UNEP

Are you a green leader?

Business and biodiversity: making the case for a lasting solution

2010 International Year of Biodiversity

UNEP WCMC

United Nations Environment Programme

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“The landscape may appear bleak, but a rising number of companies are making the link between natural assets, their bottom line, business sustainability and the urgent need for a low-carbon, resource-efficient 21st century green economy”

Achim Steiner, UN Under-Secretary General and UNEP Executive Director

Preface

Are you a Green Leader? is a contribution towards a renewed commitment to reverse the rate of loss of biodiversity. It is aimed at the companies and corporations who are either wholly or partly dependent on this key resource or whose activities can be a major impediment to its conservation. The world is currently undergoing a sixth wave of extinctions linked firmly to unsustainanable consumption and production patterns and a persistent failure of markets to capture the real value of the globe's animals, plants and other life-forms.

Value in terms of food and fibre but also in terms of multi-million dollar services such as pollination and its contribution to sectors like tourism: value too in terms of ecosystems such as forests and freshwaters to soils and indeed the atmosphere.

Biodiversity is the building block of these nature-based systems whose damage and degradation may equal a global financial loss of up to $4.5 trillion annually according to The Economics of Ecosystems and Biodiversity hosted by UNEP.

Biodiversity loss will also impact the future economy: the 20th century was an industrial age, the new century will increasingly be a biological one based on discoveries linked with genetics and biomimicry. The landscape may appear bleak, but a rising number of countries and companies are making the link between these natural assets, their bottom line, business sustainability and the urgent need for a transformation towards a low-carbon, resource-efficient 21st century green economy.

Opportunities are also emerging via new kinds of nature-based markets and trading including ones covering areas such as water and wildlife to agreements such as those relating to climate change. For example paying developing countries to maintain forests, via Reduced Emissions from Deforestation and forest Degradation (REDD), can reduce greenhouse gas emissions while also conserving biodiversity and generating jobs in natural resource management. UNEP is working with farmers and landowners in China, Kenya, Nigeria and Niger on quantifying how differing kinds of agriculture and land management sequester carbon while boosting yields.

This report, prepared in collaboration with UNEP World Conservation Monitoring Centre, is part of a broad body of work that UNEP in partnership with others is evolving in respect to a suite of environmental challenge and opportunities in respect to business.

In 2009, UNEP; the Secretariat of the Convention on Biological Diversity and the Government of Indonesia held the Biodiversity and Business event in Jakarta that also served as third conference on "Business and the 2010 Biodiversity Challenge".

It highlighted successful practices in various sectors which have been included in this report along with sectors which can have significant biodiversity impacts: mining, energy, agri-foods, fisheries, construction, forestry, tourism, pharmaceuticals, cosmetics, fashion and finance.

2010 is the United Nation's International Year of Biodiversity: it was meant to be the year when the world had reversed the rate of loss of biodiversity in order to maintain this essential environmental, social and economic asset.

The fact that this has not occurred requests and requires a renewed commitment, not least from the business community.

Achim Steiner
UN Under-Secretary General
and UNEP Executive Director

The Earth's diverse species are crucial for the functioning of ecosystems, which in turn provide essential goods and services on which people, business and global economies rely.

There is growing awareness of the impact and dependency that business operations have on biodiversity and ecosystem services, and the business risks that poor management of them can present.

Introduction

This publication provides an overview of the impacts and dependencies that business has on biodiversity and ecosystem services and the associated business risks and opportunities. It highlights existing initiatives to address biodiversity and ecosystem services and harness the opportunities this can present.

The overall aim is to raise awareness around the main issues, as well as provide a useful reference of existing tools, standards, and guidance to support companies wishing to adopt biodiversity-friendly policies and practices. The document covers a wide range of sectors, namely mining, energy, agrifoods, fisheries and aquaculture, construction, forestry, tourism, pharmaceuticals, cosmetics, fashion, and financial services. It covers the business case for businesses to manage their impact on biodiversity, includes a range of tools and initiatives available to support companies to engage in biodiversity issues and complements existing and ongoing work on business and biodiversity, such as the Economics of Ecosystems and Biodiversity (TEEB) study for business (http://www.teebweb.org/).

This report was initially developed as a background discussion paper for the Biodiversity and Business conference held in 2009 in Jakarta, Indonesia. The conference — a joint event combining the Convention on Biological Diversity (CBD) Third Business and the 2010 Biodiversity Challenge Conference and the United Nations Environment Programme (UNEP) Division of Technology, Industry and Economics (DTIE) 2009 Business and Industry Global Dialogue. This final report, prepared in collaboration with the UNEP World Conservation Monitoring Centre (UNEP-WMC) is intended as a reference material for businesses that are looking to effectively engage with biodiversity by stressing the link between biodiversity and core business and by highlighting best case practices.

Why does biodiversity matter?

Biodiversity[1] provides the basis for human development and well-being. The Earth's diverse species are crucial for the functioning of ecosystems, which in turn provide essential goods and services on which people, business, and global economies rely. These include raw materials like wood, water, fish and medicinal compounds, as well as regulating and supporting services such as climate stabilization, flood regulation, pollination and soil formation. However, biodiversity is currently disappearing at an alarming rate. Over the past 50 years ecosystems have been extensively modified to meet the rapidly growing demands for food, fresh water, timber, fibre and fuel. As a result, around 60% of examined ecosystem services are now degraded or being used unsustainably[2]. Human induced climate change, as well as a growing human population and continued economic expansion will further exacerbate ecosystem degradation and biodiversity loss — with Southeast Asia, the Congo Basin and parts of the Amazon expected to suffer the greatest losses. This loss forms a major barrier to sustainable development in these regions and around the world. Damage to biodiversity has been estimated to cost the global economy more than US$500 billion per year[3].

2010 is the United Nations International Year of Biodiversity and the world's attention is turning to the conservation of biodiversity. While we are faced with unprecedented pressures on biodiversity and the ecosystem services they provide, we are also faced with an opportunity for action. Businesses are more engaged and aware than ever before. Many companies are taking steps to identify and minimise their impacts on biodiversity and ecosystems and reaching out to civil society to create innovative solutions that enable the present day needs of society and economies to be balanced with the overarching need to ensure we continue to live in a healthy and productive environment.

The business case for biodiversity management

There is growing awareness of both the impact and dependencies that business operations have on biodiversity and the associated ecosystem services. These natural resources are often used at no cost to companies or at a price that does not reflect their true value. Business impacts on biodiversity are varied and can range from large scale impacts, including habitat and biodiversity loss, to localized impacts such as overharvesting of specific species. Impacts can also be direct, as in the case of land conversion, over-exploitation or pollution, or indirect as a result of increased access to remote areas for hunting and logging for example. Moreover, geographical scales of impacts can vary from local, regional to global and can occur at any one place along the value chain, from production, transportation, consumption to disposal.

[1] Derived from the term biological diversity which is defined by the Convention on Biological Diversity as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems

[2] http://www.millenniumassessment.org/documents/document.356.aspx.pdf

[3] The Economics of Ecosystems and Biodiversity (TEEB) for National and International Policy Makers. http://www.teebweb.org/LinkClick.aspx?fileticket=Ps6eutErJJI%3d&tabid=1019&language=en-US

Some facts

The economic cost of biodiversity loss and ecosystem degradation is estimated to be between US$2 and 4.5 trillion. This figure is expected to rise[4].

Many of the world's aquifers are becoming depleted or polluted, and it is estimated that by 2030 almost half of the world's population will be living under severe water stress[5].

Coral reefs are in danger of dying out in the next 20 years, despite providing services worth up to US$189,000 per hectare per year for natural hazard management[6].

The cost of environmental degradation related to water loss in the Middle East and North Africa has been estimated at some US$9 billion a year, or 2.1 – 7.4% of GDP[7].

[4] EU-UNEP. (2008). The Economics of Ecosystems and Biodiversity – An Interim Report.

[5] Organization for Economic Co-operation and Development (OECD), OECD Environmental Outlook to 2030 (Paris: OECD, March 2008), http://www.oecd.org/document/20/0,3343,en_2649_34305_39676628_1_1_1_1,00.html

[6] TEEB – The Economics of Ecosystems and Biodiversity for national and international Policy Makers (2009)

[7] United Nations World Water Assessment Programme.

How biodiversity can affect business

Supply of resources

Natural resources form the basis of a range of commercial products including food, paper, textiles, colorants, fabrics etc., and the services provided by ecosystems, such as water and nutrient cycling, are essential to many production and processing operations. The continued supply of these products and services depends not only on sustainable use of traded species or utilised ecosystem services, but the careful management of the entire ecosystems upon which they depend.

Licence to operate

Access to land and other resources are increasingly affected by a company's track record on environmental issues. By adopting best practices on biodiversity and environmental and social issues a company is more likely to obtain and maintain government's license to operate. Best practices also pave the way for good relationships with stakeholders, from local communities to shareholders.

Brand and reputation

The information age is allowing consumers around the globe to be informed of the activities of companies in the remotest of areas. Bad publicity can shake shareholder's confidence affecting profitability.

Access to finance and insurance

Financial institutions, in line with the Equator Principles and other directives, are making more demands on businesses to operate within suitable guidelines to minimize their impact on the environment, including preventing biodiversity loss.

Access to markets

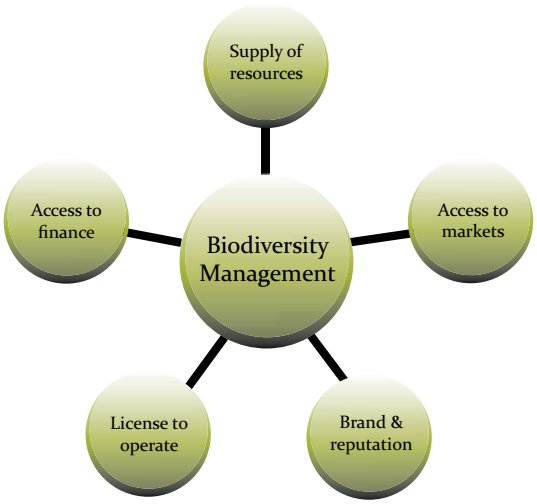
Increasingly consumers are showing preferences for products created using sustainably and ethically sourced materials and methods. The demand for environmentally-friendly paper supplies now means that 5% of the world's productive forests are covered by the Forest Stewardship Council (FSC) scheme, representing an estimated value of US$20 billion (FSC, 2009).

These impacts translate into risks to business in a variety of ways. Where there is a direct or indirect dependence, a loss of biodiversity can increase operational costs and decrease profit margins. As a result of the increased awareness of the importance of biodiversity at national and global levels, even when dependence is weak, there are significant risks to companies through liability, poor reputation, and a lack of access to credit, land and markets. At the same time, biodiversity offers new business opportunities as demand grows for more efficient, or different, ways to use natural resources and ecosystem services.

As such, growing attention is being paid to the business and biodiversity agenda. The Convention on Biological Diversity (CBD) explicitly refers to the role of business, highlighted in decisions V111/17 (COP-08) and 1X/26 (COP-09) which collectively define a consensus path forward to improve engagement of the business community in the implementation of the three objectives of the CBD. The CBD and divisions within UNEP such as the Division of Technology, Industry and Economics (DTIE) and the UNEP World Conservation Monitoring Centre (UNEP-WCMC), along with many other intergovernmental and conservation groups, are working to promote the value of biodiversity and ecosystem services and develop and promote best practices. Many groups are also engaging directly with industry associations and individual companies to incorporate biodiversity considerations into business policies and practices.

[8] http://www.ifc.org/ifcext/sustainability.nsf/Content/BiodiversityGuide_Addressing_Risks

Fig 1. The business case for biodiversity management (adapted from IFC, 2009)[8]



Overview of biodiversity initiatives

In light of the increasing importance of integrating biodiversity considerations into business policies and practices, there are a growing number of initiatives being developed across all business sectors to address the threats business operations may cause and harness the benefits and opportunities that can be gained from supporting biodiversity conservation.

Most industry initiatives described in this publication have focused on developing principles, good practice guidelines and tools related to minimizing the environmental impact of various activities and promoting sustainable production methods. In the case of pharmaceuticals and cosmetics, initiatives have also included access and benefit sharing related to the use of biodiversity. Specific criteria and standards have been developed for some activities, which are often linked to certification schemes. Various non-industry groups have also developed specific guidelines, tools, and certification schemes. The most ambitious biodiversity commitments and examples of good practice have tended to come from individual companies.

Cross-sectoral partnership appears key to finding solutions for businesses

Cross-sectoral partnership appears key to finding solutions to help businesses manage their impacts on biodiversity and capitalize on opportunities, as most initiatives are undertaken in collaboration with conservation groups, government groups, and/or academic institutions. By working in partnership with other sectors, businesses have access to resources, including expertise and networks, which can help address biodiversity issues. The drivers behind such initiatives include securing continued supplies of raw materials, branding and increasingly new legislation.

There are several emerging areas of biodiversity work, including Payments for Environmental Services (PES) as a way of conserving the ecosystem services on which individual companies depend, and biodiversity offsets and banking as a way of compensating for residual biodiversity impacts that cannot be mitigated onsite.

Such efforts have tended to be from large footprint industries such as mining, energy and construction. Carbon offsetting is also growing as a way of compensating for greenhouse gas emissions and so mitigating against the most significant long-term threat to biodiversity – climate change.

Managing biodiversity protects against risk

Market opportunities

Markets for sustainably and ethically sourced and produced materials, food and other products are rapidly growing. The global market for organic products reached a value of US$33.8 billion in 2005 (Bishop et al., 2008) and the natural personal care market exceeded $6.5 billion in 2007 (Jha, 2009). Furthermore, the potential size of markets for agricultural and fisheries products certified for environmentally sustainable production methods is estimated to reach US$200,000 million by 2050 (Bishop et al., 2008).

Environmental stewardship

Being an environmental leader can put you ahead of the game and help differentiate your brand and attract new business. Green companies that appeared on the Dow Jones Sustainability Index emerged in a stronger position from the recent financial crisis than their industry peers. It seems that investors reward those companies with long-term visions rather than short-term gains, and robust environmental risk management practices (Chhabara, 2009).

New business ideas

Sizeable markets and investment opportunities are developing for offsetting programmes to mitigate unavoidable impacts. These include wetland mitigation banking (offsetting damage done to wetlands) and conservation banking (offsetting of land containing endangered species). Restoring and protecting important ecosystems now create lucrative business opportunities.

New technologies

The challenge to build a green economy and address environmental threats while responding to the growing demands of an increasing human population, creates opportunities for new technologies. Technologies related to water desalination and purification, waste management and recycling, as well as sustainable agriculture will be among those in the spotlight for green investors.

Growth in biodiversity-based business

Bioprospecting is based on the search for new compounds, genes and organisms in the wild, an industry that could be worth US$500 million by 2050, and ecotourism that is heavily reliant on biodiversity is expanding at a rate of 20–30% per year (as compared to 9 % for tourism as a whole) (Bishop et al., 2008).

Overview of future challenges

While some of the initiatives have a global scope and many companies are willing to adopt new strategies, there is a great need for biodiversity-friendly practices to be effectively implemented at a large-scale. Raising the standards of entire industries allows for a fair and competitive environment in which companies wishing to follow ethical and sustainable practices can operate. Further involvement of business in the inter-governmental frameworks, such as the CBD, could help drive effective change at the national and international policy levels to set minimum standards for all business operations and create a level playing field in which to operate. Given the projected growth within the industries described here, failure to achieve minimum standards for all will lead to further biodiversity loss and ecosystem degradation, at a huge cost to business and society alike.

Different industries face different challenges in main-streaming biodiversity into business policies and practices; however there are two common across all:

- Achieving widespread implementation of existing frameworks, principles and tools across the world – not just amongst large multinational companies but also amongst small and medium sized enterprises, state-owned companies, and artisanal and small-scale producers. One challenge highlighted here is the difficulty for multinationals to identify local partners with the right biodiversity expertise and willingness to engage in different parts of the world.
- Widening the scope of most initiatives and certification schemes to directly include biodiversity and ecosystem considerations that address the range of impacts, direct and indirect, and promote enhancement of biodiversity and ecosystem services.

To address these challenges, there is a strong need for:

- Increased recognition of the business case for biodiversity conservation. Greater awareness among companies of the benefits of adopting biodiversity-friendly practices and policies is needed.
- Related to the above point, there is a need for increased knowledge, understanding and technical expertise on what the impacts of various activities are on biodiversity, how they can be minimized, and how biodiversity and ecosystem services can be improved for the benefit of business operations.
- Strong biodiversity commitments to be adopted by more companies, either individually or through joining industry groups that involves complying with such commitments.
- Improved environmental performance in areas that are indirectly related to biodiversity and/or not the industry's most significant impact (such as reducing pollution, and consumption of energy and water).
- Increased mechanisms for ensuring that companies meet commitments made through, or principles and criteria set by, industry groups.
- An assessment of the effectiveness and uptake of existing tools, guidance, standards and certification schemes for biodiversity protection.
- Support to strengthen legal and regulatory frameworks of national governments for those countries where they are lacking.
- Recognition and endorsement of credible environmental certification and verification schemes that incorporate biodiversity and their widespread uptake to increase the volume and availability of products certified under credible schemes on the global market.
- Increased evidence for positive biodiversity benefits from certification schemes and some other approaches.
- Business-focused tools designed with business in mind (few examples out there e.g. Global Water Tool, IBAT). Many tools are built by conservation groups and further involvement of business is needed to maximise utility and uptake by users.

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1. Overview of sources of information, tools and initiatives

A number of tools and initiatives have been created that seek to support business engagement on biodiversity across a wide range of sectors. These include those related to emerging themes such as payments for ecosystem services, biodiversity offsets and banking, and generic tools on biodiversity to inform decision-making.

Table 1. An overview of some key resources on business and biodiversity

ARIES (Assessment and Research Infrastructure for Ecosystem Services) Project http://ecoinformatics.uvm.edu/aries	A web-based, artificial-intelligence-enabled, decision-support system for assessment and valuation of ecosystem services. Focuses on ecosystem services assessment and valuation in selected geographic areas for government, companies and NGOs. System allows the effects of policy changes and changing external pressures to be explored. Allows an analysis of environmental assets and quantified spatial analysis that considers the provision, dynamics, and use of ecosystem services.
The 2010 Biodiversity Indicators Partnership http://www.twentyten.net/	Global initiative to track progress towards achieving the "2010 biodiversity target" to significantly reduce the rate of biodiversity loss by 2010.The Partnership is a collaboration between many organisations and agencies developing global biodiversity indicators and is the leading source of information on trends in global biodiversity.
Business and Biodiversity Resource Centre http://www.businessandbiodiversity.org/	Online resource centre that aims to raise awareness of biodiversity and provide information and practical advice to companies to engage with biodiversity issues. Hosted by Earthwatch Institute and is supported by the Environmental Action Fund of DEFRA, English Nature and members of Earthwatch's Corporate Environmental Responsibility Group (CERG).
Business and Biodiversity Offset Programme (BBOP) http://bbop.forest-trends.org/	Biodiversity offsets can help achieve significantly more, better and more cost-effective conservation outcomes than normally occurs as a result of development projects. They are designed to address residual impacts after developers have avoided and minimised impacts to the extent practicable, and undertaken on-site restoration. BBOP is helping companies manage their business risks and opportunities by demonstrating 'no net loss' or a 'net gain' of biodiversity through developing and applying best practice in biodiversity offsets. Have produced a set of principles, handbooks offering guidance on biodiversity offset design and implementation, and case studies of the programme's pilot projects.
Biodiversity Technical Assistance Units http://smeforbiodiversity.eu/index.php	Project that seeks to raise awareness of the opportunities for micro, small and medium enterprises (SMEs) to maintain or enhance biodiversity in the European Union. Technical Assistance units have been created in three pilot countries: Bulgaria, Hungary and Poland, to assist in the development of "Pro-Biodiversity Businesses" in each of these countries. Focuses on those areas of nature that have been recognised as high value and that are included in the NATURA 2000 network of selected countries of Eastern Europe.

Table 1. *continued*

Catalogue of Life (CoL) http://www.catalogueoflife.org/search.php	Planned to become a comprehensive catalogue of all known species of organisms on Earth. Rapid progress has been made recently and the ninth edition of the Annual Checklist contains 1,160,711 species.
CITES Trade database http://www.unep-wcmc.org/citestrade/trade.cfm	Unique resource with more than 10 million records of trade in wildlife and 50,000 scientific names of taxa listed by CITES. Currently, more than 750,000 records of trade in CITES-listed species of wildlife are reported annually.
Conservation Commons http://conservationcommons.net	Collaborative initiative to encourage and improve open access to biodiversity data to facilitate biodiversity conservation.
Convention on Biological Diversity – Business and Biodiversity Initiative http://www.cbd.int/business/	As per decision VII/17, this is an initiative to engage the business community in the implementation of the CBD objectives.
Corporate biodiversity action plans	Provide guidance at a site level to understand and manage risks and opportunities associated with biodiversity and increasingly with ecosystem services. Examples are tools developed by Rio Tinto and British American Tobacco.
Corporate Ecosystem Services Review tool www.wri.org/project/ecosystem-services-review	Enables companies to identify business risks and opportunities arising from company's dependence and impact on ecosystem services. Can be applied at site, market, product or sector level and can feed into Environmental Impact Assessments. Can also help identify new markets/ products. Following this, an initiative has been developed to determine how ecosystem services can be integrated into existing tools and management systems.
Corporate Wildlife Habitat Certification/ International Accreditation Program (Wildlife Habitat Council) http://www.wildlifehc.org/	Third party certification which recognizes commendable wildlife habitat management and environmental education programmes at individual sites.
Darwin toolkit for SMEs and business http://darwin.defra.gov.uk/reports/sme/1.general/	Toolkit for Small and Medium Enterprises (SMEs) on biodiversity.
Global Biodiversity Information Facility (GBIF) http://www.gbif.org/	Focused on making biodiversity data available for scientific research, conservation and sustainable development.
Global Reporting Initiative http://www.globalreporting.org/	Network-based organisation that has pioneered the development of the world's most widely used sustainability reporting framework and is committed to its continuous improvement and application worldwide.
Life Cycle Initiative http://www.estis.net/sites/lcinit/default.asp?site=lcinit&page_id=15CFD910-956F-457D-BD0D-3EF35AB93D60	Putting life cycle thinking into practice and improving the supporting tools through better data and indicators. The initiative provides guidance and methodology to support businesses.
MIMES (Multiscale Integrated Models of Ecosystem Services) www.uvm.edu/giee/mimes/	A mapping tool for companies, policy-makers and land owners to enable identification of the value of ecosystem services, how this value is linked to human welfare and how this may change under different management scenarios.
Global Water Tool	A World Business Council for Sustainable Development (WBCSD) tool to help companies and organizations to map their water use and assess risks relative to their global operations and supply chains.
Integrated Biodiversity Assessment Tool (IBAT) www.ibatforbusiness.org/	A partnership between BirdLife International, Conservation International, International Union for Conservation of Nature and the United Nations Environment Programme World Conservation Monitoring Centre. Provides access to information about high-priority sites via online biodiversity maps to inform the implementation of corporate biodiversity policies and enhance environmental management systems.

Table 1. *continued*

InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) www.naturalcapitalproject.org/InVEST.html	A mapping tool to enable companies, policy-makers, land managers to input and manipulate data to assess the delivery, distribution and economic value of ecosystem services and biodiversity.
ISEAL http://www.isealalliance.org/	Global association for social and environmental standards. Working with established and emerging voluntary standard systems, ISEAL develops guidance and helps strengthen the effectiveness and impact of these standards.
The IUCN Red List of Threatened Species http://www.iucnredlist.org/	The most comprehensive, objective global approach for evaluating the conservation status of plant and animal species globally.
Global Reporting Initiative http://www.globalreporting.org/	Network-based organisation that has pioneered the development of the world's most widely used sustainability reporting framework and is committed to its continuous improvement and application worldwide.
Life Cycle Initiative http://www.estis.net/sites/lcinit/default.asp?site=lcinit&page_id=15CFD910-956F-457D-BD0D-3EF35AB93D60	Putting life cycle thinking into practice and improving the supporting tools through better data and indicators. The initiative provides guidance and methodology to support businesses.
MIMES (Multiscale Integrated Models of Ecosystem Services) www.uvm.edu/giee/mimes/	A mapping tool for companies, policy-makers and land owners to enable identification of the value of ecosystem services, how this value is linked to human welfare and how this may change under different management scenarios.
Wildlife Trust Biodiversity Benchmark http://www.wildlifetrusts.org	A third party certification scheme that rewards improvement in biodiversity. Run by the UK Wildlife Trust, it is a management process which enables any organisation which owns or manages land to assess its impact on the natural world, improve its contribution to the environment and demonstrate its commitment to biodiversity.
The World Database on Protected Areas (WDPA) www.wdpa.org www.wdpa-marine.org www.protectedplanet.net	The only global dataset of protected areas, including national and international sites. The new version of the WDPA will provide additional functionalities, including the opportunity for users worldwide to interact with the data (see protectedplanet.net).

The membership organisation, Business for Social Responsibility recently undertook an analysis of existing and emerging tools for decision making on ecosystem services[9]. This identifies a range of tools that could be useful for the finance sector and which focus on ecosystems services more broadly. In addition to the global tools identified above, BSR highlights some regionally specific tools e.g. EcoAim, EcoMetrix, Measures, Servir and the Wildlife Habitat Benefits Estimation Toolkit. In addition to these more land based tools, a number of tools are emerging for evaluating ecosystem services in the marine environment e.g. the Habitat Priority Planner, Marine Spatial Planning tool and Integrated Land-Sea Planning Toolkit. Although the target audience of many of these are policy makers, they are likely to be useful to the private sector as well.

Initiatives

Regional or country level initiatives have developed in Germany, Japan and Canada. A regional initiative has developed in Africa. A number of groups have developed programmes to facilitate private sector engagement on biodiversity more broadly. These are listed below.

[9] Business for Social Responsibility (2010). Future expectations of corporate environmental performance. Emerging ecosystem services applications and their tools

Table 2. Initiatives to facilitate private sector engagement on biodiversity

The Biodiversity and Ecosystem Service Work Stream (UNEP FI)	UNEP Finance Initiative (UNEP-FI) is a global partnership between UNEP and the financial sector. Over 180 institutions, including banks, insurers and fund managers, work with UNEP to understand the impacts of environmental and social considerations on financial performance. The objective of the ambitious UNEP FI Biodiversity and Ecosystem Service Work Stream is to assist the financial services sector in addressing the challenges arising from the loss of biodiversity and the degradation of ecosystem services. Currently the group consists over 20 members.
The Biomimicry Institute http://www.biomimicryinstitute.org	Not-for-profit organisation that promotes the study and imitation of nature's designs, bringing together scientists, engineers, architects and innovators who can use those models to create sustainable technologies. Offers training and accreditation.
The Business and Biodiversity Initiative http://www.business-and-biodiversity.de	Launched by the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety, this aims to increase the engagement of the private sector in the Convention on Biological Diversity by encouraging companies to incorporate the conservation and sustainable use of biodiversity into their management systems by signing and implementing a Leadership Declaration, to publish their best practices, to actively take part in the 10th Conference of Parties in Nagoya/Japan in 2010 and to broaden the international profile of the initiative.
Business for Social Responsibility Ecosystems Markets Initiative http://www.bsr.org/	Helps companies integrate ecosystem services into corporate decision making, risk assessment, and supply chain management processes. Has produced an analysis of the environmental markets and is investigating ecosystem services assessment tools.
Canadian Business and Biodiversity Secretariat (Wildlife Habitats Council)	Developed to help Canadian businesses to plan, develop, and implement biodiversity conservation programmes and projects. Working to develop a Business and Biodiversity Conservation toolkit.
The Economics of Ecosystems and Biodiversity (TEEB) http://www.teebweb.org/	International initiative to draw attention to the global economic benefits of biodiversity, to highlight the growing costs of biodiversity loss and ecosystem degradation, and to draw together expertise from the fields of science, economics and policy to enable practical actions moving forward.
Ecosystems Valuation Initiative http://www.wbcsd.org	A World Business Council for Sustainable Development (WBCSD) initiative project which aims to provide guidance to companies on accounting for appropriate ecosystem benefits and costs. A scoping study was undertaken to consider why ecosystems valuation is important to business, what methods and approaches are available to assist in valuation and how they are currently being used by the private sector. A corporate guide to ecosystem valuation is being developed and road tested with 10-15 WBCSD member companies. The WBCSD has also developed training and awareness building tools for companies on ecosystem services.
EU Business and Biodiversity Initiative	Seeks to raise awareness of the strong competitive advantage to be gained by conserving biodiversity within Europe; to promote the use of a wide range of market mechanisms, corporate responsibility and regulatory schemes to conserve biodiversity; to support large and small businesses with operational tools for biodiversity conservation and measuring their performance in meaningful ways; and to encourage new incentives to develop and strengthen partnerships between companies and governments at all levels, from NGOs and academia. A consortium of partners (The World Conservation Union- IUCN, European Centre for Nature Conservation- ECNC and PricewaterhouseCoopers- PWC) started work on this initiative in late 2009.
The Green Economy Initiative http://www.unep.org/greeneconomy/	Designed to assist governments in "greening" their economies by reshaping and refocusing policies, investments and spending towards a range of sectors such as clean technologies, renewable energies, water services, green transportation, waste management, green buildings and sustainable agriculture and forests.

Table 2. *continued*

IUCN Business and Biodiversity Programme http://www.iucn.org/about/work/programmes/business/	The Business and Biodiversity Programme seeks to enhance IUCN's interface with business. The purpose is to engage the corporate world in the pursuit of biodiversity nature conservation by increasing businesses' understanding of the conservation imperative and of the business opportunities in nature conservation.
Japanese Business Initiative for Conservation and Sustainable Use of Biodiversity http://www.jbib.org/en	Aims to increase the engagement of Japanese industries on the issue of biodiversity by helping companies to understand the need for the conservation and sustainable use of biodiversity; promoting communication with stakeholders on the issue; providing stakeholders with examples of good practice; increasing research and development for methods, indicators, and guidelines to monitor and evaluate the conservation of biodiversity and advocating biodiversity policies to governments and local authorities.
The Katoomba Group http://www.katoombagroup.org/	Addresses key challenges to developing markets and payments for ecosystem services, from enabling legislation through establishment of new market institutions, strategies of pricing and marketing, and performance monitoring. The Group works through strategic partnerships for analysis, capacity building, information-sharing, investment, market services and policy advocacy.
Leadership for Conservation http://lcafrica.org/index.php	A collaboration with the heads of conservation of 16 African countries including Burkina Faso, Botswana, Cameroon, Ethiopia, Ghana, Malawi, Mozambique, Namibia, Republic of Congo, Senegal, South Africa, Tanzania, The Gambia, Uganda, Zambia and Zimbabwe. Aims to influence business and conservation leaders, in order to find ways to integrate business principles with conservation management, and to actively facilitate the involvement of business in sustainable conservation-led socio-economic development and capacity building in Africa. Creates fora for communication between business and conservation through establishment of national chapters, influencing business to become strategic partners of national conservation authorities.
Pro biodiversity business http://smeforbiodiversity-steppes.com	Aims to put in place a structure and procedures through which Small and Medium Enterprises (SMEs) can be engaged in delivering economically viable biodiversity conservation activities in the Eurasian Steppes. Aims to identify financial structures and instruments that will provide the market mechanism necessary for long-term sustainability of the selected SMEs in the steppe ecosystem.
Proteus http://proteus.unep-wcmc.org/	A partnership between UNEP-WCMC (United Nations Environment Programme World Conservation Monitoring Centre) and multinationals to make available global information and tools on biodiversity and ecosystems to support decision-making.
UN Global Compact http://www.unglobalcompact.org/	Strategic policy initiative for businesses that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption.
Wildlife Habitat Council http://www.wildlifehc.org	Private sector NGO collaboration aimed at bringing conservation and business together. Helps large landowners, particularly corporations, manage their unused lands in an ecologically sensitive manner for the benefit of wildlife.
World Business Council for Sustainable Development http://www.wbcsd.org/	CEO-led, global association of some 200 companies dealing exclusively with business and sustainable development. The Council provides a platform for companies to explore sustainable development, share knowledge, experiences and best practices, and to advocate business positions on these issues in a variety of fora, working with governments, non-governmental and intergovernmental organisations.

2. Mining

Mining involves the extraction of minerals from the Earth's crust, including coal, metal ores, rock, industrial minerals, and gemstones. The industry is an important economic activity in many countries and central to modern industrial societies, supplying raw materials for, amongst other things, energy production, construction, manufacturing, agriculture, communication, household goods, and medicines.

Impacts >>>

- **Habitat loss and fragmentation** through surface mining and creation of waste rock dumps.
- **Pollution** of habitats and water supplies from chemical contamination and solid waste (tailings).
- **Excessive water withdrawal** that can impact on local water systems.
- **Alteration** of creeks, rivers, and watershed regimes.
- **Increased access to sensitive and remote areas.**
- **Green House Gases emissions.**

Dependence >>>

- **Water supply for mineral processing.**

Opportunities/risks

- **Reputation:** managing biodiversity can contribute to a good reputation among local communities, governments and other stakeholders, helping secure a license to operate.
- **Access and cost of capital**: helping compliance with loan requirements from financial institutions.
- **New markets**: certification schemes are developing for responsibly mined products e.g. the Responsible Jewellery Council.
- **License to operate**: companies with a good environmental record are more likely to be selected as "developer of choice" by governments and have good relationships with stakeholders.

There are two general types of mineral deposits: placer deposits, where the target mineral is located within unconsolidated materials such as river gravels and beach sands, and lode deposits, where the target mineral is located within a mass of rock. Both types can be extracted by surface mining, where overlying vegetation, soil and/or bedrock are removed to reach the deposit, or by underground mining, where tunnels or shafts are dug to reach the deposit. Surface mining for stone is also called quarrying. Depending on the target mineral, lode deposits are also sometimes extracted by solution or fluid mining, where an acidic leaching solution is injected into the deposit via a drill hole to dissolve the soluble mineral. Extracted materials are usually processed to separate the target material from unwanted constituents and/or create a more uniformly sized material.

Metals account for most of the value of mining commodities (35% in 2004) followed by coal and uranium (32%) crushed rock (22%) and industrial minerals including phosphate for fertilizers and carbonates for cement (11%)[10]. Copper accounts for the majority of the value of metal commodities, followed by iron ore, nickel, gold, aluminium, zinc and platinum[11].

Mining boomed during the 2000s, primarily due to increasing demand from China and India, and global demand for mining products is expected to continue to increase.

Relationship with biodiversity

Dependence and impact: Except for supplies of freshwater for mineral processing, the mining industry is not heavily dependent on biodiversity. However, with almost one third of all active mines located in stressed watersheds[12], to guarantee availability of freshwater, the industry is indirectly dependent on functioning ecosystems and related services to ensure adequate supply. The industry operates in a wide range of environments — including rainforests, arctic areas, plains, coasts, and offshore areas — with a number of

[10] Ericsson, M. and Noras, P. (2005) Rocky Future. Materials World, July 2005 http://www.rmg.se/RMG2005/pages/attachments/Materials_World,_200507,_Rocky_future.pdf

[11] PricewaterhouseCoopers (2008) Review of global trends in the mining industry 2008: Mine – As Good As It Gets? http://www.pwc.com/en_GX/gx/energy-utilities-mining/pdf/mine_2008_v7_final.pdf

[12] WRI (2003) Mining and critical ecosystems: mapping the risks

significant direct and indirect impacts to a wide range of species and ecosystems around the world:

- **Habitat loss and fragmentation:** The main direct impact from the extraction of mineral deposits is through surface mining and creation of waste rock dumps, whereby overlying habitats and geological features are removed and/or covered. While such habitat loss is localized and may involve a relatively small area, it can be a significant threat in areas of high local endemism.
- **Pollution:** The processing of recovered materials is often done onsite to avoid transportation of unwanted materials and can also impact on biodiversity. For example, large quantities of solid waste (tailings) are produced in the processing of metal ores, where the target metal is usually present at a low concentration. The storage of this waste can damage or destroy underlying habitats and geological features. In addition, grinding and sorting of rocks releases dust, while chemicals used in some processing operations — including acids, cyanide, solvents, mercury, and sulphur dioxide — can cause air, soil, and/ or water pollution if not managed correctly. Processing can also use large amounts of water, whose extraction can impact on local water systems. Mining can expose metal sulphides to the atmosphere, which react with oxygen to form sulphuric acid and heavy metal oxides and, if not managed correctly, can pollute local ground and surface water. In addition, erosion of exposed land and tailings can cause sedimentation of creeks, rivers, and impact watershed regimes if inadequate environmental controls are in place.
- **Increased access to sensitive and remote areas:** With more than one quarter of the world's active mines and exploration sites overlapping with or located within a 10-kilometer radius of a strictly protected area and around one third of all active mines and exploration sites located within areas of intact ecosystems of high conservation value[13], mining operations can potentially directly impact sensitive sites and additionally have indirect impacts by allowing increased access to previously undeveloped and remote areas along roads or other infrastructure, which can facilitate further damaging activities including small-scale mining, hunting, logging and fishing.
- **Climate change:** Mining also contributes significantly to greenhouse gas emissions and hence climate change — the most significant long-term threat to biodiversity — through the use of large amounts of energy required for mining, processing of ores, as well as through the transportation of final products.

Biodiversity initiatives

Overview

Most biodiversity initiatives so far have focused on developing principles, good practice guidelines and tools to reduce the footprint of mining operations and activities and maximize benefits to biodiversity. Some industry associations have worked to ensure such good practice is followed, and a few companies have made particularly ambitious commitments and/or progress towards incorporating biodiversity considerations into business practices. Some mining companies are involved in biodiversity offsets to compensate for residual biodiversity impacts that cannot be mitigated onsite. The majority of this work has been through collaborations between industry groups/individual companies and conservation organisations.

Principles, guidelines and tools for reducing operational impacts

Various international industry associations have made broad policy statements on, or set broad objectives for, environmentally sound mining operations. These are shown in Table 3 and include the World Gold Council, the International Platinum Group Metals Association and the International Lead Association, although not all relate specifically to biodiversity. The International Council on Mining and Metals (ICMM) — which specifically seeks to promote sustainable development and improve environmental performance in the mining industry — has developed ten detailed sustainable development principles for mining operations, one of which includes contributing towards biodiversity conservation.

The ICMM has also developed good practice guidance for the industry as a whole, including guidelines on integrating biodiversity conservation into mining operations[14], a toolkit for planning mine closures that includes biodiversity considerations[15], and case studies of biodiversity conservation by different mining companies. Other groups have developed guidance for specific sectors or countries. For example, the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative has published guidelines for environmental impact assessments for quarry developments[16] and case studies on quarry rehabilitation activities that contribute to restored ecosystems and enhanced biodiversity, while the International Aluminium Institute (IAI) has set a number of specific targets for reducing the environmental impact of the global aluminium industry that include increasing the proportion of bauxite mining land rehabilitated annually. The Mining Association of Canada has also developed specific performance indicators for its guiding principles on sustainable mining, with indicators for biodiversity currently under development.

[13] WRI (2003) Mining and critical ecosystems: mapping the risks
[14] ICMM Good Practice Guidance for Mining and Biodiversity
[15] ICMM Planning for Integrated Mine Closure: Toolkit
[16] CSI Environmental and Social Impact Assessment (ESIA) Guidelines

Table 3. Some of the key Biodiversity Initiatives developed for the mining industry, the biodiversity principles and standards adopted, and examples of other material and guidance provided

Industry association	Principles and standards adopted	Guidance materials
World Gold Council http://www.gold.org/	Adopts ICMM principles.	• Reports and details of sustainability programmes from its members which account for over 40% of all gold mining.
International Platinum Group Metals Association (IPA) http://www.ipa-news.com/	None.	• Offers information on upcoming and existing legislation on emissions control, hazardous substances and waste from electrical and electronic equipment.
International Lead Association (ILA) http://www.ila-lead.org/	LA21 Charter that includes principles on environmental responsibility.	• Information on Life Cycle Assessment; case studies and recycling.
International Council on Mining and Metals (ICMM) http://www.icmm.com/	Ten principles on sustainable development, position statements on protected areas and climate change.	• Good practice guidance for mining and biodiversity (2006). • Toolkit for planning mine closures that includes biodiversity considerations. • Sustainability Reporting Guidelines & Mining and Metals Sector Supplement (2010)[17]. • Online guidance on the implementation of good practice at mining and metals operations around the world[18]. • Case studies of biodiversity conservation by different mining companies.
International Aluminum Institute (IAI) http://www.world-aluminium.org/Home	Commitment to good environmental stewardship by a focus on a set of environmental issues.	• Thirteen voluntary objectives for achieving sustainability. • Life Cycle Assessment of Aluminium: Inventory Data for the Primary Aluminium Industry (2007)[19]. • Sustainable Bauxite mining report (2008)[20].
The Mining Association of Canada http://www.mining.ca	Guiding principles on sustainable mining and performance indicators.	• Tool for Assessing Biodiversity Conservation Management Performance (2009)[21]. • Towards Sustainable Mining. • Framework (2007)[22].
WBCSD Cement Sustainability Initiative (CSI) http://www.wbcsdcement.org/	Agenda for action for sustainable development.	• Environmental and social impact assessment (ESIA) guidelines. • Case studies on quarry rehabilitation activities that contribute to restored ecosystems and biodiversity.
Certification schemes		
Alliance for Responsible Mining (ARM) http://www.communitymining.org/	Standards for fair-trade artisanal gold, silver and platinum.	• Standard Zero for fairtrade artisanal gold and associated silver and platinum (2009)[23].
Responsible Jewellery Council (RJC) http://www.responsiblejewellery.com/	Principles and codes of practice on environmental performance that includes biodiversity.	• Principles and Code of Practices (2009)[24]. • Certification Handbook (2009)[25]. • Standards Guidance (2009)[26].
International Cyanide Management Code (ICMI) http://www.cyanidecode.org/	Principles and standards of practice.	• Implementation guidance for the international Cyanide management code (2009)[27].

[17] http://www.icmm.com/document/815
[18] http://www.goodpracticemining.org
[19] http://www.world-aluminium.org/UserFiles/File/LCA.pdf
[20] http://www.world-aluminium.org/cache/fl0000292.pdf
[21] http://www.mining.ca/www/media_lib/TSM_Documents/2009_Protocols/Final_TSM_BIODIVERSITY_PROTOCOL_2009.pdf
[22] http://www.mining.ca/www/media_lib/TSM_Documents/2009_Protocols/3e._Biodiversity_Framework_EF_0729207.pdf
[23] http://communitymining.org/pdf/ARMSTANDARDZERO2009.pdf
[24] http://www.responsiblejewellery.com/downloads/boxed_set_2009/S001_2009_RJC_Prin_COP.pdf
[25] http://www.responsiblejewellery.com/downloads/boxed_set_2009/G001_2009_RJC_Cert_Handbook.pdf
[26] http://www.responsiblejewellery.com/downloads/boxed_set_2009/G002_2009_RJC_Standards_Guidance.pdf
[27] http://www.cyanidecode.org/pdf/IGRevisions09.pdf

There are also efforts to ensure that good practices are followed. ICMM's 19 member companies — representing some of the world's largest mining and metals companies — have committed to implement independent, third-party assurance of their performance against its sustainability principles and publicly report this performance. The Mining Association of Canada also requires its members to report against its performance indicators, and the International Aluminium Association has carried out periodic surveys of bauxite mine rehabilitation. ICMM member companies are additionally obliged to comply with a number of Position Statements, including not exploring or operating in World Heritage Sites, responsible management of mercury, and reducing greenhouse gas emissions.

A couple of certification schemes have also been developed (Table 3). The International Cyanide Management Code (ICMI) has developed a certification scheme for the safe management of cyanide by the gold mining industry based on compliance with a set of principles and standards that include protecting fish and wildlife from cyanide pollution of surface water. The Responsible Jewellery Council (RJC) has developed a certification scheme for diamond and gold jewellery that includes general environmental principles and specific biodiversity criteria.

The most ambitious commitments and examples of good practice have come from individual companies. Notable examples include Rio Tinto's commitment to net positive impact on biodiversity for its mining operations, which goes beyond conventional impact mitigation and rehabilitation measures.

Biodiversity offsets

Various mining companies are involved in biodiversity offsets to compensate for residual biodiversity impacts that cannot be mitigated onsite. Such offsets are required by law in several countries; however some companies are making voluntary offsets. The multi-stakeholder Business and Biodiversity Offset Programme (BBOP) has developed principles on biodiversity offsets that are supported by a few individual companies in the mining industry and is now running pilot offset projects at several mining sites around the world. BBOP has also produced technical guidance, and ICMM has produced a briefing paper on biodiversity offsets for the mining industry.

Challenges and opportunities

The long-term commitment to sites means that the mining industry can have a long-term positive contribution to the biodiversity of areas where they operate. For example by mitigating poverty-related pressures on biodiversity though the provision of employment, rehabilitation of previously degraded habitats and contribution to the conservation and protection of local habitats. Mining companies often use only a small percentage and can protect large areas to benefit communities and biodiversity. The sector also has a number of challenges, listed below:

- Achieving buy-in to existing voluntary principles and good practices from companies across the industry. This challenge is compounded by the lack of a direct link between mining companies and consumers, which means that better environmental performance does not always translate directly into tangible market benefits for the company.
- The expansion of mining activities into sites that are ecologically valuable, and where the potential for significant negative impacts is greater. This expansion is driven by continued demand for mining products, new technologies and depletion of deposits in established mineral provinces. It also often occurs in developing countries where environmental regulatory controls and associated governance processes may be weak.
- The artisanal and small-scale mining (ASM) sector presents additional significant social and economic challenges that hamper the uptake of responsible biodiversity practices, not least because of the large numbers of ASM operators working outside the formal sector and outside regulatory frameworks.
- The cyclical nature of the industry is also a potential challenge: reduced cash flow during downturns could see fewer resources for and commitment to biodiversity projects.

Sources

- Deloitte (2009) tracking the trends 2009: The top 10 global mining issues **https://www.deloitte.com/assets/Dcom-Australia/Local%20Assets/Documents/037027_Teresa_Trackinf_Trends_V6.pdf**
- ICMM Good Practice Guidance for Mining and Biodiversity **http://www.icmm.com/page/1182/good-practice-guidance-for-mining-and-biodiversity**
- IFC A Guide to Biodiversity for the Private Sector: Cement **http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/BiodivGuide_SectorSummary_Cement/$FILE/Cement.pdf**
- IFC A Guide to Biodiversity for the Private Sector: Mining **http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/BiodivGuide_SectorSummary_Mining/$FILE/Mining.pdf**
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- US Department of Labor, Bureau of Labor Statistics Career Guide to Industries: Mining **http://www.bls.gov/oco/cg/cgs004.htm (accessed 9 October 2008)**
- US National Center for Manufacturing Sciences Environmental Roadmapping Initiative Mining: Impacts, Risks and Regulations **http://ecm.ncms.org/ERI/new/IRRmining.htm (accessed 9 October 2008)**
- WRI (2003) Mining and critical ecosystems: mapping the risks

3. Energy

Energy is required every day in different forms and its use lies at the core of modern industrialized society. Global demand for energy is growing steadily, particularly in emerging countries seeking economical development. Nowadays, fossil fuels (coal, oil, gas), nuclear and renewable sources (solar and wind energy, hydropower, biofuels) are the three main types of energy resources.

Impacts

- **Habitat loss and alteration** from infrastructure development, biofuel cultivation and hydropower production.
- **Water consumption** for the production of oil and gas, as well as biofuel that can impact local water supplies.
- **Greenhouse gas emissions** from the burning of fossil fuels and the clearance of forest for biofuel cultivation.
- **Pollution** from oil spills, nuclear waste and agricultural chemicals used in biofuel production.
- **Wildlife mortality** from seismic testing for offshore oil and gas reserves.
- **Increased immigration** and access to remote areas.

Dependencies

- The extraction of fossil fuels relies largely on freshwater supply.
- The renewable energy sector has greater dependencies on a wider variety of ecosystem services:
  - Hydropower relies on a flow of water and low sedimentation rates that are provided by forested land.
  - Biofuel production depends on numerous species and ecosystem services to maintain productivity.
  - Natural coastal buffers such as coral reefs, sand dunes, wetlands etc. to protect the integrity and safety of many coastal assets.

Opportunities/risks

- **Regulatory risk:** increasing requirements for redress through legislation such as the EU Liability Directive, and that of countries such as Brazil and the USA that requires impacts to be offset or compensated for.
- **License to operate:** strong relationships with regulators can result in obtaining agreement to operate in less time.
- **Reputation:** managing biodiversity can ensure a good reputation among local communities, governments and other stakeholders.
- **Access to capital**: helping compliance with loan requirements from financial institutions.

The International Energy Agency's World Energy Outlook 2009 projects that, under a 'business-as-usual scenario', global energy demand will increase by 40% between 2007 and 2030, reaching 16.8 billion tonnes of oil equivalent. Under a similar scenario, fossil fuels continue to dominate the energy mix, accounting for more than three-quarters of incremental demand. Hence primary energy demand from the ten countries of the Association of Southeast Asian Countries (ASEAN) is forecast to expand by 76% between 2007 and 2030; much faster growth than the average annual rate of growth of 2.5% for the rest of the world.

Around 80 to 90 % of total worldwide energy is currently derived from the combustion of fossil fuels; the rest of the energy sector comprises the production of nuclear energy (10%) and renewable sources (7%). The renewable energy sector is experiencing considerable growth, particularly that of bio-energy. Between 2004 and 2008, global production of ethanol more than doubled, and biodiesel increased six-fold[28]. Targeted policy interventions linked to concerns about

[28] Renewables Global Status Report: 2009 update. REN21 – Renewable Energy Policy Network for the 21st Century http://www.ren21.net/pdf/RE_GSR_2009_Update.pdf

[29] UNEP (2009) Towards sustainable production and use of resource: assessing biofuels

[30] International Energy Outlook 2007". United States Department of Energy - Washington, DC. http://www.eia.doe.gov/oiaf/ieo/index.html. Retrieved 2007-06-06.

energy security and climate change have created a significantly increased demand for biofuels through the setting of country level targets and blending quotas. Mandates for blending biofuels into vehicle fuels had been enacted in at least 36 states/provinces and 17 countries at the national level by 2006[29]. Of the total global consumption of energy, industrial users (agriculture, mining, manufacturing, and construction) consume about 37%, personal and commercial transportation 20%, residential use 11% and commercial use 5%[30].

Relationship with biodiversity

Dependence: The energy industry shows variable levels of dependence on biodiversity. While the extraction of fossil fuels that have dominated energy production throughout the industrial era relies largely on a water supply to refine oil into diesel or gasoline, to test pipelines and facilities after construction, for cooling etc., the renewable energy sector that is gaining momentum shows much greater dependencies on a wider variety of ecosystem services. Hydropower relies on flow of water and low sedimentation rates that are provided by forested land, and biofuel production depends on numerous species, including soil micro-organisms, pollinators, and pest predators, crop and livestock genetic diversity and services provided by other ecosystems, including freshwater, climate regulation, and nutrient cycling. There is also a widespread dependence by the energy sector on natural coastal buffers such as coral reefs, sand dunes, wetlands etc. to protect the integrity and safety of many coastal assets.

Impact: The energy sector, upon which all other business sectors depend to some degree, can have a wide range of direct and indirect impacts depending on energy production methods.

Oil & gas extraction

Compared to other businesses, oil & gas direct impacts on biodiversity are generally quite localized. They may however be significant in terms of the quality of the habitat impacted, rather than of quantity, since they may affect sensitive and pristine environments previously inaccessible to humans. Secondary impacts that may reach outside the project or even concession boundaries and may begin before or extend beyond a project's life cycle can also have significant impacts on biodiversity and ecosystem services.

- **Habitat loss and alteration:** Direct impacts from the extraction of fossil fuels are habitat loss and the alteration of natural systems through the building of upstream and downstream energy infrastructure such as mines, drilling platforms, power stations, dams, roads, pipelines, harbours, terminals, refining facilities, and power lines. These impacts can be relatively localised and, when managed correctly, be relatively small depending on the quality of the habitat impacted.
- **Pollution:** The burning of fossil fuels can cause water, air and soil pollution. Oil spills from blowouts, pipeline leaks or shipping accidents pose a significant threat to many species and habitats.
- **Wildlife Mortality:** Seismic testing for offshore oil and gas reserves can pose a risk to marine species, although this risk remains unconfirmed and is the subject of extensive research. The transport of non-native and potentially invasive species in the ballast water of oil tankers, can also pose a risk to native species.
- **Greenhouse gas emissions:** As a result of the dominance of fossil fuel based energy, the most significant impact of the energy sector will come from climate change which, while an indirect impact, currently dwarfs the industry's direct impacts. The supply of energy is responsible for 26% of anthropogenic greenhouse gas emissions, while CO_2 released from the burning of fossil fuels in all industries accounts for 57% of greenhouse gas emissions. Continued emissions at or above current rates are likely to lead to dangerous climate change and consequent massive loss of biodiversity and collapse of ecosystems[31].

In addition to the direct impacts given in Table 4, indirect impacts associated with the sector are often linked to immigration[32] and increased access to remote areas: New projects stimulate the provision of goods and services both to the project and/or affected local communities, creating additional employment opportunities and attracting more people to the area. The increase in the local population also increases the need for housing, food and other goods and services often through unplanned and uncontrolled new settlements, especially in undeveloped areas. This increased demand can create additional pressure on natural resources, including:

- Deforestation from clearing of land for agriculture, building housing and other infrastructure, and collection of wood for construction, cooking and heating;
- Increased demands on water resources and generation of wastes and other pollution;
- Commercial and illegal logging;
- Extraction of non-timber forest products, such as fibers, medicinal plants and wild food sources;
- Increased hunting and fishing, for subsistence or trade including that of bushmeat; and
- Poaching for skins, exotic pet trade or other uses, such as folk remedies.

[31] Ref 31: IPCC (2007) Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. [Core Writing Team, Pachauri, R.K and Reisinger, A.(eds.)]. IPCC, Geneva, Switzerland http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

[32] EBI: Negative Secondary Impacts from Oil and Gas Development

Table 4. A summary of biodiversity impacts of the oil and gas sector (adapted from Shell's draft Integrated Impact Assessment: Environmental Impact Assessment Module, EP 95-0370, May 2002)

Summarized biodiversity impacts		
STAGE	**PROJECT ACTIVITY**	**POTENTIAL BIODIVERSITY IMPACTS**
Exploration: seismic, drilling, etc	**Onshore:** • Provision of Access (airstrips, temporary roads) • Set up and operation of camps and fly camps • Use of resources (water, aggregate) • Storage of fuel • Clearing of lines and layout geophones • Shot hole drilling • Use of explosives • Closure of shot holes, mud pits, camps and access infrastructure • Mobilization of drill rig • Drilling operations • Well testing/flaring	• Footprint impacts to habitats/flora • Disturbance of fauna • Noise impacts on animal populations • Physical disturbance of soils and water resources • Contamination of soils, surface and groundwater • Landscape modification, visual impact
	Marine: • Vessel mobilization and movement • Vessel emissions and discharges • Seismic operation • Anchor rig/lower legs • Use of chemicals • Mud and cuttings discharge • Fuelling and fuel handling • Blow-out risk	• Impact on fish • Disturbance of marine mammals • Disturbance of sediment and benthic populations • Contamination of sediment • Impact on seabirds, coastal habitats, etc. in event of soil spill
Construction	**Onshore:** • Set-up and operation of construction camps • Provision of construction access • Resource use (water, timber, aggregate) • Import of heavy plant and machinery • Vehicle movements • Earthmoving, foundations, excavation • Storage/ use of fuel and construction materials • Generation of construction wastes	• Temporary and permanent loss of habitat and component ecological populations due to temporary and permanent footprint • Soil erosion and reduction in productivity • Contamination of soils, surface and groundwater • Damage to cultural heritage
	Marine: • Mobilization and movement of vessels • Vessel emissions and discharges • Anchoring, piling	• Disturbance to sediment, benthic fauna and other seabed flora and fauna • Loss of seabed habitat • Disturbance to marine mammals
Operation/ Production	**Onshore:** • Footprint • Visible presence • Import and export of materials and products • Product handling, storage, use of chemicals & fuel • Solid wastes arising • Liquid effluent • Emissions to atmosphere • Noise and light	• Long-term land take effects on ecology • Effects on landscape and visual amenity • Soil and groundwater contamination • Effects on water quality, aquatic ecology and resource users • Effects on air quality, ecology and human health • Global warming
	Marine: • Direct footprint • Chemicals storage, handling and use • Emissions to atmosphere • Operational noise, helicopter supply and standby vessel movement • Discharges to sea • Oil spill risk • Light	• Loss of seabed habitat • Interruption of fishing effort • Disturbance to seabirds and marine mammals • Effects on water quality and marine ecology • Effects on air quality and global warming • Risk to marine and coastal resources in event of spill

Impacts from nuclear and renewable energy:

- **Habitat loss and alteration:** The rapid expansion of biofuels, as previously mentioned can have severe direct impacts on biodiversity through the loss of natural habitats due to the amount of land required for their production (see section 3 on agrifood). Hydropower can have severe impacts on both aquatic and terrestrial biodiversity through reservoir inundation, flow manipulation and river fragmentation. In addition, the use of large amounts of water for cooling in almost all electricity production can disrupt hydrological processes.
- **Water usage:** this is of particular relevance to the production of biofuel crops, as water availability is an increasingly serious concern in many parts of the world and agriculture is the largest user.
- **Risk of invasive species:** certain species that are considered for biofuel production are known as invasive species in many parts of the world[33].
- **Pollution:** Toxic heavy metals present in solar energy cells can contaminate soil, and nuclear waste remains a challenge to dispose of safely. Biofuel production can pollute waterways through the run off of agricultural chemicals.
- **Wildlife mortality:** Wind turbines can kill wildlife, particularly migratory birds and bats, as well as disrupt marine mammals and other marine life in offshore sites through noise pollution and electrical impulses, respectively.

Biodiversity initiatives

Overview

For the oil and gas industries, most biodiversity initiatives in the past have focused on developing policies and guidelines to reduce the footprint of energy operations and activities. This sector has systematically used Environmental Impact Assessments (EIA) and Environmental Management Systems (EMS) as a means to manage impacts on biodiversity, with a growing number of companies also adopting Biodiversity Action Plans (BAP). More recently, efforts have been focused on developing additional tools and operational practices to incorporate biodiversity and ecosystem services considerations into company activities. The majority of this work has been through collaborations between industry groups/individual companies and conservation organisations. Many companies are also working to reduce their greenhouse gas emissions. There has been some work on conserving ecosystem services through Payments for Environmental Services as well as in using biodiversity offsets to compensate for residual biodiversity impacts that cannot be avoided or mitigated onsite. Within the renewable energy sector there are far fewer biodiversity initiatives. However in recent years, as a result in the rapid rise in the production of biofuels, a number of certification schemes are being developed to address the potential impact of this industry on biodiversity.

The identification and protection of areas important for biodiversity, along with efforts to reduce pollution and emissions, lie at the heart of many energy-based initiatives to safeguard biodiversity from the impacts of energy production. More challenging however, are initiatives to tackle the secondary impacts that reach outside the boundaries of a project activity, as well as identifying those that occur at various stages of the lifecycle of energy products.

> The protection of important biodiversity areas lies at the heart of many energy-based initiatives

Principles, guidelines and tools for reducing operational impacts

Several large international and regional industry associations have made broad policy statements on the need to reduce environmental and/or biodiversity impacts, such as the International Petroleum Industry Environmental Conservation Association (IPIECA), the E8 electricity companies, the International Hydropower Association, and the World Coal Institute. A number of groups have developed, or are developing, specific guidelines and tools for reducing impacts related to the development of different energy sources. For example, the Energy and Biodiversity Initiative (EBI) developed guidance and other resources for integrating biodiversity conservation into oil and gas development[34]. In terms of biofuels, the Roundtable on Sustainable Biofuels (RSB), the Roundtable on Sustainable Palm Oil (RSPO), the Roundtable on Responsbile Soy (RTRS) and the Better Sugar Cane Initiative (BSI) are currently developing best practices for sustainable production of these crops. For a more complete overview of standards that relate to biofuels, see Table 5. Similarly, the US National Wind Coordinating Collaborative (NWCC) has published a range of tools and guidance for assessing, minimizing and eliminating negative impacts of wind farms on wildlife[35].

In some cases, larger industry associations have then built on this guidance. For example, based on the EBI work, the Biodiversity Working Group (BDWG) of IPIECA and the International Association of Oil and Gas Producers (OGP) developed, amongst other things, an ecosystem approach to biodiversity conservation by the oil and gas industry[36], a guide to developing biodiversity action plans[37], case studies on operating in sensitive environments[38], and a practical tool to effectively identify and assess biodiversity risks and opportunities in the development of oil and gas

[33] IPIECA (2009) Biofuels, sustainability and the petroleum industry
[34] E.g. A Framework for Integrating Biodiversity into the Site Selection Process and Biodiversity Indicators for Monitoring Biodiversity Impacts and Conservation Actions
[35] E.g. A Mitigation Toolbox, guidance for Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats, and a Protocol for Investigating Displacement Effects of Wind Facilities on Grassland Songbirds
[36] IPIECA-OGP Biodiversity Working Group An Ecosystem Approach to Oil and Gas Industry Biodiversity Conservation
[37] IPIECA-OGP Biodiversity Working Group A Guide to Developing Biodiversity Action Plans for the Oil and Gas Sector
[38] IPIECA The Oil and Gas Industry: Operating in Sensitive Environments

projects[39]. The Business for Social Responsibility (BSR) works together with a global network of member companies and, together with a number of energy companies has produced a number of environmental reports including a comprehensive review of tools to measure corporate impact on ecosystem services[40].

In addition to standards and guidance on biodiversity, some industry groups promote research in areas where either impacts or mitigation measures are not well understood. One example is the Joint Industry Programme "E&P Sound and Marine Life" which is an international consortium of oil and gas companies organised under the OGP that supports research on all sources of sound produced by the offshore oil and gas industries including seismic airguns, drilling, dredging, pile driving, construction equipment, removal of offshore structures using explosives, shipping and others[41].

Table 5. Major biodiversity initiatives in the energy sector

Biofuel initiatives and certification schemes	
Better Sugarcane Initiative http://www.bettersugarcane.org/	Multistakeholder collaboration working to provide standards and a certification scheme that enables farmers to produce sustainable sugar. The standard contains specific reference to biodiversity and was finalised in November 2009.
Roundtable on Sustainable Palm Oil http://www.rspo.org/	Multistakeholder initiative that has developed and is implementing global standards for sustainable palm oil. A site and supply chain certification scheme has been developed and a biodiversity working group is in place. This is addressing issues around high conservation value, compensation schemes, (riparian) corridors & set-asides, biodiversity assessment methodologies and green corridors/landscape issues.
Roundtable on Responsible Soy Association http://www.responsiblesoy.org/	Global platform for the main soy value chain stakeholders with the common objective of promoting responsible soy production. Principles and criteria were approved for field-testing in May 2009. Soon a full version will be made available which countries will then have to alter for a national interpretation.
Roundtable on Sustainable Biofuel http://cgse.epfl.ch/page65660.html	Global initiative to ensure that biofuels deliver on their promises of climate change mitigation, economic development & energy security without causing environmental and/or social damages, such as deforestation and food insecurity. The RSB has developed a third-party certification system for biofuels sustainability standards, encompassing environmental, social and economic principles and criteria.
Environmental due diligence (EDD) for renewable technologies http://www.unep.fr/energy/activities/ddg/	Guidelines on Environmental Due Diligence for Renewable Energy Technologies, developed by UNEP and its Collaborating Center BASE, provide a practical tool for financiers and investors to check and mitigate their risk of investments in this sector. The EDD guidelines are intended to provide practical, standardised procedures for identifying and managing environmental impacts associated with investments in particular renewable energy technologies.
Global Bioenergy Partnership (GBEP) http://www.globalbioenergy.org/	Initiative by the G8+5 resulting from the 2005 Gleneagles Plan of Action to support wider, cost effective, biomass and biofuels deployment, particularly in developing countries where biomass use is prevalent. The purpose of the Global Bioenergy Partnership is to provide a mechanism for Partners to organize, coordinate and implement targeted international research, development, demonstration and commercial activities related to production, delivery, conversion and use of biomass for energy, with a particular focus on developing countries. GBEP also provides a forum for implementing effective policy frameworks, identifying ways and means to support investments, and removing barriers to collaborative project development and implementation. The Partnership's main objectives are to: 1. Create a global high-level policy dialogue on bioenergy, support national and regional bioenergy policy-making and market development, and facilitate international cooperation. 2. Favour more efficient and sustainable uses of biomass and develop project activities in the bioenergy field. 3. Foster the exchange of information, knowledge skills and technologies by identifying and promoting potential areas of bilateral and multilateral collaboration. 4. Facilitate bioenergy integration into energy markets by tackling specific barriers in the supply chain. 5. Act as a cross-cutting initiative, working in synergy with other relevant activities, avoiding duplications.

[39] IPIECA-OGP Key Biodiversity Questions in the Oil and Gas Lifecycle http://www.ipieca.org/activities/biodiversity/downloads/publications/bdwg_lifecycle.pdf
[40] Measuring Corporate Impact on Ecosystems: A comprehensive Review of New Tools http://www.bsr.org/reports/BSR_EMI_Tools_Application.pdf
[41] E&P Sound and Marine Life Programme. http://www.soundandmarinelife.org/

Table 5. *continued*

Oil & Gas initiatives and industry groups	
The Energy and Biodiversity Initiative (EBI). http://www.theebi.org	A partnership between leading energy companies and conservation organisations to develop and promote best practices for integrating biodiversity conservation into oil and gas development and transmission. Guides: (i) Integrating biodiversity into environmental management systems. (ii) Integrating biodiversity into Environmental & Social Impact Assessment (ESIA) processes. (iii) Framework for integrating biodiversity into site selection. (iv) Biodiversity indicators for monitoring impacts and conservation actions. Biodiversity Discussion papers: (i) Negative secondary impacts from oil and gas development. (ii) Opportunities for benefiting biodiversity conservation.
International Petroleum Industry Environmental Conservation Association (IPIECA) http://www.ipieca.org/	A partnership between leading energy companies and conservation organisations to develop and promote best practices for integrating biodiversity conservation into oil and gas development and transmission. Guides: (i) Biofuel, sustainability and the Petroleum industry. (ii) Addressing Uncertainty in Oil and Natural Gas Industry Greenhouse Gas Inventories (2009). (iii) Oil and Natural Gas Industry Guidelines for Greenhouse Gas Reduction Projects: Flare Reduction Project Family (2009). (iv) Oil and Natural Gas Industry Guidelines for Greenhouse Gas Reduction Projects (2007). (v) An Ecosystem Approach to Oil and Gas Industry Biodiversity Conservation (2007). (vi) Guide to the Convention on Biological Diversity for the Oil and Gas Industry (2007). (vii) Key Biodiversity Questions in the Oil and Gas Lifecycle (2006). (viii) A Guide to Developing Biodiversity Action Plans for the Oil and Gas Sector (2005). (ix) The Oil and Gas Industry: Operating In Sensitive Environments (2003).
GRI Oil & Gas sector supplement http://www.globalreporting.org/ReportingFramework/SectorSupplements/OilAndGas	The Sector Supplement will help companies address the specific sustainability reporting issues, needs and challenges facing the Oil & Gas sector when using the GRI Reporting Framework.
International Association of Oil & Gas producers (OGP): E&P Sound & Marine Life Joint Industry Programme (JIP) http://www.soundandmarinelife.org/	Aims to identify specific, operationally focused questions that relate to the effects of sound generated by the offshore E & P industry on marine life, and promote a research programme that will test scientific hypotheses and produce the data needed to address this issue.
Hydro- and wind power initiatives	
International Hydropower Association http://www.hydropower.org	The International Hydropower Association (IHA) addresses the role of hydropower in meeting the world's growing water and energy needs as a clean, renewable and sustainable technology. Formed under the auspices of UNESCO in 1995 as a forum to promote and disseminate good practice and further knowledge about hydropower. Initiatives: • IHA Sustainability Guidelines. • IHA Sustainability Assessment Protocol. • Hydropower Sustainability Assessment Forum.
US Wind Coordinating Collaborative http://www.nationalwind.org/	The US Wind Coordinating Collaborative (NWCC) provides a neutral forum for a wide range of stakeholders to pursue the shared objective of developing environmentally, economically, and politically sustainable commercial markets for wind power in the United States. Publications: • Wind and Wildlife: Key Research Topics 2008. • Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document 2007. • Critical Literature Review: Impact of Wind Energy and Related Human Activities on Grassland and Shrub-Steppe Birds October 2007.

Company initiatives

Some individual energy companies have made ambitious operational commitments, standards or policies for biodiversity. Examples include Shell's biodiversity standard, which includes the requirement to develop Biodiversity Action Plans in areas of high biodiversity, as well as the commitment not to explore or develop in Natural World Heritage Sites; EON's work to develop guidance for minimizing the biodiversity impacts of offshore energy installations; and commitment from BC Hydro, a Canadian electric power utility, to a long-term goal of no net incremental environmental impact. Eni was identified as one of the global leaders in sustainability by the Dow Jones Sustainability Index that rates companies on their sustainability performance. This was partly based on the implementation of initiatives for biodiversity that has helped reduce the local environmental impact of its operations[42].

The ability of energy companies and producers to comply with commitments that protect or benefit biodiversity does however depend on the availability and quality of data on biodiversity. For example, data on the location of both protected areas and unprotected areas of importance for biodiversity. Many companies therefore form partnerships with biodiversity conservation organisations in order to access data and expertise as well as contribute to its development. This may be through bilateral partnerships, or multilateral partnerships such as that of Proteus[43], a partnership between the UNEP World Conservation Monitoring Centre and a number of large companies, many of which are from the energy sector.

Addressing climate change

The Kyoto Protocol of the UN Framework Convention on Climate Change so far represents the largest effort for global action on the most significant threat to biodiversity — climate change. The market-based mechanisms it promotes for reducing emissions of greenhouse gases are directly relevant to energy companies and many are pursuing various options for reducing emissions, including improving energy efficiency, diversifying to other sources of energy such as solar and wind, and developing carbon capture and storage technologies.

Off-site biodiversity conservation initiatives

There are some emerging areas of work that involve payments by business to protect biodiversity off-site. These include:

- Payments for Environmental Services (PES) as a way of conserving the ecosystem services on which individual companies depend. For example, a few hydroelectric utilities around the world are currently involved in PES systems for watershed protection, whereby the company invests in the sustainable management of the forests and freshwater ecosystems on which it relies for freshwater supplies. The Katoomba Group[44] has been organizing such projects with hydropower companies in East and Southern Africa for the past 10 years; other examples can be found in the Philippines, Fiji, and Central America.
- Biodiversity Offsets to compensate for residual biodiversity impacts that cannot be mitigated onsite. Principles on biodiversity offsets set by the Business and Biodiversity Offsets Program (BBOP) are supported by a few individual companies in the energy industry, and BBOP is now running pilot offset projects with, amongst other companies, Shell and the Solid Energy coal mine in New Zealand.

Challenges and opportunities

The Energy sector can contribute to the conservation of biodiversity and ecosystem services. For example, some oil & gas concessions and power plant sites include areas of protected forest, offshore wind developments are surrounded by no-go areas where fishing is not allowed, and dams can provide freshwater habitats. It also has the potential to mitigate poverty-related pressures to biodiversity though the provision of employment.

While energy demand is expected to continue increasing, limited stocks of fossil fuels are likely to cause a shift in energy sources towards renewables. This will therefore cause a shift in the overall relationship between biodiversity and the energy sector whereby dependencies will be much stronger, and the threats quite different. There are a number of existing and increasing challenges listed below:

- Increasing energy demands and technology innovations: Meeting the projected increased demand for energy without driving further biodiversity loss poses a major challenge and requires mainstreaming of good practices and commitments to safeguard biodiversity currently only made by a few companies. Technology innovations will have a big contributing role and investments need to be made in innovative solutions for sustainable energy production.
- Expansion of extractive activities into important areas for biodiversity: High oil prices and declining reserves in existing oil fields are driving oil and gas exploration into remote, often sensitive, areas. To gain access to such areas, the oil and gas industry will need to provide assurance that it can prevent major incidents such as large oil spills, as well as mitigate any potential indirect impacts.
- Sustainable expansion of biofuels: Of concern is the

[42] Sustainability leader: Eni. http://www.sustainability-index.com/djsi_pdf/Bios09/ENI_09.pdf
[43] Proteus 2012: http://proteus.unep-wcmc.org/44 E&P Sound and Marine Life Programme. http://www.soundandmarinelife.org/
[44] http://www.katoombagroup.org/

widespread cultivation of biofuel crops to meet new targets. There is therefore a need for better and more comprehensive information on global land use change projection which considers biodiversity and increasing demand for crop land for food and fuel to ensure biofuel expansion does not lead to food insecurity and loss of biodiversity. This can be further benefited by having an integrated approach to land use planning such as the one developed for sugarcane in Brazil.

- Initiatives and standards related to renewable technologies: There is a lack of initiatives that tackle the biodiversity impacts of renewable energy production. While there has been development of certification schemes related to the production of biofuels, they are lacking for wind and solar power, and only one was found that related to hydropower, despite the severe impacts that these industries can have and the fact that two-thirds of the world's economically viable hydropower potential remains unexploited, mostly in developing countries[45]. There is a need to make sure that efforts to mitigate climate change do not adversely affect biodiversity.
- Standards on biodiversity and buy-in to existing voluntary principles and good practices from companies across the industry: While there are a number of energy-related initiatives that include broad policy statements and guidance for good practice, there is a lack of actual standards to which member companies need to comply. Getting buy-in to existing principles and good practices globally across the sector is challenging. Added to this, there is also a need to recognize and reward biodiversity-responsible operators, particularly in counties where regulations are not requesting high standards in terms of biodiversity conservation.
- Careful application of offsetting as a means to mitigate impact: While available solutions for mitigating and compensating biodiversity impacts such as carbon and biodiversity offsetting need to be applied more widely, care needs to be taken that offsetting does not become the industry's sole means to address climate change and biodiversity impacts, at the expense of actually reducing the environmental impact of operations.
- The role of national government: There is a large role for national governments concerning sustainable energy production. This will require inter-ministerial coordination (energy, environment, agriculture, water, development, etc.) to promote responsible sourcing and provide legislative and policy support for effective land-use planning and environmental assessments for energy production.

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- EBI Negative Secondary Impacts from Oil and Gas Development **http://www.theebi.org/pdfs/impacts.pdf**
- IFC A Guide to Biodiversity for the Private Sector: Oil and Gas **http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/BiodivGuide_SectorSummary_OilandGas/$FILE/Oil+and+Gas.pdf**
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3. Agrifood

Agricultural land covers 38% of the world's land area[46]. Of this, 78% is used for livestock grazing/production[47]. Ensuring global food security is one of the challenges of the new millennium. The global population is projected to increase from 6.7 billion (2006) to 9.2 billion by 2050.

Impacts

- **Habitat loss** and degradation for cultivation.
- **Climate change** principally from the permanent conversion of forests or long-term grassland to agriculture.
- **Water scarcity** and quality from excessive water use.
- **Soil degradation** and pollution of waterways.
- **Loss of genetic diversity** through intensive agricultural systems.
- **Impacts on native species** through the introduction of invasive species.

Dependencies

- Maintaining productivity of crop systems - water, nutrient and climate regulation, pollinators, and pest predators, as well as crop and livestock genetic diversity.
- Natural products used for pest control and food additives.

Opportunities/risks[48]

- **Access to new revenue streams and markets:** through the growing demand for certified sustainable foods or the development of functional foods, flavours and fragrances.
- **Opportunities for investment and increased efficiency:** efficiencies realised through the development of new technologies, raw materials and processes that enable minimised resource use and degradation, and supply chain resilience.
- **Regulatory and compliance:** emergence of new government policies such as liability, taxes, moratoria on extractive activities and rationing of scarce resources.
- **Access to finance:** increasingly informed finance sector is developing investment policies that consider impacts and dependence on biodiversity and ecosystem services e.g. Rabobank's soya and palm oil investment policies.
- **Reputation:** high profile NGO campaigns on deforestation or impacts on endangered species can cause reputational damage. The food sector has been the subject of Greenpeace campaigns regarding sustainable sourcing of fish, soya, palm oil, timber and meat.

World demand for food is forecast to increase by 70-80% within 50 years[49]. Rising wealth has caused changes in dietary patterns, with more demand for animal protein (meat, fish, eggs, milk) and other high-value commodities such as oils, and processed goods. The demand for food will continue to increase with increasing populations and continued rising wealth. Part of this increase will be met through improvements in yield, however, with increasing demand for land for fuel as well as food, and some land now too degraded to support agriculture, further conversion of natural habitat is expected. Land degradation, urban expansion and competition for crop for non-food cultivation may reduce available cropland by 8–20% by 2050. The combined effects of climate change, land degradation, cropland losses, water scarcity and species infestations may cause projected yields to be 5–25% short of demand by 2050.

Agriculture supports the livelihoods and subsistence of a huge number of people worldwide. Over the past century, industrialization, new technologies and globalization have driven a general shift away from small-scale, local and labour-intensive methods to large-scale industrial methods. There has also been a shift from extensive farming of diverse species and varieties to intensive monocultures of just a few crops.

[46] CBD/UNEP (2001) Global Biodiversity Outlook http://www.cbd.int/gbo1/chap-01-07.shtml

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Land conversion to make way for agriculture is a key driver of biodiversity loss. It is predicted that a further 10-20% of grasslands and forests will be converted to agriculture by 2050[50]. Agriculture also has significant indirect impacts on biodiversity through, for example, the release of nutrients into rivers, water withdrawals and reduction of genetic diversity of crops through focusing on just one or two plant strains. And yet, food security is intrinsically linked with biodiversity and ecosystem services and is reliant on the existence of healthy ecosystems for sustained yields. Soil microorganisms, natural predators and natural genetic diversity are essential to maintain yields. Natural habitats play a vital role in regulating the climate, water flow and nutrient cycles, providing a stabilising environment for crop growth. The recent review carried out by The Economics of Ecosystems and Biodiversity (TEEB), for example, showed that the presence of forest based wild pollinators increased crop yield by 20% with a resulting increase in economic value of the crop equating to 7% of farm income[51].

Recent years have seen the growth of the organic food industry following increases in consumer consciousness and demand. There are likely to be tensions between the demand for organic food and the need to produce higher yields. Increasing intensification of agricultural practices seems likely, combined with the use of genetically manipulated foods. As a result, there will be an increased need for clear policy frameworks and implementation of strong sustainable agriculture management practices.
The agrifood industry is at the forefront of the food security challenge. Agrifood refers to the production of agricultural food commodities, such as food crops, poultry and livestock, and the processing of these into food and drink. Although agriculture also involves the farming of non-food crops such as fibres (e.g. cotton) and biofuels; as far as possible this section focuses on the production of food crops but in some cases, the figures provided refer to agriculture as a whole.

Relationship with biodiversity

Dependence: Agricultural ecosystems are important habitats for many wild plant and animal species, and indeed depend upon many of them. In particular agricultural productivity depends on soil micro-organisms, pollinators, and pest predators to maintain yields, as well as crop and livestock genetic diversity. Stable conditions for crop growth are provided by a number of ecosystem services for water purification, nutrient cycling and climate regulation. Natural products are also used for pest control and food additives e.g. Neem-based insecticides have been shown to be effective against over 200 different types of insects.

Impact

- **Habitat loss:** Cultivated land covers one quarter of the world's land. This has resulted in loss or degradation of natural habitats such as forests and wetlands. A further 10-20% of grassland and forest will be converted to agriculture between 2000 and 2050 with associated loss of biodiversity and ecosystem services[52]. Recent examples include the conversion of large areas of the Amazon rainforest and Brazilian savannah for soybean and cattle production, and conversion of large areas of lowland rainforest in Southeast Asia, including Indonesia, for oil palm plantations. Not all of this recent conversion is attributable to food production, as some is also due to the expansion of biofuel crops.
- **Climate change:** Agricultural practices are responsible for around 14% of global greenhouse gas emissions[53], with sources including fertilizers, livestock, wetland rice cultivation, manure management, burning of savannah and agricultural residues, and ploughing. Also of significance is the permanent conversion of forests or long-term grassland to agriculture, primarily in developing countries and particularly in tropical Asia, which accounts for an estimated 80% of CO_2 emissions from the agricultural sector[54]. In terms of the agrifoods industry, the global transport of agricultural products is now also a significant source of greenhouse gas emissions.
- **Water scarcity:** Irrigation for agriculture is responsible for 70% of freshwater withdrawal[55], of which 15–35% is estimated to be unsustainable[56]. This is leaving rivers, lakes and underground water sources dry in many irrigated areas. Irrigation can also lead to increased soil salinity.
- **Pollution and soil degradation:** Soil and water contamination from pesticides and fertilizers, erosion, and sedimentation of downstream habitats including coral reefs. Overall, some 85% of agricultural land has been degraded by erosion, salinization, soil compression, nutrient depletion, biological degradation, or pollution, and each year 12 million hectares are lost to desertification[57].
- **Loss of genetic diversity and native species:** The introduction of non-native and invasive species that can occur through the use of non-native crop species or contaminated crop seeds can out-compete native species. In addition, intensive

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agriculture has driven genetic erosion of both crops and livestock species through the replacement of traditional and local species and varieties with more universally farmed varieties. Today, just 30 crops account for 90% of calories consumed by people, while 14 animal species account for 90% of all livestock production[58]. This loss of traditional and local species and varieties through intensification of agriculture may lead to increased vulnerability of crops to disease.

- **Genetically modified (GM) crops** can contribute to and/or exacerbate some of these impacts through their potential to, for example, affect non-target species (such as insects which are not pests), become invasive, contribute to erosion of the crop gene pool and transfer the modified gene to other species, as well as through the associated use of herbicides with some GM crops.

Biodiversity initiatives

Overview

The focus of current biodiversity initiatives within the agriculture sector is on developing and promoting sustainable production methods (better management practices or sustainable agriculture practices) that include biodiversity considerations. A number of criteria have been, or are in the process of being, developed for specific food crops, which in many cases are, or will be, linked to certifications schemes. Many of these efforts are publicly oriented and involve a transparent process with participation from NGOs, government, research and academic institutions, and/or companies in the wider food sector (food processors as well as traders and retailers). Others are private initiatives, led by corporations or their associations.

[58] UNEP (2007) Fourth Global Environment Outlook: Environment for Development Section B: State-And-Trends of the Environment 1987–2007; Chapter 5: Biodiversity http://www.unep.org/geo/geo4/report/05_Biodiversity.pdf

Table 6. A description of the major biodiversity initiatives in the agrifood sector

Principles and standards	
International Treaty on Plant Genetic Resources for Food and Agriculture www.planttreaty.org/	Requires the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use for sustainable agriculture and food security. Through the Treaty, countries agree to establish an efficient, effective and transparent Multilateral System to facilitate access to plant genetic resources for food and agriculture, and to share the benefits in a fair and equitable way. The Multilateral System applies to over 64 major crops and forages. The Governing Body of the Treaty, which is composed of the countries that have ratified it, has set out the conditions for access and benefit-sharing in a "Standard Material Transfer Agreement".
Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture www.globalplanofaction.org	A framework, guide and catalyst for action at community, national, regional and international levels. It seeks to create an efficient system for the conservation and sustainable use of plant genetic resources, through better cooperation, coordination and planning and through the strengthening of capacities. Adopted by 150 countries in 1996, the GPA is a framework for action and it provides the priority basis for the funding strategy of the International Treaty on Plant Genetic Resources for Food and Agriculture.
Biodiversity and wine initiative www.bwi.co.za	Partnership between the South African wine industry and the conservation sector. The goals are to minimise the further loss of threatened natural habitat, and to contribute to sustainable wine production through the adoption of biodiversity guidelines by the South African wine industry. Brand differentiation based on a proactive stance on biodiversity is a feature of the initiative.
Biodiversity Guidelines within the Integrated Production of Wine (IPW) and self assessment forms www.bwi.co.za/downloads/	An industry-wide, audited, technical system of sustainable wine production. The guidance covers all cultivation aspects such as correct selection of cultivars, vineyard layout, irrigation, Integrated Pest Management, pruning, etc. It contains a specific chapter on biodiversity.
Better Sugarcane Initiative www.bettersugarcane.org/	Multistakeholder collaboration working to provide standards and a certification scheme that enables farmers to produce sustainable sugar. The standard contains specific reference to biodiversity and was finalised in November 2009.
Common Code for the Coffee Community (4C Association) www.4c-coffeeassociation.org/en/	A collaboration of producers, trade and industry and civil society working together to enhance the sustainability of the coffee sector. It has a code of conduct which makes specific reference to biodiversity conservation. This is supported by a verification system and support mechanisms.
Conservation Grade www.conservationgrade.org/	Conservation Grade™ is a sustainability protocol implemented by farmers in return for a contracted premium price for their crop. They prescribe the creation and maintenance of wildlife habitats, creation of a Farm Environment Plan and certain production requirements and pesticide restrictions.
Conservation Principles for Coffee Production www.conservation.org/sites/celb/Documents/Cons_Principles.pdf	Principles developed in consultation with coffee growers, importers, roasters, retailers and conservationists, which serve as a common framework for both companies and farmers seeking to integrate biodiversity conservation and social standards into their businesses. These were developed with Conservation International, Rainforest Alliance and the Smithsonian Migratory Bird Centre in 2001 and initiatives such as the Common Code for Coffee post date them.
Ethical Tea Partnership www.ethicalteapartnership.org	Aims to ensure members tea is produced sustainably. Regional managers work with producers to address issues identified through monitoring their performance against ETP's standards which address biodiversity.
The Fairtrade Foundation www.fairtrade.org.uk/	Independent non-profit organisation that licenses use of the FAIRTRADE Mark on products in the UK in accordance with internationally agreed Fairtrade standards. Standards for certification contain specific reference to biodiversity.
International Federation of Organic Agriculture Movements (IFOAM) http://www.ifoam.org	Umbrella organization for the organic movement, uniting more than 750 member organizations in 116 countries. IFOAM standards include general principles and standards for biodiversity conservation on farms[59]. IFOAM is also developing a more detailed biodiversity and landscape standard[60].
Linking environment and farming (LEAF) www.leafuk.org	Multistakeholder group working to demonstrate integrated farm management principles through a nationwide network of volunteer Demonstration Farms in the UK. Provides self assessments, technical audits and training. Global remit.

[59] The IFOAM Norms for Organic Production and Processing

[60] IFOAM (2009) D2 Draft Biodiversity and Landscape Standards - http://www.ifoam.org/about_ifoam/standards/norms/draft_standards/BiodiversityDraftStandardsD2050728.pdf

Table 6. *continued*

Rainforest Alliance Sustainable Agriculture Standards www.rainforest-alliance.org	Have social and environmental standards for coffee, bananas, cocoa, citrus, ferns and cut flowers. Subject to third party certification. Recipients are permitted to use the Rainforest Alliance label.
Roundtable on Sustainable Palm Oil www.rspo.org/	Multistakeholder initiative that has developed and is implementing global standards for sustainable palm oil. A site and supply chain certification scheme has been developed and a biodiversity working group is in place. This is addressing issues around high conservation value, compensation schemes, (riparian) corridors & set-asides, biodiversity assessment methodologies and green corridors/landscape issues.
Roundtable on Responsible Soy Association www.responsiblesoy.org/	Global platform for the main soy value chain stakeholders with the common objective of promoting responsible soy production. Principles and criteria were approved for field-testing in May 2009. Soon a full version will be made available which countries will then have to amend to a national interpretation.
Soil association www.soilassociation.org/	Works with farmers to encourage organic agriculture through provision of advice, standards (which address biodiversity), educating consumers through a recognised label linked to a certification scheme, building capacity of farmers and campaigning. Currently working on climate friendly farming linked to land management.
World Cocoa Foundation www.worldcocoafoundation.org/	Aims to encourage development of sustainable cocoa whilst raising incomes through training, building cooperatives for more effective marketing, reducing crop loss and improving productivity. Have a set of principles in place to which members commit. These explicitly refer to biodiversity.
Guidance and research	
Farming and Wildlife Advisory Group www.fwag.org.uk/	Provides advice to farmers on conservation and wildlife in the UK.
GRI Food processing sector supplement www.globalreporting.org	A food processing sector supplement is under development which will contain indicators of relevance to the management of biodiversity and ecosystem services.
Landscape Measures Resource Center www.landscapemeasures.org/	Collection of ideas and tools to aid in managing areas where interests in protecting biodiversity, producing food and securing rural livelihoods converge. Part of a wider initiative run by Ecoagricultural Partners to help ecoagriculture practitioners measure the social, economic, and ecological outcomes of landscape-scale management practices, as well as develop tools for multi-stakeholder groups to plan landscape activities and set measurable goals and targets.
Platform for Agrobiodiversity Research (Biodiversity International) www.agrobiodiversityplatform.org	Encourages its members to engage in research together, help to identify gaps in knowledge in order to set research priorities and raise awareness of the dangers to agricultural biodiversity and the advantages of overcoming them.
State of Sustainability Initiatives (IISD) www.sustainablecommodities.org/ssi	Global initiative that conducts research and reports on the impacts, effectiveness and scope of market-based, voluntary approaches to sustainable commodity production and trade. A knowledge-sharing platform focused on improving information-sharing and transparency in voluntary supply chain initiatives through an independent annual reporting service and learning network.
Tools	
High Conservation Value Forest Toolkits www.hcvnetwork.org/resources/global-hcv-toolkits	Series of toolkits to enable identification of areas of high conservation value forest – many commodity standards require this.
Response Inducing Sustainability Evaluation www.iisd.org/measure/connecting/infasa/partners.asp	A model to assess the sustainability of farms and, at the same time, to identify possibilities for improvement. Can visualize trends and developments over time on individual farms as well as within regions and samples. RISE was tested and used for the public and private sector by evaluating different farm types in Brazil, Canada, China, India, Lebanon, Switzerland and Ukraine.

Certification schemes

The use of certification schemes to demonstrate credibility to consumers, customers and investors is growing. A number of the most widely used certification schemes within this sector such as the Sedex scheme or the Ethical Trading Initiative do not address biodiversity. However, a number of schemes contain some provisions of relevance to biodiversity. The use of a multistakeholder design and approval process is becoming increasingly popular and has been a feature of the commodity roundtables on soya, sugar cane and palm oil developed by WWF.

A wide range of schemes have been developed for organic farming. These mainly focus on avoiding the use of industrial fertilizers, pesticides, and GM crops. Some 35 million hectares of agricultural land are certified according to organic standards (data as at the end of 2008). Growth was strongest in Latin America and Europe." There are almost 1.4 million organic producers[61]. The value of this market globally was over US$ 50 billion in 2008[62], with the majority of products being consumed in North America and Europe. Despite significant growth, the total volume of such products remains very small — for example, less than 5% of the internationally traded volume in the case of agricultural food products[63]. There also remains a challenge of good integration of biodiversity criteria into these schemes. Of those that do consider it, it is often considered at a farm level and there is also a need to consider impacts on a landscape level, cumulative impacts, and/or dependence on ecosystem services.

There are three broad types of certification:

- **Commodity based certification schemes:** these set out principles and criteria for a range of issues, including biodiversity. Assurance may be at a farm level or provided throughout the supply chain. Examples include the Principles and Criteria and associated assurance process for the Roundtable on Sustainable Palm Oil, the Better Sugarcane Initiative, the Roundtable on Responsible Soya, the Smithsonian Institute Bird Friendly Coffee, the Common Code for the Coffee Community, the Ethical Tea Partnership standards for sustainable tea production and the Rainforest Alliance certification standards for tea, coffee, bananas, cocoa, citrus, ferns and cut flowers and UTZ CERTIFIED 'Good inside' for coffee, cocoa, palm oil, and tea.
- **Farm based certification schemes:** examples of this include Conservation Grade (a sustainability protocol implemented by UK based farmers in return for a contracted premium price for their crop), the Soil Association, the Linking Environment and Farming integrated farm management framework, the US based Fish Friendly Farming and Global Gap, which is a business to business certification scheme for environmental performance at farm level.
- **Supply chain certification schemes:** such as the chain of custody certification scheme run by the Roundtable on Sustainable Palm Oil.

Initiatives aimed at building understanding of sustainable agriculture

A number of initiatives have developed aimed at building awareness of the importance of biodiversity within agriculture, to build capacity of farmers and policy makers to implement sustainable agriculture practices and to facilitate exchanges of lessons learned. These are described in Table 7.

Table 7. A description of sustainable agriculture initiatives

Name	Description
CropLife International http://www.croplife.org/	A global federation representing the plant science industry and a network of regional and national associations in 91 countries. Company members include BASF, Bayer CropScience, Dow AgroSciences, DuPont, FMC, Monsanto, Sumitomo and Syngenta. Address international developments in the area of crop protection (pesticides), agbiotechnology (GMOs) and sustainable agriculture. Aims to provide transparent information to its stakeholders and actively encourages open dialogue with interested parties. Scope of work includes chemical crop protection (pesticides), agricultural biotechnology (GMO) and sustainable agriculture.
Ecoagricultural partners http://www.ecoagriculture.org/index.php	Work to better understand the complex interactions between biodiversity, agricultural production, and rural livelihoods by documenting and analyzing ecoagriculture cases, strategies and outcomes. Help to build the capacity of 'innovators' by linking communities & institutions worldwide, evaluate market models and opportunities for ecoagriculture products and services, and analyze and promote national and international policies to support the development of ecoagriculture landscapes. Contains a research database on ecoagriculture.

[61] Helga Willer and Lukas Kilcher (Editors) (2010): The World of Organic Agriculture - Statistics and Emerging Trends 2010. IFOAM, Bonn, and FiBL, Frick

[62] http://www.organicmonitor.com/

[63] Bishop, J., Kapila, S., Hicks, F., Mitchell, P. and Vorhies, F. (2008) Building Biodiversity Business. Shell International and IUCN - http://data.iucn.org/dbtw-wpd/edocs/2008-002.pdf

Table 7. *continued*

Name	Description
European Initiative for Sustainable Development in Agriculture http://www.sustainable-agriculture.org	Alliance of organisations in France, Germany, Luxembourg, Sweden, United Kingdom and Austria with the common aim of developing and promoting sustainable farming systems, which are an essential element of sustainable development. Provides an integrated farming framework which includes standards on biodiversity. Aim is to define integrated farming and act as guidance to farmers.
Field to Market, The Keystone Alliance for Sustainable Agriculture http://www.keystone.org/spp/environment/sustainability/field-to-market	Provides collaborative leadership that is engaged in industry-wide dialogue, grounded in science, open to the full range of technology choices, and committed to achieving long-term, continuous improvement in sustainable agriculture production. Working to create a comprehensive set of indicators that will measure the environmental, health and socio-economic outcomes of agriculture in the United States.
Finance Alliance for Sustainable Trade (FAST) http://www.fastinternational.org/	Multistakeholder initiative which aims to ensure the continued growth of sustainable production and trade by increasing the number of producers in developing nations who successfully access quality trade finance. Project includes financial literacy for Small and Medium Enterprises with sustainability based business models.
Fish Friendly Farming http://www.fishfriendlyfarming.org/	Provides an incentive-based method for creating and sustaining environmental quality and habitat on private land. Landowners and managers enrol in the programme to learn environmentally beneficial management practices and carry out ecological restoration projects. Three resource agencies—the Regional Water Quality Control Board, the National Marine Fisheries Service, and the County Agricultural Commissioner—provide an objective third-party certification.
High Conservation Value Resource Network http://www.hcvnetwork.org/	Set up to promote cooperation, collaboration and consistency in the use of the high conservation value (HCV) concept, to enable local-level approaches to implementation, and to support activities to develop and improve the HCV approach. Provides independent peer review of HCV analysis and coordinates technical guidance on its implementation.
IFC Biodiversity & Agricultural commodities programme http://www.ifc.org/bacp	Seeks to reduce the threats to biodiversity posed by agricultural expansion by leveraging market forces at all levels of the value chain. Help mainstream Better Management Practices (BMPs) focusing on palm oil, cocoa, sugarcane and soybeans in Indonesia, Malaysia, Brazil, Ghana and Côte d'Ivoire, which are major producers and exporters of these commodities.
Roots of Change http://www.rocfund.org/	Focused on California, aims to create a grass roots movement to ensure future food supply is sustainable.
The Sustainable Agriculture Network (SAN) http://www.rainforest-alliance.org/agriculture.cfm?id=san	Network of conservation groups that link responsible farmers to conscientious consumers through the Rainforest Alliance Certified seal of approval. Seeks to transform the environmental and social conditions of tropical agriculture through the implementation of sustainable farming practices. Commencing work on standards for sustainable cattle ranching.
Sustainable commodity initiative (United Nations Conference on Trade and Development and International Institute for Sustainable Development) http://www.sustainablecommodities.org/	Aims to build effectiveness across voluntary approaches to sustainable commodity production and trade by promoting good governance, impact analysis, information exchange as well as policy and initiative development. Through a process of workshops, meetings and research, the SCI identifies: sustainable supply chain strategies from market structure and supply chain perspectives; opportunities for collaboration among existing voluntary sustainability initiatives; and new global instruments for the sustainable management of commodities trade through public/private/civil society partnerships.
Sustainable Food Laboratory http://www.sustainablefoodlab.org/	Aims to accelerate the production of sustainable food from niche to mainstream. Facilitates market-based solutions to the key issues - including climate, soil, poverty and water - that are necessary for a healthy and sustainable food system to feed a growing world. Uses collaborative learning to incubate innovation at every stage along the supply chain from producing to distributing and selling food.
UNCTAD BioTrade Initiative http://www.biotrade.org/	Promotes sustainable biotrade in support of the objectives of the Convention on Biological Diversity. Has a range of regional programmes which includes food based products e.g. coffee in Ecuador. Has defined principles and criteria for goods and services derived from native biodiversity — including cocoa, fruits and ingredients — based on the objectives of the CBD.

This summary demonstrates the focus on voluntary initiatives. It is not yet clear whether initiatives of a voluntary nature are sufficiently robust to ensure change occurs on the ground. The Sustainable Commodities initiative is undertaking a review of voluntary certification schemes to determine their impacts.

Challenges and opportunities

The growing market for sustainably grown products and the large number of initiatives developing and promoting sustainable production methods means that there are great opportunities for businesses willing to engage and promote best practices. The wide range of standards, certification schemes and commodity specific initiatives also provide companies with options for engaging in different ways. There are however a number of challenges listed below:

- **Meeting the rising demand for food whilst conserving biodiversity and managing the natural resources on which the industries depend:** The world's population is projected to increase by 2.7 billion by 2050. As a result of this, increased income and a growing consumption of meat, the demand for food is expected to increase 50% by 2050[64]. This figure does not account for losses in yield as a result of environmental degradation. It is anticipated that part of this demand will be met by increasing yields as result of irrigation and fertiliser use, however, some is likely to be met as a result of expansion into non-agricultural lands with associated loss of biodiversity and ecosystem services. It is estimated that 120 million hectares of non crop-land will be needed in developing countries to achieve this, including land with high biodiversity value[65].
- **Climate change:** In addition to directly impacting on yields through changes in weather patterns and disease, increasing concern regarding climate change is leading to an increased focus on the role that land use change plays in climate change. As a result we may see land values shift as the cost of greenhouse gas emissions released from land conversion is factored into the value of the land. The recent commitment to reduction of emissions from deforestation and degradation within the post Kyoto framework will encourage this trend.
- **Scarcity of water availability in key agricultural regions:** Many major food-producing countries, including the US, China, India, Pakistan, Australia and Spain, have reached, or are close to reaching, their renewable water resource limits[66]. A number of companies are undertaking water scarcity mapping to enable them to identify potential areas of water stress and are putting in place schemes aimed at ensuring continued access to water. Payment for ecosystem services schemes are being used by companies such as Nestlé Water in France and SABMiller in Bolivia and Colombia to maintain water catchment areas and ensure continued access to water.
- **Increasing cost of food:** Costs of input to food may increase as pressures go up to improve yields. For large scale producers, precision agriculture to more precisely evaluate fertilizer and other input needs, offers some hope for reducing fertilizer and pesticide inputs and water use[67].
- **Failure of the markets to reward sustainable agricultural products:** The cost and process of certification can be burdensome, or even prohibitive, for small-scale producers, especially those in developing countries. Certification is increasingly becoming a barrier to market entry and premiums are rarely paid on certified products making it challenging to cover the costs of implementation of sustainability programmes.
- **Loss of yield as a result of introduction of non-native and invasive species:** The use of genetically modified (GM) crops may contribute to and/or exacerbate some of these impacts through their potential to, for example, effect non-target species (such as insects which are not pests), become invasive, contribute to erosion of the crop gene pool and transfer the modified gene to other species.
- **Lack of scalable agriculture practices:** While there are a number of agro-environment schemes by a number of governments, there are few examples of biodiversity-friendly agriculture practices being promoted and adopted at a large-scale by the private sector. A lack of understanding of biodiversity and how to manage it within farming landscapes acts as a barrier to progress on this issue.
- **Lack of local biodiversity expertise or willingness to engage:** Companies with biodiversity commitments trying to find local partners with biodiversity expertise to assist their work or work of local suppliers, often find it challenging to find local organizations with biodiversity expertise in parts of the world. Another issue is that organisations with biodiversity expertise are not always willing to work with businesses.
- **Loss of genetic diversity of agricultural crops and livestock as a result of commercial intensification:** as the number of commercial cultivars decreases, crops become at higher risk of significant loss as a result of disease – monoculture encourages rapid spread of disease. A number of groups are storing 'banks' of genetic diversity to guard against this scenario.

[64] UNEP (2009) The Environmental Food Crisis. The Environment's Role in Averting Future Food Crises
[65] UNEP (2009) The Environmental Food Crisis. The Environment's Role in Averting Future Food Crises
[66] UNEP (2007) Fourth Global Environment Outlook: Environment for Development Section B: State-And-Trends of the Environment 1987–2007; Chapter 5: Biodiversity
[67] R. Bongiovanni and J. Lowenberg-Deboer (2004) Precision Agriculture and Sustainability Precision agriculture. Volume 5, Number 4 / August, 2004

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- The Business and Biodiversity Resource Centre website Food and Drink **http://www.businessandbiodiversity.org/foodanddrink.html (accessed 11 October 2009)**
- UNEP (2007) Fourth Global Environment Outlook: Environment for Development Section B: State-And-Trends of the Environment 1987–2007; Chapter 5: Biodiversity **http://www.unep.org/geo/geo4/report/05_Biodiversity.pdf**
- WBCSD/IUCN (2008) Agricultural Ecosystems – Facts and Trends **http://cmsdata.iucn.org/downloads/agriculturalecosystems_2.pdf**
- WHO 20 Questions on Genetically Modified (GM) Foods **http://www.who.int/foodsafety/publications/biotech/20questions/en/ (accessed 17 October 2009)**
- WWF International website Poorly Managed Fishing **http://www.panda.org/about_our_earth/blue_planet/problems/problems_fishing/ (accessed 11 October 2009)**
- WWF-US website Aquaculture **http://www.worldwildlife.org/what/globalmarkets/aquaculture/whatwearedoing.html (accessed 11 October 2009)**

5. Fisheries and aquaculture

The fishing industry is crucial to the world economy and food supplies. The fishing industry involves the wild capture and farming of fish, shellfish and other aquatic species, and the processing of these into food items or their sale for other purposes including the aquarium and ornamental trade. This section focuses on both the capture fisheries and aquaculture sectors.

Impacts >>>

Fisheries:

- Overfishing of target species.
- By-catch of non-target species when unselective fishing methods are used.
- Habitat destruction through destructive fishing practices and coastal development.
- Impact on other resources through redirection of exploitative pressure.

Aquaculture:

- Habitat loss for creating fish farms.
- Overfishing for food since fish farming may increase the demand for wild fish.
- Pollution caused by net-pen farming.
- Introduction of invasive alien species, parasites and disease.

Dependencies >>>

- Wide diversity of other aquatic organisms for food.
- Adequate habitat for reproduction.
- Water quality.

Opportunities/risks

- **New markets:** consumers looking for sustainably produced or caught fish.
- **Security of Supply:** Scarcity and increased cost of resources, reduced quotas and productivity.
- **Reputational risks:** loss of biodiversity can lead to poor reputation with shareholders, investors, supply chain partners and consumers.

Capture fisheries, of which food fisheries is by far the most significant, supports the livelihoods and subsistence of the largest number of people worldwide. Over the past century, industrialization, new technologies and globalization have driven a general shift away from small-scale, local and labour-intensive methods to large-scale industrial methods. Nonetheless, about 90% of fishers worldwide are small-scale, and around 50% of fish used for direct human consumption is harvested by this subsector[68].

Around 90% of capture fisheries target marine species, with the vast majority of principle fishing areas being located in the Pacific Ocean[69]. Increasing demand for seafood has been matched by increasing fishing capacity and technological advances. The peak in reported catches from oceans occurred during the mid 1980s but marine capture fisheries have since been in decline[70]. Marine capture fisheries were traditionally concentrated in coastal and pelagic areas; however declining fish populations have caused a shift to fishing in deeper waters and for previously unexploited fish species.

The exact proportion of fish captured for human consumption from inland fisheries is unknown due to

[68] FAO (2005) technical guidelines for responsible fisheries – Increasing the contribution of small-scale fisheries to poverty alleviation and food security ftp://ftp.fao.org/docrep/fao/008/a0237e/a0237e00.pdf

[69] FAO (2008) State of the World's Fisheries and Aquaculture 2008, Part 1 World Review of Fisheries and Aquaculture -ftp://ftp.fao.org/docrep/fao/011/i0250e/i0250e01.pdf

[70] Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-being. Opportunities and Challenges for Business and Industry -http://www.millenniumassessment.org/documents/document.353.aspx.pdf

much of it going unreported, however in 1997 it was estimated to be around 12%[71]. The majority (67%) of inland capture fisheries are located in Asia, primarily in China[72]. Inland fisheries have experienced severe declines in productivity as a result of the loss and modification of riparian and estuarine habitats.

As a result of climate change and the effects of rising ocean temperatures, changes in salinity and a loss of coral reefs, major shifts in the distribution of fish populations and a loss of many tropical fisheries is expected[73]. Not only will this affect future ocean food supply, but it will affect those most dependent upon fisheries for livelihoods and subsistence.

Most recently, aquaculture has emerged as a significant and growing supplier of fish to meet the widening gap between supply and demand for aquatic food products that has emerged from declining fish stocks and a growing human population. Aquaculture currently accounts for 47% of the world's fish food supply[74].

Most aquaculture has been developed in freshwater environments, however coastal and delta aquaculture is also very significant and some of its methods represent considerable risks to the marine environment and to local fish species. Shrimp farming is one of the most rapidly growing aquaculture industries and a significant proportion is produced in cleared mangrove areas of river deltas. Asia accounts for over 90% of the global aquaculture production quantity and about 80% of the value[75].

Rising wealth has caused changes in dietary patterns, with more demand for animal protein including fish, and other high-value commodities such as fish oils, and processed goods. Demand for food will continue to increase with increasing populations and continued rising wealth, and will therefore add further pressure on the production and capture of fish.

Relationship with biodiversity

Dependence: The productivity of wild fisheries is dependent on the health of marine and freshwater ecosystems, as well as on species diversity. A large number of species are exploited at both commercial and subsistence levels that in turn depend upon a wide variety of habitats. Both fishing and aquaculture are often carried out in areas of importance for biodiversity, including mangroves and coral reefs. Water quality and availability is an essential need for aquaculture.

Impact – capture fisheries

- **Overfishing of target species:** overfishing in capture fisheries is the single-greatest threat to marine biodiversity. As many as 90% of the ocean's large fish have been fished out[76], and 28% of the world's commercial marine fisheries are overexploited, depleted, or recovering from depletion[77]. If business continues as usual, stocks of all marine species currently fished for food are predicted to collapse by 2048[78]. In addition to threatening a number of fish species, removal of specific target species can disrupt food webs whereby either overfishing of prey species reduces the food supply for the predators, or removal of predator species can cause increases in prey species that can impact primary ocean productivity. Research has shown that there has been a gradual transition from long-lived high trophic level species to low trophic level species, whereby fishing has been moving down through the food webs as the larger most valued species get fished out[79].
- **By-catch of non-target species:** When unselective fishing methods are used, this can lead to population declines in several non-target marine species caught as by-catch — notably other fish, sharks, seabirds, marine turtles, cetaceans, corals and invertebrates.
- **Habitat destruction:** Destructive fishing practices, such as bottom trawling, cyanide fishing, and dynamite fishing, can damage and destroy sensitive marine habitats. Dynamite fishing, for example, has contributed to massive destruction coral reefs in Southeast Asia over the past two decades. With the prevalence of denser population in coastal areas, the human and economic costs of damage to coastal ecosystems are set to grow[80].
- **Indirect impacts on alternative food and income sources:** Due to the strong dependence on fisheries of many of the poorest people, declines in fish stocks through overfishing, either at the commercial or subsistence level, can impact other resources through the redirection of exploitative pressure. An example is the increase in bushmeat hunting that was associated with declining fish stocks in Ghana[81].

Impact – aquaculture

- **Habitat loss:** Aquaculture impacts on biodiversity through habitat loss for creating fish farms, particularly in mangrove forests for tropical farmed shrimp, diversion of freshwater into ponds, pollution and the introduction invasive alien species, parasites and disease.

[71] WRI – Freshwater systems: Food Production - inland fisheries -http://www.wri.org/publication/content/8158
[72] ibid
[73] Cheung et al. (2009) Projecting global marine biodiversity impacts under climate change scenarios. Fish and Fisheries 10, 235-251
[74] ibid
[75] In: De Silva et al. (2009) Alien Species in Aquaculture and Biodiversity: A Paradox in Food Production. Ambio Vol 38 (1) 24-28 http://library.enaca.org/genetics/papers/de_silva_et_al_2009.pdf
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[80] World Economic Forum, 2010. Biodiversity and Business risk. www.weforum.org/pdf/globalrisk/biodiversityandbusinessrisk.pdf).
[81] Brashares et al. (2004) Bushmeat Hunting, Wildlife Declines, and Fish Supply in West Africa. Science Vol 306 (5699): 1180-1183

- **Overfishing for food:** Aquaculture's demand for wild fish to feed farmed fish also contributes to overfishing in marine capture fisheries, particularly in order to feed high-value species such as shrimp and salmon.
- **Disease and introduced species:** Aquaculture farms have a high risk of disease outbreaks that can spread to wild populations. An example is the virus, Infectious Salmon Anaemia (ISA). Additionally, there is a risk of domestic, non-native or genetically modified species raised on farms escaping into the wild and outcompeting native populations.

Biodiversity initiatives

Overview

Work on sustainable fisheries management focuses on marine capture fisheries. One global certification scheme has been developed for all marine species, as well as several others focusing specifically on tuna. A few industry groups and initiatives work more specifically on particular fisheries or issues, such as illegal, unregulated and unreported (IUU) fishing and by-catch. As for agriculture and aquaculture, this work involves collaborations with NGOs, government groups, academic institutions, and/or companies in the wider food sector. There are also numerous Regional Fisheries Management Organizations dealing with the management of stocks in different geographic regions or for particular taxonomic groups e.g. Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), General Fisheries Commission for the Mediterranean (GFCM), etc.

Current biodiversity initiatives by the aquaculture sector focus on developing and promoting sustainable production methods that include biodiversity considerations. A number of specific criteria have been, or are in the process of being, developed for specific aquaculture species, which in many cases are, or will be, linked to certifications schemes. The majority of this work has been through collaborations with NGOs, government groups, academic institutions, and/or companies in the wider food sector (food processors as well as traders and retailers). Non-industry groups have also developed standards and certification schemes.

Principles, guidelines and tools for sustainable fisheries management

A number of internationally agreed laws, protocols and standards have been developed for sustainable management of fish stocks, including the UN Convention on the Law of the Sea (UNCLOS), the UN Fish Stocks Agreement, the Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries, the FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, and four International Plans of Action (IPOAs) aimed at eliminating IUU fishing, eliminating excess marine fishing capacity, and eliminating shark and seabird by-catch. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates 86 fish species to ensure that international trade does not threaten their survival.

The Marine Stewardship Council (MSC) has developed principles and criteria for sustainably managed marine capture fisheries that include biodiversity considerations, and is currently the only global certification scheme for such fisheries. Various labels have also been developed for "dolphin-safe tuna" using differing criteria[82]. The FAO has also produced guidelines for the eco-labelling of fish and fishery products from marine capture fisheries.

Several initiatives aim to raise awareness about sustainable seafood choices within the seafood sector and among consumers

A few industry groups and initiatives work specifically on particular fisheries or issues. For example, the recently formed International Seafood Sustainability Foundation is working on a number of fronts to achieve long-term conservation and sustainable use of tuna stocks, while the European Fish Producers Association developed a voluntary protocol to exclude IUU-caught Barents cod from the supply chain. In addition, the WWF International Smart Gear Competition seeks to reward and promote innovative ideas for fishing gear that reduces bycatch.

Several initiatives aim to raise awareness about sustainable seafood choices within the seafood sector and amongst consumers. These are mostly run by conservation groups; however the Seafood Choices Alliance was founded in partnership with fishing industry representatives.

Principles, guidelines and tools for sustainable aquaculture

Over 24 standards or certification schemes have been or are being developed for aquaculture, including the Global Aquaculture Alliance's Best Aquaculture Practices certification standards, the IFOAM basic standards, and those being developed by the Aquaculture Dialogue roundtables. The latter will be managed by the Aquaculture Stewardship Council.

[82] For a list see http://en.wikipedia.org/wiki/Dolphin_safe_label

Table 8. An overview of key biodiversity initiatives in the fisheries and aquaculture sectors

International and regional frameworks and initiatives	
Convention on International Trade in Endangered Species (CITES) http://www.cites.org/	Aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival, through providing a legal framework to regulate the international trade in species.
CBD Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity http://www.cbd.int/doc/publications/addis-gdl-en.pdf	Fourteen interdependent practical principles, operational guidelines and a few instruments for their implementation that govern the uses of components of biodiversity to ensure the sustainability of such uses.
United Nations Convention on the Law of the Sea (UNCLOS) http://www.unclos.com/	Provides guidelines for businesses in their use of the world's oceans, particularly the high seas that are opening up as a new frontier for genetic research.
United Nations Fish Stocks Agreement http://www.un.org/Depts/los/convention_agreements/convention_overview_fish_stocks.htm	Ensures the long-term conservation and sustainable use of straddling and highly migratory fish stocks.
Code of Conduct for Responsible Fisheries of FAO http://www.fao.org/docrep/005/v9878e/v9878e00.HTM	Global Code of Conduct for Responsible Fisheries which establishes principles and standards applicable to the conservation, management and development of all fisheries. The Code provides a necessary framework for national and international efforts to ensure sustainable exploitation of aquatic living resources in harmony with the environment.
Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas http://www.fao.org/docrep/meeting/003/x3130m/X3130E00.HTM	Improves the regulation of fishing vessels on the high seas by strengthening 'flag-state responsibility'. Parties to the Agreement must ensure that they maintain an authorisation and recording system for high seas fishing vessels and that these vessels do not undermine international conservation and management measures.
FAO - Four International Plans of Action (IPOAs) ftp://ftp.fao.org/docrep/fao/006/x3170e/X3170E00.pdf	Voluntary instruments within the code of conduct of responsible fisheries and focus on capture fisheries, sharks and sea birds.
High Seas Task Force (HSTF) http://www.high-seas.org/	Established in 2003 by a small group of fisheries ministers and international NGOs who decided to work together to develop an action plan designed to combat illegal, unregulated and unreported fishing on the high seas. The work of the Task Force identified nine practical initiatives necessary to expose IUU fishing activities, deter them and improve enforcement against those responsible. The final report of the task force is now available.
Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) http://www.ccamlr.org/	International agreement that was established to sustainably manage Southern Ocean fisheries. It is unique in its "ecosystem-as-a-whole" approach to the management of fisheries because its aim is not only to conserve the targeted species, but also to take into account the impacts of fishing on those animals (seals, whales, penguins and other sea birds, fish, squid, etc.) that depend on the targeted species.
General Fisheries Commission for the Mediterranean (GFCM) http://www.gfcm.org/gfcm	Consisting of 23 Member countries along with the European Union, the GFCM's objectives are to promote the development, conservation, rational management and best utilization of living marine resources, as well as the sustainable development of aquaculture in the Mediterranean, Black Sea and connecting waters.
International Seafood Sustainability Foundation http://www.iss-foundation.org/home	A global partnership between science, the tuna industry and WWF, working toward the science-based conservation and management of tuna stocks and the protection of ocean health.

Table 8. *continued*

Standards, criteria and guidelines	
The Marine Stewardship Council (MSC) http://www.msc.org/	Independent organisation that promotes environmentally responsible stewardship of marine fisheries. It has developed a product label based on an environmental standard for sustainable and well-managed fisheries.
The Aquaculture Stewardship Council (ASC) http://www.ascworldwide.org/	Responsible for working with independent, third party entities to certify farms that are in compliance with the standards.
Seafood Choices Alliance http://www.seafoodchoices.com	Seafood Choices Alliance is an international programme that provides leadership and creates opportunities to promote positive change across the seafood industry and ocean conservation community.
The Global Aquaculture Alliance (GAA) http://www.gaalliance.org/	International, non-profit trade association dedicated to advancing environmentally and socially responsible aquaculture. GAA promotes the Best Aquaculture Practices certification standards for aquaculture seafood. The Best Aquaculture Practices (BAP) standards address environmental and social responsibility, animal welfare, food safety and traceability in a voluntary certification programme for aquaculture facilities.
International Federation of Organic Agriculture Movements (IFOAM) http://www.ifoam.org/	Through its aquaculture group, pursues IFOAM's objectives within the area of aquaculture and captured fisheries.
Aquaculture Dialog roundtables http://www.worldwildlife.org/what/globalmarkets/aquaculture/whatwearedoing.html	WWF works with farmers, retailers, NGOs, scientists and other aquaculture industry stakeholders worldwide to develop standards for responsible aquaculture. The standards will minimize the key environmental and social impacts associated with aquaculture.

Challenges and opportunities

While the impacts of fisheries and aquaculture activities are large and growing, there are many opportunities for this industry to work with biodiversity conservation initiatives to benefit from principles and certification schemes that can provide access to new markets where sustainably sourced products are rewarded. There are however a number of challenges listed below:

- **Increase food demand and sustainability**
  The main biodiversity challenge for the fisheries industry is to meet rising demand for food – and particularly for animal protein while simultaneously conserving biodiversity and managing the natural resources on which the industry depends.
- **Governance in the high seas**
  Particular issues for capture fisheries include governance of fishing effort on the high seas, which lies beyond national jurisdictions. The High seas task force addresses IUU fishing – although currently has few member countries. Regulation and governance have a large role to play to address the issue, an example of initiatives to address this problem was given by the EU, a key global player, which recently brought in new measures on reporting to try to reduce IUU[83].
- **Lack of information on assessments**
  There are difficulties in assessing the status of fisheries in general, in particular by-catch and illegal fishing. Without robust information, setting policies to address these issues become even more challenging.
- **Slow adoption of good practices**
  There has been little progress in mainstreaming the precautionary and ecosystem-based approaches to marine fisheries, eliminating by-catch, or regulating damaging fishing practices such as bottom trawling. One problem is that although modified management systems and alternative technologies and practices that deliver biodiversity benefits do exist, these benefits need to become part of the everyday business model and not secondary considerations for producers.
- **Mainstreaming of certification schemes**
  The cost and process of certification can be burdensome, or even prohibitive, for small-scale

[83] http://ec.europa.eu/fisheries/cfp/external_relations/illegal_fishing_en.htm

fishers and aquaculture producers, especially those in developing countries. Also, only a few of the current certification schemes focus on biodiversity, and there are problems even with those that do, with many certification schemes seen as being ineffective for biodiversity.

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- WWF-US website Aquaculture **http://www.worldwildlife.org/what/globalmarkets/aquaculture/whatwearedoing.html (accessed 11 Oct 2009)**


10

6. Construction

The construction industry covers all facets of building, assembling, repairing and demolishing commercial, industrial, residential, and public buildings and infrastructure. It is one of the world's largest industries, typically providing 5–10% of national employment and generating 5–15% of national GDP[84]. It is also central to social and economic development, providing housing and infrastructure essential for modern lifestyles.

Impacts >>>

- **Climate change** from the extraction of materials, manufacture and use of infrastructure.
- **Habitat loss and degradation** through land conversion for construction of buildings and facilities, as well as for extraction of raw materials.
- **Unsustainable use of water** in extraction, manufacture and use of buildings and facilities.
- **Waste and pollution** from construction and demolition activities.

Dependencies >>>

- **Raw materials** such as timber.
- **Fresh water** for operations.

Opportunities/risks

- **Access to new sites** may be affected by a company's track record on protecting and restoring biodiversity.
- **Restoration of construction sites** for the benefit of biodiversity can lead to a good company reputation among clients and funders.
- **Sustainable design of buildings** and development areas can improve the overall quality of living spaces while also benefiting biodiversity.

The industry includes a number of activities, including land use planning (determining the location and nature of developments), property development (determining what should be built on a site and where), design (determining building specifications, including which materials will be used), the supply of building materials, and contract work (building and demolition). The industry's activities mainly occur in urban areas, and 40% of demand comes from the public sector.

The construction industry is a major user of natural resources, accounting for 50% of total resource use and consuming around 40% of total energy use[85,86]. Apart from energy, major resources and products used by the industry include cement — the second-most consumed substance after water — timber, gravel, sand, iron, and rocks. These are all derived from the mining industry, except for timber and wood products which come from the forestry industry.

The construction industry's growth rate is highly correlated to the economic and population growth rates of a country. The industry boomed in the 2000s, especially in developing countries; the 2008 economic downturn saw housing construction decline in many countries, while infrastructure construction has remained relatively steady.

Relationship with biodiversity

Dependence: Different construction activities and building materials depend on biodiversity and ecosystem services, principally for the production of raw materials such as timber and wood products that rely on a number of ecosystem services for productive growth, as well as freshwater for use in a number of different operations including the mining of construction materials and manufacture processes.

[84] UNEP (2007) Buildings And Climate Change: Status, Challenges and Opportunities - http://www.unep.fr/shared/publications/pdf/DTIx0916xPA-BuildingsClimate.pdf
[85] Economy watch website -http://www.economywatch.com/world-industries/construction/world.html (accessed 6 November 2009)
[86] The Business and Biodiversity Resource Centre website Construction-http://www.businessandbiodiversity.org/construction.html (accessed 6 November 2009)

Impact

- **Climate Change** – The largest impact on biodiversity from the construction industry will come from climate change — the most significant long-term threat to biodiversity. The production of common building materials like concrete, steel and aluminium is energy intensive, and chemical processes in cement production additionally release CO2. Overall, cement production alone accounts for 5% of anthropogenic CO2 emissions[87]. Furthermore, buildings consume approximately 40% of all energy globally, and contribute to around 30% of CO2 emissions from OECD countries[88]. In addition, 60% of total halocarbon emissions come from refrigerators, air conditioners and insulation in buildings[89].
- **Direct impact of construction on natural habitats** - Construction can have a large direct impact on biodiversity through the conversion of natural habitats to urban, industrial and other built environments. In addition to replacing and fragmenting natural habitats, such conversion can also cause hydrological changes. Some construction projects, such as roads and railways, also provide increased access to previously undeveloped and remote areas, which can facilitate small-scale mining, hunting, logging, fishing, and settlement in such areas. The construction of individual tourism facilities can also be significant due to the likelihood of being located in areas of high biodiversity importance, such as protected areas, mangroves, etc.
- **The extraction and production of building materials** – These include cement, metals and timber. Impacts related to mining are described in section 2, while those related to timber sourcing are described in section 7. In addition to contributing to climate change, the production of cement, steel and aluminium can cause air pollution. The use of wood as fuel for brick and tile kilns can also contribute to deforestation[90], including in Indonesia where this poses a significant threat to one of the world's largest and most biodiverse forests[91].
- **Waste production from construction and demolition activities** – For example, in Europe, this generates 40–50% of total waste production by weight[92]. Construction and demolition activities can also cause air, soil and water pollution, as well as noise and light pollution that may negatively affect wildlife feeding and breeding.
- **Impacts through use** - The use of buildings and facilities by society generally can negatively impact biodiversity in a variety of ways. For example, large amounts of water and energy are often consumed in buildings, impacting local water supplies and contributing to climate change.

Biodiversity initiatives

Overview

A number of sustainable construction initiatives, guidelines and tools have been developed by industry, academic and/or government groups, and the concept of sustainable construction is increasingly being recognized by governments and being reflected in government policies through regulatory, economic, fiscal, and capacity-building interventions. Some building projects include specific features to help conserve and enhance local biodiversity, and some developments are using biodiversity offsets to compensate for biodiversity impacts that cannot be mitigated onsite. Most work related to sourcing of sustainable building materials focuses on timber.

Principles for sustainable construction

A number of bodies have provided a general framework for sustainable construction, including The International Council for Research, Innovation in Building and Construction's Agenda 21 on Sustainable Construction, and the European Commission's Agenda for Sustainable Construction in Europe. Following on from this, some construction industry associations have made broad policy statements supporting sustainable construction, including the Architects' Council of Europe, while others have developed principles that include environmental and biodiversity considerations, such as the European Construction Industry Federation's Principles for Sustainability. A few governments have also created sustainable construction policies (e.g. the EU, US, Australia, Japan, Hong Kong, India, China, Thailand, Brazil, and Mexico).

Tools and guidance

A number of industry associations and other groups, including groups specifically working to promote sustainable construction, have developed tools and guidelines for different aspects of sustainable construction. Some of these directly relate to biodiversity, such as the Construction Industry

[87] WBCSD Cement Sustainability Initiative website -http://www.wbcsdcement.org/index.php?option=com_content&task=view&id=40&Itemid=95 (accessed 5 November 2009)

[88] UNEP (2007) Buildings And Climate Change: Status, Challenges and Opportunities -http://www.unep.fr/shared/publications/pdf/DTIx0916xPA-BuildingsClimate.pdf

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Table 9. An overview of key biodiversity initiatives in the construction industry

Initiatives and industry groups	
The International Council for Research and Innovation in Building and Construction http://www.cibworld.nl/site/home/index.html	Objectives are to stimulate and facilitate international cooperation and information exchange between governmental research institutes in the building and construction sector. Provides a general framework and guidance for sustainable construction.
Architects' Council of Europe http://www.ace-cae.org/	Encourage citizens to appreciate architecture as a matter of public interest and as an essential element in the creation of quality in the built environment. They have specific policies related to sustainable construction that include promotion of sustainable design for resource conservation, energy efficiency, and ecologically and socially sensitive land-use.
European Construction Industry Federation http://www.fiec.org	Represents construction enterprises of all sizes via its 34 national Member Federations in 29 countries. Have made recommendations on the role of construction in meeting the challenge of climate change, and have developed principles that include environmental and biodiversity considerations.
Construction Industry Research and Information Association (CIRIA) www.ciria.org	CIRIA is an independent member based not-for-profit association that delivers a programme of business improvement services and research activities for the members and those engaged with the delivery and operation of the built environment. It has developed tools and guidelines for different aspects of sustainable construction.
UK Green Building Council http://www.ukgbc.org/	Their mission is to improve the sustainability of the built environment, by transforming the way it is planned, designed, constructed, maintained and operated. They have produced sector specific biodiversity guidance.
Associated General Contractors of America (AGC) http://www.agc.org/	A construction industry association operating in partnership with its nationwide network. It provides a range of services in order to improve the quality of construction and protecting the public interest. It has produced a toolkit for recycling materials.
European Cement Association (CEMBUREAU) http://www.cembureau.be/	The Association acts as spokesperson for the cement industry before the European Union institutions and other public authorities, and communicates the industry's views on all issues and policy developments with regard to technical, environmental, energy and promotional issues. It has produced and provides access to a number of publications related to the environment, including climate change adaptation, alternative fuels etc.
World Business Council for Sustainable Development (WBCSD) http://www.wbcsd.org/	The Council provides a platform for companies to explore sustainable development, share knowledge, experiences and best practices, and to advocate business positions on these issues in a variety of fora, working with governments, non-governmental and intergovernmental organizations.
Cement Sustainability Initiative (CSI) http://www.wbcsdcement.org/	CSI is a global effort by 23 major cement producers with operations in more than 100 countries who believe there is a strong business case for the pursuit of sustainable development. They have produced guidelines for social and environmental impact assessment, and an agenda for action that addresses climate change and local impacts, among others.
European Alliance of Companies for Energy Efficiency in Buildings (EuroACE) http://www.euroace.org	Their mission is to work together with the European institutions to help Europe move towards a more sustainable pattern of energy use in buildings, thereby contributing to the EU's commitments on carbon emission reductions.
European Commission BUILD UP initiative	This initiative supports EU Member States in implementing the Enery Performance of Buildings Directive (EPBD). It provides information on best practices, technologies and legislation for energy reduction.
United Nations Environment Programme Sustainable Buildings and Climate Initiative (UNEP-SBCI) http://www.unep.org/	Together with key stakeholders in this sector, UNEP-SBCI works to promote sustainable building practices worldwide. They have produced a number of publications that mostly relate to greenhouse gas emissions and climate change.

Table 9. *continued*

Standards and certification schemes	
The Sustainable Building Alliance http://www.sballiance.org/	A coalition of standard setting organisations, national building research centres and construction sector stakeholders that aims to accelerate the international adoption of sustainable building practices. They are producing a common metrics framework, and promoting environmental assessment and certification of buildings. Provide tools and research to aid this process.
LEED http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988	Developed by the U.S. Green Building Council (USGBC), this is an international green building certification system, based on criteria that relate to energy efficiency, water conservation, sustainable use of resources, and sensitivity to impacts.
BRE Environmental Assessment Method (BREEAM) http://www.breeam.org/page.jsp?id=31	An environmental assessment method for buildings in the UK, based on best practice in sustainable design. It enables developers and designers to prove the environmental credential of their buildings to planners and clients.
High Environmental Quality (HQE) http://www.assohqe.org/	Green standards for refurbishment and new buildings in France. It focuses on reducing consumption of natural resources and discharge of pollutants, as well as on enhancing the comfort and the health conditions of buildings. It is concerned with the design and the construction of both refurbishment and new building projects.

Research and Information Association (CIRIA) Biodiversity Indicators for Construction Projects, CIRIA Training Manual on Working with Wildlife, and the UK Green Building Council's Sector-Specific Biodiversity Guidance for developers, owners, landlords, contractors and consultants. Tools and initiatives promoting the sourcing of sustainably produced timber are also directly related to biodiversity; examples of these are given in section 7.

Most sustainable construction tools and initiatives, however, are more indirectly related to biodiversity, through for example promoting energy efficiency and/or measures to reduce waste, pollution and/or natural resource use. Examples of such tools and initiatives include the Associated General Contractors of America Contractor Toolkit for Recycling and Using Recycled Industrial Materials, various publications by the European Cement Association (CEMBUREAU) and the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative on sustainable cement production, the Procura+ Guidelines for Sustainable Construction, the European Alliance of Companies for Energy Efficiency in Buildings (EuroACE), the European Commission's BUILD UP initiative, and the UNEP Sustainable Buildings and Climate Initiative.

Certification

Several standard and certification schemes have been created for sustainable buildings, such as LEED, BREEAM and HQE. These cover the entire lifecycle of a building and include general environmental indicators. Although work is currently underway to develop a pan-European building environmental assessment method, most standards operate at the national level and do not facilitate international environmental commitments. In 2008 the Sustainable Building Alliance was set up that now involves a number of European and world-wide partners with the aim of converging methods of evaluating the environmental quality of buildings to create an international standard.

Company initiatives

Some individual companies associated with the construction industry are also working towards more sustainable construction in partnership with environmental organisations. Holcim, for example, has created a foundation to support sustainable construction projects and through its partnership with IUCN, has made firm commitments to develop a biodiversity policy to integrate biodiversity conservation considerations during all the steps in a quarry's life cycle.

Cement producer Lafarge, through its partnership with WWF, has made ambitious commitments to reduce its CO_2 emissions in industrialized countries by 10% compared to 1990 and to reduce its CO_2 emissions per tonne of cement produced by 20% compared to 1990. They have also made commitments towards biodiversity and have a rehabilitation plan for 85% of their quarries, and at some sites have created wildlife habitat for the benefit of biodiversity[93].

Onsite conservation efforts

Various construction projects have included specific features to help conserve and enhance local biodiversity within and around buildings. These include green roofs and walls on buildings, planting of native vegetation and/or rehabilitation of wetland and other habitats on building sites, construction of

[93] LAFARGE – Onsite wildlife and biodiversity. Case Study 2008. World Business Council for Sustainable Development http://www.wbcsd.org/DocRoot/4w72Q4EIEwRTJXY10arR/USBCSDWHCLafargefullcasefinal.pdf

tunnels and overpasses to allow wildlife to cross roads, and roosting ledges and crevices for birds on buildings.

Biodiversity offsetting

In addition to energy and mining developments, some other construction projects are voluntarily participating in biodiversity offsets. For example, one pilot offset project run by the Business and Biodiversity Offset Programme (BBOP) involves a public infrastructure project and a residential project.

Challenges and opportunities

While the impacts of construction activities can be large, there are many opportunities for this industry to work with biodiversity conservation to improve green living spaces and restore habitats for wild species, as many companies are starting to do. Sustainable design is a growing trend that is largely led by the need to conserve energy and reduce greenhouse gas emissions in line with national and international commitments, but it also benefits biodiversity in many ways, allowing companies that adopt these practices to benefit from the reputational advantages of doing so. There are however challenges in the wide-scale adoption of such practices:

- Rising populations and ever increasing demands for buildings and facilities creates challenges in ensuring that new and renovated buildings and infrastructure are sustainable, in terms of building materials, construction activities, and the environmental performance of buildings and built areas. Most efforts have been focused on energy efficiency in existing and new buildings, which shows the greatest short-term potential for reducing CO_2 emissions to prevent dangerous climate change.
- One challenge to construction activities routinely being carried out in a sustainable manner is that existing initiatives usually have a narrow focus and most do not directly include biodiversity considerations. There is therefore a need to develop the range of tools and guidance for further inclusion of biodiversity considerations.
- Most initiatives and government policies for sustainable construction to date are in developed countries, and there is a need to expand the geographical reach of this expertise to developing countries where most construction activity of new buildings is currently occurring.
- A lack of knowledge and understanding within the construction industry of the local impacts of development on biodiversity, how to minimize these impacts, and how to enhance biodiversity in built environments can be an obstacle to further success in this area. This is a prerequisite to wide-scale adoption of policies, and further investment in research and sustainable design, that is needed to reduce the costs currently associated with these practices.
- The effectiveness of lifecycle approaches for choosing building materials is currently impeded by limited coordination between actors involved in different stages of a building's life span and a lack of technical expertise required to apply tools for calculating the environmental impact of construction materials and buildings.
- There is an overall lack of certification associated with building materials, with the exception of timber and wood products that while in existence are not widely available outside North America and Europe. Environmental Product Declarations, such as those currently under development in the EU, should facilitate comparison of the environmental impact of different materials.

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- UNEP (2006) Class of 2006: Industry Report Cards on Environment and Social Responsibility **http://www.uneptie.org/shared/publications/pdf/DTIx0827xPA-Class2006.pdf**
- WBCSD Cement Sustainability Initiative website **http://www.wbcsdcement.org/index.php?option=com_content&task=view&id=40&Itemid=95 (accessed 5 November 2009)**

7. Forestry and timber procurement

Forests are managed for a variety of timber and non-timber products, as well as for watershed management, conservation, recreation purposes, carbon sequestration, and the provision of other important ecosystem services. The primary focus of the commercial forestry industry is on maximizing timber yield for the production of wood products. Thus forestry can be viewed as an extractive industry, but one which, given careful management can support regeneration and renewal of the resource for long-term use.

Impacts >>>

- **Over-harvesting** of wild species.
- **Habitat change and degradation** from extraction or cultivation of important species.
- **Invasive species** from plantations.
- **Water abstraction** for plantation cultivation.

Dependencies >>>

- **Water supply, Nutrient recycling, climate.**
- **Pest resistance, Pollinators.**
- **Variety of tree species.**

Opportunities/risks

- Illegal logging may undercut legitimate business.
- Plantation monocultures reduce biodiversity and are predisposed to disease risks.
- Opportunities for payments for carbon sequestration through regeneration and for REDD+.
- Adoption of certified sustainable practices provides market opportunities.

Around half of global wood production comes from natural forests with the remainder coming from planted forests, including semi-natural forests and plantations[94]. Extraction of wood products from natural forests can be conducted under licence or concession on state lands or through ownership of private lands, held by either large public concerns, or smaller individual holdings.

The main use of timber and wood products is for building materials, particularly for housing; these products include sawn planks as well as engineered products such as glued laminated timber (glulam), laminated veneer lumber (LVL), medium-density fibreboard (MDF), and plywood. In developed countries, wood for construction products primarily comes from temperate and boreal forests; however some wood construction products are made from tropical timber. Other uses of timber and wood products include paper, furniture, and large-scale bio-energy production. The world's principle timber producing countries are the US, Russia, Canada, Japan, Sweden, Germany, Poland, France, Finland, and Brazil, while major timber importers include the US, Japan, Germany, the UK and China[95,96].

Deforestation in temperate lands has declined and forests are regenerating in many areas. In contrast, deforestation continues in the tropics, although the growth of plantations is increasing these areas.

[94] FAO (2007) State of the World's Forests 2007 -http://www.fao.org/docrep/009/a0773e/a0773e00.HTM

[95] UN Economic Commission for Europe/FAO (2009) Forest Products Annual Market Review 2008-2009 http://timber.unece.org/fileadmin/DAM/publications/Final_FPAMR2009.pdf

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Relationship with biodiversity

Dependence:

The forestry industry depends on a variety of ecosystem services for the growth of timber, including freshwater supply, climate regulation, soil nutrient cycling, pollination and pest reduction. Sustainable forest management depends on a stable climate and contributes to its maintenance, through sequestration of carbon in the growing trees. Not only do forests act as carbon sinks, but the main industrial output of the forestry industry — timber — is renewable if sourced sustainably.

Impact

- **Over-harvesting of wild species** If extraction rates laid out in forest management plans and concession requirements are exceeded, then overharvesting of wild species can occur. Unsustainable commercial logging activities can be a significant contributor to forest and biodiversity loss around the world. In South and Southeast Asia and the Pacific, for example, unsustainable commercial wood extraction accounts for 25% of deforestation[97]. Such activities are often driven by illegal logging, which is more prevalent in parts of Asia, Russia, Central and Eastern Europe, and Central Africa. Indonesia is particularly affected, having one of the highest estimated ratios of illegal to legal roundwood production[98,99]. Aspects of illegal logging that are of particular concern include harvesting without authority in protected areas, harvesting without or in excess of concession permit limits, failing to report harvesting activity, and violating international trade agreements such as the Convention on International Trade in Endangered Species (CITES). Such activities have been estimated to represent some 5–10% of global industrial roundwood production[100].
- **Habitat change and degradation from timber extraction** In many areas, particularly those that are sensitive to disturbance, specialised timber extraction techniques are required to minimise vegetation destruction, soil compaction and even erosion and soil run-off into local water sources. If such techniques are not used, then damage to the environment may also affect tree regeneration and growth, and potentially impact the future profitability of the forestry business as well as the environment. Overharvest of trees with particular morphological characteristics, such as straight boles can also lead to concerns about loss of genetic resources[101]. The construction of logging roads (both legal and illegal) can also facilitate indirect impacts on the environment such as small-scale mining, hunting, illegal logging, fishing, and settlement within previously untouched forests, resulting in additional biodiversity loss.
- **Habitat degradation associated with cultivation** Tree plantations, if poorly planned and managed for timber and wood products can cause problems through increased water abstraction, especially for fast growing species such as eucalyptus species planted in non-native areas. Other negative impacts on the environment may be similar to those associated with agriculture (see section 4).
- **Supply chain impacts** Further processing of timber products associated with the forestry industry, especially the pulp and paper sector, can be associated with discharge of chemical pollutants[102].
- **Life cycle Impacts** Overall, production processes in the forestry industry make a relatively small contribution to climate change, being responsible for about 1.6% of global CO_2 emissions[103]. In addition, compared to other common building materials like cement, steel, and aluminium, wood-based building materials require less energy for production and thus have a lower life cycle impacts than many other building materials. They also have higher thermal efficiency, and can be reused, recycled, or used as biomass for energy. Wood-based biomass is often used as a fuel which, if sourced from a sustainably managed forest and not transported far, is carbon neutral/near carbon neutral.

Frameworks, principles, guidelines and standards for sustainable forestry

Many groups are working on promoting and implementing sustainable forestry practices. Examples of internationally agreed criteria and guidelines that include biodiversity considerations are listed in Table 10. FAO and ITTO are the major inter-governmental organisations involved in provision of advice and codes of practice, although a few timber tree species threatened by unsustainable harvesting are also listed on the CITES appendices.

International certification schemes for sustainable forest management and/or sustainably produced timber and wood products, include the Forest Stewardship Council (FSC), the Program for the Endorsement of Forest Certification (PEFC). PEFC is also represented at the national level as for example in the Malaysian Timber Certification Council. Other National examples include the Indonesian Ecolabelling Institute (LEI) and Canada's

[97] Global Canopy Foundation (2009) Global Forest Footprints: How businesses around the world contribute to deforestation – the risks of inaction and the opportunity for change - http://forestdisclosure.com/docs/FFD-Global-Forest-Footprints-Report.pdf

[98] Global Forest Watch website - http://www.globalforestwatch.org/english/indonesia/forests.htm (accessed 2 November 2009)

[99] UNEP/GRID-Arendal (2008) Trade in illegal wood products and corruption-http://maps.grida.no/go/graphic/trade-in-illegal-wood-products-and-corruption

[100] Seneca Creek Associates/ Wood Resources International (2004) Illegal Logging and Global Wood Markets: The Competitive Impacts on the U.S. Wood Products Industry -http://www.illegal-logging.info/uploads/afandpa.pdf

[101] See Kometter, R. F., M. Martinez, A. G. Blundell, R. E. Gullison, M. K. Steininger, and R. E. Rice. 2004. Impacts of unsustainable mahogany logging in Bolivia and Peru. Ecology and Society 9(1): 12. [online] URL: http://www.ecologyandsociety.org/vol9/iss1/art12/

[102] (see Dahlgren, Warshaw, R., Horsak, R.D. Parker III, F.M.d and Takhar, H. 2003. Exposure assessment of residents living near a wood treatment plant. Environmental Research, 92, 99-109)

[103] WBCSD (2007) The Sustainable Forest Products Industry, Carbon and Climate Change: Key Messages for Policy-Makers http://www.wbcsd.org/DocRoot/oNvUNPZMuugn75jrL8KS/sfpi-carbon-climate.pdf

Table 10. An overview of international and regional biodiversity frameworks in the forestry sector

International frameworks and guidance	
UN Forum on Forests (UNFF) www.un.org/esa/forests/	Established in 2000, the UNFF exists to facilitate forest governance, and sustainable management by fostering international co-operation. The body meets biennially.
Food and Agriculture Organisation (FAO). 1998. Guidelines for the management of tropical forests www.fao.org/docrep/w8212e/w8212e00.htm	These voluntary guidelines focus mainly on the criterion of maintaining the productive functions of the forest, and more specifically on the production of wood and non-wood products, provide practical advice on how to plan and manage tropical forests for the sustainable production of wood in practice at an operational level.
FAO. 1996. Model code of forest harvesting practice www.fao.org/docrep/v6530e/v6530e00.HTM	The FAO model code of forest harvesting practice is intended primarily to promote harvesting practices that will improve standards of utilization, reduce environmental impacts, help ensure that forests are sustained for future generations and improve the economic and social contributions of forestry as a component of sustainable development.
FAO and International Union of Forest Research Organisations (IUFRO) 1996. Forest codes of practice: Contributing to environmentally sound forest operations www.fao.org/docrep/w3646e/w3646e00.HTM	These voluntary codes of forest practice provide sets of regulations and guidelines in forest operations and engineering, and are designed to help foresters in government agencies and forest enterprises select practices to be followed in carrying out forest management and utilisation operations.
FAO and partners. 2007. Responsible management of planted forests www.fao.org/docrep/009/j9256e/j9256e00.htm	These guidelines apply to planted forests grown to fulfil productive functions for provision of wood, fibre and non-wood forest products or protective functions for provision of environmental and/or social services. They cover policy development and planning, technical considerations of plantation management and supply chain links to marketing, industry and trade. The guidelines are non-legally binding but link international, national and local enabling environments.
International Tropical Timber Organization (ITTO). Revised Criteria and Indicators on the Sustainable Management of Tropical Forests www.itto.int/	ITTO, established in 1986, is an intergovernmental organization promoting the conservation and sustainable management, use and trade of tropical forest resources. Its members represent about 80% of the world's tropical forests and 90% of the global tropical timber trade.
Convention on International Trade in Endangered Species (CITES) www.cites.org/	Aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival, through providing a legal framework to regulate the international trade in species. Several timber species listed in the Appendices.
Regional Frameworks	
EU Forest Law Enforcement Governance and Trade (FLEGT) http://ec.europa.eu/environment/forests/flegt.htm	In 2003, the European Commission adopted a European Union (EU) Action Plan for Forest Law Enforcement Governance and Trade (FLEGT). The plan involves a voluntary scheme to ensure that only legally harvested timber is imported into the EU from countries agreeing to take part in this scheme through Voluntary Partnership Agreements.

Environmental Choice Program for green products. The WWF/World Bank Alliance Global Forest Alliance has published a Forest Certification Assessment Guide, as well as an Assessment of Certification Schemes Operating in Indonesia. Other schemes indicate that products have been developed through recycling processes and/or sustainably managed forests – these include the EU flower logo and the German Blue Angel.

Commitments, guidelines, and tools for procurement of sustainable wood products

A number of governments have developed public procurement policies that include environmental considerations. Legislation is also being developed that requires imported wood to be legally sourced in an effort to support enforcement of legislation in producer countries. Examples include the US Lacey Act and the EU Forest Law Enforcement Governance and Trade (FLEGT) due diligence proposal currently under development to address imports from countries that do not sign the Voluntary Participation Agreements (VPA).

Legal and sustainable sourcing practices are also supported by various industry groups so as to work towards eliminating illegal logging. These include the UK Timber Trade Federation and the Confederation of European Paper Industries.

Table 11. An overview of key biodiversity initiatives in the forestry sector

Standards, criteria and guidelines	
Forest Stewardship Council (FSC) www.fsc.org/	FSC, founded in 1993, is an international non-government organisation dedicated to promoting sustainable forest management through voluntary certification.
Sustainable Forestry initiative (SFI) www.sfiprogram.org/	SFI was founded in 1994 as the US forest sectors' response to the need to develop sustainable forestry.
Programme for the Endorsement of Forest Certification schemes (PEFC) www.pefc.org/	PEFC founded in 1999 is an independent, non-profit, non-governmental organisation, which promotes sustainably managed forests through independent third party certification. PEFC is a global umbrella organisation for the endorsement of national schemes. About 8% of the world's forests are certified, of which two-thirds are certified to PEFC.
EU Ecolabel http://ec.europa.eu/environment/ecolabel/index_en.htm	Voluntary scheme, established in 1992 to encourage businesses to market products and services that are kinder to the environment. Products and services awarded the Ecolabel carry the flower logo, allowing consumers - including public and private purchasers - to identify them easily. Today the EU Ecolabel covers a wide range of products and services, with further groups being continuously added. The EU flower logo signifies indirect reduction of potential impacts on biodiversity through recycling and sustainable environmental manufacturing.
Blue Angel (Germany) http://www.blauer-engel.de/en/	The Blue angel logo in Germany signifies indirect reduction of potential impacts on biodiversity through recycling and sustainable environmental manufacturing.
Industry Groups and initiatives	
UK Timber Trade Federation (UK TTF) www.ttf.co.uk/	Some 3% of UK imports are from tropical forests, the remainder from temperate regions. The UK TTF is committed to sourcing their timber from legal and sustainable sources. Over 60% of UK wood is reportedly certified, with the remainder mostly from legal sources. Wood can be risk assessed for legality through due diligence systems such as the organisations' responsible purchasing policy.
Confederation of European Paper Industries www.cepi.org	Non-profit organisation with members from the European pulp and paper industry and championing this industry's achievements and the benefits of its products.
The Forests Dialogue http://environment.yale.edu/tfd/	Ad hoc initiative that seeks to support and reinforce existing efforts related to forest management, addressing significant obstacles through a constructive dialogue process among all key stakeholders. Key topics include climate change and biodiversity conservation.
World Business Council on Sustainable Development Council (WBCSD) – Forest Products Focus group http://www.wbcsd.org/	A number of publications and tools to support sustainable forest management, procurement and financing.

A growing number of companies across all industries have also committed to sourcing sustainably harvested wood products. Some conservation groups are also working to facilitate trade links between companies committed to responsible forestry, such as WWF's Global Forest and Trade Network (GFTN).

To further aid responsible procurement, over 30 guides and tools have been published by industry groups and others. Those relating to timber include the Timber Trade Federation's due diligence tool for sourcing uncertified timber[104], the Timber Trade Action Plan's tool to assess the risk of illegal wood entering a supply chain[105], and guides to responsible sourcing of wood products by WWF and WRI/WBCSD. For the construction industry, the Procura+ Guidelines for Sustainable Construction provide guidance on sourcing sustainable building materials.

[104] Timber Trade Federation Responsible Purchasing Policy
[105] Timber Trade Action Plan Risk Assessment Tool for Buyers

Challenges and opportunities

There is a growing awareness of the issues associated with sustainable forest management and wood procurement, and this is creating opportunities to market sustainable and biodiversity-friendly production practices. While this holds promise, challenges remain throughout the supply chain for effective and wide-scale uptake. These challenges include lack of awareness amongst companies and individuals on sustainable harvesting techniques and the need to improve the efficiency of timber processing in many regions. Other challenges are:

- **Mainstreaming sustainable forest management** This is the major challenge to ensure that demand for timber and non-timber products is met while simultaneously conserving biodiversity, preventing further forest loss, and safeguarding the ecosystem services provided by forests — not least climate regulation. The initiatives and legislation described above have led to significant progress towards sustainable forest management, particularly in developed countries and those with temperate climates. However, many developing countries and tropical regions continue to lose forest area, in part due to unsustainable wood extraction.

- **Climate change** In addition to directly impacting on yields through changes in weather patterns and disease, increasing concern regarding climate change is leading to an increased focus on the role that land use change plays in climate change. As a result we may see land values shift as the cost of greenhouse gas emissions released from land conversion is factored into the value of the land. The recent commitment to reduction of emissions from deforestation and degradation within the post Kyoto framework will encourage this trend.

- **Failure of the markets to reward sustainable forest products** Only 10% of the world's forests are currently certified as being sustainably managed, with 96% of these being located in North America and Europe. The cost and process of certification can be burdensome, or even prohibitive, for small-scale producers, especially those in developing countries. Certification is increasingly becoming a barrier to market entry and premiums are rarely paid on certified products making it challenging to cover the costs of implementation of sustainability programmes.

- **Lack of local biodiversity expertise or willingness to engage** Companies with biodiversity commitments trying to find local partners with biodiversity expertise to assist their work or work of local suppliers, often find it challenging to find local organizations with biodiversity expertise in parts of the world. Another issue is that organizations with biodiversity expertise are not always willing to work with businesses.

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- UK Green Building Council website Habitats **http://www.ukgbc.org/site/info-centre/display-category?id=115**
- UN Economic Commission for Europe/FAO (2009) Forest Products Annual Market Review 2008-2009 **http://timber.unece.org/fileadmin/DAM/publications/Final_FPAMR2009.pdf**
- UNEP (2006) Class of 2006: Industry Report Cards on Environment and Social Responsibility **http://www.uneptie.org/shared/publications/pdf/DTIx0827xPA-Class2006.pdf**
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- WRI/WBCSD Guide to Sustainable Procurement of Wood and Paper-Based Products **http://www.sustainableforestprods.org/files/forestguide/Intro_Procurement_guide_v1.1_final.pdf (accessed 8 March 2010)**
- WWF. 2006. Guide to Responsible Purchasing of Forest Products **http://assets.wwf.org.uk/downloads/responsible_purchasing.pdf (accessed 8March 2010)**
- WWF. 2010. Global Forest & Trade Network Newsletter January 2010 **http://assets.panda.org/downloads/january2010_gftn_newsletter_low.pdf (accessed 8 March 2010)**

8. Tourism

Based on its contribution to global gross domestic product, the number of people it employs, and the number of clients it serves, tourism has been described as the world's largest industry. In 2008 these figures were 9.5% of global GDP, over 200 million jobs – one in 13 of all jobs worldwide – 924 million international travellers in 2008[106], and perhaps 10 times the number of domestic travellers[107].

The industry forms one of the top five export earners in 150 countries, and is particularly important for developing countries. For the world's 40 poorest countries, tourism is second to oil as a source of foreign exchange[108].

Impacts

- **Tourism facilities** and infrastructure can threaten natural and important habitats.
- **Excessive use of natural resources,** such as fresh water, energy and food can threaten supplies and lead to pollution through waste.
- **Tourist behaviour** can threaten species and ecosystems (introduction of invasive alien species, harvesting of wild species for souvenirs).
- **Climate change** the industry is responsible for 5% Green House Gas Emissions.

Dependencies

- Direct dependence on natural habitat & the health of the local biodiversity (beaches, coral reefs, mountains & animal watching).
- Dependence on natural resources (water, food, energy, etc.).

>>>

Opportunities/risks

- The rise in demand for nature-based and eco-tourism creates business opportunities that can be tied with wildlife conservation.
- Consumer awareness of ethical and environmental issues creates markets for responsible tourism.
- Environmental impacts can limit access to capital insurance and incur legal risks.
- Brand and reputation are strongly influenced by a company's environmental performance.
- Decline in the aesthetic value of nature will lead to a loss of promotional aspects and attractiveness of specific destinations.
- Decline in the availability of local resources can increase operational costs due to reduced supplies and increased regulation on use, necessitating the need to import goods and raw materials.

The industry is highly diverse, comprising transport providers, accommodation providers, tour operators, caterers, leisure activities, and entertainment. While it is dominated by small and medium-sized enterprises (SMEs) — which account for an estimated 80% of all tourism and travel activities[109] — a few large multinational companies have a significant amount of control over the industry. For example, just five companies control over 60% of organized outbound travel from Europe.

Over 50% of international tourism occurs in Europe, with the Mediterranean being the most visited area in the world — accounting for 30% of international arrivals and 25% of receipts from international tourism. Asia-Pacific is the next most popular destination, accounting for 20% of international tourism, followed by North and South America (15%) and Africa and the Middle East (5%)[110]. While most international tourism arrivals are to developed countries, developing countries are rapidly increasing

[106] UN World Tourism Organization (2009) World Tourism Barometer Vol 7 No 1 January 2009
[107] Costas, C, Hillel O, Matus, S, Sweeting, J. (2003) Tourism and Biodiversity: Mapping Tourism's Global Footprint Conservation International http://www.unep.org/PDF/Tourism-and-biodiversity.pdf
[108] Bishop, J., Kapila, S., Hicks, F., Mitchell, P. and Vorhies, F. (2008) Building Biodiversity Business Shell International and IUCN http://data.iucn.org/dbtw-wpd/edocs/2008-002.pdf
[109] World Travel and Tourism Council (2009) Leading the Challenge on Climate Change – http://www.wttc.org/bin/pdf/original_pdf_file/climate_change_final.pdf
[110] Conrady, R. and Buck, M. (Eds) (2008) Trends and issues in global tourism 2008 Springer

their share of the market with international arrivals growing by 9.5% per year on average since 1990 in such countries, compared to 4.6% worldwide[111].

Several countries in Southeast Asia have seen particularly rapid tourism growth[112]: for example, the number of international arrivals in Laos, Myanmar, and Vietnam grew by 2,000%, 890% and 756%, respectively, between 1990 and 2000. In Indonesia, the number grew by 133% over the same time frame, from 2.1 million to over 5 million people. In several places around the world, the number of tourists greatly exceeds the number of local residents.

Nature-based tourism — in which attractions and settings rely on natural environments — has been one of the fastest-growing industry sectors over the past ten years and now forms a major component of export income in countries including Australia, Botswana, Costa Rica, Kenya, Nepal, New Zealand and Tanzania[113]. Ecotourism —a subsector of nature-based tourism defined as "responsible travel to natural areas that conserves the environment and improves the well-being of local people"[114] — represents around 7% of the global tourism market[115]. In terms of habitats, the main nature-based tourism market segment is beach tourism, with mountains and, increasingly, Polar Regions being other popular destinations. Many major and emerging tourism destinations are also biodiversity hotspots, including in Indonesia.

A growing number of companies have committed to sourcing sustainably harvested wood products

The number of international travellers has been forecast to reach over 1.5 billion globally by 2020[116]. Forecasts also suggest that tourism will become increasingly important in developing countries hosting biodiversity hotspots, particularly those in Southeast Asia.

Relationship with biodiversity

Dependence: Much of tourism is directly dependent on natural attractions such as beaches, coral reefs, mountain habitats, and animal watching — and so is directly dependent on the health of the biodiversity and ecosystems supporting these attractions. Tourism operations are also dependent on a range of ecosystem services including freshwater supply, climate regulation, disease control, and the production of food and materials.

Impact: If properly managed and planned, tourism has the potential to have a positive impact on the environment. For example, individual operators can help provide or manage funds for biodiversity conservation based on tourism activities, and the economic benefits from nature-based tourism can provide incentives for local people and governments to protect biodiversity. However, this potential is often not realised, even by ecotourism ventures.

When poorly planned and managed, tourism developments and activities — even those marketed as ecotourism and responsible tourism — can pose a great threat to species, habitats and ecosystems. This is particularly the case in fragile areas such as coastal zones, mountains, Polar Regions, protected areas and biodiversity hotspots, where a lot of tourism tends to occur.

- The construction of tourism facilities and related infrastructure — such as hotels, airports, roads, golf courses, water and sanitation utilities, marinas, and shopping centres — can directly disrupt and destroy natural habitats, both for the land required for such infrastructure and through the harvesting of building materials from, for example, forests and coral reefs. Tourist developments can also lead to secondary urban development, such as housing for employees and secondary tourist homes.
- Daily operations also impact on biodiversity and ecosystems. For example, water consumption and wastewater discharge by tourists is often many times higher than that of local residents, and can result in water shortages as well as pollution and degradation of freshwater and coastal habitats. Similarly, energy use by and generation of food for tourists can result in local resource depletion. An associated impact is that tourism developments often attract large numbers of people seeking employment, who in turn add pressure on local resources and services.
- The activities of tourists and tour operators pose an additional threat. Coral reefs can be damaged by divers, snorkelers, jet skiers, and boat operators; fragile terrestrial habitats can be trampled by hikers and sightseers; and wildlife viewing can stress animals. Littering can also be a problem, especially in remote areas where waste collection can be logistically difficult. Furthermore, the introduction of alien invasive species and the harvesting of wild species for souvenirs are contributing factors in population declines of several species.
- The tourism industry also contributes to climate change — the greatest long-term threat to biodiversity. Tourism is responsible for around 5% of anthropogenic greenhouse gas emissions[117], mainly from transport and particularly from aviation. Emissions from accommodation are also significant.

[111] Costas, C, Hillel O, Matus, S, Sweeting, J. (2003) Tourism and Biodiversity: Mapping Tourism's Global Footprint Conservation International http://www.unep.org/PDF/Tourism-and-biodiversity.pdf

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[113] Emerton, L., Bishop,J. and Thomas, L. Sustainable Financing of Protected Areas: A Global Review of Challenges and Options IUCN http://www.conservationfinance.org/Documents/CF_related_papers/sustainable-financing-23feb.pdf

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Biodiversity initiatives

Industry initiatives concerning biodiversity fall into two main types: 1) those that work to reduce the impact of tourism by developing principles, good practice guidelines and other tools for sustainable tourism, including certification schemes; and 2) those that provide direct or indirect support for biodiversity conservation. Both types of initiative are often carried out in partnership with conservation groups and/or governments.

International frameworks and guidance

A number of international statements and codes have been developed that provide a general framework for ecotourism that includes biodiversity considerations. A number of good practice guidelines and tools for sustainable tourism have also been developed. Some focus on particular ecosystems and habitats, such as the CBD's international guidelines for sustainable tourism in vulnerable ecosystems[118] and related web-based Biodiversity and Tourism Network, the guidelines prepared by Tour Operator Initiatives (TOI) in partnership with others for tourism in deserts[119], mountains[120], marine areas[121], and various guidelines for tourism in Polar Regions[122]. Others focus on specific activities, particularly by hotels and tour operators. These are listed in Table 12. Some work has been done to address greenhouse gas emissions. For example, the World Tourism and Travel Council has set aspirational targets to reduce CO_2 emissions from the tourism industry, as well as a general policy for achieving this[123]. In addition, many of the tools mentioned above include guidance on reducing energy use, and individual companies have taken measures such as carbon offsetting and increased use of renewable energy.

Standards and certification

The Global Partnership for Sustainable Tourism Criteria has developed specific criteria for sustainable tourism that include several biodiversity considerations, including biodiversity conservation, interactions with wildlife, and the use of species harvested from the wild. They have now merged with the Sustainable Tourism Stewardship Council to form the Tourism Sustainability Council in order to standardise principles and criteria for responsible tourism. A number of certification schemes have also been developed, mostly for accommodation providers, facilities and tourist destinations. These mainly focus on onsite environmental management, although some also require companies to contribute to conservation efforts. International certification schemes include Green Globe, while national schemes include the UK's Green Tourism Business Scheme, the Audubon Green Leaf™ Eco-Rating Program in the US and Canada, Australia's ECO Certification scheme, and the Costa Rica Certificate for Sustainable Tourism program. More recently, the Sustainable Tourism Stewardship Council (mentioned above) has been working on a global accreditation program for sustainable tourism certification based on the GSTC criteria mentioned above.

Company initiatives to support biodiversity conservation

Various tourism companies around the world are directly supporting conservation in different ways. One is through providing and/or managing funds for conservation. One popular mechanism for generating such funds is through user permits, hotel taxes and other fees collected from tourists, with the money being used to finance protected areas. While most such schemes are operated by governments and park authorities, some also involve the private sector. In Indonesia, for example, divers are charged a fee for diving within Bunaken National Park, one of the country's premier tourist destinations. The Bunaken National Park Management Advisory Board (BNPMAB) — comprising dive operators, environmental organizations, academics, government officials, and community members living within Bunaken National Park — manages these funds, with the money used to fund park management and conservation activities.

Alternatively, some operations pay a concession to park authorities to manage tourism activities within protected areas. For example, one Swiss tour operator, Hotelplan, has established an ecofund, in which a small percentage of booking fees are used to support sustainable tourism projects and environmental efforts by partners at Hotelplan destinations. In some cases, tourist operators and hotels enter into community financing arrangements, where they provide direct payments or other benefits to local communities. Another example is Wild Jordan that works with communities in and around protected areas, supporting local markets for handicraft enterprises to reduce local impacts on the natural resources and allow such communities to gain some of the benefits that protected areas and tourism can jointly bring. Such schemes can help change local perceptions of and improve outcomes for wildlife. There are also examples of tourism companies voluntarily performing conservation activities on behalf of park authorities. The International Ecotourism Society for example, promotes holidays in which tourists can take part in conservation activities.

[118] CBD Guidelines on Biodiversity and Tourism Development
[119] Tourism and Deserts: A Practical Guide to Managing the Social and Environmental Impacts in the Desert Recreation Sector
[120] Tourism and Mountains: A Practical Guide to Managing the Environmental and Social Impacts of Mountain Tours
[121] A Practical Guide to Good Practice: Managing Environmental Impacts in the Marine Recreation Sector
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[123] World Travel and Tourism Council (2009) Leading the Challenge on Climate Change

Table 12. An overview of key biodiversity initiatives in the tourism sector

International frameworks	
The Quebec Declaration on Ecotourism www.world-tourism.org/sustainable/IYE/quebec/anglais/declaration.html	The outcome of the World Ecotourism Summit (2002), based on multi-stakeholder dialogue involving over 5,000 experts globally. Its main purpose is to set UN-level recommendations for the development of ecotourism activities.
The Cairns Charter on Partnerships for Ecotourism www.ecotourism.org.au/cairnscharter.asp	Building on the principles of the Quebec Declaration on Ecotourism, this charter seeks to support the establishment and operation of ecotourism partnerships. The Charter is accompanied by an Action Plan that outlines activities identified at the Cairns conference, along with timeframes for their implementation and the organisation responsible for implementation.
Mohonk Agreement www.rainforest-alliance.org/tourism/documents/mohonk.pdf	An agreement by a number of certification programmes of a common baseline for sustainable tourism and ecotourism certification. It provides a framework of principles and recommendations for the certification of sustainable and ecotourism.
World Tourism Organization's (UNWTO) Global Code of Ethics for Tourism www.unwto.org	The WTO is a UN agency that serves as a global forum for tourism policy issues and practical knowledge. They have provided a global code of ethics which includes references to biodiversity, as well as some guidelines for tourism decision makers.
Tourism Sustainability Group (TSG) http://ec.europa.eu/enterprise/sectors/tourism/sustainability-competitiveness/tourism-sustainability-group/index_en.htm	Set up by the EU (2004) to support the sustainability of European tourism, this group includes governments, industry members and environmental organisations and experts in sustainable tourism. They have provided necessary actions to reduce environmental impact through minimising resource use and waste and conserving natural heritage.
Global Observatory on Sustainable Tourism (GOST) http://www.unepie.org/scp/tourism/activities/taskforce/pdf/fact%20sheets%20pdf/-gost.pdf	An initiative set up by the WTO that aims to establish a network of observatories at the global, regional, national and local levels for monitoring, reporting and sharing of information related to sustainable tourism.
The World Heritage Alliance for Sustainable Tourism www.worldheritagealliance.org	An initiative that works with the travel industry to promote environmentally and economically sustainable business practices, educate travellers about the importance of responsible tourism, and support sustainable development of local communities in and around UNESCO World Heritage Sites.
Marrakech Task Force for Sustainable Tourism Development www.unep.fr/scp/tourism/activities/taskforce/pdf/TF%20REPORT_FINAL.pdf	A UNEP initiative that began in 2006 and resulted in the development of capacity building tools, policy recommendations and guidelines, new partnerships and networks on sustainable tourism development, of which an overview is given in 'A three year journey for sustainable tourism'.
Industry groups & partnerships	
International Ecotourism Society (TIES) Oslo Statement on Ecotourism www.ecotourism.org	An international ecotourism association that promotes responsible ecotourism through creating an international network of individuals, environmental NGOs and industry and supporting the integration of the principles of ecotourism into policies.
Tour Operator Initiatives (TOI) for Sustainable Tourism Development www.toinitiative.org	With this Initiative, tour operators (TO) commit themselves to the concepts of sustainable development as the core of their business activity and to work together through common activities to promote and disseminate methods/practices compatible with sustainable development.
International Tourism Partnership (ITP) (Was International Hotels Environment Initiative - IHEI) www.tourismpartnership.org	A membership organisation of leading companies from the travel and tourism industry, whose aim is to provide the hotel, travel and tourism industry with the knowledge and ability to develop practical solutions for more responsible business. It promotes high standards of environmental and social management and responsible business practices.
Ocean Conservation and Tourism Alliance (CI) www.conservation.org/sites/celb/news/Pages/120203_ocean_conservation_tourism_alliance.aspx	Partnership between Conservation International and the cruise line industry. They have developed practical guidebooks that include good environmental practices for a variety of key audiences including communities, small business owners, hoteliers, marine recreation providers and tour operators.

Table 12. *continued*

The International Centre for Responsible Tourism www.icrtourism.org/	A post-graduate training and research centre that works with governments, international agencies, the tourism industry and destinations to develop and promote strong policy frameworks and standards for making tourism more sustainable.
Tourism Sustainability Council (Merge between Global Sustainable Tourism Criteria (GSTC) & Sustainable Tourism Stewardship Council)	Initiative (2010) under a global membership council that offers a common understanding of sustainable tourism and the adoption of universal sustainable principles and criteria. It gathers tourism businesses, governments, UN bodies, research and academic institutions, social and environmental NGOs, certification programme from distinct regions of the world.
Guidance and standards	
Sustainable Tourism Criteria http://www.sustainabletourismcriteria.org/	Principal ideas/actions expressed in documents and standards worldwide under the term "sustainable tourism" (1992). The Criteria are towards hotels and tour operators, and serve as the underlying criteria for the accreditation and mutual recognition of sustainable tourism certification programme.
Convention on Biological Diversity's (CBD) guidelines on Biodiversity & Tourism www.cbd.int	A set of guidelines for the sustainable planning and management of tourism activities in vulnerable terrestrial, marine and coastal ecosystems and habitats of major importance for biological diversity.
Hotel Biodiversity Operational Guidelines www.iucn.org/about/work/programmes/business/bbp_our_work/tourism/	In partnership with Accor, IUCN have produced a guide to sustainable use of biological resources, focusing on the biodiversity implications of specific products or activities. This guide titled 'Biodiversity: My hotel in action' highlights the different ways in which hotels can influence biodiversity.
Guidelines for Tourism in Deserts, Mountains and Marine Areas	A number of guidlines for specific habitat types have been provided by the Tour Operators Initiative (TOI) together with UNEP (deserts and mountains) and CI and coral reef alliance (marine areas).
Guiding principles for Sustainable Hotel Siting, Design and Construction (CI/ITP)	An initiative between hotel companies and CI to provide guiding principles to address the challenge of sustainable hotel design and development and reduce the impact on critical ecosystems.
Integrating Environmental Practices in Small and Medium Hotels (UNEP)	A UNEP initiative to assist hotel managers and staff in assessing their current environmental practices and incorporating best environmental practice in their daily operations.
Managing Environmental and Social Issues in the Accommodations Sector (UNEP) www.unep.fr/scp/tourism/publications/other/accommodations.htm	A UNEP initiative which identifies ten environmental and social issues critical to the long-term success of the accommodations sector which includes energy and water conservation, waste management, chemical use, and biodiversity conservation.
Toolkit for Certification Programs http://www.rainforest-alliance.org/tourism.cfm?id=toolkit_programs	A users guide to certification for sustainable tourism and ecotourism produced by rainforest alliance and the International Ecotourism Society (TIES).
Management Guide for Responsible Tour Operations & Implementation Guide for Responsible Tourism Coordinators (UNEP/TOI) www.unep.fr/scp/publications/details.asp?id=DTI/0682/PA	A guide produced by UNEP and TOI to help promote responsible tourism within a company, from what needs to be changed to how to facilitate those changes. It provides an overview of best practices that have been explored by members of the TOI.

Table 13. Tourism sector certification schemes

Examples of international, regional and national certification schemes	
Green Globe International www.greenglobe.com/	An international certification programme based on standards that relate to a number of tourism activities and covers corporate social responsibility, environment and energy and conservation.
Sustainable Tourism Certification Network of the Americas www.certificationnetwork.org	A consortium of certification programme and supporting organisations in Latin America and the Caribbean that focuses on establishing effective communication between member organizations, creating common work tools, promoting certification programme and developing standard baseline criteria for certification.
UK's Green Tourism Business Scheme www.green-business.co.uk	The GTBS is the national sustainable tourism certification scheme for the UK.
Audubon Green Leaf™ Eco-Rating Program http://greenleaf.audubooninternational.org/	A programme that rates lodging facilities in the US and Canada for their commitment to water quality, water conservation, waste minimization, resource conservation, and energy efficiency.
Costa Rica Certificate for Sustainable Tourism (CST) program	The CST programme that certifies tourist companies based on their impact on the natural, social, and cultural resources of Costa Rica.

Challenges and opportunities

Biodiversity conservation will be greatly affected by the way in which tourism grows and develops. This is especially the case in developing countries hosting biodiversity hotspots, where tourism is expected to become increasingly important. Not only will a significant percentage of new tourism facilities likely be built in areas of high biodiversity, but many countries lack strong legal and regulatory frameworks for biodiversity conservation. There is however great potential for a positive relationship between tourism and biodiversity given the increasing trends for nature-based tourism, and this is illustrated by the range of company and industry-wide efforts currently happening. Nonetheless a number of challenges in achieving widespread uptake of responsible biodiversity-friendly tourism remain:

- As a result of the increasing likelihood of new developments to be in areas of importance for biodiversity, there is a greater need to ensure careful planning of all new developments to avoid negative impacts. This includes sustainable management of natural resources by both tourist developments and, in cases where tourism leads to growing local populations and/or changed local resource consumption, local communities.
- The number of visitors to individual sites is a major issue: a small number of tourists may have low impact and even provide conservation benefits, while thousands of visitors arriving each day are likely to have a large negative impact. Therefore, tourism developments near or in protected areas, fragile areas, and biodiversity hotspots need to respect the carrying capacity of the site. As this could reduce overall revenue for tour operators, there is a need for premium rates to be introduced at such locations, and increased awareness of their special importance for biodiversity by tourists – a potential selling point for these destinations.
- A lack of long-term investments in particular destinations, as is the case for most of the large tour operators, reduces the value of investing in biodiversity initiatives. While many SMEs have the necessary interest to conserve biodiversity, they may have limited access to knowledge, resources and methods for biodiversity conservation, particularly those in developing countries.
- There is a greater need for the incorporation of measures specific to biodiversity to be incorporated into efforts aimed at reducing environmental impact.
- While ambitious and effective biodiversity-friendly efforts exist, the credibility of many schemes is often compromised by the widespread and unfounded use of terms such as "ecotourism", "green tourism" and "responsible tourism" by operators not actually acting in an environmentally responsible way. There is therefore a need for harmonised certification schemes, coupled with consumer awareness, to separate green washing from genuine enterprises.
- Carbon emissions from aviation is also a substantial issue, given that flying is a fundamental part of the industry. While voluntary offset schemes are often in place, there is evidence that many travellers are not willing to support voluntary carbon offsets. There is also a need to ensure that these schemes do not replace efforts to actually reduce emissions such as investing in green energy sources, as there will be increasing scrutiny regarding the impact and effectiveness of offset schemes in coming years.

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- World Travel and Tourism Council website **http://www.wttc.org/eng/Tourism_Research/Tourism_Economic_Research/ (accessed 2 October 2009)**

9. Pharmaceuticals

The pharmaceuticals industry develops, manufactures and sells a variety of products for the medical diagnosis, cure, treatment, and prevention of human and animal disease. Continuing scientific research and technological advances over the past century or so have seen such products becoming increasingly available for a wide range of diseases, allowing the eradication or control of previously life-threatening diseases and contributing to improved quality of life and increased life expectancy.

Impacts

- **Over-harvesting** of wild species containing medically active compounds.
- **Habitat change and degradation** from the cultivation of important species.
- **Soil, water and air pollution** from manufacture processes.
- **Consumer disposal** and excretion of products.

Dependencies

- **Species components** for new medical compounds.
- **Wild species** are the source of many medicines.

Opportunities/risks

- **Lost opportunities:** at current plant and animal extinction rates the Earth is losing one major drug every two years.
- **New product development:** bioprospecting is an industry that could be worth US$500 million by 2050.
- **Consumer demand:** increasing trends in alternative medicines, in particular herbal therapies, creates an opportunity for sustainable and ethical harvesting of species which can also impact reputation, and lead to brand differentiation.

Drug discovery and development have long relied on natural compounds with medical activity found in a variety of plants, animals and microorganisms. One branch of the pharmaceutical industry is that of traditional medicine, which is based on the properties of naturally occurring substances and the associated knowledge and beliefs. While this has been replaced with more contemporary medicines in some cultures, it remains predominant in many countries of the world, such as China where Western and traditional medicine are practised alongside each other[124].

Even with the advent of techniques to synthesize chemical compounds for the development of western medicines, natural compounds continue to be significant leads or sources for new medically active substances. For example, 62% of cancer drugs approved by the US Food and Drug Administration come from, or are modelled on, natural products[125], and around 40% of new chemical entities introduced onto the world pharmaceutical market in 1991 and 1992 were natural product derived[126].

There has been a growing interest in naturally occurring resources by the pharmaceutical industry since the late 1980s, which has led to contracts between large pharmaceutical firms and the countries where biodiversity is sourced. There has also been improved knowledge as a result of existing ethno-botanic research that is based on the local knowledge held by users and providers of traditional medicines[127].

The largest pharmaceutical markets in terms of therapeutic classes are oncologics (to treat cancer), lipid regulators (to lower cholesterol), respiratory agents (to treat, e.g. asthma), antidiabetics, acid pump inhibitors (to lower gastric acid production), angiotensin II antagonists (to treat, e.g. high blood pressure), antipsychotics, antidepressants, anti-epileptics, autoimmune agents (to treat, e.g. arthritis), platelet aggregation inhibitors (to inhibit

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blood clotting), HIV antivirals, erythropoietins (to treat anemia), and painkillers. Most pharmaceutical sales are in North America (40%), followed by Europe (32%), Asia/Africa/Australia (12%), Japan (10%), and Latin America (6%)[128].The US and Europe are also home to most large pharmaceutical companies. Sales are expected to grow over the next few years, with most of this growth coming from Asia, Africa, Australia and Latin America.

Despite the advances being made in the development of new drug compounds, there is a growing trend in the use of complementary and alternative medicines (traditional medicines adopted outside of their indigenous culture) within western cultures, and levels of commercial trade within and between countries for such products has increased. Herbal treatments are the most popular form of traditional medicine, and are highly lucrative in the international marketplace. The herbal industry shares about US $62 billion with good growth potential. The World Bank reports trade in medicinal plants, botanical drug products and raw materials is growing at an annual growth rate between 5 and 15%[129].

Several pharmaceutical companies have partnered with research institutions on bioprospecting initiatives and arrangements

Pressure to discover new drugs is rising, both because two-thirds of the world's known diseases lack medication to treat them and because many existing drugs are nearing the end of their patent-protected timeframe. Given that only a small percentage of the world's species have been investigated for their potential medicinal use, bioprospecting — the search for medically active compounds from organisms, either using indigenous knowledge of species used in traditional medicine or, more commonly, screening organisms that have never been used in traditional medicine for previously unknown compounds — is also expected to grow. Bioprospecting is an industry that could be worth US$500 million by 2050[130]

Relationship with biodiversity

Dependence: The pharmaceutical industry is primarily dependent on biodiversity for new medical compounds and, in cases where a medical compound cannot be chemically synthesized, completely dependent on particular species as the source of the compound. This is particularly the case for traditional forms of medicine that rely on both particular species with known medicinal effects, as well as the associated local knowledge that is lost along with the species [131]. Dependence is typically on a wide range and abundance of species. In China for example, 18.9 % of native species are used as drugs in Chinese traditional medicine[132].

The current rate of biodiversity loss is likely to negatively affect both current provision of traditional remedies, as well as future drug discovery and development. An example of a recently discovered compound is taxol, a substance found within the Pacific Yew that kills cancer cells. This tree that was previously disregarded as having no commercial value, and there are likely to be many more equally important species that may be lost prior to analysis of their medicinal properties. According to one estimate, at current plant and animal extinction rates the Earth is losing one major drug every two years[133].

In addition to the sourcing and development of drugs, animal species are routinely used to test drugs prior to clinical trials on human beings. While these are often purpose-bred domesticated animals, animals caught in the wild are also used. For example wild non-human primates are routinely used for testing potential vaccine candidates, and the development of such drugs is thought to be hampered by a decrease in the primate availability for biomedical research, which is in part due to declining wild populations[134].

Impact:

- **Overexploitation** - When poorly managed, the harvesting of wild species containing medically active compounds or for use in drug testing, can exceed sustainable levels and cause population declines and, or damage the wider ecosystem. Indeed, several species used as sources of medicinal compounds have experienced population declines due to over-harvesting, including the Asian species snakeroot (Rauvolfia serpentine; source of reserpine, used to treat high blood pressure) and Himalayan yew (Taxus wallichiana; source of paclitaxel, an anti-cancer compound) which are considered to be threatened with extinction in at least parts of their range[135]. Given growing populations, increasing wealth, and the spreading popularity of natural remedies around the world, the demand for these medicines and remedies is rising, which is putting more species at risk of

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extinction. Traditional Chinese Medicine (TCM) for example, uses approximately 1,000 plant and 36 animal species, including endangered species including the tiger, rhinoceros, black bear, musk deer, and sea horse.

- **Habitat Loss and degradation associated with cultivation** - With the increased realization that some wild species are being over-exploited, there have been recommendations that wild species be brought into cultivation systems[136]. While this can reduce threats of over-exploitation, if poorly managed, cultivation of plant and animal species can lead to habitat loss and environmental degradation through excessive water use and soil and water contamination with fertilisers and pesticides. There can also be threats through the introduction of non-native species when species are cultivated in non-native area (for more detail on the potential threats of agriculture, see agrifood section).
- **Supply chain impacts** – When no environmental measures are in place, the manufacturing process can cause soil and water chemical contamination, air pollution, turbidity in local waterways due to the discharge of fermentation waste, and temperature changes in local waterways as a result of thermal waste from various processes.
- **Life cycle impacts** - The use, excretion, and disposal of human and veterinary medicines can also have potential impacts on biodiversity. Up to 90%[137] of the medically active compounds taken may be excreted by human and animal bodies, where it can enter surface and ground water sources as well as marine environments — even after passing through sewage treatment systems. Such compounds can also contaminate water sources following the disposal of unused pharmaceuticals and their packaging in landfill and sewage systems. While these compounds are usually broken down relatively quickly, their concentration in water sources is relatively stable due to continual input. These compounds can be absorbed by other animals, and some have been documented to disrupt the endocrine systems of fish and other animals. Nanoparticles in pharmaceuticals could potentially also negatively affect biological systems.

Biodiversity initiatives

Overview

The potential impacts on biodiversity through the collection and cultivation of wild species translate into substantial risks for the pharmaceutical industry through threatening the supply of known resources, the discovery of new compounds, as well as their reputation with both suppliers and consumers. Good management of biodiversity enables companies to not only mitigate these risks, but harness opportunities associated with growing trends and preferences for naturally derived products and ethical and sustainable sourcing.

The majority of work relating to biodiversity within the pharmaceutical industry relates to bioprospecting, and some of it relates to the sustainable use of wild species. Various international frameworks and guidelines have been developed for or apply to bioprospecting, two industry groups have developed their own guidelines for bioprospecting, and several pharmaceutical companies have embarked on bioprospecting initiatives and arrangements. International frameworks also refer to harvesting of wild species; however work by the pharmaceutical industry in this area appears limited. There are efforts to implement "green chemistry" into the industry, and various companies have worked to reduce their manufacturing footprint.

Frameworks, principles, guidelines and standards related to bioprospecting and sustainable use

At the international level, various conventions provide a framework and/or guidelines relevant to the acquisition and use of natural resources for the development of new pharmaceuticals. These are listed in Table 14. Two industry groups have developed guidelines for bioprospecting that are aligned with the CBD: the International Federation of Pharmaceutical Manufacturers & Associations (IFPMA), and the biotechnology industry organization (BIO). The European Federation of Pharmaceutical Industries and Associations (EFPIA) has also published case studies for good business practice related to bioprospecting[138].

The Union for Ethical Biotrade (UEBT) has a number of trading members within the pharmaceutical industry or who supply pharmaceutical ingredients. This initiative seeks to verify companies against internationally recognised standards that are based on the principles of the UNCTAD Biotrade initiative, which include access and benefit sharing (ABS), and sustainable use. There are also standards related to sustainable use of medicinal plants, including the International Standards for the Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP)[139] that has now merged with the fair trade standards developed by the FairWild Foundation.

Supply chain initiatives

The Pharmaceutical Supply Chain Initiative has developed the Pharmaceutical Industry Principles for Responsible Supply Chain Management which includes environmental management, as well as an implementation guide for these principles. However, neither the principles nor the implementation guide specifically mention biodiversity.

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[138] EFPIA Good Business Practice & Case Studies on Biodiversity

[139] International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants

Table 14. An overview of biodiversity initiatives in the pharmaceutical sector

International frameworks	
CBD Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits www.cbd.int/	Voluntary guidelines on genetic resources and associated traditional knowledge, innovations and practices covered by the Convention on Biological Diversity and benefits arising from the commercial and other utilization of such resources.
CBD Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity www.cbd.int/	Fourteen interdependent practical principles, operational guidelines and a few instruments for their implementation that govern the uses of components of biodiversity to ensure the sustainability of such uses.
CBD Cartagena Protocol on Biosafety www.cbd.int/	Agreement under the CBD to protect biological diversity from the potential risks posed by living modified organisms resulting from modern biotechnology. Article 5 specific to pharmaceuticals.
Convention on International Trade in Endangered Species (CITES) www.cites.org/	Aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival, through providing a legal framework to regulate the international trade in species.
United Nations Convention on the Law of the Sea (UNCLOS) www.unclosuk.org/	Provides guidelines for businesses in their use of the world's oceans, particularly the high seas that are opening up as a new frontier for genetic research.
Intergovernmental Committee on Folklore, Traditional Knowledge and Genetic Resources of the World Intellectual Property Organization www.wipo.int/	Provides a forum for international policy debate and development of legal mechanisms and practical tools concerning the protection of traditional knowledge and traditional cultural expressions (folklore) against misappropriation and misuse, and the intellectual property aspects of access to and benefit-sharing in genetic resources.
Industry Groups and initiatives	
International Federation of Pharmaceutical Manufacturers & Associations (IFPMA) www.ifpma.org/	This industry group has established guidelines on Access to Genetic Resources and Equitable Sharing of Benefits Arising out of their Utilization.
Biotechnology Industry Organization (BIO) www.bio.org/	Provides guidelines related to bioprospecting which includes both access and benefit sharing and sustainable use.
The European Federation of Pharmaceutical Industries and Associations (EFPIA) www.efpia.org/	Published case studies for good business practice related to bioprospecting.
Pharmaceutical Supply Chain Initiative (PSCI) www.pharmaceuticalsupplychain.org/	A group of major pharmaceutical companies (PSCI) that have produced a set of principles for responsible supply chain management. These include those that relate to the environment, although not specifically biodiversity.
The American Chemical Society's Green Chemistry Institute www.acs.org/	Provide a set of principles on green chemistry and green engineering so that chemical products and processes are designed and commercialised with minimum risk to the environment and human health.
International Cooperative Biodiversity Groups (ICBG) www.icbg.org/	The Fogarty-managed Biodiversity Program of ICBG awards grants to a number of bioprospecting projects that include efforts to survey biodiversity, preserve traditional medicine practices, ensure sustainable harvesting, and promote long-term funding for biodiversity conservation in the host countries.

Table 14. *continued*

Standards, criteria and guidelines	
Union for Ethical BioTrade (UEBT) Verification framework www.uebt.ch/	The UEBT has developed a verification system for companies that operate at an international level on the issues of biodiversity conservation, sustainable use of biodiversity, and fair and equitable sharing of benefits derived from the use of biodiversity.
International Standards for the Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) http://www.floraweb.de/map-pro/	Provides specific guidance on sustainable sourcing practices for medicinal and aromatic plants, and a set of principles and criteria that address conservation, sustainable use, access and benefit sharing and good environmental practice.
WHO/IUCN/WWF Guidelines on the conservation of Medicinal plants http://apps.who.int/medicinedocs/en/d/Js7150e/ www.who.int	Provides a framework for the conservation and sustainable use of plants in medicine.

Principles for green chemistry and green engineering have been developed that aim to minimize the environmental impact of chemicals and their production[140]. The American Chemical Society's Green Chemistry Institute Pharmaceutical Roundtable aims to integrate green chemistry in the pharmaceutical industry, and is currently drafting a voluntary standard that will set criteria for chemical producers and users to evaluate the environmental impact and sustainability attributes of chemicals and their derivatives.

Company-led initiatives

Starting from the early 1990s, several pharmaceutical companies have partnered with research institutions and other stakeholders on bioprospecting initiatives and arrangements. Some of these have been through the US government's International Cooperative Biodiversity Group (ICBG), which has awarded grants to a number of bioprospecting projects that include efforts to survey biodiversity, preserve traditional medicine practices, ensure sustainable harvesting, and promote long-term funding for biodiversity conservation in the host countries.

In return for access to genetic resources, these companies have generally helped build scientific, technical, and/or institutional capacity and knowledge within the host country. In Costa Rica, money provided by bioprospecting companies has also been used to fund conservation efforts, while in Australia, bioprospecting activities have helped generate information relevant to conservation planning and management. It is worth noting that most bioprospecting is currently performed by government and academic institutions. In 2007, only four large pharmaceutical companies had the capacity to undertake all facets of drug discovery based on natural compounds: Novartis, Wyeth, Merck and Sanofi-Aventis. Several smaller companies run focused research on natural compounds, which they usually go on to develop in partnership with large pharmaceutical companies.

Some companies are working on sustainable sourcing of raw materials. Novartis and its partners, for example, are working with farmers in China and Africa to source *Artemisia annua* for making Coartem, an anti-malarial therapy developed from Traditional Chinese Medicine. Amongst other things, the work includes knowledge transfer in extraction techniques, good manufacturing practices, and health, safety and environmental standards.

Challenges and opportunities

There is great potential for the pharmaceutical industry and biodiversity to support one another due to the large and growing interest in both discovering new bioactive compounds and sourcing naturally derived products for the development of drugs and remedies. This is demonstrated through the large investments being made in collecting and screening the native flora and fauna of areas. This can positively contribute to both our understanding of and protection of biodiversity. Nonetheless there is a need for raised standards across the industry to ensure that those companies wishing to operate in a sustainable and ethical manner can compete in the market place.

- While many principles and guidelines are being drawn up, there remains a challenge for the pharmaceutical industry as a whole to ensure that any benefits derived from bioprospecting are shared equitably, especially given that new medically active compounds are often discovered in biodiversity-rich areas in developing countries. Key issues include a general lack of adequate national laws for access and benefit sharing and a lack of clarity over the legal meaning of various concepts related to genetic resources.

[140] US Environmental Protection Agency Twelve Principles of Green Chemistry

- Equally, there remains a need for effective and widespread uptake of the existing principles and standards regarding sustainable use of biodiversity and the natural resources on which this biodiversity depends, both for wild harvesting and cultivation. Although regulations often exist for wild collection for commercial trade, implementation of collection and trade control can be ineffective.
- Finally, more knowledge is needed on the long-term and population effects of medical compounds that can be released into the environment on particular species and biodiversity in general. Similar studies are needed for nanoparticles present in pharmaceutical products.

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10. Cosmetics

The cosmetics industry develops, manufactures and sells a variety of products to enhance the appearance and/or smell of the human body, including makeup, fragrances, skin creams, toiletries and hair care products. While cosmetics have been used for thousands of years, the industry developed rapidly from the late 1800s due to industrialization, rising wealth, and changed perceptions about cosmetics.

Impacts >>>

- **Over-exploitation** of plant species with properties of interest to the cosmetics sector, e.g. aromatic, anti-ageing etc.
- **Potential impacts of cultivation** of species of interest, such as habitat clearance and pollution of nearby areas and waterways.
- **Pollution and waste** from manufacturing, use and disposal of products.

Dependencies >>>

- **The natural and organic sector** of the cosmetics industry is dependent on biodiversity for continued supplies, and discoveries of plant-derived ingredients.

Opportunities/risks

- **New Ingredients**: The increasing trend for natural and organic cosmetics creates opportunities to benefit from biodiversity to create a new generation of natural-based products.
- **Branding and new markets:** Responsible management of biodiversity through responsible sourcing and manufacture and packaging can allow branding of products, and access to new markets and revenue streams.

Demand for cosmetics products is predicted to grow, especially for anti-aging and natural products. There has been a recent trend towards "masstige" products. These are high-quality products with a prestigious or premium appearance that are mass marketed. While relatively expensive compared to mass market brands, they are more attainable than super premium prestige products.

At present, most cosmetic products are made using ingredients derived from petrochemicals. However, growing consumer concern about synthetic chemicals has seen the natural and organic sector emerging as the fastest-growing cosmetics sector over the past few years and is anticipated to exceed $10 billion by 2010[141]. This growth is mainly occurring in Europe and North America, where distribution of such products is becoming increasingly mainstreamed into supermarkets and pharmacies. However, the sector's share of the total cosmetic market is still low — just 2–4% in most European countries for example[142]. There is also a growing trend to use food ingredients as natural and organic ingredients in cosmetics. Accompanying this raised awareness of the potentially harmful chemicals found in synthetically produced personal care products, and a move towards more naturally derived alternatives[143], there has been an increase in cosmetic products that offer health benefits on top of traditional beauty benefits. An example is the use of seaweed as a central ingredient in cosmetics, whereby the same vitamins and minerals that can form part of a healthy diet are also thought to play a role in the health of skin, hair and nails. This hybrid field between pharmaceuticals and cosmetics has been termed 'Cosmeceuticals'[144].

The industry is highly innovative, with major cosmetic companies replacing or reformulating around 25% of their products on average every year[145]. New product development is especially a feature of the natural

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[144] T Pieroni,A.; Quave,C.L.; Villanelli,M.L.; Mangino,P.; Sabbatini,G.; Santini,L.; Boccetti,T.; Profili,M.; Ciccioli,T.; Rampa,L.G. (2004) Ethnopharmacognostic survey on the natural ingredients used in folk cosmetics, cosmeceuticals and remedies for healing skin diseases in the inland Marches, Central-Eastern Italy. Journal of ethnopharmacology Vol 91 (2-3): 331-344

[145] EC Enterprise and Industry website Cosmetics - http://ec.europa.eu/enterprise/cosmetics/index_en.htm (accessed 20 October 2009)

cosmetics sector, with companies experimenting with natural preservatives, surfactants and colourants to replace synthetic chemicals. Demand for plant-derived ingredients is accordingly expected to grow. Traditional knowledge is widely used in the development of new products.

Relationship with biodiversity

Dependence: The natural and organic sector of the cosmetics industry is dependent on biodiversity for continued supplies and discoveries of plant-derived ingredients. A number of species have been identified as having properties of interest to this sector, including aromatic properties for use in perfumes and perfumed products, colouration for use in colour cosmetics, and purification, healing, moisturising and anti-ageing for use in skin care. While no longer common, there has also been some reliance on animal musk within the perfume industry. This is typically oil which is harvested from a gland taken from musk deer, civet cats and beaver.

There are also a range of other animal derived products used by the cosmetics sector which include bees wax, honey, keratin from protein found in fur, feathers, hair, hooves, fish oils, collagen derived from animal connective tissue, and squalene from shark livers. While many of these products are now synthetically created, or derived from domestic animals, the sources are often unstated and wild animals are sometimes used, particularly in more traditional use systems[146]. In addition to the use of animals as sources of ingredients, animals are routinely used for testing cosmetic products or ingredients to ensure the safety and hypoallergenic properties for use by humans, although these are often purpose-bred domestic animals.

The maintenance of wild populations of known species with cosmetic properties relies on the maintenance of whole functioning ecosystem in which the species exists. Likewise where species are cultivated rather than collected from the wild, the productivity of their cultivation systems depend upon a range of ecosystem services provided by biodiversity, including nutrient cycling, disease regulation and pest control. As the beauty sector continues to innovate and reformulate products using novel ingredients, there is a dependence upon the range of, as of yet, unidentified species with unique properties of interest. Therefore the future trajectory of companies seeking innovation from nature depends on the conservation of diverse and functioning ecosystems.

Impact: The production of cosmetics can however negatively affect biodiversity through over-harvesting wild species as sources of raw materials, cultivation of such species, and pollution from manufacturing processes.

- Over-harvesting of wild species is a particular problem, and has caused serious local population declines of several plant species. These include a sandalwood species in Indonesia (*Santalum album*), the Asian species jatamansi (*Nardostachys grandiflora*) and rosewood in Brazil (*Aniba rosaeodora*), all of which are harvested to produce oils used in perfume[147,148]. There has also been increasing demand for an aromatic endemic plant of Crete (*Origanum dictamnus*) for its antimicrobial and antioxidant properties that are thought to have anti-ageing effects, and this is likely to pose a risk to its already threatened wild population.
- Cultivation of species is often a preferred method to ensure supply without endangering wild populations. However without careful management this can lead to land clearance for planting and pollution and degradation of nearby habitats and waterways, particularly if harmful agents are used and good waste measures are not put in place.
- Extraction of petrochemicals used in cosmetics can also pose a threat to ecosystems through the clearing and degradation of habitats at production sites, as well as through transportation. This is, however, small in comparison to the use of petroleum for energy. More detail can be found in section 3 on energy.
- Air and water pollution generated in the manufacture of cosmetic products.
- Volatile organic compounds (VOCs) are organic chemical compounds that enter the atmosphere. They are used in used in a range of cosmetics including nail varnish and aerosol products and can contribute to global warming, ozone depletion, as well as ground water and soil contamination.
- Cosmetics enter sewage systems and water sources after use, where individual ingredients may have potential impacts on biodiversity. For example, nano-titanium dioxide particles found in many cosmetic products can cause mortality of microorganisms, with potential adverse impacts on local ecosystems[149].

Biodiversity initiatives

Overview

The increasing trend towards the use of natural ingredients in cosmetics has created an opportunity for cosmetic companies to engage in biodiversity

[146] Pieroni,A.; Quave,C.L.; Villanelli,M.L.; Mangino,P.; Sabbatini,G.; Santini,L.; Boccetti,T.; Profili,M.; Ciccioli,T.; Rampa,L.G. (2004) Ethnopharmacognostic survey on the natural ingredients used in folk cosmetics, cosmeceuticals and remedies for healing skin diseases in the inland Marches, Central-Eastern Italy. Journal of ethnopharmacology Vol 91 (2-3): 331-344

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Table 15. An overview of key biodiversity initiatives in the cosmetic sector

International frameworks	
CBD Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits www.cbd.int	Voluntary guidelines on genetic resources and associated traditional knowledge, innovations and practices covered by the Convention on Biological Diversity and benefits arising from the commercial and other utilization of such resources.
CBD Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity www.cbd.int	Fourteen interdependent practical principles, operational guidelines and a few instruments for their implementation that govern the uses of components of biodiversity to ensure the sustainability of such uses.
Convention on International Trade in Endangered Species (CITES) www.cites.org/	Aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival, through providing a legal framework to regulate the international trade in species.
Intergovernmental Committee on Folklore, Traditional Knowledge and Genetic Resources of the World Intellectual Property Organization www.wipo.int	Provides a forum for international policy debate and development of legal mechanisms and practical tools concerning the protection of traditional knowledge and traditional cultural expressions (folklore) against misappropriation and misuse, and the intellectual property aspects of access to and benefit-sharing in genetic resources.
Industry group examples	
The Natural Resources Stewardship Council (NRSC) of the Aromatic, Perfume and Cosmetics Industry	A group comprised of industry leaders and specialists. They have adopted a declaration to support the goals of the CBD.
PhytoTrade Africa www.phytotradeafrica.com/	Regional trade association of the natural products industry in Southern Africa that supports the research and development of new products. They provide principles of fair trade and sustainability, as well as a charter that includes commitments to biodiversity conservation.
Cosmetics Valley www.cosmetic-valley.com/	France-based industry group that has produced a charter for eco-responsibility. This includes commitments to generic environmental actions such as reduced waste, pollution and energy consumption, as well as the preservation of biodiversity.
The American Chemical Society's Green Chemistry Institute www.acs.org/	Provide a set of principles on green chemistry and green engineering so that chemical products and processes are designed and commercialised with minimum risk to the environment and human health.
Principles, standards and certification	
Biotrade Initiative www.biotrade.org/	An initiative of the UN Conference on Trade and Development (UNCTAD) that has developed principles surrounding the sustainable use of biodiversity as well as access and benefit sharing.
Union for Ethical BioTrade (UEBT) Verification framework www.uebt.ch/	The UEBT has developed a verification system for companies that operate as an international standard on the issues of biodiversity conservation, sustainable use of biodiversity, and fair and equitable sharing of benefits derived from the use of biodiversity.
International Standards for the Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) www.floraweb.de	Provides specific guidance on sustainable sourcing practices for medicinal and aromatic plants, and a set of principles and criteria that address conservation, sustainable use, access and benefit sharing and good environmental practice.
NaTrue www.natrue.org/	International Natural & Organic Cosmetics Association that offers certification of natural and organic cosmetics. They provide a set of criteria for compliance that relates to the ingredients, processing agents and packaging of cosmetic products.
Cosmetics Organic Standard (COSMOS) www.cosmos-standard.org/	Europe-wide harmonized cosmetic standard developed by the European Cosmetics Standards Working Group. ECOCERT mentioned below is part of the consortium. It provides standards related to organic production and minimal pollution and waste throughout the supply chain of cosmetic products, and includes reference to CITES (mentioned above).

Table 15. *continued*

National certification scheme examples	
Ethical and Environmental Certification institute (ICEA) www.icea.info	Italian-based certification body that provides a standard for Environment-friendly cosmetics that includes reference to endangered species, the use of organic ingredients, and environmentally sound production and processing agents.
Natural Products Association (NPA) seal www.npainfo.org/	US-based association that has a standard and certification programme for personal care products that provides a set of guidelines on certified natural and sustainable ingredients.
ECOCERT www.ecocert.com/	France-based international organic certification organisation that primarily certifies food and food products, but also cosmetics and perfumes. They promote the use of natural substances and provide standards for natural and organic cosmetics which includes those related to waste and pollution, as well as the protection of natural habitats and threatened species.

issues. The increased dependence on biodiversity that results from this trend has led to the involvement of a number of companies on issues related to natural ingredient sourcing and access and benefit sharing. While consumer preferences for personal care products are focused on health, there is increasing awareness and preference for organic and sustainably and ethically sourced ingredients and products, creating opportunities of companies to not only secure supplies of essential and, as of yet, undiscovered species, but also to enter new markets as a result of it. Alongside this, there has been some work also on addressing impacts further along the supply chain, such as reducing the environmental impact of manufacturing processes and packaging, which supports overall products and company image and commitment to the environment.

Frameworks and Industry Initiatives

Various international conventions are relevant to the acquisition and use of natural resources for the development of new cosmetics. These are listed in Table 15. To date no international cosmetic industry associations appear to have developed guidelines or standards for bioprospecting or natural ingredient sourcing that are aligned with these conventions. However, one regional trade association for natural products in southern Africa, PhytoTrade Africa, has developed a charter that includes specific actions for biodiversity conservation and access and benefit sharing, while the France-based Cosmetics Valley industry group — representing large cosmetic companies as well as smaller upstream and downstream companies around Paris — has recently released an eco-responsibility charter that includes general commitments to biodiversity protection and improved environmental performance of manufacturing operations.

Principle and Standards

The BioTrade Initiative of the UN Conference on Trade and Development (UNCTAD) has developed principles and criteria for the sustainable collection or production, transformation, and commercialization of goods and services derived from native biodiversity (biotrade). Based on the CBD and other conventions, the criteria include conservation of biodiversity, sustainable use of biodiversity, and fair and equitable sharing of benefits derived from the use of biodiversity. The Union for Ethical BioTrade has developed a verification system for companies that operate as an international standard on these issues based on the principles of the biotrade initiative.

The Union for Ethical BioTrade is currently working with a number of actors in the cosmetics industry to help achieve compliance with these principles and criteria within a period of five years. Specific standards related to sustainable use and access and benefit sharing are also provided by the International Standards for the Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP), which is now embedded with the fair trade standards of the FairWild foundation

A number of certification schemes and associated standards have been, or are in the process of being, developed for natural and/or organic cosmetics. Examples include NaTrue, ECOCERT, the EU COSMOS standards, the Ethical and Environmental Certification institute (ICEA), the Natural Products Association (NPA) seal, and the Organic and Sustainable Industry Standards (OASIS). These define minimum requirements and common definitions for organic and/or natural cosmetics. However only three, ECOCERT, ICEA and COSMOS, include standards directly relating to biodiversity (prohibitions on harvesting endangered species and/or harvesting in a way that doesn't harm ecosystems) and none include standards on access and benefit sharing. The FairWild scheme for wild plant products, including ingredients for cosmetics, includes both biodiversity and access and benefit sharing standards.

While the focus of the cosmetic industry's involvement with biodiversity conservation is related to sustainable and ethical sourcing of ingredients, some of the certification schemes and associated standards mentioned above encourage "green chemistry" and/or minimizing the environmental impact of manufacturing and packaging. The American Chemical Society's Green Chemistry Institute Formulator's Roundtable aims to integrate green chemistry in the formulated products industry, including cosmetics.

Company led initiatives

There have been some good examples of company-led initiatives, such as developing partnerships with local communities and partners to ensure sustainable and equitable supplies of ingredients, which can in turn then help with branding of products. Examples include Natura Cosmeticos, which has developed a product line based on natural ingredients from Brazilian biodiversity, that are sustainably sourced in partnership with local communities. Beraca has a similar business plan of sustainably sourcing its natural products from Brazilian biodiversity. Aveda and Ojon, both of which are subsidiaries of the Estée Lauder companies Inc, also have local partnerships for the sustainable supply of both ingredients and packaging that is supporting local development and conservation in these areas.

A number of companies have made policy level commitments and introduced measures to meet them. For example L'Oreal has committed to the CBD objectives and undertaken a number of measures to meet these, including identifying biodiversity issues in its supply chain and creating action plans for species that may be endangered in order to minimize the company's negative impact or create a positive impact. They have managed to make some cuts in energy and water use and waste, and have set ambitious targets for 2015[150]. L'Oreal's The Body Shop sources palm oil meeting the RSPO standards for its soaps and plans to use FSC-certified wood and paper wherever possible. Some companies, including Natura, the Aveda Corporation and the Body Shop, have also incorporated access and benefit sharing measures into their business policies and practices.

Challenges and opportunities

While many opportunities exist on the business and biodiversity front within the cosmetics sector and many efforts are being made, challenges remain. Raising the standards of the industry as a whole can create a fair and competitive environment in which companies wishing to be ethical and responsible can operate.

- **Environmental leadership and new revenue streams:** For pharmaceuticals, there is great potential for the cosmetic industry to be at the forefront of biodiversity-friendly business as a result of the benefits that can be gained from such a relationship, in terms of new and novel ingredients and being a key supplier for the increasing number of environmentally and socially aware cosmetics consumers. This is demonstrated by the increasing number of companies adopting this strategy and using organic and natural ingredients and advertising ethical policies.
- **Access and benefit sharing and sustainable sourcing:** While there are many ambitious efforts currently happening, a significant challenge remains in ensuring that any benefits derived from the use of natural ingredients are shared equitably, especially given that natural ingredients are often sourced from regions with significant poverty. The incorporation of the CBD requirements on access and benefit sharing across the entire industry will be key to achieving this, which would create a level playing field for companies wishing to market natural products, whether or not their aim is to use natural sources, or discover new ingredients for cultivation. In the same way, the challenge of sustainable sourcing of natural ingredients also remains, despite the many efforts of individual companies on this issue. Without the widespread uptake of such policies, the wealth of biodiversity resources for all companies and communities will be much diminished in the future.
- **Consumer awareness and certification:** Both sustainable sourcing and equitable sharing of the benefits requires not only the efforts of individual companies to adopt and implement best practice on sourcing, but also increased consumer awareness and demand for these sustainably and ethically sourced products and credible certification schemes. While the number of consumers aware of these issues is rising, the market still represents a small proportion of the overall cosmetics market, and there is therefore great potential for growth. One of the obstacles related to this issue is the confusion associated with definitions such as 'organic' and the growing number of certification logos present that can create apathy among consumers. Standardisation of certification schemes, and/or guidance on credible certification bodies for natural and organic products and natural ingredients could therefore aid this process. Nonetheless, an important issue is that even credibly certified organic products may not be sustainably and ethically sourced, and in such cases can have a greater impact on biodiversity than chemically synthesized products. Further dialogue is therefore needed for existing schemes to incorporate sustainable sourcing and access and benefit sharing criteria.

[150] Environmental Leader. October 8th 2009. L'Oreal cuts water use, GHG emissions more than 6%. http://www.environmentalleader.com/2009/10/08/loreal-cuts-water-use-ghg-emissions-by-more-than-6-in-2008/

- **Harmful chemicals:** While regulations often exist in regard to chemicals used in cosmetic products, this depends on the region or country in which the company is operating. The revised 2003 EU Cosmetics Directive bans 1,100 chemicals that are known or suspected to cause cancer, genetic mutation, reproductive harm or birth defects from cosmetics. However in the US, cosmetics are among the least-regulated products on the market with no safety testing required for most chemicals used in cosmetics products[151]. While this mainly has strong implications for human health, the presence of such chemicals in the environment is also a biodiversity issue that can affect all companies wishing to source or operate in such areas. There is therefore a need for more research on the long-term environmental effects of chemicals used in cosmetics, including nano-particles. Some leading companies are pioneering this research in the quest to ensure consumers of health and safety, but greater investment is needed, and this needs to be coupled with some minimum regulations to ensure that at least some standards, and therefore costs, are the same for all companies.

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11. Fashion

The fashion industry designs, manufactures and sells textiles, clothing and accessories. The industry began in Europe in the 1800s when, instead of styles coming from what was worn at royal courts, the first designers began dictating to customers what they should wear. Since then, fashion has become increasingly available to different socio-economic classes as well as increasingly adopted by countries all around the world.

Impacts >>>

- **Land conversion and degradation** from the cultivation of crops and livestock for natural fibres and products, as well for the extraction of petrochemicals.
- **Over-harvesting of wild species** such as crocodiles, snakes, seals, and shells for leather, fibres, dyestuffs, and accessories.
- **Pollution, excessive water use and CO2 release** from the production of synthetic fibres, the manufacture of products, and the laundering of final products.

Dependencies >>>

- The sourcing and cultivation of natural fibres and wildlife products depends upon a number of species and ecosystem services to maintain productivity and supply.

Opportunities/risks

- **Consumer trends:** The emerging trend for eco-fashion creates opportunities to benefit from sustainable production methods.
- **Supply:** Environmental degradation will compromise the supply and productivity of natural fibres and materials.
- **New designs:** Biodiversity can provide inspiration for new and novel materials and designs.

The industry is now very fast moving, with styles typically changing every six months. This, combined with cheaper prices of materials, has led to increased consumption of fashion items. For example, in the UK the amount spent on clothing and textiles grew by 34% from 1997 to 2007[152]. Many clothing items are discarded within a year of being purchased, mostly going to landfill.

The fashion industry includes a variety of sectors, including fashion design, textile manufacturing, clothing manufacturing, shoe and other accessory manufacturing, and distribution. The clothing and textile manufacturing sectors are very important to the economies of several countries, particularly in developing countries within Asia.

China is the dominant exporting country for clothing and textiles. Europe is also a significant exporting region. The main clothing markets are Western Europe (33% of sales in 2000), North America (33%) and Asia (25%)[153,154].

Most clothing is made from fibres. Just two, cotton and polyester, account for over 80% of global fibre production. Production of natural fibres (e.g. cotton, silk, wool, linen) has stayed at about the same level since 1990, while production of synthetic fibres derived from petrochemicals (e.g. polyester, acrylic, nylon) or cellulose (e.g. viscose, lyocell) has nearly doubled, due almost entirely to increased demand for polyester. Other natural fibres and products used for clothing and fashion accessories include leather, rubber, cashmere, mohair, angora, fur, wood, hemp, jute and resins.

While the mass production of high street fashion has boomed in recent decades, there remains a luxury

[152] Reducing the Impact of Textiles on the Environment website http://www.ritegroup.org/news.php (accessed 8 October 2009)
[153] Plunkett Research, Ltd. Introduction to the Apparel & Textiles Industry http://www.plunkettresearch.com/Industries/ApparelTextilesFashions/ApparelTextilesFashionsTrends/tabid/158/Default.aspx
[154] World Trade Organization (2008) International Trade Statistics. www.wto.org/english/res_e/statis_e/its2008_e/its2008_e.pdf

market for exclusive fashion products for purchase by the elite. The products of wild animals, particular reptiles including some snake and lizard species, often feature in this market. While farming of such species is now common, it is often difficult to trace the source of products, particularly due to the fact that farmed stocks are often supplemented with wild individuals[155].

"Eco" or sustainable fashion is an emerging trend. It encompasses the use of: organic and/or fair trade fibres; new "rapidly renewable" fibre sources such as bamboo, soy and corn; textiles made without toxic chemicals; and/or recycled and reused textiles and materials. Reptile skins sourced in sustainable manner are also increasingly being used in sustainable fashion.

Relationship with biodiversity

Dependence: The fashion industry has a strong reliance on the production natural fibres; in particular cotton that is one of the most commonly used materials in the industry. Such commodities depend upon a number of ecosystem services to maintain productivity. These include freshwater, climate regulation, nutrient cycling, pollination and pest control. There is also a dependency on animal wildlife products such as skins, fibres and resins, which while sometimes obtained from farmed stocks are also sourced from the wild.

> Environmental impacts of the fashion industry are exacerbated by the large volume of fashion items consumed each year.

Impact: The production of different fibres and other raw materials used for textiles and accessories can affect biodiversity in different ways if not properly managed:

- The production of synthetic fibres can impact biodiversity both through the extraction of petrochemicals, which can lead to habitat loss and degradation (for more information see the energy section 3), as well as through manufacture processes, which can be energy-intensive and produce various by-products. Of significance are volatile organic compounds, solvents and heavy metals, which can pollute air or water sources if not correctly managed. Production of nylon also releases nitrous oxide, a greenhouse gas.
- Cultivation of crops and livestock for natural fibres and products poses the same threats as cultivation of crops and livestock for food - land conversion and degradation through chemical and waste pollution. In fact the regulations over chemical use can be less stringent than for agrifood production due to the reduced human health considerations needed. Cotton cultivation is particularly damaging, requiring large quantities of water, pesticides and fertilizers — indeed, cotton accounts for 11% of all pesticides used each year, and 25% of all insecticides, even though it is grown on only 2.4% of the world's arable land[156]. Diversion of water for cotton has impacted on freshwater resources and biodiversity in several areas, most notably the Aral Sea, whose surface area has halved[157] .
- Over-harvesting of wild species such as crocodiles, snakes, seals, corals, shells for leather, fibres, dyestuffs, and accessories such as bangles and necklaces can cause population declines and/or damage the wider ecosystem. Poaching of the endangered species, the Tibetan antelope, to make luxury shahtoosh shawls, for example, has seen their population drastically decline[158]. In addition to the over-exploitation of target species, the farming of species for their products can have a knock on effect through the use of wild species as a food source. For example, an estimated 6.9 million freshwater snakes are fed to domestic crocodiles in Cambodia that are bred for the value of their skins on the international market, leading to population declines of a number of snake species[159].
- Various processes in textile and other product manufacturing — including scouring (washing) wool, retting flax (separating the fibres from the stalk), tanning leather, bleaching, dyeing, printing and finishing — consume large amounts of water and energy, and there is therefore a need to adopt water and energy conservation measures. Such processes also use toxic chemicals and produce effluents which, of not managed, can pollute air, water sources and/or soil. Leather tanning is particularly polluting, having one of the highest toxic intensities per unit of output.
- The laundering (i.e., washing, drying, and ironing) of clothes can additionally impact on biodiversity. For example, post-purchase washing and tumble drying accounts for about 60% of the energy used in the life cycle of a cotton T-shirt[160]. Laundering also produces solid waste and waterborne effluents. While not directly the responsibility of the industry that produces the goods, there are measures such as reduced temperature washing that can be included on labels to reduce this impact.

[155] Mockrin, M.H., Bennett, E.L., LaBruna, D.T. (2005) Wildlife farming: a viable alternative to hunting in tropical Forests? WCS Working Paper No. 23. Wildlife Conservation Society, New York

[156] WWF International website Agriculture and Environment: Cotton – Environmental Impacts of Production: Use of Agrochemicals http://www.panda.org/what_we_do/footprint/agriculture/cotton/environmental_impacts/agrochemicals_use/ (accessed 7 October 2009)

[157] WWF International website Agriculture and Environment: Cotton – Environmental Impacts of Production: Water Use http://www.panda.org/what_we_do/footprint/agriculture/cotton/environmental_impacts/water_use/ (accessed 7 October 2009)

[158] Mallon, D.P. (2008) Pantholops hodgsonii. In: IUCN (2008) IUCN Red List of Threatened Species http://www.iucnredlist.org/apps/redlist/details/15967/0 (accessed 14 Novmber 2009)

[159] Brooks, S.E., Allison, E.H., Reynolds, J.D. (2007) Vulnerability of Cambodian water snakes: Initial assessment of the impact of hunting at Tonle Sap Lake. Biological Conservation 139: 401-414

[160] Allwood, J.M. and Laursen, S.E. and Malvido de Rodriguez, C. and Bocken, N.M.P. (2006) Well dressed? The present and future sustainability of clothing and textiles in the United Kingdom Technical Report. University of Cambridge - Institute for Manufacturing – http://www.ifm.eng.cam.ac.uk/sustainability/projects/mass/UK_textiles.pdf

- All these environmental impacts are exacerbated by the large volumes of fashion items consumed each year. Measures to ensure durability of products can help to some extent, but much of the over-consumption of fashion products results from rapidly changing styles and designs, as well as cultural elements such as the well-being associated with purchasing new items.

Biodiversity initiatives

Most work on fashion has focused on the sustainable production of natural fibres, particularly cotton, and subsequent processing and manufacturing into textiles. Such initiatives operate under an organic label. A small number of initiatives also focus on sustainable sourcing of animal-based products that complies with CITES regulations.

Guidelines and standards for sustainable textile production

There are a number of principles and standards that include biodiversity criteria that are of relevance to the fashion industry, including those that relate specifically to the production of cotton (The Better Cotton Initiative), those based more generally on organic agriculture (e.g. IFOAM) and fair-trade. Various national and regional trade associations have also developed certification schemes for organic textiles based on the IFOAM principles but additionally including standards for processing and manufacturing[161]. The Global Organic Textile Standard (GOTS) and certification scheme was developed to harmonize these standards. Other certification schemes focusing on textile and/or footwear manufacturing have also been developed, including the Öko-Tex Standard 1000 and the European Eco

Table 16. An overview of key biodiversity initiatives in the fashion sector

Principles, standards and certification schemes	
The Better Cotton Initiative (BCI) www.bettercotton.org/	Provides principles and criteria for cotton production that include general biodiversity considerations, and works with farmers and other stakeholders in the supply chain to share best practice and knowledge.
International Federation of Organic Agriculture Movements (IFOAM) www.ifoam.org	Umbrella organization for the organic movement, IFOAM standards include general principles and standards for biodiversity conservation on farms[162]. IFOAM is also developing a more detailed biodiversity and landscape standard[163]. Applies to cotton and other fibre crops.
Fairtrade Labelling Organizations International (FLO) www.fairtrade.net/home.html	A coalition of 24 organizations that includes 19 labelling initiatives in 23 countries working to support producers. They have produced international fair-trade standards for producers and traders, including those specific to cotton.
The Global Organic Textile Standard (GOTS) www.global-standard.org/	Produced by the International Working Group on GOTS, this international standard harmonises those of national and regional trade associations. Based on the IFOAM criteria, this standard defines requirements to ensure organic status of textiles, from harvesting of raw materials, through manufacture, to labelling.
Öko-Tex Standard 1000 www.oeko-tex.com/	Standard produced by the International Oeko-Tex® Association to test, audit and certify environmentally-friendly production sites throughout the textile processing chain. Includes criteria related chemical contamination, waste, pollution and energy consumption.
European Eco label http://ec.europa.eu/environment/ecolabel/index_en.htm	A European Union award scheme that covers a range of products, including textiles. Based on a set of criteria related to environmental impact on air, soil, water and human health throughout the lifecycle of a product.
Other Initiatives	
Reducing the Impact of Textiles on the Environment (RITE) http://www.ritegroup.org/	Formed in 2007, this industry association aims to reduce the impact of textiles on the environment throughout the global supply chain, through providing advice and information. Runs an annual conference on the issues surrounding sustainable textiles and clothing.
The Sustainable Clothing Roadmap www.defra.gov.uk/news/2009/090220a.htm	A UK government scheme to make fashion more sustainable and less environmentally damaging was launched in 2009. This initiative involves over 200 organisations including many high street retailers who have committed to a number of actions related to fair-trade and organic certification and recycling.

[161] Listed at: http://organicclothing.blogs.com/my_weblog/2006/04/certified_organ.html
[162] The IFOAM Norms for Organic Production and Processing
[163] IFOAM (2009) D2 Draft Biodiversity and Landscape Standards http://www.ifoam.org/about_ifoam/standards/norms/draft_standards/BiodiversityDraftStandardsD2050728.pdf

label, which limit the use of certain chemicals and require water and energy conservation measures.

The relatively new Reducing the Impact of Textiles on the Environment (RITE) group aims to promote best practice for reducing and minimizing the negative environmental effects not just of textile production, but also use and disposal.

Sustainable sourcing of wild animal products

A growing number of initiatives focus on the sustainable sourcing of animal based products including vicuña and guanaco wool, peccary pelts, and reptilian skins, including those from crocodiles, alligators, caimans and various snake species. The Bolivian BioTrade National Programme has prioritized the sustainable management of the yacare caiman for its skin and meat, and has successfully established commercial ties with retailers for products such as wallets, purses, belts and other accessories made from sustainably sourced yacare caiman skin.

A similar initiative is being implemented by the Ugandan National BioTrade Programme for the sustainable use of the Nile crocodile, as well as by the national government of Papua New Guinea with support from the Food and Agricultural Organisation (FAO) to maintain populations and exports of the New Guinea Crocodile[164] . The Peccary Pelt Certification Project was set up by the Durrell Institute of Conservation and Ecology (DICE) and aims to certify the peccary pelts that are used in the European leather industry for the manufacture of fine quality products, including gloves, based on sustainable community-based management[165]. The wool of the vicuña (*Vicugna vicugna*) is one of the most expensive fibres in the world, and the government of Peru have initiated a community-based project to generate and organise legal markets for vicuña wool that helps prevent illegal poaching and supports local rural development[166].

Challenges and opportunities

As consumer awareness of the importance of biodiversity, the environment, and social justice grows, so do the opportunities for major industries to adopt sustainable practices. The fashion industry is now on board and major efforts are being made to strengthen the perception that clothing can be both sustainable and fashionable. Nonetheless challenges remain in achieving this goal, particularly in the face of the cheap and disposable fashion movement that has taken hold in recent years.

- Sustainable sourcing of raw materials for textiles and accessories is often lacking. This is particularly important given the consumer preference shown for natural fibres and materials that while often of high value, without sustainable management, are likely to be less available in the future. Various labels and certification schemes for clothing and textiles have been established, especially for organic textiles; however as for organic food, not all of these focus on biodiversity. Similarly, a number of designers have released eco-fashion lines and brands, but there is no single standard for these. There is therefore a need for an internationally coordinated approach to eco-fashion, with set standards that include those related specifically to biodiversity and sustainable use.
- While consumer awareness is growing, the market for certified fashion products and textiles is still very small. For example organic fibres and textiles currently represent just 0.18% of the overall market in the case of cotton. As organic farming methods can be less productive than conventional methods, by up to 50% in the case of cotton, and the overall scale is much smaller, overall costs per unit will be higher. These markets will therefore only thrive when consumers are willing to pay more for their products. While many do, as a result of the cheap fashion alternatives available, there are major challenges to mainstreaming environmentally friendly fashion. Related to this is a need for financial support for Small and Medium sized Enterprises (SMEs) to cover the costs of entering and complying with certification schemes.
- In order to create a fair and competitive market place for eco-friendly fashion, there is a need for national level regulation to introduce minimum standards related to both environmental and social sourcing and manufacture processes that relate to a range of factors including chemical use, waste management, pollution and emissions, sustainable sourcing, and land use. These would need to apply equally to synthetic and natural fibres that can both have environmentally harmful manufacturing processes[167].

[164] Dember, S. (1990) FAO assistance in crocodile management efforts. Wildlife management for rural development. Unasylva 161. http://www.fao.org/docrep/t8850E/t8850e05.htm#fao assistance in crocodile management efforts

[165] http://www.kent.ac.uk/dice/research/peccary/home.htm

[166] Lichtenstein, G., Vilá, B. (2003) Vicuna Use by Andean Communities: An Overview. Mountain Research and Development Vol 23 (2)

[167] Fletcher, K. (2008) Sustainable Fashion and Textiles: Design Journeys http://www.earthscan.co.uk/Portals/0/Files/Sample%20Chapters/9781844074815.pdf

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- Luz, C. (2007) Waste Couture: Environmental Impact of the Clothing Industry Environmental Health Perspectives Vol. 115 No. 9, September 2007 **http://www.ehponline.org/members/2007/115-9/focus.html**
- Siegle, L. (2008) Why it's time to end our love affair with cheap fashion The Observer **http://www.guardian.co.uk/lifeandstyle/2008/aug/24/ethicalfashion (accessed 5 October 2009)**
- Sustainable Technology Education Project website **http://www.stepin.org/casestudy.php?id=ecofashion&page=2 (accessed 5 October 2009)**


2,80
1,60
5,50
5,40
5,00
2,20
10,00
9,55
9,55
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21,49
0,25
0,25
5,50
5,50
0,73
0,74
7,70
80,00
1,60

12. Finance

The finance industry constitutes the largest group of companies in the world. Banking is the largest financial services sector (24% of total assets in 2005), followed by securities (21%), insurance (18%), pensions (17%) and government related services (13%)[168]. The role of the sector in biodiversity loss and, indeed, in its conservation is increasingly being recognised. By providing financing to projects and companies, the sector has an indirect reliance and impact on biodiversity and ecosystem services.

Impacts >>> Opportunities/risks

- **Indirect impacts** through investment/ provision of financial services to company's which mismanage biodiversity.
- **Potential for positive impact** through incentivising development of biodiversity related products e.g. biodiversity offsets, REDD, payments for ecosystem services.

Dependencies >>>

- Direct dependence on biodiversity and ecosystem services is low. The sector is nonetheless exposed to risk as a result of investment, lending and the provision of financial services to companies or projects that may have a significant dependence and/or impact on biodiversity and ecosystem services.
- The nature of these indirect impacts depends on the activities of the companies being invested in and/or insured.

- **Development of new financial products** e.g. carbon credits or biodiversity offsets.
- **Differentiation and branding** e.g. HSBC's Climate Partnership.
- **New investment opportunities** e.g. biodiversity banking.
- **Reputational risk** as a result of financing environmentally damaging investments, environmental pressure groups pressurize financial institutions which may lead to reputational risks.
- **Liability and compliance risk** e.g. EU Liability directive requiring compensation payments from companies damaging natural habitats.
- **Credit risk** in cases where companies run into financial trouble due to corporate impacts on ecosystems, default risk (e.g. on corporate loans or project finance loans) may be enhanced.
- **Decreased investment returns** from disruption to business operations through natural hazards, loss of access to natural resources, increased operating costs etc.

The role of this sector in biodiversity loss and conservation can translate into either opportunity or risk, depending on whether a financial institution acknowledges biodiversity as a material risk and deals with it through sector policies, company engagement, blacklisting of companies or other forms to hedge biodiversity-related business risk.

Companies may experience loss of investment returns as a result of rising legislative costs, changing value of land, increased insurance premiums, loss of agricultural yields and insecurity of raw materials.

Finally, increases in regulation may pose a risk e.g. the EU Liability Directive which contains specific provisions on biodiversity.

The concept of sustainable finance and responsible investment is gaining ground. Recent years have seen the rapid growth of the concept of socially responsible investment with investors seeking to integrate environmental risks and opportunities within their decision-making processes. Eurosif estimated that Socially Responsible Investment[169] (SRI) assets under management in Europe totalled

[168] Mulder, I. (2007) Biodiversity, the next challenge for financial institutions? IUCN – http://www.fsd.nl/downloadattachment/70975/61666/biodiversity_the_next_challenge_for_financia_%20institutions_4%20june_07.pdf

[169] SRI (socially responsible investment) is investment that is mindful of the impact those investments have on society. SRI traditionally combines investors' financial objectives with their concerns about environmental, social and governance (ESG) issues based on a growing awareness by the population, investors, companies and governments of the impact ESG risks have on long-term issues ranging from sustainable development to long-term corporate performance (Eurosif, 2009)

€2.655 trillion as of December 31 2007, representing over 17% of the European asset management industry. Of this figure, the majority (81%) relates to activities to mainstream socially responsible investment into financial services, the remainder relates to screening strategies for portfolios which often reflect a values based approach. Although still a relatively small percentage of the overall industry, growth of this form of investment has been significant (102% since 2005 in Europe). This growth is being driven by increasing demand from institutional investors concerned about risk management, mainstreaming of environmental, social and governance considerations into traditional financial services, external pressures from civil society and a growing interest from individuals. The US holds the biggest market with US$ 2.7 trillion in assets under management. The market in Asia is still emerging. The global financial crisis, far from slowing down this trend, appears to have raised the sensitivity of individuals, companies, investors and governments to unmanaged risks such as environmental risks[170]. Social Investment groups such as Eurosif, UKSIF and AsRia are all working to encourage increased industry engagement on environmental issues.

A plethora of new investment products are being developed, driven in part by institutional environmental, social and governance (ESG) mandates, but encouraged by a growing awareness of the finite nature of resources prompted by shifting commodity prices, raw material inputs and global consumption patterns. More sophisticated ESG specific products are being developed, or teams of analysts formed, to provide overlaid ESG analyses across all investment projects. Thematic funds are also being developed on issues such as climate change, water and agriculture with the intent of securing a return through the development of innovative solutions to these issues[171].

Biodiversity initiatives

Overview

Activity within the financial sector on the issue of biodiversity and ecosystem services itself is growing, although it remains limited. Preparatory documents for the last business and biodiversity challenge meeting in Sao Paulo in Brazil in 2005[172] showed only three initiatives of relevance to the financial sector – this has expanded considerably. A number of principles, criteria, and tools for incorporating environmental assessments as part of investment, lending and insurance processes have been developed, in many cases through collaborations between industry groups/individual financial institutions and conservation organizations. Activity is underway both to understand risk exposure, to build brand (such as the HSBC Climate Partnership), and to realize new investment opportunities e.g. biodiversity offsets, water credits, forest carbon credits and sustainable agriculture. The latter perhaps offers the most exciting opportunity for biodiversity and ecosystem services. A number of financial institutions are now servicing new and mainstream markets particularly for forest linked carbon credits and water. Macquarie Capital and Merrill Lynch are financing the development of projects aimed at generating emissions reduction credits from forest conservation under the emerging policy on the Reduction of Emissions from Deforestation and Degradation or REDD. In their report 'Bloom or Bust', the UNEP Finance Initiative predicted an increase in such opportunities as a result of increasing legitimacy of returns from the carbon markets and a realization that ecosystem services can provide acceptable rates of return[173].

Biodiversity from a risk perspective: Principles, guidelines and tools to hedge against environmental risks and opportunities into decision-making processes

Several overarching frameworks, principles and tools have been developed to encourage and guide the assessment of environmental risk as part of the investment, lending and/or insurance process. At the industry level, the Collevecchio Declaration on Financial Institutions and Sustainability, the UNEP Statement by Financial Institutions on the Environment & Sustainable Development and the US 'Guidelines for Responsible Investment" lay out general principles for including environmental, social, and governance issues into decision-making in lending, investment, and insurance operations.

At the sector level, the Principles for Responsible Investment set out general principles for asset managers and institutional investors for including environmental governance as part of the investment analysis and decision-making process. These now have considerable reach with over 550 companies representing US$ 18 trillion in assets, now signatories to the Principles. Although, none of these principles make specific reference to biodiversity and ecosystem services, they act as potential frameworks for encouraging action on environmental risk and opportunity management more broadly. The NGO Banktrack acts as a watchdog on the finance sector, holding it accountable to civil society for their environmental and social performance. Biodiversity is part of a wider range of ESG issues that Banktrack addresses in this respect.

A number of principles, guidance, tools and initiatives are being developed aimed specifically to address biodiversity. Some of the key initiatives are listed in Table 17.

[170] Principles for Responsible Investment (2009) Report on Progress 2009
[171] UNEP Finance Initiative (2009) Fiduciary responsibility. Legal and practice aspects of integrating environmental, social and governance issues into institutional investment
[172] Business and biodiversity initiatives. A background document for the second Business and the 2010 Biodiversity Challenge meeting in São Paulo,3-5 November 2005
[173] UNEP Finance Initiative (2008) Biodiversity and Ecosystem Services: Bloom or Bust? UNEP FI: Geneva

Table 17. Biodiversity related initiatives aimed at integration of biodiversity risks and opportunities into decision making

Principles	
Equator Principles www.equator-principles.com	Provides a voluntary framework for addressing social and environmental issues in project financing. Requires project sponsors to assess a project's impacts on biodiversity (including specifically impacts on ecosystem services and natural habitats, the introduction of invasive alien species, sustainable use, and social impacts). The onus is placed on project sponsors to assess potential biodiversity impacts, avoid impacts where possible and mitigate remaining impacts through habitat and species management plans, offsets or other mechanisms. Apply to project finance and advisors on projects over US$10 million in non-OECD countries. About 80% of global project finance operates under the umbrella of the Equator Principles.
Guidance and research	
Eurosif www.eurosif.org	Umbrella association to cover socially responsible investment issues at the European Level. Produced a guidance document on biodiversity and ecosystems with Oekom[174].
DamRight! An Investor's Guide to Dams (WWF) http://assets.panda.org/downloads/investorsguidedams.pdf	Provides investors – officials of commercial and multi-lateral development banks, government aid agencies, export credit agencies and governments – with an overview of the benefits, costs, and risks associated with dam investments, as well as options for mitigating impacts. A checklist to aid decision-making is provided.
A Guide to Biodiversity for the Private Sector (International Finance Corporation) www.ifc.org	Designed to help companies operating in emerging markets better understand their relationship to biodiversity issues and how they can effectively manage those issues to improve business performance and benefit from biodiversity.
Is biodiversity a material risk for companies? (F&C) www.businessandbiodiversity.org	An evaluation of the risks and opportunities linked to biodiversity performed by UK based asset manager F&C. Provides an analysis of materiality of a FTSE sectors in relation to the issue of biodiversity which can be used by investors to prioritise effort.
Tools	
The Biodiversity Benchmark (Insight Investment and Fauna & Flora International)	A methodology is presented to evaluate corporate management of biodiversity in the mining, oil and gas and utilities sectors. An analysis was conducted on 22 and then 36 companies in these three sectors and the companies ranked according to the quality of their performance. The information was used by Insight Investment to encourage performance improvement in the companies evaluated[175]. F&C undertook a similar study.
Biodiversity quickscan (VBDO and CREM) www.vbdo.nl	Dutch organization of investors for sustainable development. Developed a tool[176] that uses a number of steps to quickly measure the biodiversity impact of a company in order to gather information to inform a dialogue with the companies. Developed for the financial and food sectors.
The Natural Value Initiative – The Ecosystem Services Benchmark[177] (Fauna & Flora International, FGV and UNEP Finance Initiative www.naturalvalueinitiative.org	Tool to enable institutional investors to better understand the risks and opportunities associated with their investment's management of their impacts and dependence on biodiversity and ecosystem services. Focus on the food, beverage and tobacco sectors but relevant for companies with agricultural supply chains. Developed with investors Aviva Investors, F&C Investments, insight Investments, Pax World, Grupo Santander and VicSuper. Collectively these have assets under management of approximately Euro 400 billion.
Dams and Development. A Framework for Decision Making. (World Commission on Dams)[178] http://www.unep.org/dams/WCD/ www.internationalrivers.org/	Developed in conjunction with World Bank and IUCN, this sets out a set of recommendations for sustainable construction of dams. The WCD recommendations form the basis for many decision-making processes for dams around the world and constitute international soft law. They are also being adapted to national contexts in various public dialogue processes around the world.

[174] Biodiversity (2009). Theme Report – 2nd in a series. Eurosif and Oekom - http://www.oekom-research.com/homepage/eurosif-sr_biodiversity.pdf (Last accessed on 27/04/2010)
[175] Biodiversity: Towards Best Practice for Extractive and Utility Companies
[176] Schaick et al., 2005. Quick Scan Biodiversiteit voor de voedingssector and financiele sector
[177] Grigg, A., Cullen, Z., Foxall, J., Crosbie, L., Jamison, L., and Brito, R. (2009) The Ecosystem Services Benchmark. Fauna & Flora International, United Nations Environment Programme Finance Initiative and Fundação Getulio Vargas - FGVhttp://www.naturalvalueinitiative.org/content/005/501.php
[178] Dams and Development: A New framework for Decision-Making

Table 17. *continued*

Integrated biodiversity assessment tool (IBAT) (UNEP-WCMC, Conservation International, Birdlife International and IUCN) www.ibatforbusiness.org/	IBAT provides decision-makers with access to critical information that supports planning and implementation of environmental safeguard policies and industry best practice standards. IBAT includes globally compiled spatial and tabular data drawn from established networks of national and regional sources on protected areas (World Database on Protected Areas), sites of global conservation importance (Key Biodiversity Areas, including Important Bird Areas and Alliance for Zero Extinction sites) and globally threatened species (The IUCN Red List of Threatened Species). These represent the majority of globally compiled biodiversity databases available at the scale of individual sites and species ranges. The International Finance Corporation, the Inter American Development Bank and J P Morgan are examples of organisations currently using the tool.
Investment Screening Guidelines for Financial Investors (WWF) Not yet available www.wwf.org.uk	Aims to encourage support for responsible forest finance. Identifies key environmental and social principles and criteria that need to be considered in all investment decisions pertaining to the forest sector, such as timber, pulp and paper, and other sectors whose activities impact forests, including palm oil cultivation and mining.
The Palm Oil Financing Handbook Practical guidance on responsible financing and investing in the palm oil sector (WWF) www.wwf.com http://assets.panda.org/downloads/the_palmoil_financing_handbook.pdf	Aims to help financial institutions reduce the environmental and social risks associated with transactions in the palm oil sector. Focuses on developing and implementing a responsible palm oil finance and investment policy.
Initiatives	
The Finance Lab (WWF, Institute of Chartered Accountants in England and Wales, Reos Partners and the Said Business School)	Aims to re-think the financial system and take practical action to stimulate transformational change, so that finance serves the interests of society and the environment. Concluding in 2010.
Forest Footprint Disclosure Project (Global Canopy Programme) www.forestdisclosure.com	Aims to provide high-quality market analysis for investors by helping businesses with a number of steps: recognition, measurement and management of their impact on forests. Endorsed by investors with collective funds under management of US$2.2 trillion.
Natural Value Initiative www.naturalvalueinitiative.org	Aims to: 1) build awareness of corporate dependence and impact on biodiversity and ecosystem services and the links to corporate risk, 2) build expertise both in companies and investors on evaluating and managing biodiversity and ecosystem services risks and opportunities and 3) stimulate improved performance within the private sector and encourage greater reward of responsible behaviour.

Individual financial institutions have also developed their own lending and investment conditions. For example, the International Finance Corporation (IFC) developed a set of Performance Standards with which its clients are obliged to comply, one of which (number 6) is Biodiversity Conservation and Sustainable Natural Resource Management (which also applies to the Equator Principles). These are particularly important because they form the basis of the requirements that Equator Principles banks sign up to. In the commercial world, HSBC has developed specific standards to be followed when lending to or investing in companies or projects in a number of industries — chemicals, energy, forestry, freshwater infrastructure, and mining and metals — as well as activities that HSBC will not finance, such as operations in UNESCO World Heritage Sites and Ramsar wetlands of international importance. Rabobank screens potential customers and financing applications against criteria that include biodiversity considerations, and has developed specific conditions for its involvement in palm oil plantations in Indonesia as well as a soy supply chain policy for assessing soy trading companies and processors.

An IUCN study carried out in 2006 – 2007 (Mulder, 2007) analysed how eleven banks account for biodiversity in their business operations. This revealed that most of the banks issue a CSR report, have an environmental risk standard in place and use the Equator Principles in project finance transactions in excess of US$ 10 million. Furthermore, 6 of the 11 banks had a forest guideline in place, which is directly related to biodiversity as it excludes operations in certain areas (e.g. World Heritage Sites or High Conservation Value Forests). Furthermore, some banks also developed policies for their clients in the oil & gas business (2 out of 11), mining (2 out of 11), hydropower infrastructure (3 out of 11), agriculture, fisheries and the hotel/leisure sector (all 1 out of 11).

A follow-up analysis of 50 large banks (using Fortune Global 500 data on company revenue) carried out in 2008 – 2009 (Mulder, in progress) delved deeper into

the topic by focusing how biodiversity is addressed on a group or holding level, within lending (corporate banking and project finance) and within equity investments (in so far it concerns a bank's own assets). Results indicate that 50% of the financial institutions have a written statement in which they recognize their indirect impact on biodiversity. 30% have a biodiversity policy in place, either separate or as part of an environmental policy. More interesting is to see what banks do to embed biodiversity as part of their lending and equity activities. Within lending results reveal that 65% of the banks have adopted the Equator Principles, effectively saying that they also look into biodiversity issues for environmentally and socially controversial projects (category A & B).

In corporate banking, which constitutes a much larger share of the business for many banks than project finance, banks employ three sorts of tools: 1) Environmental and Social Risk Assessment (ESRA); 2) credit policies; and 3) engagement policy. The first concerns a more generic environmental and social risk assessment (ESRA). Since such an ESRA is in many cases aligned with the World Bank's Environmental Health and Safety guidelines (EHS) that include many sector guidelines that deal with biodiversity, banks in essence account for biodiversity issues in lending applications for which significant environmental impacts can be expected. 33% of the banks assessed have an ESRA.

The second tool banks use are credit policies for clients in environmentally sensitive sectors. 32% of the banks developed a sector policy for clients and projects in the forestry sector. The guidelines found stipulate when a bank refrains from investing or financing any activities in protected areas – "red-lining investments" - activities involving illegal logging, and support certification for sustainably harvested timber (such as the Forest Stewardship Council – FSC – certification). About a fifth of the banks have also developed guidelines for environmentally sensitive sectors such as oil and gas (20%), mining (18%) and agriculture (especially related to biofuels – 16%). Few banks have so far developed sector guidelines for other environmentally sensitive sectors, such as the fisheries sector (6%), tourism and leisure (4%), and construction and infrastructure (8%). Rather than disengaging within clients when they do not meet a bank's increasingly stringent targets on environmental and social issues, about 15% of the banks researched have an engagement policy to work together with clients to make them more sustainable on a step-by-step basis. Several members of the UNEP Finance Initiative (UNEP FI) Biodiversity and Ecosystem Services Work Stream, encourage investee companies to improve their management of biodiversity risks and impacts in this way.

Few banks so far take account of biodiversity in equity investments. Since credit policies are not useful in this case, banks could make use of 'black lists' or a best-in-class approach to differentiate between companies within a certain sector based on their biodiversity performance. To apply this in practice data and tools need to be available. The Natural Value Initiative and the Biodiversity Benchmark are examples of tools that can be harnessed by asset managers and investors alike.

A number of thematic initiatives that focus on other environmental issues such as climate change or water are of direct relevance to biodiversity and ecosystem services. The CEO Water Mandate[179], for example, requires careful management of water resources throughout the supply chain, which has implications for biodiversity. The UN Principles for Responsible Investment has endorsed the requirements of the Mandate and written on behalf of their members to request the 100 largest companies in the world to sign up to it. Similarly, the Climate Wise Principles give general principles for including climate change in insurance activities and the Carbon Disclosure Project asks companies on behalf of 475 investors holding US$55 trillion to disclose their greenhouse gas emissions. This requirement was recently extended to incorporate supply chain emissions which will ultimately address emissions from the conversion of land – these clearly have implications for biodiversity.

Biodiversity as a business opportunity: "Green" products, services and investments

Some institutions have launched branded "sustainable" or "ethical" funds that only invest in businesses meeting certain environmental and social criteria. A number of thematic funds have emerged which focus on companies working towards solutions for specific environmental challenges, such as low-carbon technologies to help avoid dangerous climate change.

In general, these funds are only indirectly related to biodiversity. However, two of the sustainability indices launched to track the financial performance of leading sustainability-driven companies worldwide cite biodiversity as a material issue, namely the Dow Jones Sustainability Index and BOVESPA (the Brazilian Stock Exchange). These are bringing increasing attention to biodiversity issues, and financial institutions are referring to these indices when designing new products.

Rather than screening investments, some mainstream asset managers offer an engagement overlay as part of their product, committing to engage with the companies in which they invest to improve their performance on a range of governance, social, ethical

[179] The CEO Water Mandate http://www.unglobalcompact.org/docs/news_events/8.1/Ceo_water_mandate.pdf

and environmental issues. Some, including Insight Investment, F&C Asset Management and several members of the UNEP Finance Initiative (UNEP FI) Biodiversity and Ecosystem Services Work Stream, encourage investee companies to improve their management of biodiversity risks and impacts.

In addition, some financial institutions are involved in emerging markets for green financial products directly related to biodiversity, including payment for ecosystem services (PES), biodiversity offsets, conservation mitigation banks. These markets may still be relatively small, but are bound to grow in the near future, as the pressure to conserve biodiversity will likely continue to rise. A report by Ecosystem Marketplace identified 36 active biodiversity mitigation programme around the world with over 600 individual mitigation banks that represented a market value of US$ 2 – 3 billion. One example of an institution dedicated to biodiversity offsetting is CDC Biodiversité, a subsidiary of the French Caisse des Dépôts et Consignations. For those wishing to explore the potential opportunities around PES, the Katoomba Group's Ecosystem Market Place[180] offers a good starting point.

The Forest Carbon Partnership Facility and similar funding schemes are working to enable the development of viable markets for forest carbon or biocarbon credits. A growing number of financial institutions are also active in new carbon and water markets which are related to ecosystem services, such as forestry-linked carbon credits. The cumulative carbon market value, as estimated by the Ecosystem Marketplace in their State of the Forest Carbon Markets report (2009), is about US$ 149 million. This includes trading biocarbon credits on the Chicago Climate Exchange (CCX), over-the-counter (OTC) deals, and to a very minor extent via the Clean Development Mechanism (CDM).

Another example of green products and services are those that directly encourage environmentally friendly choices through, for example, reduced insurance rates and lower loan interest rates for energy efficient cars, housing, and buildings. Furthermore, a number of conservation groups, development banks, green investment entrepreneurs and non-profit groups provide finance to micro, small and medium sized enterprises whose operations or products aim to directly or indirectly reduce biodiversity impacts, such as companies working in the ecotourism, sustainable agriculture, fisheries or forestry, renewable energy, or energy efficiency sectors.

A selection of for-profit and not for-profit investment funds, programmes and initiatives that are currently running or in development are listed in Table 18.

Table 18. An overview of biodiversity investment funds, programmes and initiatives

Environmental Business Finance Programme (International Finance Corporation) www.ifc.org/ifcext/enviro.nsf/0/05f8a3f864185bdf85256ea2006683ed?OpenDocument	$20 million in funds from the Global Environment Facility will support micro, small, and medium enterprises working on global environmental issues. Targeted businesses will include those active in renewable energy and energy efficiency, ecotourism, sustainable agriculture, and agroforestry.
EcoEnterprises Fund (The Nature Conservancy, supported by the Inter American Development Bank) www.ecoenterprisesfund.com/about.html	Aims to demonstrate that investment in small and medium-scale enterprises contributes to conservation and business success. Provides direct investment capital to support ecosystem markets and community livelihoods, helping sustainable businesses reach scale and maximize conservation and social impacts. EcoE II will target small and growing businesses in sustainable industries such as organic agriculture (including apiculture, aquaculture and community-based energy), ecotourism, sustainable forestry, and non-timber forest products. EcoE II seeks to raise US$ 30 million in capital with an initial closing at US$ 15 million. Lead investors are being sought for commitments of US$ 5 million. Up to US$ 750,000 in donations and grant-based funding will be raised in order to offer technical assistance and business advisory support to complement investment activities.
Verde Ventures (Conservation International) www.conservation.org/sites/verdeventures/about/pages/default.aspx	Provides debt and equity financing to businesses that benefit healthy ecosystems and human well-being, such as agroforestry, ecotourism, sustainable harvest of wild products and marine initiatives.
Root Capital www.rootcapital.org/	Nonprofit social investment fund provides capital, financial education, and market connections to small and growing businesses that build sustainable livelihoods and transform rural communities in poor, environmentally vulnerable places.
Central American Markets for Biodiversity Project. (Central American Bank for Economic Integration, UNDP, FMAM) www.proyectocambio.org/english/index.html	Aims to remove barriers and create an empowering environment to catalyze biodiversity friendly investments, in sectors like organic agriculture, sustainable forestry, agro-forestry, forest grazing system, sustainable tourism, certified aquaculture, and sustainable fishery. Focus on Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

[180] http://www.katoombagroup.org/

Table 18. *continued*

Finance Alliance for Sustainable Trade www.fastinternational.org	Brings together lenders and producers to increase the number of producers in developing nations who can successfully access quality trade finance, tailored to their business needs, as they enter sustainable markets. 137 members in 26 countries include sustainable small and medium enterprises, commercial and socially oriented lenders, development focused non-governmental organizations, and others involved in sustainable trade.
New Ventures Programme (World Resources Institute) www.new-ventures.org/	Promotes sustainable growth in emerging markets by accelerating the transfer of capital to businesses that deliver social and environmental benefits at the base of the economic pyramid.
Pro-biodiversity business (RSPB) www.smeforbiodiversity-steppes.com/	Funded by EBRD, this aims to identify financial structures and instruments that will provide the market mechanism necessary for the long-term sustainability of selected micro, small and medium enterprises (SMEs) operating in steppe ecosystems, covering parts of Kazakhstan, Moldova, Russia and Ukraine.
Biodiversity Technical Assistance Project in Bulgaria, Hungary and Poland (RSPB) www.smeforbiodiversity.eu	Seeks to direct commercial loan funding along with public subsidies to create or develop profitable micro, small and medium enterprises that maintain or enhance biodiversity. Focuses on those areas of nature that have been recognised as high value and that are included in the NATURA 2000 network. These include the large majority of Important Bird Areas (IBAs) as defined under the Habitats and Birds Directives. Funded by the European Commission DG Environment.
Amazon Bond Fund+ by Bio Assets	The Amazon Bond Fund+ (The Amazon Value Fund) is currently being developed with one of the world's leading financial institutions. It is a Brazilian fixed income fund that will invest a percentage of their annual interest income into 'The Amazon Value Fund', to create economic value over the next 4 years on 98.632 hectares of land in the Brazilian Amazon close to Belem. Financial characteristics: • Fixed Income Bond size EUR 200 million; • Invested in Brazilian Treasuries Bonds, which are currently yielding above 9% per annum; • Hedging switch mechanism to help protect currency fluctuation; • ¼ of Annual Interest destined to implement a number of projects.
Australia New Zealand Forest Fund (ANZFF)	The Fund will invest in a portfolio of forestry and environmental assets in Australia and New Zealand, with total returns generated from a mix of capital appreciation from land value and biological growth, plus yield from the sale of certified timber, land leasing and sales of environmental products and services (e.g. carbon and biodiversity credits). Investment vehicle will be an Australian Unregistered Unit Trust. The investment term is 10 years. Initial close of at least AU$ 100 million in Committed Capital with a minimum capital commitment by any individual unit holder of AU$ 10 million. Total capital raisings to be no more than AU$ 400 million Committed Capital. The fund intends to focus on direct ownership of timberland assets and does not intend to invest in other timberland funds, equities or derivatives
Biodiversity products and services of Bialowieza Forest Natura 2000 area (Poland)	A fund of approximately EUR 10 million needs to be established in order to set up lending schemes with loan conditions suiting local economy conditions and financial absorption capacity of SMEs. The fund is aimed to support the development of sustainable private businesses along with the state Programme of Sustainable Development of the Bialowieza Forest.
Verama Agroforestry Project Madagascar	The Verama project represents unique agronomic innovation applied to a commercial plantation of cashew nuts on degraded land that aims to become the starting point of a sustainable industry in Madagascar and potentially for Africa through the African Cashew Initiative financed by the Gates Foundation and operated by GTZ. The project also includes strong social and environmental impacts including carbon sequestration, 2600 jobs and community infrastructures for 14000 people in a remote area of Madagascar. The project also includes reforestation of 8000 hectares with 2 million trees with high carbon sequestration potential. This project is supported by WWF and UNEP.

Table 18. *continued*

Conservation Stewards Programme (CSP) http://www.conservation.org/sites/csp/Pages/partnerlanding.aspx	The Conservation Stewards Program (CSP) utilizes Conservation Agreements to support and enable local communities to be the stewards of their resources. Protecting biodiversity and key ecosystem services in areas where poor people live underlines the need for designing conservation mechanisms that provide development opportunities to local populations. Rural farmers and local communities will choose to protect key biodiversity areas around the world if conservation benefits them in concrete ways. Through a conservation agreement, resource users choose conservation in exchange for benefits that compensate for foregone income from this choice. These benefits are provided conditional on meeting conservation goals, all jointly defined through a participative process.
Critical Ecosystem Partnership Fund (CEPF) http://www.cepf.net/Pages/default.aspx	Founded in 2000, the Critical Ecosystem Partnership Fund (CEPF) is a global leader in enabling civil society to participate in and benefit from conserving some of the world's most critical ecosystems. They provide grants for nongovernmental and private sector organizations to help protect biodiversity hotspots, Earth's most biologically rich yet threatened areas. The convergence of critical areas for conservation with millions of people who are impoverished and highly dependent on healthy ecosystems for their survival is more evident in the hotspots than anywhere else. CEPF was founded in 2000 and awarded its first grant in 2001. It has supported over 1,500 partners and committed US$ 113.8 million in grants.
The Eco Products Fund (EPF) (including the Malua Biodiversity Bank)	The Eco Products Fund (EPF) is a US$ 100 million private equity vehicle investing in mainly US-based markets for ecosystem services. It was set up and is jointly managed by Equator Environmental and New Forest. EPF returns are driven by the sale of environmental credit positions related to carbon, biodiversity and water related assets. EPF primarily invests in US forest carbon markets; wetlands and stream mitigation banks and endangered species conservation banks regulated by US federal legislation; and nutrient trading and water quality programme. EPF has a limited international allocation. Biodiversity impacts vary from project to project including species and scale. For example, the Malua Biobank is protecting and restoring 34,000 hectares of lowland dipterocarp forest, which provides habitat for orangutan, rhino, pygmy elephant, sun bear, clouded leopard, and many species of tropical birds. Investors include: US and UK based institutional investors such as endowments, private equity vehicles, family offices, and high net worth individuals.
Ecosystem Investment Partners (EIP) http://www.ecosystempartners.com/	Ecosystem Investment Partners (EIP) is a private equity management firm established in 2006 to capitalize on environmental markets that pay landowners for the ecosystem services generated by the conservation and restoration of their properties. Building upon the well established markets surrounding wetland, stream and endangered species mitigation, environmental markets are rapidly expanding into a wide array of investment opportunities including water quality trading, water quantity transactions and carbon sequestration. EIP uses these market mechanisms to generate attractive investment returns on priority conservation properties it acquires throughout the US. Through its extensive and deep relationships with the nation's leading conservation organisations and agencies, EIP has unique access to some of the most desirable and ecologically significant properties in the US.
Ecosystem Services Certificate	Valuing the services of the standing forest – conserved and sequestered carbon (natural CCS). The expected additional value creation over time is water and biodiversity. Financial characteristics: • Investment size (per annum): US$ 7 million per annum and expected to become US$ 10 billions per annum; • Revenue streams: revenues from natural CCS and other markets in forest services as they develop; • Investors/ sources of finance: institutional investors; • Other financial information: 53 nations are already stakeholders in Iwokrama and it is listed on Chicago Climate Exchange; • Potential to scale up: opportunity to develop standards for others to emulate.
The Global Conservation Fund (GCF) http://www.conservation.org/sites/gcf/Pages/partnerlanding.aspx	The GCF finances the creation, expansion and long-term management of protected areas. GCF provides financial and strategic assistance to enable local communities, NGOs and governments to protect their biological riches. This non-profit initiative has a US$ 100 million in funding from the Gordon and Betty Moore Foundation, of which 100% is committed.

Table 18. *continued*

Macquarie Capital and FFI – Carbon Forest Taskforce http://www.fauna-flora.org/news_macquarie.php	Macquarie Capital and FFI have created an international taskforce of carbon, community, conservation and financial specialists to develop and manage avoided deforestation projects. The Taskforce is expected to launch at least six projects over three years, with more projects in the pipeline.
Papua REDD, Indonesia	New Forests (co-manager of the Eco Products Fund) is developing two REDD projects covering some 226,094 hectares gross over two sites (Mamberamo and Mimika) in Papua Province, Indonesia. Initial estimates of threat from clearance and biomass present would indicate some 20 – 30 million tonnes of carbon offset. It is proposed credits would be registered through VCS and CCB standards.
Biodiversity Technical Assistance Project in Bulgaria, Hungary and Poland (RSPB) www.smeforbiodiversity.eu	Seeks to direct commercial loan funding along with public subsidies to create or develop profitable micro, small and medium enterprises that maintain or enhance biodiversity. Focuses on those areas of nature that have been recognised as high value and that are included in the NATURA 2000 network. These include the large majority of Important Bird Areas (IBAs) as defined under the Habitats and Birds Directives. Funded by the European Commission DG Environment.

Source: Nyenrode, IUCN, 2009. Boosting Investments in Biodiversity and Ecosystem Services. Projects Portfolio. Conference held 11 – 12 November 2009. Amsterdam, the Netherlands.

Differentiating brands

Increasingly, some banks are also using biodiversity to differentiate their brands, retain and recruit good employees and attract new customers. For example, HSBC and Nedbank's Green Trust — founded jointly with WWF-South Africa in 1990 to protect the biodiversity of South Africa — donates money to conservation projects based on customer use of their products, while mecu's Conservation Landbank offsets biodiversity loss and greenhouse gas emissions associated with its business as well as loans for new cars and new housing construction. HSBC has a long standing partnership with WWF, the Smithsonian Institute, Earthwatch and the Climate Group which aims to tackle the causes and impacts of climate change. The Co-Op in the UK has produced a credit card 'think' that donates 25p for every £100 spent to a rainforest conservation project in Indonesia. Barclays have produced a similar credit card called 'breathe'.

It is clear that there is considerable activity on this issue. However, despite this increase in engagement from the finance sector, the majority of financial institutions remain unengaged on this issue. And challenges remain to mainstreaming biodiversity and ecosystem services into the different segments of the financial services sector.

Challenges and opportunities

There are some emerging opportunities for green investments that go beyond risk management. For example, the emergence of markets for ecosystem services such as forest carbon through the Reduction of Emissions from Deforestation and Degradation (REDD) offers opportunities for investors to develop new financial products, invest in new industries and secure returns which appeals to an emerging set of socially and environmentally conscious investors. While such examples are encouraging, there remain a number of challenges to achieving widespread standards on lending, investment and insurance such that there is fair and equitable accounting of biodiversity across financial institutions:

- **Understanding and awareness of biodiversity within the finance industry generally remains low:** contributing factors include; uncertainty over cause and effect, lack of clarity over responsibility and materiality of risks, a failure to adequately value biodiversity and ecosystem services (externalities), lack of skills and expertise amongst the finance sector and their advisors, and free-riders
- **Lack of widely used tools for assessing and managing risks and opportunities associated with a company's management of its biodiversity impacts and dependence:** There is a need to develop consistent lending, investment and insurance policies and other tools related to biodiversity and ecosystem services. A number of tools and guidance have been developed (as outlined above), however, these are not widely used within the sector and work is required to raise awareness and uptake of these tools within the sector through training or learning networks.
- **Short-term focus reduces risk and prevents action:** the short-term nature of most investments means that investors can receive the benefits of natural resource exploitation but avoid the costs. In essence privatizing profits while socializing the costs of ecosystem degradation.

- **Greater focus on quantifying the business case from a risk perspective.** Though it is very difficult to quantify biodiversity risk in terms of tangible financial metrics, such as the credit default risk, shareholder value at risk, or a percentage of market capitalization, a process should be started to quantify biodiversity risks for financial institutions in a systematic way to the extent possible.
- **Failure to adequately value biodiversity and ecosystem services** currently the costs and benefits of unsustainable use of biodiversity and ecosystem services are borne by different parties. A review commissioned by the G8 + 5 and sponsored by the European Commission – the Economics of Ecosystems and Biodiversity (TEEB) – is underway to demonstrate the cost to society of this loss, and to set out recommendations of how policy makers, business, civil society and local governments can act to address it.
- **Continue to build the 'positive' business case for biodiversity by focusing on monetary and strategic opportunities.** This chapter has shown a broad overview of for-profit and not for-profit investment funds, initiatives and programmes underway. It underscores the strategic opportunity for the financial sector to become involved (e.g. from a reputational perspective) in markets for biodiversity and ecosystem services. In addition, the list mentioned in this chapter provides a growing number of commercial funds that seek to capitalize on the need to reduce deforestation and conserve biodiversity.

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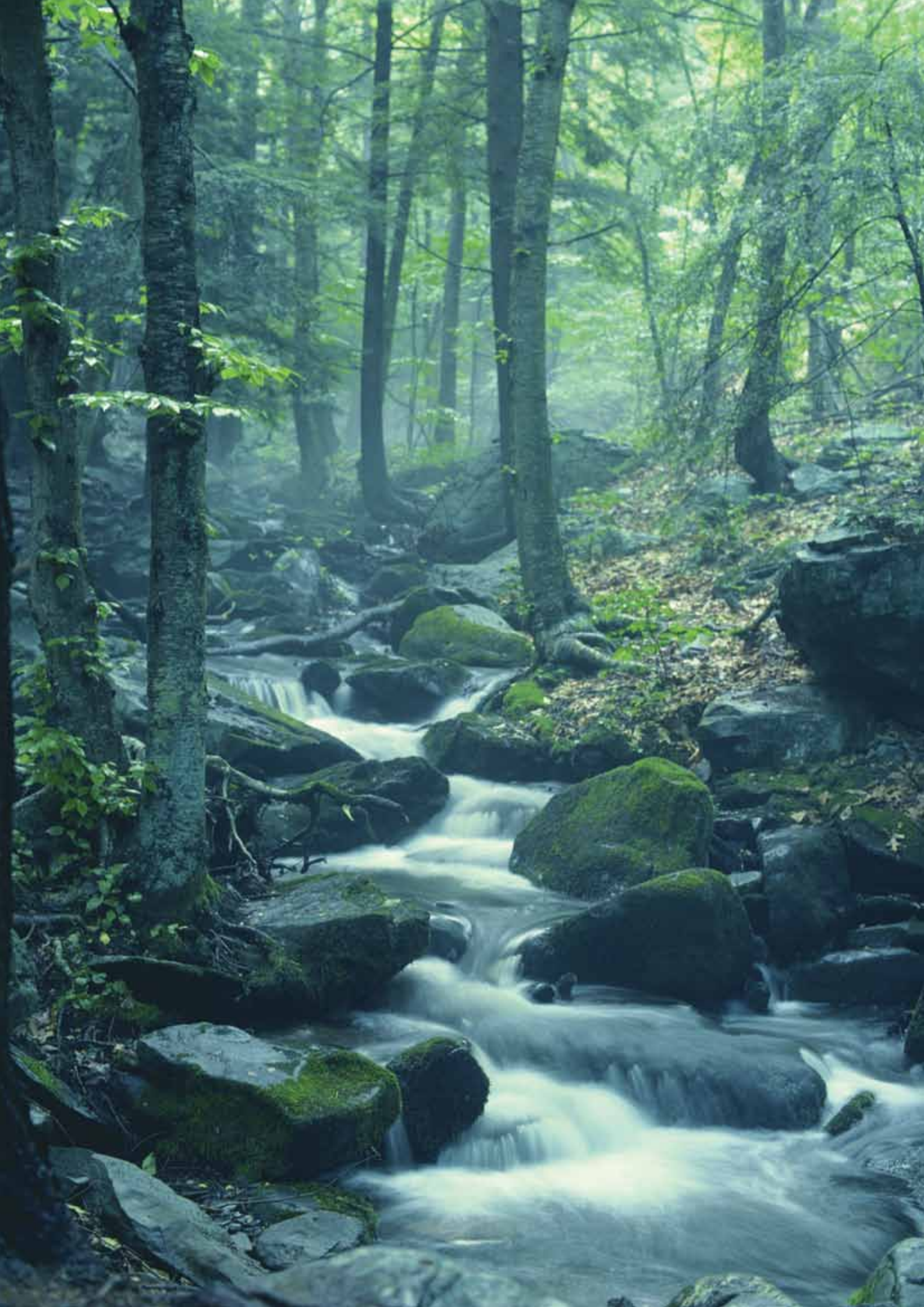

Conclusions

Biodiversity will be greatly affected by the way in which companies grow and develop. Business as usual, will result in the continued loss of biodiversity and degradation of ecosystems that will compromise the needs of society, including companies. There are, however, opportunities to develop alternative corporate biodiversity policies and practices, as illustrated in this publication.

Many companies and industry associations have developed frameworks, principles, guidelines and tools to minimize biodiversity impacts of operations and seize opportunities of emerging biodiversity markets. In some cases, these efforts are industry-wide, while others are regional or national. Many initiatives are in collaboration with industry peers, conservation groups or academic institutions, highlighting the importance of partnerships in tackling these challenges. The most ambitious biodiversity commitments and examples of good practice have tended to come from individual companies.

Within the pharmaceutical and cosmetic industries, advances have been made to implement policies on access and benefit-sharing; one of the three objectives of the Convention on Biological Diversity. This is especially important given that new medically active compounds are often discovered in biodiversity-rich areas in developing countries, and that many natural ingredients for cosmetics are sourced from regions with significant poverty.

Despite these efforts, the challenge of achieving wide-scale adoption and promotion of biodiversity-friendly policies and practices remains. While markets for sustainably produced food and materials are growing, they still represent a small percentage of the overall markets for such commodities, and while some companies have adopted principles and follow good practice guidelines, the perceived costs of considering biodiversity prevents many others from doing the same, in particular, small and medium sized enterprises, state-owned companies, and artisanal and small-scale producers.

Issues behind this lack of engagement include lack of long-term vision, limited knowledge and awareness, lack of compliance mechanisms, and a lack of regulation and good governance of natural resources.

Alternative management systems, technologies and/or practices that deliver biodiversity benefits are often secondary considerations behind short-term economic factors. Limited knowledge, understanding and technical expertise on the impacts of various activities on biodiversity, how to minimize these impacts, and how to enhance biodiversity impedes action. A lack of mechanisms for ensuring that companies meet commitments made through, or principles and criteria set by, industry groups impedes effectiveness, and the lack of strong legal and regulatory frameworks, particularly in developing countries, creates an unfair environment for those companies wishing to follow responsible and sustainable practices.

Companies face an opportunity to play a leading role in addressing one of the greatest threats posed to society – the loss of biodiversity and degradation of ecosystems. 2010 is the International Year of Biodiversity when the world's attention is turning to biodiversity. It is a time for innovation and mainstreaming. Further engagement of companies is needed to make this possible and demonstrate that market success need not come at a significant and future cost to society as a whole.

About the UNEP Division of Technology, Industry and Economics

The UNEP Division of Technology, Industry and Economics (DTIE) helps governments, local authorities and decision-makers in business and industry to develop and implement policies and practices focusing on sustainable development.

The Division works to promote:

- sustainable consumption and production,
- the efficient use of renewable energy,
- adequate management of chemicals,
- the integration of environmental costs in development policies.

The Office of the Director, located in Paris, coordinates activities through:

> **The International Environmental Technology Centre** - IETC (Osaka, Shiga), which implements integrated waste, water and disaster management programmes, focusing in particular on Asia.

> **Sustainable Consumption and Production** (Paris), which promotes sustainable consumption and production patterns as a contribution to human development through global markets.

> **Chemicals** (Geneva), which catalyzes global actions to bring about the sound management of chemicals and the improvement of chemical safety worldwide.

> **Energy** (Paris and Nairobi), which fosters energy and transport policies for sustainable development and encourages investment in renewable energy and energy efficiency.

> **OzonAction** (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition to ensure implementation of the Montreal Protocol.

> **Economics and Trade** (Geneva), which helps countries to integrate environmental considerations into economic and trade policies, and works with the finance sector to incorporate sustainable development policies.

UNEP DTIE activities focus on raising awareness, improving the transfer of knowledge and information, fostering technological cooperation and partnerships, and implementing international conventions and agreements.

For more information, see **www.unep.fr**

This publication provides an overview of the impacts and dependencies that business has on biodiversity and ecosystem services and the associated risks and opportunities.

It highlights existing initiatives to address biodiversity and ecosystem services and harness potential opportunities.

The overall aim is to raise awareness and to provide a useful reference of existing tools, standards and guidance to support companies in adopting biodiversity-friendly policies and practices.

The document covers a wide range of sectors – mining, energy, agrifoods, fisheries and aquaculture, construction, forestry, tourism, pharmaceuticals, cosmetics, fashion and finance.

It presents the business case for managing biodiversity and includes a range of tools and initiatives that can support companies to engage in biodiversity issues.

The publication complements existing and ongoing work on business and biodiversity, such as the Economics of Ecosystems and Biodiversity (TEEB) study for business (http://www.teebweb.org/).

www.unep.org
United Nations Environment Programme
P.O. Box 30552 Nairobi, 00100 Kenya
Tel: (254 20) 7621234
Fax: (254 20) 7623927
E-mail: uneppub@unep.org
web: www.unep.org

UNEP

For more information, contact:
UNEP DTIE
Sustainable Consumption and Production
15 rue de Milan
75441 Paris CEDEX 09
France
Tel: +33 1 4437 1450
Fax: +33 1 4437 1474
E-mail: unep.tie@unep.org
www.unep.fr/scp

UNEP World Conservation Monitoring Centre (UNEP-WCMC)
219 Huntingdon Road,
Cambridge CB3 ODL, UK
Tel: +44 1223 277314
Email:
BusinessandBiodiversity@unep-wcmc.org
www.unep-wcmc.org

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