

Diversity not Adversity

Sustaining Livelihoods with Biodiversity
Izabella Kozell

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Biodiversity and
Livelihoods Group

International Institute
for Environment
and Development

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Preface

Why was this paper written?

The reduction of world poverty is perhaps the biggest challenge facing the world today, and it is a major goal for the international community over the next decade. It is increasingly clear that the long-term sustainability of poverty eradication will be undermined if the natural resource base for development is threatened. Biodiversity is a fundamental characteristic of that resource base, defining many of its immediate and future potentials and vulnerabilities. The purpose of this document is to explore how biodiversity - and people's interactions with it - might either support or restrict poverty reduction processes.

There are many reasons why biodiversity is integral to poverty reduction. Firstly, some of the financially poorest countries hold the majority of the world's biodiversity. Economic pressures are driving the short-term exploitation of this biodiversity, which is occurring at more rapid rates and over larger areas than ever before. The associated changes in biodiversity, whilst deriving immediate benefits for some, are imposing both short and longer-term costs on others. These undermine biodiversity's capacity to contribute to poverty reduction. They also trigger an ever more pressing need to conserve and protect whatever remains, which many poor countries or communities cannot manage under present systems of property rights and with current skills and capacities.

There are few poverty-reduction/ biodiversity-conserving 'magic bullets'. So far, most biodiversity-related actions have focused on how to reduce biodiversity



loss. Despite external financial support, these actions struggle to sustain themselves as they are obliterated in the face of the massive counteracting development forces. They do not get to grips with powerful extra-sectoral or livelihood realities. One way forward is to channel effort into developing the conditions in which biodiversity can act as a positive development-enhancing tool. Thus enabling financially poor countries to start reaping benefits from the continued existence of their biodiversity, rather than simply bearing the short-term costs of protection with minimal livelihood enhancement, and the long-term costs of the loss of resources and resilience conferred by biodiversity.

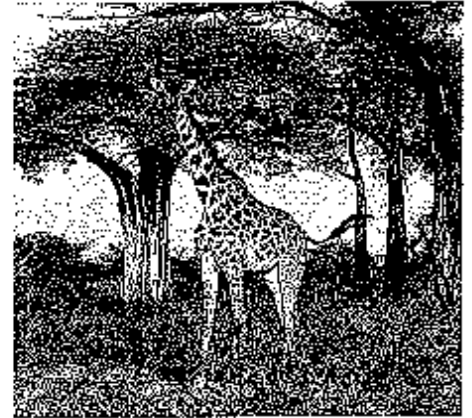
This paper is based on the premise that, with defined improvements to the policy, institutional and market environment, biodiversity would have the potential to contribute to poverty reduction; whether by reducing the cost burden of conservation (for global benefit) on poorer countries, or, by creating new livelihood opportunities. It demonstrates how a number of governments, civil society organisations and private sector bodies are already taking steps in this direction.

What does this paper offer?

The purpose of this paper is to promote better practice *vis-à-vis* biodiversity in the context of human development. It does so by aiming to develop a better understanding of biodiversity, the values it holds, and how people respond to it. It attempts to shed light on the differing impacts of these values – and their associated management systems – on peoples' livelihoods, especially those of the poorest groups. It ends with a presentation of possible future actions. Acknowledging the enormous agenda – over which much uncertainty and contradiction still exists – its purpose is to stimulate the need for further debate and discussion.

How was it compiled?

The paper is the result of a process – the Linking Policy and Practice in Biodiversity Project – funded by the UK Department for International Development (DFID) in collaboration with the International Institute for Environment and Development (IIED). This included a literature review, wide consultation in the UK and overseas and an analysis of lessons learned from DFID-funded projects. The process attempted, as far as possible, to incorporate Southern views through a Southern peer review group. The latter inputs were critical, as, for many years, the biodiversity debate has been strongly influenced by Northern



perspectives and concerns for biodiversity's global values, rather than their livelihood-enhancing values.

Who is it for?

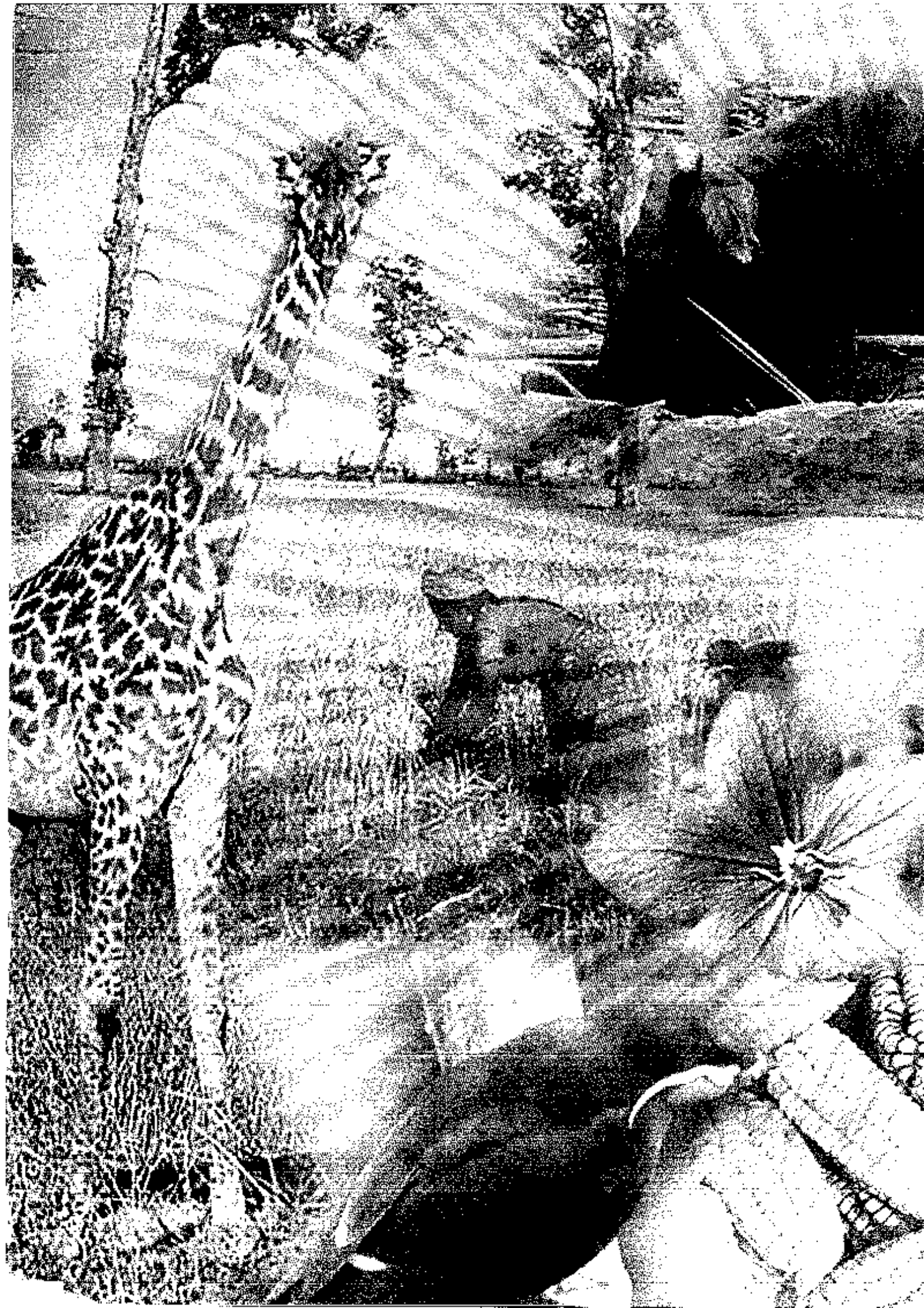
The paper is targeted mainly at development agencies and companies or non-governmental organisations with interests in biodiversity rich countries. However, it is likely to be of equal interest to anyone engaged in seeking trade-offs between economic development and biodiversity conservation or wishing to pursue further work on this subject.

What next?

IIED believes that there is a real need to generate more interest and more commitment towards integrating biodiversity and livelihoods, not only within but also outside the current biodiversity fora. Throughout the process of compiling this paper, the need for diverse Southern inputs into international debates on this issue has become ever more apparent, as has the need for building institutions that link livelihood and biodiversity goals. IIED's own mission calls for improved efforts to meet the challenges outlined in this report. It particularly welcomes comments on this report and ideas for collaboration, especially with stakeholders in the South.

Izabella Koziell
London, December 2000





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Acronyms

CBD	Convention on Biological Diversity
DAC	Development Assistance Committee
DFID	Department for International Development
FAO	Food and Agriculture Organisation
MDG	International Development Target
IIED	International Institute for Environment and Development
IPR	Intellectual Property Right
OECD	Organisation for Economic Co-operation and Development
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WTO	World Trade Organisation

Executive Summary

Introduction

Biodiversity sustains livelihoods and life itself. An estimated 40 per cent of the global economy is based on biological products and processes. Human dependency on biodiversity is nowhere more keenly felt than in the communities of people who live in close association with it, drawing upon biological products and services to meet their daily needs. Most of the volume and range of the world's biodiversity is to be found in economically poor countries, which bear the costs of its continued existence but which benefit the least.



Changes in biodiversity are now progressing at an unprecedented rate. Most of the efforts to address this phenomenon have been made by conservation and environmental agencies. Whilst these efforts go some way towards addressing our ultimate dependence on biodiversity in the long-term, they have been unable to tackle the immediate problems of the poor, for whom access to biodiversity is critical for their survival. Indeed, there have been many examples of situations in which conservation of biodiversity has led to increased hardship for poor people.

Several nations are re-aligning their development efforts in order to help meet the International Development Target to halve the number of people living in extreme poverty by 2015. Most of the world's 1.3 billion extremely poor people live in countries that are economically poor but rich in biodiversity. This paper contends that realising the (currently neglected) livelihood opportunities that the existence of biodiversity could offer has the potential to usefully complement poverty reduction efforts.

N.B. All underlined words are found in the glossary on p54.

What is biodiversity?

Biodiversity, or biological diversity, is the biological capital held in an area. It properly describes the differences between organisms at different levels of biological organisation: gene, individual, species and ecosystem. These differences are the prerequisite for natural or artificial selection through which species evolve naturally or may be modified to express characteristics desired by humans. It is often mistakenly confused with wildlife and natural resources.

The value of biodiversity to human development

Biodiversity holds multiple values: direct use, indirect use and non-use values. Direct uses can be further subdivided into subsistence and tradable values. The former describes the vast range of biological products that are harvested, or hunted, from natural or managed systems, whether to provide food, materials for clothing or shelter, and are of primary importance to the financially poor. Tradable items are a vital source of income for small scale farmers, herders or fishermen. Biodiversity often acts as an economic 'buffer' supplying alternative biological resources, should needs or market preferences change.

Indirect uses may be subdivided into environmental services and evolutionary, or informational, values. Environmental services include, for example, watershed protection or nutrient cycling and many other services that provide benefit to humanity. Informational values refer to the knowledge gained from generations of observation and analysis of species and ecosystem processes and the genetic information contained within living cells.

Information gleaned from biodiversity has critical applications and provides the raw material for molecular biologists and, ultimately, plant and livestock breeders and pharmaceutical and other industries.

Non-use values may be subdivided into future options and existence values. The former is a way of valuing genetic resources that may be of future use in combating new diseases or conferring resistance or tolerance to new pests or changed environmental conditions. Existence values refer to the intrinsic worth of biodiversity and are an acknowledgement of the cultural, religious, philosophical or aesthetic values that areas of biological diversity may have and which are of value to communities, tourists and others.

Biodiversity clearly holds many values. Yet, of utmost significance are the benefits arising from the variety and variability of biological organisms that constitute biodiversity. Both these characteristics form the basis of choice. Without choice, humankind simply would not exist in its present form.

Could the poor benefit more from biodiversity?

Very little of the world's biodiversity remains in its pristine form, unaffected by human activity. To date, a minority have generally captured most of the economic benefits of human manipulation of biodiversity. The costs of maintaining biodiversity are borne increasingly by those least able to afford them. In order to redress the imbalance a much clearer understanding of who gains and who loses, the extent of gain or loss, and over what time scale, is essential.

Biodiversity continues to be altered for short-term gains and, if nothing is done to curb the negative impacts of biodiversity

change, this may have unfortunate consequences in the long-term. In the short-term, people dependent upon biodiversity for subsistence will continue losing their livelihoods, as will those dependent upon access to biodiverse areas as a source of income through trade. In the longer-term, indirect uses will be devalued to the ultimate detriment of human society.

Whilst international conventions have been drawn up in response to the biodiversity 'crisis' they often conflict with powerful economic development paradigms. Economically poor countries are still given insufficient support to enable them to implement many of the recommendations without undue cost or conflict. Yet, it is unrealistic to expect poor countries to bear the costs of maintaining biodiversity for the global good. Greater awareness is needed amongst world governments, development agencies, the private sector and the public about the risks of undermining the life and livelihood support systems underpinned by biodiversity. However, of more immediate importance, the complex and contradictory nature of the relationship between biodiversity, poverty and development must be more widely recognised and appreciated.

Options for tackling these issues could exist, but demand long-term political commitment on an international scale. Ways should be sought to create desirable development benefits for the poor out of the conservation or sustainable use of biodiversity - as existing policies, institutions and markets do not provide the enabling environment for doing so. Future actions are, therefore, likely to entail re-examination of policies governing the access and rights of poor people to, and over, biodiversity. Establishing positive incentives, such as new market outlets that value 'biodiversity-friendly' products, will be essential if, for instance, the sustainable





trade of biodiversity products is to be more widespread. Moreover, if the poorest groups are to benefit from such activities they will need capacity building in all areas of commercial engagement.

Environmental services, as yet, are not traded, but related initiatives are beginning to emerge. Greater awareness of their value to the economy, and the role biodiversity plays in underpinning them, would be a prerequisite for any progress in this area.

To date there are few examples of indigenous or traditional knowledge being properly recompensed following the marketing of, for example, a traditional medicine. Much more work needs to be done to protect the Intellectual Property Rights of those who have maintained biodiversity and knowledge of its use for human benefit.

Ecotourism is an example of a new industry attempting to generate revenue from the existence value of biodiversity. Whilst it has some potential, it does not realise the entire spectrum of existence values, nor is it a universal solution to protecting these values. There is much scope for the development of new 'transfer' mechanisms through which developing countries could be reimbursed for opportunities they must forego when conserving biodiversity for the global good.



All in all, government and private sector policies and institutions regulating markets and influencing the economics of biodiversity use and management will need to be modified to permit a more equitable distribution of the benefits of biodiversity. They will also need to be seriously re-examined to assess if and how the conservation and sustainable use of biodiversity could become a truly viable development proposition for poorer countries.

Suggestions for the way forward

This section was drafted with development agencies in mind. However, the recommendations are equally applicable to governments, the private sector and civil society. The recommendations outline how poverty reduction could be, at once, more equitable and more inclusive of the widest range of biodiversity values.

There are five sets of recommendations. The first recommendation addresses the need to actively take account of biodiversity in poverty reduction strategies and programmes in order to reduce negative impacts upon it and dependent livelihoods. The second attempts to disaggregate the multiple functions and uses of biodiversity. It also makes recommendations on how to enhance the opportunities they provide to improve the livelihoods of the poor and how to address the challenges to be faced if these opportunities are to be grasped. The third highlights the need for a strong partnership approach with the private sector to achieve a much wider impact. The fourth emphasises the need for more educational work to be done in improving the understanding of biodiversity and how consumption patterns affect it. The final section identifies priorities for further research, focusing on the need for methodological development, empirical and comparative analyses.

1. Introduction

1.1 The context

The International Development Targets encapsulate a strong commitment to reducing world poverty. Given that a quarter of the world's population still lives in extreme poverty, this is a formidable task. This is doubly challenging if all efforts to achieve poverty reduction are also to be economically, socially and environmentally sustainable. Moreover, poverty reduction also has to be in harmony with the other International Development Targets: human development and environmental sustainability and regeneration, in the short- and longer-term.

"A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with, and recover from, stresses and shocks and maintain, or enhance, its capabilities and assets both now and in the future, while not undermining the natural resource base".

The social and cultural diversity of the world's 1.3 billion extremely poor people necessitates a flexible and versatile approach to helping them out of their poverty. There are many ways in which this can be done and the sustainable livelihoods approach is one of them. This approach recognises the diversity of people's livelihoods and the dimensions and causes of their poverty - whether it manifests itself as a lack of money or access to social justice; it builds on people's strengths and helps them to achieve lasting livelihood improvements through work at the local as well as at the policy levels².

Box 1: The International Development Targets

These are milestones against which progress towards the goal of poverty elimination can be measured and have been brought together by the Development Assistance Committees of the Organisation for Economic Co-operation and Development (OECD). They come from the agreements and resolutions of the world conferences organised by the United Nations in the first half of the 1990s. These conferences provided an opportunity for the international community to agree on the steps needed to reduce poverty and achieve sustainable development. There are seven goals in total and progress is needed in each one if they are to be mutually reinforcing.

The goals are:

- Economic well being, a reduction of 1/2 in the proportion of people living in extreme poverty by 2015;
- Human development, universal primary education in all countries by 2015;
- Demonstrated progress towards gender equality and the empowerment of women by eliminating gender disparity in primary and secondary education by 2005;

- A reduction by 2/3 in the mortality rates for infants and children under the age of 5 and a reduction by 3/4 in maternal mortality, all by 2015;
- Access through the primary health care system to reproductive health services for all individuals of appropriate ages as soon as possible and no later than the year 2015;
- Environmental sustainability and regeneration - the implementation of national strategies for sustainable development in all countries by 2005 so as to ensure that current trends in the loss of environmental resources are effectively reversed at both global and national levels.

These goals will not be easy to achieve. According to the Development Assistance Committee, success will require, above all, *"Stronger voices for the poor, economic stability and growth that favours the poor, basic social services for all, open markets for trade and technology and enough resources for development, used well".*

Biodiversity plays a key role in the achievement of sustainable livelihoods, but is commonly considered to be primarily the domain of environmentalists and conservationists. In this way, it has become largely alienated from livelihoods and poverty reduction agendas, especially as the primary focus of concern has rested on how to curb biodiversity loss at whatever cost. Whilst this is, for many reasons, a valid objective, the primary purpose of this paper is *not* to investigate how biodiversity is to be conserved, but whether or not biodiversity - and all its associated values - could contribute more effectively to the achievement of sustainable livelihoods for poor people. It is intended that this will, in turn, lead to more mainstreaming of biodiversity objectives into the policies and actions of development agencies.

1.2 The challenge

Biodiversity is of enormous value to human development - an estimated 40 per cent of the world's economy is based on biological products and processes. It has made possible the massive increases in the production of food and other natural materials, which have fed the growth and development of human societies. It is also the basis of innumerable environmental services, which keep us alive, from the provision of clean water to pollination.

The greatest range and volume of the world's known biodiversity is currently held by some of the world's poorest countries⁴. Many rural communities in these countries still live in close association with biodiversity and remain directly dependent upon its continued existence for most of their livelihood needs (i.e. food, fuel, shelter, transportation or medicines)⁵. But, despite its great value, those living with it benefit least and bear the majority of the costs of its existence. This paper explores why such communities are unable to benefit more from the whole range of biodiversity's values and what could be done to resolve this.

To date, biodiversity has widely been recognised as priceless. Paradoxically, that pricelessness has led either to its progressive reduction or to its control through some form of protection. Wherever people have exploited biodiverse areas, by extraction of products or conversion of the land to other uses, there have been associated changes in biodiversity or restrictions in people's access to it. Herein lies another dilemma: whilst a particular type of change in biodiversity might be good for one group of people, the same change might be bad for others. For example, the elimination of harmful pests and predators, such as insect disease vectors, has benefited many but their

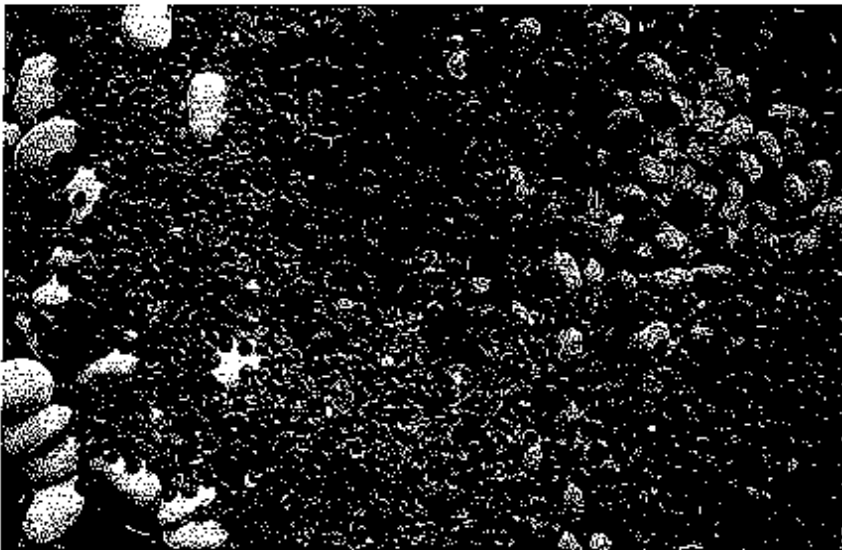
The Convention on Biological Diversity defines biological diversity as:

*"The variability among living organisms from all sources, including inter alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems"*⁶.

Box 2: People's impacts on biodiversity

For thousands of years, people have modified biodiversity to meet their changing needs, mitigating losses as natural habitats have been replaced by farmlands and managed forests of perhaps fewer, but more valuable, species and varieties. However, this process of replacing natural with managed biodiversity for human gain has resulted not only in losses and extinction, but also in enhanced biodiversity through the creation of thousands of new crop varieties and livestock breeds. The enormous diversity of form and function under intense human selection is particularly evident in various cows, dogs and crop varieties. The last few hundred years have nonetheless witnessed a rapid increase in the rate at which biodiversity is being altered by humankind, both in unmanaged areas and in farmed ones. The consequences of this may, as yet, be uncertain, but they are potentially very serious and are likely to impact heavily on the financially poorest groups.

eradication may have also necessitated the reduction of other wild species or habitats valued by others. Another example is the conversion of biodiverse areas to intensive cropping. Whilst this has provided cheaper food in greater abundance for urban dwellers, the loss of these areas has been to the detriment of those groups originally dependent upon them.



As populations grow and consumption increases, the rate of biodiversity change is faster and the scale of that change is larger than ever before⁷. In an attempt to protect and conserve this global inheritance, *in situ* and *ex situ* conservation policies have been formulated and implemented. The main aim of *in situ* conservation is to minimise human use and access to specific zones - usually those containing high levels of endemic and rare species, or unique landscapes. However, as development pressures grow, these same areas can become ever more vulnerable to pressures from external commercial interests or local inhabitants for the land and resources they hold. Governments have consequently found it increasingly difficult to maintain these zones as 'no-use' areas, particularly with the limited funds they have available and with no prospect of such areas paying their own way. *Ex situ* conservation activities have aimed to ensure adequate

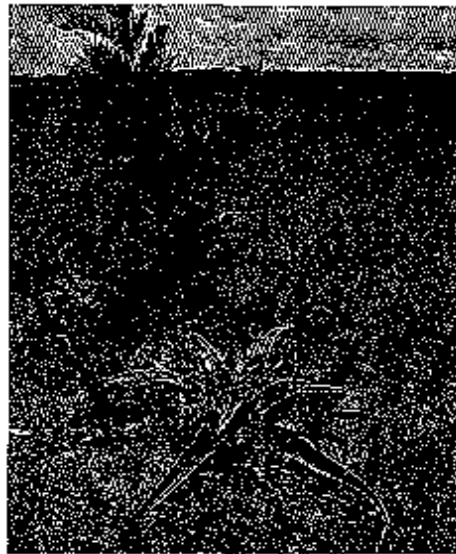
access to genetic resources for the research and development of food, agricultural, pharmaceutical or cosmetic products. However, most *ex situ* collections are now held in countries that have often paid scant regard to the source of the material held. As public funds for gene banks have declined, the private sector has increasingly assumed the role of collector, curator and user of genetic resources. Thus, developing countries' access to genetic resources has gradually become more difficult and more costly.

The pattern of declining support for biodiversity conservation should not, therefore, be interpreted solely as a lack of concern but also as a result of policy, legal and market frameworks, under which *in situ* conservation activities remain a drain on national treasuries and *ex situ* conservation activities remain prohibitively expensive. However, if adverse impacts on biodiversity are permitted to continue in their severity the poor are likely to be hit the hardest since they have fewest alternatives to fall back on. Whilst this is a critical consideration in the context of poverty reduction, it is also sobering to consider that no individual, community or nation will escape the potentially disastrous consequences of severe alteration to the world's biodiversity.

1.3 The opportunity

Economically poor countries are the richest in biodiversity. The biodiversity they maintain is of enormous value to everyone, not just to people living in close association with it. An opportunity for the international community and host governments therefore lies in ensuring that these countries benefit more from their biodiversity. The uniqueness of the products and services potentially arising from biodiversity offers host countries a comparative advantage in trade. Moreover, the value that people, local

*Interactions between species can be beneficial: planting a local type of succulent next to *Grevillea* seedlings can prevent termite attacks.*



and distant, assign to these products and services has great potential to enhance this comparative advantage. As biodiversity is progressively undermined, or consumers' awareness of their dependency on the world's biodiversity grows, whatever remains both in protected and production areas is likely to be increasingly perceived as scarce and should correspondingly increase in value. However, few of these economically poor, but biodiversity-rich, countries have as yet attempted to realise this comparative advantage for pro-poor growth, mainly because of the policy and institutional constraints that stand in their wake. It is now time that the global community starts to explore how to capitalise on the existence of biodiversity, but in ways that contribute towards sustainable livelihoods for the poor without undermining biodiversity itself.

This is not to say that the other significant poverty reduction challenges and policy and institutional constraints that such countries currently face at local, national and especially, international levels should be ignored. These are of utmost priority. Nor should we ignore the fact that mechanisms for making the most of biodiversity for all

its stakeholders are only just beginning to evolve; in fact, much exploratory work still remains to be done. Conscientious 'green' shopping is far from widespread and trading in 'intangibles', such as environmental services, is only just emerging. Yet there have been some encouraging developments, which suggest that helping the economically poor, biodiversity-rich countries to benefit from biodiversity may not be as unlikely a proposition as it might initially appear. Furthermore, such an approach may have the potential to contribute towards more equitable growth, especially in areas where conventional forms of natural resource based development are not feasible as a result of physical or social isolation. More supportive policies and institutional opportunities are beginning to emerge and there are already real world examples to learn from. Take for example Costa Rica's efforts to build an 'alternative' economy based on the existence of its biodiversity, i.e. trading in the products and services that their biodiversity offers them.

1.4 The international context

The International Convention on Biological Diversity (CBD) - signed and ratified by the UK government and many of its partner countries - is evidence of the increasing recognition of the value of biodiversity and concern over its loss. Significantly, it is one of the first biodiversity-related conventions to acknowledge that: "*Economic and social development and eradication of poverty are the first and overriding priorities of developing countries*". This brings to the fore the dilemma of how to tackle poverty whilst satisfying the many legal obligations that become binding once a country has ratified the CBD. (Similar

Box 3: Biodiversity-related conventions

The legally-binding International Convention on Biological Diversity (CBD) was signed in 1992 in the wake of the United Nations Conference on Environment and Development. To date 177 countries, including the European Union, have ratified it. The three main objectives of the CBD are: *"The conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources..."*. The convention is pioneering in the way it covers biodiversity in a comprehensive way. Genetic diversity is specifically addressed for the first time in a binding global treaty and the conservation of biodiversity is seen as the common concern of all humankind. By emphasising national sovereignty over natural resources - and by including issues related to access and use of genetic resources, as well as technology transfer and biosafety - it demonstrates an intention to address all aspects of biodiversity. It also highlights the

need for continual new and additional resource flows from North to South.

Many countries have also signed up to a range of other legally-binding agreements that demonstrate the continuing global concern for, and commitment to, conservation and sustainable use of the biodiversity. The main ones include:

- Ramsar Convention on Wetlands (1971)
- Convention for the Protection of World Cultural and Natural Heritage (1972)
- Convention on International Trade in Endangered Species (CITES) (1973)
- Bonn Convention on Migratory Species (1979)
- International Undertaking on Plant Genetic Resources (1982)
- Framework Convention on Climate Change (1992)
- Convention to Combat Desertification (1994)

There are other non-legally-binding agreements, such as the Forest Principles, which should not be overlooked⁹.



conflicts emerge upon signing other related conventions such as RAMSAR, CITES and so on.) The conflicts arise from the difficulty in balancing the extraction or conversion of biodiversity for immediate (usually private) gain and the conservation of biodiversity for the public good or future needs. This is because biodiversity conservation policies often prohibit people's access to biological resources, or limit people's use of them. Conversely, poverty reduction policies encourage the conversion of biodiverse areas to ones of intensive cultivation, benefiting, for instance, urban consumers but severely reducing the range of resources available to neighbouring rural communities.

In signing up to these international conventions parties are legally obliged to ensure implementation. Set alongside the International Development Targets, these obligations become doubly challenging. One way forward is to begin to build recognition of the contribution that biodiversity has made, and will continue to make, to economic and human development. Then, to locate what needs to be done, at all levels, to enable the poor countries to continue to realise from biodiversity the livelihood and development returns they have defined.



1.5 The approach

Economically poor, biodiversity-rich countries face considerable pressures to exploit biodiversity by extracting its products or converting it to other uses. Currently, these are the only practicable ways that people in these countries may reap the sort of development benefits they desire from biodiversity. Whilst conservation of biodiversity yields other benefits, in most cases these benefits would not be those prioritised locally but those of interest to the global community. The sustainable use of biodiversity, on the

other hand, cannot always compete with other forms of use. If, therefore, biodiversity is to start to yield more desired livelihood and development benefits, but without compromising its indirect and non-use values, alternative systems must be sought.

Such systems must render practices that conserve, or sustainably use, biodiversity competitive with those that do not. They must also yield desirable benefits for the poorer and more vulnerable groups, not just the richer and more powerful ones. This is likely to entail moving beyond a singular focus on, for example, creating employment opportunities for poor people by securing their access to or rights over genoplasm or biodiverse areas. The marketing of new 'biodiversity-friendly' products and services would be similarly inadequate. Whilst such activities can yield important development benefits each is, alone, unlikely to prove competitive with other forms of livelihood activity. It may be necessary to combine different activities, create supportive policy and market incentives, or even compensate those people who engage in livelihood activities that conserve or use biodiversity sustainably. Resources for such compensation could be found from distant (usually wealthier) communities who are 'willing to pay' for the continued existence of biodiversity.

This is not to say that setting up mechanisms that can generate tangible benefits out of the conservation or sustainable use of biodiversity is an easy way out. There are many policy, institutional and technological challenges to resolve. For now, it is likely to be applicable only in certain areas, possibly only in those that are currently

marginalised and find themselves to be economically poor and biodiversity-rich. Success will rely heavily on policy and institutional reform at national and international levels; for example, giving smallholders the incentive to produce 'biodiversity-friendly' products, or addressing issues of governance, access and intellectual property rights. It will also rely on engaging with the private sector in innovative ways, perhaps by strengthening poor people's capacity to gain employment in biodiversity-based enterprises such as ecotourism, or through strengthening corporate-community partnerships. Above all, it will rely on innovative ways of

reimbursing communities living with, or conserving, biodiversity through the development of new mechanisms that can transfer existence values assigned by distant communities. If the governments in both North and South are serious about ensuring that development addresses a broader range of stakeholder needs in poorer countries, they must recognise that success requires heightened public awareness along with strong political, governmental and private sector commitment. It will also require significant additional resources targeted as much towards policy, institutional and market reform as towards activities on the ground.



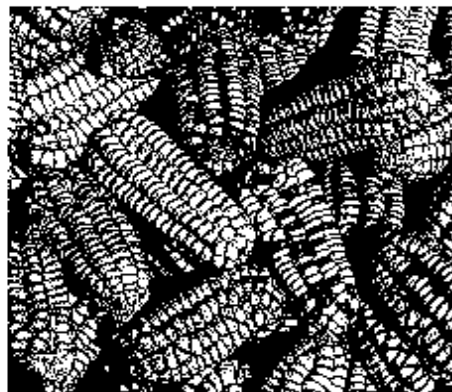


2. What is biodiversity?

2.1 Biodiversity is characterised by variety and variability

E. O. Wilson, credited with coining the word biodiversity, elucidates: "One slice of biodiversity would be the variety of chromosomes and genes with one species of freshwater fish found in Cuba. Another would be all freshwater fish species of Cuba, and still another would be the fishes and all other forms of life living in each river in Cuba studied in Iara"¹⁰.

Biodiversity - or biological diversity - describes the biological capital held within an area¹⁰. It refers, particularly, to the differences between living organisms at different levels of biological organisation - gene, individual, species and ecosystem. These differences are significant because it is through the myriad interactions amongst, and between, the different levels of biological organisation and the abiotic environment that the possibility of adaptation (through natural selection) arises. Adaptation may also occur through



artificial selection, in which farmers and plant and animal breeders produce new varieties by crossing genetic lines. Biodiversity, then, is the foundation for numerous biological 'goods' and environmental 'services'.

The term biodiversity is frequently misused, as though it were synonymous with biomass, which properly describes the total mass of living organisms in a given area and bears no reference to biological variety or variability. Biodiversity is also confused frequently with natural resources, which refers to naturally occurring materials such as the trees, water or soil which people might use for subsistence and economic development. Whilst natural resources may be living, non-living or dead, biodiversity refers to *all* living things, and not just those

that we find useful. Another popular misconception is that biodiversity refers only to wildlife. In fact, biodiversity encompasses wild and domesticated organisms. Since genetic variability is its wellspring, biodiversity is as conspicuous in the proliferation of species that make up a tropical rainforest as it is in deep sea sediments, an urban garden or a single stand of wheat.

2.2 Biodiversity is dynamic

Evolution relies on changes in genes. Such changes occur naturally, enabling a population to adapt to better suit its external environment, or to compete more effectively with other populations for food or other life requirements. This adaptive response also enables a single species to extend its distribution and chances of survival. It may also lead to the evolution of new species. At the same time, however, species that prove to be less well adapted, or less able to compete, may become extinct or redundant.

The significance of biodiversity lies not only in differences between the particular qualities of each species that emerge from this process of selection (the goods) but also in the interactions between them - (which give rise to the services). The interactions may manifest themselves as simple relationships in a food chain or complex interdependencies in reproduction and survival. The interactions with the abiotic environment conduct the exchange of materials - such as water, chemicals and gases in the environment - driving life-sustaining processes that modify climate or bring about soil fertility. On a larger scale, biodiversity confers resilience on ecosystems, because it enables them to adapt to changing conditions and contributes towards stability in the natural environment¹².

Biodiversity is, therefore, much more than the sum of individual biological organisms within an area and describes both their

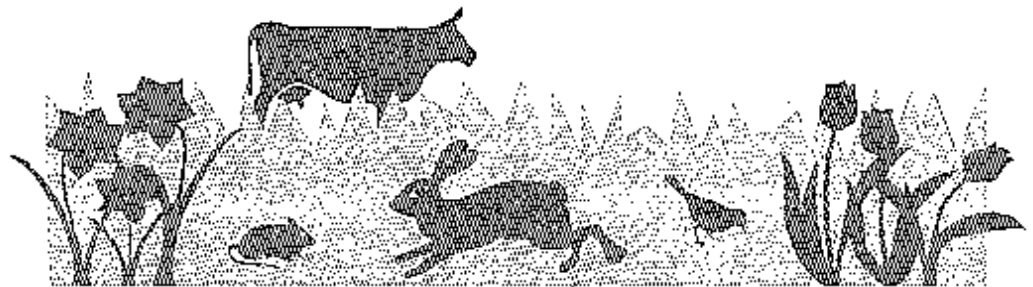
genetic differences, at one extreme, as well as their interaction and interdependency in a constantly changing world.

Figure 1: The building blocks of biodiversity



Genetic diversity is the variety of genes or the diversity occurring within a species. Each species is the repository of many genes - for instance numbers can range from about 1,000 in bacteria to 400,000 in flowering plants. A gene is a unit of heredity composed of DNA or RNA and forming part of the chromosome found inside the nucleus of every living

cell. Each gene is a chemical instruction controlling a particular characteristic of an individual, e.g. rapid growth, disease resistance, eye colour etc. Genetic resources are those being, or likely to be, used in the selection or improvement of domesticates and crops. Genetic engineering can involve the transfer of genes from unrelated species to another.



Species diversity is the variety of species or the diversity among species. A species is a category in the classification of living organisms consisting of similar individuals (and their populations) capable of exchanging genes or interbreeding. Apart from small

variations, individuals within a species are almost identical in their anatomy, physiology and behaviour. Species diversity varies significantly between regions and over time but much remains unknown over why such variation occurs.



Ecosystem diversity is the variety within and between different ecosystems. An ecosystem is a system of plants, animals and other organisms interacting within themselves and the non-living components of their environment, e.g. a lake or a forest. There are both 'natural' and 'managed' (e.g. farms or market gardens) ecosystems. Today, there are few ecosystems that remain untouched by human activity. Managed ecosystems are essential to our

survival, by reducing competition through removal of non-useful species (e.g. weeds) people are able to intensify food and other natural materials production. These processes more often reduce species diversity but there are instances where human management of ecosystems actually increases species diversity. No simple relationship exists between the diversity of an ecosystem and ecological processes.

Box 4: Biodiversity is constantly changing

The Earth's biodiversity is continually changing as processes of speciation and extinction occur together all the time. Throughout geological time there have been several epochs of mass extinction - the best known of which was the loss of the dinosaurs - as well as periods of massive biodiversification. For example, vast numbers of species disappeared during the Cambrian era as a result of catastrophes such as asteroid impacts and huge volcanic eruptions. But this period was as creative as it was destructive. The 'Cambrian explosion' entailed the appearance in the fossil record of the ancestors of all the main animal groups that are alive today¹³.

More organisms may be alive today than at any time in Earth's 4.6 billion-year history but despite this fact, 99 per cent of all species that

have ever lived are now extinct. Whilst such changes in biodiversity are clearly an inevitable consequence of evolutionary processes, the rate at which biodiversity is now being altered by humankind appears to have increased significantly over the last few centuries. For example, of total tropical forest cover, 0.8 - 2 per cent is now estimated to be lost every year. 1 per cent of tropical forest populations are likely to be lost with it. As most species have multiple populations, the total annihilation of species does not always occur as a direct consequence of habitat loss. However, the progressive undermining of populations will undermine the genetic viability and variability of the species concerned. Perhaps most serious is that current extinctions, when they do occur, unlike naturally induced mass extinction, are highly non-random with related species sharing the same fate¹⁴.

2.3 Biodiversity is not equally distributed

Of an estimated 10-100 million species on this planet, taxonomists have named just 1.4 million¹⁵. However, estimates should be treated with caution since knowledge about biodiversity is mainly species focused and varies with taxa. Much more is known about the larger and more visible species such as birds, large mammals and woody plants than about the smaller, less visible species such as insects, fungi, nematodes and organisms found in the deep sea and it is expected that further study of the latter groups will reveal millions of new species. Knowledge also varies with location. Certain areas are subject to more enthusiastic and rigorous surveying than others, either because they are already being heavily researched, or because they are more accessible, visible, attractive or 'exotic'.

The available data from species counts suggest that some areas have more species than others. Indeed, most of the world's known species are found in only a small

fraction of its surface area; and even within these species-rich regions, some areas are richer than others. At the global scale, species numbers have been shown to increase along a latitudinal gradient, from the poles towards the equator. This is largely due to the exceptional richness of tropical rain forests. Although they cover less than 7 per cent of the Earth's land surface they are believed to contain more than half of the world's known species. This has been attributed mainly to the high levels of solar energy, climatic stability and the large number of niches for life forms resulting from the partitioning of area and time (day/night). There are a few exceptions to the general rule of increasing species numbers towards the equator, for instance, coniferous species and where humans have intervened (e.g. creation of numerous breeds of horses, cattle, and dogs whose diversity is higher in the North). And, not all tropical rain forests are equally rich in species. Furthermore, biodiversity tends to decrease with increasing altitude whether near the equator or not.



Tracking the numbers of bird species breeding on areas of land of roughly the same size from higher to lower latitudes illustrates well how species distribution increases towards the equator: Greenland (56); Labrador (81); Newfoundland (110); New York State (195); Guatemala (469); Colombia (1,525)¹⁶.

Table 1: Countries with greatest species richness¹⁷

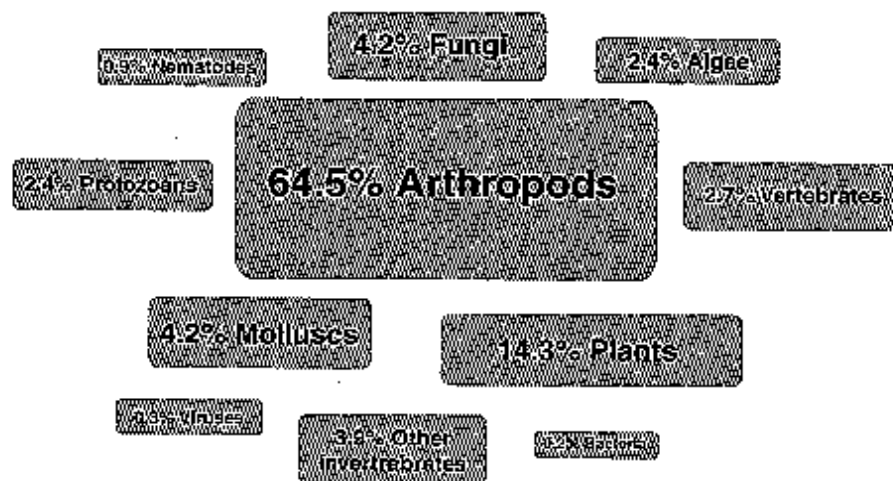
Mammals	Birds	Reptiles
Indonesia (518)	Colombia (4,721)	Mexico (717)
Mexico (449)	Peru (1,701)	Australia (688)
Brazil (428)	Brazil (3,622)	Indonesia (600)
Zaire (409)	Indonesia (1,519)	India (383)
China (393)	Brazil (3,014)	Colombia (360)
Peru (381)	Venezuela (1,275)	Ecuador (345)
Colombia (353)	Bolivia (1,260)	Peru (337)
India (350)	India (1,200)	Malaysia (294)
Uganda (311)	Malaysia (1,200)	Thailand (282)
Tanzania (310)	China (1,195)	Papua N.G. (282)

Other tropical ecosystems, from savannah woodlands and grasslands to coral reefs, are also very important havens of biodiversity. Although the drier forest and woodland formations appear to be less rich in species, the value of their genetic resources lies in the adaptations of species to the severe

environmental conditions which have enabled them to survive and also to support human occupation. Much still remains to be done in refining the understanding of why such differences in distribution occur, and what this means for future human needs and well being¹⁸.

Figure 2: Number of described species for major groups of organisms as proportions of global total¹⁹

The figures used in these estimates are highly speculative. However, the purpose of the diagram is mainly to demonstrate the sort of differences that might exist between the major groups of organisms. Particularly striking is the fact that the human species constitutes only 1 out of the 45,000 described species of vertebrates, which constitute only 2.7% of the global total



2.4 The problem of assessment

Biodiversity, as we have seen, is abstract and multidimensional and therefore measuring it is problematic. Which indicators would best provide a picture of genetic wealth, species interaction and uniqueness? Species numbers are the most obvious proxy and have therefore been the most widely applied means of measurement and analysis to date. Their widespread use perhaps stemmed from a belief that areas

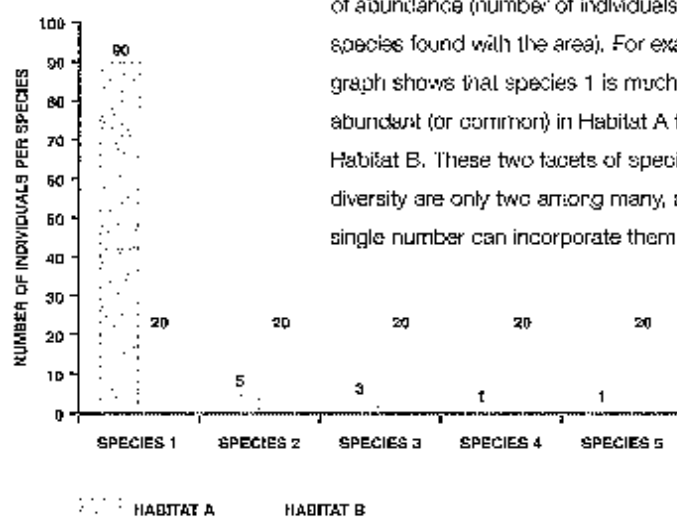
with high numbers of species are 'wealthier' than areas with fewer species. However, species numbers give no indication of the differences in ecological, social or economic value between different species. For example, some species may be globally endangered while others, such as keystone species, may play a more critical role in the functioning and viability of an ecosystem. Species diversity is also a function of both species richness and the abundance of each species, as explained in Box 5.

There are many other ways of assessing biodiversity²⁰. One newer, and still evolving, notion is of 'bioquality', which could go some way towards addressing the problems of assessing biodiversity in the context of sustainable livelihoods. 'Bioquality' assessment, as currently applied, offers a more accurate measure of the relative significance of species globally by weighting species according to their unique contributions to ecosystems²¹. A patch of forest with, for example, one or a few species of high ecological value, could be assessed as having higher 'bioquality' than a more species-rich forest. Although primarily designed as an index of the relative global importance of biodiversity sites, and a means of prioritising them for

biodiversity conservation, new bioquality assessment methodologies could be designed to integrate a wider range of indicators. These could include global rarity, keystone species, ecological importance, taxonomic relatedness and local abundance, as well as social and economic criteria such as sacredness, attractiveness to tourists, role in pollinating or cross breeding with crop plants and so on. This would help provide a more accurate reflection of the value of biodiversity at the local as well as global scale. Participatory methods could be used to provide information on the interests and values of global, national and local communities. Information emerging from all analyses could then be pulled together and prioritised.

Box 5: What constitutes species diversity?

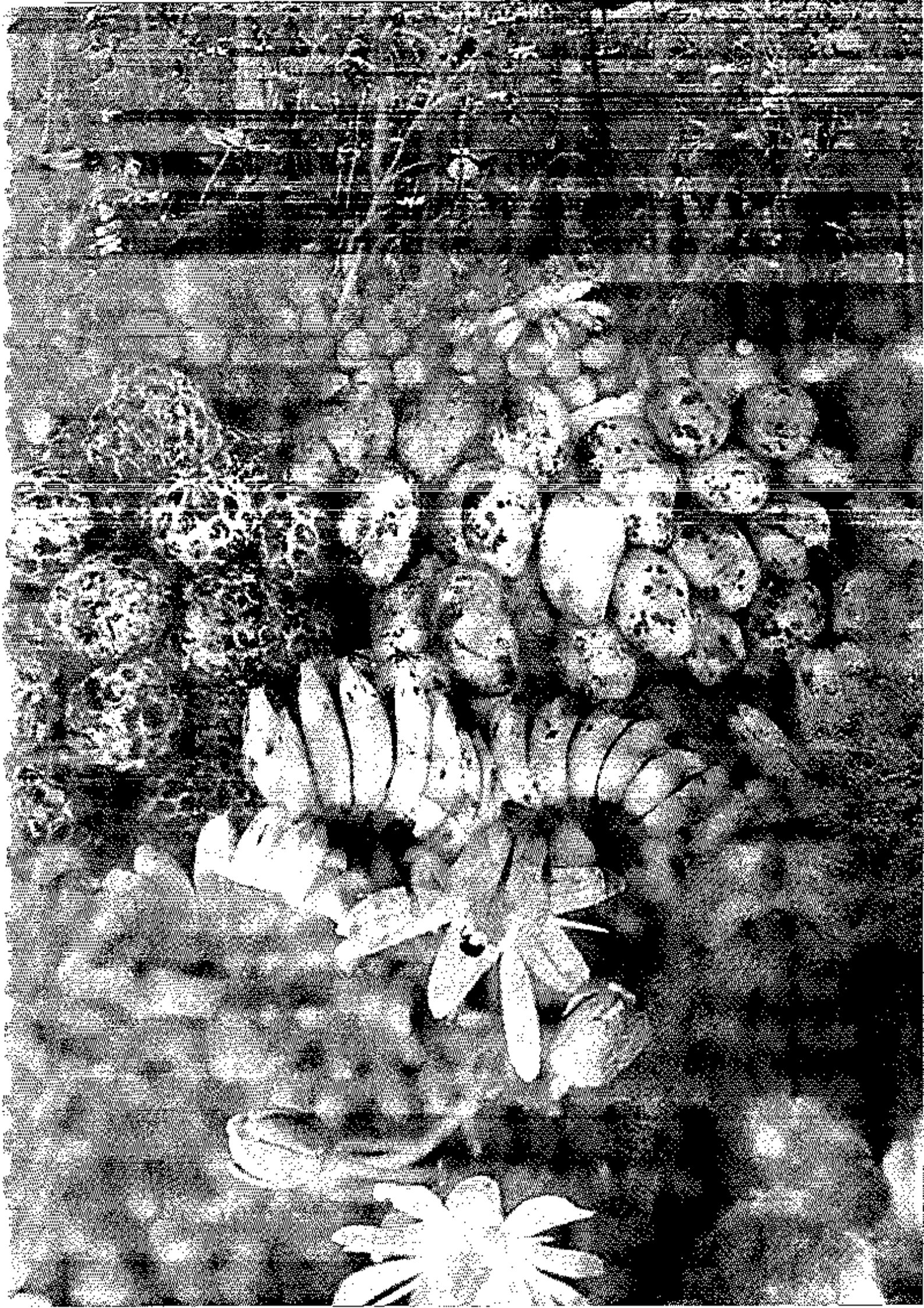
It is essential to note that species diversity is more than just species richness (the number of species per unit area) but is also a function of abundance (number of individuals of each species found with the area). For example, the graph shows that species 1 is much more abundant (or common) in Habitat A than in Habitat B. These two facets of species diversity are only two among many, and no single number can incorporate them both



It is important to note that 'bioquality' will be influenced by external factors, such as policies and incentive mechanisms, access rights, resources and technology, and that these are likely to be in continuous flux. It is not, therefore, possible to establish one everlasting objective measure of bioquality. Local and global assessments of bioquality are also likely to conflict, often due to inherent differences in value systems. For

without loss of information. As far as human interaction with species diversity is concerned, whether there are more species or more individuals of one species can be extremely significant. For example, where one useful wild species presents itself in large numbers of individuals as compared to other species, it is generally easier to harvest: for example, the commercially valuable North Sea herrings. However, such ease of capture tends to attract the adoption of efficient capital-intensive harvesting technology. In the long-term, this can also lead to over harvesting and subsequent damage to the ecosystem. As a result, people have tended to rely on artificial enhancement of the abundance of selected useful biological resources, such as crops in fields²².

example, the protection of certain species of high global value may call for limiting the access to its habitat, which could severely harm local people who may require access to harvest other species for subsistence or livelihood use. However, the analysis of bioquality is a welcome development, which could start to provide the basis for incorporating local, national and global needs and interests in biodiversity.



3. The value of biodiversity to human development

3.1 A source of biological 'goods' and environmental 'services'

All biological resources – from the many species of edible fish harvested from oceans, lakes and rivers to the most advanced cultivars of wheat and rice – are the products of biodiversity. Whether these products are individual biological resources or genes with useful properties their continued existence depends on continual interactions with a diversity of other species that, in turn, constitute the biological production system that supports them. For example, the availability of bushmeat depends upon the existence of the type of habitat that supports forage species favoured by the edible wild animals. Equally, to enjoy the durian (a tropical fruit highly prized in South East Asia) Malaysians know they must protect coastal caves, the habitat of the particular species of bat that fertilises the durian trees²³.

On the whole, it is the goods or products of biodiversity (rather than its services) that are consumed directly, or exchanged for other preferred capital assets, such as money. However, of greatest importance here, is the increased choice of development paths based on natural capital, which biodiversity makes possible. Biodiversity provides people with the opportunity to diversify their use of biological resources, thereby adding to livelihood choices and increasing potential benefits both locally and nationally. Consider, for example, the enormous range of livelihood options from fishing, hunting and gathering to farming and herding that arise out of the variety of different species and ecosystems that can afford them. Or, consider the genetic variety in a single crop such as wheat (and its wild relatives) – that has made possible selective

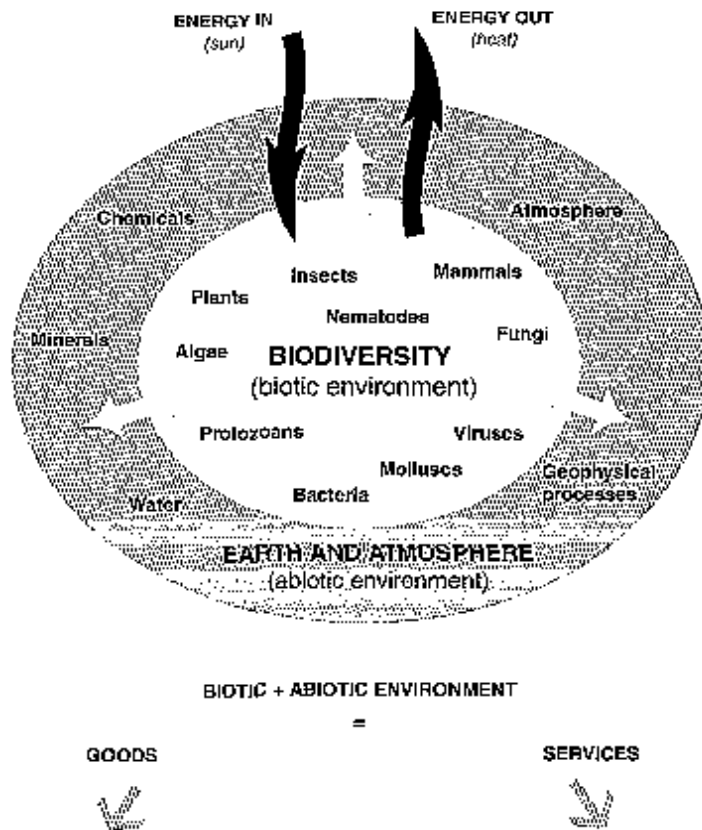
adaptation, enabling it to be grown successfully across different climatic zones – from North America, to Africa, Asia and Australia. This combination of natural and human selective processes has accounted for the remarkable variability and extraordinary ranges of adaptation of different crops, trees or livestock breeds²⁴.

Although biodiversity supports the continued viability and production of natural resources or biomass, its value should not be interpreted only as this. Biodiversity is important because it offers choice, not only from an evolutionary perspective, but also from that of human development and survival. This choice has helped people to manage change. For example, the vast diversity of wild and domesticated species provides people with an assortment of genetic resources from which they can select those crop varieties or livestock breeds with characteristics that suit a particular need at a particular time. Biodiversity also provides alternatives to fall back on when other resources happen to fall absent. If one crop fails, it supports other sources of wild or planted food. For example, during a recent drought in Namibia, even the most drought tolerant cereal available, pearl millet, failed. Coping strategies included re-threshing of the pearl millet heads from previous harvests, by the women, gathering of various wild resources, such as palm fruits, by the girls, and the movement of cattle much further afield to 'greener' pastures available elsewhere, by the men and boys²⁵. Such diversification of use of the biological resource base, coupled with specialisation within the family, allows for flexibility in times of stress and would be clearly impossible without access to biodiversity.



Hundreds of different plant and animal species are grown as major sources of food. Thousands of additional plant, fish and animal species are harvested from the wild to supplement those cultivated or farmed. Many more thousands contribute directly and indirectly to the productivity of the ecosystems within which all these grow.

Figure 3: Biodiversity - environment interactions²⁶



Considering biodiversity as a list of the species that make up an ecosystem is as inadequate as considering a human being as a list of his or her bodily organs. The organs may be intricate and interesting but they in no way approximate the way in which they work together in a walking, talking, living human being. Similarly, biodiversity is much more than the sum of its parts – it yields a vast range of ‘goods’ and it fuels environmental services that sustain life on earth as we know it.

People select useful organisms from this unique storehouse, harvesting them directly or adapting them to create ones with more useful or desirable characteristics. Or they manipulate ecosystems to enhance productivity or reduce threats from predators, pests or diseases.

For example:

Micro-organisms living in association with plants, as free entities or in symbiotic associations with other organisms, including algae, bacteria, fungi, protozoa and viruses.

Macro-organisms such as earthworms and insects. **Traditional varieties** of crop plants (strawberries) and livestock that are adapted to local conditions.

Wild relatives of crop plants and livestock, which can introduce useful attributes to cultivated or domesticated species.

Crops and domesticates that are not grown or used anywhere else yet meet local needs effectively and may have a comparative advantage for use elsewhere on the grounds of nutrition (e.g. wing beans), texture (e.g. bush mango) or structural versatility (e.g. rattan). **Wild species** with distinctive local uses as medicines, dyes, goods, perfumes, drinks, in religious worship etc., or which have external markets as luxury items, such as certain hardwoods or wild animal skins. Such species may include plants, mammals, insects or fish.

Exotic species that have been introduced to the area through trade and have not evolved within local conditions but can survive within them.

For example:

Decomposition and nutrient cycling functions.

Available evidence shows that decomposer communities are highly diverse and are centrally involved in nutrient cycling, organic matter production, and other ecosystem functions. But knowledge on this diversity remains limited and more is known about soil biodiversity than the dynamics of decomposer communities in aquatic environments.

Pest control functions. Many methods of pest and disease control – both traditional and modern – rely on biodiversity in the form of predators and competitors, parasites or micro-organisms. It is estimated that more than 90 per cent of potential crop pests are controlled by natural enemies that live in natural and semi-natural areas adjacent to farmlands. The value of natural pest control services is estimated at \$54 billion/year.

Pollination and seed dispersal functions.

There are more than 500,000 known species of pollinators (bees, butterflies, bees, birds, flies and bats). Pollination is a key function in a variety of terrestrial ecosystems (biotic pollination per se is poorly represented in aquatic ones). Animals pollinate about half of all plant species, including those plant species that produce food.

Soil and water conservation functions. This is a typical function of natural vegetation and can be improved with the use of windbreaks, contour farming with appropriate border crops and cover crops in a wide range of agro-ecosystems. The role of below ground biodiversity in supporting such services, for example root systems and structures of plants, should not be overlooked.

Climate functions. Biodiversity contributes to the chemical composition and properties of the atmosphere and has a marked influence on climate.

3.2 Multiple functions, multiple values

A generic typology of the multiple benefits of biodiversity is presented in Table 247. The table shows that biodiversity yields benefits from people's direct use of it. This involves the selection and extraction of its 'tangible' elements – the goods or products – which are consumed or traded in markets in exchange for other capital assets. Financial values are most easily assigned to the direct use of biodiversity because biodiversity yields private goods and services that are most easily captured by individuals. However, the table also reminds us that biodiversity provides benefits from its indirect or non-use, which are more 'intangible'. For example, the contribution that biodiversity makes to environmental services, religion or folklore is not easily converted to financial values, mainly because they are spread too widely to be directly consumed, or over too long a period of time. These 'intangible' benefits cannot be traded yet (although there are a few experimental efforts now underway to explore the market potential for environmental services²⁸). The indirect or non-use benefits of biodiversity yield public goods and services that cannot be captured by individuals but flow to society at large, whether at local, regional or global levels.

We are **all** stakeholders in biodiversity, but we differ enormously from one another in the way we value it. For some people – smallholder farmers, for instance – the direct-use value of biodiversity, such as gathering wild foods or planting different varieties of one crop, is most important as it contributes to food security. For others – perhaps those living within the flood-prone zone of a city – the indirect use values of the same biodiversity, through its contribution to upstream watershed protection, are more important. People have

learnt to benefit from the many facets of biodiversity in different ways. Thus they will assign different sorts of values to the same biodiversity. Furthermore, these different ways of valuing biodiversity will not hold the same level of importance within different cultures and societies. Herein lie some of the greatest dilemmas surrounding biodiversity. Some of these differences can coexist; for example, when an area provides a variety of biological resources that can all be used and processed in different ways by different people on the basis of wealth, age and gender, providing livelihood niches for different groups. However, some conflict, for example, when the extraction of resources for economic gain degrades a habitat to such an extent that its intrinsic or religious worth is completely destroyed.



As human populations increase and material interests and demands grow, the capture of private benefits of biodiversity takes precedence over the maintenance of its public benefits. In so doing, however, the continued viability and production of private benefits is gradually undermined as are those societies that remain directly dependent as much on public benefits of biodiversity (as a result of their religious beliefs) as on the private benefits. Recognising these multiple ways of valuing biodiversity, and understanding whose value systems are most influential, and with what effect, is of critical importance if we are to begin to resolve the dilemma of how to reduce poverty *without* seriously undermining our ability, and that of others, to continue benefiting from biodiversity.

Table 2: The multiple values of biodiversity²

Value	Description	Primary beneficiaries
Direct use		
Subsistence	Biodiversity supports and provides a selection of products that can be hunted or gathered from natural, semi-natural or managed systems for subsistence use. Such products will include different foods (meat, fish, and fruits), building and clothing materials, medicines, fodder for livestock and other materials such as dyes, gums and resins.	Mostly rural people - especially poorer groups, indigenous peoples, traditional healers and those most reliant on common property resources and least likely to own land.
Tradable	Biodiversity supports and provides a range of products that can be hunted or gathered from natural or managed systems to be traded in markets outside the area of origin. These may include bushmeat, crops, timber, fish and genetic resources.	Small and large-scale commercial enterprises and their employees, e.g. artisans, hunters, collectors and timber companies.
Indirect use		
Environmental services	Biodiversity is the medium through which air, water, gases and chemicals are moderated and exchanged to create environmental services such as watershed protection, carbon storage - on a wider scale - and pest and disease control on a smaller scale. It ensures the continued functioning, resilience and productivity of ecosystems, which provide 'direct-use' goods.	Everyone. At local levels, small-scale producers rely heavily on local environmental services, e.g. nutrient cycling, to boost production, especially in more marginal environments or where they do not have access to chemical inputs.
Informational and evolutionary	Biodiversity comprises genetic diversity (and associated information) used by people to create new crop or animal varieties or pharmaceutical derivatives. It plays a critical role in enhancing agricultural productivity and is a key source of medicinal and cosmetic products. It also enables natural selection to take place.	Farmers, in small and large-scale industrial-type agriculture, forestry or livestock development. Plant and animal breeders. Researchers and gene scientists. International gene bank systems. Agro-chemical, food and pharmaceutical companies.
Non-use		
Future options	Biodiversity may hold species or genes that can help insure against future risk and uncertainty; for example, the continued availability of genetic resources may be needed to combat new diseases or to ensure adaptability to changed climatic conditions.	Future generations.
Existence	Biodiversity holds an intrinsic worth that can be used to justify its mere existence. This worth transcends its use and financial values, whether for aesthetic, cultural, philosophical or religious reasons. (Sometimes activities associated with existence values, e.g. tourism, can have impacts ranging from limited to quite severe and cannot then be considered as non-use activities but could be classified as direct use activities.)	Urban dwellers. People practising religions that hold nature in reverence. Indigenous peoples, artists, poets, photographers and conservationists. Tourists and tourism companies.

N.B. Not all that biodiversity holds is necessarily good for humankind. Vectors, diseases and predators of humans, crops and livestock can all pose serious threats to sustainable livelihoods.

3.2.1 Subsistence value

Biodiversity has a particular importance for people, independent of the monetary economy. Such people rely upon harvesting and manipulating its products and services to fulfil all their basic livelihood needs.

These 'biodiversity-dependent' people are often small-scale farmers, pastoralists, fisherfolk or landless labourers and are amongst the financially poorest or most politically marginalised groups. Any loss of access to biodiversity can have very serious livelihood impacts. Amongst these groups are people, mainly among traditional, tribal or indigenous groups, who choose to depend directly on biodiversity for all their livelihood needs. However, more often this dependency is being forced upon them because they have no alternative source of basic livelihood needs. This is caused by the same factors that render people financially poor, such as population growth, lack of political power, illegal seizure of land or resources by unscrupulous outsiders etc., which, in turn, also force unsustainable use. These groups will often be highly dependent on harvesting goods that are ignored by others, either because collecting is too labour intensive or because the value or quality is low.

The value of biodiversity to subsistence lies mainly in its variety of species and their individual abundance. No single plant or animal species can provide the full complement of proteins, vitamins and starches essential for a balanced diet. Furthermore, the protein, vitamin and mineral content of the vast range of wild foods is often much higher than that of domesticated or farmed foods. By providing the medium from which to harvest and then consume a variety of species, biodiversity's role in good nutrition is of

paramount importance. Another way biodiversity really 'adds value' is during periods of stress by reducing people's vulnerability to shocks. Wild plants that might normally be considered redundant because they are of low food value or are difficult to harvest or prepare may become critical, perhaps because they are more resistant to drought or disease. Small producers will also rely mainly on genetic diversity as a buffer against variable yields: the greater the variety of crops and individual varieties grown, the greater the chance that something will survive the adversities of climate and disease. Seasonal variability of different species can also enable farmers to stagger labour and harvest regimes throughout the year according to availability of human resource and food needs¹².

Biodiversity also provides various food processing options that allow further diversification of product; for instance, the micro-organisms that convert sugars to alcohol, leaven bread, make cheese and the woods required to smoke fish. Furthermore, many communities still rely on traditional medicines harvested directly from the wild for maintaining their health and well being. In many countries of sub-Saharan Africa, for example, there has been a resurgence of interest in turning back to natural biodiversity as a source of remedies as the costs of commercial medicines become prohibitive.

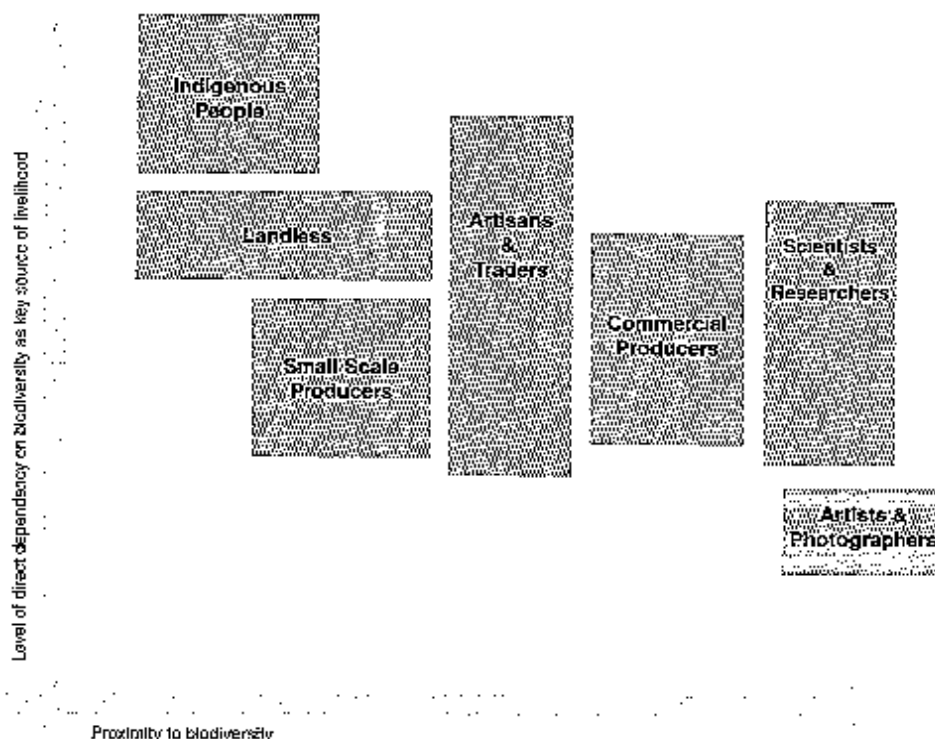
A recent survey in India recorded over 10,000 wild plants used by tribal people - of these, as many as 8,000 were for medicinal purposes and as many as 4,000 for food¹⁰.



The loss of biodiversity can have far reaching impacts on rural people's health and nutrition. If, for example, fuelwood comes into short supply, more time is spent searching and less on cooking. If only fast burning woods are available then only fast cooking foods, such as starches, can be prepared. Other foods such as whole grains, legumes and meats cannot be cooked properly and will be inedible either because they are unsafe or toxic¹¹.



Figure 4: The nature of different peoples' dependency on biodiversity



Traditional and indigenous people

What we have come to term 'biodiversity' is important to many traditional and indigenous people, although they may not define it as such. It is important not only for their basic survival, but also for their spiritual and aesthetic fulfillment. Indeed, 'biodiversity' is so directly linked to the sustainability of their livelihoods that it is often held as sacred. Access to, and uses of, biodiversity are therefore regulated through elaborate social rules, which may be embedded in spiritual beliefs. Their maintenance and knowledge of many traditional varieties of crops, their wild relatives and plants with medicinal and cosmetic properties, is of great value. For a long time this knowledge and any associated resources, have been taken freely. But there have been many recent attempts to redress this practice - especially Article 8j of the Convention on Biological Diversity, which attempts to: 'Encourage the equitable sharing of the benefits arising from the utilisation of such (indigenous) knowledge, innovations and practices.' However, there are many enormous challenges surrounding the successful implementation of this article.

Rural landless peoples

These peoples often trade labour, or their human capital, for survival. They will often act as 'cleaners', cleaning up 'leftover' resources after others have exploited the best that an area has had to offer or collecting products that are secondary to the actual designated resource use. For example, access to a rice field after harvest means that they can collect fallen grain that no-one else wants. Access to a shrimp farm enables them to collect the mixture of small fish that might, for example, accompany shrimp netted and which would otherwise be thrown away. Such people may also efficiently invest their labour in tasks that do not depend on acquisition of land or costly equipment but on freely harvested goods. Most of this work relies on adding value to different biological resources: for example, basket-making from wild palms, brewing from minor cereals such as finger millet, small scale food processing such as fish smoking and preparing condiments for sale. This sort of work has often provided much needed jobs for rural women, thus highlighting the important role biodiversity plays in providing livelihood opportunities for both genders. Access to such biodiverse resources is vital for such people but is often closed or illegal.



Small scale producers

Small scale producers who eke a livelihood from low external input farming, herding or fishing rely heavily on off- and on-farm biodiversity and their own enhancement of ecosystem services. For example, these people may use soil management practices that improve soil fertility by promoting earthworms, other soil fauna and micro-organisms, or they may place bird perches in fields to encourage birds to reduce pests or intercrop to reduce crop diseases. For many smallholders a key priority is to reduce exposure to risk, such as that caused by the vagaries of climate or markets. They construct complex livelihood strategies, juggling their investments in activities such as farming, harvesting wild resources, hunting or fishing as circumstances change and new opportunities arise. Similar to indigenous and traditional people, they often have a fair degree of understanding of behavioural characteristics of different varieties and broods and, of sources of emergency foods and medicinal plants because they rely heavily on these during periods of stress. Biodiversity is key to the smooth functioning of such systems as it makes available different resources, which, in turn, allows different people, men or women, to exploit different niches. However, people's access to biodiversity is becoming restricted as the breakdown of local resource management rules has led to open access regimes or as land privatisation programmes allocate land to larger farmers or outsiders.

Artisans, traders and small entrepreneurs³³

Artisans, traders and small entrepreneurs are involved in growing numbers in activities that rely on processing of, and trade arising from, the products or services of biodiversity. These people often live outside source areas. For instance, in parts of eastern and southern Africa, 14 per cent of all those processing and selling forest products are located in urban areas. As many of these activities are full-time their association and links to these areas remain strong, but usually at one stage removed. That is, they are more likely to acquire their materials through local suppliers. This group will be affected by a decline in availability of products or raw materials, however, they may be more able to shift to other sources, other products or other locations than the suppliers.

Commercial harvesters and producers

Commercial harvesters and producers, such as the rancher settlers of many parts of Latin America, have access to government and market incentives that encourage replacement of biodiverse systems with monocultures. This usually involves planting of only one or two high-yielding cultivars that rely heavily on chemical inputs and mechanised farming. These varieties, however, could not have been produced without the genetic resources of wild relatives, nurtured and protected by indigenous peoples or subsistence farmers. When the right government and market incentives are available this package yields high returns and encourages expansion towards 'frontier' lands where conflicts often ensue between local people not engaged in such activities and the newcomers. The newcomers often have access to capital markets (unlike local people) and will invest any short-term proceeds, thus attempting to free themselves from a direct dependence on the land or ecosystems. This trend is increasing and larger areas of capital-intensive agriculture are increasingly displacing former uses of the land.

Scientists and researchers

Biodiversity is the source of a vast body of information for scientists and researchers. Aided by modern technology, the processing of information gained from the study of biodiversity today (whether in its 'natural' or 'stored' form) is faster, wider and delves deeper than ever before; thus continually creating important new applications for commerce and industry. However, the original holders of traditional knowledge have commonly received little recognition or benefit from the successful application of their knowledge.



3.2.2 Trade value

Some biodiversity products, such as charcoal, rattan, bushmeat or medicinal herbs, may only be of interest to local markets but others, such as hardwoods, birds, ornamental fish, plants with cosmetic properties or genetic information, attract international interest. Biodiversity is also a source of alternative products that can be tapped should market preferences change. It can also act as an 'economic buffer' by providing a critical source of income, when other income generating activities fail.

Biodiversity makes possible the discovery of new and niche products that can provide sudden and rapid sources of income gained specifically as a result of their recent entry into the market. Examples are wild meats such as ostrich meat, organic foods and increasingly popular leisure pursuits such as ecotourism, sport hunting or fishing. Whilst the actual traded volume of such niche products is still low compared to trade in staple foods, they can be of high value and they create new opportunities for people living close to source areas who are unable to benefit from more production of more conventional commodities¹⁵.

It is genetic diversity, held in wild relatives traditional varieties and livestock breeds, that has enabled the massive increases in production of, and associated trade in food and other natural materials. Farmers, breeders and scientists have selected individuals with the desirable quality and yield characteristics from the vast genetic pool, enhancing and multiplying them further in farms and fields. It is this selection of a very small fraction of species diversity and further manipulation of its genetic diversity that has enabled the massive increases in food and natural materials production necessary to meet the needs of expanding human societies. Given

that the world's population is predicted to grow at the rate of 73 million people per year until 2020, the need to produce, trade in and improve access to the staple foods remains urgent. World grain production alone will need to increase by 40 per cent by 2020, notwithstanding extra demands of fish and livestock resources. Future advances in both yield and quality of food and other crops will have to be achieved through a variety of means¹⁶, but all of these depend upon continued access to diverse genetic resources¹⁷.

The productivity gains from the introduction of improved varieties have also instigated falls in the global price of staple foods, such as rice and wheat, providing direct benefits to the urban poor, who spend a large proportion of their income on food. However, while larger producers and consumers have benefited, small farmers have suffered as farm-gate prices have dropped and production has been taken over by larger farmers from elsewhere. In these circumstances, small farmers would suffer fewer losses if they were able to diversify into a wider range of crops, so as to escape this intrinsic market pressure. However, the focus (often for valid reasons) tends to rest on how secure aggregate food supplies from the production, or imports, of a few staple food products. As a result, markets for regional speciality products such as millet, oca, teff, fonio, bambarra nut and bushmeat, do get overlooked but remain particularly vibrant at a local level.

Trade in the products of biodiversity has also been stimulated by the fact that certain crops and livestock breeds flourish better outside their country of origin due to the absence of co-evolved pests and diseases. Today about 70 per cent of crops in African traditional farming systems are from other continents, for example maize,

Only four crops (wheat, rice, sugar and maize) supply 63 per cent of the world's plant-derived caloric intake, out of 7,000 edible plant species. Only three tree genera (Pinus, Eucalyptus and Tectona) account for 85 per cent of plantation production¹⁴.

beans and cassava came from the Americas and bananas, rice and sugar cane came from Asia. However, such trade and exchange between continents of different species has its drawbacks as pests and diseases sometimes follow or, over time, new ones emerge in the new habitat.

Deliberate, sometimes accidental, introductions of new (exotic) species, such as the water hyacinth, shown here, can sometimes seriously disrupt local biodiversity.



3.2.3 Environmental service values

Biodiversity underpins the environmental services necessary for maintaining productivity and a healthy and stable environment, upon which local, regional and global communities depend. These services include, for example, pollination, biodegradation, soil aeration and fertilisation. However, much still remains to be done in improving our understanding of the precise role that biodiversity plays in maintaining environmental services. For example, there is uncertainty over what are the minimum and maximum thresholds of biodiversity, above which different environmental services might be seriously impaired or significantly improved.

Experiments conducted in grasslands demonstrate that losing a few species in the short-term matters little to how a system functions. However, the loss of certain species that are more tolerant of environmental stresses or shocks, or perhaps because they are keystone species,

can prove devastating. Other analyses have shown that plant productivity, nutrient use and resistance to diseases and weeds increase with the first 5-10 species. After that, more species can bring diminishing returns³⁹. Further still, some services depend as much on biomass as on biodiversity. For example, in terms of carbon sequestration a tract of old-growth biodiverse rainforest may not sequester as much carbon as a newly established uniform plantation of fast growing eucalyptus trees. However, a eucalyptus plantation would probably provide less cycling of minerals and soil nutrients and support fewer other plants and animals⁴⁰.

Overall, existing studies seem to indicate that biodiversity-poor⁴¹ environments can be vulnerable, or less resilient, to change triggered by environmental, social or economic factors. For example, they can be more prone to flooding or crops and livestock may become more susceptible to large-scale and perhaps even catastrophic pathogen attacks. However, not all environmental services collapse following reductions in biodiversity. Some may, but others will be highly resilient and can supply functioning services, even in highly modified states. It depends on which species are lost, their function in the ecosystem and whether there are close substitutes that could take on similar roles.



The economic value of these environmental services to the entire biosphere has been estimated at US\$16-54 trillion per year. Taking the higher estimate this is substantially more than the global gross national product, which is around US\$18 trillion a year³⁸.

Environmental services are of critical importance but their contribution to sustainable livelihoods is rarely incorporated into economic valuation and livelihood assets or vulnerability analyses. Reducing uncertainty surrounding the role that biodiversity plays in environmental services may help in assigning value to diversity *per se*, and hence generate more willingness to accept and pay for biodiversity's contribution to these services.

3.2.4 Informational value

Information generated through years of observation and analysis of biodiversity by farmers and scientists alike has played a very important role in the development of many of today's agricultural and horticultural crops and livestock breeds, crop protection and medical and cosmetic products. For example, knowledge of toxicity of plant products, or specific agronomic needs of different crop varieties, has contributed to the development of food and agriculture, whilst the locations and uses of plants with medicinal properties has helped to narrow down pharmaceutical research. Today, this information exists in very different formats: as recorded by rural, indigenous or academic observers. The Northern model has become dominant in many societies, bringing with it huge advances in medicines, agriculture and other sciences. In the meantime, however, the value of rural and indigenous knowledge has often been overlooked. Moreover, its increasing marginalisation means that it is now disappearing fast. For example, a study in one village of Himachal Pradesh in India demonstrated that whilst those over 50 years old could identify 70 per cent of local flowering plants and their useful characteristics, this declined to one per cent among people 30-50 years old⁴³.

Much of the traditional knowledge and information arising out of genetic diversity has been collected freely over the past few hundred years and is now held in databases, academic literature, herbaria, gardens and research institutions. It is now of obvious importance to agro-chemical, food, pharmaceutical and cosmetic industries, especially in developed countries. Advances in biotechnology may create even more opportunities for the use of genetic resources and associated information.

There are many questions, however, over the security and financial sustainability of who actually owns and benefits most from these developments - the source or the developer of the information - and in what proportions? Efforts are underway in the UN Food and Agriculture Organisation and the Convention on Biological Diversity to resolve these complex issues. The CBD - which recognises biodiversity as being under national sovereignty - aims to address this dilemma by acting as an instrument to promote more equitable exchange, on mutually agreed terms, of benefits⁴⁴ from access to genetic resources and associated knowledge⁴⁵. However, these provisions are proving controversial and difficult to implement. They relate closely to many other policy and legislative frameworks - such as those on trade and investment, environment, intellectual property, constitutional law and indigenous peoples' rights⁴⁶.

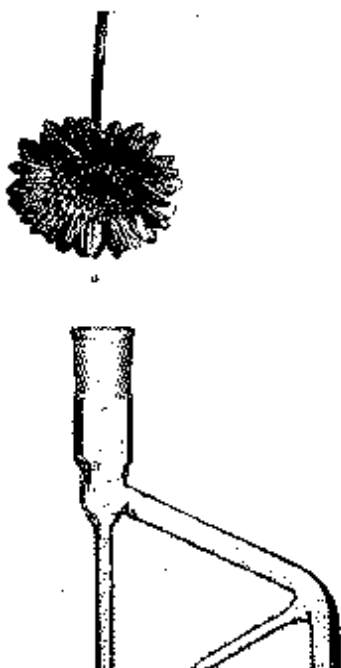
3.2.5 Future option value

It is hard to predict what our future biodiversity requirements might be. We can, however, assume with a reasonable level of certainty that our needs are likely to change over time. Population growth, technological developments, education, the emergence of new diseases and pathogens or global climate change, for

About 25 per cent of all prescription drugs contain at least one compound derived from, or modelled on, compounds found in higher plants⁴².

The chemical combinations held within nature have long been critical sources of information for the development of suitable cures for the evolving diseases of humans, crops and animals.

The recognition that biodiversity produces myriad substances of great chemical and pharmaceutical potential is of significant interest to industry.



instance, may all change what we value in biodiversity. Many of these disruptions will emerge from currently unknown phenomena and, in disrupting the status quo, they will demand flexibility and the means of adaptation which biodiversity is often able to provide. We may start to need vast quantities of a species that we

currently consider insignificant or even harmful. Who was to know, for example, that bread mould would become one of the most useful sources of antibiotics, or that a heat-loving microbe in a hot spring in Yellowstone National Park would provide a key ingredient in DNA fingerprinting work⁴⁷?

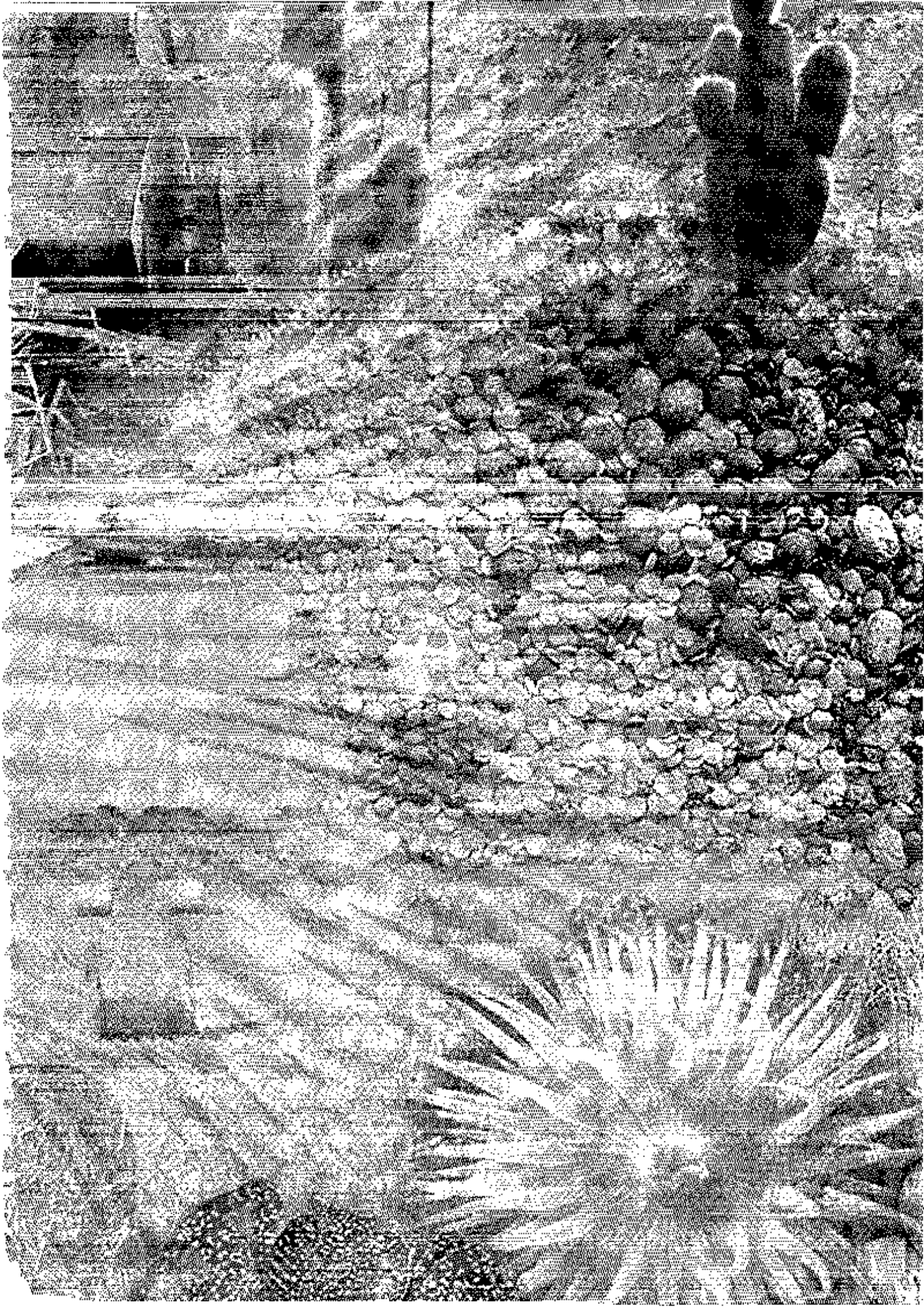


An analysis of Bombay residents' willingness to pay for the maintenance of Borivli National Park near Bombay showed that businessmen are willing to pay significantly more than others for its continued existence⁴⁸.

3.2.6 Existence value

For some, the continued existence of biodiversity for its 'intrinsic worth' is important enough to leave it untouched. This may be because it is considered beautiful, interesting, spectacular or critical for ecosystem health, or because certain species are revered. Indeed, landscapes containing biodiversity enjoyed by human beings have provided inspiration not only to biologists but also to millions of naturalists, explorers, painters, photographers, writers,

poets, musicians and religions. Existence values have, in the past, dominated the actions and responses of conservationists from industrialised countries towards tropical biodiversity - usually at great cost to local people living with the 'conserved' resource. However, it is becoming increasingly apparent that we must all be willing to accept the need to compensate local people, and even governments, for the income foregone as a result of not using conserved areas.



4. Could the poor benefit more from biodiversity?

4.1 Poor peoples' relationships with biodiversity are complex

We have seen, in the earlier sections of this report, how human societies have benefited from the range of biodiversity's values (see Section 3.2 and Table 2, p22). For thousands of years people have selected, extracted and consumed useful organisms or converted biodiverse ecosystems into ones containing configurations of varieties and species of greater value, and in greater abundance, than would otherwise exist.

These processes have significantly changed the 'original' biodiversity present at the birth of human civilisation. Today, very few of the world's ecosystems remain untouched by humans. Our biological inheritance is, therefore, as much a product of human modification as it is of natural evolution.

Certain groups have gained significantly from the changes they have made to biodiversity but many of these changes have instigated livelihood losses for others. If we are to understand more about how changes in biodiversity affect progress towards sustainable livelihoods for the poor we must acknowledge the interconnected, multifaceted and dynamic nature of the

relationships we have with biodiversity. This means distinguishing which practices instigate which changes in biodiversity and how these changes are likely to affect different people's livelihoods. It also requires analysis to a level of detail that discriminates between impacts that are localised and immediate and those that are longer-term and distant. Such analysis is especially important today as changes in society and in biodiversity are occurring faster and over wider areas than ever before. Table 3 outlines four scenarios of how human intervention impacts both on biodiversity and the extent to which other groups of people may gain or lose as a result. Its purpose is not, however, to suggest causality between biodiversity and poverty. The scenarios described are based on anecdotal evidence and are not intended to present a comprehensive picture. They do, however, highlight the fact that relationships between biodiversity and poverty or biodiversity and financial wealth are becoming increasingly complex and contradictory.

People's attitudes towards biodiversity change continually as their perception of what they need or want from it is influenced by technological progress, the media and their assessment of their own affluence or poverty in relation to others. The move towards a more material-based culture is bolstered by trends such as globalisation, market liberalisation, population growth and urbanisation, which have focused mainly on the extraction of private goods but have paid scant attention to the maintenance of the public good aspects of biodiversity. This focus on the generation of private, as opposed to public, good is part of a consumerist trend that is now increasingly adopted by cultures all over the world. It is extremely powerful but,

"...development trends to date have tended to overlook how far the build up of created capital (physical infrastructure, buildings, machinery and equipment) has been at the expense of natural capital⁴⁹."



Table 3: Examples of livelihood and biodiversity change scenarios – who wins, who loses?

Resource Management Choice	Impacts on biodiversity	Impacts on livelihoods
1. Intensive timber extraction	Reduction in timber species and associated biodiversity	Benefits flow to governments from associated tax revenue and to harvesters, investors and traders, i.e. those able to secure rights of extraction, or who have access to capital-intensive harvesting technology. Costs imposed on local people who are dependent on other forest products and also on those who may suffer the loss of services that would otherwise be provided by the original forest ecosystem.
2. Land conversion for agricultural production	Reduction in wild biodiversity where natural habitats are converted to farms and fields. Also, where large-scale intensive monocultures have been introduced there will be losses of traditional crop varieties and livestock breeds. Paradoxically, under the right conditions intensive farming can reduce pressure on wild biodiversity as more is produced per unit area ⁵⁰ .	Benefits flow to larger producers and urban poor (who might spend up to 80 per cent of their income on food hence low food prices are a key priority). Costs are imposed on communities once dependent on converted biodiversity as their lands are taken over, or impacted upon by the external effects of large-scale production, e.g. pesticide pollution.
3. Establishment of exclusionary protected areas	This helps maintain wild biodiversity in its 'pristine' state, primarily to enhance its contribution to environmental services, existence and for future needs.	Benefits flow to distant communities. Costs are imposed where access to such areas and the useful resources within them is restricted for those once dependent on them. Such areas may also harbour predators of humans, crops and livestock, which may present severe threats to local residents.
4. Traditional or non-intensive production systems	Help maintain both wild and agricultural biodiversity in semi-managed systems. Currently such practices whilst biologically very productive are not always efficient enough to supply the burgeoning urban populations and their consumption needs.	Benefits flow mainly to financially poor rural communities whose livelihoods depend on direct access to biodiversity, whether by choice or for lack of alternative. However, distant communities will also benefit (for instance, the genetic resources these communities have conserved).

Note:

- Scenarios 1 and 2 suggest that policies aimed at enhancing production for national economic growth purposes or to service the needs of urban populations can impact negatively on the relationship between biodiversity and the rural poor.
- Scenario 2 favours distant or urban consumers, or landed or larger scale producers in high-potential areas. These groups are able to access the sort of technology associated with large-scale conversion. Those losing out are the rural or smallholder producers on poorer land who cannot compete with large production systems and who might also be forced to bear the negative impacts of accompanied use of agro-chemicals.
- In Scenario 3 biodiversity is increased as a result of conscious action for the benefit of distant, usually urban, dwellers in developed countries or future generations. But this often happens at the expense of the local residents whose access to this area may be restricted.
- Scenario 4 is the classic 'win-win' situation, but it is now disappearing rapidly as globalisation establishes new social and economic systems that do not sit easily with indigenous or non-material cultures. Whilst attractive to many, those who chose to 'opt out' find that it is increasingly hard to pursue such lifestyles independently.



however attractive it might appear, the impacts that these development forms might have on other aspects of life (or biodiversity) should not be ignored.

It is a minority of people (and, on a larger scale, nations) that reap the lion's share of the extraction of private good benefits of biodiversity. Yet the activities of this minority trigger massive changes that have the potential to affect us all. The policies, institutions and market structures that have enabled this minority to benefit from biodiversity do little to bring value to the indirect and non-use benefits of biodiversity. The result is to penalise those pursuing lifestyles that depend directly on biodiversity and who - by the very nature of their religious beliefs, low-impact technologies or low-level exploitation -

help to maintain these resources. In this way, the significant contribution that such people make towards maintaining the indirect or non-use benefits of biodiversity remains unrewarded. Furthermore, they are ignored or neglected as their livelihood systems are not easily incorporated into the consumerist or material paradigms. Consequently, they are driven to overexploit the 'leftover' resources on marginal lands, often illegally, as their traditional lands or waters, institutions and management systems are taken over, disrupted or damaged by the newer forms of economic activity. In so doing, they may be forced to adapt so rapidly to new resource conditions as to jeopardise the stability of their local social and economic systems and place the national economy under unfeasible pressures to absorb them.

Box 6: Contemporary development paradigms

The prevailing 'neo-liberal' philosophy of development assumes that, with unrestrained markets and individuals free to do as they please, society (as long as it encompasses democracy, freedom, liberty and equality) will operate in the fairest way possible. It is also assumed that scientific innovations will help correct any environmental degradation triggered by profit-seeking individuals.

The resulting distribution of resources within society, although unequal, is seen to be as fair and just as possible. This is accepted since 'neo-liberalism' assumes that inequality between societies is a natural condition of human species. Many of these principles have been adopted and followed by key international institutions through, for example, structural adjustment packages⁵¹.

Our global economy is constructed such that developing countries - which host most of the world's known biodiversity - are currently left with little option but to follow the same 'development path' taken by financially wealthier nations. Personal, community and national indicators of 'progress' are forming in the context of this same development path. This means that the cultures and economics of today's nations are increasingly biased towards livelihood outcomes based on 'created' capital rather than on natural capital. However, whether there is going to be enough economic, social and environmental

'space' to enable all those wishing to adopt such lifestyles to participate remains uncertain. Currently, inequalities between financially rich and poor appear to be increasing and the potential redistribution of assets or trickle down effect has yet to take place in many parts of the world⁵². Concerns over impacts associated with high levels of consumption on the environment and biodiversity are also growing. All these issues raise some very difficult questions over whether or not we are jeopardising the capacities of each other, the poor and of future generations from accessing equal levels of consumption and livelihood opportunity.

Contemporary development needs and trends are triggering ever more rapid changes in biodiversity. Unless other processes, such as improved production technologies, help address the escalating development demands and associated pressures on biodiversity and its surrounding environment, then the rate at which biodiversity is modified is likely to increase. This will jeopardise not only those

In the longer-term:

- The indirect values, such as the environmental services supported by biodiversity – some known, others unknown and as yet not understood – will be impaired, with potential and far-reaching impacts on water availability and land productivity, exposure to pathogens and public health.



livelihoods currently dependent on the direct use values of biodiversity but also the ability for the world's poor to access lifestyles comparable to those of industrialised countries. It will also jeopardise our longer-term futures, which ultimately rely on the indirect values of biodiversity. If the current *status quo* prevails, in the short-term:

- Those people directly dependent on biodiversity for all their needs are most at risk of losing their livelihood security as they are least able to adapt to new conditions and new institutions or 'rules of the game'; and,
- Those people dependent on access to biodiverse areas as a supply of tradable goods, raw materials or genetic resources stand to lose a key source of income as these areas are converted to other uses or closed off for the public good.

There are several international conventions that seek to prevent the escalation in biodiversity loss. Most of these conventions, most notably the CBD, present challenging agendas for action. But most countries still struggle to integrate biodiversity conservation and sustainable use successfully into poverty reduction and economic development strategies and actions. This is because current development frameworks, with their emphasis on the direct over the indirect benefits of biodiversity, frequently exacerbate the conflicts between poverty reduction and biodiversity conservation and sustainable use. Much biodiversity 'action' – focusing on establishment of protected areas or through the implementation of integrated conservation and development projects⁵³ – has added to these tensions. Most of these conservation-biased activities are costly to implement and, in most cases, have constituted net drains on the economy, which most people living in economically poor biodiversity-rich regions cannot afford. At the same time, poverty reduction and development strategies have consistently ignored the role that biodiversity has played, and continues to play, in sustaining livelihoods. Nevertheless, conservation measures have become a first step towards safeguarding biodiversity, since our understanding of the quantity, or even the type, of biodiversity that needs to be maintained for future needs remains limited. However, they have also instigated serious conflicts with local people and human rights abuses⁵⁴.

It is unrealistic to expect financially poorer countries to mainstream biodiversity objectives⁵⁵ into their development actions if international policies and institutions fail to provide supportive frameworks for doing so. It is equally unrealistic to expect local people to maintain biodiversity for biodiversity's sake when national and local policy and institutional frameworks do not provide suitable rewards. This does not mean that there are no solutions to addressing the livelihood and development needs of developing countries, whilst at the same time safeguarding our biological inheritance. Solutions exist, but they require a much stronger commitment towards addressing these issues within international and national policies, institutions, legislation and a commitment from the media to present a comprehensible and fair picture of the issues.

4.2 Implications for development agencies

Under current policy, institutional and market conditions, the poorest and most vulnerable people are likely to suffer most as a consequence of either biodiversity conservation or its loss. Therefore, the challenge is to ensure that biodiversity-rich, economically poor regions start to benefit from the conservation or sustainable use of biodiversity (rather than bearing associated costs), and that these benefits reach the broadest range of stakeholders. To achieve this, such activities will have to become competitive with other forms of livelihood activity and use methods that compromise as few of the full range of biodiversity values as possible.

Such an approach would require exploring ways in which policy, institutional and market frameworks can be modified to enhance the relationship between poverty reduction and biodiversity conservation or its sustainable use. Such action need not be expensive; rather the essential requirements

are a better understanding of the issues and options (e.g. how far government induced incentive mechanisms distort competitiveness of sustainable use activities) and a political commitment to acting on that understanding.

There are many important constraints that must first be overcome to enable governments and interested agencies to take the first steps towards such action. Firstly, there is a need to recognise the fundamental importance of biodiversity and its role as provider, supporter and sustainer of livelihoods and of life itself. Secondly, there is a need to raise awareness of the complexity and contradictory nature of the relationship between biodiversity and poverty. There is still insufficient empirical evidence to demonstrate the extent of dependency upon biodiversity of different groups, especially the poorest ones, and how changes in biodiversity might affect them. Indeed, the analysis of current approaches to biodiversity, and how this affects progress towards poverty reduction, is relatively new. Thirdly, the lack of ability to communicate the subject effectively outside the biodiversity arena has resulted in scepticism and indifference over biodiversity and its role in development. Despite benefiting from considerable research effort, which has yielded many valuable scientific insights, much of the language of biodiversity research remains inaccessible to non-biologists. Furthermore, analyses of the significance (and value) of biodiversity to human development processes remains ambiguous.

If these constraints are not addressed, those who are charged with making decisions that affect biodiversity will continue to take it for granted, and strategies for enabling poor people to benefit more from its existence will remain inappropriate and ineffective.



Consider a location where financial poverty and biodiversity coincide.

Different stakeholders, local and distant, depend on, and assign, different values to this biodiversity.

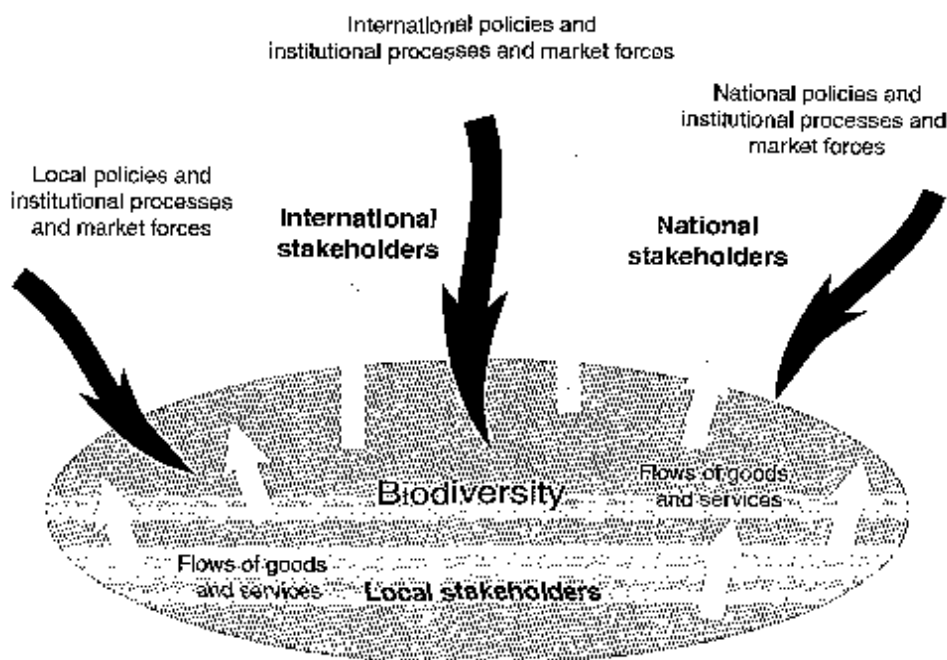
These value systems are then encapsulated in the range of local, national and international policies, institutions and markets that either encourage conversion for economic development or conservation of the biodiversity.

The challenge lies in exploring

- (i) What does the biodiversity comprise of, whose is it and who controls it?
- (ii) Who is benefiting most from, and who really paying the price, of the different ways of valuing (and managing) the biodiversity?
- (iii) What influence do existing policies, institutions and legislation have?
- (iv) Wherein lie the viable opportunities for reform? (v) How can this be achieved, i.e. where do the deals have to be struck, and with whom?

The aim is to make the distribution of benefits and costs associated with biodiversity more equitable, now and into the future.

Figure 5: Impacts and influences



4.3 What could be done?

The generation of tangible and desired development benefits out of the conservation or sustainable use of biodiversity requires pursuit of two complementary approaches. The first is to ensure that the direct use values of biodiversity yield more equitable returns for the poor and in a sustainable manner. Secondly, we must find ways in which the indirect values of biodiversity can be both valued and paid for, ensuring that they contribute as much as they can to poverty reduction. Such mechanisms have significant potential for generating revenue and sustaining livelihoods. Moreover, through 'recompensing' poor people and developing nations for their maintenance of biodiversity, the long-term security of indirect values and the environmental services that biodiversity provides may be ensured.

Prevailing policies, institutions and markets constrain the effective implementation of the above approaches. Carefully planned

reform in all these areas is essential if the poor are to benefit from the conservation and sustainable use of biodiversity. Two examples of where immediate action is needed are around access and property rights policies, or around 'perverse' incentives that render sustainable use activities uncompetitive. Another challenge is to value the contribution that the indirect and non-use benefits of biodiversity make to our well being and poor peoples' and developing countries' critical role in generating these benefits. Enhanced recognition of their contribution could then stimulate new markets or develop existing markets for environmental services, such as the marketing of watershed functions and sustainable or 'fair trade' organic products.

This is not, however, a panacea for poverty reduction, it also does not attempt to replace other ways of addressing poverty. There are still many constraints and issues to be resolved in parallel if poverty is to be successfully reduced. It does, however, offer

alternative ways forward and new livelihood opportunities – especially in areas where other development activities are less feasible as a result of physical or social isolation. It is also one of the only ways of ensuring poverty reduction without compromising on the conservation or sustainable use of biodiversity. If such alternatives are not pursued then this compromise will have to come about if 1.3 billion people are to reach standards of living comparable with the financially richer countries. (Except if, for example, technological developments are able to provide a ‘wonder’ solution, which currently appears unlikely in the shorter-term.)

“People would very much like that biodiversity brings them more money, helps them develop”⁵⁶.”



Given their mandates, development agencies are well placed to engage in processes that enable the poor to enjoy a more equitable share of the benefits of biodiversity (and its conservation or sustainable use). Sections 4.3.1 – 4.3.5 identify possible areas of engagement. However, as mentioned above, the activities described are by no means an immediate panacea to the enormous challenge of integrating conservation and sustainable use objectives into poverty reduction. There are still many issues to resolve before some of the activities outlined below can really deliver real development and biodiversity benefits. There is nonetheless a real need to start somewhere. The following sections should, therefore, be interpreted more as starting points on the challenging journey of seeking out truly viable ‘win-win’ solutions.

4.3.1 Protecting subsistence values of biodiversity

Selected biological resources provide the food and materials that sustain the livelihoods of millions of rural people in developing countries (see Section 3.2.1, pp23). But their access to this biodiversity is increasingly restricted due to the inability

of local, national and international policies and institutions to incorporate their diverse needs and interests. All in all, these policy and institutional ‘failures’ have slowly undermined poor peoples’ entitlements to biodiversity. For example, the establishment of protected areas has been associated with severe conflicts as local peoples have been removed from their traditional lands and their rights to use resources within the protected areas nullified⁵⁷. Access restrictions have also resulted from attempts to convert biodiversity to cash crop agriculture to fuel the export market or to meet the needs of growing urban populations. These trends are frequently encouraged by governments, or by market incentives – they tend to benefit outsiders more than local people.

Access restrictions usually force more people to depend on fewer resources, leading to local over exploitation of available resources. In the process of assigning new uses for existing land or water bodies, the traditional rights that once controlled and safeguarded access to biodiversity, and the cultures and way of life from which they emerged, are discarded and replaced by more ‘traditional’ – usually state – policies and institutions. Thus, more traditional local institutions and the people they represent have little, if any, political power but, at the same time, the formal institutions have not proved to be successful replacements. As a result, it is difficult for local people to participate effectively in policy and decision making or to challenge vested interests or corrupt authorities. In this way, the livelihoods of people who depend on biodiversity for subsistence are impoverished and rendered economically obsolete.

Understanding the direct contribution of biodiversity to people’s livelihoods, and how different policy and institutional

frameworks govern their continued access and use of the whole range of biological resources, would seem to be a particularly pertinent place to start when protecting local communities subsistence use of biodiversity. However, addressing access and property rights for local people will not be the only solution. Strengthening their ability to stand against unscrupulous vested interests, who often control access to resources, whether legally or illegally, is especially necessary. For example, urban based merchants (and their urban markets) are often responsible for over harvesting of biological resources and hence restricting the range of livelihood options open for rural people. These merchants may gain access through state allocated licenses and permits or they may use threats to maintain their access to resources. Giving local people control of access through property rights does not necessarily mean that they will be able to benefit more from commerce or protect themselves from strong outside interests. Other options need to be considered, such as support for market entry and local ability to tax and protection from unscrupulous interests. Analysis should focus on who really controls access, market and labour opportunities as well as on who owns the resources⁵⁸.

producers harvesting from the wild). This applies as much to the international trade of wild resources, such as ornamental fish or birds, as to local trade in bush products, such as fruits, grasses or charcoal, or to benefit sharing from the discovery and subsequent use of genetic resources (or information) found in biodiversity-rich areas. New mechanisms need to be developed that can help redirect a fairer and more equitable proportion of the benefits from trade in biodiversity products back to source.

There are many reasons why source communities do not benefit more, and why they cannot gain access to income from trade in off-farm resources when they most need it, for example during a period of crop failure. Some reasons are legitimate – the very nature of the commodity chain means that the value of the product (and associated returns) will rise along it – but others are less so. Factors hindering a fairer and more equitable distribution of benefits are both internally and externally generated. Internally, the poor usually have the least capacity to participate in negotiating a better deal with traders or marketers. Indeed, the vast disparities between micro-scale communities and market actors are often underestimated. The poorest groups rarely possess the market information, or the political standing that could help strengthen their negotiating position. Furthermore, their access to markets is often restricted by a powerful minority that guards entry from potential competitors. They also lack the necessary skills for adequate quality control, processing or specialised marketing of such products and often do not have a good enough understanding of what the end consumers actually want. In Senegal, for example, a women's group decided to



Tree diversity in local forests can impart different flavours to fish as smoking with different woods helps diversify market outlets for the poor who are often marginalised from mainstream fish markets⁵⁹.

4.3.2 Realising pro-poor benefits from biodiversity's trade value

Trade in the products of biodiversity can make enormous contributions to local, national and global economies. In most cases, however, only a relatively small proportion of the final value reaches the source communities. For example, farmers in many developing countries usually receive only 5 per cent of the value of the final product (this figure is even lower for

venture into the local tourism and supermarket trade after having done very well selling dry fruit in Dakar's local markets. They acquired an expensive sizing and packaging machine but drying was of poor quality and did not appeal to the middle-class consumer. Meanwhile, the product had become too expensive for the traditional consumer⁶⁰.



Some of the more recent niche products, such as ornamental fish or butterflies, have the advantage of being relatively high-value but low in demand so, if carefully managed, such activities can provide important livelihood opportunities for small producers with relatively low impacts on related biodiversity. They lie in stark contrast to products that are lower-value but high in demand, such as certain types of bushmeat.

Externally generated constraining factors include disregard for the livelihood potential of the products of biodiversity, despite the visible returns. This is demonstrated no better than in the Transvaal Lowveld in South Africa where, because of the marginal nature of the land, the harvest of secondary products⁶¹ can yield from US\$10.7/ha up to US\$228/ha, which, when compared to a yield of US\$17/ha from formal agriculture, is highly lucrative. Whilst some communities do harvest a small proportion of these products, vast amounts remain unavailable due to protectionist policies⁶². They may be found on state-owned, protected or private lands or are subject to international trade restrictions. (This does not imply that, occasionally, restrictions may be legitimate and necessary to prevent unsustainable harvesting of rare or endangered species.) There is also a tendency to ignore existing markets in such products since access to these resources, especially 'wild' ones, is often illegal. Or, they are simply de-incentivised by market-based instruments, such as subsidies, which are placed on other more conventional activities. However, the existence of such limitations is often a result of uninformed or biased policy decisions.

All in all this only serves to restrict potential sources of income for poor people, who are then blamed or threatened

with criminal penalties for the acts of others – usually unscrupulous interested parties who care little for the environmental consequences of their actions.

There are concerns that adding value and creating new markets for wild products may exacerbate unsustainable harvesting. There is, therefore, a clear need to monitor sustainable use limits of different products. However, much more needs to be done to understand how different methods of harvesting might affect different organisms in different contexts. (Some resources are more vulnerable than others, depending on whether harvesting entails removal of the whole live organism – e.g. timber for carving, or bulbs – or whether products, such as deadwood, thatching material, fruits etc. are merely collected.) Experience from projects in different regions indicates that where the transfer of ownership and management responsibility for wild resources is devolved to source communities, this, in combination with extensive awareness, training and capacity-building programmes, can actually reduce the likelihood of unsustainable harvesting⁶³.

Redirecting a greater proportion of the benefits back to source is clearly challenging, but certainly easier in some cases than in others. The needs and interests of stakeholders in the supply chain must be taken into account. The 'middleman' is often singled out as a key offender and, often, his or her critical role in the supply chain is overlooked. Whilst (s)he can be very ruthless, especially where there are vibrant illegal markets, removing the 'middleman' can also result in poverty relocation, heightened conflict or loss of market access, especially where (s)he has provided a critical transport link. In every

case, there is a need to develop a thorough understanding of where, in these complex systems, the value is added, how it is added, by whom and to whose benefit⁶⁴.

There are, however, examples of situations where producer prices have been increased to the benefit of smallholders: Brazil nut collectors in Latin America; small-scale timber producers in Papua New Guinea; heart of palm producers in Costa Rica and shrimp producers in Ecuador⁶⁵. This has been done without affecting the final price significantly, as the raw materials often constitute only a small proportion of the total final product volume and costs. Such minor returns may appear to be insignificant but, if regularly transmitted to the source community, they have the potential to contribute to sustainable livelihoods. Much work has also been done in adding value at source within the ornamental fish industry. This has the additional benefit of being a 'high-value, low-impact and limited-demand' product, hence one in which it is easier to maintain sustainable extraction levels⁶⁶. In terms of policy and institutional issues, projects such as Campfire (Communal Areas Management Programme for Indigenous Resources) in Zimbabwe or the DFID funded Mbomipa Project in Tanzania have managed to devolve responsibility downwards to yield

some livelihood returns for rural communities and some conservation benefits. However, the need for further improvement remains, especially in lacking corruption, competition and vested interests⁶⁷.

The recent upsurge in consumer interest in 'natural', 'green' and 'organic' food and in homeopathic medicines and beauty preparations has stimulated markets for these products. A MORI poll conducted in 1990 showed that 80 per cent of consumers would buy 'green' products given the choice, however, for many, higher prices and lack of confidence in product credibility remain barriers to regular purchase. Various 'green' or 'organic' accreditation schemes have been established to address this, such as that of the Forest Stewardship Council, which offers a credible worldwide timber certification scheme for all forest types and plantations. However, much remains to be done in terms of identifying suitable indicators for biodiversity, within the range of certification schemes, and ensuring that such schemes do not impact negatively on smaller southern producers.

This section does not deal with the important role that genetic resources, which in many cases have been modified and nurtured by smallholders and communities in tropical regions, play in enhancing agricultural trade. This is a complex area and cannot be dealt with here, although some issues relating to Intellectual Property Rights are outlined in Section 4.3.4. Impacts on biodiversity and dependent livelihoods arising out of the enhanced trade in basic commodities are also not addressed. Whilst responsible for large-scale biodiversity loss, the links to livelihoods are multifaceted. These issues alone could constitute the subject of an entire paper⁶⁸.

As consumer awareness grows, the potential for marketing and adding value to products on the basis that they are 'biodiversity-friendly' should increase. Indeed, it is already happening for some products, for example 'bird-friendly' coffee.



Box 7: Developing markets for products of Amazonian biodiversity

The Bolsa Amazonia project concept aims to facilitate and promote trade in Amazonian products of biodiversity that will also benefit poorer groups. It builds on existing local and international demand for simpler products of biodiverse areas such as fibres, dyes, industrial and edible oils, aromatic oils, processed and semi-processed foods, resins, latex and fish, rather than on the information, principles and processes needed to develop new drugs and cosmetics. The main project activities include the contracting of commercial facilitators who mediate between buyer, provider and seller, identifying new potential products, enhancing participation of the providers in trade fairs, providing training (e.g. on patents, contracts, regularity and quality of supply) and advising on marketing campaigns etc. Other activities include establishment of a databank in Belem, linking

all nine Amazonian States to each other and to the Bolsa Amazonia Office (UNCTAD) in Spain, which holds information on the demand and sources of demand of natural products. This should help facilitate commercial contacts and negotiate privileged import tariffs with the European Community (EC). Exploring how to add value to existing products is another important component of the project. The project was initiated by a non-governmental organisation (NGO) called POEMAR (Pobres e Medio Ambiente - Poverty and Environment in Amazonia) located in Belem, in collaboration with the UNCTAD Biobrade initiative. Private organisations like Mercedes Benz, Henkel, the National Economic and Social Development Bank (BNDES) and the Amazon Bank, as well as public institutions, are already involved in the project⁶⁹.

4.3.3 Yielding pro-poor benefits from biodiversity's contribution to environmental services

Environmental services, because they are not directly consumable, are not yet recognised and traded in markets. Yet, it is often poorer peoples who, by the very nature of their smaller production systems, subsistence and consumption, maintain these services⁷⁰. Indeed consumers are generally unaware of the relationship between biodiversity, the products they consume and the impact that current patterns of consumption have on biodiversity and its contribution to environmental services. As a result, in an increasingly market-driven world, this aspect of biodiversity gets neglected since its value is not immediately apparent to society. New mechanisms that recognise the value of maintaining services in production processes need to be developed.

Consumer awareness of the value of biodiversity's contribution to environmental services also needs to be raised if such markets are to be successful.

4.3.4 Creating pro-poor benefits from biodiversity's information store

The study and analysis of biodiversity has yielded a vast and potentially powerful body of information which has, so far, benefited developed economies more than less developed ones. This information could, however, still be applied much more effectively to the needs and concerns of the poor. At the same time, poor peoples' roles in creating and building up the knowledge base could also be more widely recognised and rewarded. For example, traditional knowledge systems, the result of centuries of collective observations and experimentation, have been shown to stimulate innovations and improved practices. However, it is that knowledge of





how to survive with limited resources or under conditions of high variability and uncertainty that might be of immense practical use in other poor societies. Practical application would increase its value and therefore its resilience to erosion; the People's Biodiversity Registers and the Honey Bee Network in India⁷¹ are good examples of such processes – whereby local people's knowledge is gathered and documented but with appropriate Intellectual Property Rights protection⁷².

Despite such initiatives, significant obstacles blocking the poor's ability to benefit more from information arising out of biodiversity, remain. One of these is the current system of **Intellectual Property Rights (IPRs)**. It has been suggested that most IPRs (especially those defined by TRIPS⁷³ agreement) discriminate against the interests of many traditional or indigenous peoples, because they are based on private rights as understood in the North and only recognise collectively held knowledge if the 'community' is a company. Much traditional knowledge is not eligible for patent protection because it cannot be traced to a specific community or geographical area.

But, even if it were viable, many traditional communities lack the finance or technical background necessary to make an application, let alone engage in litigation to protect their patented right. There are, unfortunately, few easy alternatives. The Community Intellectual Rights Act formulated by the Third World Network was an attempt to prevent the *"Privatisation and usurpation of community rights and knowledge through existing definitions of innovation."* However, the Act implies that innovation is collective, thus denying the rights of individuals⁷⁴.

There are, however, cases where conventional IPRs have been used to protect traditional knowledge. An example

of this occurred when the Tropical Botanic Garden Research Institute of Trivandrum in South India granted a pharmaceutical company an exclusive 7 year licence to sell and manufacture a product based on the Jeevani plant. TBGRI's ownership of a patent gave it exclusive rights to sell the product and resulting royalties are shared with members of the tribal Kani people who demonstrated the Jeevani plants' medicinal properties to TBGRI scientists⁷⁵.

Following the signing and ratification of the CBD by many countries in 1992, there was much hope that the article relating to *"...benefit sharing from the utilisation of genetic resources..."* would generate significant new sources of finance for developing countries from bioprospecting. These expectations were based on the recognition that different organisms found within developing countries, and the information held within them, would be of great financial value to industry. Whilst there have been a handful of successful benefit-sharing agreements, such as the one between the National Biodiversity Institute in Costa Rica and Merck Pharmaceuticals, benefit flows have not yet proved to be highly significant. Furthermore, countries have discovered that the process of developing access arrangements and benefit-sharing mechanisms is not easy and requires considerable researching⁷⁶. The capriciousness of the market for 'naturally-based' products, the high costs of product development, the complexities of establishing reliable supplies of products and the implementation of regulatory controls have all reduced interest in new bioprospecting activities⁷⁷. Nevertheless, as the Costa Rican example illustrates, even modest remuneration can contribute to the local economy and raise people's self-esteem (even if related only to the initial exploration rights and to opportunities for employment).

Box 8: People's biodiversity registers

The People's Biodiversity Registers (PBR) Programme is sponsored by WWF-India and co-ordinated with the Centre for Ecological Sciences of the Indian Institute of Science (IISc) and the Foundation for Revitalisation of Local Traditions. Objectives include: providing a record of local knowledge for present and future generations; promotion of the revitalisation of local knowledge, skills, techniques and conservation practices by rewarding those outstanding ones; and protecting local biodiversity and local knowledge from misappropriation. The programme works from a decentralised, bottom-up system, recognising that people

must have incentives to participate in the documentation of their knowledge. Promotion of traditional biodiversity-related knowledge, primarily for the benefit of the poor, is emphasised, while careful regulation of access to information in the registers is considered a way of achieving this. There is debate about how to encourage further development of the PBR through, for example, charging access to PBRs that are held by panchayats (local elected councils) and educational institutions. Benefits also accrue if individuals or communities decide to exchange biological material or knowledge for financial or in-kind benefit⁷⁸.

4.3.5 Generating pro-poor benefits out of biodiversity's existence

Protected areas or *ex situ* collections are the means by which existence and future option values have been maintained. However, funding for these activities has become more difficult to obtain. Most protected area budgets have declined in recent years and such activities are usually found near the bottom of the expenditure list. For example, Cameroon contributes only 0.02 per cent of its national budget to managing its protected area network and Tanzania only 0.26 per cent, even though protected areas account for nearly 25 per cent of Tanzanian lands⁸⁰. In current institutional contexts, protecting areas for local religious reasons cannot guarantee future protection. Finding new ways of financing the protection of existence values and, especially, new ways of providing tangible livelihood benefits for people living in their vicinity, is critical if these values are to remain intact.

Large numbers of people living in economically richer countries maintain a

strong interest in biodiversity. Their interest is demonstrated in many ways. For instance, 48 per cent of World-wide Fund for Nature (WWF)'s income comes from individual donations, legacies and subscriptions while the Royal Society for the Protection of Birds (RSPB) has over 1m members in the UK alone. However, for many, the link between the interest in biodiversity and the need to 'pay' more or find new mechanisms to safeguard its existence values, is not really being made. Many governments of industrialised countries donate funds towards such activities and the UNDP/UNEP/World Bank Global Environment Facility was established to address the need for new financial resources. However, even in total, these resources are still unable to offset the opportunity costs faced at local and national levels by non-use and protection. Kenya, for example, could generate gross annual revenues of US\$565 million and net returns of US\$203 million while employing 4.2 million Kenyans if all protected areas were converted to agriculture⁸¹. Whether converting these areas to agriculture is actually realistic or not is, of course, subject to debate and

The global ecotourism market is growing at 10-15 per cent in the South. As much as 1/5th of Costa Rica's foreign exchange earnings now come from tourism⁷⁹.

this statistic also ignores the fact that the protected areas yield vital tourism revenues for Kenya. Nevertheless, it does help to demonstrate the scale of the problem.)

If the 'consumers' of existence values were more aware of the crisis facing biodiversity and how it affects livelihoods, the 'willingness to pay' for these values might also increase. Quite how to create tangible livelihood benefits for those living with tropical biodiversity out of this 'willingness to pay' - beyond the current mechanisms i.e. public grant finance for 'projects' - has not really been ascertained. Many new and innovative channels, private as well as public, would have to be created. Currently, ecotourism has provided one such means of doing so. There is much potential for countries to yield important foreign exchange earnings from ecotourism, an industry based on the perceived beauty or scientific interest of biodiversity. However, establishing a successful ecotourism enterprise requires not only strong business acumen but also the right conditions for it to work. Furthermore, if it is to benefit local people, their capacity to engage in such enterprises must be strengthened. Many private investors may support such

activities in principle, but do not have the time or resources available to make their investments pro-poor. The direct benefits do not, therefore, necessarily reach the poorest communities, since entrepreneurs from other areas own most ecotourism enterprises and may bring in their own staff. The prospects of lucrative ecotourism enterprises have raised expectations in many countries, and when actual benefits have not matched those expected they have become very quickly disregarded as a viable option. The challenge is, therefore, to learn the lessons of past mistakes⁸² and to develop more effective ways of ensuring that a fair proportion of the benefits from such activities are channelled back to the region. Strengthening interactions between the private sector and local people has been shown to help through, for example, a corporate - community partnership approach⁸³.

Various conservation organisations are experimenting with innovative means of generating finance to safeguard these existence values. These include endowment funds, which generate income for protected area from investments, and private protected areas established and owned by individuals attracted by the tax breaks they offer. For example, in the Brazilian state of Parana 5 per cent of the revenue gained from a tax on consumption is now redistributed towards conservation efforts⁸⁴. However, whilst many of these activities may relieve the cost burden of conservation on government, the real challenge lies in ensuring that such activities do not result in foregone livelihood opportunities for poorer groups and continue to generate essential livelihood benefits for those residents within or around the areas in question.

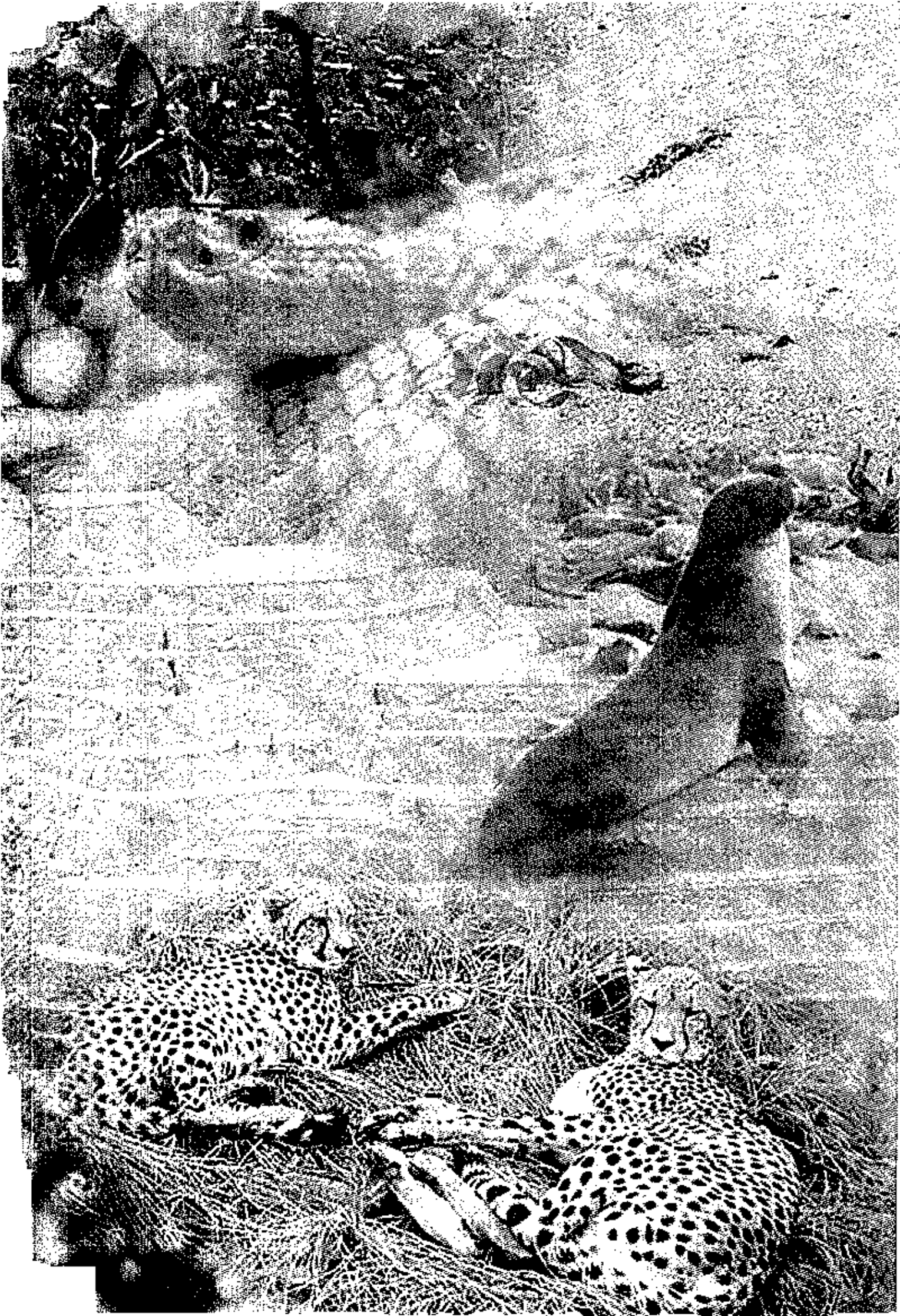




Box 9: The Kijani initiative

Kijani is an initiative jointly implemented by the World Conservation Union (IUCN) and the International Finance Corporation (IFC). The aim is to conserve biodiversity in Africa through catalysing the biodiversity business sector (or attempting to contribute to economic growth through biodiversity conservation). The initiative plans to establish two entities that will develop and invest in sustainable biodiversity businesses. The Kijani Business Service will provide technical assistance to entrepreneurs to develop biodiversity business plans. It will foster critical partnerships between the conservation and business communities and promote market access for African biodiversity goods and services. The Kijani Capital Fund will provide

private equity and debt finance to biodiversity business projects with capital requirements from \$500,000 to \$10 million. It will stimulate new foreign and domestic direct investments in the emerging African biodiversity business sector, which is to incorporate organic agriculture, ecotourism, sustainable forestry and aquaculture. The success of the initiative will be in demonstrating the ability of biodiversity-benefiting ventures to generate attractive returns to investors. This will enable the effective conservation of African biodiversity through sustainable commercial activity. However, the major challenge will lie in ensuring that such ventures contribute towards pro-poor growth⁸⁵.



5. Suggestions for a way forward

The biodiversity held by some of the world's poorest countries is essential for humanity. In many of these countries it is the poorest and most marginalised groups who, by the very nature of their livelihood strategies, have often acted as its custodians. The increasing emphasis on 'private goods' over 'public goods' in development paradigms is, however, leading to significant changes in the 'original' biodiversity - with potential long-term consequences on ecosystem health and to loss of local control. It also means that the least powerful groups, the biodiversity-dependent poor or those pursuing less materialistic lifestyles, lose out to more powerful elites. This has serious implications for the livelihoods of poor people directly dependent on biodiversity. It is also one of the reasons why biodiversity is being altered at ever faster rates.

What are the implications for agencies committed to the reduction and eventual elimination of poverty? Elimination implies an irreversible state. It is possible to achieve a short-term reduction in poverty by 'mining' the world's natural resources immeasurably. However, this would not be sustainable. There is simply not enough environmental 'space' to fulfil the needs, and to absorb the impacts on biodiversity, that bringing 1.3 billion people out of poverty would entail. We must, therefore, ensure that poverty elimination strives towards greater harmony between the economic, environmental and social components of sustainable development and encompasses actions in both North and South.

The only way to achieve this is to reward actions that conserve or sustainably use biodiversity through carefully planned policy, institutional and market reform. This will require serious commitment by all sectors of society and especially for us all to realise that without addressing the biodiversity problem the chances that today's poor will ever enjoy a similar lifestyle to today's rich are limited.

This section has been drafted with development agencies in mind. However, the recommendations are equally applicable to governments, the private sector and civil society. The recommendations provide an overview of how poverty reduction can be more equitable and more inclusive of the widest range of biodiversity values.



There are five sets of recommendations. The first set addresses the need to actively take account of biodiversity in poverty reduction strategies. The second attempts to disaggregate the multiple functions and uses of biodiversity; it makes recommendations on the opportunities these functions and uses provide to improve the livelihoods of the poor and the challenges to be faced if these opportunities are to be grasped. The third highlights the need for a strong partnership approach with the private sector to achieve a much wider impact. The fourth emphasises the need for more educational work to be done in improving the understanding of biodiversity and how consumption patterns affect it. The final section makes recommendations on the priorities for further research.

5.1 Poverty reduction strategies and programmes

Recommendation: Mainstream biodiversity into poverty reduction processes to make related actions more inclusive of the diverse needs of the poor.

Poverty reduction necessitates changes in biodiversity. Such changes yield important livelihood benefits for some, but usually occur at the expense of groups who maintain lifestyles directly dependent on biodiversity. Mainstreaming biodiversity into poverty reduction processes can help mitigate the negative effects of biodiversity change on these groups. It can also help to identify new livelihood opportunities for the poor from emerging markets for biodiversity goods and services. Nevertheless, biodiversity mainstreaming rarely happens. This is partly because biodiversity is so broad in scope, and so abstract in nature, as to render it incomprehensible to many. It is also because understanding of the nature and scale of dependency of different groups on biodiversity, and how changes in it affect them, is limited.

Livelihoods approaches offer the potential to mainstream biodiversity in poverty reduction. However, they will need to be further refined to ensure that they achieve this potential. These approaches should -

- Undertake a review of poverty reduction programmes to assess whether or not they have incorporated biodiversity in programme design, with what outcome and for whom.
- Ensure that poverty reduction programmes are informed by livelihood analyses to provide, *inter alia*, a better understanding of the importance of biodiversity to poor people and how to build on the opportunities it offers for reducing poverty.
- Develop the mechanisms and tools (e.g. criteria and indicators) for mainstreaming biodiversity in poverty reduction processes and improving decision-makers' access to them.



5.2 Policy and institutional processes

Recommendation: Create the conditions that enable the poor to benefit more from the multiple values of biodiversity through policy, institutional and legislative change.



Biodiversity plays an important role in the livelihoods of millions of poor people. It is a source of food, fuel, medicines, fodder and other natural materials. This very diversity helps communities cope with change by, for instance, reducing their vulnerability to unforeseen shocks. However, their access to biodiversity is being increasingly restricted. Biodiversity also provides a range of tradable commodities, which constitute an important source of income. But, it is 'outsiders', rather than the co-resident poor, who capture most of the trade value of biodiversity and existing market incentives discourage sustainable use. Prevailing development paradigms help support this *status quo*. If, however, poverty reduction is to be sustainable then the policy and institutional processes that promote inequities and discourage sustainability must be identified and modified to -

- Empower communities maintaining a direct dependence on biodiversity, and their institutions, by supporting their active participation in the devolution and decentralisation of biological resources management.
- Encourage the concept of diversified resource use within policies, institutions and legislation (especially sectoral, land use, trade and investment). For example, addressing access and tenure of wild resources (and the lands or water bodies within which they are found) and demonstrating the comparative value

of different forms of land use - for instance made in wild resources versus cash-crop agriculture - in different environments.

- Ensure that the range of international and national policies, whilst controlling trade in endangered species, do not restrict poor people's access to biodiversity and do not promote protectionism through non-tariff barriers on biodiversity products and services.
- Strengthen capacity in governments and civil society to integrate livelihood perspectives into biodiversity-related policies and actions; also, to integrate biodiversity perspectives into sectoral policies and actions.
- Work towards the adoption of policy and institutional mechanisms that seek to safeguard and improve returns to primary producers from the sustainable use of biodiversity, (e.g. products arising out of sustainable agriculture, organic farming and sustainable forest management methods). This is likely to entail, *inter alia*: addressing property rights; designing incentive mechanisms that work for biodiversity and the poor; improving access to appropriate technologies; developing a better understanding of biological limits to sustainable harvesting; building on, where relevant, indigenous knowledge and management systems; and managing unscrupulous interests.
- Identify niche products that are 'high value' and 'low impact' and help stimulate suitable new markets for such products. Help communities to improve value addition at source through capacity building that aims to strengthen their negotiation power, local distribution networks, marketing, quality, market information and local processing skills.

Many poor people are, by the very nature of their livelihood strategies, custodians of the indirect values of biodiversity that support critical *environmental services*. Their contribution towards safeguarding these values is not always immediately apparent to those benefiting from them. Poor peoples' contribution towards protection of these public goods must be adequately rewarded; otherwise they are forced to adopt unsustainable practices. Steps must be taken to -

- Identify which livelihood strategies contribute most effectively towards maximising the positive contribution of biodiversity to environmental services, and to discover ways to reward those pursuing such livelihood strategies in such a way that they contribute to poverty reduction.
- Promote standard-setting processes (e.g. forest certification and eco-labelling) that strengthen the market credibility and competitiveness of 'biodiversity-friendly' products, without imposing prohibitive costs on the poor.
- Ensure that emerging initiatives to establish markets for environmental services in developing countries fully acknowledge the role of the poor in maintaining the biodiversity that supports these services.

The vast amount of information available about biodiversity has, to date, largely benefited developed economies. The challenge lies in developing a means by which the *information value* of biodiversity also benefits poor people in developing countries, and protects their own knowledge systems. There is a need to -

- Enhance awareness of the implications of the global trends and developments in Intellectual Property Rights (IPR) systems, especially the implications for

poor peoples' control of biodiversity at local level and access to associated knowledge and innovations.

- Strengthen the capacity of governments to respond to, and address, the conflicts between different IPR systems in locally appropriate ways.
- Improve poor peoples' access to relevant information.

Protected areas play a critical role in maintaining the existence value of biodiversity but carry a high cost in terms of denying poor people access to an important source of livelihood needs. They are also often perceived as a financial drain on national treasuries. However, in developed countries there is some willingness to pay for the existence value of biodiversity. So far this willingness has been channelled through charitable contributions to conservation organisations, donor contributions and debt-for-nature swaps or through industries such as ecotourism. Resource flows through existing mechanisms remain insufficient and more needs to be done to enhance these flows by -

- Exploring the potential for new institutional and market mechanisms that could help transfer a 'willingness to pay' into actual benefits for poor people living in close association with biodiversity and maintaining the existence values.
- Promoting ecotourism, where it can provide a means of poverty reduction and actively promote the conservation of biodiversity.



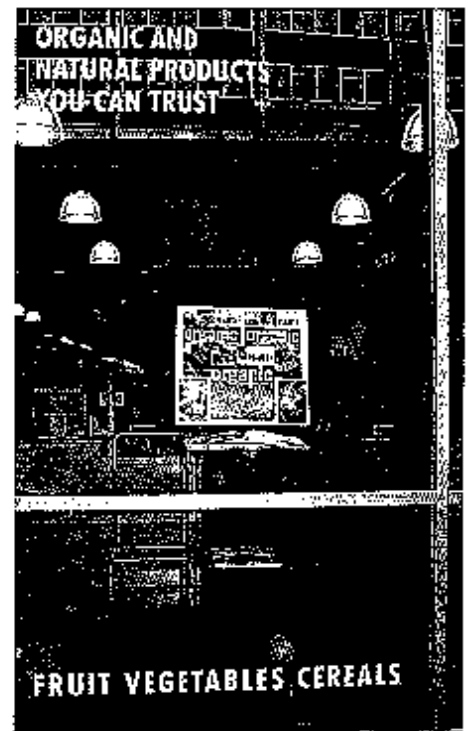
5.3 Business partnerships

Recommendation: Engage proactively with the private sector to amplify biodiversity's contribution to poverty reduction.

Trade in goods and services produced by sustainably used or conserved biodiversity – e.g. wild products, organic foods and ecotourism – is still relatively small, but growing. There is potential for poor people to benefit from these activities, but participation is likely to remain limited unless their capacity to access these opportunities is improved. The public sector is well placed to provide the sort of capacity strengthening support that is needed, whilst the private sector can drive enterprise and investment activity. Scope for such mutually reinforcing partnerships is strong.

Larger-scale commercial activities, and the processes that support them, can have significant impacts on biodiversity and biodiversity-dependent livelihoods. Any negative impacts can be reduced through collaborative work on corporate responsibility programmes and action including –

- Encouraging the introduction of ethical and environmental standards into the investment criteria of major credit agencies and commercial ventures – such as mining, manufacturing and food production. The collation of best-practice guidelines and the development and promotion of appropriate principles, criteria and indicators for biodiversity (ensuring that local livelihood links to biodiversity are fully incorporated), should also be encouraged for the successful development and implementation of such standards.



- Developing stronger coherence between the public and private sectors regarding their priorities for research and development into new production technologies.
- Assisting governments, companies and civil society to tackle complex issues surrounding the CBD objective relating to *“Fair and equitable access and benefit sharing from the utilisation of genetic resources.”*
- Ensuring that opportunities for poor peoples' participation in commercial ventures funded by 'green' and ethical investment funds are maximised (e.g. corporate-community partnerships).
- Building up the capacity within small businesses which rely on biodiversity for financial management, supply and quality control, business acumen, negotiation and marketing skills etc. Those businesses with potential impacts on biodiversity should be given access to more 'biodiversity-friendly' production technologies and management systems.

5.4 Communication and education

Recommendation: Raise awareness of the role that biodiversity plays in achieving sustainable livelihoods for the poor, and of how consumption patterns can affect progress towards achieving sustainability.

Clear and effective messages regarding the significance of biodiversity to different aspects of human development are essential to raise awareness of its importance amongst decision-makers. For example, promoting a wider understanding of how natural resource management activities such as agriculture, wildlife management or fisheries impact on biodiversity, and who benefits and who loses out as a result, can also help resolve any negative impacts such activities may have on livelihoods and biodiversity. The messages must –

- Improve clarity and relevance of information available to decision-makers on links between biodiversity and sustainable livelihoods.
- Make more information available to communities directly dependent on biodiversity regarding the implications of policies, laws and programmes that have the potential to impact upon them or provide new opportunities for local livelihoods. This could involve, for example, improving the flow of market information to producers of 'sustainable products' in the South.

- Facilitate the integration between 'traditional' knowledge systems and 'Northern' ones to build understanding and mutual respect between local communities and outsiders.
- Support programmes which raise consumer awareness of the role that biodiversity plays in maintaining food and other natural-materials production systems, and of what role they can play in reducing the impact of their consumption patterns.
- Increase consumer choice by promoting ethical and environmental labelling, whilst ensuring that it does not discriminate against smaller Southern producers.

5.5 Research

Recommendation: Improve the quality of information on how biodiversity conservation or sustainable use could sustain the livelihoods of poor people more effectively.

Our knowledge of the part biodiversity can and does play in sustaining the livelihoods of poor people is far from complete. On the 'supply' side we need to know more about the biological limitations of the sustainable harvesting of biodiversity products, sustainable forest management and low-input agricultural production systems. On the 'demand' side there are uncertainties about the extent to which consumers will pay a premium for





biodiversity products produced in a sustainable and ethical manner. 'Process' questions cover the policy, institutional and social arrangements, which improve the livelihoods of poor people dependent on biodiversity. The impact of international conventions on poor people is also less than fully understood.

This is a big agenda, within which it is important to prioritise. The priority for development agencies should be practical steps - such as how to quantify the potential benefits to poor people and thus help in the design of poverty reduction strategies and programmes - rather than theoretical solutions. Priority areas should be -

- How to establish policy and institutional processes that can generate effective and desirable sustainable livelihood benefits for the poor out of the conservation and sustainable use of biodiversity. Initial aims would be to:
 - Identify existing constraints, especially 'perverse' incentive structures and how these could be modified;
 - Assess markets' potential for biodiversity-friendly goods and services;
 - Identify valuation mechanisms that are able to incorporate 'biodiversity' in a meaningful way.
- The impact of international conventions and trade negotiations related to biodiversity on poor people. Initial aims would be to:
 - Gain a better understanding of how to mitigate negative impacts of IPR regimes on the poor;
 - Increase our knowledge of the impact of environmental conventions on local economies with a degree of dependency on biodiversity and of how to mitigate any negative impacts.

- The biological limitations of programmes which seek to reduce poverty through the sustainable management of biodiversity. Priority should be given to:
 - Developing biodiversity indicators to be used in the context of poverty-reduction programmes;
 - Gaining a better understanding of the effectiveness of low biodiversity-impact agriculture in safeguarding indirect values and non-use values of biodiversity.
- More analytical and empirical evidence about:
 - The impacts on poverty reduction of community wildlife management and other community-based activities that manage biodiversity-rich common property resources in a sustainable manner.
 - The extent to which the poor can benefit from attempts to obtain a premium price on products of sustainable use - e.g. from certified forests or organic agriculture - or from environmental services markets.
 - Comparative analyses of livelihood gains from production of, and trade in, basic commodities versus diverse (wild) resource production, harvesting and marketing.



Glossary⁸⁶

Adaptation is the act, or process of, adapting or being adapted; that is adjusting, or becoming adjusted, to new conditions.

Artificial selection is the intentional manipulation of the fitness of individuals in a population (e.g. through cross breeding) by humans to produce a human-desired evolutionary response.

Biodiversity-friendly implies that biodiversity is not negatively impacted upon.

Biological resources are living, natural resources including plants, animals and micro-organisms. They have two important properties, which in combination distinguishes them from non-living resources: they are renewable if conserved; and destructible if not conserved.



Biotechnology is any technology that is applied to living organisms to make them more valuable to people.

Carbon sequestration is the absorption of carbon dioxide from the atmosphere by photosynthetic organisms. Carbon storage is the process by which sequestered carbon is stored over time as biomass, e.g. in terrestrial vegetation. A carbon sink is a carbon pool that is expanding, e.g. a growing forest.

Comparative advantage is the relative superiority with which a region or state may produce a good or a service.

Common property resource management is the management of a specific resource (such as a forest or a lake) by a well-defined group of resource users with the authority to regulate its use by members, and outsiders.

The term **community** is frequently used but the term does not lend itself easily to generalisations, and remains fluid and dynamic as communities constantly redefine themselves. The term invokes unity – an undifferentiated thing with intrinsic

powers, which speaks with a single voice. However, the term 'community' can be related to a range of other terms – such as tradition, custom, religion and indigenous activity – leading to questions of representation, power, authority and accountability and fragmentation within the perceived homogenous group. Others propose that the term 'community' should be broken down into three groups: community as a spatial unit; community as a social structure; and community as a shared set of norms. A community can also represent users of a resource rather than a homogenous resident unit⁸⁷.

The conservation of biodiversity is the management of human interactions with genes, species and ecosystems so as to provide maximum benefit to the present generation while maintaining their potential to meet the needs and aspirations of future generations. In the context of this report it encompasses elements of saving, studying and using biodiversity. Conservation is a word that has frequently been given meanings that are at odds with the cultural perspectives of the communities that might be practicing conservation, or who are expected to do so.

A **custodian** is a guardian or a keeper, especially of public goods.

Eco-labelling is the labelling of a product, under a government-backed but voluntary scheme, with information (often a label or a logo) that identifies the product as produced in an environmentally sustainable way. It involves inspection and certification of compliance by independent monitors. There are a myriad of different eco-labelling schemes around the world. A key dilemma is how to ensure that eco-labels do not restrict trade opportunities for poorer countries which may lack resources to comply with the eco-label requirements of richer countries⁸⁸.

An **ecosystem** is a system of plants, animals and other organisms, together with the non-living components of their environment.

Ecosystem diversity is the variety and frequency of different ecosystems.

An **endemic species** is one restricted to a specific region or locality.

Environmental services are generated by the complex combination of natural cycles driven by solar energy that constitutes the workings of the biosphere; i.e. the thin layer near the earth's surface that contains all known life. These cycles operate on very different scales; for example, at larger scales environmental services may be biogeochemical cycles, at the micro-level environmental services may refer to the cycling of nutrients in fields⁸⁹.

Ex situ conservation refers to conservation outside the natural range in which the species in question originally evolved (long-term seed storage, living collections such as arboreta, botanic gardens, botanic stands, seed orchards, zoos, aquaria etc.)⁹⁰.

Extreme poverty. The UK Department for International Development defines this as persons living on less than US\$1 per day. However, focusing on income poverty alone may not reveal the real extent of deprivation, for example, an older or more seriously ill person, may need more income to achieve the same quality of life, because (s)he must spend on help or treatment⁹¹.

Fair trade has been established by the fair trade movement – a network of development charities around the world that have agreed international standards. These standards attempt to promote fairer trade in certain major commodities (e.g. coffee, chocolate bars, drinking chocolate, orange juice, tea, honey, sugar and bananas) in poor countries that have been affected by long-term price declines.

A **gene** is a unit of heredity composed of DNA or RNA and forming part of chromosomes found inside the nucleus of every living cell. Each gene is a chemical instruction that controls a particular characteristic of an individual, e.g. rapid growth, disease resistance, eye colour etc.

A **genotype** is the set of genes possessed by an individual organism.

Germplasm is the genetic material, especially its specific molecular and chemical composition, that comprises the physical basis of the inherited qualities of an organism.

'Green' implies a concern with or support for the protection of the environment as a principle.

Indigenous peoples are people whose ancestors inhabited a place or country when persons from another culture or ethnic background arrived and dominated through conquest, settlement or other means and who today live more in conformity with their own social, economic and cultural customs, and traditions than with those of the country of which they now form a part (also native peoples or tribal peoples).



In situ conservation is a conservation method that attempts to preserve the integrity of genetic resources by conserving them within the evolutionary dynamic of their original habitat; in other words, maintaining populations of species in the natural state in the communities, ecosystems and habitats to which they naturally belong.



A **Intellectual Property Right (IPR)** is the right enabling an inventor to exclude imitators from the market for a limited time. Intellectual property rights confer legal protection on companies and individuals against the counterfeiting of their products, technologies and services. Their growing importance in the global economy and international trade in recent decades has been driven primarily by transnational corporations seeking to protect their investments in research and development. The Agreement on Trade-Related Aspects of Intellectual Property Rights, TRIPS, administered by the WTO, is the first and only international treaty that establishes minimum standards of protection for all the major IPRs. The IPRs covered by TRIPS are relevant to plants and plant varieties and include patents, plant variety protection, geographical indications, undisclosed information (trade secrets) and trademarks⁹².

A **keystone species** is one that has a disproportionately large effect on other species in a community. The loss of a keystone species from an ecosystem can cause greater than average changes in other species populations or ecosystem processes.

Landraces are crop cultivars or animal breeds that have evolved wild, and have been genetically improved by traditional agriculturalists and have not been influenced by modern breeding practices.

Natural resources include the renewable resources (forests, water, wildlife, soils etc.) and non-renewable resources (oil, coal, minerals and metals etc.) which people use.

Natural selection is the Darwinian theory of the survival and propagation of individuals best adapted to their environment; i.e. it is the primary force responsible for evolution. It is the differential contribution of offspring to the next generation by

various genetic types belonging to the same populations, or the tendency for some individuals to produce more successful offspring than others.

Nitrogen fixation is a process whereby nitrogen-fixing bacteria living in mutualistic associations with plants convert atmospheric nitrogen to nitrogen compounds that plants can utilise directly.

Organic production involves production without the use of environmentally damaging practices such as chemical fertilisers and pesticides.

An **organism** is a living being or form of life that is a cell or is composed of cells. These can be any member of the kingdoms of Prokaryotae (bacteria), Protocista, Fungi, Animalia, or Plantae.

A **pathogen** is a disease causing micro organism; a bacterium or virus.

A **public good** is one which, once provided to one user, must be provided in the same amount to all users due to its non-rival and non-excludable nature.

A **population** is a group of individuals with common ancestry whose members are much more likely to mate with one another than with individuals from another such group.



Poverty is often interpreted in economic or financial terms, as this is the most straightforward proxy. In the context of international development, however, it is important to interpret poverty not only as a lack of economic opportunities, but also a lack of political freedom, social facilities, a healthy environment, transparency guarantees and protective security. Moreover, not every society places equal importance on economic objectives, since will value social or environmental objectives as, if not more, highly. They will, therefore, perceive themselves as poor if their access to social justice or a healthy environment is restricted⁹³.

A **private good** is one owned, controlled by an individual, or a group of people.

A **species** is a category in the classification of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.

Species diversity is the variety of species or the diversity among species.

Species richness is the number of species within a region.

Symbiosis is the living together, in more or less close association, of two dissimilar organisms, in which one or both derive benefit from the relationship.

The **sustainable livelihoods approach** is broad and encompassing. It can be distilled into 6 broad objectives, including: improved access to high-quality education, information, technologies and training and better nutrition and health; a more supportive and cohesive social environment; more secure access to, and better management of, natural resources; better access to basic and facilitating infrastructure; more secure access to financial resources; and a policy and institutional environment that supports multiple livelihood strategies and promotes equitable access to competitive markets for all. For more information see www.livelihoods.org

The **sustainable use of biodiversity** is the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

Traditional or tribal peoples.
See Indigenous peoples.

A **Taxon** is a term for any category used in classification.

Taxonomy is the science of the classification of plants and animals. The fundamental taxon in biology is the species, which represents a real biological entity; this category can be defined generally in objective terms, whereas all other taxa are either subdivisions of the species or grouping of species, which cannot be defined except in terms involving subjective judgements.

Variety is the absence of uniformity or a quantity or collection of different things.

Variability is the ability to be varied or adapted. The variability of an organism is a tendency to change in structure or function.

A **wild plant or animal (wildlife)** is one that is not domesticated, but can reproduce itself independently of human control; i.e. it is not sown, planted or reared but propagates itself. Its critical habitats for reproduction and nutrition can regenerate without human intervention. Some wild species are adapted to habitats partially disturbed by human activity but they are not wild if they survive only or largely in cultivated fields and gardens or urban areas. Wild genetic resources differ significantly from their domesticated counterparts chiefly in terms of their means of conservation, the latter mainly occurring *ex situ* and the former mainly *in situ*⁹⁴.

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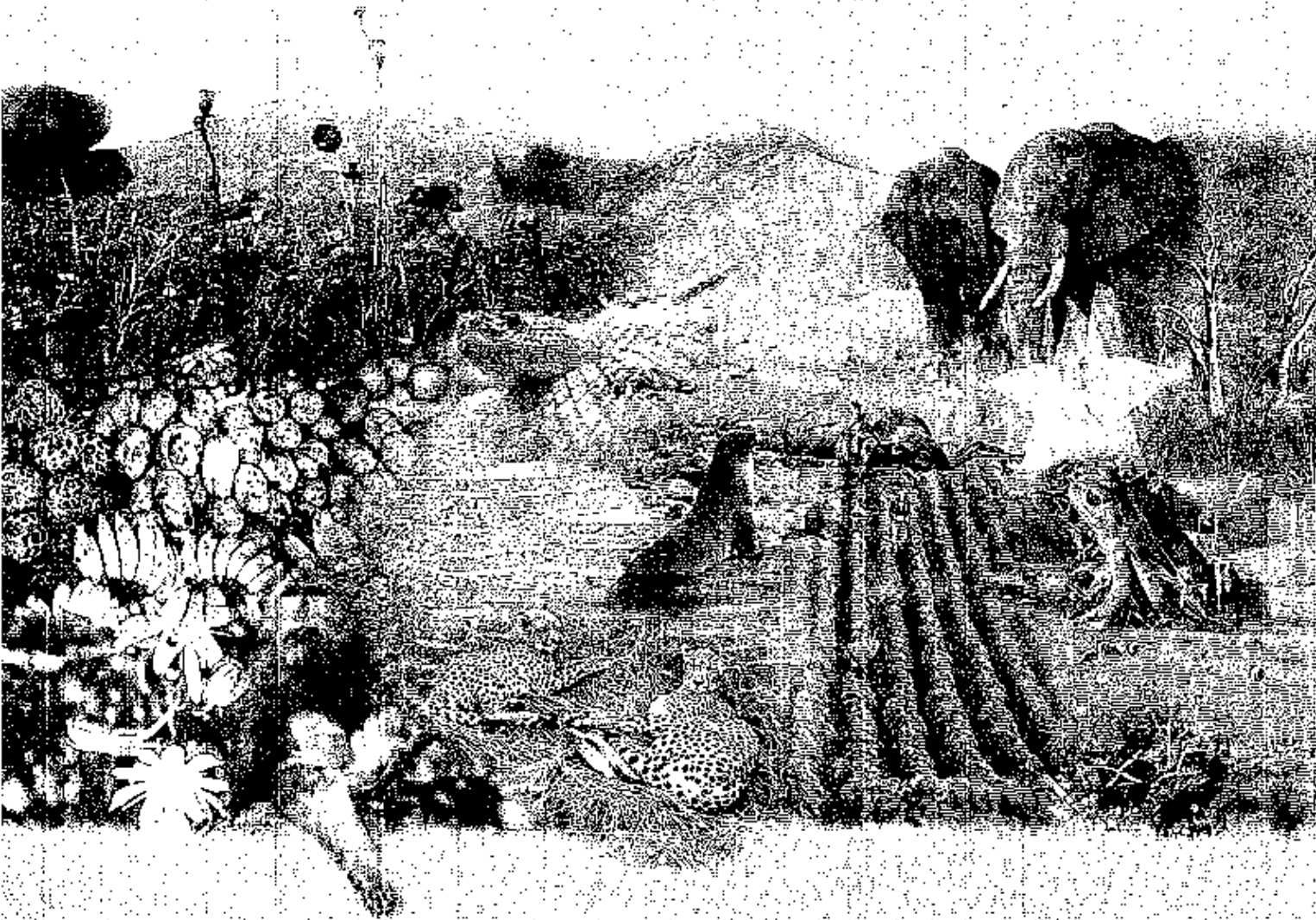
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