

## SAVING BIOLOGICAL DIVERSITY: ECONOMIC INCENTIVES

### EXECUTIVE SUMMARY

The term "biological diversity", or "biodiversity", refers to the number, variety, and variability of all living organisms in terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part. In its widest sense it is synonymous with "life on earth". Biodiversity has been slowly and naturally evolving since the beginning of life. Human activities also shape biodiversity. In the past, when the Earth's natural abundance seemed boundless, there was little concern over the effects of human activities on the world's stock of biological diversity. It is only recently that the relative "smallness" of the planet, the extent to which human activity can cause the extinction of species, and the implications for the environment (including human society) have come to be recognised. The rate at which species are becoming extinct is unclear, because so many species are unknown, and because of the absence of a baseline from which to measure. However, a recent United Nations report suggested that over the next quarter century from 2 per cent to 25 per cent of species in tropical forests in the various groups examined might be extinct, which represents a rate between 1 000 to 10 000 times the historic rate of extinction (UNEP, 1995).

There are many reasons that biodiversity is important to human society.

- biodiversity facilitates ecosystem functions that are vital for continued habitability of the planet (such as carbon exchange, watershed flows of surface and ground- water, the protection and enrichment of soils, the regulation of surface temperature and local climate, and so on);
- it offers aesthetic, scientific, cultural and other values which are intangible and non-monetary -but which are nonetheless almost universally recognised;
- biodiversity is the source of many of the world's products, including foodstuffs, fibres, pharmaceutical products, and chemicals, and is a fundamental source of information for and input to biotechnology;
- biodiversity forms the basis for crop and livestock varieties, the improvement of existing varieties, and the development of new ones;
- the uniqueness and beauty of diverse ecological systems has value for a wide range of recreational uses and for eco-tourism.

The loss of the world's biological diversity, and its economic and ecological consequences, is now widely recognised as an environmental matter of urgent global concern. The importance of conserving diverse biological resources and using them sustainably led to the rapid ratification of the Convention on Biological Diversity, one of the 11 international environmental treaties signed at the United Nations "Earth Summit" in 1992. It calls for 'the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources'. Attaining these objectives is an integral part of sustainable development. The convention entered into force in December 1993 and has now been ratified by over 130 countries.

With the Convention on Biological Diversity in place, international attention focused on the practical implementation of strategies for the conservation and sustainable use of biological diversity. The biodiversity convention recognises that the causes species and ecosystem losses are diffuse in nature, involving many different sectors. To address the underlying causes of the problem, the convention underscores the need for multi-stakeholder processes aimed at protecting biodiversity at the genetic, species, a ecosystem level through national-level actions, and on the need to integrate conservation and development objectives in government planning and practice. The convention identifies incentive measures as a specific mechanism to help guide national-level actions and to promote the conservation and sustainability goals expressed in the convention. Incentive measures are highlighted in the Convention in Article 11

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which states that "Each Contracting Party shall, as far as possible and as appropriate, adopt economically a socially sound measures that act as incentives for the conservation and sustainable use components of biological diversity".

The OECD, through its Expert Group on Economic Aspects of Biodiversity has recently completed a two-year project that examined how policy can guide human action towards the conservation and sustainable use of biodiversity, with a particular focus on the use of incentive measures. This work supports the implementation of the Convention on Biological Diversity by providing a basis for understanding and future development of incentive-based biodiversity policy measures. A discussion on implementation of Article 11 is planned for the third meeting of the Conference of the Parties to the Convention in 1996.

### **What are incentive measures in the biodiversity context?**

Incentives can be defined broadly to include those measures that make use of the price system and market forces to achieve their objectives. Working through the price system, incentive measures improve decision-making on biological resources by reducing the differences between the value of biodiversity to individuals and to society as a whole. Incentive measures increase returns to activities that conserve or restore valuable biological ecosystems and increase the cost or lower the return to activities that damage ecosystems. They work to level the playing field between the observable returns to destructive activities and the non-observable returns to conservation. For example, farmers who receive a return in the form of a government payment for maintaining biological diversity on their land will be more willing to use farm practices that sustain biodiversity values than they otherwise would.

The causes of species and ecosystem losses are extremely diffuse in nature and involve many different sectors. Biodiversity is pervasive to the economic system, being affected by land and water use decisions, by pollution and by economic activity generally. Since they are market-based, incentives can "filter" through the entire economic system, and can make it the enlightened self-interest of property owners and people using resources to put their knowledge and skill to work on behalf of conservation. Underlying eco-labelling schemes for timber products, for example, is the premise that trade in timber can provide a powerful incentive to producers to engage in sustainable forest management. Similarly, limiting development rights to an area, and making such rights tradable, sends a price signal that indirectly affects the entire economic system by its direct impact on property values and economic development.

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Positive Incentives	Disincentives	Indirect Incentives	Removal of Per-verse Incentives
<ul style="list-style-type: none"> <li>• agricultural land set-aside schemes</li> <li>• public or grant-aided land purchase</li> <li>• wetland reserves</li> <li>• covenants / conservation easements</li> <li>• cost-sharing /management agreements</li> <li>• species enhancement schemes</li> <li>• customary cultivation of biodiversity</li> <li>• international biodiversity transfers</li> <li>• incentive payments for organic farming</li> <li>• taxation and fiscal measures</li> </ul>	<ul style="list-style-type: none"> <li>• user fees</li> <li>• non-compliance fees</li> <li>• fines for damages</li> <li>• environmental liability</li> <li>• performance bonds</li> <li>• habitat mitigation schemes</li> <li>• marine pollution liability</li> </ul>	<ul style="list-style-type: none"> <li>• individual transferable fishing quotas</li> <li>• tradeable development rights</li> <li>• property-right mechanisms</li> <li>• species commercialisation</li> <li>• biodiversity prospecting deals</li> <li>• forestry offsets</li> <li>• air emission trading</li> <li>• effluent discharge trading</li> <li>• tradeable water entitlements</li> <li>• wetlands mitigation banking</li> <li>• joint implementation</li> <li>• debt-for-nature swaps</li> <li>• international franchise agreements</li> <li>• eco-labelling</li> </ul>	<ul style="list-style-type: none"> <li>• reduction and restructuring of agricultural support harmful to biodiversity</li> <li>• introduction of agricultural conservation compliance measures</li> <li>• reform of public forestry concession pricing, licence fees, reforestation fees, and royalties</li> <li>• full appraisal of forest benefits</li> <li>• discontinuation of below-cost timber sales</li> <li>• reform of tax structures</li> <li>• full cost pricing for water services</li> <li>• appraisal of biodiversity impacts in the transport sector</li> <li>• road pricing</li> <li>• costing of biodiversity loss in energy investment appraisal</li> </ul>

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Incentives can be grouped into four categories:

- positive incentives: monetary or non-monetary inducements which encourage or motivate governments, organisations and individuals to safeguard biological diversity;
- disincentives: mechanisms that internalise the costs of use of and/or damage to biological resources in order to discourage activities that deplete it;
- indirect incentives: trading mechanisms and other institutional arrangements that create or improve upon markets and price signals for biological resources, encouraging the conservation and sustainable use of biological diversity;
- perverse incentives: incentives which induce behaviour that reduce biodiversity; most of them are unanticipated side-effects of policies designed to attain other objectives.

A large variety of incentive measures can be applied with direct or indirect benefit to biodiversity. The incentive measures described in this report, and currently being used or under consideration in OECD Member countries to address biodiversity issues are listed below.

Although the list is extensive, experience with incentive measures directed at the conservation and sustainable use of biodiversity is still limited in OECD countries; it is therefore important to continue sharing country experiences in the design and implementation of incentive measures.

### **Biodiversity policy must address the underlying causes of biodiversity loss**

A principal conclusion of the report is that all biodiversity policies, incentive-based or otherwise, which attempt to conserve biodiversity without addressing the fundamental pressures that cause biodiversity loss cannot succeed in the long run. The pressures remain and the incentive to engage in activities that are inconsistent with conservation will not have been changed. While no-one knows in detail the relative importance of the factors producing biodiversity loss, it is clear that land conversion, away from high diversity land uses such as natural forests to low diversity uses such as urban development, is a major proximate cause, and is probably the leading cause of loss of terrestrial biodiversity. Other proximate causes of biodiversity loss include: exploitation of wild species; introduction of exotic species; homogenisation of agricultural systems; pollution and; global environmental change.

To find the underlying or fundamental causes of biodiversity loss, it is necessary to ask why land conversion and the other proximate causes of biodiversity loss occur. Expressed in this way, it can usually be seen that there are a number of major driving forces, including population distribution and growth patterns, consumption and production patterns, and economic failure. Economic failure, in turn, encompasses market failure; inadequate or poorly defined property rights; uncertainty and information failure; intervention, or institutional failure; government integration failure; and, international trade.

Among the most commonly heard reasons for the loss of biodiversity is that the interplay of market forces will not secure the balance of habitat conversion and conservation desired by society. Such "market failure" can arise through ill-defined, disputed or non-existent property rights; missing or incomplete markets for biological resources; externalities (for example, the impact on biodiversity of transport systems or water pollution from agricultural production); and, from the "uncaptured" externalities of conservation benefits (a forester, for example, may have little incentive to undertake costly changes in harvesting practices that are beneficial to biodiversity since all of society, and not necessarily the forester, will benefit from the change). In the case of biodiversity, market failure extends beyond the local level to the global level. Global market failure is the failure of the world economic system to enable those who generate benefits from conservation to capture or appropriate those benefits through an international market. For example, residents of other countries might assign high value to the maintenance of biodiversity in a tropical forest, but in the absence of a market in which that value can be established, the user of the tropical forest -an exporter of hardwood, say -fails to appropriate the benefit, and will continue to destroy the forest. By creating or improving upon local and global markets and property rights for biodiversity, incentive measures help rectify the problem of market failure.

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It is not always absent markets and price signals that cause the loss of biodiversity. Government policies, too, can have unintended and harmful side effects on biodiversity. Price controls and subsidies in agriculture, urban development, water provision, transport, energy and forestry can distort the costs of the use of biological resources. The level of agricultural assistance for the OECD area as a whole in 1994, for example, was \$175 billion -equivalent to about 43 per cent of the value of total agricultural production. Such support creates major distortions in agricultural prices, potentially affecting production, land use, and biodiversity.

The removal, reduction, or reform of the most perverse policies in terms of biodiversity is one of the most cost-effective means of promoting biodiversity conservation. Not only would it reduce public expenditure, but since perverse incentives, by distorting markets and prices for biodiversity undermine the effectiveness of incentive measures, they make the conservation of biodiversity more expensive than it otherwise would be. The example of the Delta Smelt (a species of fish) demonstrates how water subsidies can threaten an endangered species. The sole habitat of the Smelt in the Sacramento-San Joaquin Delta in California has faced considerable threat from a combination of drought and high rates of water abstraction -which can be partially traced to subsidies to agricultural irrigation.

To avoid government intervention failures in the first place means that all economic and sectoral policy needs to be appraised for its impact on biodiversity. The need to sustain biodiversity must be fully integrated into overall plans for sustainable development and into sectoral plans such as those for forestry, transport, water resource management, agriculture, coastal zones, fisheries, and rural development. Government policies need to be incentive compatible or consistent from a biodiversity standpoint. Policy that provides an incentive to one resource user, *e.g.* to clear a forest, is clearly inconsistent with policy that provides incentives to forest users to manage the forest sustainably. Integrating sectoral policies with biodiversity concerns is essential and is called for in the Convention on Biological Diversity, which requires that each contracting party shall, as far as possible and as appropriate, integrate consideration of the conservation and sustainable use of biological resources into relevant sectoral or cross-sectoral plans, programmes, and policies.

To overcome problems of integration failure some OECD countries have experimented with new administrative and institutional structures, often as part of recently introduced national biodiversity action plans. The Norwegian government, for example, requires that selected government ministries prepare their own biodiversity strategy which outlines how that sector will address biodiversity conservation within their spheres of influence. The Ministry for the Environment is then responsible for integrating the multi-sector strategies into a national plan of action. Other countries, such as the Netherlands and Australia, have adapted a strategy in which the major national environmental and development plans are analysed against the provisions of the biodiversity convention to identify gaps in existing or proposed measures.

Integration of biodiversity in environmental policy itself is also important. Since biodiversity is pervasive to environmental systems, all environmental policy affects biodiversity in one way or the other. The appraisal of environmental policy needs to stress the multiple benefits of environmental measures. What is essential is biodiversity screening of environmental policy -effectively an environmental impact assessment of environmental policy -to check for impacts. Not only might projects with biodiversity benefits be more appealing, but such procedures will assist in the design of biodiversity incentive systems.

Another source of biodiversity loss can be ignorance of the functions and structure of ecosystems, and lack of hard data to demonstrate their importance. As a result, policy decisions may not be environmentally sound, encouraging behaviour that depletes natural resources. The full spectrum of biodiversity values and the impact of human activity on stability and resilience of ecosystems (their capacity to recover from external stress and shocks such as habitat destruction, water pollution or acid precipitation) therefore have to be understood. It is thought, for example, that ecosystems undergo an irreversible collapse when certain "thresholds" of damage are reached. But knowledge of such thresholds is at present poor, although they are critical for the design of biodiversity policy. Where such thresholds exist, it may mean that the rate of environmental exploitation should not simply be slowed down but ultimately restricted.

The economic and ecological implications of the ecological role of biodiversity are extremely significant yet difficult to assess, and therefore require much more analysis. Ignorance and uncertainty concerning the ecological role of biodiversity limit our ability to value its full contribution to human welfare. Improvement in both the scientific and policy

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analysis of the implications of biodiversity loss for ecosystem functioning and resilience as well as human welfare will require the development of inter-disciplinary approaches to analysing these implications, involving ecologists, economists, and scholars from other disciplines.

The many uncertainties about biodiversity mean that policy formulation should be based on the "precautionary approach" and the idea of "safe minimum standards". The precautionary approach suggests that where there is a likelihood of serious or irreversible biodiversity loss, lack of full scientific knowledge should not be used as a reason for postponing an action to prevent that loss. The safe minimum standard requires a presumption in favour of safeguarding biodiversity unless the opportunity costs are very high. Put another way, no significant deterioration of biodiversity should occur unless the benefits associated with that deterioration heavily outweigh the costs of the deterioration. Both the safe minimum standard and precautionary approach are similar in that they reflect a conscious policy decision to err on the side of safety.

Poor information on the economic value of biodiversity also underlines the importance of continued theoretical and primary empirical research into the measurement of the benefits of biodiversity with a focus on application to policy. Information on the economic benefits of maintaining biodiversity and the costs of biodiversity loss should be made available in such a form that informed decision making can result. The role of valuation and cost-benefit analysis in biodiversity policy making is twofold:

- to identify and quantify the value of biodiversity in order to assist policymakers in prioritizing conservation objectives;
- to help establish and calibrate the economic incentives needed to secure those conservation objectives.

However, policy makers must recognise the limited utility of cost-benefit analysis in the biodiversity context, given that both the costs and benefits associated with the loss or conservation of biodiversity are largely unknown and have not been well translated into economic terms.

## **Incentive policy design and implementation**

Incentive measures can be directed at three main target groups: 1) people whose behaviour enhances biodiversity-related goods and services and who tend to bear the cost of conservation (such as farmers and other landowners who use the land in a way that conserves its biological values); 2) people who benefit from biodiversity-related goods and services and who attach value to biodiversity (for instance, anyone who enjoys the natural landscape); and 3) those whose behaviour diminishes or harms biodiversity-related goods and services (such as an industrial plant that pollutes air and water, or an urban development), affecting both groups 1) and 2).

In principle, groups of individuals who damage biological resources should pay for preventing damage and for the social costs of the damage itself. Likewise, the users of biological resources should pay for the full costs of resource use, including the costs associated with controlling or preventing any associated resource damages. And the incremental costs associated with the delivery of non-market benefits should be reimbursed with the use of positive incentives.

Compensation to farmers and other landowners for the additional costs associated with the delivery of biodiversity values is an example of payments to providers of biodiversity. In Sweden, for example, ancient and unimproved meadows are an important source of the country's in situ plant and insect diversity. Farmers are compensated for maintaining traditional farming practices that sustain and improve the biodiversity in these areas. Positive incentives can help to enhance public acceptance of biodiversity conservation measures and, if properly structured, provide dynamic and continuing incentives for improvement. It is important that people recognise biological resources as assets in order to develop incentives for conservation and sustainable use.

Disincentives (such as entrance fees to parks, fines for damage to the natural environment, and marine pollution liability) and indirect incentives (such as individual transferable fishing quotas, tradable development rights, and biodiversity prospecting deals) can cause the users and damagers of biodiversity to pay, at least in part, for their use or damage to biological resources. Some of these measures generate revenues and have a potentially powerful role to play in funding conservation activities and in compensating local communities and the other providers of biodiversity

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for the opportunity cost of conservation. The ability of incentive measures to raise revenues provides a double dividend argument to their use. In one mountain community of Northern Italy (Comunale Parmensi), for example, harvesting of wild mushrooms on communal land has always been very important for local people. When mushroom harvesting by visitors began to generate serious competition for the resource, an access fee was introduced. Now the revenues from mushroom-picking fees account for 50 per cent of the community's total annual revenues.

In the implementation of incentive-based measures, close co-operation with stakeholders has many advantages and is usually preferred. Multi-stakeholder approaches tend to: increase the leverage of instruments by developing stakeholder willingness and enthusiasm; be flexible and adaptable to changing conditions; and, require less information and information synthesis.

No single policy approach or instrument will be sufficient to solve all biodiversity threats in any country. As a general rule, mixes of instruments are required to meet the complex objectives of biodiversity conservation. In the selection of mixes of incentive measures a large number of variables come into play specific to the country, location, and particular biodiversity problem. The effectiveness of a given policy measure in addressing biodiversity issues will depend on the particular legal, political, economic and physical conditions in the country in question. It is therefore difficult to generalise on what specific incentive measures, or mix of measures, might be most appropriate in any specific situation. Policy measures that are appropriate for one country may not be for another. The biodiversity priorities and policy measures needed in Europe, for example, where land has been in use or cultivated for millennia are likely to be different from North America, or Australia where large areas of wilderness, or semi-wilderness still exist.

All policy options should be systematically analyzed with a view toward cost minimisation in terms of public costs of administration, monitoring, and enforcement, and in terms of the private costs of implementation. As a general principle, prevention of biodiversity loss is likely to be more effective and less expensive than last minute cure via rehabilitation or reclamation. Gene banks and captive breeding are, for example very costly. The cost of last minute cures can be justified as a buffer against final extinction, but they are not a long-term solution. Wild species can only be preserved in the context of their communities within their natural habitats.

The most successful applications will be those which build upon a number of different policy instruments and approaches and tiers of government, and which act locally, nationally and internationally. Incentive measures are not alternatives to conservation laws and other traditional regulatory techniques but rather a means to support and complement them. Education and awareness campaigns, for example, have complementary roles to play with regulatory and incentive-based measures. All evidence suggests that people are willing to take action and to pay more for conservation when they are more aware of what is under threat and why it may be important. Similarly, regulations have a supportive and complementary role to play with incentive measures. In particular, where the risks of irreversible loss of biodiversity are acute, incentive mechanisms may have to be underpinned by a regulatory safety net that assures an identifiable degree of protection.

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For more information about the **Saving Biological Diversity: Economic Incentives**, contact :

**Philip Bagnoli, GSP Division**, Environment Directorate  
Email - [philip.bagnoli@oecd.org](mailto:philip.bagnoli@oecd.org); Fax : +33 1 44 30 61 84

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