage resources which had previously not been income generating. "Conservation of resources is most likely to be achieved when bottom-up and top-down strategies are pursued in tandem" (Clay 1991:272).

Examples of Improved Participation

The first establishment of an internationally recognised reserve created by indigenous people was Kuna Park. Kuna park was created with the assistance of international conservation agencies by the Kuna indians of Panama. The park serves the dual roles of providing the Kuna with income, both from tourists and the sale of research rights to scientists, and protecting Kuna heritage.

Kuna park has become a celebrated example amongst both indigenous rights activists and environmentalists. But as an example of participation there are many reasons why it may not provide a model for similar projects. The Kuna "never depended on internal forest area to provide significant income or even space for subsistence agriculture... thus, they experienced no fundamental conflict over restricting land use in rain forest areas. " (Clay

1988:66) They modified only a small area of their environment for subsistence needs, relying on modified shoreline forests, near shore agriculture and received other incomes from trade and latterly employment on US armed forces bases. Perhaps more importantly they have title to their land and were politically astute, with a number of western advisors.

Perhaps the Chongon-Colonche project within the Cerro Blanco Forest Reserve in Western Ecuador provides us with a more universally applicable model for participation. This reforestation project has directly involved the local '*communas*' (rural communities) in the replanting of indigenous species. The reforestation programme is based around existing *communas* which are the successors to indigenous settlements. This existing organisational structure has a 'democratic parliamentary process' which has provided the basis for a transfer of technology and community involvement in decision making.

> As everyone is affected, everyone must be involved. The Chongon-Colonche project will not only save forest and valuable plants and animals, but restore traditional cultural and ethical values (Lacoste, Illeueca and Hurtubia 1995:32).

Location Specific

Because of the wide variety of conditions which face every existing and potential protected area a diverse range of conservation strategies should be applied. These strategies need to be tailored to the specific conditions of the local area. "These conditions are not only ecological and biological, but also esthetic, social, cultural, economic and political" (Fletcher 1990:201). To achieve this requires a greater analysis of the local situation, especially the demands placed by humans on the area in a concrete historical setting.

Conclusion

While there has been considerable evolution in park and reserve management, considerable improvements are still necessary to ensure the local viability of the protected area approach to conservation. One area which requires much more attention, particularly in developing countries, is the involvement of local people.

Protected areas do not exist in isolation, they require the support of local people if they are to be successful. Local people should be involved in decision making because protected areas often represent their homes, livelihoods and culture. Local people will be the most effected by any decision, their well being is intimately linked to the protected area. Their human rights should be an important consideration in any decision making.

Their close ties to the local environment mean local people have a greater stake in conservation. Often they will have a long history of living in relative sustainability within the local environment. Their social structures and knowledge systems have been effective in the past and these may form a sound basis for any conservation strategy. Instead of imposing a alien conservation model there is a need for more participatory approaches to be implemented, where local people have as much say as outside 'experts'.

The focus of national parks needs to be changed to reflect local people's needs as much if not more than those of external tourists and conservationists. There is considerable scope for international agencies and local people to work together for conservation. Conservation and human rights organisations can help in empowering local communities. They can give support and advice which can legitimise and aid in modifying tradition systems and structures to meet both local and conservation objectives. They can also collaborate to present a united voice against the common enemy which is threatening the environment, the relentless expansion of technocentric development.

CHAPTER 6

SUMMARY AND

CONCLUSION

Summary

This thesis examined the concept of sustainable development, a term used to encompass the connection between development and the environment. Chapter one emphasised two differing approaches towards achieving sustainable development. The first was technocentric development, which advocates a continuation of current development modified to incorporate the environment. The other approach was ecocentric development, which recommends a radical, fundamental change so that development is ecologically based.

This thesis focused primarily on a critique of the technocentric approach, as it is the dominant current form of development. As such it has resulted in the current level of environmental degradation. In order to demonstrate the detrimental environmental impact of technocentric development has, this thesis has focused on biodiversity.

Biodiversity is especially relevant to the issue of sustainable development because human actions have become the fundamental cause of species extinctions. In particular our decisions over how we allocate the world's resources has been the major determining factor in the rate of species loss. Extinctions have become primarily a socioeconomic rather than a natural phenomenon. The crisis of species extinction within the last few decades illustrates the lack of sustainability within the technocentric development model.

Our allocation of the world's resources is also central to the issue of equity. Equity plays an important role in sustainable development as development should be concerned with improving the welfare of those in most need. It is common for the poorest within developing countries to bear the brunt of any environmental degradation. This is despite being responsible for considerably less environmental degradation than wealthy overconsumers, who primarily come from developed countries.

Biodiversity is also especially appropriate to the examination of the sustainability of technocentric development, as it provides an example of the reductionist approach of technocentric knowledge systems. During the current extinction crisis emphasis has been on biodiversity rather than the environment. This illustrates the tendency for science and economics to focus on components, rather than a more holistic approach. Public attention and interventionist conservation efforts have targeted individual species under threat and these endangered species are often manifestations of problems within the environment.

In chapter two the component approach of technocentric development was examined. This approach views the environment as a collection of biological resources which are treated identically to other natural and human constructed resources.

The technocentric system utilises the market mechanism for resource allocation. The market approach fails to incorporate the importance of conservation because it relies solely on price for resource allocation. The market price is determined by the quantity

which is supplied to the market and the demand within the market for the resources use. This fails to include the wide range of other values associated with biological resources.

Attempts to modify the market price so as to incorporate these other environmental values have relied on amalgamating the economic valuation of each species. This approach values each species by further reducing a species into components for quantitative analysis.

Such a piecemeal economic approach values each species based on amalgamating individual preferences for the consumption or conservation of the biological resource. This may not result in sufficient conservation because the value society gives the species may differ widely from its ecological importance. There is a bias towards overconsumption because direct use values, those which are received from harvesting, are emphasised. This is because they are the most readily identified with an individual species, the easiest to measure, and they often appear in national accounts.

Indirect values which can be received without resulting in a reduction in biological resources are downplayed. These include the values associated with maintaining options for the future, improving knowledge of the environment, as well as the ecological services which allow life as we know it. Despite the importance of maintaining the availability of these values, they have not received sufficient attention under the technocentric approach. This is because they are difficult to measure and are not commonly identified or associated with an individual species. Ecological services are provided by the combination of many species working together in a functioning ecosystem. An individual species approach is not an appropriate basis for their evaluation as the value of the environment is greater than the sum of its parts.

In placing an emphasis on economic valuation this approach attempts to quantify values which do not readily lend themselves to quantitative analysis. In doing so it falsely assumes that we can accurately measure the dollar value of a species and that this dollar amount is the most important factor in justifying a species continued existence. In valuing a species we are legitimising the conversion process: the extinction of a species is acceptable so long as we receive sufficient monetary compensation.

Chapter three investigated how the individual species approach of technocentric development has also is utilised in conservation. Like the technocentric approach to valuation this approach has failed to adequately consider the importance of focusing on ecosystem or the environment in general, rather than individual species.

Individual species conservation efforts have largely been focused on charismatic, flagship species which have been effective at attracting public attention and sympathy. While often effective at raising public attention for conservation, it is not an appropriate basis for the implementation of conservation programmes. While the individual species approach has been successful in protecting selected species and their habitats, it is limited in its applicability for conserving the bulk of the world's biodiversity. Even in situations

where the targeted species play a crucial role in ecological functioning, their conservation will be necessary but not sufficient for the continued viability of the ecosystem.

Ecosystems are dynamic and complex, their continued functioning is dependant on the changing interrelationships amongst different species and between species and their environment. Within an ecosystem, the species composition and the importance of their ecological roles change over time. We possess limited knowledge about the changing roles species play in maintaining their ecosystem or generating ecological functions. Thus, an ecosystem basis for valuation and conservation better incorporates the environment's dynamic and interconnected nature, making it a more appropriate for maintaining continued ecological functioning.

Chapter four examines national parks, the epitome of the Western legislative approach which is founded on a belief that humans are inherently antagonistic towards nature. This results in a focus on preservation rather than conservation, restricting all non-recreational direct use within the boundaries, while allowing relatively unrestricted exploitation beyond.

In 1872 Yellowstone, the first national park was created in a uniquely North American situation. It was developed by a wealthy immigrant society, primarily for the purpose of public recreation. National parks were founded to preserve pristine enclaves of wilderness in an untouched state. Conservation of functioning ecosystems was not the reason for their development.

Throughout the last hundred years the national park ideal has been exported around the world, especially to developing countries. It has often been used to preserve charismatic flagship species which have attracted public attention and sympathy, particularly in developed countries. In more recent years encouraging overseas tourists has become a major reason for the creation of national parks. The global exportation of national parks has resulted in them becoming the single most important global means of in situ conservation. However, this exportation has failed to realise that other cultures do share the belief that humans have to separated from nature in order for it to be conserved.

Chapter five examined how externally imposed technocentric conservation can often have a detrimental impact on and create conflict with local people. National parks and reserves do not exist in isolation. Their success is dependant on receiving both local support and the recognition of the protected areas existence.

The creation of national parks or other protected areas is often seen by local people as an alien imposition on their way of life. There are often large differences between externally imposed conservation and local culture. From the outset local people are often ostracised as it has been rare for them to participate in the protected area's development. In restricting access to the protected area they reduce the resources which were traditionally available to local people. The reduced resources available outside the park's boundaries

face increased pressure and local people are often willing to risk fines and imprisonment in order to obtain abundant park resources.

There have been attempts to incorporate local people in protected area conservation, notably integrated conservation-development projects. However these evolved primarily out of the necessity of gaining local support for protected areas rather than a recognition of the rights and ability of local people to manage the environment. A move towards the recognition of these rights and abilities will be more likely to receive local support, as well as aid in the conservation of biodiversity.

Conclusion

The technocentric approach to development believes that we are in a position to control the environment. It believes that this control can be achieved through our understanding of the environment. The understanding is based on a belief in the superiority of the reductionist approach of western knowledge systems. It is believed that we can achieve control through our scientific comprehension of the environment and our economic knowledge of the environments value.

However this thesis has argued that we do not possess sufficient knowledge to assume that we can control the environment. This mistaken belief that we are in control has resulted in the widespread loss of biodiversity. Our lack of comprehensive scientific knowledge about biodiversity is illustrated by our limited knowledge of the number of species (Hammond 1995:116), the role a species plays in an ecosystem (Barbier et. al. 1994:26), and the effect a species extinction will have on neighbouring species (Vermeij 1986:40). Our lack of economic knowledge is demonstrated by the difficulty in accurately quantifying the values associated with biodiversity (Norton 1987:40). These difficulties are enhanced when try to quantify ecological services (Meadows 1990:33), especially when we try to distribute these benefits amongst species (Norton 1987:41).

The mistaken belief that we are in a position to dominate and control the environment, combined with our reductionist approach to knowledge has resulted in a world where every species must have an identifiable economic reason for keeping it. This has resulted in an intensification of economic analysis in order to demonstrate the value of biological resources to a country's social and economic development (McNeely et. al. 1990:25). However if conservation strategies become solely based on the economic value of maintaining biodiversity they will fail to ensure sufficient conservation. This approach will leave unchallenged the existing technological and socioeconomic premises within the technocentric system which will continue to result in the loss of biodiversity (Ehrenfeld 1978:214).

Technocentric conservation programmes have often been reactionary, focusing on saving endangered species which have a recognised public value. Their preservation has often been as part of national park based conservation programmes. National parks represent the epitome of the legislative approach to conservation, which are required because of

technocentric developments exploitative relationship with the environment (McNeely 1988b:239). The current rate of extinction is challenging whether an approach which preserves pristine enclaves of untouched wilderness surrounded by intensively managed multiple use lands is the most appropriate for the conservation of biodiversity (Grumbine 1994:229).

In many situations the preservation priority of national parks means that they are not the most appropriate means of conservation. National parks have often been externally imposed to protect environments that local people have been inhabiting in relative harmony for centuries. They have existed in relative harmony with the environment. Their lack of detrimental environmental effect is perhaps best demonstrated by external conservationists who see the area as akin to untouched and therefore worthy of national park protection.

In these situations the application of a national park protection seems somewhat paradoxical. The national park approach is based on the preservation priority, which believes that humans are inherently antagonistic towards nature. Local people are often restricted from access or displaced from the park arbitrarily, based on ideology rather than any physical evidence. Commonly the creation of national parks in developing countries has done little which is beneficial for local people, the primary beneficiaries being those who have the leisure and wealth to be a tourist (Adams 1990:200).

Rather than being utilised to earn foreign exchange and principally benefiting foreign tourists, conservation should be primarily concerned with the welfare of local people. Since they are the ones who will be the most effected by the chosen conservation strategy, they should be a major participant in any decision making process.

In many situations the local people affected by external conservation programmes are dependant on local resources for most, if not all of their diverse needs. The proposed protected area often represents their homes, livelihoods and culture. Because of this dependence they have a greater incentive to conserve the local biodiversity in order to meet these needs (Damodaran 1992:419). If they were to continue to violate local ecological rules they would degrade their environment to the point where it could no longer support their community (Dasmann 1988:305).

Local people commonly possess considerable local knowledge which they have accumulated in adapting to the local environment. Their culture and knowledge systems have often evolved in response to local conditions, allowing them to coexist with the surrounding ecosystem without violating local ecological rules. Thus it is common for these communities' knowledge systems to have an ecological basis and for their culture to be closely tied to the local environment.

There is considerable scope for improvement in the participation of local people in conservation programmes. However technocentric conservation believes that local control of resources will result in environmental destruction. This belief has been

pervasive since the creation of the first national park, where the indigenous Shoshone were either evicted or killed (Runte 1995:189) This belief remains today with many governments and conservationists that the only way to protect the environment is to bar local access and give the reserve economic value through development (The Ecologist 1993:12).

If local communities are to survive in fragile environments it will be important that they can work with organisations that will support them (Clay 1991:249). Strategies which focus on breaking down the artificial barriers between conservation and human rights will be effective at conserving both cultural and biological diversity.

Local people and external conservation agencies share similar but not identical conservation priorities. Both wish to conserve the biological diversity and ecological integrity of the region. Management of local resources can often be based on traditional systems, while still meeting the desires of external conservationists. Local people can often complement international conservation efforts by providing an ecocentric perspective which sees themselves as part of nature. Conservation strategies are most likely to be effective when bottom up and top down approaches are pursued in combination (Clay 1991:272). External conservationists and local people also share a common enemy against which to unite, the relentless expansion of technocentric development (Kothari et. al. 1995:192).

The most appropriate basis for the conservation of biodiversity should focus on co-ordinating ecosystems rather than species conservation. Despite the need for co-ordination across ecosystems, each strategy should be locally based, as the environment is local. Strategies need to be tailored not just to the local biology or ecology but also incorporate the local culture, economy and political situation.

> A far more effective conservation effort would focus on the whole landscape instead of a few reserves, on the whole diversity of species and ecosystems instead of on large vertebrates... above all it would place the major responsibility for the task squarely in the hands of local people, rather than impersonal centralised bureaucracy or technocracy. (Gadgil 1992:269)

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