
USING ECONOMICS FOR BIODIVERSITY STRATEGIES AND ACTION PLANS IN EASTERN AFRICA

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1. OVERVIEW OF THE LINKS BETWEEN ECONOMICS AND BIODIVERSITY

1.1 THE BASIC ECONOMIC PROBLEM

Economics explains how people survive. It concerns the ways in which individuals and groups act to attain what they want in terms of income, subsistence and other goods and services which they feel will provide them with an acceptable standard of living and quality of life. While everyone wants adequate food, enough cash, good health, a long life, material comfort, pleasant surroundings and mental and physical recreation, the supply of all these goods and services – and the natural, human and financial resources which generate them – is limited, for the world, for countries, for firms, for households and for individuals. Nobody has all their wants satisfied. The basic economic problem addresses human needs and scarcity: *how can we satisfy people's unlimited wants for goods and services from a scarce resource base?*

Incorporating biodiversity concerns into economics involves introducing concepts of sustainability into scarcity: *how can we meet people's current needs in a way which is both equitable and efficient and does not diminish the amount and diversity of scarce biological resources available for future generations?*

This chapter looks at the links between biodiversity and economics and presents an overview of the economic approaches, tools and measures which can be applied to biodiversity conservation.

1.2 WHAT IS BIODIVERSITY?

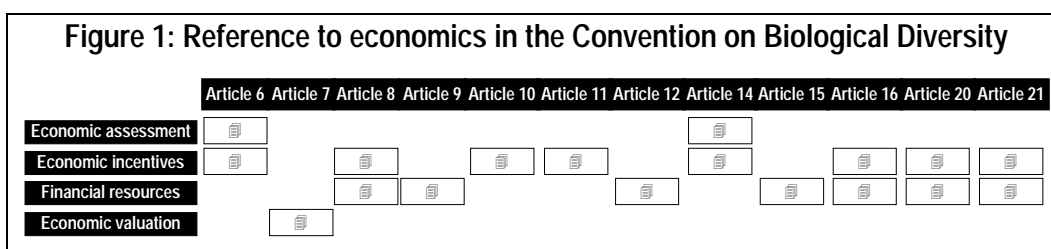
Biodiversity – as defined in the Convention on Biological Diversity – is “the variability between living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems”. It is therefore an attribute of life – in contrast to biological resources which are tangible parts of ecosystems and can be defined as “genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity”.

1.3 THE ROLE OF ECONOMICS IN THE CONVENTION ON BIOLOGICAL DIVERSITY

The Convention on Biological Diversity came into force in 1993. Its three major objectives – conservation, sustainable use and benefit sharing – all require the understanding and use of economics for their implementation, as reflected in the Articles of the Convention.

As illustrated in Figure 1, throughout the Convention on Biological Diversity there is reference to the use of economics. Article 11 calls for Contracting Parties to “...

as far as possible adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity ...”. Article 20 again mentions the use of economic incentives to achieve the objectives of the Convention. Economic incentive measures are also central – although implicit – to the implementation of other parts of the Convention including Articles 6 (general measures for the conservation and sustainable use of biological diversity), 8 (*in situ* conservation), 10 (sustainable use of the components of biological diversity), 14 (impact assessment and minimising adverse impacts) and 16 (access to and transfer of technology).



Both Articles 20 (financial resources) and 21 (financial mechanisms) explicitly underline the need to provide financial support to national activities intending to achieve the objectives of the Convention, from within countries and via new financial mechanisms and global transfers. It also calls for financial support for biodiversity conservation elsewhere – including Article 8 (*in situ* conservation), Article 9 (*ex situ* conservation), Article 12 (education and training), Article 15 (access to genetic resources) and Article 16 (access to and transfer of technology).

The development of new procedures for biodiversity impact assessment is called for in Article 14 (impact assessment and minimising adverse impacts) and by implication in Article 6 of the Convention, which calls upon its contracting parties to develop – in accordance with their specific national interests and conditions – strategies, plans and programmes for the conservation of biodiversity and sustainable use of its components. The Convention also calls for them to integrate the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programmes and policies. It implies the importance of economic valuation in Article 7 (identification and monitoring) of components of biological diversity important for its conservation and sustainable use.

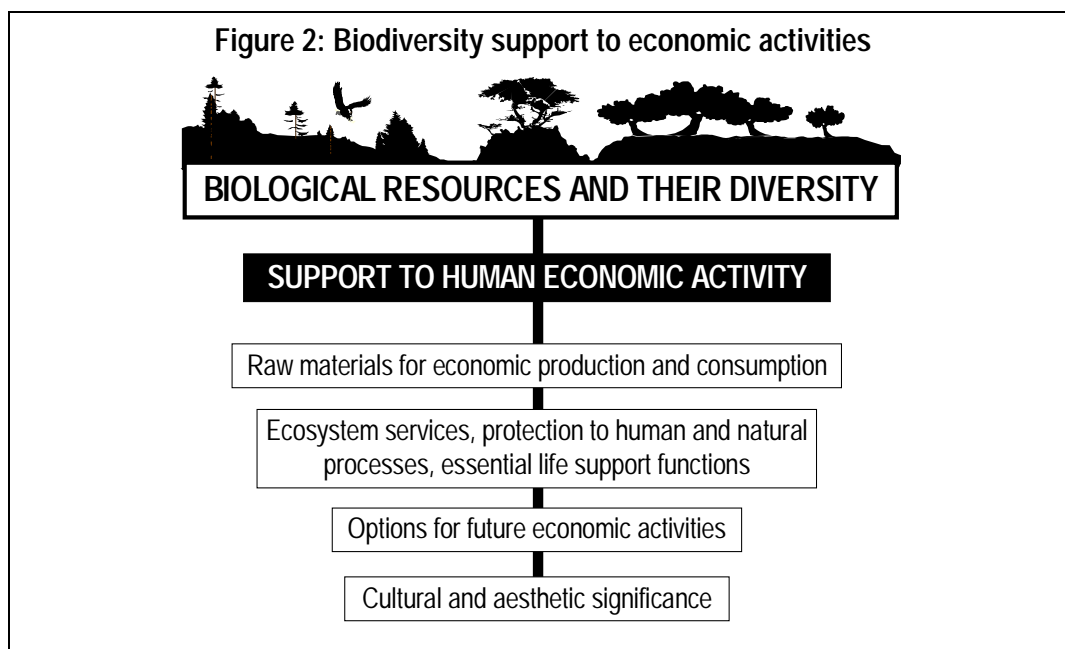
It is clear that economics forms a cross cutting issue in the Articles of the Convention on Biological Diversity. Implementation of the provisions of the Convention on Biological Diversity by countries who have signed and ratified it – including the adoption of appropriate incentive measures, financing mechanisms and the development of strategies, plans and programmes for the conservation of biodiversity and sustainable use of its components – requires an understanding of economic issues relating to biodiversity conservation, and its degradation and loss and the incorporation of economic tools and measures for biodiversity conservation.

1.4 BIODIVERSITY AND ECONOMIC ACTIVITY

Biodiversity economics is concerned with identifying and understanding the links between economic activity and biodiversity: *how does biodiversity contribute to economic activity and help to meet people's needs and wants, and how do the economic activities that people carry out in turn impact on biodiversity?*

Biodiversity is most importantly linked to economics because biological resources, ecosystems and their diversity form the basis of human production and consumption activities. As illustrated in Figure 2 biological resources support economic activity by:

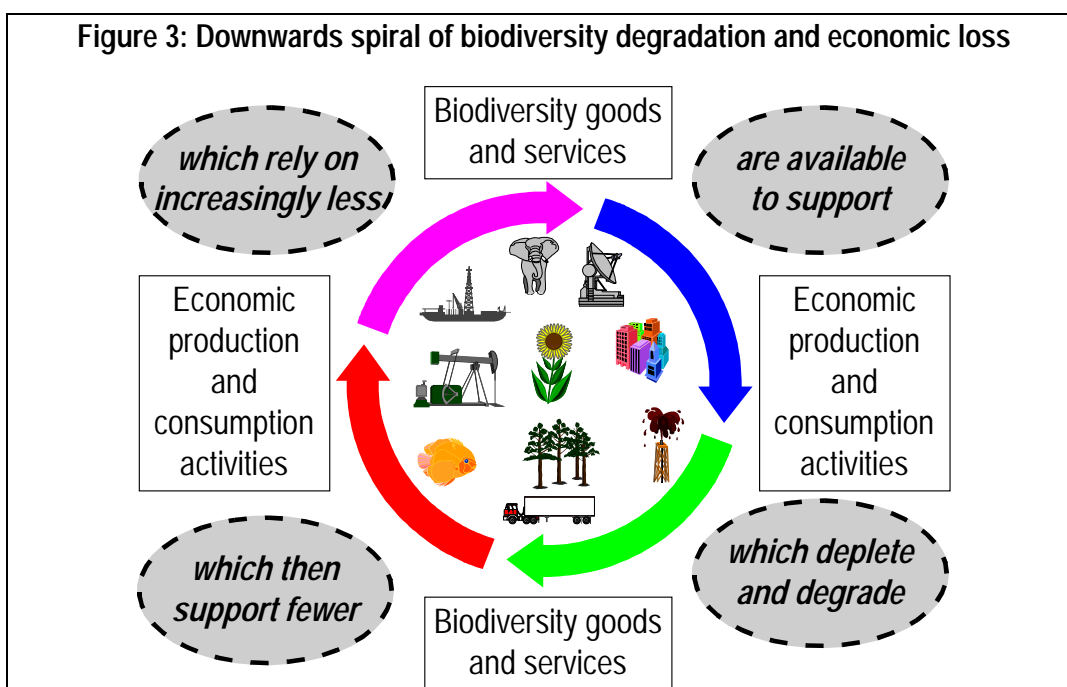
- Providing raw materials such as food, shelter, medicines and fuel for economic production and consumption;
- Supporting ecological services such as pollution regulation, climate control, land and water catchment protection which protect natural and human resources through providing a sink for wastes and residues and maintaining essential life support functions;
- Maintaining the option of carrying out economic activities in the future, some of which may not be known now;
- Giving aesthetic pleasure and holding cultural significance for many different people.



Biodiversity is also linked to economics because economic forces are an important cause of biodiversity degradation and loss. Economic activities impact on biological resources, ecosystems and their diversity – and thus on their own production base –

through using up non-renewable resources, by converting resources and habitats to other uses and by adding waste and effluent to the environment. In turn, biodiversity depletion and loss impacts on economic activities by diminishing the amount of goods and services available for production and consumption, and by progressively precluding the possibility of carrying out economic activities in the future.

This results in a downward spiral of decreasing economic opportunities and declining economic growth as biological resources and their diversity become more and more degraded, as outlined in Figure 3. This downward spiral has implications for both economic efficiency – the sound use and management of scarce resources to generate economic output, and equity – the access of different groups and individuals to secure livelihoods and economic opportunities.



Biodiversity degradation and loss therefore lead to economic costs, both now and in the future. These include direct economic costs in terms of production and consumption opportunities foregone, expenditure necessary to prevent biodiversity degradation occurring or to mitigate the effects of its loss, costs of replacing lost biodiversity goods and services through other means, indirect economic costs to other production and consumption activities through knock on effects and externalities and costs in terms of future economic options foregone.

Biodiversity degradation and loss also have implications on equity and income distribution. The people who bear the costs associated with biodiversity loss are not necessarily those who are causing degradation, either spatially or temporally. For example, many of the indirect or knock-on effects of biodiversity degradation such

as bad health, loss of productive opportunities and ecological disaster are felt by poorer people who lack the resources to cope with these costs, or will be felt by future generations of people as a result of activities carried out today. Many of the long-term production and consumption losses incurred by biodiversity degradation will be reflected in a decline in national economic indicators such as falling employment, decreased foreign exchange earnings and worsened food security.

1.5 ECONOMIC APPROACHES AND TOOLS FOR BIODIVERSITY CONSERVATION

One of the most important economic tools for biodiversity conservation is valuation (dealt with in Chapters 5, 6 and 7 of this manual). Unless it can be demonstrated that biological resources have a high economic value – and that their degradation give rise to economic costs – it is hard to justify their conservation. Calculating the total economic value of biodiversity shows that conservation gives rise to widescale benefits – including outputs that can be consumed directly, ecological services which protect human and natural resources and maintain essential life support functions, future possible options for carrying out economic activities and diverse intrinsic cultural, aesthetic and heritage values. Valuation underlines the fact that biodiversity is far more than a static reserve of genes, species and ecosystems – it is a stock of natural capital which yields a wide range of economic benefits to human populations.

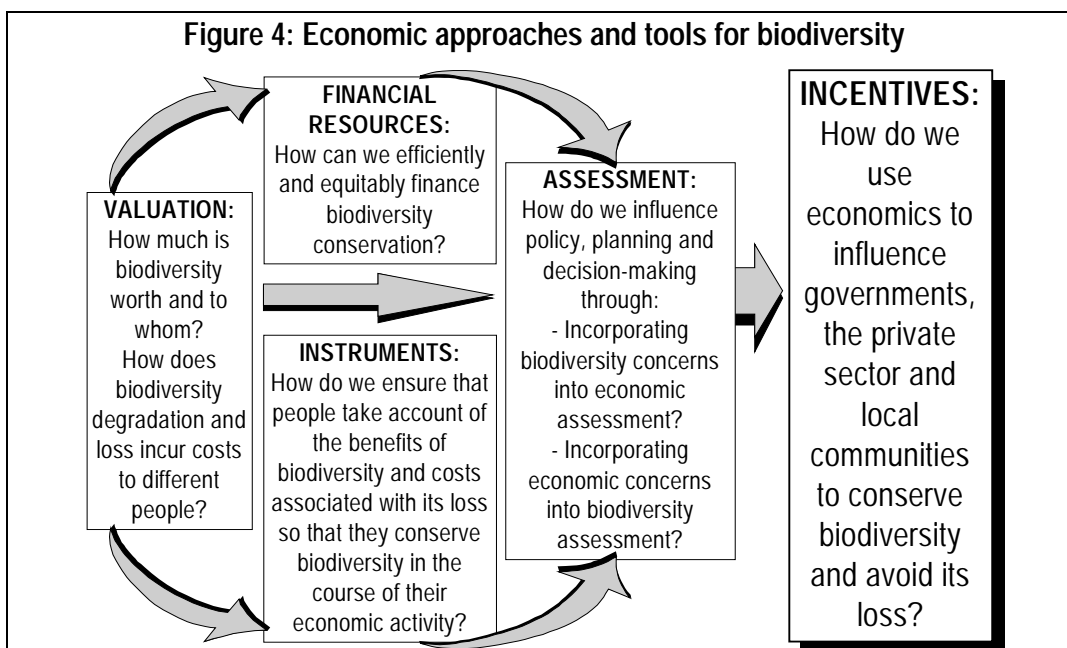
Economic instruments (dealt with in Chapter 8 of this manual) include such measures as property rights, taxes, subsidies, markets, charges, funds, loans, bonds and deposits. They provide an important set of tools for biodiversity conservation because they can be used to make it more profitable for people to conserve biodiversity than to degrade it. Economic instruments aim to overcome the market, policy and institutional failures which result in biodiversity being under-priced, over-consumed and under-conserved because it can be treated as a free good which can be mined, converted, depleted or otherwise degraded at no cost. They ensure that producers and consumers take account of the full value of biodiversity when they carry out economic activities. They make sure that the people who give rise to biodiversity degradation bear its costs and that the people who conserve biodiversity benefit from their activities.

Biodiversity conservation is not cost-free, and the costs and benefits of biodiversity are unequally distributed both between and within countries. Making sure that there are adequate *financial resources* available, and that they accrue to the people who bear the costs associated with biodiversity, is an important economic tool for biodiversity conservation (dealt with in Chapter 9 of this manual). Sources of finance are limited in both the private and public sectors, and there is much competition for investment funds and many pressing demands on public expenditure to meet basic social and economic needs. Finding new and innovative ways of generating finance for biodiversity conservation and appropriate as cash the benefits of biodiversity from domestic and global, public and private sources, and

setting in place the mechanisms to distribute these funds, is an important economic tool for biodiversity conservation.

Together, tools of valuation, instruments and financial resources are applied within the framework of *biodiversity economics assessment* (dealt with throughout this manual). Applying biodiversity economics assessment involves both integrating biodiversity concerns into economic analysis as well as integrating economics concerns into biodiversity analysis. Biodiversity economics assessment provides a series of iterative steps which can be applied to the identification, planning, appraisal, monitoring, evaluation and impact analysis of any economic or biodiversity activity, policy, project or programme.

As illustrated in Figure 4 the ultimate aim of biodiversity economics assessment, its component tools and recommended measures, is to identify and set in place *economic incentives* for biodiversity conservation (dealt with in Chapters 8 and 9 of this manual). Incentives are specific inducements designed and implemented to influence government bodies, businesses, NGOs and local people to conserve, sustainably utilise and equitably share the benefits from biodiversity. They usually take the form of a new policy, law or economic or social programme. Their purpose is to encourage people to conserve biodiversity, and to avoid its degradation and loss, by making it economically worthwhile for them to do so.



2. A FRAMEWORK FOR THE ECONOMIC ASSESSMENT OF BIODIVERSITY

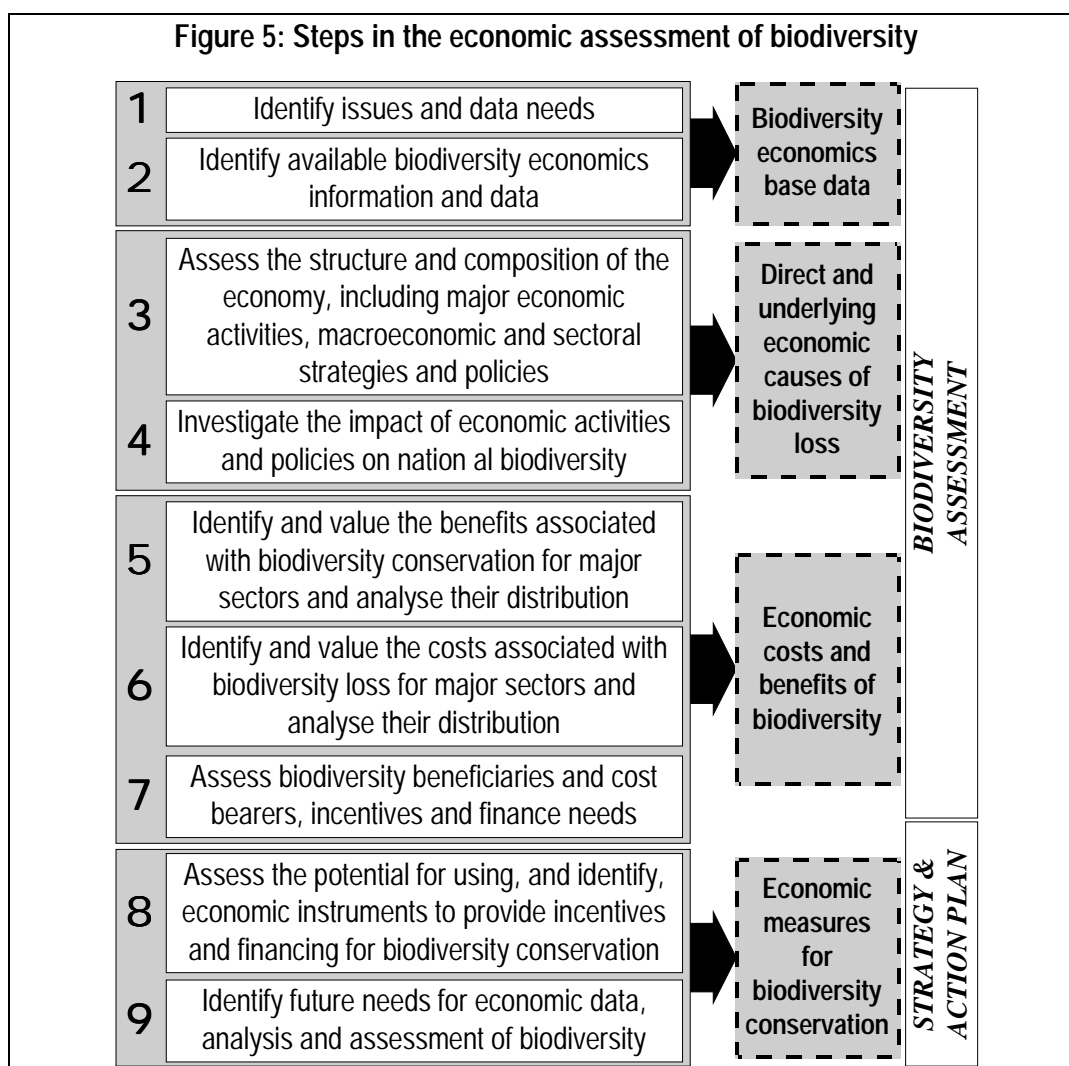
There are three major stages in the development and implementation of National Biodiversity Strategies and Action Plans –the *biodiversity assessment or country study*, the development of a *national biodiversity strategy and action plan*, and monitoring and impact assessment of the *implementation of policies, programme and projects* forming a part of the action plan. Economic assessment forms an important part of all these stages.

In order to generate information and recommendations which are consistent with other aspects of the biodiversity strategy and action plan process, the economic assessment of biodiversity follows ten iterative steps and generates five sets of information and recommendations, as outlined in Figure 5. The chapters in this manual largely follow these steps.

- **Step 1 - Identify issues and data needs; Step 2 - Identify available biodiversity economics information and data:** Up-to-date information on biodiversity is often scarce, and especially little is known about the economics of biodiversity. A first step in economic aspects of the biodiversity assessment or country study is to identify issues which will be dealt with and to find out which data and information exist, or can be used, to address these concerns.
- **Step 3 - Assess the macroeconomics and sectoral economic context; Step 4 - Investigate the impacts of national economic policies and activities on biodiversity:** Economic aspects of the biodiversity assessment or country study include analysis of the macroeconomic, sectoral and policy context of a country. These conditions set the overall framework within which the economy operates, and within which people conserve or degrade biodiversity as they undertake the production and consumption activities necessary for their survival.
- **Step 5 - Identify and value biodiversity benefits and their distribution; Step 6 - Identify biodiversity costs and their distribution; Step 7 - Identify the beneficiaries, cost-bearers and financing needs for biodiversity conservation:** Economic valuation of biodiversity benefits and costs provides important information for the biodiversity assessment or country study. By highlighting current inequities in the distribution of costs and benefits, and identifying the need for incentives and financing for biodiversity conservation, economic analysis of these values also contributes to the development of activities which will form a part of biodiversity strategies and action plans.
- **Step 8 - Assess the potential for using economic instruments for biodiversity conservation; Step 9 - Identify future needs for economic assessment of biodiversity:** Economic tools and measures form an integral component of national biodiversity strategies and action plans. The identification of economic instruments which can provide finance and incentives for

biodiversity conservation forms an important step in the development of these strategies and action plans.

- Step 10 - Economic monitoring and impact assessment of biodiversity status and of on-going biodiversity projects and programmes:** Economic monitoring and impact assessment takes place both during and after implementation of the programmes and projects which form a part of national biodiversity strategies and action plans. They look at the economic changes which have taken place as a result of changes in biodiversity and at the economic factors underlying biodiversity changes. By highlighting the costs and benefits associated with biodiversity change, the aim of monitoring and impact assessment is to make recommendations as to how both economic and biodiversity conditions can be improved in future policies, programmes and project activities.



3. ANALYSING ECONOMIC STRUCTURE AND POLICIES

STEPS IN THE ANALYSIS OF ECONOMIC STRUCTURE AND POLICIES

1. Defining the composition of the economy
2. Analysing policy trends and processes
3. Identifying policy impacts on economic activity
4. Assessing the impacts of economic activity on biodiversity
5. Highlighting policy incentives and disincentives to biodiversity conservation
6. Making conclusions and recommendations as part of the biodiversity assessment or country study.

3.1 WHY ANALYSE ECONOMIC STRUCTURE AND POLICIES?

Policies are instruments which lay out goals for development and growth, and specify the strategies and means by which they will be achieved. The economy of every country is defined and regulated by a set of policies.

Two main categories of economic policy can be distinguished. Macroeconomic policies relate to the whole economy. As well as specifying overall economic targets and goals and defining variables such as exchange and interest rates, the trade regime and the role of the public and private sectors, they outline which sectors of the economy are to be promoted and targeted for growth and sets the conditions under which they will operate. Sectoral policies relate to these different areas of economic activity and lay out their individual goals, strategies and institutional set-ups.

All policies have the potential to impact positively or negatively on biodiversity. Some – such as policies in the environment and natural resource sectors – are aimed directly at conservation. Many policies in non-environmental sectors also affect biodiversity because they relate to the demand for biological resources as raw materials (for example in the energy, fisheries, forestry, manufacturing and tourism sectors), the possible conversion of natural habitats (for example in the agriculture, mining and settlement sectors) and the generation and disposal of various types of wastes and effluents (for example in the industry, transport and infrastructure sectors). Other relate to biodiversity because they define the terms and conditions under which resources can be held, used and managed – including policies in the land, water, wildlife and forests sectors as well as those concerning urban planning, local authority and local government.

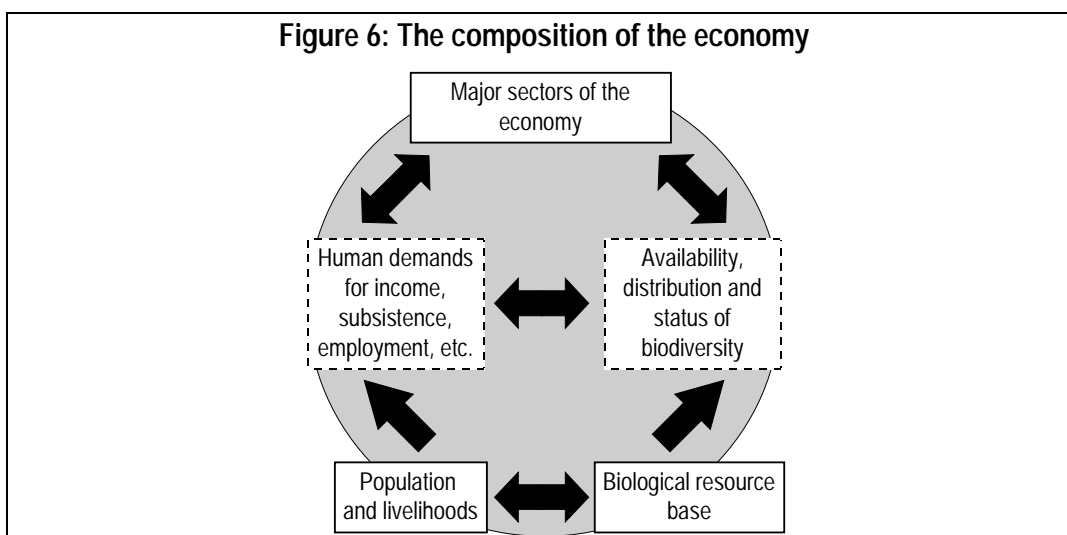
Analysis of economic structure and policies forms an important part of the biodiversity assessment or country study because it presents an understanding of the overall framework within which people carry out economic activities which use, deplete or conserve biodiversity.

This chapter looks at the analysis of economic structures and policies as part of the biodiversity assessment or country study. The aim of analysing a country's

economic structure and policies is to determine how these variables affect, have affected and will affect the status and integrity of biodiversity, to understand economic and policy sources of biodiversity degradation and loss and to highlight potential policy niches for biodiversity conservation.

3.2 DEFINING THE COMPOSITION OF THE ECONOMY

A first step in the analysis of economic structure and policies is to define the composition of the economy. As illustrated in Figure 6 basic attributes such as population and the biological resource base, and variables such the relative importance of different sectors in the national economy, are all closely interrelated. Defining the composition of the economy involves collecting basic data about population, livelihoods, economic activity and the biological resource base.



Together all these factors define the ways in which biodiversity is used and managed, how it is degraded and depleted, and how it may be conserved. The population of a country, their distribution and livelihoods determine human demands for income, subsistence and employment. These demands have an important influence both on the availability, distribution and status of biological resources as well as on the relative importance of different sectors of the economy. The biological resource base also has a strong effect on how human population is distributed, what kinds of livelihoods they follow and which sectors of the economy predominate at the national level. In turn, major sectors of the economy feed back into the integrity of the biological resource base, and the nature and status of human livelihoods.

Box 1: The composition of the Seychelles economy

The Seychelles archipelago consists of an estimated 115 islands, covering a land area of some 445 km² within an exclusive economic zone of 1.3 million km². Nearly 90% of the population – which is in total some 76,500 people – live on one of these small islands, Mahé. Most occupy the fragile narrow coastal strip, where the tourism, industrial and commercial activities are also concentrated. The Seychelles has a per capita GDP of US\$ 6,500 and is therefore characterised as a middle-income country. Tourism, fisheries, industrial and manufacturing activities account for the bulk of income, employment and foreign exchange earnings in the country.

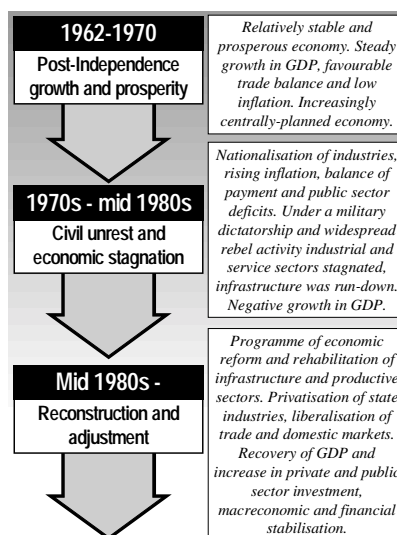
3.3 ANALYSING POLICY TRENDS AND PROCESSES

Most countries have been subject to several different political, policy and economic regimes over the last decades. Previous policy regimes set the scene for how the economy operates today, and may also have had effects on the status and management of biodiversity over time. A second step in the analysis of economic structure and policies is to trace these shifts in policy.

Analysis of policy trends involves tracing the key economic, social and political changes which have taken place in a country. This includes taking account of both externally-driven and internal processes, such as the imposition of colonial rule, post-Independence changes in government and ideology, the adoption of economic stabilisation and structural adjustment measures, external economic shocks such as the oil crisis and global recession, periods of drought and civil insecurity.

Box 2: Analysis of policy trends and processes in Uganda

Immediately after Independence in 1962 the Ugandan economy prospered and grew. From 1971, under the Amin regime, the economy was characterised by heavy state intervention in most sectors of the economy, widespread civil rights abuses, high levels of corruption and extreme economic stagnation and collapse. Subsistence agriculture formed the basis of most people's survival. During the 1980s, after the Amin government was overthrown, the country, Uganda entered a period of further civil unrest and the national economy continued to stagnate. Since the mid-1980s, under relative political stability, the economy has recovered and grown rapidly. Infrastructure has been rehabilitated, the economy has been liberalised, national income and production have recovered, inflation has remained low.



3.4 IDENTIFYING POLICY IMPACTS ON ECONOMIC ACTIVITY

Macroeconomic and sectoral policy control the ways in which the economy operates. A third step in the analysis of economic structure and policies is to understand how policy trends and processes have affected economic activity.

Policy impacts on economic activity can be identified by looking at how the nature and composition of major sectors of the economy have contracted and expanded to the present day, and linking these changes to different policies, social, economic and political regimes. Of major importance to the economic assessment of biodiversity is the identification of which sectors of the economy are dominant and account for the majority of economic activity currently, historically and in the future.

Box 3: Policy impacts on economic activity in Eritrea

Eritrea is a newly independent state, and is still in the early stages of rebuilding its economy. Both macroeconomic and sectoral policies have been only recently developed. A national strategy for growth has been promulgated which incorporates increasing deregulation, liberalisation and privatisation of the economy. The Eritrean economy is today characterised by a high degree of openness. Trade, exchange rate and industry have been liberalised and commerce and financial systems deregulated. Growth efforts are focused on the services sector, and natural resource-based activities such as mining, fisheries and agriculture are also being promoted as a means of increasing domestic food self-sufficiency as well as generating export earnings.

3.5 ASSESSING THE IMPACTS OF ECONOMIC ACTIVITY ON BIODIVERSITY

All economic activities have the potential to impact on biodiversity. Assessing these impacts forms an important fourth step in the analysis of economic structure and policies. Of overriding importance is the identification of which activities in the economy have led, are leading to, or are likely in the future to lead to, biodiversity depletion and loss, including:

- Economic activities which *depend directly on biological resources* – such as fisheries, forestry and wildlife – and may impact on biodiversity through unsustainable utilisation or direct damage incurred in the course of harvesting or processing activities;
- Economic activities which *impact on biodiversity primarily through their effects on ecosystem integrity and environmental quality* – such as agriculture, industry, manufacturing, tourism and urban settlement – through the production of wastes, effluents and pollution, removal of wild species or clearance of natural habitat.

Box 4: The impacts of economic activity on biodiversity in Djibouti

The Djiboutian economy is characterised by a dual economy: the modern, urban, service sector-based economy which contains the majority of the population; and the rural, traditional, livestock-based economy. Within both of these sub-economies production and consumption activities impact on biodiversity, including:

- Economic activities which depend directly on biological resources as their primary inputs including rural pastoralist production and subsistence resource utilisation, fisheries, trade in wild animal products and the commercial harvesting of wild plant products. Some of these resources are extracted at unsustainable levels, damage biodiversity in the course of their harvesting or degrade ecosystems through their secondary and support industries which discharge wastes and effluents into the land and sea;
- Economic activities which, although unreliant on biological resources as primary inputs, impact on biodiversity through their effects on environmental quality include manufacturing, shipping, urban settlement and construction. These involve the clearance of natural vegetation and reclamation of land for infrastructure and housing as well as the uncontrolled discharge of wastes, effluents and residues into the sea and land, and thus impact on both terrestrial and marine biodiversity.

3.6 HIGHLIGHTING POLICY INCENTIVES AND DISINCENTIVES TO BIODIVERSITY CONSERVATION

Having analysed the effects of economic activities on biodiversity, and identified the policy context in which they are carried out, the final step in the analysis of economic structure and policies is to highlight the key economic activities and policies which influence biodiversity integrity and status in a country. The main aim of this analysis is to identify major underlying policy incentives and disincentives to biodiversity conservation, such as:

- **Macroeconomic and sectoral focus of economic growth:** Whether the thrust of macroeconomic policy, including such factors as privatisation, liberalisation and external trade, sets in place a framework for economic activity which encourages or discourages biodiversity conservation. Whether national economic growth and development strategies focus on sectors which depend, or have the potential to impact, heavily on biodiversity;
- **Policy and legal consideration of biodiversity:** Whether macroeconomic and sectoral policies contain adequate consideration of biodiversity conservation and address the ways in which economic activities impact on biodiversity. Whether there is an adequate legal framework for biodiversity conservation. Whether there is a single policy, law or institution concerned with co-ordinating biodiversity concerns across different sectors of the economy;
- **Local pressures:** Whether macroeconomic and sectoral policies adequately address the local pressures – such as land scarcity, poverty, population pressure and unemployment – which cause people to threaten biodiversity in the course of their economic activity;
- **Institutions, control and management:** Who makes decisions about natural resources, biodiversity, and the economic activities which impact on biodiversity. To what extent there is public participation in these decisions and to what extent this encourages or discourages biodiversity conservation. Whether the

government institutions mandated with biodiversity conservation are adequately funded, and how they carry out their operations;

- **Tenure:** Which systems of land and resource tenure pertain in the country, and whether they encourage or discourage biodiversity conservation. Whether people are permitted to own, use and benefit from biological resources and under what conditions;
- **Price and market distortions:** Whether the prices of inputs and outputs are manipulated, or controls set, to make particular sectors or ways of carrying out economic activity more profitable than others. How the prices of biological resources are set, and whether they reflect their true value. How these distortions encourage or discourage people to conserve biodiversity, and to carry out activities which degrade or conserve biodiversity.

Box 5: Policy incentives and disincentives to biodiversity conservation in the Seychelles

Despite a strong and innovative conservation sector and long history of protection of wild flora and fauna, economic policy to date in the Seychelles, rooted in the need for rapid economic growth with poor considerations of sustainability, has promoted a range of economic activities which have impacted negatively on biodiversity. Of particular concern to biodiversity conservation in the Seychelles are:

- Since Independence, the focus of national development strategies on rapid infrastructural and industrial growth and on the promotion of biological resource-dependent industries. These continue to be targets of economic growth, without accompanying considerations of biodiversity impacts and sustainability;
- A rapidly growing population within a very small and fragile land area. Urban settlements and industrial developments are concentrated on a narrow coastal strip and impact on vulnerable ecosystems. Activities such as land reclamation, infrastructural development and disposal of shipping and industrial wastes are presenting severe threats to marine biodiversity. Expanding settlement into the centre of Mahé is also presenting threats to watershed protection and terrestrial biodiversity;
- A history of over-regulation of the economy by the public sector which has meant that environmental regulation, in common with the provision of most goods and services, has been seen as the responsibility of government responsibility rather than private producers and consumers. Meanwhile, the government has lacked sufficient funds to allocate to biodiversity conservation;
- Within the context of heavy price controls and market regulation, prices of other goods and services have been distorted relative to biodiversity, and biological resources themselves have largely been treated as free. The price of most goods and services fail to reflect the value of biological resources and there are few incentives for producers and consumers to carry out economic activities in a way which does not deplete or degrade biodiversity.

3.7 CONCLUSIONS AND RECOMMENDATIONS FROM THE ANALYSIS OF ECONOMIC STRUCTURE AND POLICIES

Analysis of economic structure and policies provides an understanding of the major underlying economic influences on biodiversity status and integrity in a country. It gives rise to the following conclusions and recommendations:

- a) An understanding of the links between population, livelihoods, economic activity and biodiversity;
- b) An overview of policy changes which have taken place over time, especially those which have had a major effect on biodiversity status and management;
- c) Identification of the economic activities which present a threat to biodiversity, and an understanding of how these activities impact on biodiversity;
- d) Analysis of the policy factors underlying economic threats to biodiversity, and of policy incentives and disincentives to biodiversity conservation;
- e) Identification of possible future economic threats to biodiversity.

4. IDENTIFYING BIODIVERSITY BENEFITS AND COSTS

STEPS FOR IDENTIFYING BIODIVERSITY BENEFITS AND COSTS

1. Identifying direct, indirect, option and existence biodiversity benefits
2. Identifying biodiversity management costs, costs to other economic activities and opportunity costs
3. Making conclusions and recommendations as part of the biodiversity assessment or country study.

4.1 WHY IDENTIFY BIODIVERSITY COSTS AND BENEFITS?

Biological resources and their diversity generate a wide range of benefits to human populations, both within the country where they are found and at regional and global levels. Simultaneously the conservation of biological resources and their diversity give rise to economic costs. These economic benefits and costs of biodiversity are often not fully recognised when either conservation or development decisions are made. This omission has led to economic activities being carried out which harm biodiversity, it has also resulted in biodiversity conservation approaches which interfere with human economic activities.

Identification of biodiversity costs and benefits forms an important part of the biodiversity assessment or country study because it presents the information which enables economic concerns to be fully integrated into biodiversity projects and programmes, and biodiversity concerns to be incorporated into economic activities and decisions..

This chapter looks at the identification of biodiversity benefits and costs as part of the biodiversity assessment or country study. The aim of identifying the costs and benefits associated with a country's biodiversity is to understand the economic impacts of biodiversity conservation and degradation, so as to inform both economic and biodiversity decisions.

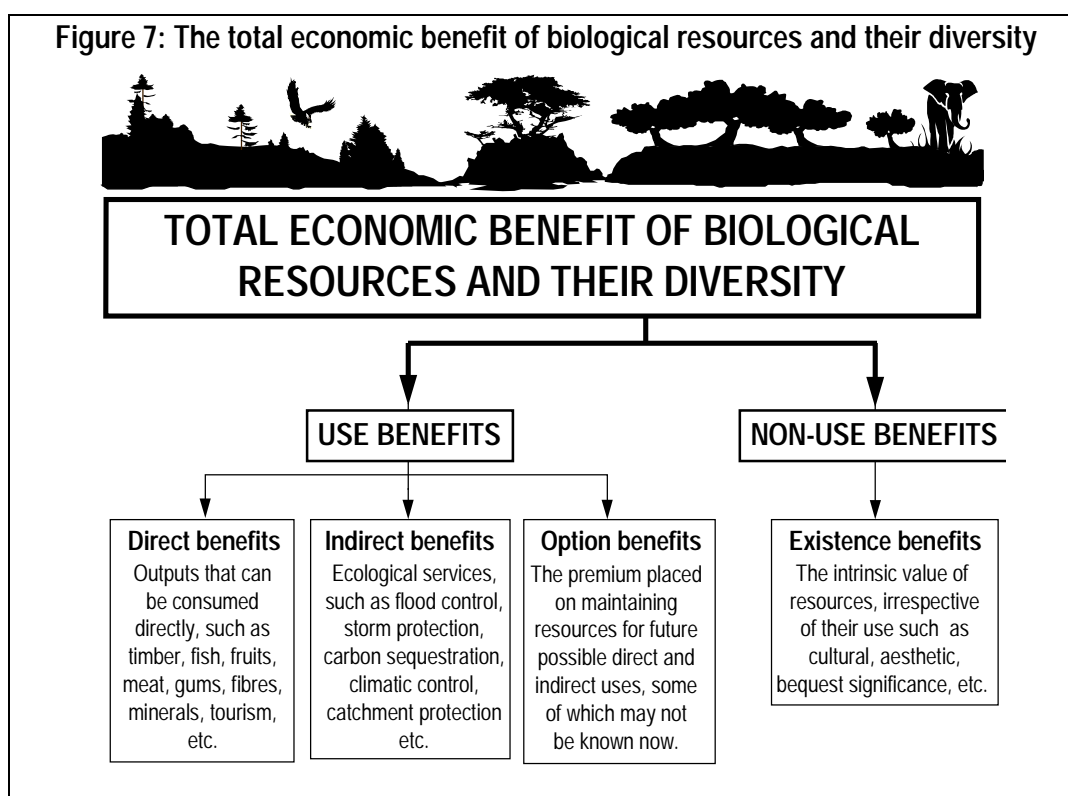
4.2 THE NATURE AND SCALE OF BIODIVERSITY BENEFITS AND COSTS

Looking at the economic benefits and costs of biodiversity *per se* – the economic premium or loss attached to the variability between living organisms over and above the benefits and costs attached to individual biological resources – is in most cases impossible, because it involves the manifestations of an attribute of living organisms – their variability – rather than the living organisms themselves. For this reason the primary focus in the identification of biodiversity benefits and costs are the values attached to conserving biological resources and ecosystems, and thus maintaining their variability and diversity. The benefits and costs of biological resources and ecosystems can together be taken as an indicator of the economic value of biodiversity, because biodiversity conservation relies on the maintenance of all these component parts.

The costs and benefits of biodiversity can be judged at many different levels of scale. Biodiversity economics assessment in the context of National Biodiversity Strategies and Action Plans is concerned primarily with indigenous biodiversity, and with costs and benefits accruing to the country under consideration. Wider biodiversity costs and benefits should be recognised, and mentioned, but usually do not form a major focus of economic analysis unless they have the potential to influence directly national attempts at biodiversity conservation.

4.3 THE ECONOMIC BENEFIT OF BIOLOGICAL RESOURCES AND THEIR DIVERSITY

When identifying the economic benefits associated with a country's biodiversity as part of a biodiversity assessment or country study, it is important to take into account the full range of benefits that biodiversity gives rise to. Economists and decision-makers have traditionally seen the value of biological resources in terms of the raw materials and physical products that they generate for production, consumption and sale. These direct uses however form only a small part of the value of biodiversity, which generates economic benefits far in excess of just physical products.



As illustrated in Figure 7 the concept of *total economic benefit* recognises the full range of economic benefits generated by biological resources and their diversity, including:

- **Direct benefits** – raw materials and physical products for production, consumption and sale such as timber, fish, fruits, meat, gums, fibres, minerals, tourism and the income, subsistence and employment they support;
- **Indirect benefits** – ecological goods and services such as flood control, storm protection, carbon sequestration, climatic control, catchment protection and the production and consumption opportunities and life support functions they provide;
- **Option benefits** – the premium placed on maintaining a pool of resources and services for future possible uses such as leisure, commercial, industrial, agricultural and pharmaceutical applications of biological resources, some of which may not be known now;
- **Existence benefits** – intrinsic values attached to biological resources and diversity, regardless of their use, such as aesthetic, cultural and heritage significance.

Identifying the economic benefits of biodiversity to a country involves assessing the major direct, indirect, option and existence values associated with different biological resources and their diversity.

Box 6: The total economic benefit of biological resources and their diversity to Kenya

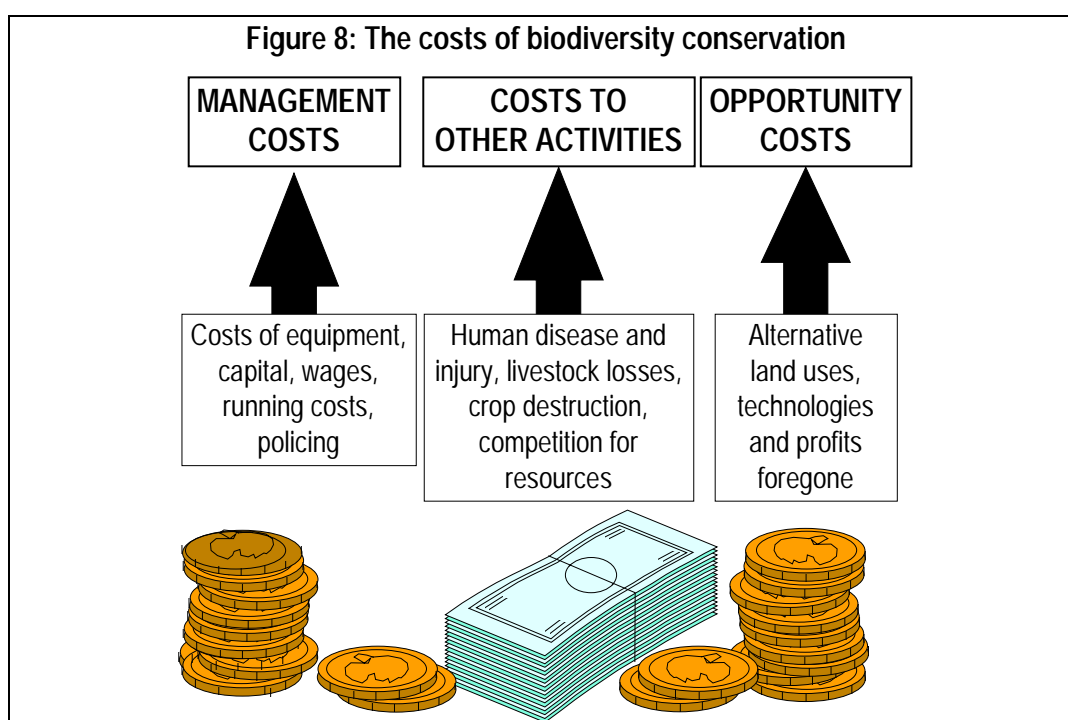
Analysis of Kenya's major economic sectors and ecosystems identified a wide range of biodiversity support to production and consumption:

		ECONOMIC BENEFITS			
		Direct	Indirect	Option	Existence
MAJOR ECOSYSTEMS	Agricultural lands	Crops, livestock products, biomass fuel, manure	Resilience of indigenous breeds, food security	Pool of genetic resources	Cultural preference for traditional breeds
	Forests	Timber, fruits, fibres, poles, pasture, tourism, medicines, fuel	Watershed protection, erosion control, climatic control, carbon sink	Pool of genetic resources	Religious and ritual, national heritage, aesthetic, tourism
	Marine and coastal	Fish, shells, corals, meat, fuel, poles, building materials, tourism	Flood and storm control, beach protection, carbon sequestration	Pool of genetic resources	Cultural, national heritage, aesthetic, tourism
	Wetlands	Fibres, fish, fruits, tourism, pasture	Water recharge, water purification, flow regulation	Pool of genetic resources	Cultural, national heritage, aesthetic, tourism
	Wildlife areas	Meat, hides, skins, trophies, tourism	As wetlands, marine and coastal, forests	Pool of genetic resources	Cultural, ritual, national heritage, aesthetic, tourism

4.4 THE ECONOMIC COST OF BIOLOGICAL RESOURCES AND THEIR DIVERSITY

Biodiversity conservation is not cost-free. In addition to direct expenditures on biodiversity conservation programmes and projects, the presence of biodiversity gives rise to costs because it interferes with or diminishes other economic activities. Alongside benefits, it is therefore necessary to consider the *total economic cost of biodiversity* as part of the biodiversity assessment or country study, as illustrated in Figure 8, including:

- *Direct costs* – expenditures on the infrastructure, equipment, staff and other inputs required for biodiversity conservation projects and programmes;
- *Costs to other economic activities* – the damage and interference caused by the presence of biodiversity such as human disease and injury, crop damage by wild animals and pests, competition for habitat or resources;
- *Opportunity costs* – the alternative uses of land, time, money and other resources allocated to biodiversity conservation which could have generated income and profits elsewhere such as agricultural uses of protected areas foregone, unsustainable utilisation foregone, biodiversity-damaging technologies and production processes foregone.



Identifying the economic costs of biodiversity to a country involves assessing the major management costs, costs to other economic activities and opportunity costs associated with different biological resources and their diversity.

Box 7: The total economic cost of biological resources and their diversity to Kenya

Economic analysis of Kenya's major economic sectors and ecosystems identified various costs imposed on economic activities as a result of biodiversity:

		ECONOMIC COSTS		
		Management	Other activities	Opportunity
MAJOR ECOSYSTEMS	Agricultural lands	Farm labour, equipment and inputs, MoA/KARI expenditures	Pests, disease and interbreeding with other varieties	Exclusion of exotic monocropping
	Forests	FD/KEFRI/private management expenditures	Damage to crops, livestock and humans from forest dwelling animals	Exclusion of agriculture, exotic plantations, unsustainable land developments and resource uses
	Marine and coastal	KWS/Fisheries/KEMFRI/ private management expenditures	Damage to humans from marine fish and mammals	Exclusion of unsustainable resource uses and marine developments
	Wetlands	KWS/private management expenditures	Damage to crops, livestock and humans from wetland dwelling animals, water-borne and water-related disease	Exclusion of agriculture, ranching, unsustainable land developments and resource uses
	Wildlife areas	KWS/private management expenditures	Damage to crops, livestock and human injury and disease, competition for pasture from wildlife	Exclusion of agriculture, ranching, unsustainable land developments and resource uses

4.5 CONCLUSIONS AND RECOMMENDATIONS FROM THE IDENTIFICATION OF BIODIVERSITY BENEFITS AND COSTS

Identification of biodiversity benefits and costs provides an understanding of how biodiversity influences economic activity. It gives rise to the following conclusions and recommendations:

- a) An understanding of the role of biodiversity in national and local economies;
- b) Identification of biological resources, areas and ecosystems with particular economic importance;
- c) Identification of the major costs associated with biodiversity conservation.

5. TOOLS FOR VALUING BIODIVERSITY GOODS AND SERVICES

STEPS FOR THE VALUATION OF BIODIVERSITY GOODS AND SERVICES

1. Identifying quantifiable biodiversity costs and benefits
2. Selecting valuation method and type
3. Ascribing monetary values to biodiversity goods and services
4. Making explicit the assumptions contained in, and limitations to, biodiversity valuation
5. Making conclusions and recommendations as part of the biodiversity assessment or country study.

5.1 WHY VALUE BIODIVERSITY GOODS AND SERVICES?

Individuals, households, firms and countries all make decisions based on the benefits and costs they receive from different goods, services and activities. In order to understand economic decisions and plan for economic activities it is necessary to know the value of the goods and services people use. The aim of valuation is to determine people's preferences – how much better or worse off they would consider themselves to be as a result of changes in the supply of goods and services. Valuation provides information used by economists to weight up the costs and benefits of alternative courses of action, to choose which economic activities to carry out and to determine the most equitable and efficient use of resources to generate production and consumption goods.

Valuation of biodiversity goods and services is an especially important exercise – because many are so difficult to value and have no obvious price, biodiversity benefits and costs are often ignored by policy and decision-makers. Being able to demonstrate the economic value of biodiversity goods and services, and quantify it in monetary terms, places them on an equal footing with other activities and sectors of the economy.

Valuation of biodiversity goods and services forms an important part of the biodiversity assessment or country study because it helps to demonstrate the high value of biodiversity, justify its conservation and highlight the fact that biodiversity loss and degradation constitute real economic costs which must be balanced against the economic benefit of activities which harm biodiversity.

This chapter looks at methods for valuing biodiversity goods and services as part of the biodiversity assessment or country study. The aim of valuing biodiversity goods and services is to demonstrate the monetary and non-monetary values attached to biodiversity, and to quantify the role of biodiversity in local, national and global economic production and consumption processes.

5.2 IDENTIFYING QUANTIFIABLE BIODIVERSITY BENEFITS AND SELECTING METHODS FOR THEIR VALUATION

It is possible to place a monetary value on at least some of the benefits and costs which have been identified as being associated with biodiversity. To what extent these values can be quantified as part of the biodiversity assessment or country study will depend largely on data available and the applicability of various valuation techniques and methods.

5.3 USING MARKET PRICES TO VALUE BIODIVERSITY GOODS AND SERVICES

The simplest and most straightforward way of valuing biodiversity goods and services is to look at their market prices – what they cost to buy or what they are worth to sell. These prices reflect what people are willing to pay for biodiversity goods and services, the value that they place on them.

Collecting data about market prices, purchases and sales is a good way of quantifying the value of biodiversity goods and services which can easily be bought and sold. It is applicable primarily to selected direct benefits associated with biodiversity – for example goods such as fish, timber, crops, livestock products and items manufactured from biological resources.

Box 8: Market valuation of Eritrea's agrobiodiversity

Eritrea's agrobiodiversity has been valued using market prices. Data was collected about the area under different crops and size of livestock herds, their yields and prices. The proportion of land area under indigenous crops and livestock was then estimated, and their returns calculated as 181 million and 542 million Nakfa a year respectively. This value is only a partial estimate of the direct value of indigenous agrobiodiversity, and the animal and plant genetic resources it represents. Especially, it excludes the option value of this biodiversity, the contribution of indigenous landraces and livestock to food security, choice and resistance to drought, disease and pest attack – a very important set of benefits given the marginal and uncertain nature of agriculture, and the limited rural livelihood base in Eritrea.

5.4 THE NEED TO GO BEYOND MARKET PRICES

It is usually necessary to go beyond market prices when valuing biodiversity goods and services as part of the biodiversity assessment or country study. Markets do not always perform well or properly reflect biodiversity values, meaning that biodiversity goods and services are frequently underpriced by the market –for example the price of indigenous timber products rarely reflect the scarcity of indigenous forests, their ecosystem functions or the environmental damage which may be caused by timber harvesting activities. Other biodiversity goods and services have no price at all – for example many subsistence level biological resource uses, ecosystem and life support functions, or the cultural and religious values attached to biodiversity.

Where market prices do not properly reflect the value of biodiversity goods and services, a range of alternative techniques have been developed for their valuation. These are generally of great relevance to economic aspects of biodiversity assessments and country studies, and are outlined below.

Figure 9: Useful techniques for valuing biodiversity goods and services

<u>Method</u>	<u>Valuation technique</u>	<u>Applicability</u>
Market prices	The price of biodiversity goods and services	<i>Direct values</i>
<u>Surrogate market prices:</u>		
Replacement expenditure	The cost of replacing biodiversity goods and services by other means	<i>Direct and indirect values</i>
Travel cost	The time and cost incurred in travelling to see or use a biodiversity good or service	<i>Recreation and leisure values</i>
<u>Changes in productivity:</u>		
Effect on production	The value of production supported by biodiversity goods and services	<i>Direct and indirect values</i>
<u>Stated preferences:</u>		
Contingent valuation	Willingness to pay for biodiversity goods and services if they could be bought and sold	<i>Direct, indirect, option and existence values</i>
<u>Methods not commonly applied to valuation of biodiversity in developing countries:</u>		
Human capital (productivity change)	The impact of biodiversity on human health and earnings	<i>Direct and indirect values</i>
Hedonic methods (surrogate market)	Variation in property prices and earnings arising from changes in biodiversity status and integrity	<i>Indirect, option and existence values</i>

5.5 REPLACEMENT AND AVERTIVE EXPENDITURE

Even where biodiversity goods and services have no market themselves they often have alternatives or substitutes which can be bought and sold. The price of these other goods represent what it would cost to buy the next-best alternative if biodiversity goods and services were not available, or to purchase goods and services to offset the effects of biodiversity loss. They can be used as a proxy for the value of biodiversity benefits because they reflect the amount of money that the natural provision of goods and services is worth in terms of expenditure saved on alternative items.

Box 9: Replacement cost of forest direct uses in Uganda and Sudan

Use of woodland biological resources by refugee populations living on the Sudan/Uganda border was valued using replacement cost techniques. The cost of replacing natural woodland and forest construction and energy materials was calculated by looking at total demand for these resources, and assessing the area, available increment and costs of establishing and maintaining sufficient plantation and woodlot sources of poles and firewood. The resulting value of some US\$ 13 million a year, or US\$ 600 per household, presents a minimum estimate of the direct value of selected forest biodiversity goods.

Box 10: Replacement cost of forest ecosystem erosion control and watershed protection services in Kenya

The watershed protection and erosion control benefits of a large area of natural forest, Mount Kenya Forest Reserve, were valued using replacement cost techniques. The cost of replacing these ecosystem functions was assessed by looking at their provision by artificial means under the next most likely alternative land use to forest. This involved the calculation of the costs of developing and maintaining on-farm soil and water conservation measures over the forest area. The resulting value of some KSh 768 million a year, or KSh 12 per hectare, presents a minimum estimate of the indirect value of selected forest biodiversity services.

Box 11: Avertive expenditures and marine and coastal ecosystem protection services in the Seychelles

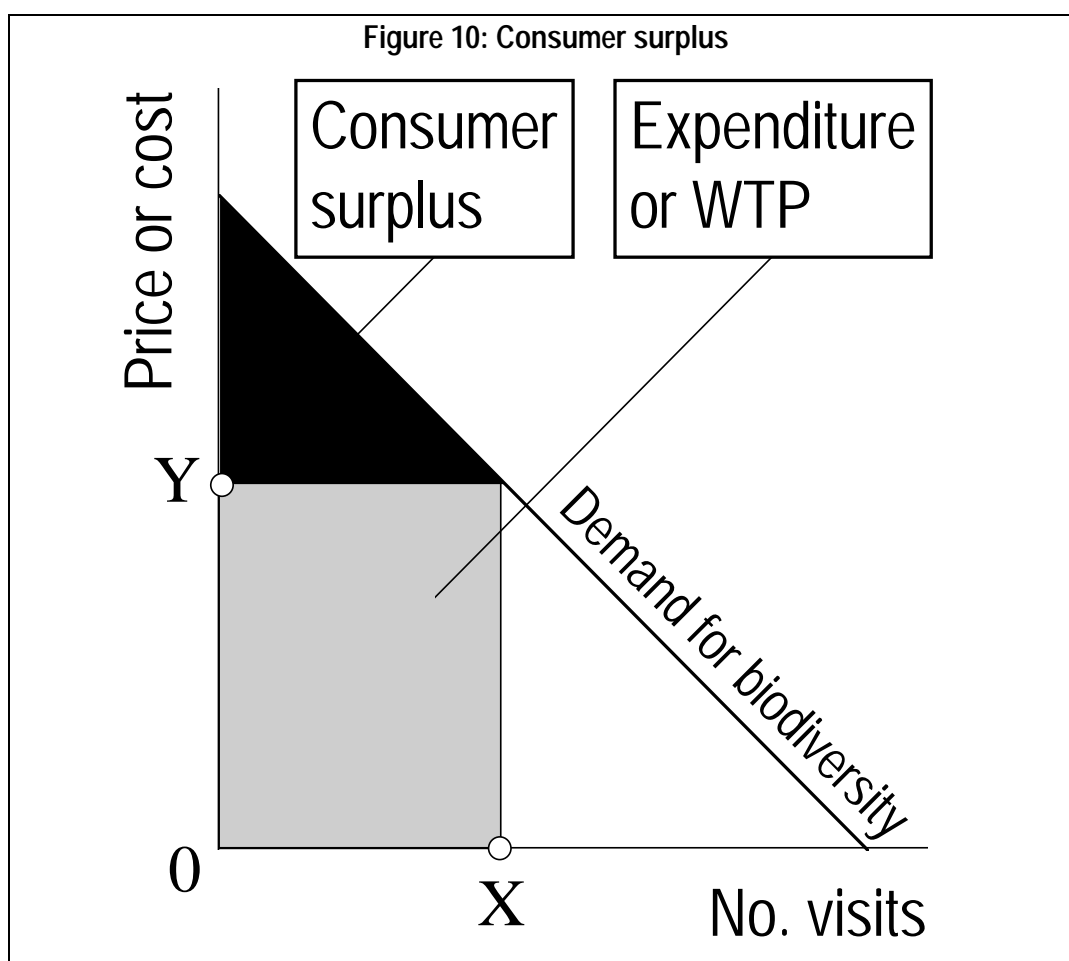
The beach protection, storm and flood control provided by wetland marshes, mangroves and coral reefs in the Seychelles were valued using avertive expenditure techniques. The cost of averting the effects of the loss of these marine and coastal ecosystem functions were assessed by looking at expenditures on the construction and maintenance of mitigative groynes and flood barriers. The resulting value of some R 4 million a year, or R 282 per kilometre, presents a minimum estimate of the indirect value of selected marine and coastal biodiversity services.

Looking at replacement and avertive expenditure is a good way of valuing biodiversity benefits which have no market, but which can be at least partially replicated by artificial means or have substitutes which people use when they are not available. It is commonly used to assess the direct and indirect value of biodiversity. Examples of replacement and avertive expenditure include the price of kerosene instead of biomass energy, chemical fertilisers instead of manure, farmed fish instead of marine fish, plantations and woodlots instead of natural forest, the costs of *ex situ* conservation instead of wild areas, physical measures to protect against soil erosion instead of natural vegetation cover, desilting and protecting against downstream flooding of downstream watercourses for forest watershed catchment protection or regulation of waterflow by wetlands, groynes and barriers for reef shoreline protection.

5.6 TRAVEL COST

Biodiversity typically holds a high value for both tourists and local visitors because it provides leisure occupations. Although the recreational use or enjoyment of biodiversity is often available free or at a low charge, people still spend time and money to carry it out. The total value that people place on leisure and recreational aspects of biodiversity can be inferred by the costs they spend in carrying out these occupations.

Travel costs can be calculated by collecting data on all the costs incurred by carrying out biodiversity leisure occupations – including transport, time, entry fees, accommodation and other charges incurred in the course of the activity. With a sufficiently large sample size, a demand function can be constructed relating visitation rates to travel expenditure. This demand curve, illustrated in Figure 10, illustrates how much people use biodiversity at different cost levels, as well as measuring their *consumer surplus* – the value they receive from biodiversity over and above what they actually pay to see or use it.



Travel cost methods are a good way of assessing the tourism, recreation or leisure value of biodiversity. They are also frequently used to provide information for setting charges for biodiversity leisure activities and park entry charges. Examples of travel cost include analysis of the value of activities such as safari hunting, game fishing, national parks and protected areas, snorkelling and diving.

Box 12: Wetland biodiversity travel costs in Kenya

The recreational and leisure value of an important wetland resource in Kenya, Lake Nakuru, was calculated using travel cost methods. Surveys of visitors to lake Nakuru were carried out distinguishing between Kenya residents and overseas tourists, collecting data on length of visit and costs of travel. Regression models relating visitation rates to travel costs also included as independent variables various other income and socio-economic characteristics of respondents. Two separate demand curves were constructed and consumer surplus calculated. The resulting value of US\$ 13.7-15.1 million a year, or US\$ 5 million for flamingos alone, presents a minimum estimate of the recreational value of this wetland resource.

5.7 EFFECT ON PRODUCTION

Biodiversity goods and services are often closely linked to other production processes. They provide raw materials, support ecosystem services and generate income, subsistence and employment. These wider benefits and off-site production and consumption opportunities form part of the value of biological goods and services. When they have a market, it is possible to look at changes in the supply, output or income of other production activities to quantify the value of changes in the status and integrity of biodiversity goods and services.

Effect on production is a good way of valuing biodiversity goods and services which have no market but support other consumption and production processes. It is commonly used to value the direct and indirect benefits of biodiversity. Examples of effect on production include the loss in fisheries and tourist income resulting from coral reef degradation; loss in downstream activities such as hydropower, fisheries and agriculture, or flood damage and water shortage caused by, loss of forest watershed catchment protection and wetland water regulation; loss in tourism income, employment and foreign exchange earnings arising from loss of wildlife.

Box 13: River ecosystem services effects on production in Kenya

The flooding regime of a large and important river ecosystem in Kenya – the Tana River – were valued using effect on production techniques. Data was collected on the downstream populations living around the river, production systems and biological resources. The extent to which these natural and human production systems depended on the Tana's flooding regime were assessed. The value of flood-dependent production was calculated using various methods including the tourist revenues and bushmeat prices associated with wildlife populations; the costs of replacing floodplain pasture with irrigated grassland and boreholes; the market value of floodplain agriculture, wetland and marine fisheries, mangrove utilisation and forest utilisation; and the costs of damage avoided by mangrove and reef shoreline protection. The resulting net present value of some KSh 2.5 billion presents a minimum estimate of some of the direct and indirect values associated with floodplain biodiversity and river ecosystem services.

5.8 CONTINGENT VALUATION

Many biodiversity benefits have no market themselves and also have no close substitutes or replacements, including a range of direct and indirect values as well as most option and existence values. Regardless of the fact that they are not marketed, people place a high value on these components of biodiversity value. Contingent valuation methods (CVM) have become one of the most widely-used techniques for assessing the less tangible values associated with biological resources and their diversity.

CVM are not based on observed market behaviour, but instead infer the value that people place on biodiversity goods and services – their willingness to pay for them, or willingness to accept compensation for their loss – by eliciting bids under a hypothetical scenario where they are available for purchase.

CVM are a good way of valuing biodiversity goods and services which have no market or market substitutes, but provide clear and tangible benefits to people. They are commonly used to value the subsistence, indirect, option and existence values associated with biological resources and their diversity. Examples of CVM include people's willingness to pay for clean water, the conservation of culturally important or aesthetically pleasing natural species and areas, non-traded biological resource products, or their willingness to accept compensation for their degradation or loss.

Box 14: Contingent valuation of the recreational value of forest biodiversity in Kenya

The recreational value of Mount Kenya Forest Reserve was valued using contingent valuation techniques. Although many local and overseas visitors make use of Mount Kenya Forest for leisure and recreational purposes, there is currently no entry fee. A contingent valuation exercise was carried out to assess the recreational value of the forest to these visitors. A survey was carried out over a period of a year for every visitor entering the forest area. Equal numbers of three separate questionnaire forms were distributed between visitors asking different questions in order to assess the extent to which their visit depended on forest biodiversity, their willingness to pay for entry and their willingness to make additional contributions to the conservation of forest biodiversity. Questions posed included "would you still visit the area if the forest were severely degraded", "how much would you be willing to pay as an entry fee to the forest", "would you be willing to pay \$x, \$y or \$z to enter the forest area", "if a conservation fund for Mount Kenya Forest were set up, would you be willing to make a voluntary contribution and if so how much?". The resulting value of some \$15-20 a day per visitor presents a minimum estimate of the recreational value of forest biodiversity.

5.9 HUMAN CAPITAL AND HEDONIC METHODS

Two additional methods for valuing biodiversity goods and services are human capital – a technique looking at surrogate market prices, and hedonic pricing – a technique looking at changes in productivity. These have rarely been applied to the case of biodiversity in developing countries, typically require data which is detailed and difficult to obtain, and tend to have only limited usefulness in many situations.

The human capital approach to valuation sees people as units of economic capital, and their earnings as a return on investment. It focuses on the impacts of biodiversity degradation or depletion on human health, and the effects this has on individuals' and society's productive potential. It establishes a dose-response relationship – a direct cause and effect relationship between biodiversity loss and, for example, decreased income, poorer nutrition, increased incidence of disease and illness and lower output – and adds up the loss of earnings and costs of medical treatment and healthcare arising from the loss of biodiversity goods and services.

Hedonic pricing look at the differential between property prices and wages between locations, and isolates the proportion of this difference which may be ascribed to biodiversity goods and services. It assumes that people are willing to pay higher prices for land, housing or other property – or accept lower wages and salaries – as a premium for living or working in an area which contains particular biological resources, ecosystems or biodiversity.

5.10 VALUING BIODIVERSITY COSTS

The valuation of biodiversity costs is usually much more straightforward than benefit valuation – whereas many of the benefits associated with biodiversity are intangible and indirect, its costs tend to be felt as real expenditures or losses in income. Various simple techniques can be applied to the three elements of biodiversity costs – direct management costs, costs to other economic activities and opportunity costs.

The direct management costs of biodiversity can usually be calculated using market prices – for example the price of the staff, equipment, maintenance and other inputs required to manage biodiversity projects and programmes, or the investment in new machinery and equipment implied to carry out production activities in a way which does not harm biodiversity.

Box 15: The direct management costs of biodiversity conservation in Seychelles

The direct costs of biodiversity conservation in the Seychelles were calculated by developing a national programme of activities considered necessary to conserve biodiversity, and calculating how much they would cost to implement in terms of staff, equipment and other inputs. These costs included government and NGO conservation agencies' expenditures of R 113 million a year on biodiversity projects and programmes, and commercial and industrial investments of R 150 million on new, biodiversity-friendly, technologies.

Biodiversity costs to other economic activities can usually be calculated by applying either effect on production, replacement costs or avertive expenditures techniques to valuation. The effect on production approach looks at how the presence of biodiversity leads to losses in income, output or other products – for example it values the losses in crop or livestock income arising as a result of damage caused by forest dwelling animals. The replacement cost approach, often identical to effects on production, looks at the cost of replacing the physical goods and outputs interfered with by biodiversity – for example the cost of rebuilding farm buildings and fences after they have been destroyed by forest dwelling animals. The avertive expenditures approach looks at the cost of measures necessary to avoid biodiversity damage to other economic activities, or to avert its effects – for example the costs of drugs and veterinary treatment to animals infected with diseases from wildlife, or the costs of building fences to separate domestic livestock and wildlife.

Box 16: Wildlife costs to agriculture in Uganda

The costs of wildlife damage to agriculture have been calculated by looking at the market value of crop losses. Crop damage rates average some US\$ 90,000 per year per km of boundary for major national parks. In total, wildlife around National Parks causes economic losses in terms of crop damage to a value of more than US\$ 75 million a year.

Opportunity costs can be usually valued using effect on production or replacement cost techniques. Effect on production approaches look at how the allocation of land, financial or human resources to biodiversity affect output, income and profit – for example the income foregone from commercial investment of funds allocated to biodiversity or the agricultural income and resource use values foregone by demarcating land as protected areas. Replacement cost approaches look at the costs of replacing resources foregone by biodiversity conservation by other means – for example the costs of resettling human populations in protected areas or of setting up alternative, non-biodiversity sources of livelihoods and income.

Box 17: Opportunity costs of the establishment of biodiversity protected areas in Eritrea

The local opportunity costs of establishing biodiversity protected areas in Eritrea were valued using effect on production techniques. Proposed protected areas were identified, and existing agricultural livelihood systems and biological resource utilisation in these areas quantified. Opportunity costs were estimated by looking at income foregone from potential arable and pastoralist land uses and from biological resource uses which would be prohibited in these protected areas. The resulting value of some 64 million Nakfa a year presents a minimum estimate of the local opportunity costs of biodiversity protected areas.

5.11 DIFFERENCES BETWEEN GROSS AND NET, ECONOMIC AND FINANCIAL VALUES

It is important to distinguish between gross and net, and financial and economic, prices when valuing biodiversity goods and services. If biodiversity values are being combined or compared, then they must be expressed in comparable terms. Any type of pricing may be used to value biodiversity, as long as it is consistently applied across the analysis of different costs and benefits.

A decision must be made as to whether to deal with gross or net values when valuing biodiversity goods and services. Whereas gross values look at the value or price of end products and outputs, net values discount all the fixed and variable costs incurred in generating these end products – such as labour, equipment, energy and other inputs. In effect gross values relate to the total value of finished products at their point of consumption, net values take the value of biodiversity goods and services to their original point of extraction or primary production. In practice, given data constraints and the high level of speculation involved in valuing biodiversity, it is usually easier to calculate gross rather than net values of biodiversity goods and services.

A decision must be made as to whether to deal with financial or economic prices when valuing biodiversity goods and services. Whereas economic prices concern wider social costs and benefits, financial prices are based on market prices. Financial

and economic values are not the same because a range of subsidies, taxes and other price distortions operate in markets. For economic analysis it is necessary to adjust financial prices so that they reflect real resource costs – or opportunity costs – to the economy and society. Economic prices account for – and exclude from calculations – the price distortions in an economy, for example by subtracting taxes from market prices, adding on subsidies, adjusting the price of imported inputs for an overvalued or undervalued exchange rate and altering wage rates to reflect the real opportunity cost of labour. In practice, given data constraints and the high level of speculation involved in valuing biodiversity, it is usually easier to calculate financial rather than economic values of biodiversity goods and services.

5.12 LIMITATIONS TO VALUATION

Valuation is an extremely useful tool, because it highlights biodiversity costs and benefits and shows that they have a value – they are not just intangible biological or ecological goods and services, but have real influences on human and production processes.

It is important to understand – and to emphasise within the biodiversity assessment or country study – that valuation techniques only provide tools to help people make better and more informed decisions. Valuation is not an end in itself, and has a number of shortcomings and weaknesses. When valuing biodiversity goods and services it is always important to bear in mind and make explicit its various methodological issues and limitations, including:

- Even where biodiversity goods and services can be valued the *reality of these figures is usually limited*. Biodiversity values do not always represent concrete prices and income. Rather than definitive or binding figures they should be seen as indicative estimates of the magnitude of different benefits and costs which present a rough guide to what biodiversity is worth, for use in planning and making policies and decisions.
- Biodiversity valuation is a very *approximate exercise*. It involves many assumptions, hypotheses and speculations. This uncertainty is largely a function of the lack of good quality data, and the newness of the methods, upon which biodiversity valuation is based. It is important to always make explicit the assumptions involved in valuing biodiversity goods and services.
- It is *impossible to value all biodiversity goods and services*. Data and methodological limitations mean that some biodiversity values can never be calculated, especially certain option and existence values. Even where a value can be attached to a biodiversity good or service, this frequently underestimates its full value because it is based on a proxy good or service or on a partial estimate of second-best alternatives or substitutes. It is important to emphasise that values usually represent a minimum estimate of the full worth of biodiversity.
- *Not every biodiversity good and service should be valued*, even where sufficient data exists. Especially, values relating to human life, religious and cultural significance involve ethical and political considerations, particularly when they

are being compared or used to argue that particular activities or certain people's needs are more desirable or important than others. In some cases valuation should not even be attempted.

- Different valuation techniques provide a choice of methods, and sometimes deal with different aspects of the value of a single biodiversity good or service. It is however important to ensure that valuation does not give rise to *double counting*. The values of one biodiversity good or service are sometimes captured, reflected or incorporated in another. Care should always be exercised that the biodiversity values are not replicated or repeated in different estimates.
- The value of biodiversity is *unequally distributed* between people and over time. Most valuation techniques do not take account of this differentiation or variability. Different people have different perceptions of the value of biodiversity goods and services, and these may vary at different times. Economic valuation is usually based on a particular person's or group's conception of what a particular biodiversity good or service is worth at a specific point in time. It is not necessarily universally valid, or extrapolable between different groups, areas, species, ecosystems, years or seasons.
- Biodiversity degradation and loss can have *irreversible effects*. They can lead to the complete collapse of human livelihoods, the permanent loss of consumption and production possibilities or the total extinction of wild species. The full risk and ultimate implications of these losses, and ways in which the loss of one species or habitat may affect other resources and activities in the future, is largely unknown. The final or knock-on effects of biodiversity loss can never be fully known or reflected in valuation.

5.13 CONCLUSIONS AND RECOMMENDATIONS FROM BIODIVERSITY VALUATION

Valuation of biodiversity benefits and costs provides a quantitative assessment of how much biodiversity goods and services are worth in an economy, and what the monetary costs of their conservation are. It gives rise to the following conclusions and recommendations:

- a) The quantified value of different biodiversity goods and services;
- b) The quantified value of biodiversity costs;
- c) A description of the economic value of biodiversity goods and services which cannot be quantified;
- d) The assumptions and hypotheses applied in the course of biodiversity valuation.

6. ANALYSIS OF BIODIVERSITY BENEFITS AND COSTS

STEPS FOR ANALYSING BIODIVERSITY BENEFITS AND COSTS

1. Analysing how biodiversity benefits contribute to national economic indicators
2. Analysing how biodiversity benefits and costs accrue to different socio-economic groups and stakeholders in the country
3. Analysing how biodiversity benefits and costs accrue outside the country
4. Analysing biodiversity costs and benefits over time
5. Analysing who gains and who loses from biodiversity conservation under the *status quo*
6. Identifying the need for incentives and financing for biodiversity conservation
7. Making conclusions and recommendations as part of the biodiversity assessment or country study and influencing the formulation of the biodiversity strategy and action plan.

6.1 WHY ANALYSE BIODIVERSITY BENEFITS AND COSTS?

Valuation provides important data about the magnitude of biodiversity benefits and costs. By itself, it however provides little meaningful information which can be used to plan for conservation activities. It is necessary to analyse biodiversity values so as to find out in what form and to what extent the costs and benefits of biodiversity vary between groups, countries, areas, sectors and over time.

This more detailed analysis provides important information about the nature and distribution of biodiversity costs and benefits, the likely economic impacts of biodiversity conservation, and the need to set in place and target to particular groups and areas biodiversity financing mechanisms and incentives.

Analysis of biodiversity benefits and costs forms an important part of the biodiversity assessment or country study because it provides the basis for identifying how the current distribution of costs and benefits encourages or discourages biodiversity conservation, and how economic tools and measures can be used to effect changes in this distribution which will enhance conservation. It also provides an important contribution to the justification for, and formulation of activities in, the biodiversity strategy and action plan.

This chapter looks at the analysis of biodiversity benefits and costs as part of the biodiversity assessment or country study, and strategy and action plan. The aim of analysing biodiversity benefits and costs is to assess their nature and distribution between different groups, sectors and areas, to identify the major beneficiaries and cost-bearers of biodiversity conservation, and to highlight the need for biodiversity incentives and financing mechanisms.

6.2 THE ROLE OF BIODIVERSITY IN THE NATIONAL ECONOMY

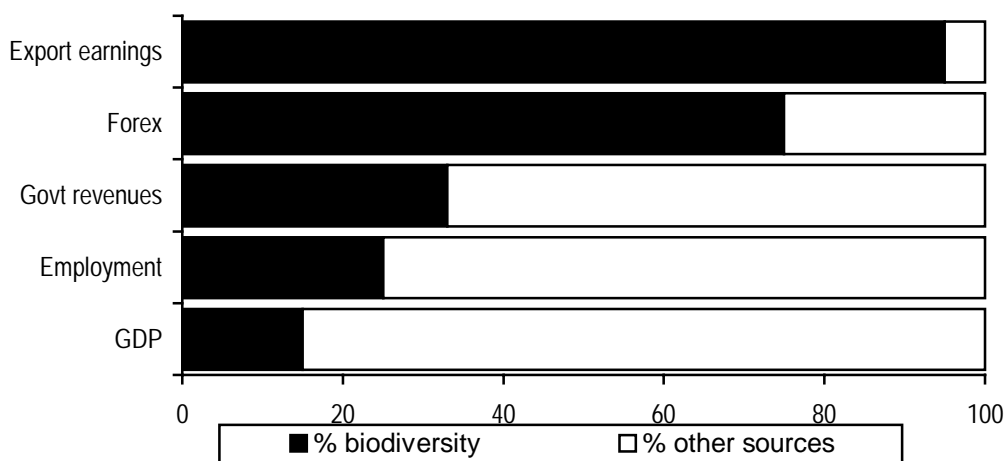
Analysis of the role of biodiversity in the national economy forms an important part of the biodiversity assessment or country study, and also contributes to the formulation of the biodiversity strategy and action plan.

Biodiversity goods and services typically have an important role in the national economy and contribute to sectoral goals and strategies. Analysing the extent to which they contribute to different aspects of economic and development indicators – such as national income, employment, public revenues, exports and foreign exchange earnings – provides important information about the national economic and development significance of biodiversity.

It also presents a strong justification for allocating scarce public sector resources to biodiversity conservation by demonstrating that this is a socially and developmentally beneficial use of funds. This typically forms a key issue in the justification of national biodiversity strategy and action plan activities.

Box 18: Biodiversity contributions to national economic indicators in the Seychelles

Analysis of the benefits associated with biodiversity goods and services in the Seychelles illustrates their important contribution to the national economy. Biological resources and ecosystem services together contribute ninety five percent of total export earnings, over three quarters of foreign exchange earnings, more than one third of the government's domestic revenues, nearly a quarter of national employment and one sixth of GDP.



The vast majority of biodiversity benefit accrue within the tourism (54%) and fisheries (44%) sectors of the Seychelles economy. Other sectoral contributions to total biodiversity benefits arising from the plants, animals and ecosystem functions supported by forest biodiversity and terrestrial protected areas, although large in monetary terms at some R 25 million a year, contribute only 2% of the total quantifiable benefit of biodiversity.

6.3 THE DISTRIBUTION OF BIODIVERSITY BENEFITS AND COSTS WITHIN THE COUNTRY

Biodiversity benefits and costs are unequally distributed between different socio-economic groups in a country. The people who receive the benefits from biodiversity are often not those who bear the costs associated with its conservation.

Analysis of the distribution of biodiversity benefits and costs between groups provides important information about who reaps the major proportion of biodiversity benefits and who bears most of the costs associated with its conservation. It also highlights whether particular groups are burdened with biodiversity costs which are disproportionate to the level of benefits, or whether large biodiversity benefits are accruing to groups who bear few conservation costs.

This information forms an important part of the biodiversity assessment or country study. It also contributes towards the formulation of the biodiversity strategy and action plan because it highlights groups who may be targeted by or participate in biodiversity activities, who may need to be provided with additional incentives or finance in conservation activities, and who may potentially contribute towards the costs associated with conservation.

Box 19: The distribution of biodiversity costs and benefits within Eritrea

	Benefits	Costs
Household livelihoods	<ul style="list-style-type: none"> • Agricultural output worth Nfa 722.3 million a year • Energy inputs worth Nfa 798.2 million a year • Fisheries worth Nfa 336.9 million a year • Other biological resources worth Nfa 43.7 million a year • Maintenance of soil fertility and agricultural productivity worth Nfa 114.0 million a year 	<ul style="list-style-type: none"> • Costs of participating in biodiversity conservation activities • Unsustainable fuelwood use foregone worth Nfa 3.9 million a year • Loss of land and resource use opportunities in protected areas worth Nfa 63.9 million a year
Commercial profits	<ul style="list-style-type: none"> • Energy inputs worth Nfa 38.9 million a year • Forestry earnings worth Nfa 16.3 million a year • Marine earnings worth Nfa 241.4 million a year 	<ul style="list-style-type: none"> • Energy substitution with a gross benefit of Nfa 92.9 million a year • Introduction of new technologies and production processes
Government budget	<ul style="list-style-type: none"> • Royalties, taxes and licence fees worth Nfa 2.1 million a year 	<ul style="list-style-type: none"> • Investment costs of Nfa 445.3 million • Recurrent expenditure of Nfa 3.5 million a year

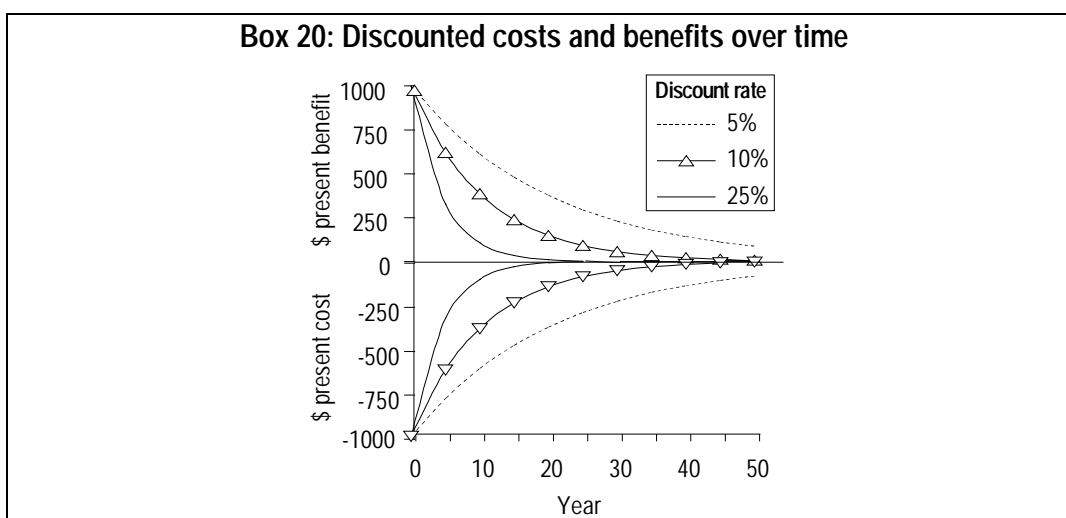
6.4 THE GLOBAL DISTRIBUTION OF BIODIVERSITY BENEFITS

Many of the benefits associated with biodiversity accrue internationally, or are received by the global community, especially indirect, option and existence values. Analysing – although not necessarily quantifying – the degree of benefits accruing from a country's biodiversity outside that country provides important information which can be used to justify biodiversity conservation as a global priority, and to seek external financial assistance in implementing conservation activities.

6.5 BIODIVERSITY COSTS AND BENEFITS OVER TIME

Biodiversity benefits and costs do not accrue equally over time. Whereas many of the benefits gained from using biological resources unsustainably accrue now, the benefits of biodiversity conservation – and the costs associated with its loss – are long term in nature and will be felt by future generations. In order to deal with the long-term benefits of biodiversity conservation, and long-term costs associated with its loss, some kind of analysis of costs and benefits as they accrue over time is desirable.

Time factors are usually incorporated into economic analysis by means of discounting, the reduction of future costs and benefits by a factor which accounts for the fact that they are worth less in today's terms the further they accrue in the future. The higher the discount rate applied to values, the less future costs and benefits are worth in present terms. This takes account of social time preference (that money is generally worth more to people when it is held now than if it may be received in the future) and the opportunity cost of capital (that money tied up in a project has an alternative value because it could have been invested elsewhere to generate interest or profits). Opinion is divided as to whether biodiversity and environmental costs and benefits should be subjected to discounting – whether they should be treated like investments and projects in other sectors of the economy, or whether they should be given a lower or zero discount rate because of their long-term nature.



Some account must be taken of time in the analysis of biodiversity benefits and costs, demonstrating that biodiversity conservation implies the maintenance in perpetuity of a wide range of economic benefits, while the benefits associated with economic activities which deplete or degrade biodiversity are usually short-term in nature, and that the costs associated with this loss are long term. Whether or not biodiversity costs and benefits are discounted is largely a decision of the person implementing economic aspects of the biodiversity assessment, and also depends on the level of costs and benefits and impacts of discounting on them.

6.6 IDENTIFYING GAINERS AND LOSERS, AND NEEDS FOR INCENTIVES AND FINANCING FOR BIODIVERSITY CONSERVATION

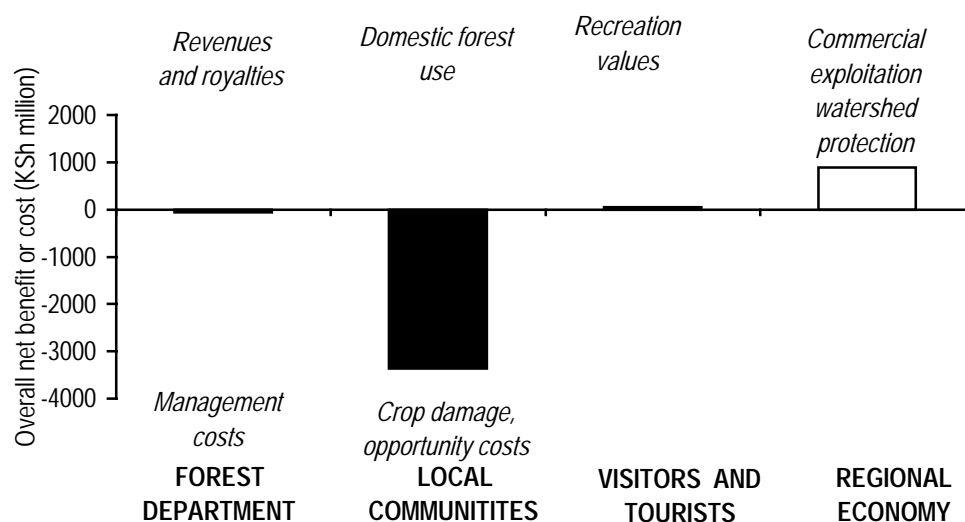
The ultimate aim of analysing biodiversity costs and benefits is to identify who gains and who loses from biodiversity conservation and loss. This provides important information in the biodiversity assessment or country study as to the equity and sustainability of biodiversity conservation, and highlights socio-economic issues which need to be addressed in biodiversity strategies and action plans.

It is clear that if under the *status quo*, particular social or economic groups in a country bear the bulk of the costs associated with biodiversity conservation while reaping few of its benefits, it is unlikely that these cost bearers are going to be either able or willing to support biodiversity conservation. This may also mean that biodiversity conservation is in direct contradiction to a country's national development and equity goals, which will also diminish its political acceptability and economic sustainability. Likewise if it is demonstrated that a high value of biodiversity benefits accrue freely to particular groups, or accrue outside the country, it may be concluded that this is both inequitable and uneconomic – the groups who benefit economically from biodiversity conservation are able, and likely to be willing, to contribute towards the costs of its conservation.

Identifying the gainers and losers from biodiversity conservation therefore highlights the potential to distribute more equitably, sustainably and efficiently the costs and benefits of biodiversity, and helps to identify the need for incentives and financing. Where groups are bearing the costs of biodiversity conservation receive a disproportionately small share of its benefits – at an individual, group, sector or country level – there is a clear need to incorporate additional incentives for these groups into biodiversity conservation activities and strategies, and to ensure that sufficient finance is available for them to be willing and able to conserve biodiversity. Where groups receive biodiversity conservation benefits at low or zero cost, there is a clear niche for capturing some of these values or benefits as real cash amounts.

Box 21: Gainers and losers in Mount Kenya Forest biodiversity conservation

Analysis of Mount Kenya Forest shows that under the *status quo*, there are net gainers and net losers from forest conservation. Both recreational visitors and the regional economy – including the groups and businesses who are licensed to extract timber and minor forest produce from Mount Kenya Forest as well as the off-site and downstream beneficiaries of the ecological services provided by the forest – receive a net benefit from forest conservation. This is because they bear few of the costs of forest conservation except for paying nominal charges and fees for the extraction of forest products. The Forest Department – who bear the direct costs of forest conservation, which are in excess of the revenues accruing from the sale of forest products, and forest-adjacent residents – for whom the opportunity costs and animal damage costs associated with the forest outweigh the benefits of non-resident cultivation and domestic forest utilisation, are net losers from forest conservation. There is a clear need to generate incentives for the Forest Department and local communities to participate in forest conservation. It is clear that at least some of this finance can be generated from visitors and tourists, and the regional economy who currently benefit freely from Mount Kenya Forest's biodiversity.



6.7 CONCLUSIONS AND RECOMMENDATIONS FROM THE ANALYSIS OF BIODIVERSITY BENEFITS AND COSTS

Analysis of biodiversity benefits and costs gives provides information about how biodiversity values accrue to different groups, and how the distribution of costs and benefits affects people's incentives and ability to support conservation. It rise to the following conclusions and recommendations:

- The economic justification for biodiversity conservation;
- The contribution of biodiversity conservation to different national economic and development goals;
- The distribution of biodiversity costs and benefits within and between countries, and the extent to which this is equitable, efficient and sustainable;
- Identification of the need for incentives and financing to be incorporated into biodiversity strategies and action plans.

7. ECONOMIC INSTRUMENTS FOR BIODIVERSITY CONSERVATION

STEPS FOR THE IDENTIFICATION OF ECONOMIC INSTRUMENTS FOR BIODIVERSITY CONSERVATION

1. Highlight niches for economic instruments to support biodiversity strategy and action plan objectives and overcome policy, institutional and market failures which are leading to biodiversity degradation and loss
2. Define types of economic instruments which are appropriate and acceptable to the structure and goals of the economy
3. Identify specific economic instruments for overcoming the forces leading to biodiversity loss and for encouraging biodiversity conservation in the course of economic activity
4. Make conclusions and recommendations for the inclusion of economic instruments in biodiversity strategy and action plan activities.

7.1 WHY IDENTIFY ECONOMIC INSTRUMENTS?

Economic instruments include such measures as taxes, subsidies, property rights, fees, charges, loans, bonds and deposits. Their aim is to change the prices and profits that people face so as to encourage them to consume or produce particular goods in a particular way. In most countries economic instruments are already widely used as tools for broad macroeconomic management and regulation, and to pursue major sectoral economic strategies.

Although this potential is less commonly recognised, economic instruments provide a useful set of tools for biodiversity conservation. Because they influence people's economic behaviour, economic instruments can be used to encourage people to conserve biodiversity in the course of their economic activity, or to avoid depleting it. Economic instruments are based on overcoming the market, policy and institutional failures which lead to biodiversity being under-priced, over-consumed and under-conserved. They manipulate the costs and benefits that producers and consumers face to take account of the full value of biodiversity. By making the prices of goods which degrade biodiversity incorporate this cost, and the prices of goods which conserve biodiversity incorporate this benefit, they change the relative profits accruing from production and consumption activities. Economic instruments ensure that the costs of biodiversity degradation are incurred to the people who give rise to it, and that people who conserve biodiversity can benefit from their activities.

Identification of economic instruments forms an important part of the biodiversity strategy and action plan because they can provide a major means of achieving national biodiversity conservation goals, and provide major support to biodiversity strategy and action plan activities.

This chapter looks at economic instruments for biodiversity conservation as part of the biodiversity strategy and action plan. The aim of identifying economic instruments is to present people with incentives to conserve biodiversity in the course of their economic activity by ensuring that the prices and profits they face incorporate biodiversity values.

7.2 HIGHLIGHTING NICHES FOR ECONOMIC INSTRUMENTS

It is first of all necessary to assess where there is potential for the application of economic instruments as incentives for biodiversity conservation. Identifying niches for economic instruments involves assessing the market, policy and institutional failures which lead to biodiversity degradation and loss, and seeing where economic instruments can strengthen the components and activities which form a part of biodiversity strategies and action plans.

Much of the information regarding underlying market, policy and institutional causes of biodiversity degradation and loss will have been provided during the course of the economic assessment of biodiversity. Analysis of economic structure and policies, and of biodiversity benefits and costs, should have identified the major areas of distortions, disincentives to conservation and needs for conservation incentives which provide niches for the application of economic instruments. Analysis of proposed biodiversity strategies and action plans, and their component programmes and projects, should also highlight areas which can be further strengthened by the use of economic instruments.

7.3 ACCEPTABILITY AND APPROPRIATENESS OF ECONOMIC INSTRUMENTS

A wide range of economic instruments with potential application to biodiversity conservation exist, but not all will be useful within the context of a particular country's biodiversity strategy and action plan. To what extent different economic instruments are appropriate, and likely to be effective if applied, depends largely on the specific characteristics of a country.

Countries have different social and economic characteristics, development goals and political ideologies. Unless economic instruments are consistent with, and lend support to, these wider goals and attributes they are unlikely to be politically, economically or socially acceptable, to be practically implementable, or to contribute successfully to biodiversity conservation.

Box 22: Appropriate economic instruments for biodiversity conservation in Djibouti

Economic instruments are relatively easy to apply and enforce in a small economy like Djibouti. There are however a number of characteristics of the economy which influence the choice of economic instruments and their appropriateness to goals of biodiversity conservation:

- Djibouti is characterised by extreme *economic duality*, and is comprised of two distinct sub-economies within which very different economic conditions pertain. It is likely that two sets of economic instruments will have to be formulated in order to deal with this heterogeneity. It will be important to set in place economic measures for biodiversity conservation which target both the commercial, market-based urban sector and the subsistence-based rural sector. It cannot be assumed that one set of biodiversity economic measures will simultaneously have relevance to both these sub-economies.
- *Consumer prices* are already extremely high in Djibouti. Any economic instrument for biodiversity conservation should not increase commodity prices, even those of biodiversity-depleting goods. Rather, economic measures which present positive incentives for biodiversity conservation by saving money, increasing production efficiency or contributing to consumer choice will be far more effective than those which use the price mechanism to penalise directly for biodiversity loss.
- Both urban and rural *poverty* is widespread in Djibouti, with extreme inequities in the distribution of income between a small élite and a large, poorer population. Economic instruments which balance more equitably the costs and benefits of biodiversity conservation, and redistribute income, will provide a means to help overcome these inequities. Conversely, there is little potential for using economic instruments which will further widen disparities in socio-economic status.
- In both of Djibouti's sub-economies *production and consumption opportunities are limited* and focused on a small number of commodities. Rather than increasing the reliance of the Djiboutian economy on these limited economic activities, instruments for biodiversity conservation should aim to strengthen the diversity, and sustainability, of different economic opportunities at national and local levels.
- Djibouti is in the process of *policy development and reform*, major aims of which are to strengthen and diversify the economy, to increase liberalisation and to decrease the role of the public sector. Economic instruments for biodiversity conservation should from the start be integrated with, and consistent with the goals of, these new macroeconomic and sectoral policies. In particular biodiversity economic measures should support new policy by aiming to minimise the costs of conservation to government, increase decentralisation, privatisation and liberalisation and to contribute to national economic growth and development goals.
- The Djibouti economy is already *dependent on external financial assistance* and is *highly vulnerable to exogenous shocks*. Economic instruments for biodiversity conservation, if they are to be sustainable over the long-term, should decrease rather than exacerbate this dependence and vulnerability.

7.4 IDENTIFYING ECONOMIC INSTRUMENTS FOR BIODIVERSITY CONSERVATION

Depending on the underlying economic forces driving biodiversity degradation and loss, the niches for economic measures within planned biodiversity strategies and action plans and the specific nature and characteristics of a country's economy, a range of economic instruments may have potential application to biodiversity conservation. These include:

- **Property rights** deal with the fact that market failure is due in part to the absence of well-defined, secure and transferable rights over land and biological resources. By establishing property rights biodiversity markets and scarcity prices should emerge, and permit the users and owners of biological resources to

benefit from conservation or be forced to bear the on-site implications of degradation. Examples of property rights include the allocation of legal rights and tenure over the ownership, management and use of biological resources or biodiversity areas to particular groups or communities.

- **Market creation and charge systems** entail trading in biodiversity goods and services and giving them a price which reflects their relative scarcity, costs and benefits. Creating markets ensures that biological resources are allocated efficiently and put to their best use according to people's willingness to pay. Creating the ability to buy, sell and trade in biodiversity, or to exchange biodiversity-damaging economic activities between sites, can encourage biodiversity conservation and discourage activities which result in biodiversity loss. Assigning charges or prices to biodiversity goods and services is also a means of generating revenues. Examples of market creation and charge systems include the direct creation of markets – such as by instituting the purchase and sale of biodiversity goods and services and value-added products where there is a demand and willingness to pay on the part of consumers; the establishment of tradeable rights, shares and quotas in biological resources and environmental quality – such as fishing quotas, pollution permits or development rights; setting new charges or rationalising existing charges – such as park entry fees, biological resource utilisation licences, environmental pollution and waste clean up charges; and initiating charges for biodiversity goods and services which are currently received free – such as downstream water catchment benefits, storm protection or consumptive and non-consumptive biological resource utilisation activities.
- **Fiscal instruments** include various types of taxes and subsidies. They can be used to raise the relative price of biodiversity-degrading products and technologies in line with the costs of the damage they cause and discourage people from using them, and to decrease the relative price of biodiversity-conserving products in line with the benefits of conservation and encourage people to use them. Fiscal instruments can also be used as a budgetary tool to raise revenues. Examples of fiscal instruments include differential tax rates – such as relatively higher taxes on biodiversity depleting land uses, equipment, inputs and products, or subsidies to biodiversity-neutral or biodiversity conserving technologies, land uses and enterprises.
- **Financial instruments** are a way of mobilising and channelling funds to biodiversity conservation. They include funds, loans, grants and investment activities specially earmarked for biodiversity conservation. Examples of financial instruments include green funds, trust funds and preferential loans to biodiversity-conserving activities and technologies.
- **Bonds and deposits** are product surcharges which shift the responsibility for biodiversity depletion to individual producers and consumers. They are levied on activities which run the risk of harming biodiversity, and require the person carrying out these activities to pay a bond or deposit before they start against the possibility of this damage occurring. By charging in advance for possible biodiversity damage, bonds and deposits provide funds for covering the costs of this damage and ensure that producers or consumers cover the cost themselves, and also presents an incentive to avoid biodiversity damage and reclaim the

deposit or bond. Examples of bonds and deposits include those set on land restoration, disposal of dangerous or hazardous chemicals, waste clean up and proper harvesting of biological resources.

Box 23: Economic instruments for biodiversity conservation in Eritrea

A range of economic instruments were identified to have potential for application to biodiversity conservation activities in Eritrea:

In the **commercial sector**, economic instruments can be used in combination with existing conservation measures to ensure that future urban and industrial developments do not lead to biodiversity degradation and loss, at the same time as maintaining current levels of expansion and economic growth in these sectors. They can also be used to increase sources of finance and funding for biodiversity conservation, especially by spreading the costs of conservation and attracting increased investment from the private sector.

	PROPERTY RIGHTS	MARKETS AND CHARGES	FISCAL INSTRUMENTS	FINANCIAL INSTRUMENTS	BONDS AND DEPOSITS
Urban and industrial planning and development		Tradable development rights	Differential land use, property taxes Taxation zones		Bonds and deposits on biodiversity damage, land restoration
Technologies, waste disposal and production processes		Charges for waste disposal and clean up, pollution and effluents	Differential technology, product and input taxes Pollution taxes	Loans to clean technologies, waste treatment	Bonds on toxic and hazardous waste production, treatment and disposal, chemical use, pollution
		Tradable/nettable pollution quotas			
Biological resource dependent industries	Rights to develop and trade in biological resources	New biodiversity products and markets Charges for use	Differential input and product taxes	Loans to alternative product and enterprise development	
Financing mechanisms		Development of biodiversity markets and prices	Fiscal revenues from royalties and taxes Tax relief on biodiversity investments and contributions	Sponsorship, joint ventures, foundations, trusts, endowments	Deposits and bonds

At the **local and rural economic level** economic instruments can be used to overcome threats of

unsustainable resource harvesting and poor land management practices. They can also be used to enhance the degree to which rural communities participate in, and benefit from, biodiversity and its conservation and to offset some of the local livelihood costs that biodiversity conservation implies. Economic instruments can provide community incentives for biodiversity conservation as well as being used as redistributive mechanisms to generate local benefits from biodiversity.

	PROPERTY RIGHTS	MARKETS AND CHARGES	FISCAL INSTRUMENTS	FINANCIAL INSTRUMENTS	BONDS AND DEPOSITS
Land management in agriculture and settlement	Land tenure Rights over biological resources	Promotion and development of value-added markets, processing and products in indigenous crops	Differential land use and property taxes	Loans and grants to afforestation, soil and water conservation, indigenous crops Support to development of alternative energy and construction materials sources	Land maintenance and biodiversity conservation bonds
Protected areas	Local rights over biodiversity areas and species Promotion of joint venture enterprise development with government and private sector	Entry fees and resource utilisation pricing Development of tourism markets and charges Development of biological product markets and enterprises		Revenue sharing and benefit sharing Funds for local enterprise development	
Biological resource enterprises	Property rights over biological resources and biodiversity areas	Development of new product uses, prices and markets		Loans and grants to biological resource and substitute enterprises and products	

7.5 CONCLUSIONS AND RECOMMENDATIONS FROM THE IDENTIFICATION OF ECONOMIC INSTRUMENTS FOR BIODIVERSITY CONSERVATION

Identification of economic instruments for biodiversity conservation highlights economic measures and tools which can be incorporated into the biodiversity strategy and action plan. It gives rise to the following conclusions and recommendations:

- a) Identification of the underlying root economic causes of biodiversity degradation and loss and niches for economic instruments in biodiversity strategies and action plans;
- b) Justification for the use of economic instruments for biodiversity conservation;
- c) Definition of the types of economic instruments which are appropriate and applicable to a country's particular structure, ideology and situation;
- d) Provision of recommendations for specific economic instruments for biodiversity conservation to be included in the national biodiversity strategy and action plan.

8. FINANCING MECHANISMS FOR BIODIVERSITY CONSERVATION

STEPS FOR THE IDENTIFICATION OF FINANCING MECHANISMS FOR BIODIVERSITY CONSERVATION

1. Highlight the funding needs for biodiversity conservation and identify those which are currently unmet
2. Identify existing sources of finance and assess their limitations
3. Identify economic instruments which can generate finance
4. Identify private sector investment opportunities
5. Identify innovative international financing mechanisms
6. Make conclusions and recommendations for the inclusion of financing measures in biodiversity strategy and action plan activities.

8.1 WHY IDENTIFY FINANCING MECHANISMS?

Conserving biodiversity is not a cost-free exercise. As well as direct expenditures on projects and programmes, biodiversity conservation gives rise to costs by interfering with other economic activities and incurring opportunity costs. These costs accrue to government, to commercial and private sectors and to individuals, households and local communities. Funds are needed to offset and compensate for these costs. Not only does finance need to be generated, but mechanisms also established which ensure that funds accrue to the individuals or groups who bear the costs of biodiversity conservation.

Available sources of finance are extremely limited. Both government budgets and donor funds are low and under severe pressure from other sectors of the economy such as defence, health and education, all of which are often seen as having a more urgent need, and priority claim, on public finance than biodiversity conservation. Sources of private and commercial investment funds are also limited and under heavy competition from activities which may be able more easily to demonstrate themselves to be profitable and secure investment opportunities than biodiversity. There is a clear need to identify additional and innovative financing mechanisms for biodiversity conservation which can supplement and improve existing sources of funds.

Identification of financing mechanisms forms an important part of the biodiversity strategy and action plan because it provides the means of funding biodiversity conservation programmes and projects in a way which is both sustainable and equitable.

This chapter looks at financing mechanisms for biodiversity conservation as part of the biodiversity strategy and action plan. The aim of identifying financing mechanisms is to raise money for biodiversity and to ensure that these funds accrue to the groups who bear the costs associated with conservation.

8.2 HIGHLIGHTING FUNDING NEEDS FOR BIODIVERSITY CONSERVATION

It is first necessary to identify the financial implications of biodiversity strategy and action plan activities. The costs of biodiversity conservation includes management expenditures as well as costs to other activities and opportunity costs. Funding must be made available to cover all these costs, in terms of direct cash expenditures, compensation and the sharing of other benefits.

Highlighting funding needs for biodiversity conservation involves assessing which groups, areas, activities and components of proposed biodiversity strategies and action plans require finance or other inputs, and assessing what and how much these needs are. Biodiversity strategies and action plans will themselves include specific programmes and projects, which can be costed in terms of direct expenditures as well as broader socio-economic and distributional impacts. Much of the information regarding broader socio-economic and distributional impacts will have been provided during the course of earlier stages of the economic assessment of biodiversity through the analysis of biodiversity benefits and costs.

Once funding needs have been identified it is necessary to assess how much finance is currently available to cover these needs. This involves investigating government, donor, NGO and private funding sources which have or can be allocated to biodiversity strategy and action plan activities. This will provide information about which funding needs for biodiversity conservation are currently unmet and require the identification of additional funding sources and financing mechanisms.

8.3 CONVENTIONAL SOURCES OF FINANCE

Once funding needs have been identified it is necessary to see how they can be met. One way of funding biodiversity conservation programmes and project is to rely on conventional financial instruments. Three major categories of instruments are used conventionally to raise finance, and can potentially be used to fund biodiversity strategies and action plans. These include borrowing from banks and other commercial lending institutions; multilateral, bilateral and NGO grants and loans; and public sector investments and budgetary allocations. The potential for raising funds from these sources for biodiversity conservation activities should be assessed.

There is no reason why some or all of these sources of funds should not be tapped for biodiversity conservation – they are after all the primary means of financing other public and private sector activities in most countries. They however all have common limitations which may constrain the degree to which they can fully meet biodiversity funding needs.

A major constraint to the use of conventional sources of finance is that they are limited in scope and amount. There is frequently little potential either for increasing the overall amount of finance available from them, or for reallocating funds to biodiversity from other activities. Biodiversity projects and programmes may find it hard to compete with other sectors of the economy which may appear to

generate wider development benefits, or can demonstrate higher and more immediate returns.

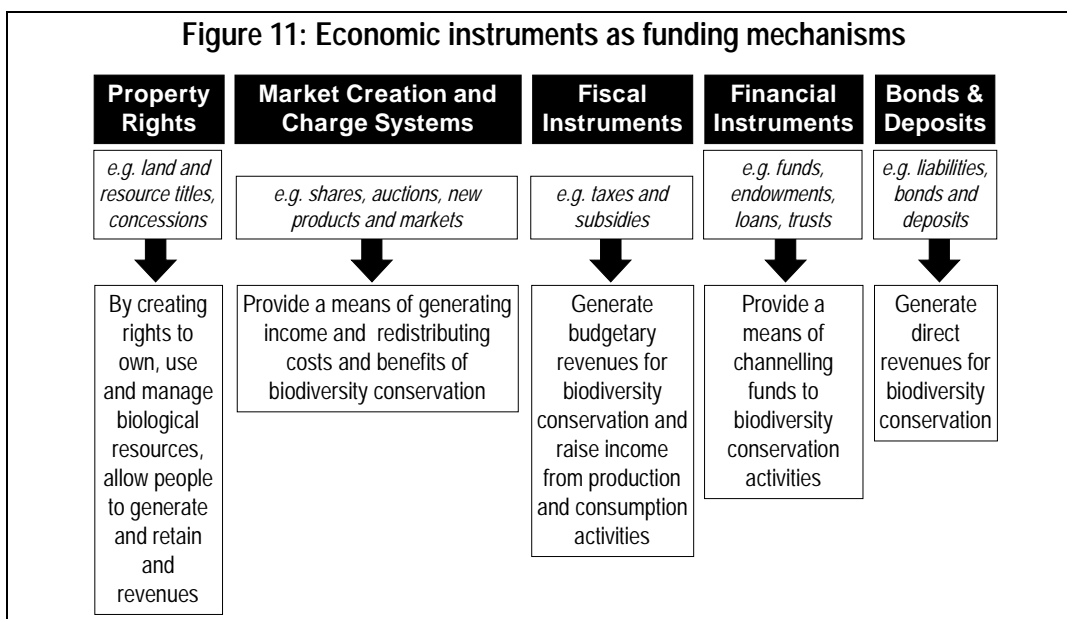
Conventional sources of finance are also often unsustainable. Donor funds are limited, government budgets are mostly decreasing in real terms, and both commercial and donor loans incur financial and pay-back burdens. As well as stretching already indebted public and private sectors and sometimes being uncertain over the long-term, such financing mechanisms run the additional risk of decreasing national, individual or group control and sovereignty over biological resources because they depend on external decisions and are often tied to particular conditions, goals or activities.

For these reasons, although conventional financing mechanisms provide a useful source of funds for biodiversity conservation, they are usually by themselves inadequate, and may not even be desirable for all types of conservation activity. There is a clear need to consider additional sources of finance for biodiversity conservation which can fill the gaps left by conventional mechanisms, and which have the potential to be more sustainable over the long-term.

8.4 THE USE OF ECONOMIC INSTRUMENTS TO GENERATE AND ALLOCATE FINANCE

The potential for domestic economic instruments to raise funds – especially those which are also being used as incentives for conservation – should be considered as part of biodiversity strategies and action plans.

The primary goal of economic instruments is to change incentive structures and to encourage people to conserve biodiversity in the course of their economic activities. Some economic instruments however have the additional advantage that they simultaneously generate and allocate funds for biodiversity conservation. For example, fiscal instruments, markets, charge systems, bonds and deposits all generate revenues; property rights and financial instruments provide a means of ensuring that funds accrue to particular economic sectors or social groups. Economic instruments are particularly effective ways of making sure that the private sector and communities both generate and receive biodiversity finance, and channelling revenues to the small-scale, community or site-specific level.



8.5 DOMESTIC PRIVATE SECTOR SOURCES OF FINANCE

Private sector sources of finance should also be considered as potential means of funding biodiversity strategies and action plans. There is no reason why the state should have a monopoly on funding or managing biodiversity conservation – most countries have an efficient and rapidly expanding private sector, including large-scale commercial concerns as well as small-scale and community-level groups. There is great potential for encouraging private and community sector investment in biodiversity. This can not only generate funds, it can increase public participation in biodiversity conservation and transfer some of the cost burden away from government.

For the private sector to be more fully engaged, biodiversity must be made into an attractive and accessible investment opportunity. There are a range of ways in which the private sector can be encouraged to invest in biodiversity conservation. Most importantly opportunities must be created for private engagement, both in terms of ownership and control of biological resources and biodiversity areas as well as in support to sustainable biodiversity-based enterprises such as the extraction and processing of biological resources or biodiversity tourism.

Support can be provided to the entry of the private sector into biodiversity conservation in various ways, including research and development into new biodiversity products and markets, the elimination of barriers to trade and business, the allocation of concessions, franchises, sponsorship and advertising deals in biodiversity areas or enterprises, the provision of credit on favourable terms and other inducements to investment. Many of these forms of support can be made under joint arrangements and partnerships between the public, commercial and community sectors.

Box 24: Private sector and community wildlife conservation innovations in Tanzania

A new wildlife tourism facility is in the process of being developed on Village land adjacent to Serengeti National Park. This camp will be run as a three-way joint venture between a commercial company, the local Village Council and a bilateral donor, who will provide the bulk of investment funds on a soft loan basis. A 40 year land lease, to be renewed every 5 years, has been agreed with the Village Council for the construction of the 30 bed camp. The terms of this lease and joint venture agreement include the allocation of equity in safari operations to the Village Council, a re-negotiable annual land rent of TSh 1 million and bed fees of US\$ 5 per visitor. The camp management has also committed to support village income and employment through sourcing foodstuffs locally, drawing staff – including management trainees – from the locality and establishing a micro-credit scheme for villagers. If a similar occupancy rate to other lodges in the Serengeti area is achieved, this may provide rental and bednight fees of some US\$ 20 000 a year for the Village, in addition to other local income and employment opportunities associated with the camp.

The private sector can also be encouraged to invest in biodiversity aside from direct participation in biological-resource based enterprises and management of biodiversity areas and species. Efforts can be made to attract charitable contributions and donations through such mechanisms as trusts, foundations and endowments. Such contributions can be made more attractive to the private sector by providing incentives such as tax relief or publicity to contributors. Economic instruments can also be used as a means of raising revenues from the private sector and allocating them to various types of biodiversity funds – for example from subsidies saved, charges made or taxes levied.

8.6 INNOVATIVE INTERNATIONAL FINANCING MECHANISMS

Donor arrangements are not the only means of funding biodiversity conservation from international sources. Multiple possibilities exist for attracting international finance to biodiversity conservation, including those which encourage the transfer of private financial resources as well as the more innovative use of donor funds. Although several of these methods have already been piloted in sub-Saharan Africa it is worth noting that some have given rise to great controversy, especially in issues relating to national sovereignty, ownership and control over biological resources and the balance of power between developed and developing countries.

- A range of **international funds** can be used to finance biodiversity conservation. These include trust funds, foundations, endowments, revolving funds, green funds and other grant or loan-making entities. These funds can both be used as a means of raising money from international sources as well as channelling money to biodiversity conservation.

Box 25: Trust fund mechanisms for forest biodiversity in Uganda

The conservation of Bwindi Impenetrable National Park and Mgahinga Gorilla National Park in Uganda is financed through a Trust Fund mechanism. A consortium of donors, led by the Global Environmental Facility, made available sufficient capital to be invested on the world financial markets. The annual interest from this capital is used to finance forest biodiversity conservation.

- Various approaches to **debt relief** such as debt rescheduling, debt forgiveness, debt-for-equity and debt-for-nature swaps can be used as a means of simultaneously generating funds, increasing private and NGO participation in biodiversity conservation and reducing national indebtedness.

Box 26: Debt-for nature swaps as a means of financing biodiversity conservation

Several Eastern African countries have engaged in debt-for-nature swap arrangements, under which a portion of a country's debt is purchased at below face value by an outside agency – usually an NGO – and redeemed against local currency which is allocated to national conservation activities.

- **Offsets and credits** can generate flows of funds from international industries to biodiversity conservation. For example under carbon offset and credit arrangements, developed country power utilities finance the operations of a developing country Forest Department, in exchange for credit for the amount of carbon saved or sequestered.

Box 27: Global carbon offsets as a means of financing forest biodiversity conservation in Uganda

Under the FACE programme, the Uganda Forest Department receives funds for afforestation and forest management from a commercial power generation firm in the Netherlands. This money is invested in tree planting in Uganda because forests act as carbon sinks and offset the carbon emissions resulting from power generation.

- **International compacts** are voluntary agreements made by developing countries to engage in policy reforms and biodiversity conservation in exchange for the transfer of financial or technological resources from international sources to support these reforms.
- **Concessions or prospecting rights** can be offered in biodiversity areas and species to companies interested in their possible future uses – for example agricultural, industrial and pharmaceutical applications – of biodiversity and genetic resources.

Box 28: Biodiversity prospecting concessions in Tanzania

A variety of governments in sub-Saharan Africa have entered into biodiversity or genetic prospecting concession arrangements with medical and pharmaceutical organisations regarding the search for naturally occurring biochemical compounds with commercial values. Concession fees and some proportion of promised royalties for any commercially valuable discoveries are paid in advance, and a certain proportion allocated to the *in situ* conservation of genetic resources. These include agreements between the US National Cancer Institute with Tanzania.

- **Internationally transferable development rights** offer for sale units of areas set aside for biodiversity conservation to groups with an interest in biodiversity conservation, or for firms who can use them as an credit or offset.

8.7 CHOICE OF FINANCING MECHANISM

A potentially large range of financing mechanisms exist with potential to be applied to biodiversity conservation. Which financing mechanisms are suitable and should be included in a country's biodiversity strategy and action plan will depend on its exact requirements for funding and biodiversity conservation, the nature and distribution of biodiversity costs and benefits, preference for different arrangements and the structure and composition of the economy.

In most cases the search for biodiversity strategy and action plan financing mechanisms will aim to combine as many funding sources as possible so as to spread risk, and to choose funding sources which are most appropriate to national needs and conditions, sustainable over the long-term, maintain national or local sovereignty over biodiversity, and decrease external reliance and dependency.

8.8 CONCLUSIONS AND RECOMMENDATIONS FROM THE IDENTIFICATION OF FINANCING MECHANISMS FOR BIODIVERSITY CONSERVATION

Identification of financing mechanisms for biodiversity conservation highlights tools for raising funds for the conservation activities specified in the biodiversity strategy and action plan. It gives rise to the following conclusions and recommendations:

- a) Identification of total financing needs for biodiversity conservation;
- b) Identification of already funded components of biodiversity strategies and action plans;
- c) Identification of currently unmet funding needs for biodiversity conservation;
- d) Provision of recommendations for specific additional financial mechanisms for biodiversity conservation to be included in the national biodiversity strategy and action plan.

9. ECONOMIC MONITORING AND IMPACT ASSESSMENT OF BIODIVERSITY

STEPS FOR THE MONITORING AND IMPACT ASSESSMENT OF BIODIVERSITY

1. Identify changes which have occurred in the integrity and status of biodiversity
2. Identify economic impacts of changes in biodiversity
3. Assess the costs and benefits of economic changes
4. Assess the distribution of economic costs and benefits
5. Identify measures for minimising economic costs and biodiversity degradation, and maximising economic benefits and biodiversity conservation
6. Make conclusions and recommendations for measures which will enhance economic benefits and biodiversity conservation in the future.

9.1 WHY MONITOR AND ASSESS THE ECONOMIC IMPACTS OF BIODIVERSITY?

Previous chapters of this manual have been concerned primarily with the early stages of documenting economic aspects of biodiversity, and identifying supportive economic activities for national biodiversity strategies and action plans. The role of economics does not however end with the production and adoption of a biodiversity strategy and action plan, but continues after its implementation.

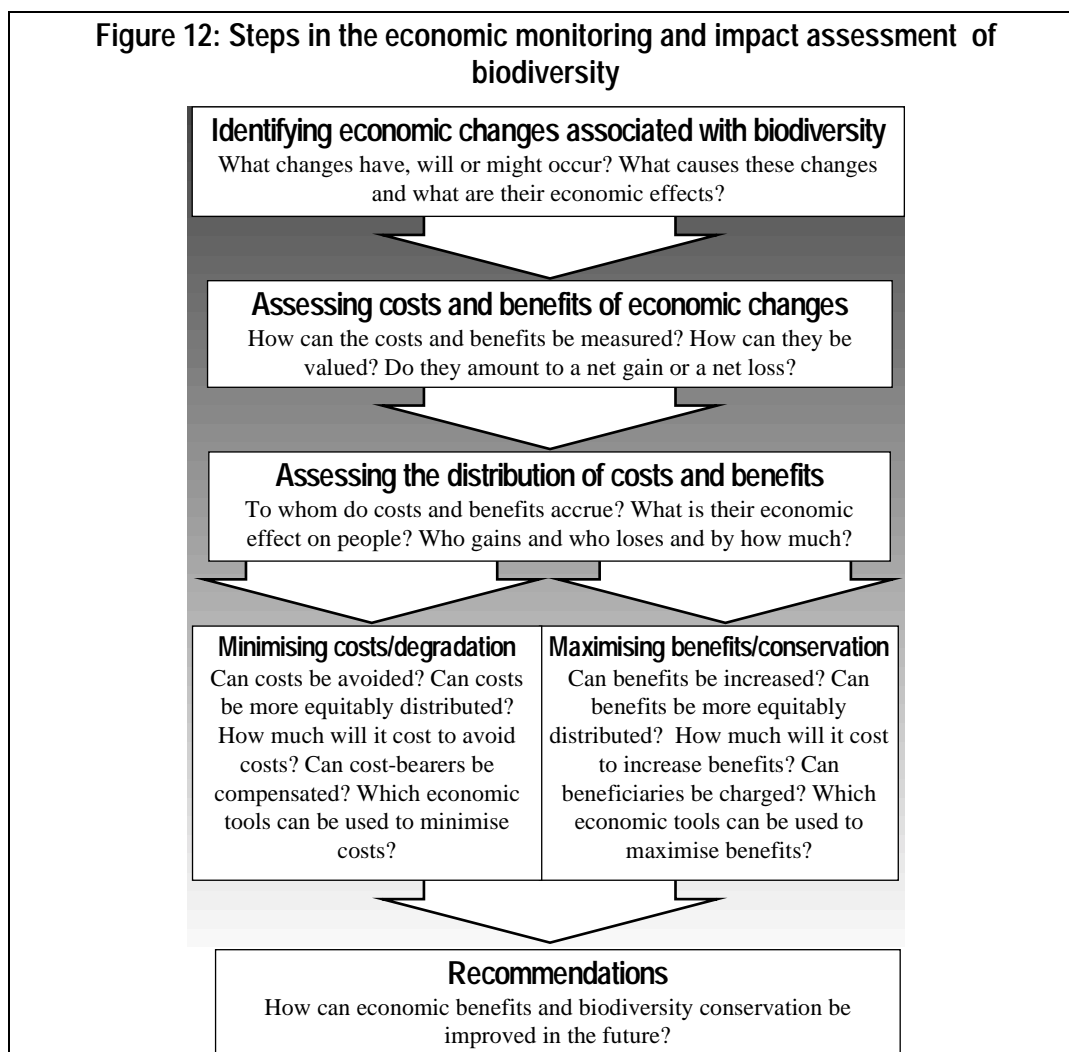
Economic factors and situations, and biodiversity status and integrity, are continuously undergoing change. It is necessary to assess the economic impacts and causes of changes in biodiversity, and to monitor the economic effects of activities set in place as part of biodiversity strategies and action plans.

This chapter looks at the economic monitoring and impact assessment of biodiversity during and after the implementation of the biodiversity strategy and action plan. The aim of economic monitoring and impact assessment is to track the cause and effect relationships between changes in economic and biodiversity variables, with a view to ensuring that future efforts at biodiversity conservation are improved and give rise to economic benefits.

9.2 STEPS IN ECONOMIC MONITORING AND IMPACT ASSESSMENT OF BIODIVERSITY

Economic monitoring and impact assessment of biodiversity is concerned with the economic effects of changes in biodiversity which have arisen as the result of particular projects and programmes or have occurred because of wider economic, political, institutional, social, biological or ecological changes. The steps they follow and tools they use are similar to those used in identifying and planning economic aspects of biodiversity strategies and action plans and include:

- **Identifying economic changes and causes** associated with changes in biodiversity;
- Assessing and where possible **valuing the costs and benefits** associated with these economic changes and seeing whether, overall, they constitute a net gain or loss;
- Assessing the **distribution of costs and benefits**, identifying to whom they accrue, and highlighting who gains and who loses from the economic effects of changes in biodiversity;
- Identifying how the **benefits of biodiversity conservation can be maximised** and the **costs of biodiversity loss minimised**, and distributed more equitably between different groups;
- Making **recommendations for economic tools** which can be used to improve efforts at biodiversity conservation, sustainable use and equitable benefit sharing in the future.



9.3 CHANGES IN THE STATUS OF BIODIVERSITY

The aim of assessing the impacts of changes in the status of biodiversity is to see what economic costs and benefits arise from changes in biodiversity, and to highlight the economic forces which underlie biodiversity changes.

On-going impact assessment of biodiversity status provides important information to planners and decision-makers within and outside the biodiversity sector as to how economic policies, programme and activities can be modified so as to contribute to biodiversity conservation and avoid biodiversity loss. It also demonstrates the impacts of these biodiversity changes on different economic groups, sectors and activities, and highlights tools and measures which are required to mitigate the negative economic effects of biodiversity loss or to maximise the positive economic effects of biodiversity conservation.

9.4 BIODIVERSITY CONSERVATION PROJECTS AND PROGRAMMES

The aim of monitoring and assessing the impacts of biodiversity projects and programmes is to see how they have resulted in economic change, and to highlight ways in which they may be better implemented.

On-going monitoring and impact assessment of biodiversity conservation programmes and projects provides important information to programme and project planners and decision-makers as to whether these programmes and projects have met their targets and how they can be improved in the future. It demonstrates the planned and unforeseen economic changes which have arisen from programmes and projects, the underlying factors which have led to their occurrence and highlights whether biodiversity conservation activities have improved or worsened people's economic status. In the light of this analysis, monitoring provides guidelines and recommendations as to how biodiversity projects and programmes can better improve economic status in the future, and how economic tools can in the future be incorporated into projects and programmes to assist them to better meet their conservation targets.

9.5 CONCLUSIONS AND RECOMMENDATIONS FROM ECONOMIC MONITORING AND IMPACT ASSESSMENT OF BIODIVERSITY

Economic monitoring and impact assessment of biodiversity provide information about the impacts of biodiversity change on economic status, and the impacts of economic change on biodiversity status. It gives rise to the following conclusions and recommendations:

- a) Understanding of the economic factors underlying changes in biodiversity;
- b) Identification of the economic impacts of changes in biodiversity;
- c) Analysis of the distribution of costs and benefits arising from changes in biodiversity, and of the net gainers and losers from these changes;
- d) Recommendations of tools and activities which can improve biodiversity conservation and economic benefits, and minimise or mitigate economic costs and biodiversity degradation.

