Harnessing Markets for Biodiversity

TOWARDS CONSERVATION AND SUSTAINABLE USE

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Publié en français sous le titre :

Mobiliser les marchés au service de la biodiversité
POUR UNE POLITIQUE DE CONSERVATION ET D'EXPLOITATION DURABLE

FOREWORD

Arresting the decline of biodiversity in species and ecosystems is a major objective of environmental policy. Recognising this, OECD Environment Ministers stressed the need for incentive measures to protect biodiversity, including the creation and use of markets for biodiversity products and services, when they adopted the *OECD Environmental Strategy of the First Decade of the 21st Century* in May 2001.

This publication provides a conceptual framework to help users in the identification and use of markets for biodiversity products and services that can promote their conservation and sustainable use. It is aimed at policy-makers, potential investors, non-governmental organisations (NGOs) and practitioners. The publication is illustrated with examples of successful market creation, and discusses some of the main policy issues that arise in the market creation process. It draws on the results of a joint OECD/World Bank Institute International Workshop on Market Creation for Biodiversity Products and Services, held in Paris on 25-26 January 2001.[1] The work also contributes to the implementation of the Convention on Biological Diversity (CBD), which stresses the need for substantial investments to conserve biodiversity, recognising the unique role private sector can play in promoting the sustainable use of biological resources.

The book was prepared under the auspices of the OECD Working Group on Economic Aspects of Biodiversity (WGEAB), and was drafted by Dr. Dan Biller of the OECD Secretariat. It is in part based on a background paper prepared by Dan Biller and Patricia Moles (Consultant). It benefited from in-depth discussions with Karoline Rogge, comments provided by Giovanni Ruta and Philip Bagnoli, and the research and editorial support of Maria Isabel Fernandes Serra and Ann Whitham. Financial assistance was provided by the governments of the UK, Norway and the Netherlands, and there was substantial co-operation with the World Bank Institute. The book is published under the responsibility of the Secretary General of the OECD.

[1] A list of the papers and case studies presented at that workshop is available in the Annex to this report, and some are available on the OECD website (www.oecd.org).

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EXECUTIVE SUMMARY

Biodiversity and its underlying resources have always been important for economic activity. This link can be exploited in order to promote sustainable use and conservation of these resources.

All societies depend on biodiversity and biological resources either directly or indirectly, having used markets to commercialise its products ever since humankind learned the benefits of trading. However, most biodiversity values are implicit rather than explicit, and thus are often not captured by markets. For biodiversity and many other biological resources, the absence of apparent values combined with their "public good" characteristics in the absence of well-defined property rights, have created problems of over-exploitation and unregulated use. Moreover, increasing development pressures have led to what many believe is an unprecedented rate of biodiversity loss. The resulting impacts on global well-being have been sufficient to warrant a global convention - the Convention on Biological Diversity (CBD) - to co-ordinate the international conservation effort.

A first step toward market-based sustainable use requires that economic values be made explicit.

An important first step in the process of biodiversity conservation is to quantify its *economic* values. This helps to identify the potential market value of biodiversity. Valuation methodologies were the subject of recent work of the OECD Working Group on the Economic Aspects of Biodiversity (WGEAB), and resulted in two publications (OECD, 2001c; OECD, 2002a). A second important step in the process of biodiversity conservation is to actually use or create markets to promote conservation and sustainable use. This permits the capturing of values that previously were not securable via markets. As pointed out in OECD (2002a):

Once valued, biodiversity goods and services need to be part of a process that allows rational decisions to be made regarding use or conservation.

"The direct relevance of ensuring that economic values for non-market ecosystem effects are recorded lies in the judgement… that most diversity loss is due to land use change. In turn, land use change is primarily driven by the respective rates of return to the different land uses. A forest converted to agriculture appears to have a higher economic value than as a conserved forest. 'Green belt' land in richer countries appears to have low conservation value relative to the value of the land

for housing developments, and so on. While economic values may not capture by any means all of the 'value' residing in diversity, the importance of economic value derives from its role in altering the accounting balance sheet for land conversion. The higher non-market economic values are, the less likely it is that land conversion that damages biodiversity will be justified. The corollary is that simply measuring non-market values is not enough: they have to be 'captured' through some process that converts non-market values into real financial or resource flows"

This book focuses particularly on the last sentence of the above quote: how markets can be harnessed to conserve biological diversity (biodiversity) and foster its sustainable use.

Marketing of biodiversity is not always possible: some goods and services are better suited for markets; others are not.

When harnessing markets for biodiversity conservation and sustainable use, it is important to first identify the products and services of biodiversity that are most marketable. To undertake such an exercise, it is essential to understand biodiversity in light of its private/public good characteristics. A **private** good is both rival in consumption (one person's consumption depletes the availability of the good to others) and excludable (it is feasible to exclude people – e.g. by charging a price – from consuming that good). **Public** goods and services are those that fail to display either rivalry or excludability. When they display neither characteristic, they are termed "pure public goods" – a relatively common case for biodiversity. Often, however, the characteristics of rivalry and excludability are applicable in varying degrees, rather than as simple binary attributes. Biodiversity goods and services can thus be arranged on a spectrum ranging from "completely private" to "pure public" goods. The policy relevance of these designations is that the more a good or service displays either non-excludability or non-rivalry, the less likely it is that private provision via markets will materialise. Society would often be better off through private provision (less overuse would occur).

Careful consideration is needed of both the appropriate role of markets, and the ways in which that role will be achieved.

Chaper II of this book examines the conceptual framework outlined above – indicating where the private provision of biodiversity goods and services is most feasible. Even in the case of pure public goods (where markets have great difficulty in adequately providing biodiversity goods and services), markets can *assist* policy-makers and society in the provision of those goods and services. Since certain services are not divisible from others, by coupling a non-marketable good or service (e.g. existence of a species) with a more marketable biodiversity good or service, pure public goods may be preserved without relying

on direct private or government provision. Private/public partnerships may work best in these cases.

Because there is much scope for the market provision of certain biodiversity goods and services, policy-makers should consider markets as an integral part of biodiversity policies. Markets for biodiversity should be promoted as opportunities to channel scarce financial resources to public policy goals, via the provision (by alternative means) of those components of biodiversity that would not normally be supplied by markets. Such use of markets is illustrated in Chapter III through Chapter VI, using case study examples.

Private markets show particular promise in the management of agriculture, forestry, and genetic resources.

Chapter III discusses emerging private markets for biodiversity goods and services. Four examples are presented: organic agriculture, sustainable forestry, non-timber forest products (NTFPs), and genetic resources. Organic agriculture, a subset of sustainable agriculture, is the most developed of all emerging markets covered in this book. By growing and processing food using no (or strictly limited) chemical inputs such as fertilisers and pesticides, some benefits from integrating biodiversity into agricultural management systems can be realised. These include long-term productivity increases from soil preservation, reduced disease risks, and, in some cases, higher profit margins. High demand for organic products has led to annual growth rates in sales volumes of around 25 percent. This has led to substantial investment in the conversion of conventional farms into organic ones. In many countries, policy measures have been introduced to mitigate the high costs of this transition (e.g. the period after conversion, during which products cannot be sold as "organic"). While demand for organic agriculture is mainly driven by health issues rather than biodiversity concerns, conversion from conventional into organic agriculture seems to yield a significant positive impact on biodiversity conservation.

For example, in forestry, the demand for sustainably harvested timber can create premiums which encourage market development. . .

Sustainable forestry uses low impact timber harvesting methods that take into account ecosystem conservation needs, and secures long-term continuity of the harvesting activity. Sustainable forestry provides a renewable resource (harvested timber), while at the same time preserving habitat and migration corridors and (thus) genetic diversity, as well as maintaining other ecosystem services. Despite recent expansion, markets for sustainably harvested timber are still small and difficult to assess. However, the niche for certified products is gradually developing, with the Forest Stewardship Council (FSC) already accrediting most certification organisations. Industry participants seem particularly keen on maintaining market share, and there is some

evidence indicating that certified sustainable timber does trade at a price premium. Additional values associated with sustainable forest companies' properties are increasingly being recognized. Their core business is starting to be complemented with other goods and services, such as eco-tourism and bioprospecting.

… while demand for other forest products, such as natural cosmetics and herbal medicines, also helps in conservation and sustainable use.

NTFPs are based on the extractive values of forest ecosystems. Markets for these products are not yet fully developed and do not seem to incorporate biodiversity's full value. Nonetheless, they represent a potential source of income for local populations. Since there is still a large difference in income between extraction activities and agricultural ones, agro-forestry may be a means to combine both in a sustainable way (Chapter VI). While extraction has traditionally been an important economic activity of forest inhabitants, most exchange has taken place on an informal basis. Institutional frameworks need to be developed to allow for commercial exchange of these products. One promising sector is the natural products market, including natural cosmetics and herbal medicines; however, the commercial success of certain species should be viewed with caution, since it may have a long-term negative repercussion on biodiversity due to overexploitation or disruption of ecosystems. When extraction is unable to match increases in demand, or is much costlier than plantations, domestication of NTFPs in plantations is the consequence. This product cycle can be avoided if a price premium is placed on sustainable NTFPs (i.e. when consumers prefer sustainable extraction).

Finally, although the market potential for genetic resources is well recognised, its regulation and its prospective size, among other issues, are not without controversy. While the products discussed above have clear *use* value, genetic resources are primarily linked to the use of the *information* they may contain. For potential sources of genetic material, there is even more uncertainty than in other areas of biodiversity policy. This, in turn, implies an increased potential for information asymmetries and the need for even more carefully considered policies to address markets for genetic resources.

Chapter IV analyses biodiversity as a "club good" or service (e.g. a good that is excludable but non-rival in consumption). Three examples are discussed where this is occurring with some level of success: eco-tourism, parks and reserves, and ecological services.

The most successful and extensive existing markets for biodiversity are in eco-tourism, which is both a public sector and a private sector activity.

Eco-tourism – when undertaken responsibly – conserves the environment and sustains the well-being of local people. It is, therefore, one of the most promising activities for the sustainable use of biodiversity. Eco-tourism, however, is essentially a private sector activity. Although often dependent on public assets such as national parks, it can easily be based on privately held resources. As such, it can be a source of substantial income for public as well as private parks and reserves, and provide significant incentives for the conservation of biodiversity. Private parks and reserves are on the rise, often provide certain services better than their public counterparts, and are arguably more efficiently managed. Finally, while there are a significant number of examples of private provision of ecological services, these tend to be less characterised by excludability. In situations where non-excludability is difficult, dependency on private/public partnerships or public policies (such as government support) increases, in order to ensure long–term viability.

Creating markets for biodiversity sometimes simply requires that governments establish legal instruments that the private sector can value and exchange…

Chapter V discusses some characteristics of biodiversity as issues of "open access" and "pure public goods". Again, the lack of excludability calls for greater policy intervention. This intervention may, nonetheless, be intended to enable the use of markets to achieve their goals – as in the case of policies that create marketable instruments. There are at least two types of economic instruments. First, there are instruments that may limit open access regimes, based on clear property rights. A common example is individual transferable quotas (ITQs) in fisheries. Second, there are economic instruments that create markets to limit the negative impact of activities on ecosystems. Examples include tradable pollution permits and land-use related mechanisms, such as development rights and wetland banks. This latter group is used to reduce the impact of economic developments on land use, by compensating holders of biodiversity land for its preservation.

Harnessing markets for biodiversity conservation and sustainable use is also facilitated by "market enhancers". These are tools used by private (and sometimes public) agents interested in providing capital, diminishing transaction costs, and profiting directly or indirectly from biodiversity goods and services. Two market enhancers are identified in Chapter VI: financial mechanisms and community involvement.

… such as providing the financial capital that encourages profitable (but long term) ventures to succeed.

Financial mechanisms that target investment in biodiversity include: non-market transfer payments, venture capital funds, and mutual funds. While generally responding to a broader definition of "sustainable investments", financial mechanisms can have direct or indirect positive repercussions on biodiversity conservation and sustainable use. Financial mechanisms that are not grant-based generally search for investments in companies that are active in excludable biodiversity goods and services.

Due, in part, to the substantial involvement of the Global Environmental Facility (GEF), non-market transfer payments are the largest existing financial mechanism. These payments fund environmental projects of global interest on an "incremental" basis relative to domestic costs. Debt-for-nature swaps are another class of transfer payments. Through these agreements, a portion of external debt in the hands of a donor country is cancelled, in exchange for environmental commitments on the part of the host country. These market-based mechanisms were popular in the late 1980s. Although they remained so for a relatively short period, in some countries they achieved some success in the conservation of biodiversity.

Most biodiversity-related investment opportunities remain unknown to international and local banks, investment funds, and multilateral agencies. This is partly due to financial institution risk aversion. The inherent high risk of biodiversity markets – natural disasters, volatile markets, etc. – represents a barrier to entry to most traditional banking institutions. This is likely to be the reason why most attention to the sector has originated from high-risk investors, such as venture capital and equity funds.

Capital funds of various forms are increasingly important for mobilising global savings for the benefit of biodiversity …

Some venture capital funds have been active in seeking to generate profit from biodiversity. These include the Terra Capital Fund and the EcoEnterprises Fund in Latin America. Other "green" venture capital funds have been launched in recent years, especially in OECD countries, although none is solely oriented to biodiversity. Most funds have wider investment criteria, but their investment activities tend to have a positive impact on biodiversity as well. Biodiversity venture funds are only a small fraction of the venture capital markets. As a result, biodiversity markets have not yet reached the attention of major venture capitalists.

… including changes in corporate culture which make sustainability a valuable corporate asset.

Private individual investors and pension funds generally invest in mutual funds. Responding to consumer preferences – which include social and environmental factors as well as financial performance in the screening process of investments – there has been a large increase in mutual funds investing in ethically and environmentally responsible firms. "Green" investors exert pressure on companies to adopt social and environmental codes of conduct, and have gradually begun to influence stock market prices. Corporate sustainability principles are used to select and rank companies based on the concepts of innovative technology, corporate governance, shareholders relations, industrial leadership, and social well-being. In 1999, Sustainable Asset Management (SAM) announced a partnership with the Dow Jones Group to develop the Dow Jones Sustainability Group Indexes (DJSGI). This Index is an important benchmark for the development of ethical funds, and represents an interesting first step towards including environmental factors into share values. As investors and market analysts develop more reliable evaluation tools, more sector-specific funds (such as those targeting biodiversity) should develop.

Successful markets for biodiversity will also require a long-term perspective …

Most biodiversity exists in rural areas where people are generally poorer, and property rights are more difficult to enforce. As discussed in OECD (2002a), it is well–known that unsustainable resource use often generates greater short-term benefits than sustainable use. The defence of sustainable use is stronger when one considers longer time horizons and when the effective discount rate of individuals and society is low. As those on the edge of poverty are less likely to be able to plan for the future, a switch into sustainable use systems requires compensating them for foregoing short-term gain – even if they will eventually gain from sustainable management systems.

… support for transition measures that build local support…

Community involvement is, of course, an important "market enhancer", and is more successful if individuals in the community have some previous experience in the activity that generates biodiversity businesses and/or investments. Because most local communities close to biodiversity-rich areas are engaged in farming or hunting, the transition to sustainable use of biodiversity and/or biodiversity conservation usually involves some form of agriculture or alternative use of species and ecosystems, or a combination of both. Often, small farmers and local communities are already engaged in sustainable practices. For those groups, premiums for their products would help expand the market for sustainable activities. In other situations, unsustainable practices are the rule, and local communities need to be convinced of the advantages that conservation or sustainable use may bring, both in the short- and the long-term. This entails some level of education and the provision of information about that activity. Most examples of community-based biodiversity projects therefore rely on some kind of agro-forestry system, ecological service provision, animal viewing, hunting/fishing licensing, or sustainable harvest of particular species.

… and improved information.

Perfect markets assume that their participants are well-informed about the choices they make. However, most of the cases discussed in this book indicate that information is neither fully available nor costlessly attained. The lack of sufficient and reliable information is thus a major challenge for harnessing markets for biodiversity conservation and sustainable use. Private sector, government, and civil society can each contribute, although their final goals may be different. Information instruments seem to be more successful when local and concentrated benefits can be derived. For example, it is easier to stop poaching when rural communities act as monitors and enforcers of hunting rules. Chapter VII presents a brief discussion of the role of information, and instruments aimed at its enhancements.

ISBN 97 2003 03 1 P1
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Chapter 1

Introduction

This book explores the ways in which markets have been harnessed for the benefit of biodiversity conservation and management. Most countries have made commitments, both domestically to their constituents and internationally through Conventions, to safeguard biodiversity by ensuring that its use is consistent with long-term benefits for everyone. Since decisions regarding the best use of biodiversity need to reflect social values, governments have a key role to play in establishing the conditions under which markets will operate. Proper valuation of biodiversity goods and services, followed by market creation in which those values influence choices, is an increasingly attractive alternative. When the process of valuation is sufficiently thorough, the outcome in the market will naturally reflect social choices regarding the best use of biodiversity. This chapter introduces some of the concepts and background issues related to making markets successful tools of biodiversity policy. It introduces concepts such as excludability and rivalry in use that are important determinants of market viability. It also highlights the role that markets can play as a key part of policies to reduce biodiversity loss and that other measures will also be necessary, such as forging public/private partnerships for maintaining biodiversity over the long-term.

I. INTRODUCTION

Biological resources have been commercialised ever since humankind created markets. In fact, the Convention on Biological Diversity (CBD) defines biological resources as: "…genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity."

Biological resources should thus be considered as a subset of biological diversity or biodiversity, defined by the CBD as: "…the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems." (UNCBD, 2000).

Clearly, both biological resources and biodiversity have value. However, accounting for and capturing the total value of biodiversity is not trivial. Markets often fail to incorporate the values associated with biodiversity, resulting in unsustainable harvesting practices and discouraging long-term investments in natural resources in favour of alternative land uses. This comes about due to the economic characteristics often associated with biodiversity. For example, many products and services linked to biodiversity are either non-excludable (it is generally not possible to exclude people from their benefits) or non-rival in consumption (the derived benefits are not depleted by the additional user). In addition, property rights on biodiversity are often unclear and markets fail to indicate their true value. If property rights were clearly defined, enforced, and traded, an important characteristic of environmental problems – the market failure – would be mitigated. Unfortunately, this is usually not the case.[2]

In order to circumvent this problem, economists, ecologists and others created a myriad of methods to try to signal biodiversity values to policy-makers and society at large. The nature of biodiversity values, methods to assess them, and their policy

[2] A broad definition of property rights is given in Annex B. It should be noted that societies have different ways of establishing, monitoring and enforcing property rights. Often but not always, they are established through written laws. Property rights can also take different forms. For example, it is not uncommon to differentiate "unbundled" ownership from user rights; in natural resources. In many countries, mineral ownership rights are separated from surface (land) ownership rights; hence a farmer may farm his/her land but may require a permit from the government to gain user rights to exploit gold under his farm.

implications are the subject of other OECD publications (OECD, 2001c; OECD, 2002a).

The increasing recognition of biodiversity values, however, is also yielding another interesting impact beyond the design and implementation of methodologies to assess them. Producers, consumers, traders, investors and other market participants are finding that creating and using markets to promote biodiversity conservation and sustainable use may at least in part fulfil their economic, financial and environmental goals. In certain cases, even regulators are finding that markets may assist in achieving regulatory standards in an efficient manner. In a sense, therefore, the market can assist in the correction of the market failures.

The potential for market creation and implementation in harnessing biodiversity conservation and sustainable use has been recognised in different ways through the CBD process and earlier OECD work (OECD, 1999a). Researchers have also been paying more attention to market creation to mitigate environmental issues in general and specifically biodiversity (e.g., Chichilnisky and Heal, 2000; Heal, 1999; and Heal, 2000). However, examples scattered throughout the world show that creating and using markets for biodiversity conservation and sustainable use is still at an early stage, with reliable policy lessons in many instances still too premature to be drawn. Therefore, market creation should not be viewed as the preferred remedy for biodiversity conservation and sustainable use, still less as a substitute to biodiversity policy itself. Rather, it should be viewed as a tool to complement other policies and assist society at large to achieve its goals in terms of biodiversity conservation and sustainable use in a more efficient manner.

OECD (1999a) identifies and classifies several incentive measures, including market creation. The present book takes market creation and the use of biodiversity a step further by detailing a conceptual framework analysing the marketable functions of biodiversity. As recognised by Heal (2000), biodiversity in a certain sense can be viewed as Earth's infrastructure; therefore, one can analyse biodiversity in a similar way one analyses man-made infrastructure in public economics. This entails mapping the different economic characteristics that define private and public goods and services against recognised biodiversity products and services. This approach facilitates identifying where and how markets can best complement policies for biodiversity conservation and sustainable use. Chapter II describes this conceptual framework.

When defining private and public goods and services, existing biodiversity products and services are likely to be closer to the private axis, where consumers and producers may more easily reveal their preferences for environmentally friendly products and sustainable practices. Responding to relatively new demands, several industries primarily linked to direct extractive uses are emerging. Chapter III discusses some of these industries including organic agriculture, sustainable forestry, non-timber forest products (NTFP), among others.

The private provision of excludable (but non-rival in consumption) goods and services (club goods) is also feasible. This often captures the direct non-extractive use

and indirect use values. Chapter IV discusses examples of private provision of club goods and services, especially different forms of eco-tourism and nature parks.

Lack of excludability may preclude the sustainable private provision of public goods and services. Markets, however, may still assist in achieving sustainable goals via economic instruments like tradable rights (e.g. tradable development rights, tradable fishing quotas etc.). Such instruments have been extensively analysed in the literature and generally involve trading over well established and regulated property rights over resources or their use (OECD, 1999b). Chapter V briefly presents some examples of regulatory instruments that use markets to achieve biodiversity conservation and sustainable use, and indicates in which cases government provision may be needed.

The increase in demand for biodiversity products and services has been accompanied by investors interested in providing capital to ventures that secure environmentally sustainable investments at positive rates of return. Many of these investments have direct or indirect positive effects on biodiversity conservation and sustainable use. To be successful, they often depend on the involvement of local communities. Chapter VI discusses several of these initiatives from the financial sector and local communities.

Many of the examples provided here underscore the importance of information in biodiversity markets. OECD (1999a) discusses information provision and capacity building as incentive measures. Both private sector and governments have a role to play in correcting market failures linked to information in biodiversity markets. While biodiversity markets are still new and policy lessons are just starting to be drawn, Chapter VII discusses policy instruments, paying particular attention to the role of information. Finally, Chapter VIII concludes the book, indicating the major challenges ahead for harnessing markets with the objective of fostering biodiversity conservation and sustainable use.

Biodiversity markets often deliver private and public goods together. For example, a sustainable forestry project does not only provide an alternative to secure the exploitation of timber sustainably. It may also provide watershed protection, conservation of an endangered species, and other goods and services. By grouping sustainable forestry with private goods, one is to a certain extent making an arbitrary choice. This choice is by no means an attempt to restrict the potential of biodiversity markets as indicated by the conceptual framework; it merely facilitates illustrating the conceptual framework with real cases.

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Chapter 2

Biodiversity and its marketable functions

Market creation attempts to overcome difficulties in formulating government policy by using the market to "reveal" social preferences. For example, "pure" public goods are not suitable for markets. There are two characteristics that together define public goods: non-excludability and non-rivalry in use. Government policy that enhances excludability will encourage markets by ensuring that market-demand can be made to match the environmentally sustainable level of supply. Enhancing rivalry helps to ensure that markets provide the right quantity of a good or service. Proper valuation of biological resources is also needed to ensure that markets allocate biodiversity to its best social uses. Reflecting use-values in the market place will require an understanding of how goods and services that people use are connected to biodiversity. Attention must also be paid to the fact that outcomes in the market can be sensitive to conditions such as the amount of information available to buyers and sellers, the number of buyers and sellers, and cultural and enforcement capabilities. These are factors that policy-makers will have to monitor and adapt to if markets are to successfully complement policies for biodiversity conservation and sustainable use.

II. BIODIVERSITY AND ITS MARKETABLE FUNCTIONS

Only a limited number of biodiversity products and services are traded in the marketplace, mostly at prices that do not reflect their full value. Many biodiversity products and services display some public good characteristic; they are either non-rival in consumption, or non-excludable, or both. Non-rivalry in consumption means that one person's consumption of the good does not reduce its availability to anyone else. Non-excludability entails that once the good is provided, the provider is unable to prevent anyone from consuming it.[3] The public good characteristics of biodiversity induce market failure by precluding its products and services from being easily traded in markets; therefore, prices do not reflect the full value of biodiversity to society.[4]

Non-excludability is the essence of a public good. If the good is freely available to one person, it is freely available to all. In such a situation, why would a consumer pay to acquire this particular good or service? The incentive to 'free-ride' is large, which in turn inhibits private provision since it is difficult to recuperate the cost of provision and make a profit. If approached from a property rights perspective, non-excludability translates into open-access, as in the case of international fisheries, or into a pure public good, as in the case of the existence of species and ecosystems. Services provided by the former are also rival in consumption. With appropriate regulations to address non-excludability, these services can be provided by markets. The latter is both non-rival and non-excludable, depending more on public provision. This can be contrasted with a private good, in which one person's consumption depletes the good's availability to others and for which it is feasible to exclude people (e.g. by charging a price) from consuming the good (OECD, 1999a).

The existence of at least one of the characteristics of a public good, especially if it is non-rivalrous in consumption, does not necessarily preclude markets from delivering it. In fact, there are several examples of "club goods" – goods which are non-rival but excludable – that are provided via markets. However, the more a good or service

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3 Pearce (1986).

4 A pure public good (bad) can also be interpreted as the extreme case of a positive (negative) externality. An externality can be defined as costs (negative) or benefits (positive) resulting from a marketed transaction but accruing to individuals not involved in the exchange. The extreme case would eliminate the "equity" or connecting link between the causers and the receivers, i.e. all are affected (Feldman, 1982).

displays non-rivalry and particularly non-excludability, the less likely it is that private provision will materialise. As a policy issue, it is thus important to understand biodiversity in the light of its public good attributes. In some cases, this may call for policy-makers to form partnerships with the private sector to deliver certain biodiversity goods and services. In other cases, it may be best to allow the private sector to act alone – once some institutional issues have been addressed. An understanding of its public good attributes would even help governments in identifying instances of pure public goods, for which direct intervention will be most effective.

In many respects, the public good problem of biodiversity is remarkably similar to the provision of man-made infrastructure. A coherent regulatory framework plays an important role, but direct government provision may not be necessarily desirable. However, in at least one important aspect, biodiversity products and services differ from man-made infrastructure. While in the latter technology has revolutionised provision (in some cases allowing for unbundling and thus more competition), in the case of biodiversity goods and services, unbundling may not be an important policy goal.[5] Since certain services, are not divisible from others, the creation of marketable services that engender positive externalities may justify indirect government support for biodiversity (rather than a direct attempt to unbundled biodiversity goods and services). In that case, government deregulation would take a different form from that which is currently emphasized for man-made infrastructure in several OECD countries.

As an example of such bundling, suppose that a market for flood control (perhaps by arresting riverine forest degradation) can be successfully established. Flood control is likely to be close to a local public service; therefore, a feasible market solution would be for farmers who do not own land bordering rivers to compensate those who forego production for the sake of protecting or recuperating riverine forests. Further, suppose that a specific type of snail inhabits the riverine forest and may be under threat of extinction through habitat destruction. While the ultimate goal of this market creation is not to supply the existence of the snail species, its outcome may well be flood control coupled with existence. Continued existence of the snail, close to a pure global public good, may not be achievable by itself, even if there is a high willingness to pay by certain sectors of society. However, by associating it with a more marketable biodiversity good or service, pure public goods of this type may be obtained. Moreover, some kind of government support may even be welcomed to ensure that an optimal societal level of provision is attained.

Using the concepts of public goods and externalities to assess marketability of biodiversity products and services, a spectrum of alternatives ranging from "private" to "pure public" goods emerges. The spectrum underscores the degree of the different characteristics of biodiversity goods and services – illustrated by Figure 2.1.

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[5] *Bundling* in this context implies the combination of activities in which economies of scale are important with activities in which economies of scale are not important. *Unbundling* reverses this process.

From an economic perspective, the value of biodiversity products and services can be divided into five categories (OECD, 1996):

- *Direct Extractive Uses*: Includes food, plants and other products of commercial value. Products that are part of this group are either traded or have potential for trade.

- *Direct Non-Extractive Uses*: Includes services provided by biodiversity, relating to ecosystems and genetic material, such as eco-tourism, education, recreation and the development of new pharmaceuticals.

- *Indirect Uses*: Ecological values including services provided by ecosystems such as water supply, flood control, soil conservation, etc.

- *Option Values*: Refer to the possibility that people may want to have the option of using a resource in the future.

- *Existence or Bequest Values*: The amount that people are willing to pay to preserve the existence of biodiversity.

Table 2.1 summarises the primary goods and services provided by ecosystems according to a classification adapted from one developed by the Word Resources Institute (WRI). Although a large number of services described below cannot be valued or traded individually, they should be considered as part of bundled services when assessing the costs and benefits of conserving ecosystems. In principle, at least some of them may be used in developing financial transfer mechanisms that capture their value.

Key elements for the development of markets for biodiversity products and services are consumers' recognition of their values, combined with enforceable regulations. Companies devoted to natural resource exploitation or in sectors highly dependent on natural resources such as fisheries, timber, agricultural crops and tourism have traditionally exerted negative pressure on biodiversity with little reaction from stakeholders. It is only recently, and largely because of changes in consumer preferences, that these activities are gradually being undertaken with innovative practices that include biodiversity conservation as a consideration. These practices are valued and recognised by consumers and opinion makers, resulting in differentiated products in the market. Companies frequently respond to consumer demand through voluntary adoption of new management and production practices and by seeking information dissemination schemes that may have the added benefit of a price premium. Nonetheless, government intervention is still key to biodiversity conservation and, if well placed, may lead to new markets and new industries as well (e.g. consulting services for impact assessment).

Table 2.1. **Primary goods and services provided by ecosystems**

Ecosystem	Goods	Services
Agro-ecosystems	1. Food crops 2. Fibre crops 3. Crop genetic resources 4. Other crops (energy, fodder, etc) 5. Cultural resources	1. Maintain limited watershed functions 2. Provide habitat for humans, birds, pollinators, soil organisms important to agriculture, maintain biodiversity and cycle nutrients. 3. Sequester atmospheric carbon 4. Provide employment 5. Contribute to aesthetic beauty and provide recreation
Coastal ecosystems	6. Fish and shellfish 7. Fish meal (animal feed) 8. Seaweeds (for food and industrial use) 9. Salt 10. Genetic resources 11. Cultural resources	6. Moderate Storm Impacts (mangroves; barrier islands) 7. Provide wildlife (marine and terrestrial habitat) 8. Maintain biodiversity 9. Dilute and treat wastes 10. Provide harbour and transportation roots 11. Provide human and wildlife habitat 12. Provide employment 13. Contribute to aesthetic beauty and provide recreation
Forest ecosystems	12. Timber 13. Fuel wood 14. Drinking and irrigation water 15. Fodder 16. Non timber forest products 17. Food (honey, mushrooms, fruit, and other edible plants; game) 18. Genetic resources 19. Cultural resources	14. Remove air pollutants, emit oxygen 15. Cycle nutrients 16. Maintain array of watershed functions (infiltration, purification, flow control, soil stabilization) 17. Maintain biodiversity 18. Sequester atmospheric carbon 19. Moderate weather extremes and impacts 20. Generate soil 21. Provide employment 22. Provide human, wildlife, and beneficial insect habitat 23. Contribute to aesthetic beauty and provide recreation
Freshwater ecosystems	20. Drinking and irrigation water 21. Fish 22. Hydroelectricity 23. Genetic Resources 24. Cultural Resources	24. Buffer Water flow (control of timing and volume) 25. Dilute and carry away wastes 26. Cycle nutrients 27. Maintain biodiversity 28. Provide aquatic habitat 29. Provide Transportation corridor 30. Provide employment 31. Contribute to aesthetic beauty and provide recreation

Table 2.1. continued on next page.

Table 2.1. **Primary goods and services provided by ecosystems**
(Cont.)

Ecosystem	Goods	Services
Grassland ecosystems	25. Livestock (food, game, hides, fiber) 26. Drinking and irrigation water 27. Genetic resources 28. Cultural resources	32. Maintain array of watershed functions (infiltration, purification, flow control, soil stabilization) 33. Cycle nutrients 34. Remove air pollutants, emit oxygen 35. Maintain biodiversity 36. Generate soil 37. Sequester atmospheric carbon 38. Provide employment 39. Provide human and wildlife habitat 40. Contribute to aesthetic beauty and provide recreation

Source: Adapted from World Resources Institute (2000).

2.1 Creating markets

Clear property rights guarantee and define how the owner of a resource, good or service can use, transform or transfer his or her asset. It does not, however, imply that the resource, good, or service is privately owned. As pointed out by Nicholson (1978):

> *"Two important examples of privately owned goods that are not exchangeable are an individual human's capital (this could be sold only in a society that permitted slavery)*[6] *and an individual's vote (a private good that is provided by the state). Some property may be only'partly' sold. For example, some land plots are sold but the original owner retains 'mineral rights' on those plots. Similarly, governments may buy 'development rights' from farmers to ensure that their land remains in agricultural production [or ecosystem conservation]."*[7]

Alternatively, in some societies communal ownership is well established and accepted. Moreover, it should be noted that clear property rights do not necessarily need to be backed by laws. Informal rights in some societies are also well disseminated and recognised.

In order to create markets, clear property rights are fundamental. If property rights are clearly established and enforced, and if trading is permitted, markets can in principle develop. Naturally, markets will only survive if there is a demand for the specific good or service being traded. Although clear, enforceable and tradable property rights

6 Knowledge which is part of an individual's human capital can be sold.

7 Brackets added.

ultimately mitigate or eliminate sources of market failures such as externalities and public goods, information asymmetries and monopolistic behaviour may still impede the workings of markets.

While perfect markets hardly ever exist, it is useful to understand the conditions in which they may thrive. A perfect competitive market occurs if all of the following conditions are satisfied simultaneously:

- there are numerous small buyers and sellers;
- a standardised product is traded (also referred to as a homogeneous product);
- perfect information flows among all buyers and sellers;
- no collusion amongst buyers and sellers;
- all economic agents can freely enter and exit the market;
- consumers maximise their preferences and sellers maximise total profits;
- the product is transferable.

The condition that there are numerous small buyers and sellers implies that no single agent has a significant impact on quantity supplied or market price. Thus each agent is a *price taker*. Farm products usually provide good examples. As Fisher *et. al.*, (1988) describes:

> *"Even if a small farmer triples his or her output, the percentage change in the total quantity supplied will be completely negligible, and hence so will any effect the individual might have on price. The farmer is therefore right to assume the price at which the output is sold is independent of the amount individually produced."*

This condition disappears when discussing other types of markets, such as monopoly and oligopoly. A monopoly is defined as a market in which there is only one firm and therefore its action affects the market's price and supply. The smaller the number of firms in an industry, the greater the power of each firm.

Standardisation of products guarantees that consumers are equally satisfied when buying a good, no matter the seller. Products are homogeneous in very few markets. If this condition is kept and buyers are aware of all sellers' prices, any seller raising its price will lose all its customers. As long as there is symmetry of information among buyers and sellers, no seller can charge more than the others do.

But neither standardisation of products nor symmetry of information is frequently observed in the real world. Most products are differentiated. Thus, according to each consumer's preferences, it makes a difference from which seller he or she buys the product. Sellers have to struggle to distinguish their products from those produced by competitors.

Asymmetric information between buyers and sellers is also relatively common. Farmers can sell agricultural products, claiming to be organic, even if they used inorganic fertilisers when farming. How can consumers guarantee the quality of the "organic food" they buy? This problem gives rise to a potential market for information and labelling as well as a need for regulation.

The "no collusion" and the "freedom of entry and exit" conditions in the foregoing list ensure that buyers and sellers separately have no influence over market supply and price. For example, a few firms may choose to exit an industry, reducing the industry's supply and thus raising the price. This would attract other firms, which again would put pressure market prices. If the firms cannot collude, they do not have control over prices.

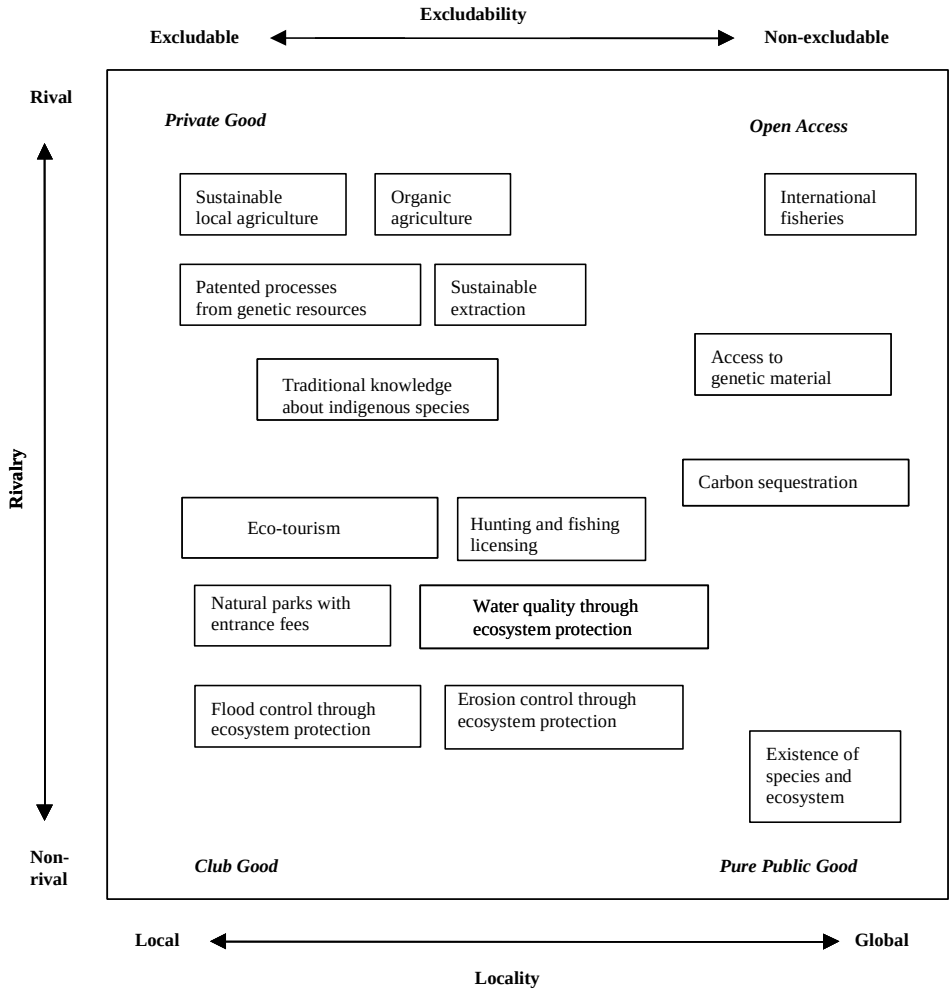
As pointed out by Pindyck and Rubinfeld (1992):

> *"Apart from agriculture, few real world markets are perfectly competitive in the sense that each firm faces a perfectly horizontal demand curve for a homogeneous product, and that firms can freely enter or exit the industry. Nevertheless, the analysis is important because many markets are almost perfectly competitive. Firms in these markets face highly elastic demand curves, and entry and exit are relatively easy. As a result it is profitable to set output so that the marginal cost of production is approximately equal to the price."*

Different policy instruments may enhance the foregoing conditions, facilitating the creation of markets that conserve or sustainably use biodiversity. For example, economic instruments such as tradable permits address the problem of property rights. Information instruments, promoted by grassroots, academia, government, non-government and private institutions, provide all market participants with the necessary elements for decision-making. Certifiers contribute to the standardisation of products, and financial and economic instruments can bring liquidity to the market through financing mechanisms and the introduction of trade exchanges.

Figure 2.1 summarises the various possibilities along the three axes of rivalry, excludability, and spatial extent. The following Chapters deal with these possibilities in greater detail.

Figure 2.1. **Economic characteristics of biodiversity goods and services**



Source: *OECD*

ISBN 97 2003 03 1 P1
Harnessing Markets for Biodiversity: Toward Conservation and Sustainable Use

Chapter 3

Emerging private markets for biodiversity products and services

Markets have long been used to trade biological resources. Yet, due to its public-good characteristics, biodiversity has often been negatively affected by markets that led to unsustainable use and degradation. This process has been changing with the emergence of markets that attempt to capture the private value of biodiversity beyond the simple and immediate resource-use value. There are several markets in which this process is occurring, most notably organic agriculture, sustainable forestry, non-timber forest products, and genetic resources. They all provide unique biodiversity goods and services and face unique policy challenges. The demand for organic produce seems to be largely fuelled by health considerations in OECD and middle income developing countries. When compared to conventional produce, it yields positive impacts to biodiversity. Many consumers are also willing to pay a premium for products made from sustainable forestry. This helps maintain an industry whose products are biodiversity-friendly. Commerce in non-timber forest products (whose production can be biodiversity-friendly) is well established in both OECD and non-OECD countries, and given the variety of products, has the potential to be spread. Genetic resources also have the potential to create important markets that would support the sustainable use of biodiversity.

III. EMERGING PRIVATE MARKETS FOR BIODIVERSITY PRODUCTS AND SERVICES

This chapter discusses some examples of markets for emerging private goods and services associated with biodiversity conservation and sustainable use. Though not unique, this collection of examples likely encompasses most of the private good markets currently available for biodiversity.

3.1 Organic agriculture[8]

Agricultural development and biodiversity conservation are sometimes perceived as incompatible. Biodiversity is indeed negatively affected by agricultural development in many areas since agriculture is often responsible for provoking soil erosion, genetic homogenisation, ecosystem contamination and other factors that threaten sustainability. However, this perspective is changing, and a growing consensus as to the benefits of integrating biodiversity in agricultural management systems is developing. Benefits of biodiversity integration include long-term productivity increase, soil preservation, reduced risk of disease, and, in some cases, higher profit margins. As a subset of sustainable agriculture, certified organic agriculture has become a recognised market label for foods grown and processed using no or strictly limited chemical inputs. Although not fully regulated, the organic products industry is by far the most fully developed of all emerging markets covered here. It already enjoys substantial growth in developed countries and its demand is likely to increase among the higher income population of developing countries as well. Consumers are expressing growing preferences for these types of products, and are therefore attaching a higher value to the inherent qualities associated with them (e.g. chemical free, natural, non-genetically modified).

Organic agriculture includes all agricultural systems that promote the environmentally, socially and economically sound production of food and fibres (International Federation of Organic Agriculture Movements, IFOAM, website). These systems take local soil fertility as being the key to successful production by reducing external inputs and refraining from the use of chemical/synthetic fertilisers, pesticides

[8] Important sources for the material of this section include Moran 2002 and Van Bellegem *et al*. 2002.

and pharmaceuticals. The practice adheres to globally accepted principles, which are implemented within local socio-economic, geo-climatic and cultural settings.

Contrary to common belief, organic agriculture is unlikely to have negative effects on the amount of available food on a global scale. While it is true that organic agriculture in western countries with advanced farming methods is estimated to result in a decrease in crop yield between 5 percent and 20 percent, organic farming methods with the right technology in developing countries could increase yields by 300 percent. Promoting organic agriculture in developing countries thus requires conveying know-how and technology. It would have additional local benefits, for example diminished health risks such as deaths from pesticides use and misuse.[9]

From an ecological viewpoint, organic farming systems are more biologically diverse. Furthermore, they have fewer harsh environmental impacts than conventional systems because they do not rely on chemical fertilisers and pesticides. However, converting to an organic system is a costly undertaking for farmers, usually requiring a 5 year soil-conversion period of lower yields and higher variable costs before the farmer can sell his/her produce as certifiably organic. Frequently the undertaking is accompanied by government support during the conversion period and afterwards while the farmer recovers the cost of converting.

3.1.1 Organic agriculture markets

Though the main demand drivers for organic markets have not been fully explored, health issues associated with the absence of fertilisers and characteristic of being non-genetically modified are thought to be important factors. Whatever the source, consumer preferences for organic produce are strong enough that they are willing to pay a price premium. Evidence suggests that the increase in organic production also has positive impacts on biodiversity when compared to conventional agriculture. In this case, biodiversity benefits are measured in the floral and faunal diversity along the perimeter of cultivated organic fields as well as the field's neighbouring biotopes (even non-cultivated organic arable land and grassland). Furthermore, the diversity of cultivated species is higher on organic land. The removal of synthetic fertilisers and pesticides offers greater potential for wildlife habitat creation and maintenance. Organic farming is considered as the least detrimental form of farming, indirectly contributing to wildlife conservation.

The Soil Association, a leading organic certifier in the United Kingdom has reviewed a number of research studies that investigate the comparative biodiversity benefits of organic and conventional farming. The final report points out "that there is now conclusive evidence that organic farming supports much greater levels of both

[9] For example, it has been estimated that the annual impact of pesticides use in developed countries accounts for 220 thousand deaths among rural workers and other pesticides handlers (WRI 1994).

wildlife numbers and diversity than conventional farming. Furthermore, the total in-field benefits are at the least as significant as the non-crop habitat differences and are unique to organic farming". The report further concludes that "widespread expansion should be considered as the most straightforward, cost efficient and secure policy option for biodiversity, as well as almost certainly by far the most beneficial" (Soil Association website).[10]

The benefits of organic agriculture have translated into impressive market figures, particularly in developed countries. While reliable figures are unavailable, evidence indicates that the demand of higher income population from developing countries are also increasingly being fulfilled by locally grown organic produce. The US and EU certified-organic agricultural market in 1997 was valued between USD 4 billion and USD 5 billion each. Growth rates have recently been around 25 percent annually, compared with a 2 percent growth rate in conventional agricultural markets. Estimates are very optimistic, with the UK expecting to grow from GBP 390 million in 2000 to GBP 500 million in 2002 (Moran, 2002), and Denmark targeting a 20 percent organic market share of the total food-market products in the next couple of years. Germany alone has about 8 000 organic farmers, and organic markets are gradually taking over an increasing share of traditional agricultural activities, reaching up to 10 percent of total production as in the case of Austria. The US witnessed a more than threefold increase in organically farmed land in the last eight years and Canada experienced an annual increase of 15 percent to 20 percent (IFOAM website).

Because of the high value attached to organic products and the relative current scarcity, producers have been offered large sales margins in relation to conventional markets. Margins range from 30 percent to 200 percent depending on the product (OTA, 1999). These margins have attracted conventional producers, and a large amount of investment on conversion to organic agriculture is taking place in the sector. As supply for organic products increases, margins are expected to be lower, and a consolidation in the market is due to take place.

While market numbers indicate an increasing role for organic agriculture in the agricultural sector, the practice remains more costly than conventional farming. Organic agriculture requires more labour since no pesticides are used. Manpower requirements can vary considerably depending on the crop, but in general are estimated to be an additional 10 percent to 20 percent. For example, while labour hours required per hectare (ha) to grow potatoes and carrots are 30 and 1000 respectively for conventional farming, organic farming requires 185 and 1140 hours per ha (PBLV, 1997). The costs are also high due to a lack of know how and resources. As a relative newcomer to the agricultural sector, organic agriculture also faces obstacles related to the cost of conversion to a newer practice, short-comings on the

[10] The report includes research studies commissioned by Agriculture & Food Research Council, BBSRC, English Nature, MAFF, NERC, the Northmoor Trust, the Rhodes Trust, SAFE Alliance, WWF and the Agricultural Ministry in Denmark. In addition, the key findings of 14 other studies are included in the review.

network/chain of commercialisation, limited product reliability and range, and often confusing systems of certification and information provision.

Obstacles are present each step of the way from the farm level to the final consumer – both specifically to each individual level (farmers, processors, trade and customers), and to the links between levels. Farmers struggle with additional costs imposed by the transition period when switching to an organic farm, a lack of know-how and resources such as organic pest control techniques, limited availability of capital and, labour shortages. The processing sector, as the second level, is characterised by few small-scale processing companies. The lack of scale and scope result in increased costs, including extra charges for transport among other factors. Additionally, processors suffer from the absence of widely known brand names and discontinuity in the supply, as crops are highly seasonal in nature. Retail trade, the third level, circumvents marketing obstacles by creating new ways of selling such as specific health food shops, farmers' markets (15 percent of sales) and vegetable subscriptions. However, by now, supermarkets selling organic produce have acquired a sizeable market share. Problems arise as organic suppliers have to fulfil the same economic, logistical and market requirements that are also imposed on other suppliers. If organic products are to become commonplace, they must meet the usual requirements for ordinary market products such as: adequate volume of sales, regular supplies and consistent quality. International trade of organic produce suffers due to the difference in definitions of organic agriculture and differences in certification systems and logos. At the last level, consumers end up facing higher prices for organic products, along with a limited range of products and availability and can only check product quality by relying on an often confusing system of certification.

General operating costs in organic agriculture are still high, relative to conventional agriculture. The lack of co-ordination between activities in the chain causes production not to reach markets, delayed participation of the usual distribution channels (supermarkets), limited range of products, and discontinuity in production. The primary producers - the farmers - often deal with poor links in the chain by taking over functions of other levels, processing their own crops or dairy products and selling them directly to retailers, or at local markets. Since local supermarkets are often poorly stocked, consumers turn to local farmers and markets, even though this involves more time and travelling greater distances. Farmers and consumers therefore attempt to create the one step model in order to avoid the problems associated with the chain/network model.

As these observations suggest, there are still many reasons for not engaging (or even abandoning) organic farming. At the farm level, failed producers are divided in two groups: those who either could not sell their produce or could not receive a sufficient premium; and, those who were motivated by lifestyle considerations and principles but had little experience and knowledge to secure a sufficient livelihood. Surveys indicate that: marketing and market incentives problems (travel distance from retail/wholesale outlets); cost issues; and lack of technical information are among the main causes for ceasing organic production.

3.1.2 Policy issues

The quantity and quality of information available in the production, processing and marketing chain of organic products suggests the potential for information related market failures. This issue is discussed in more detail in Chapter VII. Specifically related to organic agriculture, however, research and quality information is still needed to better define guidelines and principles for organic agriculture practices and their links with biodiversity conservation, enhancement and sustainable use. An adequate system of information dissemination, including certification and labelling, is also needed to ensure both that each level is well-informed, and that information asymmetries between levels diminish. As organic markets grow, the need to guarantee the origin and homogeneity of products and services increases. Without safeguards, the industry's reputation may be tarnished by a few members that claim to be organic, but in fact are not.

3.1.2.1 Non-governmental responses

The recognised market and environmental potential of organic agriculture prompted both the private sector and non-governmental organisations (NGOs) to attempt to mitigate the obstacles faced by the industry. In order to secure better and more reliable supplies, some supermarkets and large retail chains implemented direct conversion support to farmers and use long-term forward agreement on volume and price. While this may have clear advantages in terms of establishing production methods and ultimately industry standards, the participation of large retailers also concentrates buying power and may lead to prices being dictated. Given scenarios of decreasing future premiums, farmers have responded by forming co-operatives and securing more advantageous agreements. For example, OMSCO - a co-operative in the UK - has enabled the establishment of a sustainable marketing framework for organic milk and other dairy products through a lucrative 5 year contract with Sainsburys. This contract became a benchmark in the industry. Industry consolidation can further facilitate the design and implementation of acceptable organic agriculture standards.

Support schemes may also materialise from sectors not directly involved with organic agriculture, recognising that this private good may have additional characteristics associated with it. In the UK (Wessex Water), Germany (Augsburg, Dortmund, Göttingen, Leipzig, München, Osnabrück and Regensburg), and Luxembourg water companies and municipalities pay local organic farmers for water protection and conservation purposes. The rationale is that these payments are less costly than removing pesticides and nitrates from water sources (Lampkin *et al*., 1999; ENDS, 1999).

In developing countries, organic and more benign forms of agriculture have also developed for local or export markets as a means of protecting the environment. However, poor farmers generally do not have easy access to sophisticated local or international markets and the organic character may disappear once farmers have enough income to invest in farming inputs. While the important marketing channels that

are starting to be developed in the US and European Union have not reached developing countries, more sophisticated producers have, on their own, tapped into local and international demand for organic products. For example, supermarkets in large Latin American cities are offering organic products in distinctive sections and health food stores are not unusual. Furthermore, even large landowners are starting to engage in more benign forms of agriculture in bulk commodities (such as soybeans) for environmental reasons. For instance, the use of direct drilling has been increasing in Brazil throughout the 1980s and 1990s.[11] While not pollution-free and demanding high capital investment, direct drilling has several environmental advantages including better maintaining local biodiversity. Some of these advantages have a direct impact on agriculture production (Bale *et al.*, 1997).

The issue of certification has also been tackled by non-governmental measures. For example, IFOAM accredits country-specific certification schemes to facilitate trade. Internationally recognisable certification standards are still lacking. While the diversity of certification schemes allow for the different economic and philosophical origins of organic agriculture, a single simple standard can reduce the cost of seeking information, protect consumers from false claims, and facilitate the understanding of requirements expected to be fulfilled by producers.

3.1.2.2 Governmental responses

On the one hand, government support generally focuses on financial assistance for farmers, especially during the transition period from conventional to organic farming and post-conversion support. As illustrated in Box 3.1, the support may take form of a premium per ha, thereby acting as an incentive to convert. On the other hand, some OECD governments are still actively promoting conventional agriculture and its market position, often via perverse incentives, which makes organic agriculture less attractive in relative terms. If future premiums indeed diminish and governments want to maintain the competitiveness of organic agriculture for its perceived external benefits, it is likely that they will have to revise their current policies towards conventional agriculture. Regarding non-OECD countries, government financial support seems minimal, and government-related growth-induced measures may be more related to export support.

Governments may also have an indirect role in promoting organic agriculture through research and development. This may mitigate the lack of know-how and technology available to farmers in both OECD and non-OECD countries. While governments have begun to undertake this role, research efforts in organic agriculture

[11] Direct drilling (also known as no-till or zero-till farming) is an agricultural technique adopted from developed countries. It generally diminishes the use of modern inputs and minimises the movement of machinery over the soil. Since it depends on special machines, direct drilling is capital intensive, requiring substantial investments. The technique eliminates ploughing and grading, reducing erosion and soil loss, using dead vegetation to control weeds.

still lag behind its conventional counterpart. For example, in The Netherlands the aim is to have 10 percent of agriculture research focus on organic issues. Latin American countries such as Cuba, Brazil and the Andean nations have on-going training and experimental organic farms linked to universities and agriculture institutes (IFOAM website).

Box 3.1 **Organic agriculture in The Netherlands**

In The Netherlands, both the number of organic farms (from 521 in 1995 to 786 in 1999) as well as their average size (from 21 ha in 1991 to 27.5 ha in 1999) are steadily increasing. By 1999, organic farms covered 21 511 ha of land, and this sector accounts for approximately 1-2 percent of agricultural activity. Also, the retail sale value of organic products increased to 515 million guilders in 1999 which is 1.1 percent of total Dutch agricultural retail trade.

Government financial support to organic agriculture is based on a premium which is paid per ha. In 1999, this premium ranged between EUR 227 and EUR 2 270. In 2000 and 2001, it was calculated at 65 percent of income loss, but in 2002 it will be reduced to 50 percent of these costs. Eventually, the aim is to drop the premium entirely in 2003. This reflects the attitude that instruments should focus more on facilitating market forces; therefore, it will be important to generate and spread knowledge among primary producers. Indirect aid in the form of advisory, public education and marketing support is needed to overcome information deficiencies among both producers and consumers. Several Dutch initiatives took on the challenge of the chain/network specific organisational measures, which can be illustrated by framework covenant chain parties, and partnering events. Link-specific organisational measures have been tackled as well, e.g. by study clubs and labour pools.

Source: Van Bellegem *et al.* 2002.

3.2. Sustainable forestry

Timber extraction has, in some cases, had a negative effect on biodiversity, frequently damaging habitats and ecosystems. For many years, environmental activists have been raising a concern about forest depletion. As society demands more environmental and social responsiveness from the industry, low impact timber harvesting methods that attach a value to ecosystems are being developed. While plantations exist as an alternative, particularly during the past 20 years (both in developing and developed countries), as of 1995 only 16 percent of the world's round-wood supply originated from such plantations. Thus, natural forests still account for the largest share of timber origin (Best and Jenkins, 1999).

In general, sustainable forestry can be grouped in two major categories:

- sustained yield forestry ensures the continued ability of the land to produce timber which can be harvested into the indefinite future; and

- sustainable forestry maintains the existing biological diversity in the ecosystem, its ecological productivity, and its continued ability to provide

> a full range of products and ecological services. It also emphasizes the forest's ability to meet the needs of current and future generations through vegetative management that falls within the range of disturbance under which the ecosystem has evolved.

The first definition refers primarily to a concern for sustaining production, timber in particular. This concern dates back at least to the 19th century with the work of Faustmann (Faustmann, 1849). The second definition, on the other hand, also encompasses ecological services and thus additional pure and impure public goods. The latter is more applicable to the issues discussed here, and clearly distinguishes forest plantation from natural forests. It should be noted however that the second definition does not preclude the possibility of timber extraction from natural forests, as long as the overall impacts on other potential biodiversity goods and services are minimised.

Sustainable forestry operations harvest wood from forests based on silvicultural practices that meet management objectives, efficiently create conditions that result in the desired vegetative composition, maintain soil productivity, ensure conservation of biological diversity, and continue to produce goods and services for society while minimizing negative consequences. Although the short-term negative impact on biodiversity of any forest management activity can be argued from a strict conservation perspective, sustainable forest management activities contribute to the preservation of biodiversity by providing an alternative to the more harmful conventional practices and by releasing pressures on land use changes (Best and Jenkins 1999). Sustainable forest systems can preserve habitat and migration corridors, provide renewable resources and preserve genetic diversity. In addition, they maintain other ecosystem services such as greenhouse gas sequestration, watershed preservation and soil erosion prevention.

3.2.1 Sustainable forest markets

Timber is largely traded as a commodity, and it is an important source of income of both developed and developing countries. The value of world wood consumption is estimated at USD 400 billion, with 75 percent of the total used for industrial purposes. Markets for timber products are fully developed, with North America, Scandinavia and Japan providing about two-thirds of the world's forest products (FAO, 1999b). Timber markets are following a similar trend seen in agricultural markets, in that producers are shifting to the production of specialty products to meet consumer demand, and away from commodity production. Developing country participation in world timber trade is less important in volume, but has been growing. Consumption of timber for fuel purposes still dominates timber extraction in emerging markets.

Despite their recent expansion, markets for forest products that are certified to be sustainably produced are still small and difficult to assess. The only available information thus far refers to the number of hectares under certification, which does not necessarily translate into products entering the market. Although market size is still unknown, a niche for certified products is gradually developing, as a result of consumers', traders', and wholesalers' interests. Moreover, the leading producers in the

industry are seeking certification. For example, the three largest forest companies in Europe (AsssiDoman, Stora and Korsnas) have converted over 6 million hectares to Forest Stewardship Council (FSC) certification (WWF, 1998).

Timber that is certified to have been extracted with sustainable methods has on occasion traded at a premium when compared to prices of conventional timber. This premium ranges from 5 percent to 15 percent in the case of tropical timber (Precious Woods, personal communication 1999). In addition, forest companies are increasingly recognising additional values of their properties associated with ecosystems services, eco-tourism and bioprospecting programs.

3.2.2 Policy issues

Market failures in sustainable forestry are associated with the complex nature of the goods and services related to it. In the case of tropical forests, this is augmented by the fact that these forests are generally located in less developed countries, where property rights are either non-existent or insecure and more difficult to enforce due to institutional fragility and lack of capacity. Complexity of many tropical ecosystems, such as the high level of species diversity with associated challenges for timber processing, utilization, and marketing, further aggravates the problem. Moreover, since poverty and other economic forces such as pressures from alternative activities may increase the uncertainty with which people view the future, poorer societies may choose short-term economic activities over more sustainable longer term activities. Political uncertainty, and associated discounting of the future by timber concessionaires, are also important factors in hampering sustainable forestry in areas such as the Brazilian Amazon, Indonesia, Malaysia, and the countries of the Congo Basin. In some cases, traditional or previously accepted property and resource use rights have been circumvented or overlooked by logging companies and the responsible government agencies. These factors act as disincentives to engage in sustainable forestry projects. Therefore, conferring property rights to existing used land alone may not be enough (OECD, 1996; OECD, 2002a; OECD, 2002b). Well-targeted policies may be needed if sustainable forestry is to develop. Some examples are discussed below.

3.2.2.1 Non-governmental responses

The global tropical timber market currently focuses on a relatively small proportion of the tree species found in forest stands. To improve operational efficiency and profitability, sustainable tropical forestry must increase the diversification of tree species utilized, and participate in markets for other goods and services that a forest may yield without significantly jeopardising its related ecosystems.[12]

[12] Despite a large consensus on the positive impact of sustainable forestry, some critics have indicated that traditional single timber extractions may be less damaging than the sustainable harvesting approach of multiple species (Rice, 1997).

Well-targeted public relations and advertising campaigns may be needed to ensure that potential consumers understand that not all forest products contribute to forest destruction, become familiar with timber from species other than the traditional ones, and recognise the multi-use of forest products. For example, many rainforest tree species can be successfully used for outdoor furniture, patios and decks with minimum treatment, since they come from flooded-forest regimes (igapos) and developed natural resistance to rotting, insects and other common sources of natural damage (Kahn, 2002).

Eco-certification can also play a major role. Certification is performed by many entities, including:

- organisations accredited by FSC, which reported about 17 million hectares certified worldwide by July 1999;
- member companies of the American Forest & Paper Association and their suppliers under its Sustainable Forestry Initiative (SFI), for which over 24 million hectares had been independently certified by the end of 2001;
- European forest areas under the Pan-Euorpean Forest Certification (PEFC) standards;
- Canadian forest areas under the Canadian Standards Association (CSA) certification standards;
- forested areas worldwide under the International Standards Organisation Environmental Management Systems standards (ISO 14001).

Non-timber forest products (NTPFs) such as exotic fruits, nuts, dyes, fibre and latex are also important and are discussed in more detail later.

3.2.2.2 Governmental responses

As with other natural resources such as petroleum, natural forests generate resource rents associated with them.[13] Due to nature's productivity, resource rent in natural forests is defined as the difference between the cost of cutting a tree and the market value of the tree cut. Since natural forests in many countries are publicly owned, there is substantial debate on how to share this resource rent between an exploiting firm and the general public. Governments often attempt to capture this resource rent via concession fees that may take different forms (e.g. area-based, undifferentiated volume-based, differentiated volume-based). Moreover, to maximise short-run economic gains, governments may agree to short-term leases. None of these practices are necessarily good for sustainable forestry. Fees targeting resource rents do not generally take into consideration ecological functions, though they may impact ecological services by changing the exploiting firm's incentive structure. The length of concession agreements may clearly impact a firm's behaviour – with short term

[13] Resource rent is also known as scarcity rent.

concessions being problematic from a sustainability view point. While preferable, long-term concessions do not secure sustainable behaviour either – firms may have higher discount rates than those which may be socially desirable (Kahn, 2002).

As indicated by the second definition above of sustainable forestry, one can identify at least two ecological determinants of sustainable forest management: (1) the severity of any disturbance caused by the exploitation; and (2) a forest's capacity to recover. A government interested in promoting sustainable forestry should focus on these factors, without necessarily hampering the potential development of markets. A detailed discussion of steps to undertake a sustainable forestry policy is well beyond the scope of this book and is the subject of a prolific specialised literature. These steps include both governmental and non-governmental responses, and are a function of political, cultural, economic, social and ethical realities in the country involved. However, as proposed by Kahn (2002) some ingredients of the steps may include:

- a well-developed, cross-sectoral and participatory system of ecological zoning;
- a complete and detailed inventory of areas set aside for forest concessions should be undertaken by government agencies or independent third parties;
- concession fees to capture resource rents should be designed so as to minimise negative ecological impact;
- a system of monitoring through Geographic Information Systems (GIS), field audits, and remote sensing techniques should be in place;
- engaging preferably on long-term concession agreements with well-defined harvesting parameters possibly backed by a significant performance-based bond, which is returned to the company once it is established that the company complied with the agreed parameters;
- other forms of regulations including social and labour goals.

Essential components of sustainable forest management include vegetation management decisions based on a resource inventory and scientific knowledge of the ecological relationships of tree species and their associated flora, fauna, and a biotic environment and of the human role in ecosystem management, monitoring of outcomes from decisions, and incorporation of knowledge gained from management in future decisions. In addition to the regulatory measures indicated above, governments may also facilitate certification schemes for sustainable forestry by disseminating information about them, and promote transparency about concessions provided on public forests.

Finally, the development of markets for carbon sequestration (which is closer to a pure public good) may also be beneficial, but is highly dependent on public policy.

These markets, however, should be designed in a way not to stimulate the conversion of natural forests in other forms of forestry or agricultural use.

3.3 Non-timber forest products (NTFPs)

As with other products discussed in this Chapter, NTFPs are often close to private goods in the spectrum of private/public goods and services. As with timber, they may be derived from natural forests that are publicly owned or managed as commons, but are primarily exclusive and rival in consumption. While the synergies between sustainable timber harvesting and extractivism of NTFPs are apparent, NTFP extraction is usually independent of any timber harvest activity. Because most NTFPs are found in the under story where canopy openings may favour certain species, they may be positively as well as negatively affected.

Trading with NTFPs is not new. Informal exchanges and commercial exchange among forest inhabitants and others have been an important economic outcome of extractivism. Products of some species extracted from the wild, such as spices and ginseng, have been traded as commodities on the global market for centuries. Yet, it is only recently that local governments, NGOs and Official Development Assistance have promoted the development of institutional frameworks that allow NTFPs to have formal commercial exchange. Further, it should be noted that NTFPs are not exclusive to less developed countries, as wild fruits, mushrooms, herbal supplements, decoratives, craft materials, and medicines are also important in developed countries.

3.3.1 NTFPs markets

According to FAO, at least 150 NTFPs are significant in international trade with an estimated value of USD 11 billion in 1997 (Best and Jenkins, 1999). Palm hearts, wild fruits, nuts, oils, plant gums, insects, latex, spices, as well as, handicrafts made by the native people, are abundant in tropical forests. They represent a potential source of income for local populations. For example, the income generated by extractivism in Brazil during 1995/96 was around USD 430 million, of which USD 322 million refer to non-timber products. Income generated from these activities is concentrated in a few products: out of 82 products included in the survey, the top six products account for 86 percent of income – despite efforts by policy-makers and donors to diversify extractivism of non-timber forest products. One of the reasons points to the large difference in income between extractivism and agriculture, the latter generating a far higher income. This may indicate that agro-forestry may be a more viable option when equating profits and ecological concerns (Wunder, 1999). It should also be noted, however, that interest in sustainable extractivism from forested lands containing high levels of biodiversity by governments and NGO's is new. A variety of models are emerging in other regions such as Central America and the Caribbean Basin, linking sustainable use of biodiversity to other community benefits (Lagos-Witte, 2002). Table 3.1 presents the main NTFPs.

Table 3.1. **Important products derived from non-timber forest resources**

Category	Important products (lists not exhaustive)
Food products	*Nuts*: brazil nuts, pine nuts, malva nut, walnuts, chestnuts. *Fruits*: Jujube, sapodilla, ginkgo, bush mango. *Edible fungi*: morels, truffles and other mushrooms. *Vegetables:* bamboo shoots, reindeer moss, various "green" leaves, palm hearts, wild onions (ramps). *Starches:* Sago. Birds' nests. *Oils*: Shea butter, babassu oil, illipe oil. *Sap and resin:* Maple syrup, birch syrup.
Spices, condiments and culinary herbs	Nutmeg and mace, cinnamon, cassia, cardamom, bay leaves, oregano, etc.
Industrial plant oils and waxes	Tung oil, neem oil, jojoba oil, kemiri oil, akar wangi, babassu, oiti cica and kapok oils. Carnauba wax.
Plant gums	*Gums for food uses*: arabic, tragacanth, karaya and carob gums. *Technological grade gums*: talha and combretum gums.
Natural plant pigments	Annatto seeds, logwood, indigo.
Oleoresins	Pine oleoresin. copal, damar, gamboge, benzoin, dragon's blood, and copaiba oil. Amber.
Fibres and flosses	*Fibres*: bamboo, rattan, xateattap, aren, osier, raffia, toquilla straw products, cork, esparto, Erica and other broom grasses. *Flosses*: kapok.
Floral greenery	Beargrass, boughs, Club moss, Galax leaves, Grape vine, Lycopodium, Mistletoe, Rhododendron, Salal, White birch bark.
Vegetable tanning materials	Oak, mimosa, chestnut and catha/cutch.
Latex	Natural rubber, gutta percha, jelutong, sorva and chicle.
Insect products	Natural honey, beeswax, lac and lac-dye, mulberry and non-mulberry silks, cochineal, aleppo galls, kermes.
Incense woods	Sandalwood, gaharu.
Essential oils	Eucalyptus, Canaga oil (ylang-ylang), Aniba, Sandal oil.
Plant insecticides	Pyrethrum, Derris,Medang and Peuak Bong.
Medicinal plants	Around 5000 to 6000 botanical entering world market every year.
Animals and animal products	Ivory, trophies, bones, feathers, butterflies, live animals and birds, bushmeat, etc.

Source: Secretariat of the Convention on Biological Diversity (2001).

Wild fruits, mushrooms and herbal supplements are also important in developed countries. For example, the world herbal supplements market was estimated in 1997 to be approximately USD 16.5 billion and has been experiencing high growth rates (Gruenwald, 1998). Wild mushrooms harvested in the western US were valued at USD 40 million in 1992 (Best and Jenkins, 1999). From 1991-1998, the 12 leading importing countries acquired 340 000 tons of medicinal and aromatic plant material, the majority of which was obtained from wild native sources, at a value of USD 1 billion. Countries leading in export of medicinal and aromatic plant material were China, India,

Germany, USA, Chile, Egypt, Singapore, Mexico, Bulgaria, Pakistan, Albania, and Morocco (Lange, 2002).

Consumers in the US and Europe are increasingly choosing natural cosmetics and herbal medicines. Europe has a better-regulated and established market (valued at USD 7 billion) with Germany being the leading consumer country followed by France and Italy. US authorities took an interest in these types of products in the 19th Century, and began to regulate their marketing as dietary supplements in the 1970's and 1980's. The result was an exponential increase in sales until the late 1990's; since then the market has declined drastically. Among internationally leading herbal remedies are Ginkgo Biloba, St. John's Wort, Saw Palmetto, Echinacea, Ginseng and Valerian (Blumenthal, 1999). It should be noted, however, that despite most herbal remedies being classified as non-timber forest products, their commercial success in part has encouraged their cultivation and growing in agricultural systems. This guarantees the availability of the large volumes demanded by the market and the homogeneous composition of the plant ingredients (Gruenwald, 1998). But this is not universal. Species such as St John's Wort are far more accessible, and can affect the market differently than less widely distributed endemics such as ginseng. Table 3.2 provides some examples of NTFPs market values.

Table 3.2. **Examples of NTFP international trade values**

NTFP	World's import (million USD)	Notes
Natural rubber	4 221.8	Tropical moist forest regions, from intensively managed plantations, agro-forestry systems and natural stands (extractive reserves) of *Hevea brasiliensis*
Ginseng roots	389.3	Tropical or subtropical, both from wild and plantations
Essential oils	319.4	Various regions, both from wild and cultivated resources
Cork	310.7	Mediterranean regions from managed natural stands and plantations of *Quercus suber*
Honey	268.2	Worldwide product from intensively or extensively managed and wild resources
Walnut	215.9	Temperate from cultivated populations of *Juglans spp.*
Mushrooms	206.5	Temperate and sub-tropical both from wild and cultivated populations
Rattan	119.0	Tropical rainforests, mostly from natural stands, few plantations in Asia
Gum Arabic	141.3	Tropical arid regions, mostly from wild or extensively managed natural stands of *Acacia senegal* and *A. seyal*
Brazil nuts	44.3	Amazonian rainforests, from wild or semi-intensively managed natural stands of *Bertholetia excelsa*
TOTAL NTFP	11 108.7	

Source: Secretariat of the Convention on Biological Diversity (2001).

3.3.2 Policy issues[14]

NTFPs are harvested under different management regimes, ranging from: agro-forestry systems, extraction reserves, and sustainable forest management areas. Agro-forestry systems generally incorporate the use of trees coupled with the planting and maintenance of an agricultural good. Examples include shade coffee, and sustainable cocoa, among others discussed in more detail in a later chapter. Sustainable forestry has been discussed in a section above. However, while extraction is perhaps the most common form of NTFPs harvesting, it is not always sustainable. In many regions, harvests of NTFPs from wild sources are often uncontrolled and treated as "open access", resulting in severe resource depletion.

Traditionally, markets for NTFPs are complex and characterised by small, dispersed producers. They have little experience in marketing, restricted access to credit and often face high costs of delivering the goods to markets. NTFPs are often perishable and need a well developed infrastructure network to reach markets. Furthermore, in some cases, quarantine regulations in developed countries serve as an obstacle for NTFPs to increase their share of the world trade, and consumers are still not knowledgeable about these products. Prices and demand are subject to extreme fluctuations and the quality of products varies significantly (Kahn, 2002; Acharya, 2002).

For the reasons described above, NTFP markets have been slow to develop beyond the local level. Their development should also be undertaken with care. Market success may lead to over harvesting as in the case of palm hearts in the Brazilian Atlantic Rainforest and Tagua nut – "the vegetable ivory". Ultimately, the worst possible scenario would be if NTFPs become extinct, or if pristine forests were cut to give way to plantations of products that were originally NTFPs. Market success, however, may also help by stimulating the conversion of agricultural land into NTFPs plantations, thereby diminishing the pressure on forests. In this case, NTFPs would become like any other agricultural product, and in principle should face the same type of regulations.

In general, the policy issues linked to NTFPs are similar to those of organic agriculture and sustainable forests. NTFPs may face more challenges because they are still primarily consumed in local markets with little capital to expand. In this sense, they face obstacles similar to community based initiatives discussed in a later chapter. An important concern related to NTFPs is to ensure that they are indeed harvested in a sustainable way. This will require including NTFPs in resource inventories, developing knowledge on distribution, regeneration potential, and ecological relationships, including NTFPs in land management and project plans, monitoring harvest levels, and incorporating monitoring results back into management regimes. Certification of NTFPs should not occur without these conditions, but could play a positive role in promoting

[14] Due to the available information, this section targets primarily developing countries.

their conservation, allowing a premium for the conscientious producer while signalling to concerned consumers the true quality of the product purchased.

Although NTFPs may originally represent a value driver for biodiversity conservation, the commercial success of certain species might have a long-term negative repercussion on biodiversity. Extraction has been unable to follow increases in demand. Since supply is insufficient and prices increase, alternative cultivation techniques introduce competitive products harvested with superior technologies, better quality and at lower costs. The more homogeneous products are likely to displace extraction outputs from markets. Many resources of forest origin, such as cocoa, cashew, guaraná, palm heart, and latex experienced a similar historical product cycle. This is likely to occur with successful herbal remedies as well, unless a premium is placed on sustainable herbal products. Nonetheless, Wunder´s analysis of Brazil's extraction products concludes that although it does not represent the "ultimate" solution for biodiversity conservation, it *"facilitates a steady flow of new products that are gradually integrated into the market economy, as an intermediate phase between biodiversity's option values and the stage of full commercial (domesticated) integration."*(Wunder, 1999).

3.4 Genetic resources

The market potential for genetic resources derived from natural resources is well recognised. For example, in the United States alone, 86 of the 150 most prescribed drugs are derived from, or patterned after, natural resources (Grifo *et al.,* 1996). The CBD recognises this potential in article 15 (paragraph 7) by stating that:

> *"Each Contracting Party shall take legislative, administrative or policy measures, as appropriate and in accordance with Article 16 [Access to and Transfer of Technology] and 19 [Handling of Biotechnology and Distribution of its Benefits] and, where necessary, though the financial mechanism established by Articles 20 [Financial Resources] and 21 [Financial Mechanism] with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources. Such sharing shall be upon mutually agreed terms."*[15]

Moreover, contracts regulating access to genetic resources and benefit sharing (ABS) among the different actors including governments, private sector and civil society, are already in place. The best known example is perhaps the contract between Merck, the world's largest pharmaceutical firm, and Costa Rica's Instituto Nacional de Biodiversidad (INBIO) dating back to 1991. In exchange for a limited number of samples to be used in pharmaceutical research, Merck paid an up-front fee of

[15] Brackets added.

approximately USD 1 million. If commercial products are developed, INBIO will receive royalties, although the terms of these were not disclosed. Although the details of the Merck/INBIO contract are not fully known, it may be considered a trend-setter in the industry and several others materialised after 1991 (Ten Kate and Laird, 1999; INBIO, 2001).

While the market potential for genetic resources is recognised, its regulation and its prospective size among other issues are not without controversy. While the other products discussed here have clear use value, genetic resources are primarily linked to the use of the information they may contain. This increases uncertainty, the potential for information asymmetries and the complexity of policies to address markets for genetic resources. A detailed discussion of these issues can be found in OECD (1997c) and (1998b) and Ten Kate and Laird (1999).

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Chapter 4

Biodiversity as a "club good"

"Club goods" are non-rival in use, but excludable. Since they are excludable, there is some scope for private sector markets to provide them. Eco-tourism is one of the best examples: eco-tourism is garnering an increasing share of the growing tourism industry. It may involve different beneficiaries with varied interests and income levels in both OECD and non-OECD countries. Yet, clear definitions and standards are still emerging, and as with other biodiversity products and services, quality is mostly assessed by consumers. A country's natural assets, as represented by its parks and reserves, are often closely linked to eco-tourism. As long as they are excludable, fees can be charged to access parks. Yet, charging entry to national parks may be controversial due to regressivity considerations. Excludability is less clear vis-à-vis ecological services and in this case regulatory interventions by government can play an important role.

IV. BIODIVERSITY AS A "CLUB GOOD"

The previous chapter dealt primarily with biological diversity and biological resources as (or close to) "private goods". Most of the products discussed were therefore both excludable and rival in consumption. To a certain extent, they were linked to direct extractive uses where markets can more easily be established. However, many biodiversity goods and services are characterised as "club goods". That is, they are excludable, but non-rival in consumption. Would non-rivalry preclude markets from assisting in the conservation and sustainable use of biodiversity? The answer to this question is "no", as shown by the dynamism of the industry developing around eco-tourism, private and even government parks. These rely at least in part on entry fees as a source of revenue.[16] Even if one considers ecological services such as flood control, soil conservation and watershed management for protecting water supply, markets can be an efficient way of achieving conservation and sustainable use as indicated in some of the examples provided in Chapter III. This Chapter provides examples where direct non-extractive use value and indirect use values are at least in part captured in the provision of club goods and services related to biodiversity.

4.1 Eco-tourism

Tourism is possibly one of the world's largest industries, and it is growing by around 10 percent a year. International tourism is valued at approximately USD 400 billion, and recent estimates indicate that tourism revenues related to nature and the desire to visit natural areas may be between USD 80 billion to USD 250 billion (Heal, 2000; Best and Jenkins, 1999). The wide range in estimates can at least in part be explained by the lack of a widely accepted definition for eco-tourism. The term eco-tourism is often used to describe all types of nature tourism, even though some potentially damage the environment. There are a number of principles, guidelines and

[16] Not all parks are excludable in practice. There are cases where it may be costly to exclude potential visitors. Excludability is a function of several factors including technology, institutional capacity, even cultural as discussed in a subsection below.

parameters under discussion, but there is little consensus among industry promoters, NGOs, consumers and natural reserve owners on what constitutes eco-tourism.[17]

Eco-tourism may be defined as *"responsible travel to natural areas which conserves the environment and sustains the well being of local people"*(Eco-tourism Society website). From the existing guidelines on eco-tourism, three common elements emerge (Mader, 2000):

- providing for conservation measures;
- including meaningful community participation;
- being profitable and sustainable.

Eco-tourism is considered to be one of the most promising activities for biodiversity conservation. As incomes grow in developed countries and leisure increases in importance, the demand for nature-based tourism is also expected to grow. Consumers are increasingly choosing natural habitats for holiday destinations. According to the Eco-tourism Society, typical eco-tourists are young professionals (35-54 years old) that travel for periods of 7-15 days. They spend more money than do traditional tourists, and are particularly attracted to landscapes in the wilderness, wildlife viewing, and hiking activities. Conservative demand growth estimates for the next few years range from 10-15 percent to 30 percent (Eco-tourism Society website). The World Tourism Organisation predicts total international tourism will grow by 6.7 percent per year (Best and Jenkins, 1999).

Most eco-tourism activities involve visiting one or more public or private parks; therefore, eco-tourism and park visits are closely linked. Nonetheless, eco-tourism suggests a much broader experience involving different goods and services, which may involve significant travel distances.

4.1.1 Eco-tourism markets

One of the reasons to separate the discussion on eco-tourism from the demand for parks is that eco-tourism is "naturally a private market-based activity" (Heal, 2000). The activity is led primarily by the private sector with little direct government participation. This implies neither a lack of scope for policies addressing eco-tourism, nor that eco-tourism is independent from governments.[18]

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17 The United Nations designated 2002 as the International Year of Ecotourism. There are a number of activities planned on the topic. This will hopefully lead to more clear guidance and best practices.

18 Since eco-tourism enjoys public parks, for example, unless the parks charge fees, there may be at least an implicit subsidy to eco-tourism.

Since much of the world's biodiversity can be found in the developing world, less developed countries are a popular destinations for eco-tourism. Central America is a particularly favourite destination. In Costa Rica, for example, tourist arrivals totalled more than 781 000 in 1996, bringing around a third of the country's total foreign exchange revenues and making tourism the country's leading "export" activity. Over 66 percent of the visitors visited a protected area. (Heal, 2000; Eco-tourism Society website). In 1999, almost 13 percent of the 172 292 tourists who went to Belize visited parks and reserves, and 87 percent of the visitors visited Cayes and Barrier reefs. These tourists mentioned that their main motivation to visit Belize included: to observe scenic beauty, enjoy a natural setting, and observe wildlife. Honduras is also a popular destination with more than 200 000 nature tourists in 1995 (Eco-tourism Society website).

South America is also attractive. About 10 percent of tourists who visit Peru go birdwatching in natural areas. Although it is known for its cultural attractions, almost 50 percent of foreign tourists who visited Peru combined visits to cultural areas with visits to natural zones. The flow of visitors to 26 of the 52 State Protected Natural Areas increased by 250 percent during the 1990s. Foreign visitors, however, must share eco-tourism facilities with visitors from the host country. Brazil has 40 national parks and in 1998 an estimated 3.5 million people visited these parks. That year, approximately 600 000 eco-tourists were Brazilian nationals while 200 000 were from abroad (Eco-tourism Society website).

Eco-tourism clearly depends on a country's natural capital and, within it "charismatic megafauna" can be a major attraction. Perhaps no place on Earth is best endowed with large terrestrial mammals, reptiles and birds than East and Southern Africa. Indeed, some of the East African economies are highly dependent on earnings from eco-tourism. In Kenya, for example, one third of total foreign exchange revenue is generated by eco-tourism, comparable to key export crops such as coffee and tea. Eighty percent of its tourist market is attracted by the country's wildlife. Between 1986 and 1998, the number of visitors to South African game and nature reserves experienced an annual growth of 108 percent, reaching almost 6 million people. It is the number one activity for visitors to the country. As indicated in Box 4.1, South Africa also provides an interesting example of private sector involvement in eco-tourism.

Most eco-tourists come from OECD countries. However, some OECD countries are equally important destinations for eco-tourism as they play host to an often unique fauna, flora, and natural beauty. For example, almost 50 percent of the respondents in a survey of 3 342 households (representing 47 US mainland states outside Florida) indicated that regardless of the vacation they participate in nature-based activities. It should also be noted that experienced eco-tourists (i.e., those who had already participated in at least one previous "eco-tourism" trip, are also willing to spend more money than general tourists).

Box 4.1 **The Conservation Corporation of Africa**

An interesting example of successful eco-tourism market development is the Conservation Corporation of Africa, a business venture created in 1990 that grew in just six years from a family-owned set of Lowveld lodges into a multinational corporation operating 20 of the most luxurious lodges south of the Sahara, managing more than 350 000 hectares of land. CCAfrica currently employs 2 500 people on a permanent basis, in turn supporting more than 20 000 people in rural Africa. Valued at more than USD 65 million, CCAfrica seeks to forge partnerships with the rural communities surrounding and sharing the reserves, involving them in decision-making and the benefits of eco-tourism. A Rural Investment Fund was created to assist local communities in planning and networking, fund-raising from external sources and providing managerial input and training for local development projects (CCAfrica website). Land devoted to a reserve for tourism and hunting purposes can yield between USD 200 to 300 per hectare, substantially more than the alternative of ranching (USD 25/hectare) or farming (USD 70/hectare). CCAfrica generally capitalise on this greater demand by contracting with landowners to incorporate this land in its reserves. While CCAfrica manages the business part of the venture, landowners are expected to adhere to strict regulations to recuperate and maintain their natural assets (Heal, 2000).[19]

Australia is also an important destination for eco-tourists, with an estimated 600 eco-tourism operators. Eco-tourists represent almost 30 percent of domestic travellers and the private sector is trying to capture this increasing demand in several ways. As indicated in Box 4.2, below, Australia offers a similar example to the Conservation Corporation of Africa, but with some important financial and administrative differences.

While it is early to derive any clear lessons from ESL, its net conservation benefits seem positive. However, its strategy has been different from the Conservation Corporation of Africa. ESL in effect seems to have attempted a vertical integration by acquiring land, recuperating degraded areas, engaging in selling eco-tourism services, among others. Conservation Corporation of Africa appears to have chosen to focus its business solely on selling eco-tourism services, while ensuring that its "outsourcing" to landowners is successful by keeping strict quality control. In comparison to providers of similar services, ESL's strategy may require more financial capital for investment purposes, which in turn drew it to the stock market. This increased its transparency, but also brought a new challenge by increasing its dependency on the private investment community.

[19] A similar model is being applied by the South African National Parks in incorporating land with the cooperation of landowners. While goat and other ranchers and subsistence farmers are eager to participate, dairy farmers - an activity that yields substantially higher rates of return – do not see natural parks as an economic alternative (Personal communications with Park managers 2002. See also www.addoelephantpark.co.za).

Box 4.2 **Earth Sanctuaries Ltd.**

Earth Sanctuaries Ltd. (ESL) is the first publicly traded company in Australia (and perhaps in the world) to make wildlife preservation its business by establishing "safe habitats for Australia's wildlife and conserving biodiversity needed for their survival". ESL's safe habitats are essentially large fenced-in parks in Australia's varied geographic areas, focusing on small to medium-sized mammals that are threatened by exotic predators or loss of habitat. The main strategy has been to acquire land, erect electrified vermin-proof fencing, remove feral animals, regenerate native vegetation and reintroduce selected native species. ESL has had success in breeding several rare species and establishing them in their sanctuaries.

ESL must strike a balance between creating a wildlife preserve that is appealing to the public and achieving its ultimate goal, biodiversity conservation. Revenue comes mainly from eco-tourism and associated activities at its sanctuaries such as permits for film crews and photographers, and from professional consulting. In 1999-2000, ESL's annual revenue was AUD 3 697 203. However, most of the investment capital has come from capital raising, over AUD 30 million in the last 15 years.

- In ESL's case, conservation strengths would appear to be:
  - regeneration of habitat;
  - increase in populations of Australian wildlife, including platypus and endangered species such as woylies, boodie, bridled nail tailed wallaby, quolls;
  - education programmes;
  - improving public information;
  - development of new techniques in conservation;
  - innovation; and
  - savings to government.
- Criticism of ESL usually focuses on:
  - use of fencing;
  - narrow selection of species; and
  - the potential for commercial objectives to outweigh conservation.

Additionally, ESL faces regulatory challenges in acquiring and relocating species and in obtaining licensing to remove feral species from the preserves and construct vermin-proof fencing around them. As an organisation operating in several jurisdictions, varying, inconsistent, and non-coordinated approaches across jurisdictions for private conservation providers amplify ESL's uncertainty. Also, activities on Crown leasehold land may conflict with lease conditions and associated regulations. Finally, Australia's competitive neutrality principles and measures, which ensure that government businesses do not enjoy net competitive advantages, appear to have limited applications to public sanctuaries.

Source: ESL website and Arentino *et al.* (2001a).

4.1.2 Policy issues

Eco-tourism is an excellent example of how public/private partnerships can achieve environmental goals, such as conservation of biological diversity. Since it contributes to providing a mix of private and public benefits, eco-tourism assists in freeing government financial resources to other activities. Governments thus can be better off by avoiding "crowding out" private sector involvement in conservation through eco-tourism. This has been at least one of the obstacles faced by ESL (Arentino *et al*., 2001a). It should also avoid subsidising unsustainable land use practices, which end up promoting the conversion of natural habitat.

On the other hand, together with the eco-tourism industry, governments can foster a better understanding of the activity. While eco-tourism's growth seems to outpace the growth of the general tourism industry, the actual notion of eco-tourism is still very unclear. As the international year of eco-tourism, 2002 may prove pivotal in fostering a better understanding of the industry through the dissemination of best practices, principles and guidelines. Ultimately, better information tools and appropriate regulations are needed to signal to consumers what constitutes eco-tourism (UNEP, 2002).

4.2 Parks and reserves

A country's natural capital is probably its greatest asset in attracting eco-tourism. A sample of this natural capital is generally contained in a country's parks and reserves, which is often the main destination of nature-based tourism. These parks and reserves are often publicly managed, yet reserves that are privately owned or managed through concession schemes are increasing in both developed and less developed countries (Eco-tourism Society website). This trend may prove especially important in countries with weak enforcement and institutional capacity, where the natural capital is often threatened by environmental degradation and unsustainable use of biodiversity.

4.2.1 Markets for parks and reserves

Parks and reserves can be important for both local and national economies. For example, in the US, it is estimated that travel to the National Parks Service areas generated over USD 14 billion to local communities and supported almost 300 000 tourist-related jobs in 1996. Throughout the 1990s, international visitors to Australia's national parks have steadily increased to nearly 1.7 million or about 47 percent of all inbound visitors to Australia in 1998. Single unique natural areas may have significant impact in national economies as in the case of coral reefs in small island nations or even the Galapagos Islands in Ecuador. While the figures vary, through its 60 000 visitors a year, Galapagos is estimated to contribute over USD 100 million to the Ecuadorian economy (Eco-tourism Society website).

Effective conservation of protected areas, particularly in developing countries, often demands more funding than the amount allocated in the national budgets for this purpose. For example, in Africa this is estimated between USD 200/km² and USD 230/km². However, even in some East and Southern African countries where parks are an important revenue source, budgets are well below these estimates. Namibia and Tanzania spend around USD 70/km² and USD 30/km², respectively. As the importance of parks in the economy grows, countries tend to spend more on their conservation, as in the case of Kenya (USD 409/km²), Zimbabwe (USD 436/km²) and South Africa (USD 2 129/km²). In fact, South Africa spends more than the developed country's average of USD 2 058/km². Despite some exception, the average across developing countries is only 30 percent (USD 157/km²) of the financial requirements for effective conservation (James, Green and Paine, 1999; James, 1999).

The lack of appropriate budgetary allocations has increased the need for market sources to assist in funding park management. Since 1908, when Mount Rainier National Park in the US began to charge visitors, fees have been widely used in many countries. In the early 1990s about one-half of the world's protected areas charged entrance fees (MacIntosh, 1984; Giongo, Borco-Nizeye and Wallace, 1994). Fees not only generate revenues, but can also assist in controlling the number of visitors (Lindberg, 2001).

Another effort to increase the supply of conservation and sustainable use areas has been undertaken by the private sector. Some examples were already discussed in the eco-tourism section. In addition to these examples, hunting programmes and viewing safaris are a major factor in the business of private reserves, conservancies, game ranches and mixed wildlife-cattle ranches. Currently in Southern Africa (Botswana, Namibia, South Africa and Zimbabwe), at least 14 million hectares are privately managed for some form of wildlife conservation or sustainable use. About 80 000 wild animals were utilised in 1990, with kudu, onyx and springbok accounting for about 90 percent of all hunted animals. Farmers only hunted approximately 20 percent for their own consumption. A single antelope to a trophy hunter can earn a farmer 3 to 4 times the amount of a cow. In the world's largest conservancy, the Save Valley Conservancy in Zimbabwe, wildlife utilisation can yield an 11 percent return on capital, while cattle ranching was providing only 1 percent. With figures like these, it is little surprise that many cattle ranchers converted to providing hunting programmes and viewing safaris, while at the same time bringing poaching in many areas under control. Wildlife populations as a result have enjoyed high growth rates (Krug, 2002; Krug, 1996; Price Waterhouse, 1994).

4.2.2 Policy issues

Given the positive effects on biodiversity, the success of private reserves as a complement to public parks is an encouraging alternative. Even companies for which the core business is not eco-tourism or park management are finding it advantageous to engage in these activities as an additional source of income. For example, Champion

International, a large timber company, has started hunting programmes in some of its areas to complement sustainable forestry operations.

Park fees are becoming important tools in park management. As indicated in Box 4.3 below, fees may have several objectives.

Box 4.3 **Goals of park fees**

- *Cost recovery.* Generation of revenue to at least cover tourism's financial costs (e.g., for facility construction and maintenance) and possibly tourism's other costs (e.g., environmental damage).
- *Generation of profit.* Generation of revenue in excess of costs, with the excess being used to finance traditional conservation activities (at the destination or at other sites) or to achieve other objectives.
- *Generation of local business opportunities.* This typically involves low or no fees in an effort to maximise number of visitors.
- *Generation of foreign exchange and/or tax revenues from tourist purchases.* As with business opportunities, this typically involves low or no fees in an effort to maximise number of visitors thereby generating revenues through activities linked to park visits.
- *Provide maximum opportunities for learning and appreciation of the natural resource*. Again, this may involve low or no fees, though overall learning and appreciation might be increased by charging fees and using resulting revenue to enhance education programmes.
- *Visitor management.* Use fees to reduce/redistribute visitor numbers or reduce depreciative behaviour, thereby decreasing congestion, user conflict, and environmental damage. Achievement of this objective may require relatively high fees.
- Naturally, park fees are generally set to achieve simultaneously a number of goals mentioned above.

Source: Lindberg (2002).

The effectiveness in achieving the different goals is at least in part dependent on the price elasticity of visitors fees.[20] Research suggests that visitation to natural areas is generally price inelastic; that is, even with substantial fee increases the number of visits to natural areas decreases little. For example, Rocky Mountain National Park in the US did not experience a significant fall in visitation when it doubled its entrance fee from USD 5.00 to USD 10.00. Surveys in the US also indicate that visitors accept fees well: 89 percent said entry fees were "about right" or even "too low". Empirical studies in the Australia typically generate elasticity estimates between –0.033 and –0.40. For Lake Nakuru National Park in Kenya, elasticity estimates are between –0.17 and –0.84 for foreigners and –1.77 to –2.99 for residents. The greater price responsiveness for

[20] This is a measure of how sensitive quantity demanded is to change in park fees. The higher the numerical value of the elasticity, the larger the effect of a fee change on quantity demanded.

residents may be due to their lower income. Moreover, international travellers are less likely to know about entrance fees before reaching the park and, since they have limited time and visiting opportunities, may not have the chance to find another park to visit. Foreign tourists are also less likely to know about good substitutes and thus are likely to face more inelastic demands.

It should be noted that charging a fee to enter public parks has also been subject to criticism. As public land of special interest, many people feel that it is inappropriate to charge citizens an access fee. Since access fees are often flat charges, they tend to be regressive, having a disproportionate impact on low-income groups. Charging a fee may also change the nature of the visiting experience, as visitors may link it with a commercial enterprise expecting to be "entertained" rather than "educated". All these concerns are relevant and should be weighted against forgoing the benefits and revenues associated with fees. Of particular relevance though is the issue of fees disproportionately affecting certain groups, which can be specially relevant in developing countries with poor income distribution among their population. This can be mitigated by designing a fee structure that takes into account vulnerable groups such as senior citizens, students, and the poor.

4.3 Ecological services

Indirect use values are also being increasingly signalled and captured via markets, particularly if a direct correlation with some sort of economic cost is clearly established. For example, maintaining watersheds upstream can decrease the costs of purifying water supplies to large urban areas. Curbing deforestation and recuperating ecosystems may diminish sedimentation of nearby dams thereby providing an alternative to dredging. Richer farmers in prime land may be willing to pay poorer farmers in marginal land (such as steep hills or flooded areas), if the latter switch from farming to recuperating and maintaining ecosystems. This measure would decrease the economic loss due to erosion and other factors in rich farm areas, while ensuring that poor farmers are able to secure a living. Even insurance companies may find it financially advantageous to conserve ecosystems, thereby diminishing the property impact of catastrophes such as hurricanes. The measure could minimise payments to their clients in case of losses.

4.3.1 Markets for ecological services

While paying for ecological services is no longer just a theoretical possibility, markets have not developed in earnest as with other biodiversity related club goods. In most cases, markets for ecological services are very dependent on government policies and seldom start via spontaneous private sector participation. At this stage, it is difficult to provide an actual market size, since functioning markets tend to be local. Nonetheless, a number of anecdotal cases in both developed and developing countries are available to illustrate payment for ecological services.

Most examples are related to watershed management, as large municipalities and water companies struggle to secure adequate sources of water supply. Box 4.4 summarises a well–known case involving New York City. Other areas of the US such as New Jersey and Colorado have similar examples. Even in other OECD countries, where water utilities are privatised such as France and UK, a similar trend is detected (Heal, 2000).

Box 4.4 **New York City Water pays for water**

New York City recently witnessed its water supplies deteriorating as development near its two sources – Croton and the Catskills – took its toll. The original source, the Croton reservoir and watershed, was beginning to suffer from uncontrolled local development which led to the runoff of pollutants and a substantial reduction of the amount of soil available for it to act as a watershed. In the 1990s, water quality from the more distant and sparsely populated Catskills watershed system also fell below standards, and the city received a warning from the US Environmental Protection Agency (USEPA) that a filtration plant would be needed. Capital costs and operating costs for the plant were estimated in the range of USD 6 billion to 8 billion and USD 300 million/year, respectively. In search of an alternative, the city started to investigate the sources of the water quality deterioration.

The watershed was being contaminated by untreated sewage from local communities and summer homes. Animal waste, fertilisers and pesticides from nearby farms were also key pollution sources. However, damage to the watershed was not irreversible, and New York City could choose between investing in the filtration plant or restoring the quality of the watershed. The latter, estimated between USD 1 billion–to 1.5 billion, was well below the costs estimated for the former. In order to finance it, the city floated an environmental bond issue in 1997, and has been investing in compensating farmers for conservation measures, purchasing land in and around the watershed, and providing appropriate sanitation to residential areas, among other measures. This has not only improved the water quality to the city and its image, but also the livelihood of local rural communities.

Source: Heal (2000).

Paying for ecological services is not restricted to OECD countries. Some interesting and innovative examples occur in developing countries as well. Colombia has been particularly active in this area. Through some of its Autonomous Regional Development Corporations, Colombia has linked several charges (e.g., electricity and water) to ecosystem maintenance and restoration. In some areas, such as the Cauca Valley, the corporation also facilitated compensation schemes funded by private agents through diminishing transaction costs. It brought higher income farmers and cattle ranches together with subsistence farmers and indigenous reserves in Watershed User Associations; stimulating the farmers who occupy prime land to compensate the latter for ecosystem conservation measures if they gave up using their marginal land unsustainably (Tlaiye and Biller, 1994). Costa Rica has adopted its water tariff structure to take into account financing of investments in natural capital, thus compensating landowners for conservation measures (Castro, 2001). Some states in Brazil earmark tax revenues to pay municipalities in important watersheds for water quality maintenance. The amount paid is calculated according to the quality of the ecological service provided (Bale *et al.*, 1997; Tlaiye and Biller, 1994).

4.3.2 Policy issues

Ecological services are different from the other club goods discussed in this chapter. As in the case of parks, they tend to be geographically restricted. However, the links between ecological services and benefits enjoyed by individuals, households or firms are less clear. An individual may enjoy eco-tourism or a natural park without needing extensive information on the experience. For example, clean air in the park need not be related to health considerations. Through seeing photos of a park, tourists may decide it is worthwhile to visit it due to its scenic beauty. On the other hand, while an individual needs access to clean water, linking it to watershed conservation requires more sophisticated information. The individual may need to understand hydrological, ecological and physical information and processes, among other factors, in order to comprehend the cleansing process and to recognise its value. Moreover, these benefits are likely to be diffused, increasing the possibility of free-riding. This may at least in part explain the more limited involvement of the private sector in the provision of ecological services at this stage. For instance, though the potential of ecosystem conservation to decrease insurance payments is being discussed in the industry; unless linked to some regulation, actual examples of insurance industry involvement in ecosystem conservation are difficult to find. This is likely due to the characteristics of ecological services and the nature of environmental risks (Pearce, 2002).

This suggests a more prominent role for governments in securing the provision of ecological services. As with the Brazilian example above, cases of direct government involvement through different incentives, such as economic instruments and other regulatory tools are not uncommon in both OECD and non-OECD countries (OECD, 1999; Bale *et al.,* 1997; Tlaiye and Biller, 1994). The previous section, however, also suggests a somewhat new role. In this role, governments or quasi-government agencies not only are important in establishing property rights as before, but also can act as catalysts to facilitate bargaining and income flows as in the case of the Cauca Valley in Colombia. By assisting the process, governments can help diminish transaction costs and strategic behaviour, facilitating a market solution for achieving the social optimum.[21]

[21] This idea is closely related to the Coase Theorem (Coase, 1960).

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Chapter 5

Biodiversity as an "open access" and "pure public" good

Since "open access" and "pure public goods" display non-excludability, markets are more restricted in the provision of goods with those characteristics. This does not mean that markets are irrelevant. Markets can still be used to help design and implement regulatory tools that impose some level of excludability and hence control on over-exploitation and biodiversity loss. At least two areas are important for the use of markets as regulatory instruments to promote sustainable use and conservation. Markets can be used to limit open access regimes, as in the case of individual transferable quotas in fisheries and in the exploitation of other biological resources. Markets can also be used to limit the negative impacts of activities on ecosystems, as in tradable land development rights and wetland banks. As in the previous examples, market-use to achieve policy objectives should be viewed as one of many tools available to the policy-maker.

V. BIODIVERSITY AS AN "OPEN ACCESS" AND "PURE PUBLIC" GOOD[22]

As one moves along from left to right in Figure 2.1 (Chapter II), the private provision of public goods and services become less feasible. Heal (2000) clearly explains the phenomenon:

> *"The problem with public goods is that the market provides inadequate incentives for their provision. The main reason is their non-excludability. The fact is that the seller cannot prevent non-payers from benefiting from them. If a good is really public, I have little incentive to buy it for myself. I may as well wait for you or someone else to buy it, let them pay, and then enjoy the benefits of their purchase. If the good is really non-excludable, then this is always possible."*

The incentive to free-riding is large. By not being able to exclude others, there is little economic incentive to provide the good or service in the first place. Goods and services that display open access or pure public good characteristics (especially non-excludability) are thus prime candidates for regulation and societal provision. The scope for government investment increases and public policy is likely to play a greater role.

However, the lack of excludability does not mean that markets are irrelevant. Governments may use markets as tools to achieve certain biodiversity goals. In addition, the existence of markets for goods and services that are beneficial for biodiversity conservation provides an additional path that governments may take to promote the achievement of these goals. For example, consider a case where the existence of a particular species or ecosystem is "bundled" with a private natural park. To generate profits, the park owner charges a fee but is interested in increasing visits. More visits may jeopardise the particular species or ecosystem, since it may surpass the park's carrying capacity. Rather than allowing for the park's increased depreciation, a government may choose to complement the park's budget through additional revenues

[22] This Chapter is based on recent OECD publications: OECD (1996, 1998a, 1999a, 1999b, 1999c, 2001e). Since the literature on the subject is extensive and the instruments discussed here are more related to government policy than to market creation, the interested reader is invited to consult the aforementioned reports for detailed information.

subject to ensuring that the existence of the species or ecosystem is not threatened. The target would be securing the non-use value of the good or service that the park provides to society, while allowing the owner to capture some of the use value through fees.

5.1 Using markets as regulatory tools

Although using regulatory tools that employ markets to address environmental issues is relatively new, there is an extensive literature on the topic. The OECD has been particularly active in analysing experiences related to using markets to address issues linked to pollution, unsustainable use of biological resources, water, and others. There are at least two types of economic instrument involving market use: economic instruments that limit open access regimes and economic instruments that create markets to limit the negative impact of activities on ecosystems. The purpose of this section is to briefly review some tradable permit schemes applied to biodiversity and biological resources.

5.1.1 Economic instruments that limit open access regimes

Market mechanisms such as tradable permit schemes have proven useful in reducing the pressure of unsustainable harvesting practices on ecosystems. The mechanisms have been implemented, for example, to regulate fishing practices. One of the best known tradable permit schemes directly relevant to biological resources is individual transferable quotas (ITQs) in fisheries. They can be used to mitigate the impacts of commercial fishing on the fish stock and in marine ecosystems. ITQs provides individual fishermen the right to catch a specified quantity of a particular species in a specific location during a pre-determined period. ITQ programmes use a number of different units to specify individual quotas. The most common one is a percentage of the total allowable catch (TAC) expressed in weight units in a fishing season. The TAC is set at a level that supports the maximum sustainable yield (MSY).[23] Examples of tradable fishing quotas exist in New Zealand, USA, Australia, The Netherlands, and Iceland. Evidence suggests that these mechanisms have been successful in reducing pressure on natural resources. The role of local authorities as market makers has been key to motivate trades, and inject liquidity, especially for cases such as water markets.

ITQs have been used internationally and in a number of countries. They can be an effective measure for managing target species. In fact, in few cases ITQs have been even voluntarily used (Muse, 1991). Nonetheless, ITQs are not flawless and need complementary measures in order to adequately address ecosystem issues. For example, ITQs based on TAC can lead to high-grading, where fishermen discard smaller often young fish keeping only high-grade ones to count in the quota. This may unnecessarily

[23] MSY is not without controversy. For a discussion of the controversies and detailed mathematical analysis, see Conrad and Clark (1987).

kill young fish. In order to mitigate this practice, observers, mandatory landings, improved year selectivity and prohibitions may be necessary (OECD, 1998a).

ITQs do not need to be global or focussed only on marine species. In fact, they have worked quite well with terrestrial species such as in the case of tradable hunting permits. Mexico has implemented a form of tradable permits for the right of hunting big-horned sheep (*Ovis Canadensis*). The regulator sets a sustainable hunting level and allocates tradable rights to local communities, who can sell them on international markets. By engaging the local community, one may diminish enforcement costs, improve local income, and decrease poaching.

5.1.2 Economic instruments that create markets to limit the negative impact of activities on ecosystems

Tradable permit schemes do not have to be restricted only to species. Industrial and agricultural activities have traditionally generated negative impacts on biodiversity, through air and water pollution and the pressure of economic growth on land use. Market mechanisms that have been implemented to tackle these problems and projects are usually divided into two large groups. The first group of mechanisms implements tradable pollution permits for different types of emissions, either air or water based. The methodology is similar to harvesting quotas, and has proven to be an effective and efficient measure for the reduction of these negative externalities, especially at the local level.

A second group of market mechanisms can be implemented to reduce the impact of economic development on land use. Mechanisms are implemented with the objective of generating a compensation mechanism for projects that negatively affect biodiversity. Development rights, wetland banks, and other land use related mechanisms are design to compensate the holders of biodiversity for its preservation.

Wetland banks, largely developed in the US, provide an interesting example of a compensation mechanism that can be implemented at a local, regional, or global level. Through the wetland banks mechanism, infrastructure developers are allowed to compensate wetland mitigation through the acquisition of conservation rights for alternative wetland areas in other selected regions. Conservation of wetland banks therefore has the potential to receive financial incentives. Land development rights and wetland banks are mechanisms in which transactions take place on a “one off” basis, rather than on an ongoing basis.

As indicated by OECD (1999a), several US states allow for the trading of development rights which can be detached from a given land property, to be used on another property. This enables attaching conditions to the development of a particular zone, following certain environmental objectives, while allowing for unrestricted development of another zone if the rights are indeed traded. Variations of these types of schemes can be applied to several areas but clearly depend on how a particular country defines and applies the concept of property. For example, if land ownership involves a

number of different rights for its use, some components of these rights may be traded, even if the land itself is not traded (OECD, 1999a).

5.2 Policy issues

Tradable permit schemes are based on the premise that the owner of the property right will maximise the value of the resource over time, and thus would prefer this to short-term exploitation on a first-come, first-serve basis, typical of an open access resource. They are particularly useful in the context of biological resources, where direct use value can be easily captured. The use of tradable permit schemes results in an efficient allocation of resources between competing users. By involving the right stakeholders, it may diminish monitoring and enforcement costs.

Tradable permit schemes work best where clearly defined property rights can be established, transaction costs are low, and there are sufficient interested parties to establish a market with little risk of collusion. They can contribute to the regulators' budgets, if for example, sale auctions are used to establish initial allocation of rights. Auctions, however, should be used with care, since the sale to the highest bidder may also have social consequences by excluding local communities due to their relatively low incomes. In order to create a tradable permit scheme, the regulator should take into account not only environmental and financial targets, but also social issues that may hamper efforts in the other areas.

As with the cases described in the previous Chapters, tradable permit schemes should be viewed as part of a menu of potential instruments, rather than as the final answer to a biodiversity related problem. As previously discussed, tradable permits are imperfect options where there are substantial externalities and monopolies are easily established. Moreover, they are less successful in the conservation of complex entities such as ecosystems and where non-rivalry in consumption is also present. For pure public goods, society still must rely on either public policy or on the altruism of its members (OECD, 1999a).

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Chapter 6

Market enhancers: financial mechanisms and community involvement

Through the framework previously described, it is possible to identify areas in which markets are likely to develop for biodiversity conservation and sustainable use. As with other businesses, many factors that need to be addressed in order for markets to evolve. In the case of biodiversity, two factors seem especially important: the availability of credit and the buy-in of local communities living in biodiversity-sensitive or -rich areas. While credit from non-market sources such as the Global Environmental Facility (GEF) is likely to remain vital, several private sector initiatives are also increasing in importance. These include venture capital funds that invest in biodiversity businesses, mutual funds openly quoted in different stock markets throughout the world, and green saving accounts. As most biodiversity exists in rural marginal areas where people are generally poorer, a biodiversity venture is unlikely to succeed without the support of the local community. This support occurs where the community itself sees a benefit to maintaining the ecosystem. Examples come from agro-forestry systems and sustainable harvest of species.

VI. MARKET ENHANCERS: FINANCIAL MECHANISMS AND COMMUNITY INVOLVEMENT

The preceding Chapters have discussed numerous forms of market creation to enhance biodiversity conservation and sustainable use. They were presented individually as means of illustrating the conceptual framework depicted in Figure 2.1. It is important to recognise that these forms seldom occur in isolation. As with some other businesses, there are a myriad of factors that need to be addressed concurrent to dealing with the excludability characteristic, in order to ensure the adequate and successful provision of biodiversity goods and services via markets. Perhaps the most important ones are those related to the availability of credit and the adherence by parties directly or indirectly involved in the business with access to biodiversity.

On the supply side, private agents and local rural communities involved in biodiversity businesses are generally attracted primarily by the sector's profit potential. Nonetheless, sometimes just as important is the possibility of maintaining a particular lifestyle while contributing to society as a whole. For example, a local community in Oaxaca, Mexico that conserves a watershed and maintains water quality in order to sell bottles of pure mountain water gains the revenues of the sales, and thus reduces the pressure on its members to secure a living elsewhere. Society as a whole benefits from the continued existence of the watershed.

On the demand side, consumers may have a preference for pure mountain water because they perceive a gain in other private benefits such as personal health improvements. They may also buy it because they feel they are contributing to society by indirectly helping to conserve the watershed. Most likely, several factors together will explain consumers' behaviour. Given the current interest and increasing levels of activity in all biodiversity businesses (in spite of the inherent risks) it is likely that a combination of motives underlie the phenomenon.

That complex of motives also helps explain the emergence of market "enhancers". These enhancers are essential for the development and growth of biodiversity businesses, for they provide needed financial capital and community commitment. They can be divided into two main categories, both of which are discussed in this Chapter: financial mechanisms and community involvement.

6.1 Financial mechanisms

As in any other business, biodiversity ventures depend on injections of capital for their growth, the financing for which may come from either public or private sources. Following the 1992 UNCED conference, both international and domestic transfer payments have increasingly targeted biodiversity conservation and sustainable use activities. Public sector and multilateral agencies are the main financing agents through grant mechanisms, thereby expressing their interest in assisting in the conservation of biodiversity as a global pure public good. While public capital finances most biodiversity conservation and its sustainable use, private capital is now becoming a key player. This increasing role can be partly explained by the recognition that biodiversity not only has a global pure public good characteristic, but also has value that can be privately appropriated due to its excludability. While recognising that public financing is likely to remain an important source of capital for biodiversity projects, this section focuses on the financial sector as another source of private capital investment in biodiversity. It discusses some interaction between public and private sources of financing, but does not undertake a detailed analysis of public financing.

6.1.1 The financial sector and its investments in biodiversity

"Green" funds are potential instruments to create and expand markets for biodiversity conservation and sustainable use by providing "biodiversity companies" with capital needed to finance their operations. Recipient companies are required to have appropriate business practices compatible with biodiversity conservation. As such, green funds tend to invest in companies that provide biodiversity goods and services in marketable form (i.e., individually or through clubs). Additionally, they enhance consumer awareness by gathering and disseminating information on biodiversity products. Some of the labels attached to green funds and other "socially conscientious" investments are Socially Responsible Investing (SRI) or Ethical Investment. They often apply some form of environmental screening considers the ethical, social, and environmental performance of companies selected for investment, as well as their financial performance (EIRIS, 2000).

No aggregated data on biodiversity-specific investment exists, but aggregate data on SRI underscores its recent success. In August 2001, EIRIS estimated the value of ethical investments to be GBP 4bn, up from GBP 3.7bn in December 2000 and GBP 2.1bn in January 1999 (EIRIS, 2001). The number of unit holders and policyholders in ethical funds was estimated to be 492 000, while the number of ethical funds was estimated to be 60.[24] Yet, the financial sector interest in environmental issues has not always been positive. In fact, as described in Box 6.1, the sector's attitude

[24] In an August 2002 newscast from Cable News Network (CNN) discussing the continuous downward trend of US stocks, the presenter highlighted that mutual funds linked to SRIs were the only ones to experience a healthy growth of 3 percent, even while all other categories were witnessing a decline.

towards the environment went through four distinct phases and depending on the country involved, the domestic financial sector may still be in its early phases of development.

Box 6.1 **Phases of the financial sector attitude towards environment**

- *Defensive phase*: In this phase, environmental issues are perceived as threats to business. The industry denies having anything to do with them, taking a critical and wait-and-see attitude toward any environmental measures governments may take, i.e. this phase is characterised by opposition and defensive behaviour.
- *Preventive phase*: In the preventive phase, checks of environmental risks are carried out in any standard assessment of credit applications. Risks are thus a manageable phenomenon, and any expected detrimental effect can be neutralised in advance.
- *Innovative phase*: Environmental risks are identified as a potential market. Innovative products are developed to take advantage of market opportunities and to present a green image to customers. Environmental aspects of companies' internal processes are targeted. For example, financial companies publish environmental reports. Several motives explain the creation of innovative green products, including possible direct firm benefits from these products, avoiding negative reactions from clients and non-clients, achieving a green image with customers and non-customers, tapping into new potential markets, preventing losing business to competitors offering green products, and addressing environmental concerns among bank directors, the bank's employees and shareholders.
- *Sustainability phase*: In this phase, sustainability becomes a benchmark in dealing with affairs beyond specifically environmentally related products. A limited number of committed banking institutions are currently at this phase.

Source: Van Bellegem *et al.*, (forthcoming).

Green funds can generally be classified under two broader categories common in the sector: open-end mutual funds and venture capital funds. Open-end mutual funds comprise the majority of mutual funds in the market and are available to any investor. Open-end mutual funds invest in publicly traded securities. To avoid major losses from one industry or company that performs poorly, mutual fund managers diversify their holdings and may invest in industries across the market, usually according to pre-established criteria. Venture capital funds can be more specific in their investment portfolio as they are not required to invest in publicly traded securities, may maintain a less diversified portfolio and typically assume more risks. Venture capital funds are subject to an agreement of the partners, who are generally comprised of a small number of institutions and private individuals.

6.1.2 Examples of private financial institutions investing in biodiversity

While funds that are explicitly investing at least a small fraction of their holdings in biodiversity businesses are rare, the market for "green investments" has been growing and, therefore, positively impacting biodiversity. Several examples come from the Netherlands, where tax advantages offered for "green investments" have motivated

dedicated financial products to the sector. The review given below of various entities on the market is not meant to be exhaustive, but rather illustrative of ongoing developments. The choice of examples was primarily based on availability of information.

ING Group, a leading global financial institution based in the Netherlands, established a dedicated bank for ecological savings and investments - Postbank Groen. The bank invested around EUR 550 million from 1996 until 1999 in environmentally-related investments under the following headings: nature (EUR 17 million), district heating (EUR 282 million); wind power (EUR 69 million), solar energy (EUR 4.5 million), sustainable construction (EUR 28 million), green label greenhouses (EUR 15 million), international (EUR 17 million), and miscellaneous projects (EUR 119 million) (ING, 1999).

Triodos Bank, founded in 1980, is another Dutch example of a financial institution devoted to sustainable development. Triodos Bank is active in the following areas: social economy (innovative businesses, trading, innovative living and working, services and business centres); nature & environment, sustainable energy (sun and wind), organic agriculture, environmental technology and nature conservation; non-profit and art; north-south development co-operation and fair trade. In November 1997, the Bank launched the Organic Saver Account, in partnership with the Soil Association, targeting funds for organic food and farming enterprises. In 1998, Triodos had extended EUR 150 million in loans, and managed funds amounting to EUR 300 million.

Private banks focusing on financing sustainable development are also active in the United States. The ShoreBank Group, which has focused on community-level banking since the early 1970s, has recently partnered with Ecotrust, a non-profit organisation devoted to fostering a conservation-based economy, to create ShoreBank Pacific. ShoreBank Pacific focuses on biodiversity markets. It is the first regulated financial institution in North America dedicated to economic revitalisation and ecosystem restoration - or more simply, conservation development. ShoreBank Pacific lends to businesses in rural communities in the temperate rainforest of the Columbia-Pacific Coast region of Washington and Oregon. To foster connections between rural communities and larger urban markets, the Bank also lends to conservation-minded companies in the greater Portland area. The bank takes deposits both from the US and abroad under a commitment to allocate them, for a profit, to support conservation loans to small businesses in their target communities. ShoreBank Pacific's loans have supported firms in the following areas: manufacturers that make wood products from sustainably harvested timber; manufacturers that reprocess waste into new products; manufacturers that produce innovative pollution-prevention technology; rural small businesses taking incremental steps to reduce their impact on water quality through thoughtful site improvements or by finding alternative markets for waste materials; and rehabilitation of affordable housing using sustainable building materials and conservation management practices.

Several NGOs active in the field of conserving biodiversity have taken advantage of the opportunity to promote biodiversity conservation and its sustainable use by

improving synergies between the financial sector and potential biodiversity-related investments. For example, IUCN is developing several funds such as the Biodiversity Capital Fund, the Kijani Initiative and the European Conservation Farming Initiative that attempt to generate profits from biodiversity. Conservation International and the Nature Conservancy, among others, have similar initiatives.

One of the difficulties in establishing biodiversity-related investments is the lack of a well-accepted operational definition of biodiversity and the absence of solid information. This gap is being addressed in several ways. For example, the purpose of the European Biodiversity Resourcing Initiative (EBRI) is to establish an operational framework that brings the needs for biodiversity resourcing in Europe together with the interests of the Banking Community and International Financial Institutions (IFI's). The aim is to recognise opportunities for co-operation and synergies, mainstreaming biodiversity in existing banking policies and operations, and for sharing information and raising awareness about Europe's biodiversity conservation with the ultimate goal of increasing investments in bankable biodiversity activities. EBRI was established under the framework of the Pan-European Biological and Landscape Diversity Strategy (PEBLDS), building on the CBD and the first Intergovernmental Conference "Biodiversity in Europe" (Riga, March 2000) on biodiversity resourcing. In addition, during the UNEP FI Annual Global Roundtable Meeting on Finance and Sustainability, 14-15 March 2002, on "Building Opportunities and Tools in Finance, Insurance, and Sustainability for Latin America and Worldwide", the topic of private biodiversity business equity funds was addressed.

Finally, several additional centres have been established to inform the investor interested in SRI. While these centres do not in general focus uniquely on biodiversity, or even on environmental issues, they provide a wide range of information for those interested in green investment. Such centres include EIRIS, IMUG, Centre Info, Ethibel, SAM and the SRI World Group.

6.1.3 Private financial sector investment channels for biodiversity

As mentioned above, public sector, bi-lateral, and multilateral agencies have been key biodiversity financing agents. Financial support has been mainly through grant mechanisms and has often targeted biodiversity protection. In a sense, public financing has aimed at the pure public good characteristic of biodiversity, often attempting to enhance its global nature. The private financial sector, on the other hand, has primarily used equity funds as channels for investing in biodiversity. These equity funds have identified potential money-making biodiversity enterprises and a pool of investors willing to finance them. As described above, the sector mainly focuses on biodiversity's private and club good characteristics – excludability permits the attainment of conservation and sustainable use goals with a positive financial rate of return on investment. However, biodiversity has strong pure public good characteristics, and thus non-market financial transfers are likely to remain important components of its financing. A nascent trend is for public and private sources of financing to interact so as to make biodiversity firms and projects feasible. Prior to analysing *private*

financial-sector channels, a brief discussion of some key *public* sources of financing is thus provided.

6.1.3.1 Non-market transfer payments

The Global Environmental Facility (GEF) is the main international source of funding for biodiversity conservation activities. It was established in 1991 with the objective of funding "incremental" domestic costs of projects that protect the global environment. GEF has transferred USD 775 million to nearly 250 biodiversity projects, and generated an additional USD 1.2 billion in co-financing.

Debt for nature swaps are another class of transfer payments, which were popular during the 1980's to reduce developing countries debt (which was then being traded at a large discount). The agreements usually between donors (including NGOs, private sector or governments) and recipients (developing country governments), aim at the cancellation of a portion of the latter's external debt in exchange for environmental commitments. Although an innovative concept in their design, they lasted only a short time. From 1987 until 1994, 32 transactions took place in fifteen debtor countries, mostly in Latin America. Transactions reduced the stock of commercial foreign debt by USD 177 million, and generated around USD 130 million in domestic programs for conservation. Adding in second-generation swaps that targeted the cancellation of public bilateral debt, transactions are estimated at USD 1 billion. In some countries, debt for nature swaps achieved interesting and successful results in the conservation of biodiversity.

Trust funds are also playing an increasingly important role (Norris, 2000; GEF, 1999a; GEF, 1999b).[25] The Mexican Nature Conservation Fund (FMCN), a private institution funded mainly by the Mexican and U.S. governments, provides an interesting example. FMCN was founded to promote the continuity of the official conservation agenda during the transition of six-year government periods (FMCN website). FMCN was incorporated in 1994 after an extensive and participatory consultation process with the support of all sectors of society. After almost five years of operation, FMCN has proven very useful in field-testing conservation initiatives like the protected areas program (FANP) and the recently created Wildfire Prevention and Restoration Program (PPRIF). For the protected areas program, FMCN has helped to leverage funds from different sources, strengthening the financial self-sufficiency of protected areas (Norris, 2000).

6.1.3.2 Venture capital funds

The Terra Capital Fund was founded in 1998 in response to growing consumer demand in developed countries for biodiversity goods and services. As the first

[25] A list of trust funds, including those under development, is available in Norris 2000.

biodiversity-only investment fund for Latin America, Terra Capital Investors seeks to invest in small and medium-sized companies active in the five sectors: organic agriculture, sustainable forestry, non-timber forest products (NTFPs), sustainable aquaculture and eco-tourism. Each investment is between USD 500 000 and USD 2 000 000 and is structured as a 6-8 year long-term lease. Investors in Terra Capital include the International Finance Corporation (IFC), Swiss Government Agency of Economic Co-operation (SECO), the Multilateral Investment Fund (the Inter-American Development Bank), the Triodos Bank, and private institutional investors. Terra Capital Advisors, a partnership between the A2R environmental fund and the Sustainable Development Inc. (SDI) from Brazil; the Environmental Enterprise Assistance Fund from the USA; and the IFC; manage the Fund. Terra Capital Investors is supported by the Global Environmental Facility (GEF) through a USD 5 million grant during the life of the fund (10 years) to cover its costs of screening, technical assistance, monitoring and evaluation. While the GEF grant is not used for investment, it was instrumental in attracting private sector companies to participate in the management of the fund (Terra Capital website).

Terra Capital considers biodiversity conservation and financial profitability when screening potential projects, weighing both criteria equally in the decision-making process. In addition to the usual financial review of each company, the Fund hires an independent biodiversity consultant to research each potential investment's environmental performance. Furthermore, it relies on a Biodiversity Advisory Board composed of researchers and experts with experience in Latin America and in the Funds' fields of activity, to supervise and guide the development of Terra Capital's biodiversity guidelines. Three groups of activities are identified: (1) activities that maintain or enhance biodiversity assets or resources; (2) activities that reduce or eliminate possible negative impacts or threats to biodiversity; and, (3) catalysing activities that promote actions with positive impacts on biodiversity.

During its first two years of operation, Terra Capital has approved investment in five companies: two in organic agriculture; two in NTFP; and one in eco-tourism. Projects include organic vegetables production in Brazil; organic berry production in southern Chile; development of sustainable management practices for the açai palm, from which both the açai fruit and the palm heart are extracted; and Babassu coconut industrial processing in northern Brazil. A boat operation in the Galapagos Islands approved by the Rainforest Alliance faced resistance by one of Terra Capital partners as Galapagos is considered a World Heritage site. With the process delay, the operators secured financing elsewhere (Moles, forthcoming).

Corporacion Financiera Ambiental (CFA) is an additional example specific to Central America that has direct or indirect interests in biodiversity. Launched in 1996, CFA invests in small companies active in the sectors of organic agriculture; sustainable forestry — including tree plantations and derived wood products; renewable energy — including co-generation using bio-mass; recycling, reduction and treatment of pollution — in addition to clean technologies and products; and sustainable tourism — specifically oriented towards the preservation of biodiversity. Investors include the

Inter-American Development Bank, bilateral and private sources (Corporacion Financiera Ambiental website).

The EcoEnterprises Fund, established by the Nature Conservancy (TNC) and the Multilateral Investment Fund of the Inter-American Development Bank, provides venture capital to environmentally compatible enterprises undertaken by private businesses in co-operation with local non-profit institutions. Individuals and institutions may purchase Fund shares or make a charitable contribution toward its work; however, the fund is not directly traded in the market. A venture fund for nature, the EcoEnterprises Fund also provides venture capital and technical assistance in environmentally compatible businesses in Latin America and the Caribbean (EcoEnterprises Fund website). Investments aim not only at generating profits, but also at improving income for local communities, funding for conservation and improving some of the planet's most diverse and dramatic landscapes. The initial closing of the EcoEnterprises Fund is USD 10 million. The EcoEnterprises Fund consists of two components: a USD 6.5 million Venture Fund that invests in small- to medium-scale environmentally compatible enterprises in Latin America and the Caribbean, and a USD 3.5 million Technical Assistance Fund that covers fund management costs and provides limited business advisory services for prospective projects.

The EcoEnterprises Fund invests in companies at all stages of development with sales revenues up to USD 3 million. Investments range from USD 50 000 to USD 800 000, with an average investment of USD 225 000. The Venture Fund finances up to 50 percent of the individual project costs. Financial exposure to any one venture must be less than twelve percent of the Fund's total committed capital and not more than 20 percent to one or more companies in an affiliated group. The Inter-American Development Bank matches each dollar received by the Fund one-to-one. In addition, the Fund finances up to 50 percent of any single venture. Targeted sectors for investment include alternative agriculture, sustainable forestry, non-timber forest products and eco-tourism. Portfolio ventures must adhere to strict standards for biodiversity conservation, sustainable use and community involvement.

TNC is not the only NGO involved in venture capital for biodiversity. The World Conservation Union (IUCN) is also involved in venture capital for biodiversity through the Kijani Initiative. Kijani's goals are to encourage the sustainable and equitable use of natural resources, strengthen rural economies, open up local and foreign markets, create new job opportunities and alleviate poverty while generating sustainable financial returns (Kijani website; IUCN website). In collaboration with the International Finance Corporation (IFC), the Global Environment Facility (GEF) and others, IUCN is currently developing the technical assistance and private equity components of Kijani. The fund is yet to be capitalised.

The above-mentioned examples are interesting investment initiatives toward biodiversity products and services. However, they represent only a small fraction of the venture capital market, which in Europe alone, has been estimated at EUR 100 billion, with at least 300 investment firms. Biodiversity products and services are only now starting to capture the attention of mainstream venture capitalists (European Venture

Capital Association website). While general information on biodiversity-related venture capital funds is available, actual performance data is very difficult to obtain. This may be in part explained by the fact that most biodiversity venture capital funds are new and thus do not have sufficient data to establish a track record. Moreover, as closed partnership funds, they are not required to provide this sort of information to the public.

6.1.3.3 Mutual funds

Consumer preferences for environmentally sound products are also influencing the financial markets through open funds. Consumers are gradually allocating investments to companies that have a socially and environmentally clean track record. Pension funds and other participants in the stock markets are expressing their "ethical" preferences by including new factors in the screening process of investments in addition to financial performance.

Although the large menu of socially responsible funds varies in objectives and screening methodologies, most of them limit themselves to excluding the sectors that are not socially and environmentally sound (tobacco, alcohol and gambling are the most common exclusions). Some investors pressure companies to adopt social and environmental codes of conduct, which often has a positive influence on their stock market prices.

Similar to venture capital funds, mutual funds that focus on socially and environmentally responsible investing are also a strong trend in developed countries' financial markets. In the US, this segment represents USD 2.2 trillion, or around 13 percent of the total market. Total assets of these funds have increased 80 percent during the past three years, compared to a little over 40 percent in the rest of the market. Even at the present when the markets have performed poorly, SRIs have attracted more investments.

Open-end mutual funds had some holdings in biodiversity businesses in June 2001 included: the Domini Social Equity Fund (started in 1991); Portfolio 21 (started in 1999); the Sustainable Performance Group (SAM, started in 1997); the UBS Eco Performance Equity Fund (started in 1997); and, the Triodos Greenfund. Nonetheless, only a small percentage of total holdings are in biodiversity businesses. For example, some funds such as the Domini Social Equity Fund (with seven biodiversity holdings, or 1.75 percent of the total) have been in the market for over a decade and shows positive returns, achieving an annualised rate of return of 14.16 percent since its inception in 1991. Another example, Portfolio 21, with an annualised rate of return of 0.06 percent since its inception in 1999, has eight companies out of 38 that positively contribute to biodiversity conservation. The Swiss UBS Eco Performance Equity Fund with a 12.4 percent rate of return since its inception in 1999, has eleven biodiversity holdings out of 106 or about 10 percent of the portfolio. The Zurich-based Sustainable Asset Management (SAM) Group of Sustainability Funds has 12.1 percent of its holdings in biodiversity companies. Triodos Greenfund, a USD 60 million fund listed at the Amsterdam Stock Exchange, invests in organic farming, wind energy and a wide

range of green projects and businesses, from organic butchers to eco-offices. Dividends from this fund in the Netherlands are tax free under the Green Tax Break, introduced in 1995. Although biodiversity investments are at times part of larger funds; mutual funds that only invest in companies actively conserving biodiversity, are not yet available.

An interesting effort to incorporate environmental and social issues as investment selection criteria has been developed by a Zurich-based company called Sustainable Asset Management (SAM), which has been pushing forward the concept of corporate sustainability. The premise for this approach is that companies that incorporate environmental and social aspects into their management strategies will, over the long-run, have a superior management performance compared to companies that ignore these factors — leading to an increase in shareholder value. These corporate sustainability principles are used to select and rank companies based on the concepts of innovative technology, corporate governance, shareholder relations, industrial leadership, and social well being. The corporate sustainability performance of the eligible companies is assessed on the basis of an industry-specific questionnaire, an analysis of company policies and reports, and stakeholder relations. Most analysis is based on qualitative and broad criteria, and considers a large number of factors that include corporate intentions and commitments as well as current performance. Although biodiversity is not specifically targeted in the selection criteria, the focus on the environmental impact of corporate activities and natural resources management can be indirectly beneficial (SAM website).

In 1999, SAM announced a partnership with the Dow Jones Group to develop the Dow Jones Sustainability Group Indexes (DJSGI website). SAM selected more than 200 companies that are part of the Dow Jones Global Index, covering 68 industries in 22 countries, with a market capitalisation of USD 4.3 trillion. The DJSGI family consists of one global, three regional and one country index. Each of these five broad indexes has four narrower, specialised sustainability indexes (ex-alcohol, ex-tobacco, and ex-gambling), for a total of 25 indexes. Companies in these indexes include: Stora Enso (the second largest paper and board maker in the world); BMW AG, Bristol Myers Squibb; Unilever; and, Credit Suisse.

The index is based on vague criteria difficult to evaluate, and uses a large number of criteria for ranking. Nonetheless, the index is an important benchmark for the development of ethical funds sectors, and represents an interesting first step toward including environmental factors into share valuations. As investors and market analysts develop more reliable evaluation tools, more sector-specific funds could in principle develop, since identifying the right investment for an investor's objective could become less costly.

6.1.3.4 Other instruments

Other "green" financial products include green payment accounts, green savings accounts, and environmental insurance. Green payment accounts, another Dutch example, allow for a part of transactions to be donated to causes that are relevant to nature or the environment such as the WWF. In green savings accounts, banks guarantee that the deposited capital will only be invested in companies or projects that contribute to sustainable development. Environmental liability insurance covers corporate liability for environmental damage. With environmental recovery insurance, the insurance company is responsible for eliminating pollution. Instead of a payment, a clean-up service is provided (Pearce 2002, Van Bellegem *et al.* forthcoming).

6.1.4 Policy issues

The financial sector is one of the most dynamic and competitive sectors of any economy. As such, it is constantly adapting to attract new customers and provide novel instruments to address customer needs. This dynamism is reflected in the interaction between the financial sector and environmental issues, which evolved from the financial sector viewing environmental issues as potential threats to attractive market opportunities. While the use and scope of market-based financial instruments (MBFIs) to address environmental issues in general and biodiversity specifically, is growing — MBFIs are limited by several factors. Some of these factors can be addressed by the creativity of financial institutions themselves. Other limiting factors, however, may require additional policy measures.

- *Biodiversity issues require long term commitments*: Environmental and biodiversity processes often take a long time, and to effectively participate in them, customers and suppliers are frequently bound into long-term relationships. This limits exit options, when the financial sector is actually willing to pay a premium for "liquidity". That is, the sector is often willing to forgo potential returns for the opportunity to exit an investment. To be more attractive to the financial sector, environmental investments would be expected to provide greater financial returns so as to compensate for the limited exit option. However, this may be difficult due to the nature of these investments. The Dutch government has addressed this issue by granting a tax exemption for green investments and lowering interest rates for green enterprises.

- *Biodiversity enterprises are difficult to value*: As many biodiversity values are not captured by markets, it is difficult to actually assess the monetary value of a biodiversity investment. This may also generate a potential liquidity problem in case a company needs to be sold or restructured due to financial shortcomings. For example, consider Earth Sanctuaries Ltd. (ESL), the first publicly listed commercial company in Australia (discussed in Chapter IV). Revenue comes mainly from eco-tourism, associated activities at ESL's sanctuaries such as permits for film crews and photographers, and from professional consulting. In 1999-2000, ESL's

annual revenue was AUD 3 697 203. ESL listed on the Australian Stock Exchange in May 2000 at AUD 2.50 per share, and by June 2001 the option had fallen to AUD 0.75. The volume of ESL shares traded on the stock exchange has been low with few active buyers and sellers. ESL attributes these weak numbers to an "investment and conservation wariness", arising from the fact that the investment community has little experience to judge ESL's worth – valuation techniques are not well-adapted to the broad range of ESL assets. Moreover, the conservation community prefers to buy shares from the company itself rather than the market. (Aretino *et al.*, 2001).[26]

- *Biodiversity investments are uncertain*: Successful financial products generally have well known risk profiles. As sustainable products often entail considerable financial uncertainty, the level of risk is difficult to estimate. This is augmented in the case of biodiversity where certification of environmental claims is undeveloped, property rights are poorly defined, and laws are difficult to apply or unclear. Policies that clearly define property rights over natural resources, including biodiversity, are therefore an important condition for market creation for biodiversity products and services and thus increased involvement of the financial sector.

- *Biodiversity markets are dominated by small and medium-sized enterprises (SMEs)*: Biodiversity products and services are often supplied by SMEs in economically marginal areas. This may be in part explained by the fact that biodiversity is often found in these areas but also implies that there is lack of skills necessary to comply with the stringent business requirements of open mutual funds and even venture capital funds. Lack of capacity is an important obstacle that only a few financial institutions are willing to address. Policies that favour capacity building, education and information could catalyse innovative private approaches.

- *Success of financial instruments is linked to societal well-being*: Much of the success of the novel financial instruments discussed here relies on the client's perception of doing something positive for society. This implies an understanding of the concept of sustainability. However, the concept itself is multifaceted and often lacks clear operational applicability. Difficulties also arise when customers lack sustainability criteria for selecting products. Rather than looking for exact properties, they then buy a product that appears more sustainable in comparison with competitive products. This issue can be addressed by third party information agencies that rank different "green" products according to clear criteria.

[26] According to recent news, ESL has been experiencing financial troubles. A large expansion of the company during the 90s has not yielded the necessary cash flow. ESL is currently under restructuring to attempt to correct these issues. Once again, accurate valuation would be helpful, but as indicated in the recent accounting scandals of Enron and WorldCom this is difficult, even in well-established markets.

- *Certification may decrease information asymmetries*: As with other sectors that are venturing in biodiversity, the financial sector is susceptible to significant information asymmetries. Certifiers (public or private), contribute to the standardisation of products, thereby diminishing information asymmetries. As biodiversity markets grow, there is an increasing need to guarantee the origin and homogeneity of products and services. Without such safeguards, the industry's reputation may be jeopardised by a few suppliers that claim to provide biodiversity-friendly products or services, but in fact do not; and funds that claim to be based on sustainability, but in reality are not. Without an effective system that indicates to consumers the quality of the products they are purchasing, including products from the financial sector; markets may collapse the moment their reputations are questioned in major media sources. Certification schemes based on standards-setting have proven to be a key information tool for the development of biodiversity markets. Despite its still embryonic stage, certification is fundamental for the development of biodiversity products and services and is likely to become an industry in itself. Certification and eco-labelling programs have proven to be more successful in regions where consumers are more environmentally aware;, have higher incomes; and are more sensitive to NGOs, consumer groups and the media. However, consumers and producers are currently faced with large numbers of certifiers and labels that focus on different aspects of the activities, with large disparities in quality. Because of the lack of specific regulations, consumers are faced with the confusing task of discriminating among certifiers in addition to choosing the products. Avoidance of confusion and establishment of credibility are thus important tasks. On the financial side, no independent regulating body, officially certifies environmental funds so far.

- *A financial institution depends on its environmental reputation throughout its areas of business*: The environmental reputation of the financial institution can be just as important as the environmental quality of the green product being sold. That is, a bank wishing to operate successfully in the sustainable product market has to be aware of the requirements this market sets for its other products as well. The necessity for an overall green image leads to environmental criteria for other activities, such as environmental reporting, among others. Some traditional business activities may be challenged to become compatible with environmentally related products.

- *Transparency is often key but has its constrains*: Successful environmental instruments are often transparent. Transparency in terms of financial products means indicating where the money is coming from, how green funds are deployed, where they are deployed and under what conditions the funds are invested. Difficulties may arise not only because of uncertainties inherent in biodiversity processes, but also because of sensitivity issues involving economic interests.

- *Minimising risks on biodiversity investments may be more difficult*: Financial products often face risks from many areas; therefore, minimising risks through stability and continuity is a key goal for financial managers. However, as

mentioned earlier, biodiversity investments sometimes need to be long-term contracts to be effective. Loans in nature projects can run up to twenty and sometimes thirty years. Stability and continuity over such a time-span can be difficult to achieve. Policies to minimise risks such as government sponsored insurance may be useful.

- *Biodiversity requires acquiring additional knowledge*: Developing and selling banking products requires significant information on economic, financial and fiscal issues both nationally and internationally. In addition to this combination of specific knowledge, sustainable products require a different kind of knowledge about biodiversity, nature, and the environment. They also require a different marketing strategy to convey that an institution has the knowledge needed to establish a reputation in sustainable products. These types of knowledge do not often overlap. The required additional knowledge and marketing needs often translate into additional costs, which may make these products less attractive to potential clients. This is a risk that needs to be assessed by the financial institution involved.

- *Regulators should be sensitive to the potential for harnessing financial markets*: Legal and administrative conditions may be more stringent when involving environmental issues. This is at least one of the reasons why financial products addressing environmental issues have been developed. However, it may also serve as a deterrent to the development of biodiversity financial markets. When designing laws and regulations which concern environmental issues, regulators need to be sensitive to potential effects these measures may have on private market solutions to environmental problems.

6.2 Community involvement

Most biodiversity exists in rural areas where people are generally poorer and property rights are often more difficult to enforce. As discussed in OECD (2002a), it is well known that under a short time horizon, unsustainable resource use often generates benefits that are greater than what is sustainable. Sustainable use is more compelling when one considers longer time horizons (i.e., when the discount rate of individuals and society is low). However, while long-term poverty alleviation and conservation often go hand-in-hand, the poorer someone is, the more likely it is that immediate needs will dominate decision-making. Hence, persuading those on the margins of poverty to switch into sustainable use may involve compensating them for short-run needs, even if they themselves would gain in the longer run from sustainable management systems. The relative values of short- and long-run concerns have to be changed, and the involvement of local communities that live where biodiversity is located is fundamental to this task. In some cases, different segments of society may have unique contributions they can make. For example, the different roles of men and women on a farm might lead to specific policies oriented to various roles and specific genders.

Community involvement is more successful if individuals in the community have some previous experience in the activity that generates biodiversity businesses and/or investments. As most local communities close to biodiversity-rich areas are often engaged in farming or hunting, the transition to sustainable use of biodiversity and/or biodiversity conservation usually takes place in some form of agriculture or alternative use of species and ecosystems. However, maintaining sustainable practices might be dependent on consumer premiums, government support, or even off-farm employment. Community-based enterprises in sectors other than biodiversity can provide alternative income so that natural resource extraction remains at benign levels. In other situations, unsustainable practices are the rule, and local communities need to be convinced of the advantages that conservation or sustainable use may bring, both in the short and the long run. This entails some level of education and the provision of information about the activity. Most examples of community-based biodiversity projects thus rely on some kind of agro-forestry system, ecosystem service provision, animal viewing, hunting/fishing licensing or sustainable harvest of particular species. Successful projects often include provisions that allow continued or improved production of basic household needs, such as fuelwood for cooking and clean water.

6.2.1 Examples of agro-forestry systems

Sustainable agro-forestry systems may contribute to the preservation of some indigenous ecosystem such as a tropical forest through a dependency of an agricultural product on the existence of a forestry ecosystem. This can provide a positive impact in maintaining a particular ecosystem service.[27] For example, in the case of tropical rainforest, cocoa and coffee use as inputs the shade from the surrounding trees to protect the shorter productive trees from the tropical sun. While the system tends to be less productive, it also faces lower production costs than felling the trees.

Traditionally, sustainable agro-forestry systems have been used by small farmers and communities that lack the necessary capital to convert the forest into agricultural land. Since they often produce cash crops, they are very dependent on the commodity price fluctuation. Their economic sustainability is thus periodically at risk, particularly when prices are either too high or too low. For example, shade cocoa is produced in the south of the Brazilian state of Bahia, in one of the last remaining areas of Atlantic rainforest. The agro-forestry system is known as *cabruca*. When cocoa prices are high, farmers tend to use the clear-cutting system, due to its short-term productivity. When prices are persistently low, as they were in the first half of the 1990s, farmers seek more profitable land-use alternatives, including pasture cattle rearing and monocropping (Bale *et al.*, 1997). Similar challenges occur in the cocoa producing countries of West

[27] There may be exceptions to this. For example, certain ecosystem services may diminish according to the demands of the agro-forestry system. Agro-forestry systems involving trees may support soil conservation but may also at times exert greater pressure on water quantity. While market solutions for ecosystem services of the type described in the Oaxaca example earlier in this chapter do occur, most major ecosystem services provision cases depend on a certain level of government support.

Africa that use a similar system to the *cabruca*. Unless policies are in place to compensate local communities and small farmers for ecosystem conservation or offer them alternatives to sustain a living, the lack of economic sustainability may preclude the possibility of attaining biodiversity conservation and sustainable use.

Coffee[28] that is certified as sustainably produced is gaining market share in developed countries as consumers are becoming more discerning about the quality, taste and mode of production of their brew. While increasing in importance, certified coffee still comprises less than 1 percent of the total North American and global coffee markets. It is also important to note that certified coffee includes several types of specialised coffees, and not all are produced in agro-forestry systems.

The term "sustainable coffee" generally includes organic, shade-grown and fair-trade coffee. While these are non-exclusive of each other, for example shade-grown coffee can also be organically grown and linked to fair-trade, they try to capture different consumer sentiments and thus are committed to offering different services. Only shade-grown coffee necessarily uses an agro-forestry system, and when its shade is provided by tropical rainforest, it is especially effective in biodiversity conservation. Shade-grown coffee also provides many of same ecological services provided by forests such as soil conservation, carbon sequestration, and habitat maintenance or enhancement. Organically grown coffee follows a similar pattern to organic agriculture discussed in detail in a previous Chapter. Finally, "fair trade" coffee mainly provides a pledge that small growers are receiving some kind of protection, such as a minimum price from exploitation by intermediaries and other agents.

The different types of coffee are also valued differently by the market with average price premiums ranging from USD 0.53 for shade grown to USD 0.59 to organically grown, and USD 0.62 for "fair-trade" coffee. While it is tempting to assert that the difference can be explained by the greater value placed by consumers in the different services associated with the respective coffee, this may be misleading. Studies indicate that since sustainable coffee certification is not obligatory or regulated, there is substantial confusion among suppliers and consumers on what constitutes sustainable coffee. This lack of regulation endures asymmetric information as suppliers may claim to provide a service without needing to comply with standards related to it. Consumers, on the other hand, may be fooled into believing they are buying a product providing additional benefits that are not actually there.

Latin America is the world's largest supplier of sustainable coffee. Leading suppliers of organic coffee include Colombia, Costa Rica, Guatemala, Mexico, and Peru from the region and Indonesia from Asia. In terms of fair trade and shade grown coffee, Colombia, Costa Rica, Guatemala and Mexico dominate the supply market. For example, according to the Consejo Mexicano del Café, 99 percent of Mexican coffee is shade-grown, mainly because 92 percent of Mexican coffee growers are small

[28] The discussion on sustainable coffee is based on CEC (1999) and Giovannucci (2001).

independent farmers owning fewer than 5 hectares who lack the capital to launch modern sun-grown coffee plantations. Between the years of 1996/97 and 1997/98, Mexican production of organic and shade-grown coffee has increased from 150 000 bags of coffee to over 5 million bags and 85 percent of the annual coffee production is exported. However, creating a stable market for Mexican shade-grown coffee has proven difficult. Consumers in the US and Europe frequently associate Mexican coffee with lower grade yields, despite the nation's ability to produce high quality beans. "Shade-grown" is also not a term as well known as "organic." On the supply side, shade-coffee producers in Mexico do not understand consumer markets for gourmet coffee in the US and Europe and are unable to consistently produce the high-quality coffee demanded by the gourmet market. Due to these quality inconsistencies, Mexican coffee often receives lower ranking than coffee from other countries.

6.2.2 Examples of sustainable harvest of species

Communities have managed biological resources as local common property throughout much of history. When human populations were small, this did not lead to degradation of the resource. Continued increases in human populations, however, led to the implicit/explicit establishment of community boundaries which were crossed by migratory wildlife – making property rights an important issue. Over time, with economic development, open access exploitation intensified, on occasion leading to over-exploitation or even extinction of species and ecosystems. Enforceable property rights, therefore, can be an important element in sustainably managing biological resources, especially when they can potentially become open access.[29] However, as illustrated by the examples below, identifying property rights may not be sufficient for achieving a sustainable harvest.

Community management and ownership, combined with government and NGO support, seems to provide a successful foundation for natural resource management and sustainable harvest of species. The Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) program in Zimbabwe is possibly the most documented example of multi-stakeholder co-operation in natural resource management. Established in 1989, it is arguably one of the first community-based natural resource management programs that involves and is supported by major local, national and global stakeholders. The conditions for its development dates back to 1975 when the country allowed private property holders to claim ownership of wildlife on their land and to benefit from its use; recognising that as long as wildlife remained the property of the state no one would invest in it as a resource. Under CAMPFIRE, people living on Zimbabwe's impoverished communal lands, which represent 42 percent of the country, claim the same right of proprietorship. Conceptually, CAMPFIRE includes all natural resources, but its focus has been wildlife management in communal areas,

[29] As pointed out by Conrad and Clark (1987) an "open access" resource is in fact a common property resource that was poorly managed.

particularly those adjacent to national parks, where people and animals compete for scarce resources (Box 6.2).

Box 6.2 **CAMPFIRE Programme in Africa**

The Foundation

Multiple stakeholders and democratic representation: The start of the process is when a rural community, through its elected representative body (the Rural District Council), asks the government's wildlife department to grant them the legal authority to manage its wildlife resources, and demonstrates its capacity to do so. While no single organisation manages CAMPFIRE, a Collaborative Group is responsible for co-ordinating the various inputs, including policy, training, institution building, scientific and sociological research, monitoring and international advocacy. This group is composed by the CAMPFIRE Association (representing rural district councils), The Department of National Parks and Wildlife Management, The Ministry of Local Government, Rural and Urban Development, Zimbabwe Trust (focusing on capacity building), The Africa Resources Trust (monitoring external policy and regulation), World Wide Fund for Nature - WWF (providing ecological and economic research, monitoring, and advisory services), ACTION (providing environmental education, training and materials to schools) and The Centre for Applied Social Sciences at the University of Zimbabwe (involved in socio-economic research and monitoring within CAMPFIRE communities).

The Area

Zimbabwe's communal lands were created early in last century with European colonisation in semi-arid and arid areas. These now contain more than five million people, almost half the national population. Many of the communal lands have too little or unreliable rainfall for agriculture, but provide excellent wildlife habitat. Zimbabwe has set aside, in perpetuity, more than 12 percent of its land as protected wildlife areas. Most of these are surrounded by communal lands. CAMPFIRE will help prevent the protected areas from becoming islands in a sea of development by making wildlife valuable for nearby communities.

The Products

Most communities sell photographic or hunting concessions to tour operators - under rules and hunting quotas established in consultation with the wildlife department. Others choose to hunt or crop animal populations themselves, and many are looking at other resources, such as forest products. The main revenue sources are:

- *Trophy hunting*: This has always provided the highest proportion of income under the CAMPFIRE programme, due to the fact that trophy hunters will pay much higher fees and need less infrastructure than other tourists.

- *Nature tourism*: Although more difficult to establish than trophy hunting, nature tourism is likely to be the area of fastest growth in terms of CAMPFIRE revenues over the next few years. Already, the number of districts earning revenue from tourism projects has increased from one in 1989 to five in 1993.

Box 6.2 continued next page.

Box 6.2 **CAMPFIRE Programme in Africa** *(cont.)*

- *Harvesting natural products*: Communities harvest and sell natural products such as crocodile eggs, timber and river-sand to raise CAMPFIRE revenues. In most communal areas, skins and ivory are sold from 'problem animals' - individuals which persistently raid crops, prey on livestock, or threaten local residents.

- *Live animal sales*: This is a new area of wildlife utilisation under CAMPFIRE. In 1994, Guruve district sold 10 roan antelope, earning some USD 50 000 in the process.

- *Meat cropping*: Cropping impala and other abundant wildlife species for their meat and selling their skins is a common occurrence in CAMPFIRE areas, done under the supervision of the Department of National Parks. However, the revenues from game cropping in CAMPFIRE regions have been negligible since 1990.

The Revenues

The revenues from these efforts generally go directly to households, which decide how to use the money, often opting for communal efforts such as grinding mills or other development projects. The councils, however, have the right to levy these revenues.

Source: CAMPFIRE website.

By enabling rural communities to derive income from wildlife via markets in a sustainable manner, CAMPFIRE has changed the incentives (and thus, local attitudes towards wildlife). For example, an elephant found raiding the crops was previously viewed as a nuisance and could be potentially poached or killed by authorities. Currently, this animal is viewed as "future income" and is simply chased away. Rather than illegally poached, hunting licenses are sold to safari operators and part of the funds are used to protect crops and houses. These funds are also often used to sustain other public goods such as education and health. Locals have thereby become policemen, rather than illegal poachers.

From its inception, CAMPFIRE has grown significantly. The two rural districts, initially involved have grown to over 26 districts. Revenues have also increased dramatically, from USD 327 621 in 1989 to over USD 1.4 million in 1993 and have been increasing throughout the 90s.

Ways of capturing revenues also improved. Instead of negotiating with one or two contenders for their leases, rural districts now invite bids and suggest a minimum price for each species that they can offer under their quota. More recently, districts have started diversifying their income base, so that they also offer tourism or sustainably harvested natural resource products such as river-sand and timber. Revenue variance among districts is high[30].

30 While CAMPFIRE may not be the definitive answer to rural poverty, the program provides revenue that can make significant contributions to the quality of life for the

CAMPFIRE has also had an impact in some rather surprising ways. An interesting example comes from crocodilians, which have traditionally been poached for their skins. With the interest in crocodilian skins, a number of crocodilian farms emerged. Governments and a handful of producers and traders targeted illegal trade, but local communities were less responsive as they benefited from sale of the skins (Hutton et. al., forthcoming). CAMPFIRE addressed this issue using markets rather than promoting heavy regulatory measures. Crocodiles cruise the Manyame River in the Guruve CAMPFIRE area. After negotiation, crocodile farmers decided to pay local communities a fee for all the eggs they collect. The communities thereafter became quite protective of the crocodile nests. In Guruve's Chitsungo ward, some villagers went so far as to 'arrest' several egg collectors who they thought were in the area illegally. It turned out the collectors had the appropriate permits, but the arrests provide another example of how CAMPFIRE has prompted a new attitude among rural communities (CAMPFIRE website).

Local groups have been actively participating in sustainable harvest of species in other regions as well. In Latin America, there are examples where government provides some initial regulatory framework but the program relies heavily on individual landowners. For instance, in Mexico the "Units of Management and Use of Wildlife" (UMAs), launched by the environmental authority in 1997, granted landowners the right to the resources and allows land developers to commercially exploit their wildlife resources. Units operate under an authorised and registered management plan, with a census and monitoring of the exploited species, and certification of production with shared surveillance. In July 2000, 3 552 units with an approximate total surface of 14 million ha were covered. These units include 2 370 extensive breeders, 712 intensive breeders, 203 nurseries, 74 circus, 71 zoos, 66 wildlife shows and 56 botanical gardens. The program addresses both private proprietors and communities. There was special promotion of the scheme with impoverished communities, often also biodiversity-rich, and those communities with a historic and documented record of illegal trade.

Hunting and breeding birds cover 80 percent of the total registered units. Unfortunately, the program creates a preference for species with commercial use that can be detrimental – the specialisation of a territory in only one species can weaken the ecosystems. This was aggravated by reports that authorities were slow to issue permits for non-traditional species. Another criticism is that the scheme is not strategically designed to cover relevant territories, depending on the landowner's willingness rather than on their biodiversity importance. An important factor is that most of Mexico's biodiversity is located in the poorer south, where communities lack the financial resources to participate in the scheme. Management plans alone cost around USD 9 000 and revenues could take up to 8 years to realise. Finally, there is a lack of co-ordination between different government levels, leading to regional and local governments not providing necessary resources for monitoring and enforcement.

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community if used to build social infrastructure, such as health clinics or schools. Such a contribution can thereby serve to motivate rural communities to conserve wildlife habitat, and with it, its associated biological diversity, regardless of the direct private benefits individuals may attain.

In Mexico, as in other Latin American countries, land belongs to those that cultivate it. In order to secure property rights over land and avoid problems with the environmental authority, plant breeders and hunting ranches often registered their activities in the UMAs scheme. Under the scheme, land can be kept natural without the risk of being invaded as "idle land" by non-proprietors. Surprisingly, the scheme seems to be less successful with local communities.

6.2.3 Policy issues

Community involvement in the market provision of biodiversity goods and services is more successful if it entails activities already undertaken by the community itself. Even if these activities were previously unsustainable, transforming them to be sustainable seems to yield higher payoffs at a faster pace. For example, it is not easy to transform a community that engaged in poaching to providers of quality eco-tourism targeting high-income tourists. Nonetheless, the knowledge of poaching can assist in catching poachers. This know-how can sometimes be used sustainably by itself or in activities involving broader programs (e.g., eco-tourism) when undertaken in conjunction with industry and business experts.

The knowledge acquired by communities in their field of expertise does not ensure successful community involvement. Market provision of biodiversity goods and services also requires knowledge of a multifaceted business. This can, in part, be solved by intermediaries but communities also need to be assisted in understanding the basis for attracting financial capital and providing a sustainable product. This understanding would allow them to take advantage of markets, by facilitating finding sources of financing for projects. A more knowledgeable supplier would also benefit potential buyers and investors. For instance, quality of products such as shade coffee could be improved and venture capitalists who commonly complain about the lack of capacity to follow usual business practices in the sector (e.g. need for business plans prior to investments) could experience a decrease in their transaction costs.

Policy-makers and those interested in policy can assist in the process by providing the needed capacity to diminish transaction costs. Both CAMPFIRE and the shade coffee examples use different actors to facilitate the entrance of sustainable biodiversity products and services into international markets. In addition, they involve local communities in the planning processes, provide training and environmental education. They often assist in monitoring and enforcement, when pooling the activities provides economies of scale (e.g. aerial surveys of wildlife), but largely rely in the communities to aid in this process through their field experience.

ISBN 97 2003 03 1 P1
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Chapter 7

The role of information in biodiversity markets

A recurrent theme in efforts to use markets for biodiversity conservation is the need to address information asymmetries. As with public goods, information often cannot be efficiently allocated via markets, and inadequate information may have grave consequences for markets. In response to this problem, a number of information instruments have been developed, ranging from: certification / eco-labelling via third parties or industry associations, to valuation as a tool to inform policy makers and potential users of biodiversity values. While the existence and usefulness of these instruments will vary according to the context, this is likely to remain an important area with a potential need for some level of government intervention. Good quality information is needed to assist consumers and policy makers in decision-making. The existence of strong information asymmetries in markets for biodiversity goods and services may impede the full development of markets for biodiversity conservation and sustainable use.

VII. THE ROLE OF INFORMATION IN BIODIVERSITY MARKETS

A recurrent theme in virtually all cases presented here is the need to address information asymmetries. As one of the potential sources of market failures, information asymmetries have to be addressed to secure biodiversity conservation and sustainable use. Both the private sector and governments have a role to play in addressing the market failures linked to information in biodiversity markets. Rather than signalling the demise of biodiversity policies or the need for less government and regulatory intervention, market creation and use increase opportunities for public/private partnerships in tackling issues related to the different economic characteristics of biodiversity discussed in Figure 2.1. In many cases, governments therefore need to be an active part of the solution, and often the parties involved create a regulatory framework to establish property rights and safeguard the resource itself. At times, the private sector itself calls for more government action — a call which can seldom be solely interpreted as rent-seeking behaviour.[31] From time to time, the call requests less government intervention, but in most cases this call refers to quality rather than to quantity. This is one of the key issues related to information asymmetries. This Chapter discusses the role of information in general and pays particular attention to some of the instruments used in addressing information asymmetries in the markets discussed earlier.

7.1 The role of information

Perfect markets assume that their participants are well-informed about the choices they make. However, information is neither fully available nor costless to attain. One of the ways of increasing human capital is by investing in the gathering and understanding of information. This can be done by private sector, government and civil society alike, though their goals may be different. Companies spend billions annually on

[31] As indicated in OECD (1999), rent-seeking behaviour is a potential disadvantage of pubic financing, but it can appear through other means as well. Some authors are particularly critical of environmental regulations as promoters of rent-seeking, but often use examples related to pollution control rather than to biodiversity conservation (Adler, 1996). Differentiating rent-seeking behaviour from securing the provision of a pure public good (or a positive externality) may be clear in theory, but is complex in practice.

advertisements, trying to influence consumer preferences and knowledge about their products. Schools, governments, and different members of civil society also participate in the process of human capital formation through education and capacity building, but often focus on information about public goods and services. Environmental and consumer organisations may also seek to stimulate governments, corporations, international governmental organisations (IGOs) and people to change their behaviour in order to conserve biodiversity or assist conservation by purchasing products harvested in a sustainable way. Their roles and activities vary from organisation to organisation, but there are at least four major categories in which NGOs channel information: generation and dissemination of information, information campaigns, social mobilisation and boycotts, and assisting in development of certification schemes. Through information, civil society can be better prepared for imposing social norms and negotiating outcomes that affect nature. Information instruments seem to be more successful when local and concentrated benefits can be derived. For example, it is easier to stop poaching through rural communities acting as monitors and enforcers of hunting rules.

Not all information is efficiently allocated via markets – in which case market interventions may be justified. Asymmetry of information may occur when the seller knows more than the buyer in an exchange. Producers of organic crops know how the product is cultivated. Fishermen know if a fish was caught by means harmful to the surrounding environment. Unless the means are available to gather and disseminate that information accurately, consumers will be effectively forced to purchase products claimed to be "sustainable" on faith.

Environmental policy provides a number of examples that attempt to mitigate market failures related to information concerning environmental issues. In recent years, several instruments have been designed to signal to the consumer the environmental quality of the product they purchase. These include a variety of tools ranging from the use of instruments via markets (labels, advertisements, retailers and corporate environmental reports), the mass media (television, radio, newspapers, magazines, and the internet), to governmental and social organisations interventions providing environmental information ("green" publications, manuals and brochures, environmental campaigns). A few of these are also used in biodiversity-related issues.

Most emerging markets for biodiversity products and services lack the necessary information and knowledge about the products and services exchanged; the characteristics of market participants (including suppliers and consumers); and the potential business opportunities that they present. A number of information instruments are therefore being developed to address this problem. These include industry associations that facilitate the development of standards, certification, and awareness campaigns. The following section surveys the characteristics of some of these instruments and their role in developing biodiversity markets and policies.

7.1.1 Certification/eco-labelling

Eco-labels generally indicate whether products are environmentally benign (e.g., organic, species-friendly, sustainably produced and harvested, etc.). While the number of instruments attempting to label biodiversity-friendly products is increasing, their complexity also seems to be growing. Efforts are being made at the international (ISO), regional (EC), and national levels to provide standards and guidelines for claims related to biodiversity goods and services, since the effectiveness of environmental labels ultimately depends on the extent to which consumers perceive and assimilate the information it conveys, and then act on it. While single-issue labels may have the advantage of clarity, they may fail to capture the cross-sectoral nature that characterise biodiversity issues. However, with multiple labels, consumers may find it difficult to differentiate the underlying messages, and the instruments may themselves carry misleading information. To avoid a general discrediting of labelling schemes, some kind of regulatory instruments may be needed to signal to consumers that certain schemes are more appropriate for some issues than others. However, these regulatory instruments do not need to come solely from governments, as some industries and producers associations may find it beneficial to engage in self-regulation, through coordinated measures among their own constituents.

Manufacturers also often consider eco-labelling programs valuable tools to communicate environmental qualities and improve the image of their product and their company. When buying a product carrying an eco-label, consumers are in theory recognising a set of principles and production practices defined by the certifier, and at times may be willing to pay a premium for this enhancement. Certification and eco-labelling programs are more generally successful in regions where consumers are more environmentally aware, have higher incomes, and are more responsive to activities by NGOs, consumer groups, and the media. Eco-labelling programs are used by a small number of producers in specific markets and are contracted on a voluntary basis. Most certification schemes emphasise organics and sustainable forest products and originated in NGOs and grassroots initiatives.

The International Organisation for Standardisation defines three types of environmental labels. Type I labels refer to multi-use, voluntary labels (commonly referred to as eco-labels) usually targeting product categories that traditionally have negative environmental impacts (e.g. paper or detergent producers). Most government sponsored projects and a few well-known NGO initiatives in OECD countries fall in this category. Examples include Canada's Environmental Choice Program, the German Blue Angel, the Nordic Swan, the Swedish Environmental Choice, the EU-Label Award Scheme and the Japanese Eco-Mark scheme (OECD, 1997). Type II environmental labels are informative self-declaration environmental claims made by manufacturers, importers, distributors, and retailers. Finally, Type III environmental labelling refers to quantified product information labelling based on independent verification, using pre-set indices.

Certification schemes based on standards setting (Type III labelling schemes) have proven to be a key information tool for the development of biodiversity markets.

Despite being still in embryonic stages, certification is fundamental for the development of biodiversity products and services and is likely to become an industry in itself in the future. However, consumers and producers are increasingly faced with large numbers of certifiers and labels that focus on different aspects of the activities. Certifiers are mostly NGOs and community participants, although private and government institutions are also entering the market. Because of the lack of specific regulations, this results in consumers being faced with the confusing task of discriminating among certifiers in addition to choosing the products.

7.1.1.1 Eco-tourism

Certification for nature-based tourism is not yet fully developed. Guidelines vary among institutions, and there is no consensus regarding recognition of certifiers. In Costa Rica, for example, efforts are conducted directly by the government. In 1997, Costa Rica created the Certificate of Sustainable Tourism (CST) to motivate the tourism industry towards higher quality standards. The certification process focuses on four key aspects of candidate operations: physical-biological parameters (evaluates the interaction between the company and its surrounding natural habitat); infrastructure and services (evaluates the management policies and the operational systems within the company and its infrastructure); external clients (evaluates the interaction of the company with its clients in terms of how much it allows and invites the client to be an active contributor to the company's policies of sustainability) and the socio-economic environment (evaluates the interaction of the company with local communities and the population in general). The Costa Rican Tourism Institute developed a ranking system (0 to 5) that can be a reference for consumers and industry participants.

NGOs and environmental groups are also implementing other standards. For example, the Rainforest Alliance is gradually establishing credibility and is being considered a reliable source for investors. It has recently launched the Smart Voyager certification program, in association with the Corporation for Conservation and Development (CCD), an Ecuadorian environmental group with experience in nature tourism and eco-labelling. The program has set standards for the maintenance and operation of tour boats in the Galapagos Islands. The standards focus on reducing the environmental impact of operations, promoting environmental education of staff and visitors, improving local capacity building and committing to conservation efforts. This is the first certification effort undertaken in the Galapagos Islands, promising to set the standards for other eco-tourism operations.

7.1.1.2 Forest products

Certification of forest products is widely developed with initiatives arising at the national and international level. Despite important national initiatives (especially in North America and Scandinavia), the certification with the largest impact in the market place is the one provided by the Forest Stewardship Council (FSC). The FSC, a non-profit NGO founded in 1993, is an international membership organisation with

representation of environmental groups, forest product companies, foresters, indigenous groups and others concerned with the socio-economic impact of forestry. Widely supported by the WWF, the FSC offers a worldwide standard-based environmental certification scheme for all forest types and plantations. FSC accredits certification bodies, which audit forests and management systems, according to agreed and accepted standards. SmartWood and SGS are known accredited certifiers. As indicated in Table 7.1, about 17 million hectares have been certified under FSC, with the largest proportion being found in Sweden in September 1999.

Table 7.1. **FSC Certification – Leading five nations by area (September 1999)**

Country	No. certificates	Area certified (ha)
Sweden	25	8 875 979
Poland	6	2 324 013
United States of America	64	1 558 615
Brazil	9	1 329 705
Zambia	1	1 273 700

Source: FSC (www.fscoax.org).

In order to qualify for FSC certification, forest owners and managers must comply with a set of principles and criteria for sustainable forest management (Best, 1999). The FSC principles and criteria encompass both process and performance standards. Forest managers seeking FSC certification must agree to abide by the FSC principles and practices as they are locally interpreted, and open themselves to regular inspection by the approved independent auditors. Companies that acquire the FSC label have to pay a fee for the certification process and periodic audits.

Tracking the chain of custody is critical for any certified product, to document the source of the product that meets a particular environmental standard and to ensure the integrity of intermediate marketing, storage, and transport between producer and end consumer. This technique is proving useful to reduce illegal timber harvesting in developing countries, and to introduce an inventory-based approach to harvesting practices. This in itself is likely to have a positive impact on biodiversity, when compared to common practices such as “mining” the tropical forest. This approach has the added advantage of increasing the level of knowledge regarding forest diversity.

Other sustainable forestry certification schemes include: Canadian Standards for Sustainable Forestry, Sustainable Forestry Initiative (US), Finnish Forest Certification Scheme, Malaysian National Timber Certification Council, CERFLOR (Brazil), and the UK Woodland Assurance Scheme (Kanowsky *et al*., 1999).

7.1.1.3 Organic products

Contrary to markets for forest products in which the FSC label dominates, the organic market is covered by a large number of certifiers, who adopt different criteria and guidelines. Producers usually choose a certifier according to the target market of their products and to the requirements of their clients. Export markets are certified by a small number of organisations that are members of the International Federation of Organic Agriculture Movements (IFOAM). In order to reduce the confusion generated by the large number of certifiers, in 1999 IFOAM contracted the International Organic Accreditation Services (IOAS) to operate the Seal System in conjunction to its Accreditation Programme. Local certifiers authorized to use the IFOAM seal include: KRAV (Sweden); National Association Sustainable Agriculture (Australia); Farm Verified Organic (USA); Instituto Biodinamico (Brazil); Soil Association Certification Ltd. (UK); Bioagricoop (Italy); Oregon Tilth (USA); Naturland-Verband (Germany); California Certified Organic Farmers (USA); Organic Growers and Buyers Association (USA); Argencert (Argentina); Bio-Gro (New Zealand); and Bolicert (Bolivia).

IFOAM has been a key actor in the development of organic-products markets. Its main function is to co-ordinate the network of organic movements around the world, exchanging knowledge among its members, informing the public about organic agriculture, setting up and revising the federation standards for organic agriculture, and representing its members in international forums. IFOAM's international accreditation program has contributed significantly to standardise certification programs worldwide.

Following a similar concept as the one behind the FSC certification scheme, IFOAM intends to create uniform certification principles that are adapted to particular environments and activities by local certifiers. Standards cover all aspects of organic production, from the two-year conversion period, crop rotations, weed, pest and disease control management practices, soil fertility maintenance, and livestock management.

Trade fairs are common in the organic products markets, with the most important ones still taking place in developed countries. The Organic Trade Association (OTA) in the Americas and BIO FACH in Europe are responsible for three large annual trade fairs focusing on organic and natural products that bring together the main participants of these markets. BIO FACH has become the world's biggest trade fair of its kind. In 1998, there were 1 267 exhibitors and 20 500 trade visitors, and for the first time foreign companies made up slightly above half of the exhibitors.

7.1.1.4 Fisheries

The Marine Stewardship Council (MSC) was established in 1997 with the objective of promoting sustainable and responsible fisheries and fishing practices worldwide. Though operating independently since 1999, MSC originated as an initiative of WWF and the multinational corporation Unilever. Unilever continues to support the effort since it has expressed its commitment to buy all its fish from sustainable sources by 2005 – and is working with suppliers toward meeting this target. As the producer of

nearly half the world's fish products, Unilever exerts significant influence by encouraging its suppliers to acquire MSC certification.

Box 7.1 **Trading Marine Ornamentals from Coral Reefs and its Certification**

Coral reefs are among the world's most biologically rich and productive ecosystems, although occupying only 0.25 percent of the marine environment (McAllister, 1995). They yield benefits such as: provision of animal protein as food; tourism and recreational use; buffering of adjacent shorelines from storm and wave impacts; incorporation of carbon dioxide; and offer options for finding new disease cures. Furthermore, coral reefs provide income to many coastal populations in developing countries. While reef fish harvested for food from one island country was valued at USD 6 000 per ton, live fish for aquariums from the same country was estimated to be over USD 496 000 per ton (FAO, 1999a). The same trend is true for live versus dead coral. This makes marine ornamentals one of the highest value products possible to be harvested sustainably from coral reefs. Trade of aquarium fish exported to the US and Europe, with approximately 85 percent being captured on the reefs of the Philippines and Indonesia, is thought to be worth USD 200 million annually in retail sales (Cesar, 1996). This trend may be upward, as marine aquariums gain popularity among aquarium enthusiasts.

Coral reef benefits are endangered by a number of pressures, such as: coastal development (e.g. construction of landfills on top of reefs; dredging for harbours; extraction of sand and rock); pollution (sewage); and tourism (e.g. trampling on corals by snorkel and scuba divers, boat anchors); over-fishing and destructive fishing (includes the use of dynamite, cyanide and other poisonous chemicals, muro-ami netting - all generally non-selective methods); global climate change (damage through greater frequency and intensity of storms; bleaching of corals due to higher temperatures causing them to expel their symbiotic algae that provides the coral polyps with nutrients and thus may cause death) and cumulative effects (less resistance). Bans on the trade of marine ornamentals can negatively affect reef conservation, as coastal communities lose income (similar to ivory bans) and may seek an alternative income in destructive fishing practices, leading to more stress on reef ecosystems. Alternatively, they may be forced to migrate to over-populated urban areas, adding to social issues in the country.

Rural, coastal communities, fishermen and their families, predominately in developing countries, can be part of the solution to reef conservation. This is because healthy reefs underlie their incomes, so they have an incentive to become active reef stewards. Their guarding is especially important in areas far from the reach of governments. However, without certification, consumers lack information about the quality and practices of the industry. Even if they prefer products from sustainable harvesting, they cannot be sure to purchase such a product. The Marine Aquarium Council (MAC) is an international, multi-stakeholder institution to achieve market-driven quality and sustainability in the marine aquarium industry. It does so by developing standards, establishing a system to certify compliance and creating consumer demand and confidence in certification and labelling. Some other tools used are public awareness raising, the assembling and dissemination of accurate data, and education and training of industry and enthusiasts.

Source: Holthus, forthcoming.

MSC is also working to attain sustainable fish harvesting in reef fisheries in (Box 7.1). Live-reef fish trade is particularly suitable for certification, since its final consumers are generally developed countries where consumers keep fish in aquariums. Uncontrolled fishing methods not only impact fish stocks, but also have severe detrimental effects on the surrounding environment and habitat.

7.1.2 Other certification initiatives

7.1.2.1 International associations

Producer associations have traditionally acted as key drivers for market development, and can be successful in establishing norms to their economic sectors. They operate as information brokers for the industry, disseminating information, creating consensus among market participants, and lobbying policy-makers. They can also promote the association with governments, producers, consumers and grassroots organisations. For example, the International Tropical Timber Organisation (ITTO) was created in 1983 as a multilateral initiative sponsored by UNCTAD, with the objective of providing an effective framework for consultation, international co-operation and policy development among all members with regard to all relevant aspects of the world tropical timber economy. A key objective of ITTO has been to enhance the capacity of members to implement a strategy for achieving exports of tropical timber and timber products from sustainably managed sources by 2000. ITTO has contributed to the development of certified timber sources. The organisation is an important source of information and guidance for producers and consumers and has achieved leadership in promoting sustainable harvesting in tropical countries.

Among the many non-government and government efforts created to contribute to the promotion of sustainable forestry, one initiative with a focus on market creation stands out. Forest Trends is a recently created international organisation that focuses on promoting incentives that diversify trade in the forest sector, moving beyond only lumber and fibre to a broader range of products and services. The organisation is a coalition of individuals from private, public and non-profit institutions brokering information and relationships to encourage changes in the market place, helping sustain forest ecosystems. Through the promotion of workshops and seminars, it engages the private and public sector in dialogue and networking exercises that can lead to new market creation. Members of the Board of Forest Trends include leading private companies active in the timber and non-timber forest products markets, research institutes, multilateral organisation and private financial institutions.

7.1.2.2 Buyers' groups

WWF has intensively promoted the creation of buyers groups of certified timber (now called forest and trade networks). These networks are open to any organisation that supports the objective of improved forest management and credible independent certification. The networks are now operating in Australia, Austria, Belgium, France, Germany, Ireland, The Nordic Countries, the Netherlands, North America, Russia, Spain, Switzerland, the UK, and recently Brazil. According to WWF, there are more than 600 member companies, from small producers to world leading companies such as Home Depot and IKEA. In 1997, the network represented an annual demand of 9 million m^3, which represents around 6 percent of estimated sawn wood and wood-based panels in Europe. However, this number is expected to have almost

doubled in the past 3 years. In addition, the number of members in buyers groups worldwide is expected to significantly increase.

7.1.3 Valuation

Understanding the notion of value that is being targeted and adequately accounting for these costs and benefits are crucial if sustainable management of natural resources is to be achieved, and may assist in providing information to those interested in market creation for biodiversity conservation and sustainable use. Throughout the last three decades, a number of methods have been developed to estimate the values and are widely disseminated in the specialized literature.[32] Previously largely an academic exercise, the importance of valuation is increasingly being recognised by governments and in international fora. For example, the Convention of Biological Diversity (CBD), acknowledges that "economic valuation of biodiversity and biological resources is an important tool for well-targeted and calibrated economic incentive measures", and encourages the Parties to "take into account economic, social, cultural, and ethical valuation in the development of relevant incentive measures" (UNEP, 1998). The OECD also highlighted the importance of revealing the economic value of biodiversity in its Environmental Outlook, and OECD environment ministers made it a key element of their strategy for the future (OECD, 2001b).

There are a number of sources of value associated with ecosystems. The total economic value of ecosystems can be broken down in use values and non-use values (Cesar, 2000). Using coral reef ecosystems as an example, **use values** include:

- *Direct use value*: Captive fisheries, mining of reefs and ornamentals. These correspond to extractive use. Non-extractive use includes tourism, recreation, research, education and aesthetic attributes.

- *Indirect use value*: Biological support to species and other ecosystems (e.g. turtles, sea birds, fisheries, etc.), physical protection against wave erosion maintaining coastlines and navigation, and global life-support, such as carbon storage.

- *Option and quasi option value*: Future benefits that can be derived from species, habitats and reef biodiversity in general.

[32] For a detailed analysis of valuation, see OECD (2001c) and OECD (2002a). For a summarised discussion, see Waller-Hunter and Biller (2001).

Table 7.2. **Economic value of a mangrove resource**

Use values			**Non-use values**
Direct value	*Indirect value*	*Option value*	
Timber, fuelwood, charcoal	Shoreline, riverbank stabilisation	Future direct and indirect values	Cultural, aesthetic
Fisheries	Groundwater recharge/discharge		Spiritual, religious
Forest products: food, medicine, wildlife etc	Flood and flow control		Global existence value
Agricultural resources	Waste storage and recycling		
Water supply	Biodiversity maintenance		
Water transport	Provision of migration habitat		
Genetic resources	Nursery/breeding grounds for fish		
Tourism and recreation	Nutrient retention		
Human habitat	Coral reef maintenance and protection		
Information	Prevention of saline water intrusion		

Source: Pearce in OECD (2001c).

Non-use values generally encompass:

- *Bequest value*: Examples from coral reefs are similar to option and quasi-option values, yet they should also include traditional way of life and cultures.

- *Existence value*: Knowledge of conservation of charismatic endangered or threatened species and ecosystems, even if the one who values them may never encounter or use these assets in any way during his or her life.

Table 7.2 illustrates the different values in one specific ecosystem - a mangrove. There is a wide range of functions associated with a mangrove and each function has some economic value. Some of these were discussed in previous Chapters. Table 7.3 presents an actual result of a valuation exercise undertaken in Thailand on most values associated to a mangrove.

Table 7.3. **Economic value of mangrove functions: Surat Thani, Thailand**

Type of economic value	Net return per rai (USD)	As % of total returns
Local use value	169	23
Indirect use value:		
Off-shore fishery	13	2
Coastal protection	498	67
Carbon sequestration	68	9
Total	748	100

Note: 6.25 rai = 1 hectare.
Source: Sathirathai, 1998.

Not all categories of value can be easily captured by markets. However, valuation assists policy-makers, potential suppliers, and likely consumers by informing them of forgone gains and losses and probable future net benefits. For example, a cost-benefit (CBA) model analysis undertaken to assess the impacts of blast-fishing in Indonesia, showed that this practice meant a net loss to society after 20 years, of between USD 33 900 per km² and USD 306 800 per km² of coral reef, according to its potential value for tourism and coastal protection. The key quantifiable costs were loss of the coastal protection function, forgone benefits of tourism, and forgone benefits of non-destructive fisheries. For areas of high potential value, the economic costs to society were four times higher than the total net private benefits from blast fishing. For the country as a whole, it was estimated that the cost of non-enforcement of existing blast-fishing regulations over the last decades amounted to USD 3.8 billion (Cesar, 2000). Tourism and coastal zones are often linked due to their recreational use. As such, tourism revenues are often used to assess non-extractive direct-use values. In Ecuador alone, tourism brings around USD 255 million/year and together with petroleum is an

important component of the country's balance of payment. Most of this revenue comes from interest in a single marine park - The Galapagos Island (OECD, 2001c).

Environmental conservation programs can also benefit from thorough valuation. For example, in April 1999 the Jamaican government created its largest conservation area, the Portland Bight Protected Area (PBPA). The PBPA covers a land area of about 520 km^2, including wetlands, forests and marine ecosystems. To manage this large area sustainably, investments and recurrent expenditures are urgently needed. It was estimated that in NPV terms, over 25 years at 10 percent discount rate, the incremental costs of PBPA management are around USD 19.2 million, while the incremental benefits are between USD 41 million and USD 53 million, depending on the tourism scenario chosen. The estimation also includes some non-use values and show that the expenditures to manage the area are more than justified on economic grounds (Cesar, 2000; Waller-Hunter and Biller, 2001).

The main purpose of valuation exercises for both policy-making, as well as for investment in biodiversity products and services is to foster better decision-making. Valuation facilitates priority setting by underpinning systematic approaches to policy problems. It allows policy makers to choose between alternatives in a manner that provides the maximum social welfare. Such an outcome, however, is clearly dependent on ensuring that all values that individuals give to various facets of biodiversity are taken into consideration (for present as well as future generations).

Valuation is a helpful tool in assisting in the decision-making process. However, even if a valuation study of, for example, a marine park indicates that access fees can be increased, without effective stakeholder participation, it is unclear that revenues will actually increase. Locals may be left out of potential benefits and engage in illegal exploitation of the park. Tourist developments that do not consider local objectives may be boycotted, and tend to be short lived. Rather than a substitute, valuation should be viewed as a complementary instrument to other tools such as participatory assessments. It is yet another way of keeping all stakeholders better informed.

ISBN 97 2003 03 1 P1
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Chapter 8

Concluding Remarks

The different economic characteristics of biodiversity can be correlated with the different notions of "value". For example, pure public goods are dominated by non-use values while private goods are primarily characterised by use values. Since this multifaceted nature of value is inherent to biodiversity, creating markets for biodiversity should not be viewed as a panacea for biodiversity conservation and sustainable use. Rather, they should be perceived as an integral part of biodiversity policies – a way to funnel scarce financial resources to help achieve policy objectives and to the provision of the pure public good components of biodiversity. While much remains to be researched in this topic, one common theme that requires particular attention is the improvement of information flows. Information asymmetries may prove to be a significant bottleneck in the functioning of markets that promote biodiversity conservation and sustainable use.

VIII. CONCLUDING REMARKS

Figure 2.1 earlier indicated the different characteristics of biodiversity according to the economic classification of the goods and services it provides to society. This is correlated with the different notions of "value" as described in Chapter II. For example, pure public goods that are both non-rival in consumption and non-exclusive tend to be dominated by non-use values. Biodiversity in general has a strong pure public good characteristic. An important source of its value as a public good is its insurance value. As noted in OECD (2002a):

> *"The diversity-resilience linkage gives rise to the notion of an insurance value of diversity. What is being insured against with more diverse systems is the risk that the whole system may collapse. More strictly, since risk tends to refer to contexts where probabilities of stress and shocks are known, the insurance is against uncertainty, i.e. a context where risks often are not known in any actuarial sense... From an economic standpoint, the issue is one of identifying and measuring this insurance value. Unfortunately, neither is easy. Identifying how close a system might be to collapse, of some or all functions, is extremely difficult. Yet one would expect willingness to pay to avoid that collapse to be related to the chances that the collapse will occur. If the probabilities are known, the value sought is then the premium that would be paid to conserve resilience."*

Society as a whole may indeed be willing to pay to conserve biodiversity or its resilience, but individuals may be dissuaded from doing so because of the free-riding problem. Not only it is difficult to identify and measure the insurance value, but it is also complex to capture this value via markets. The complexity and strong pure public good characteristic of biodiversity imply that, rather than viewing markets for biodiversity as panaceas, policy-makers should consider them as integral parts of biodiversity policies. These policies should not deem market creation and the commercial use of biodiversity as threats, nor attempt to hamper them. As an integral part of biodiversity policies, markets for biodiversity should be perceived as opportunities to divert scarce financial resources to regulatory functions and to the provision of those components of biodiversity (such as pure public goods) that would not normally be supplied by markets.

Biodiversity is being impacted by human-induced changes, either as a direct or an indirect consequence of economic activities. This book provides a conceptual

framework, backed by examples, illustrating how markets can be harnessed to achieve biodiversity conservation and sustainable use. Much remains to be researched and learned about the topic. Traditionally, the interaction between markets and biodiversity has been detrimental for the latter. In part, this is because biodiversity is inherently characterised by open access, leading to the over-exploitation of species and ecosystems. Remedies to this problem include giving economic values to biodiversity, and addressing open access problems. When all values of biodiversity are accounted for and those characteristics that are marketable placed in the private sector, government policy can focus on the open access and pure public goods elements of biodiversity protection. An optimal setting is one where the public sector undertakes to ensure that only conservation and sustainable use that is socially desirable (but cannot be achieved in the private sector) is publicly financed. As discussed earlier, bundling can be a means of safeguarding certain facets of biodiversity that, from an economic perspective, may only have existence values. In this respect, unlike man-made infrastructure, where unbundling may be important to advance the technology of provision and to stimulate competition, the bundled goods and services provided by nature's infrastructure serve as justification for potential government support. This support should, however, be carefully designed, and not generate rent seeking or stifle potential market development.

One particular need identified in this book is the improvement of information flows related to markets for biodiversity goods and services. The role of information, of course, is to provide knowledge to consumers and producers in their decision-making processes. The provision of information often defines the borderline between functioning markets, market imperfections and market failures. In certain cases, it is clear that markets are quite efficient in channelling information to those who value it the most. In other cases, uncertainty and lack of correct information precludes market participants from attaining efficient market transactions. When the latter occurs, the risk is that biodiversity may not be conserved or sustainably used in a socially optimal manner.

The value of harnessing markets for biodiversity conservation and sustainable use is increasingly being recognized in international fora as well. The Convention on Biological Diversity incorporates the need to create markets for biodiversity products and services into its framework. This is done via several of its Articles, especially those on Incentive Measures (Article 11), and Sustainable Use of the Components of Biodiversity (Article 10). Moreover, COP Decision V/23 on the conservation and sustainable use of dryland, Mediterranean, arid, semi-arid, grassland and savannah ecosystems also encourages Parties to diversify sources of income, to promote sustainable harvesting including wildlife and game-ranching, to explore innovative sustainable uses of biodiversity for local income generation, and to develop markets for products derived from the sustainable use of biodiversity. The work carried under the theme of Access and Benefit-Sharing (Article 15) also promotes the use of markets to achieve conservation and sustainable use (UNEP, 2001).

While recent changes in the interactions between markets and biodiversity are remarkable, it should be underscored that markets are not suitable to provide all biodiversity goods and services. Therefore, they should not be viewed as the "magic

formula" that will arrest biodiversity degradation. As noted earlier, many development, regulatory and information related challenges remain. However, the use of markets is a promising new area that offers much for achieving biodiversity conservation and sustainable use.

ANNEX A: INTERNATIONAL WORKSHOP ON MARKET CREATION FOR BIODIVERSITY PRODUCTS AND SERVICES

OECD and World Bank Institute (WBI), 25 and 26 January 2001

Conceptual Framework

- Dan Biller (OECD) and John Dixon (WBI) - Conceptual Analysis of Markets for Biodiversity Products and Services.

Information Instruments for Market Development

- Leornard J. Mirman [Paul Goodloe McIntire Professor of Economics, University of Virginia] - Remarks on 'Biodiversity and Information'.
- Paulo Nunes [Senior Economist Fellow of the Netherlands Organization for Scientific Research, Department of Spatial and Environment Economics, Free University of Amsterdam]: Certification (Eco-labeling) as a Policy Instrument to Signal the Non-market Values of Biodiversity: a Critical Review.
- Paul Holthus [Executive Director, Marine Aquarium Council] - Creating Markets For Biodiversity Resources And Services: Certification Of The Marine Ornamentals Trade.

Regulatory Instruments Using Markets

- Herman Cesar [Researcher, IVM, Free University and Cesar Environmental Economics Consulting]: The Biodiversity Benefits of Coral Reef Ecosystems: Values and Markets.
- Edmundo Castro [SEED]: Costa Rican Experience in the Charge for Hydro Environmental Services of the Biodiversity to Finance Conservation and Recuperation of Hillside Ecosystems.

Organic Agriculture

- Theo Van Bellegem [Ministry of Housing Spatial Planning and the Environment]: Market Creation: Organic Agriculture in The Netherlands.
- Dominic Moran [Scottish Agricultural College]: Market Creation for Biodiversity: The Role of Organic Farming in the EU and US.

Eco-tourism

- Deborah Peterson and Neil Byron, Productivity Commission, Government of Australia: Creating markets for biodiversity: A Case Study of Earth Sanctuaries Ltd.
- Kreg Lindberg (CRC for Sustainable Tourism / School of Tourism & Hotel Mgmt - Griffith University): Tourist "Consumption" of Biodiversity: Market Characteristics and Effect on Conservation and Local Development.
- Wolf Krug (Researcher - CSERGE): Private *vs.* Public Supply of Protected Land in Southern Africa.

Forest Resources

- Manuel Rodriguez [Former Environment Minister (Colombia) and Former Co-Chairman of Intergovernmental Panel of Forestry]: The Colombian Green Plan.
- Gayatri Acharya, Environmental Economist, World Bank Institute, Strengthening Markets for Biodiversity Goods and Services.
- Stefano Pagliola and Gunars Platais [The World Bank]: Selling Biodiversity in Central America.
- James Kahn [Director, Environmental Studies Program Washington and Lee University]: The Development of Markets and Economic Incentives for Sustainable Forestry: Application to the Brazilian Amazon.
- David Simpson [Resources For The Future]: Bioprospecting as a Conservation and Development Policy: Overview and Insights from Three Cases.

Financial Markets

- Patricia Moles [A2R] - Terra Capital Investors – Case Study prepared for the OECD.
- Frank Vorhies [IUCN] –Kijani Fund Initiative.
- Michel Geelhaar [Brugger und Partner AG] - "Sustainable Equity Funds" (SEF) to Promote High Value Nature Tree Species Reforestation in Costa Rica.

- David Pearce [Professor of Economics, CSERGE]: The Insurance Industry and The Conservation Of Biological Diversity: An Analysis of the Prospects for Market Creation.
- Theo Van Bellegem [Ministry of Housing Spatial Planning and the Environment]: Creating a Market for Environmentally-Related Financial Products.

Community Based Market Involvement:

- Jon Hutton [IUCN and Africa Resources Trust]: Using the Market to Create Incentives for the Conservation of Crocodilians: A Review.
- Scott Vaughan [CEC]: Shade Coffee in Mexico.
- Ina-Marlene Ruthenberg [The World Bank]: Implementing Shade Coffee Projects.

ANNEX B: GLOSSARY OF IMPORTANT TERMS

Access restrictions: measures to conserve biodiversity through restricting access to geographical areas or to the biological resource themselves. Particularly common in situations where there is an endangered species or ecosystem requiring protection for which no level of use is sustainable.

Adverse perverse incentives: any incentive which induces behaviour that leads to a reduction in biological diversity; these are the result of government intervention failures.

Adverse selection : principle that says that those who most want to buy insurance tend to be those most at risk, but charging a high price for insurance (to cover the high risk) will discourage those at less risk from buying insurance at all. Negotiation between two people with asymmetric information may restrict the quality of the good traded. This typically happens because the person with more information can negotiate a favourable exchange.

Assignment of property rights: delineation of the rights of individuals or the public to biological or environmental goods or their components – to use, trade, or exclude others from their use.

Benefit sharing: apportionment of the benefits arising from the use of biological resources, especially genetic resources, between providers of the resources and those who transform or commercialise them.

Benefit transfer: process by which monetary valuations of the benefits of environmental resources (or the costs associated with their loss) can be applied to similar situations.

Bequest values: the value humans place on ecosystems or biological resources for the possibility of maintaining them for the use or enjoyment by future generations.

Biodiversity prospecting: the search for potentially valuable biochemical or genetic resources as mediated through contractual agreements between the owners of genetic resources and others interested in access to those genetic resources (usually pharmaceutical firms).

Biological diversity: variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexities of which they are part of. This includes diversity within species, between species, and of ecosystems.

Biological resources: genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.

Clearing-house mechanism: a facility established by Conference of the Parties to the Convention on Biological Diversity to ensure that information and experiences are shared among interested parties.

Club good: a good that is not private, but whose use is exclusive to a certain group of people (non-rival, but exclusive).

Conference of the Parties to the Convention on Biological Diversity: represents the Contracting Parties to the Convention; those responsible for taking decisions on implementing and monitoring the progress of the Convention.

Conservation: the implementation of measures to ensure that biodiversity is used, managed, and protected in a way that its decline is avoided.

Contingent valuation studies: derive economic valuations for environmental goods or services through surveying people directly to find what they are willing to pay for a biodiversity benefit and/or what they are willing to accept in compensation for the removal of such benefit.

Convention on Biological Diversity (CBD): an international Convention signed by 150 nations at the Earth Summit in Rio de Janeiro in 1992, which entered into force in December 1993. It aims at the conservation of biodiversity, the sustainable use of its components, and the equitable sharing of its benefits; ratified by over 160 countries and the European Union by the end of 1996.

Covenants: see *Easements.*

Creation of markets: the removal of barriers to trade and the assignment of well-defined property rights to create markets where environmental goods and services with privately-appropriable values can be traded to realise their full potential values. Generates incentives for the sustainable use of resources.

Cross-price elasticity of demand: measure of how responsive consumption of one good is to a change in the price of a different good. Cross-price elasticity is positive when the goods are substitutes, and negative when they are complements.

Debt-for-nature swaps: purchase of a country's debt at a discount on the secondary market and its redemption in return for environmental conservation action on the part of debtor government.

Direct use values: value to human societies of those elements of biodiversity, which can be directly consumed, traded, or used as an input to commercial activities.

Easements: contractual agreements between private land users or owner and public or non-governmental organisations that remove part of the bundle of rights associated with ownership of the land, and confer part of the rights of ownership to the easement holder. Agreements are often voluntary and accompanied by financial compensation.

Eco-labelling: provision of information about product characteristics, its origin and/or production process that relate to the environment to inform consumers about their purchasing decisions and to differentiate products for the creation of separate markets for the differentiated products.

Ecological threshold: level of biodiversity deterioration beyond which the ecosystem will experience a sudden increase in adverse (and possibly irreversible) effects on the system's functioning and overall resilience to change.

Economic valuation: assignment of monetary values for environmental goods and services for which market values do not exist, so that these values can be explicitly reflected in any decision-making process based on monetary benefits and costs.

Ecosystem approach: tackling biodiversity conservation or sustainable use objectives through measures that address the whole ecosystem, rather than focusing on its individual components.

Ecosystem: dynamic complex of plant, animal, and micro-organic organism communities and their non-living environment interacting as a functional unit (CBD, 1994).

Ecosystem services/indirect use services: all those functions of the environment which provide direct value to the well-being of humans, through maintenance of a healthy environment.

Eco-tourism: tourism that creates private revenues without destroying the underlying public asset of attractive ecosystem (sustainable use); can provide a safeguard against competing pressures for land use change, agricultural expansion, etc.

Elasticity of demand or price elasticity of demand: measure of how sensitive quantity demanded is to a change in the price of a product; provides a quantitative measure of the price responsiveness of quantity demanded along a demand curve. The

higher the numerical value of the price elasticity of demand, the larger the effect of a price change on quantity demanded.

Environmental fees and user charges: compulsory or requited fees for the use of an environmental good or service. These generate revenues that can be recycled to biodiversity conservation; they also increase the private cost of resource use.

Environmental funds: revenue or resources from public or private sources that are set-aside only for environmental purposes.

Environmental taxes: compulsory or unrequited payments linked to the creation pollution or the use of environmental goods and services. These generate revenues that can be recycled to biodiversity conservation; they also increase the private cost of resource use.

Existence values: the value human place on ecosystem or biological resources for their pure existence.

***Ex-situ* conservation:** the conservation of biodiversity components outside their natural habitats.

Externalities: costs or benefits that result from an activity, but accruing to other than those undertaking the activity in the first place without any mechanism to impute them to the original actors; the existence of externalities is closely linked to the absence of market of the goods in question.

Free-rider: A person who is able to receive the benefits of a "public good" or a "positive externality", without contributing to paying the costs of producing those benefits.

Government intervention failure: interventions by the government that distort price signals and markets.

Habitat: the place or type of site in which organisms exist or function.

Hedonic pricing methods: derive economic valuations for environmental goods or services by examining variations in prices paid for properties which are associated to a greater or lesser degree with the environmental attributes.

***In-situ* conservation:** conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in surroundings where they have developed their distinctive properties (CBD, 1994).

Incentive measures: measures that encourage the conservation or sustainable use of biological diversity.

Income elasticity: measure of how responsive consumption of a good or service is to a change in income. The sign of the income elasticity indicates whether the good is "normal" or "inferior". If the income elasticity is positive, the good is considered to be "normal". Negative income elasticity indicates that the good is "inferior".

Indirect use values: see *Ecosystem services.*

Information provision: ensuring that relevant scientific and technological information is at the disposal of decision-makers and stakeholders in order to inform government policies and individual decisions about the use of biological resources.

Institution-building: creation or strengthening of institutions for mediating, monitoring, and enforcing incentive measures for the sustainable management of biodiversity.

Institutional capacity: overall capacity of government, community, and private groups to effectively design, manage, and enforce biodiversity policy.

Integration failure: lack of capacity or institutional structure to take full account of the effects of sectoral policy on biodiversity (*e.g.* the effects of transport policy).

Intellectual property rights: promote and protect innovation by allowing the owner of knowledge to have security over his/her invention for a designated period of time.

Market: process involving a sizeable number of people that are free to buy or sell a particular good or service.

Market failure: failure of market forces to fund the economically correct level of biodiversity conservation or sustainable use. The four main sources of market failures are: (1) public good, (2) externality, (3) imperfect information, and (4) monopoly (market control).

Monopoly: market in which there is only one firm producing a good for numerous consumers. Its demand curve is the market's demand curve for the product. Thus, it determines both the market price and the supply.

Moral hazard: principle that says that those who purchase insurance have a reduced incentive to avoid what they are insured against.

Mutual fund: Pools of money managed by an investment company, sometimes with specific conservation objectives in mind.

"Open Access" resource: a good that is difficult to keep nonpayers from consuming, but where use by one person prevents use by others.

Option values: values associated with maintaining biological resources so that choices can be made regarding their use in an uncertain future.

Perfect competition: a market in which the following conditions are satisfied simultaneously: numerous small buyers and sellers; a standardisation of product (a homogeneous product); perfect information flows among all buyers and sellers; no collusion amongst buyers and sellers; economic agents have freedom of entry and exit; and consumers maximise total utility and sellers maximise total profits; product is transferable.

Positive incentives: any monetary or non-monetary inducement which directly motivates conservation or sustainable use of biological resources, or to equitably share the benefits of their use.

Precautionary approach/principle: an environmental principle which states that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (Principle 15, Rio Declaration on Environment and Development, 1992).

Private goods or services: goods and services for which one person's consumption deplete its availability to others (rival) and for which it is feasible to exclude people from using its consumption (exclusivity) by charging a price.

Property rights: exclusive authority to determine how and by whom a particular resource is used. Property rights may be seen as a bundle of separate and distinct rights over a particular good - including at least the right of personal use, the right to demand compensation as a prerequisite for its use by other people, and the right to transfer any or all of these rights to others (either permanently by sale or temporarily through some form of contractual arrangement). Property rights may be exercised by governments through their designated officials (public ownership or public property) as well as by private individuals and other sorts of non-governmental organisations (private property).

Protected area: geographically defined area which is designed or regulated and managed to achieve specific conservation objectives (CBD, 1994).

Public goods and services (pure): goods and services whose benefits are not depleted by an additional user (non-rival) and for which it is generally not possible to exclude people from its benefits (non-exclusive).

Regulations: *see Standards and regulations.*

Rent: amount of any payment to the owner of a factor of production (land, labour or capital) that exceeds the minimum payment that would have been necessary to motivate that owner not to transfer it to some other use.

Rent-seeking behaviour: expenditure of resources to bring about an uncompensated transfer of goods or services from another person or persons to one's self as the result of a "favourable" decision on some public policy.

Resilience: measure of the ability of an ecosystem to withstand stress and shocks; and to persist in the face of unpredictable and sometimes drastic natural changes and pressures.

Safe minimum standards: principle suggesting that there be a presumption in favour of not harming biodiversity unless the opportunity costs of that action are very high (*i.e.* no significant deterioration of biodiversity should occur unless the benefits associated with that deterioration heavily outweigh the costs of deterioration).

Scarcity rent: foregone future profits as a result of a natural resource extraction today.

Species: population whose members are able to interbreed freely under natural conditions.

Stakeholder involvement: involvement of representatives of all parties affected by biodiversity (or its loss) in processes for determining its management.

Standards and regulations: legal measures that restrict, prohibit; or require certain activities or methods.

Support measures/subsidies: government-directed and market-distorting interventions which decrease the cost of producing a specific goods or services, or increase the price which may be charged for that good or service.

Sustainable use: use of components of biological diversity in a way that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations (CBD, 1994).

Tradable/transferable permits or rights: rights or allowances to undertake a certain restricted activity – such as the emission of pollutants, land development, harvesting of market a particular species – which can be traded between interested parties through a market.

Travel-cost methods: economic estimates of people's values for biodiversity resources according to the amount of time and money they are willing to expend to reach the resource.

Unbundling: separation of activities in which economies of scale are not important from those in which they are.

Use rights: rights over certain aspects of a natural resource for private uses (*e.g.* bioprospecting, grazing, hunting); does not include the right to sell the resource or to damage the surrounding ecosystem, and may be linked to certain condition or *covenants* ensuring the sustainability of use.

Venture capital: investment in a business that is perceived to have excellent growth prospects, but which does not have easy access to capital markets.

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OECD PUBLICATIONS, 2, rue André-Pascal, 75775 PARIS CEDEX 16
PRINTED IN FRANCE
(97 2003 03 1 P) ISBN 92-64-09922-0 – No. 53075 2003

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